THE INQUA NEWSLETTER

Quaternary Perspectives

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INQUA President's message

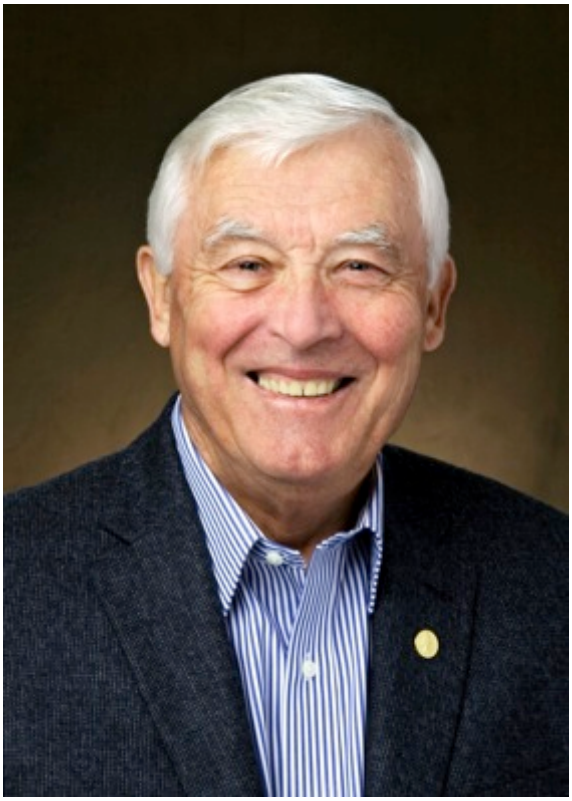
I have spent my entire career as a Quaternary scientist and I am looking forward to presiding over an organisation for which I have a great fondness. Multidisciplinary science and international involvement are at the very heart of INQUA and it is important to me that we remain focused on those missions.

As we all know, our Earth is facing an uncertain future because of global warming, stress on natural resources, degradation of natural habitats, extinction of species, and the effects of hazards with an ever-growing global population. Through our research at the interface with the modern world, we are uniquely positioned to play an important role in keeping these issues alive in the public eye and providing policy makers with knowledge upon which to make informed decisions.

For the strength of our organisation it is important that, through the projects, workshops and field trips sponsored by the five INQUA Commissions, we integrate activities directed to the future well-being of our Earth. Other organisations involving Quaternary scientists, notably PAGES (Past Global Changes), the ICSU (International Council for Science) GeoUnions and SCAR (Scientific Committee on Antarctic Research), are moving in similar directions and it is important that together we forge relationships in order to provide necessary information for addressing global problems.

There has been significant turnover in the INQUA Executive Committee and Commission structure with the Secretary General, three of the four Vice-Presidents, and three of the Commission Presidents being new to their positions. The challenge for us is to strengthen our organisation and to ensure that it remains relevant in today's world. Currently, there are 50 nations in INQUA providing delegates to the International Council. Other nations have expressed an interest in joining, and we will be working with them to ensure that they become part of the family.

Previous Executive Committees and Commissions have done a very good job in working with early career scientists and those from developing nations. An inter-Congress symposium organised by early career scientists was very successful, and for the continued success of INQUA it is vital that we continue to support those activities



The primary activity of INQUA is to organise a major international Congress. These continue to be very successful forums for Quaternary scientists as was witnessed recently in Nagoya, Japan, where 1800 of us congregated to discuss our research. Our congratulations and thanks go to our Japanese colleagues for providing a venue and an excellent scientific programme. The Executive Committee look forward to working with our colleagues from Ireland to ensure success for the next Congress in Dublin in 2019.

Allan Ashworth
September 2015

XX INQUA Congress 2019, Dublin, Ireland

INQUA Funding

INQUA funding is designed to support and facilitate activities that are considered priorities by its five Commissions. Commissions sponsor applications for funding, and the INQUA Executive Committee makes decisions concerning the allocation of funding. There are three categories for INQUA funding:

1. funding for International Focus Groups (IFGs),
2. funding for projects,
3. funding for skills enhancement.

All applications for INQUA funding (e.g. IFGs, projects etc.) have a single deadline each year: **31st January 2016**. All applications using the relevant forms must be submitted to the Secretary General, via Commission Presidents, by this deadline. Applicants should contact Commission Presidents well in advance of the final deadline to ascertain the internal deadline of the relevant Commission. Further information on these deadlines may also be found on the Commission websites.

INQUA-Recognised Activity

You may also apply to INQUA for non-financial recognition of international activities. Please submit the relevant form to the relevant Commission President by **31st January 2016**.

INQUA ECR Committee

The new INQUA Early Career Researcher (ECR) Committee was established following the XIX INQUA Congress 2015. For the present inter-Congress period 2015-2019 the goals of the ECR Committee are to:

1) increase Commission communications with their representatives and members (and potential members)
2) establish ECR Committee guidelines for the election of (i) a chair for the ECR Committee, and (ii) new representatives
3) contribute to the organisation of the XX INQUA Congress in 2019 in Dublin
4) encourage ECRs to lead, and participate in, projects including International Focus Groups (IFGs)
5) increase IFG visibility & communications with the INQUA community (for example, writing a report for *Quaternary Perspectives*, communicating activities through ECR social media etc.)
6) update and improve the INQUA website, making it more engaging and user-friendly
7) increase the visibility of INQUA through, for example, social media (e.g. twitter etc.), automated subscribe/unsubscribe Commission member lists, an ECR INQUA blog for both Commission and non-Commission ECRs etc.

Interested? Get involved here:

- Visit us here http://www.inqua.org/ecr.html
- Like us on facebook and post any relevant information here: https://www.facebook.com/INQUAECR
- Follow us on Twitter here https://twitter.com/INQUA_ECR
- Send us news, suggestions, questions and comments at inquaecrs@gmail.com

Welcome to CMP

The aim of the INQUA Commission for Coastal and Marine Processes (CMP) is to promote communication and international collaboration in basic and applied aspects of Coastal and Marine Quaternary research. We currently have one IFG and we are moving forward to develop two additional IFGs. These are concentrated on 1. PALSEA: Sea-Level variability in the past to assist in modelling future sea-level change and associated impacts; 2. Shelf and deep marine environments, and; 3: Past, Present and future coasts (coastal evolution; including coastal archaeology). Please contact Craig Sloss if you are interested in being involved in an IFG or interested in developing a project associated with a specific IFG.

Craig Sloss,
President of CMP

CMP – Nagoya Congress report

The Congress had 1,790 participants from 68 countries and regions, including 398 students. CMP contributed to:

- Coastal evolution (a very broad term that covers ecological and geomorphological evolution) – 105 papers.
- Holocene and Late Quaternary sea level change (e.g. 22,000 to present) – 58 papers
- Tsunamis and storms – 47 papers
- Deltas and continental shelves – 47 papers
- Coastal human interactions – 44 papers
- Interglacial sea levels – 20 papers
- Ice and sea level – 3 papers

Business Meeting:
Elections were held with the following results:
President: Craig Sloss (c.sloss@qut.edu.au; Queensland University of Technology, Brisbane, Australia).
Vice Presidents: Anders Carlson (acarlson@coas.oregonstate.edu; Oregon State University, Corvallis, Oregon, USA) and Yusuke Yokoyama (yokoyama@aori.u-tokyo.ac.jp; University of Tokyo, Japan).
Secretary: Lynda Petherick (lynda.petherick@xjtlu.edu.cn; Xi'an Jiaotong-Liverpool University, Suzhou, China)
Early Career Representative:
Alistair Clement (A.Clement@massey.ac.nz; Massy University of New Zealand)
Advisory Group: Till Hanebuth; Helmut Bruckner; Teresa Bardaji; Cari Zazo; Javier Lario; Vaughn Barric; Kim Cohen; David Smith; Ed Garret; Vanessa Heyvaet, Fabrizio Antonioli.

The potential of having three overriding IFGs was discussed related to the following themes.
- Sea-level (PALSEA): Already an existing IFG, this is of interest to the Holocene/Quaternary sea-level and modelling communities. PALSEA2 is a PAGES IGBP (International Geosphere-Biosphere Programme) focused on using past changes in sea level and Earth's cryosphere to constrain future sea-level rise in response to climate change. http://people.oregonstate.edu/~carlsand/PALSEA2/Home.html
Projects proposals in association with PALSEA2 are welcome. If you are interested please contact the PALSEA2 lead scientists to discuss options.
- Past, present and future coasts (coastal evolution) – NEW IFG: deltas and the marginal marine environment, coastal "evolution", coastal hazards, and human interaction (including archaeologists, coastal managers). So far we are waiting for volunteers to contribute to this IFG. If you are interested in developing this IFG please contact Craig Sloss (c.sloss@qut.edu.au).
- **Shelves and deep marine – NEW IFG**: from present-day seafloor processes to the evolution of the margins at Quaternary scale. Contact: T.Hanebuth (thanebuth@coastal.edu), J.Vaughn Barrie (vbarrie@nrcan.gc.ca) and C.Sloss (c.sloss@qut.edu.au) if you are interested in contributing to this IFG.

CMP in the spotlight:
- Robert E. Kopp (Rutgers, The State University of New Jersey) was awarded the "Sir Nicholas Shackleton Medal". The medal is awarded once every four years to an outstanding young Quaternary scientist, chosen by his or her peers and evaluated by a blue-ribbon committee of distinguished scientists. Roberts's research focuses on understanding uncertainty in past and future climate change, with major emphases on sea-level change. http://www.bobkopp.net/
- Cecile Bateman (Royal Belgian Institute of Natural Sciences, Geological Survey of Belgium) received the INQUA Honorary Life Fellowship.
- Evelien Boes, a PhD student working on the QuakeRecNankai project, won a Student Poster Award at the INQUA Congress. The project explores the potential of Lake Hamana (Shizuoka Prefecture, Japan) to hold a long and reliable sedimentary record of palaeo-earthquakes and -tsunami along the Nankai-Suruga Trough. http://quakerecnankai.blogspot.be/2015/08/evelien-boes-wins-inqua-best-student.html

CONGRATULATIONS TO ALL!

PALSEA2 - 1301F

Project Leaders: Anders Carlson (University of Wisconsin-Madison, USA), Andrea Dutton (University of Florida, USA), Antony Long (Durham University, UK), Glenn Milne (University of Ottawa, Canada).

PALSEA2 Workshop: Data-Model Integration and Comparison: Tokyo, Japan, 22nd – 24th July 2015.

Authors: Karen Vyverberg[1], Benoit Lecavalier[2], Gaylen Sinclair[3].

Organising Committee and Conveners: Glenn Milne[4], Yusuke Yokoyama[5], Ayako Abe-Ouchi[5], Anders Carlson[3], Andrea Dutton[1], Antony Long[6].

[1]University of Florida, USA; [2]Memorial University, Canada; [3]Oregon State University, USA; [4]University of Ottawa, Canada; [5]University of Tokyo, Japan; [5]Durham University, UK.

The PALSEA2 (PALeo constraints on SEA level rise) Working Group held their third meeting at the Atmosphere and Ocean Research Institute at the University of Tokyo 22nd – 24th July 2015. Funded by PAGES and INQUA, PALSEA2 is the second phase of a cross-disciplinary effort to improve quantitative reconstructions of past sea-level and ice sheet variability. This year's workshop focused on data-model integration as a way to reduce uncertainty in reconstructed,

modern, and projected sea-level and ice sheet evolution. Three days of formal talks, informal discussions, and interactive poster sessions showcased climate research in the warm periods of the late Pliocene, the last interglaciation (LIG), and the Holocene as well as the last deglacial interval.

With average global temperatures and atmospheric CO_2 concentrations slightly above pre-industrial values, the Pliocene is often considered a comparable warm period for near-future climate conditions. While considerable progress has been achieved (Dutton et al., 2015) workshop participants agreed that incomplete and/or chronologically uncertain sea-level records from this time period prevent the accurate reconstruction of rates of sea-level change, and that concentrated efforts to constrain the maximum amplitude of the Pliocene global sea-level will be more fruitful. Furthermore, translating the Pliocene sea-level record into a global ice-volume history requires careful consideration of vertical displacement of palaeoshorelines due to dynamic topography. Current model results put this vertical displacement on the order of tens of metres for some shorelines since the Pliocene (Rovere et al., 2014), and discussion on the topic by workshop delegates focused on improving model inputs and palaeoshoreline elevation measurements.

Talks and discussion around the LIG sea-level record identified recent success in narrowing the maximum global mean sea level (GMSL) estimate to ~6-9 m above modern sea level (Dutton and Lambeck, 2012; Kopp et al., 2013), but the focus was primarily on the present issue of determining the timing and number of intra-highstand sea-level oscillations. Site-specific sea-level reconstructions around the globe show LIG histories that are not all compatible with a single GMSL curve, indicating that further work is needed to assess the accuracy and precision of these reconstructions. Multi-proxy approaches to empirical climate and ice sheet reconstructions can be used to improve boundary conditions in coupled ice sheet-climate models – a need highlighted by several delegates – and lead to a more accurate estimate of GMSL change.

The Holocene sea-level record is relatively well constrained compared to previous warm periods, with a fair amount of empirical sea-level information augmented by statistical techniques to identify trends in the data. Compilations of observational sea-level data from different proxies over the last 2 ka paired with a Gaussian process model, for example, reveals sub-millennial GMSL changes (Kemp et al., 2011). Remaining uncertainties in constraining the timing and relative contributions of the Greenland and Antarctic ice sheets to Holocene sea-level rise were discussed, as were the semi-empirical statistical methods that are sometimes used to provide projections of future sea-level rise.

The last deglaciation, and glaciations in general, were also examined as important examples of climate-ice sheet interactions that can improve our understanding of the system as a whole. Constraining the magnitude and timing of deglacial meltwater events, for example, can lead to a better understanding of ice sheet dynamics and climatic tipping points.

Throughout the workshop, several discussions to clarify uncertainties in proxy data or model outputs highlighted the need for consistent and transparent reporting procedures in climate and sea-level reconstructions. Such data – like cosmosgenic exposure ages or palaeoshoreline elevations – should be presented in a consistent format and include all available collection and measurement parameters, including interpretations. This concept was underscored by presentations on the construction of new databases for sea-level and palaeoclimate data that proposed methods for constructing a viable database as well as promoting standardisation in the community. Progress in the design of these databases has been achieved since the last PALSEA2 meeting in 2014 (Düsterhus et al., 2015).

Overall, this workshop highlighted progress in using palaeo-sea-level field data from both warm and cold climates to improve sea-level reconstructions as well as inform and improve climate and ice sheet models. Discussions on data reporting standardisation – especially the inclusion of uncertainties – complemented presentations on the progress of sea-level and palaeoclimate databases. Rigorous standards of data reporting are the most viable path to improving the types of data-model comparisons that will facilitate a more thorough understanding of climate forcing mechanisms and interactions, and ultimately enhance predictions of future sea-level change.

Fig. 1. PALSEA2 Workshop participants; Atmosphere and Ocean Research Institute, University of Tokyo.

References

Düsterhus, A., Rovere, A., Carlson, A. E., Barlow, N.L.M., Bradwell, T., Dutton, A., Gehrels, R., Hibbert, F.D., Hijma, M.P., Horton, B.P., Klemann, V., Kopp, R.E., Sivan, D. & Tarasov, L. (2015). Palaeo sea-level and ice-sheet databases: problems, strategies and perspectives. *Climate of the Past Discussions* 11, 2389–2404.

Dutton, A., Carlson, A.E., Long, A.J., Milne, G.A., Clark, P.U., DeConto, R., Horton, B.P., Rahmstorf, S. & Raymo, M.E. (2015) Sea-level rise due to polar ice-sheet mass loss during past warm periods. *Science* 349, 4019.

Dutton, A. & Lambeck, K. (2012). Ice Volume and Sea Level During the Last Interglacial. *Science* 337, 216–219.

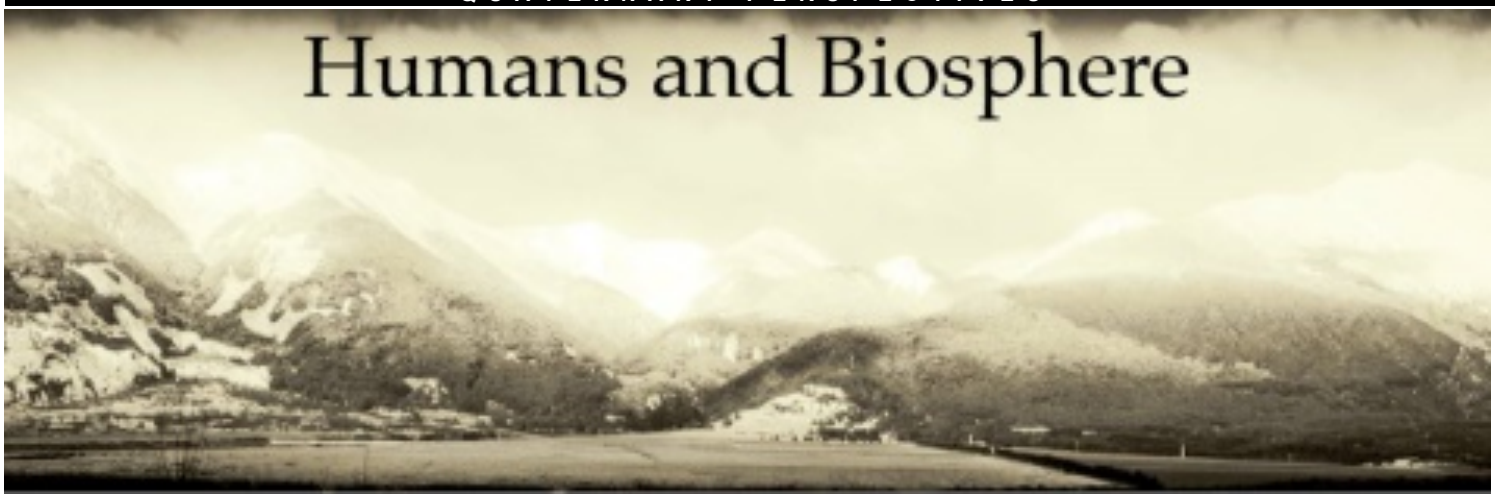
Kemp, A.C., Horton, B.P., Donnelly, J.P., Mann, M.E., Vermeer, M. & Rahmstorf, S. (2011). Climate related sea-level variations over the past two millennia. *Proceedings of the National Academy of Sciences of the United States of America* 108, 11017–11022.

Kopp, R.E., Simons, F.J., Mitrovica, J.X., Maloof, A.C. & Oppenheimer, M. (2013). A probabilistic assessment of sea level variations within the last interglacial stage. *Geophysical Journal International* 193, 711–716.

Rovere, A., Raymo, M.E., Mitrovica, J.X., Hearty, P.J., O'Leary, M.J. & Inglis, J.D. (2014). The Mid-Pliocene sea-level conundrum: Glacial isostasy, eustasy and dynamic topography. *Earth and Planetary Science Letters* 387, 27–33.

Acknowledgements

Funding for the PALSEA2 2015 workshop was provided from PAGES, INQUA and the Atmosphere and Ocean Research Institute at the University of Tokyo. We kindly thank the delegates and local hosts – Y.Yokoyama, A.Abe-Ouchi and their research groups – for making the workshop a success.



Welcome to HaBCOM

XIX INQUA Congress 2015 session: Cultural responses to Late Glacial - middle Holocene palaeoenvironmental changes in Europe

Conveners: Erick Robinson (University of Wyoming, USA), Felix Riede (Aarhus University, Denmark).

The session was one of 33 sessions organised under the Humans and Biosphere Commission (HaBCOM). HaBCOM had the second highest number of sessions behind the Palaeoclimate Commission (PALCOMM) at the XIX INQUA Congress. This illustrates the prominent role being played by interdisciplinary archaeological and palaeoenvironmental research within INQUA as a whole.

The session showcased the INQUA HaBCOM Project 1404p, *Cultural and Palaeoenvironmental changes in Late Glacial to Middle Holocene Europe—Gradual or Sudden?* The impetus for the project came from recent advances in palaeoenvironmental research that have highlighted the diverse magnitudes and tempos of environmental changes on inter-regional scales. Specifically, a consideration of the variability of human responses to palaeoenvironmental changes of differing durations and magnitudes such as gradual and cumulative ecosystem changes in different regions, abrupt cooling events caused by glacier meltwater outbursts, and extreme events such as volcanic eruptions and tsunamis warrant much greater and more systematic attention. This forces archaeologists to reconsider traditional models for human-environment interaction during this period; we can start to move from simple determinism to a more thorough understanding of the dynamics of human vulnerability/resilience.

The project brings young archaeologists and palaeoecologists together to integrate Europe-wide regional archaeological and palaeoenvironmental records. This data integration will provide a continental-scale comparison for developing a multiple model approach (chronological, species distribution, and agent-based modelling) investigating the diversity of human-environment interactions during the Late Glacial and early Holocene.

The session was very well attended, with standing room only throughout much of it. The President of the INQUA HaBCOM commission, Nicola Whitehouse, was in attendance throughout the entire session.

Project 1404p co-leaders E.Robinson and F.Riede gave the opening presentation, introducing the project aims and scope. The project members have isolated three time-slices that enable a focus on the variability of human responses to different kinds of environmental change: 1) the late Allerød to the first half of the Younger Dryas (YD), 2) the second half of the YD to the 11.4 ka event, and 3) the 9.3 ka event to the 8.2 ka event. E.Robinson and F.Riede presented an example of initial species distribution modelling work on the first time-slice. Species distribution modelling enables the development of empirical, quantitative, testable, and regionally comparative models of human-environment interactions by hindcasting palaeoecological and human communities for particular time-slices of focus. This presentation emphasised the importance of developing quantifiable units of measurement in archaeology, which are necessary for integration with palaeoenvironmental data to make robust inter-regional comparisons.

S.Griffiths (Manchester Metropolitan University, UK) and colleagues presented on "The 8.2ka event: evidence for human-environment interaction in north-west Atlantic Europe". This presentation highlighted how addressing the potential influences of abrupt climate change on humans requires archaeological studies to focus on more than just the span of the actual event, but in the several hundred years before and after the event in order to examine possible lead-lag relationships. A geo-referenced chronological database was developed for Britain, Ireland, northern France, Belgium, the Netherlands, and Luxembourg. A Bayesian statistical analysis was carried out on these data. According to Griffiths and colleagues, their results show a lack of evidence for devastating impacts on humans in the region, such as population collapse. In some regions there were changes in social organisation/mobility and lithic technology. The different evidence for changes in the archaeological record enable further investigations of the different adaptive strategies employed to make societies resilient to this event across the region.

M.Vander Linden (University College London, UK) and colleagues presented "A long hard road…: Assessing evidence for environmental and population history in the Eastern Adriatic and western Balkans during the Late Pleistocene and early/middle Holocene". This is a particularly interesting region for research on human-environment interaction during the Late Glacial and early Holocene because it has been argued that this region serves as a Late Glacial refugium, for plants, animals, and humans. They noted how, despite this region being central to discussions of the spread of agriculture into Europe from the Near East, consideration of abrupt climate changes such as the 9.3 ka and 8.2 ka events has been generally overlooked, due mostly to a lack of data. M.Vander Linden's ongoing project has changed this situation, with the collection of new data on hundreds of sites from the Final Palaeolithic to the Neolithic/Eneolithic. They noted that, in the Bølling-Allerød to YD, there were some slight fluctuations in site numbers, but there is little evidence for changes in behaviour. Regarding the relationship of early farming and climate change events, they note that farming appears in the region before the 8.2 ka event, and that, despite having evidence for changes in population structure and in the use of certain landscapes, there appears to be no association with climate forcing.

H.Seppa and M.Tallavaara presented, "Did the mid-Holocene environmental changes cause the boom and bust of hunter-gatherer population size in eastern Fennoscandia?" They test the assumption that hunter-gatherer population sizes are constrained by climate and environmental forcing by investigating the co-variation of the summed probability distribution of radiocarbon dates, which is used as a proxy of population change, with locally available high-resolution environmental records. The key point is made that we can only test these possible relationships by

using local records and focusing on biotic proxies that would have been relevant to hunter-gatherer food availability and population dynamics at the time of investigation. They find that major population growth occurred during a period of high summer temperature and productivity of terrestrial, lacustrine, and marine ecosystems from 7500-5500 cal. years BP, followed by a major decline 5500-4000 cal. years BP during a period of cooling and forest decline. An interesting result from this research is that, after the transition to agriculture, long-term population growth was less constrained by environmental forcing.

K.Kitagawa (National Museum of Natural History, France) and colleagues presented on "Subsistence practice and mobility of hunter-gatherers during the Late Upper Palaeolithic and Mesolithic of the steppe of Eastern Europe". They presented zoo-archaeological and stable isotope analyses from multiple open-air sites spanning the period 20,000-8000 cal. years BP in order to test the hypothesis that hunter-gatherer populations underwent shifts in their subsistence strategies around the Pleistocene-Holocene transition. These kinds of analyses are very important because, in general, there has been little research on human responses to environmental change during this period on the Eastern Europe steppe, and more specifically, zoo-archaeological data provide a direct proxy for how specifically hunter-gatherers adapted to change. Furthermore, in the regions of Western Europe where there is a longer tradition of research into human responses to different kinds of environmental change during this period, taphonomic processes have limited the preservation of bone in many areas.

N.Kitchel (University of Wyoming, USA) and colleagues expanded the geographical scope of the session by presenting on "Abrupt climate change events and the Paleoindian period in the northeastern US". They compiled a radiocarbon dataset for all Paleoindian and Early Archaic period sites from the northeastern US. Bayesian modelling was carried out to test the chronological relationships between different typological groups and sub-phases of the Paleoindian, and whether changes in these phases possibly occurred around periods of abrupt climate change. The results suggested that the only major cultural change that might have occurred in response to climate change was the initial human colonisation of the region. This initial modelling work suggests the hypothesis that the human colonisation of the northeastern US occurred after caribou populations were bolstered by rapid but brief cooling during Greenland Interstadial-1b (GI-1b). They note that the earliest colonisation of this region provides evidence for typologically different groups living contemporaneous with each other, possibly suggesting different cultural adaptive strategies to these newly encountered landscapes.

R.Wragg-Sykes (University of Bordeaux, France) and colleagues presented an introduction to the newly funded INQUA HaBCOM project 1502p, "Reconstructing hunter-gatherer mobility: building new inter-disciplinary frameworks in the Quaternary". The impetus for this project has been the lack of critical discussion around how to build common analytical frameworks to examine hunter-gatherer mobility across different specialist boundaries. For example, specialists in zoo-archaeology, stable isotopes, and lithic analysis often ask similar questions that concern hunter-gatherer mobility, but there has been little attempt to focus on the intersection of the different data generated and how the integration of these data might help to test different models of mobility. This project creates an international working group to promote integrative approaches of best practice that balance the disadvantages of single methods. It develops online resources and databases focusing on the most promising regions and periods that will enable comparisons among multiple forms of data. Because mobility is one of the main ways that hunter-gatherers buffer impacts caused by environmental changes, project 1404p and 1502p are developing means for knowledge exchange between projects.

The session closed with presentations from two invited speakers. A.Moreno (Pyrenean Institute of Ecology, Zaragoza, Spain) and INTIMATE (INTegrating Ice-core, MArine, and TErrestrial records) Working Group colleagues presented, "Reconstructing western Europe climate since last deglaciation and Early Holocene: an INTIMATE compilation of records." The impetus behind this working group was that, unlike marine and ice core records, terrestrial palaeodata are often not available in databases that are easily accessible to the non-specialist, and are therefore left out of comparisons and modelling exercises. The presented compilation comprises 50 archives that include lake records, speleothems, ice-cores, and terrestrial proxies in marine records. The aim is to provide the wider palaeo-community with a consistent compilation of high-quality terrestrial records, to facilitate model-data comparisons, and to identify key areas of interest for future investigations of last deglaciation and early Holocene climates. The compilation showed how, during deglaciation, changes in atmospheric and ocean circulation affected the global distribution and fluxes of water and heat, resulting in a series of abrupt climatic changes, which have broadly similar trends in palaeoclimate records from many sites throughout the North Atlantic region. This compilation enabled this working group to investigate the latitudinal gradients in response times at the onset of deglaciation, the characterisation of temperature changes and precipitation variability during GI-1, and the evidence for response of ecosystems to early Holocene abrupt events. This emphasis on different responses of regional ecosystems and leads-and-lags in their responses, viewed through multiple proxies, provides a key influence to INQUA project 1404p, because it aims to add archaeological data in order to consider different human responses.

L.Straus (University of New Mexico, USA) closed the session by discussing the changes in research on human responses to environmental change in recent years. He emphasised the increasingly important role of high-resolution radiocarbon chronology and critical assessment of taphonomic problems if we are to ask potentially answerable questions regarding the relative impact of climate and environmental changes on human societies. He questioned just how bad a minor cold snap would be for hunter-gatherers, compared to a longer, more intensive cold period: "How much slack or margin for error did hunter-gatherers have with these kind of changes, particularly in the mid-latitudes where more flexibility would be afforded?" He made the important point that population density would determine the relative impact that a climate change event would have on a particular hunter-gatherer society. Furthermore, culture would have been the important determinant of whether a particular change would impact a particular society. His central message is that we are only starting to really investigate these problems with the inter-disciplinary vigour and multi-scalar data that they deserve, for which he saluted the efforts of project 1404p.

Overall, this session highlighted the bright future ahead of research on human and ecosystem responses to different environmental changes during the Late Glacial and early Holocene. This session highlighted the many challenges that face this kind of research, namely the very basic challenge of integrating disparate archaeological and palaeoenvironmental data that was often recorded years ago, before the advent of high-precision AMS (Accelerator Mass Spectrometry) dating and critical assessments of site stratigraphy using Bayesian statistics. Furthermore, this data was collected, interpreted, and published according to different kinds of research questions, many of which were based in culture historical descriptions, rather than the investigation of behavioural and adaptive change in the face of a range of different environmental factors. Project 1404 takes on this challenge by isolating an area of research on which different regional specialists can come together to develop a theoretical and methodological framework for integrating this different data and making it more amenable to quantitative and comparative research questions.

African large carnivores: impacts on ecosystems and humans interactions – 1402P

Project Leaders: Ogeto Mwebi (National Museums of Kenya, Kenya) and Jean-Philip Brugal (National Centre for Scientific Research, France & IFRA, Nairobi, Kenya).

Carnivores are major components of the ecosystems and their predatory activities have cascading influences on the functioning of the biosphere. Their influence on human behaviour dates back to pre-historic times. For example, Pleistocene spotted hyenas bone assemblages in Eurasia and Africa are found intermingled with those of Palaeolithic humans. This interaction is thought to have influenced, and continues to influence, the evolutionary behaviour of both humans and the carnivores themselves with their prey. Thus carnivores have been of great interest to archaeologists, palaeoanthropologists, social scientists and conservation biologists/ecologists. Studies on past and modern carnivore bone

modifications and accumulations play a key role in understanding human evolution and their associated palaeoenvironmental dynamics. Additionally carnivore bone accumulations inform us about their herbivore prey resources and the associated prevailing environmental conditions at their accumulation sites during the period of deposition. To understand large carnivores' evolutionary and social behaviours and their ultimate conservation, a combination of research approaches is therefore required. For example carnivore eco-ethological studies can inform evolutionary studies that may put observed carnivore traits into perspective. Similarly, understanding site taphonomic processes are important in the interpretation of palaeontological remains and bone assemblages and hence provide greater understanding of palaeoecology, climate and faunal dynamics during the Quaternary period.

While the role of carnivores in helping understand human and faunal evolution has long been recognised, there exists no forum in Africa where researchers involved in modern and past carnivore research can come together to exchange ideas and focus upon common areas of interest. This project, that was inaugurated last year with a long-term goal of forming an IFG, aims to bridge this gap. This brought together young and senior researchers working on diverse aspects of the modern and fossil record with a scientific purpose of linking Pleistocene scientists and Holocene scientists as well as to nurture the skills of upcoming researchers. We started with carnivore researchers and we shall recruit herbivore researchers in due course. This is because studying carnivores cannot be done in isolation; their prey base and habitat requirements need to be included. The ultimate aim of the project is to integrate modern, palaeontological and zoo-archaeological approaches to understanding predator-prey and human-carnivore interactions with their ecosystem dynamics over time and space. Research approaches to understanding carnivore evolution and their interactions with prey and humans have been improving over time (e.g. through the use of isotopes to reconstruct diet); the results of such investigations need to be shared and their merits and limitations discussed. Similarly, conservation approaches for large carnivores are diverse with various goals that sometimes lead to formulation of conflicting carnivore management strategies. To integrate the diverse perspectives requires open discussions using forums with a multidisciplinary audience.

To achieve our goal of integrating multidisciplinary perspectives in understanding carnivores; this year with INQUA's funding, we proposed and held a 'carnivores' session within the 5th biennial EAAPP (East Africa Association of Palaeoanthropology and Palaeontology) conference held at the National Museums of Tanzania and House of Culture 3rd - 6th August 2015. We saw this as an opportunity to advertise our project, reach out to a larger audience and recruit more members who might be interested in our topic. The three-day meeting covered a wide range of themes: palaeontology and palaeoenvironments, early Stone Age archaeology to post Late Stone Age archaeology, cultural heritage management and advancement of prehistory education. Our project's session 'Carnivores and their Prey' had six presentations. T.Adhola talked about historical challenges in conservation of large carnivores in Kenya, A.Mneza's presentation discussed effects of giraffe skin disease on giraffe-lion interactions in Ruaha National Park in Tanzania, L.K.Horwitz and colleagues discussed the cheetah prey taphonomy in Mountain Zebra National Park in South Africa, O.Mwebi and J.Brugal discussed bone taphonomy of the two sympatric hyaenas in Kenya, and N.Gitahi and colleagues gave forensic insights into the predatory behaviour of the 'Human-Eaters' of Tsavo. Some of the participants of the conference appear in the photograph below and

Fig. 2. EAAPP conference participants, Dar es Salam, 2015.

more information about it is posted on their web/face-book page.

Following last year's conference and workshop recommendations; a two-day workshop for carnivore bone identification, ecology, taphonomy (marks, coprolites, etc.) and scat analysis is planned in late November (27th – 28th) or early December (3rd - 4th) 2015. It will be held at the National Museums of Kenya in Nairobi. We ask those interested in participating to contact us (ogeto_mwebi@yahoo.com) as soon as possible. Students and young/senior scientists are encouraged to participate. We would also like to notify masters and PhD students studying carnivores that we shall give a small financial grant (to meet certain field logistic costs like research permits etc.) to two east Africans.

Modelling human settlement, fauna and flora dynamics in Europe during the Mid-Pleistocene Revolution (1.2 to 0.4 Ma) - 1403P

Project Leaders: Jesús Rodríguez (National Research Center on Human Evolution, Spain), Ana Mateos (National Research Center on Human Evolution, Spain), Christine Hertler (Senckenberg Forschungsinstitut, Germany), Maria Rita Palombo (Università di Roma "La Sapienza", Italy).

Website

Authors: C. Hertler[1], J. Rodríguez[2], A. Mateos[2], & M. R. Palombo[3].

[1]Senckenberg Forschungsinstitut, Germany; [2]National Research Center on Human Evolution, Spain; [3]Università di Roma "La Sapienza", Italy.

The main aim of the project is to identify and interpret the distribution and dispersal patterns of early hominins in Europe in conjunction with a series of well-documented shifts in palaeoclimate, the so-called Mid-Pleistocene Revolution (MPR). These shifts exerted profound effects on the structure and constitution of ecosystems in Europe and they can be traced in the fossil record of both animals and plants. While the many research questions which are evidently raised by such an intertwined meshwork of topics shall be studied in the frame of a joint international focus group, the present projects lays the foundations for such a work in providing and organising the necessary infrastructure. In the initial phase of the project we identified crucial data sources and developed a strategy to make it accessible for the scientific community (Fig. 3). We introduced a joint meta-tool on several occasions including session H22 at the XIX INQUA Congress held in Nagoya, 2015.

The main activity of the project in the present phase consisted of an assessment of potential modelling procedures, a comparison of their respective advantages and achievements, as well as the identification of potential tools for the evaluation of the datasets by the joint and web-based interface. We organised a series of sessions for a conference on hominin expansions held by the ROCEEH (Role of Culture in Early Expansions of Humans) project in Frankfurt (13th – 17th July 2015) http://www.roceeh.net/network/expansions-2015/). The session started with an introduction to the project and a problem-based summary. Following this, we focused on the introduction and discussion of recent modelling techniques, among others agent-based modelling, graph theory and recent approaches in geoinformatics. Each of the approaches was introduced by modelling specialists who are not necessarily geo-scientists. In the interest of an adequate application of rather sophisticated modelling approaches we invited informaticians and mathematicians with an expertise in the respective approaches and combined their expertise with exemplifying case studies.

The conference included some theoretical, but mainly methodological, contributions. The epistemological nature and limits of modelling approaches were addressed by M.Gutman who focused on the problem of the correspondence between the simulation (the model) and the real process. Agent-based modelling appears as one of the most promising tools to simulate human expansions, and I.Timm provided a nice overview of its fundamental applications, potential and limitations.

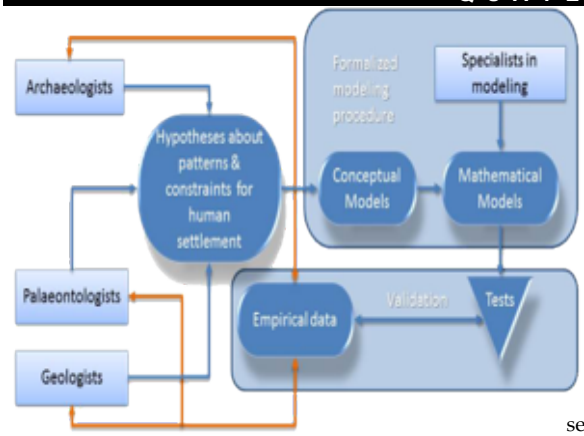


Fig. 3. Project 1403P structure.

Many contributions focused on the study of the causes of dispersals and the tools to model dispersal processes. Models should be fed with data, thus J.Rodríguez analysed the distribution of Pleistocene palaeontological sites in Europe and how it may affect our perception of the distribution of mammals in the past. The effect of climate change on dispersals during the early Pleistocene was addressed by M.Palombo through an analysis of the dispersal events, shifts in biodiversity and turnovers of the large mammal faunas in SW Europe. Agent-based models were used by E.Hölzchen to explore different 'Out of Africa' scenarios, while C.Heise presented a different tool to model expansions - the methods based on graph theory. B.Duppe introduced the use of cellular automata to model the spatial distribution of the multiple and complex environmental factors that may influence the dispersal behaviour of hominins. Although not restricted to it, dispersion is closely linked to long-distance movement thus, T.Müller focused his presentation on the role of learning and environmental factors on the long-distance movement of animals. Niche modelling and other tools commonly used for the study of the distribution and dispersion of recent organisms were the main subjects of the presentation by B.Sshröder-Esselbach. The aim of the project is not only focused on dispersion processes but also on the dynamics of climate change and their effect on

Fig. 4. Presentations (E.Hölzchen) at the ROCEEH conference, Frankfurt.

the biotic and abiotic environment. Consequently, the conference also included some examples of the use of modelling approaches to simulate other phenomena different from dispersions. D.Capolongo presented a numerical landscape evolution model to be used in geomorphological studies and C.Carleton presented a reappraisal of the relationship between climate change and the dismissal of the Classic Maya civilisation based on time series analyses. But factors other than climate affect hominin survival and their dispersion opportunities. Ecological competition is a key factor that should be to taken into account and R.Volmer introduced a model to evaluate the competition of food resources between secondary consumers with an example of competition between small carnivores and humans in SE Asia during the Holocene.

From all the above, we are now reformulating our major research questions in a more formal context, integrating the various approaches in a single research programme.

Evolution of ground squirrels (Spermophilus) and the Mid-Late Quaternary environment of the northern Black Sea area: Ground squirrels on the March – 1501

Project Leaders: Lilia Popova (Taras Shevchenko National University of Kyiv, Ukraine), Lutz Christian Maul (Senckenberg Research Institute, Research Station of Quaternary Palaeontology, Weimar, Germany).

Authors: L. Popova[1], Ju. Veklich[2], L. C. Maul[3], P. Shydlovskyi [1], V. Shevchyk[1], K. Bondar[1].

[1] Kyiv National Taras Shevchenko University; [2]Ukrainian Geological Survey, [3]Senckenberg Research Institute.

Well-known peculiarities of ground squirrel ecology and behaviour make this group an eminently suitable subject to study palaeoenvironmental constraints affecting species distribution and speciation. In addition, transformations of *Spermophilus* species' range can be used to imply changes of biogeographical barriers. Supporting evidence for such events has been found in the Dnieper area, which witnesses a striking variety and strength of Quaternary geological processes; new events of species range dynamics as a result of environmental constraint changes (we call such events PBEs - palaeobiogeographical events), are plausible to be revealed there. The field workshop "Taphocoenoses of the Quaternary fauna and geological events" was held from 4th - 8th June in order to form a multidisciplinary team studying PBEs. A bus excursion along the Dnieper focused on impact of geological events on the system of environmental constraints and, therefore, on species ranges. Kaniv Natural Reserve (Ukraine) served as a base camp.

There was another focus of our work - the evolutionary one - which turned out to be the most debatable. L.Popova assumes that local evolutionary challenges of ground squirrels dominate global ones. It can be named an 'opportunistic style of evolution' that ground squirrels do not show pronounced adaptive trends and succeeded during the Quaternary. This ground squirrels` opportunism would be a good explanation of their inefficiency for solving biostratigraphical tasks. Two evening meetings in Kaniv Natural Reserve were dedicated mostly to discussions of these issues.

The field (palaeogeographical) part of the meeting was planned to be easily understandable for participants of different countries and research backgrounds. Y.Veklich emphasised two main geological factors of the area. The first is the Dnieper (Saalian) glaciation, the only Quaternary glaciation in this region, the till of which is a good stratigraphical benchmark. Even if the till is scoured, a sequence can be easily subdivided into a pre-Dnieper and a post-Dnieper part (without and with erratic granite material, respectively). The second is the Dnieper river, which has formed a huge alluvial plain on the left bank and undercut terrace staircases of its small tributaries on the right bank. One of these terrace staircases was our first stop (Khalepia locality). The most ancient (post-Dnieper, so called periglacial) terrace of the staircase contains a tundro-steppe mammal fauna, including two ground squirrel species, the extinct *S. superciliosus* and *S. odessanus*, still living in this region. Then we observed left bank dunes opposite Rzhyschiv town. The right bank exposures were crowned there with the Dnieper till and loess-soil cover. Somewhat downstream the till was replaced with limnoglacial (post-Dnieper) and alluvial (pre-Dnieper) deposits. The section shows evidence of neotectonic movements or base level changes after the forming of the alluvial unit. Both could result in a re-arrangement of biogeographical barriers.

By the evening of the first excursion day we reached the zone of Kaniv dislocations. The next morning we crossed two of these glacio-tectonic scales, moving through the Malanchyn Potik gully. The uppermost, probably water-encroached part of the allochthone was almost flowing and formed tongues and protrusions penetrating Quaternary silts. A land snail fauna of this silt shows evidence of cold, but not extreme, environmental conditions (according to V.Prisiazhniuk, Geological Institute of National Academy of Sciences of Ukraine). Also a few vole teeth and a ground squirrel had been recorded, but they were not sufficient to determine the age of the silt biostratigraphically. However, stratigraphic information can be implied from Cretaceous and Jurassic material in the silt. Its re-deposition might be possible only after the diapiris of Jurassic clay protruded through many-meters of Cretaceous and Palaeogene sands and sandstones. As the dislocation is believed to be formed during the terminal phase of the Dnieper glaciation, all the fauna must be of the same geological age i.e. 200 ka.

Our route on the next day (Kostianiets) included outcrops of dislocated Jurassic, Cretaceous and Palaeogene rocks. However, the main goal of the trip was to see a late Holocene deposit, which contains a burrow taphocoenosis with two ground squirrel species (*S. superciliosus* and *S. odessanus*). There was an on-site discussion about taphonomy of burrow localities.

The next day was dedicated to locations south of the town of Kaniv. First, we dropped into the Khmilna sand pit to see a big fold of glacial and fluvio-glacial deposits. Then we visited the site of Mezhyrich, well known for its Palaeolithic dwellings made of mammoth bones. P.Shydlovskyi lectured on the Mezhyrich Gravettian human population and its interaction with the environment. Mezhyrich is interpreted as the base camp, in contrast to summer camps found on the plateau. The two site types suggest a seasonal structure of human hunting activities connected with the mammoth migration. When main mammoth pastures were unsuitable during the spring-summer period (even for herbivore giant), the flood-plains must have been impassable for ground squirrels.

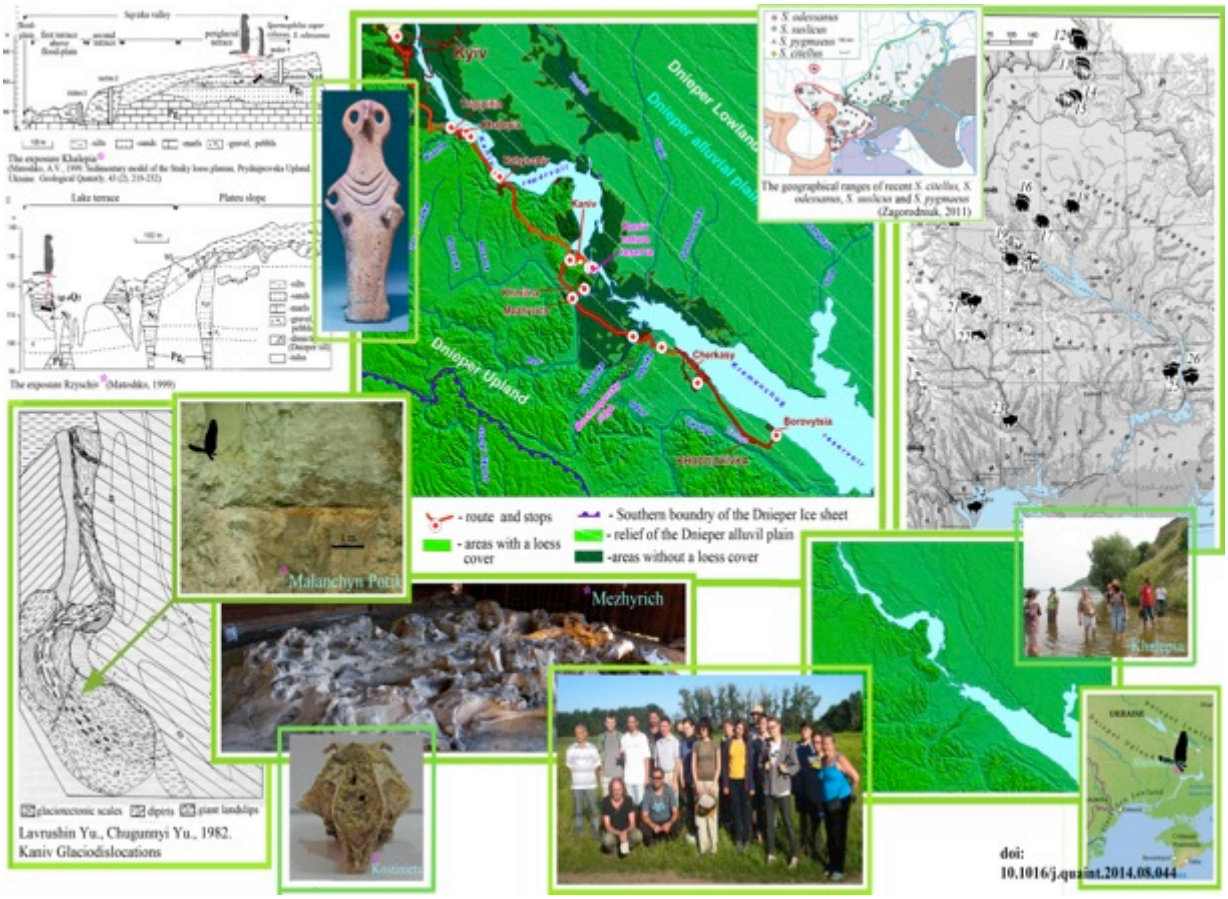


Fig. 5. Field workshop "Taphocoenoses of the Quaternary fauna and geological events".

The landscape (see the map) and the herbaceous plant composition of the area stretching further to the south differ distinctly from that of the Dnieper right bank, as we were told by L.Shevchyk. Rivers behave in a completely stunning manner here e.g. the Irdyn' (a tributary of the Tiasmyn) and Irdyn'ka (a tributary of the Dnieper). The Irdyn'ka sometimes even changes the thread of stream and runs back, to Irdyn' and Tiasmyn when the Dnieper level is high. A plausible explanation is that Irdyn', Irdyn'ka and Tiasmyn inherited a dead channel, abandoned by the Dnieper, and all the area is in fact the former left bank, joined to the right bank, when the Dnieper cut off the loop. It is not the only loop of that kind here. The first one to the south from Moshnogirskyi Ridge is now framed by the rivers Ros', Fosa and Vil'shnka.

With this in view, a flat surface between the Tiasmyn and the Dnieper must be interpreted as a Dnieper terrace (unknown age), and the fauna of its alluvium must be also a left-bank one, with *S. pygmaeus* instead of the usual left bank species *S. odessanus*.

The next day, the head of the Museum of Kaniv Natural Reserve, O.Polishok, guided us through the rugged highlands of the reserve and told us about present-day trends of vegetation changes, and nature-conservative measures initiated by the reserve staff, as well as the ancient populations, from the Late Palaeolithic to the Old Slavic, who found refuge in these highlands.

After that we left Kaniv Natural Reserve, and went back to Kyiv, with a stop at the Museum of Cucuteni-Trypillian culture in Trypilla, where O.Kyrylenko told us about this most ancient farming population of the Ukrainian area.

The discussions during the meeting started with an introduction into the methods of geomorphological studies of fluvial processes (Yu.Veklich). The target group of this presentation was young Ukrainian palaeozoologists, dealing mainly with faunal remains from fluvial deposits. Then L.Popova presented her main ideas for her project. L.Maul, provided morphometric data from German and Polish samples of *Spermophilus* that showed trends in ground squirrel evolution during the Biharian (early to early Middle Pleistocene). However, these size trends seem to be limited to the above mentioned region and stratigraphic interval. Next, discussions were dedicated to the distribution and ecological preferences of *Spermophilus major* on the northern periphery of its range (N.Pogodina) and to the history of the study of fossil Marmotinae (M.Sinitsa).

The lecture session for the next day was opened by P.Shydlovskyi who told us about high mobility and population density of Gravettian mammoth hunters of the Dnieper area. However, there is no evidence of Gravettian sites within the triangle formed by valleys of the Dnieper, Desna and Trubizh rivers. The causes of this phenomenon are debatable.

The workshop was concluded with a brainstorming session aimed to formulate disputable issues and ways of solving them, and to develop a plan for our future activities. To start we have launched a "pilot project" that eventually could be developed into an IFG focused on species expansion and environmental constraints over the Quaternary. Already we have some promising results from our multidisciplinary collaboration, which we will publish in *Quaternary International* (*QI*). We are expecting other interested researchers to join us: http://www.inqua.org/habcom/projects/1501.html.

Welcome to PALCOMM

Hello, I'm the new president of the INQUA Palaeoclimate Commission - PALCOMM.

My name is Atte Korhola, I'm a Finn, and Professor in Environmental Change and Vice-Dean of Societal Interaction of the Faculty of Biological and Environmental Sciences at the University of Helsinki. I'm also the leader of the Environmental Change Research Unit, a research group focusing on large-scale environmental changes and their implications to societies. My other activities include, inter alia, a membership in the Research Council for Biosciences and Environment of the Academy of Finland (the main research funding organisation in Finland) and the Environment Panel of the European Academies Science Advisory Council (EASAC), while I'm also the Finnish representative of the Nordic Committee on Bioethics (NORDFORSK) and a Fellow of the Finnish Business and Policy Forum (EVA). I have acted as a consultant and adviser for several companies/enterprises in climate matters. I'm leading several international and national research projects and programmes and have over 100 scientific publications in international peer-reviewed literature dealing with global environmental changes and their impacts, water and air pollution, past climatic variability and ecosystem resilience.

We all know that the overall objective of PALCOMM is to enhance understanding of Quaternary climatic perturbations, transitions and abrupt events through the combined use of observations and modelling. PALCOMM has emphasised the need for quantitative reconstructions of climate and environmental parameters. PALCOMM has worked towards a closer integration of observationalists and modellers in order to (a) promote the use of climate models in hypothesis-testing mode, and specifically the design of experiments to address the specific challenges posed by the observations, and (b) the use of Quaternary records to evaluate the performance of the climate models used to predict future climate changes.

I strongly stand for these intentions. However, during my era as the president, I would also like to work towards better and more transparent reconstructions – and science, in general. Clearly, acknowledging also uncertainties and limitations of our procedures in trying to achieve reliable information from past climatic fluctuations, is a big step forwards.

The proxy data we use have heterogeneous origins that amplify reconstruction uncertainty due to proxy- and archive-specific technical challenges like record sparsity, age uncertainty and sampling time irregularity. Further challenges include multicollinearity, a great number of species and occurrences, many zero values (missing values) and that species invariably show non-linear responses to their environment. Despite these obstacles, we strongly agree that palaeoclimate reconstructions are essential to test how adequately climate models simulate long-term climate variability, and to identify potentially lacking mechanisms that propagate internal climate variability on annual to millennial timescales.

It is exactly now the time to understand that the Big Data era has begun also in the palaeoclimate sciences, and that the "scientific revolution" of quantum computing is being prepared. The scale of data sets targeted for our analyses consequently has increased by several orders of magnitude during the recent years. However, more data does not automatically mean more knowledge or better science. Climate science will need people, who are at the core of transforming data into knowledge. This means also the involvement of other fields, apart from data producers, for the common effort to make sense of proxy records. My hope is that PALCOMM will improve communication and collaboration between palaeoclimate scientists and in particular statisticians. This will be a breakthrough, compared to the present situation, where statisticians and climate scientists have too little interaction.

Due to this collaboration, novel statistical and numerical approaches could perhaps be developed, including new visualisation techniques and spatio-temporal reconstruction ideas that also take into account multiple sources of uncertainty. Once generated, they all have great potential to lead to new scientific discoveries and breakthroughs. The use of different temporal and spatial scales broadens our understanding of major climatic processes and regenerates our scientific thinking.

Atte Korhola,
President of PALCOMM

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INTIMATE news

A CPD (Climate of the Past Discussions) manuscript proposes a new definition for formatting the palaeoclimate data series, so that everybody can use the same database. The idea is to simplify the construction and homogenisation of palaeoclimate databases. While the idea has been around for some time, this manuscript proposes a fixed format for everybody. If adopted, this could change the way you are reporting your proxy data measurements. There is thus a DIRE NEED to discuss it, and INTIMATE is the right place for that. Since the manuscript is submitted at CPD, anybody and everybody has the freedom to add public comments, ideally before 6th November 2015. We are evaluating the "database and computers" side of things. This is also something to comment on.

With best regards,
Didier Roche

Welcome to SACCOM

Dear Quaternarists,

During the INQUA Congress in Nagoya I was honoured to be elected President of the Commission on Stratigraphy and Chronology (SACCOM). I shall do my best to promote the activity of this Commission that today, as never before, needs a strong commitment of all the members and I would say, all the Quaternarists.

Stratigraphy is the primary science for Quaternarists but in recent years it has been in some way blurred by the results of dating methods. The two wheels of the chariot have to go ahead together. Dating methods have improved in the recent years but I am sure more progress will be achieved in the near future with many unexpected consequences for our disciplines. We, and especially geochronologists, have to remember that not many people are aware of the problems hidden in a dating outcome. Many people uncritically accept these as solid truth while I recommend considering a working hypothesis to be tested and continuously checked. This is particularly true for some of the most applied methods such as OSL (Optically Stimulated Luminescence), ESR (Electron Spin Resonance) and Amino Acid Racemization (AAR) but also for more classic methods like U/Th, Ar/Ar and also radiocarbon dating. We still have many questions to solve related to our topics and I am sure we shall not solve them in the short inter-Congress period. All the fields of stratigraphy needs further research. Bio-stratigraphy, bio-chronology and bio-chronostratigraphy of the continental area are all still a great challenge; faunal units and floristic complexes have been recognised in many regions for a certain time span but still have a local significance and a lot of work remains to be done. Climato-stratigraphic units changing in time and space is also a matter of debate in many regions of the world. Morpho-stratigraphy is rarely used because, like litho/stratigraphy and facies analysis, it needs a basin-wide approach; pedo-stratigraphy is also largely neglected because few Quaternarists have deep knowledge of pedology and micromorphology of soil and sediments; archaeologists, palaeo-ethnologists and anthropologists mostly rely on the results of chronological methods and I think we shall see great advances in these branches with the progress of knowledge and resolution of uncertainties.

It is evident from previous lines that our work needs a multidisciplinary approach and I recommend a strict collaboration among scientists from different disciplines and a cross collaboration with the other INQUA Commissions. Many people said that I have many, too many doubts. I invite all of you to have doubts. Science progresses in this way, science progresses with doubts not with certainties. I request the collaboration of all of you to the activities of SACCOM and especially the SACCOM Focus Groups (Tephro-chronology and Vulcanism (INTAV), Section on Europen Quaternary Stratigraphy (SEQS), Asian Quaternary Stratigraphy (ASQUA), Loess and Pedostratigraphy (LFG) that are usually carried out with an annual meeting that includes a field trip; in this way participants can literally touch, with their hands, the reliability of the local stratigraphic and chronological setting. A special invitation to young researchers that are set to continue our work and to reach great achievements in the future.

Mauro Coltorti,
President of SACCOM

24th Biennial Meeting of the American Quaternary Association (AMQUA)

Retooling the Quaternary to Manage the Anthropocene

28th – June – 1st July 2016

Santa Fe, New Mexico

Website

Early registration: 1st October 2015 – 1st May 2016
Abstract deadline: 10th April 2016

In 2016, the International Commission on Stratigraphy (ICS) will decide on whether or not the Geologic Time Table will designate a new Anthropocene Epoch, and where in time to drive the Golden Spike. This decision is apt to shine the spotlight on the Quaternarist, who surely will be challenged and motivated to discriminate how geological and ecological rates and processes in the Anthropocene deviate from the Holocene and other times past. The 24th AMQUA Biennial Meeting will address the theme, **"Retooling the Quaternary to Manage the Anthropocene,"** and will kick-off on 28th June 2016 with **three exciting, all-day fieldtrips** addressing ongoing research in geology and palaeohydrology of the Jemez Mountains; vegetation, fire, and alluvial histories in the Jemez Mountains; and Paleoindian geoarchaeology in the Middle Rio Grande Basin. Our meeting's **keynote speaker is the award-winning science writer Andrew Revkin**, author of the *New York Times* blog DotEarth and himself a member of the Anthropocene Working Group of the Subcommittee on Quaternary Stratigraphy. Over two and a half days, our **25 invited plenary speakers** (see programme) will address different aspects of the "Retooling" challenges. The **remaining presentations will be contributed posters**, and will be displayed for the entirety of the meeting. All posters will be featured in **one-minute lightning talks** (1-2 slides) at strategic times during the technical program. When the meeting ends at noon on 1st July we will offer a **guided tour to the New Mexico Museum of Natural History & Science** in Albuquerque and an all-day **Neotoma/Tilia/Bacon workshop** at the University of New Mexico on 2nd July. We recognise the educational value of the meeting and strongly encourage students to register and apply for **AMQUA Student Travel Grants** on our meeting registration page. The 24th Biennial AMQUA meeting is sponsored by the University of New Mexico, United States Geological Survey (USGS) and other organisations. For more information, please visit our website.

IFG on Tephrochrononology and Volcanism (INTAV) Project "Enhancing tephrochronology as a global research tool through improved fingerprinting and correlation techniques and uncertainty modelling (phase II)" (INTREPID Tephra-II: INQUA-1307s)

Project Leader: David J. Lowe (School of Science, University of Waikato, New Zealand).

Author: David J. Lowe[1]

[1]School of Science, University of Waikato, New Zealand.

INTAV exists primarily to develop the science, methodology, and application of tephrochronology in multiple disciplines, and to mentor and support ECRs to maintain and enhance the discipline in perpetuity. INTAV represents one of the strongest examples of inter-environmental and inter-disciplinary working that exists in the geoscience community including INQUA. INTAV has three broad aims: (1) to improve the methodologies of tephrochronology and thus, through chronostratigraphy, support and underpin Quaternary projects (e.g. INTIMATE etc.), (2) to enhance volcanological applications through tephrostratigraphy, tephrochronometry, and petrological studies, and (3) to maintain and extend the capability of the discipline and to promulgate its value to the wider community, both scientific and laypersons. INTAV members are working towards these aims via a series of seven objectives that formed the basis of the INTREPID Tephra-II project "Enhancing tephrochronology as a global research tool through improved fingerprinting and correlation techniques and uncertainty modelling (phase II)", as follows.

Objective 1

To evaluate and apply new and emerging technologies to:

(a) identify and map proximal-to-distal tephras and cryptotephra deposits (i.e. at a full range of scales);

(b) to establish their spatial and stratigraphic interrelationships;

(c) to improve understanding of the environmental data preserved in the morphology and distribution of tephra and cryptotephra deposits;

(d) to facilitate their use as chronostratigraphic units (including developing the use of tephrochronology in cross-scale analysis); and

(e) as a basis for documenting volcanic eruption histories and hazards.

Objective 2

To develop and evaluate new and emerging methods to characterise tephra and cryptotephra constituents mineralogically and geochemically (including isotopically) using formalised protocols that enhance data quality and quantity.

Objective 3

To develop and apply improved age models for tephra and cryptotephra deposits.

Objective 4

To evaluate and develop objective ways of correlating tephra and cryptotephra deposits from place to place using statistical techniques and numerical measures of (un)certainty of correlation.

Objective 5

To develop regional databases (using a uniform global framework) of high-quality mineral, geochemical, and other data (stratigraphic, chronologic, spatial) for tephra and cryptotephra deposits.

Objective 6

To maintain and enhance the global capability of tephrochronology for future research through mentoring and training of emerging researchers in the discipline.

Objective (7)

To improve education to the wider community (outreach) about tephrochronology and its application and relevance.

To help meet these objectives, tephrochronologists have been working on a range of projects that relate to one or more of these objectives (e.g. see Lowe et al., 2011a, for a compendium of research published on the earlier INTREPID project). For example, since around 2013:

(i) Hall and Hayward (2014), Pearce (2014), Pearce et al. (2014), and Tomlinson et al. (2015) have been developing or improving methods relating to the chemical characterisation of glass shards;

Fig. 6. A.Beaudoin, with alluvial soils/paleosols and 7 ka-Mazama ash (marked by a break in section), leading a CANQUA field trip, Edmonton, 23rd August 2013.

(ii) Griggs et al. (2014, in review) have been working on new 2D and 3D visualisation methods to identify and explain tephra deposits in marine sedimentary sequences;

(iii) advances in cryptotephra studies, reviewed by Davies (2014), were spectacularly highlighted by new research showing the dispersal of NW American tephras across the American continent and the Atlantic to western Europe as reported by Pyne-O'Donnell et al. (2012) and Jensen et al. (2014);

(iv) examples of integrative tephra-linked projects involving palaeoenvironmental reconstructions, archaeology, and palaeoanthropology include those of Ponomareva et al. (2013a), Riede and Thastrup (2013), Smith et al. (2013), Blockley et al. (2014), Lane et al. (2014), Streeter and Dugmore (2014), Blegen et al. (2015), Lowe et al. (2015), and Moriwaki et al. (2015);

(v) projects involving volcanological aspects of tephra studies include those of Ponomareva et al. (2013b), Shane et al. (2014), and Stevenson et al. (2015);

(vi) application of new dating methods for tephras such as (U-Th)/He dating of zircons include papers by Danišík et al. (2012) and Howe et al. (2014);

(vii) research developing and utilising statistical correlation methods for tephras includes that of Green et al. (2014) and Pouget et al. (2014a, 2014b); and

(viii) encyclopaedial overviews of the discipline and its application, written for a wider audience, include those of Alloway et al. (2013) and Lowe and Alloway (2015).

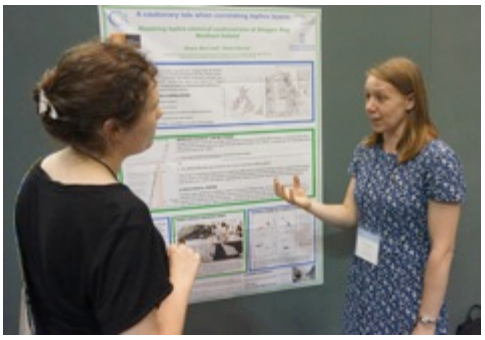

Fig. 7. A.MacLeod at INQUA, Nagoya.

INQUA project 1307s (part of INTREPID Tephra-II) was launched at the Canadian Quaternary Association (CANQUA) 2013 meeting held at University of Alberta, Edmonton, Canada, from 18th - 22nd August 2013, and convened by D.Froese (University of Alberta). Several tephra-focussed sessions and INTAV meetings and workshops were held during the conference. Subsequently, a skills-enhancement workshop "Tephra 2014: Maximising the Potential of Tephra for Multidisciplinary Science" that ran from 3rd – 7th August 2014, was held in Portland, Oregon, USA. The workshop was convened by S.Kuehn (Concord University, USA), M.Bursik, and the late S.Pouget (University of Buffalo, USA) to discuss major developments, best practices, and future directions/needs in tephra studies from both volcanological and tephrochronological perspectives. The funding provided by grant 1307s was used to support 10 participants, including eight emerging career researchers and two invited leading specialist tephrochronologists. The average expenditure for each person was $500 (details were reported to the INQUA Executive Committee in January 2015, by D.Lowe).

By bringing together an international group of over 70 scientists with a variety of backgrounds who study tephra for different purposes, the aim was to enhance interdisciplinary collaboration and data sharing. To provide training, the workshop incorporated hands-on sessions on optimal sample collection and treatment, dispersal modelling, and the use of databases. Volcanologists, tephrochronologists, archaeologists, palaeoclimatologists, palaeoecologists, palaeolimnologists, petrologists, geochronologists, tectonophysicists, Quaternary scientists, atmospheric scientists, data managers, and others who work with tephra were represented. During three days of presentation and discussion, tephra scientists discussed challenges, opportunities and solutions in studies ranging from physical volcanology to archaeology.

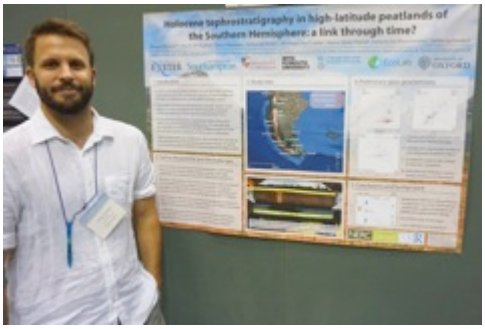

Fig. 8. T.Roland at INQUA, Nagoya.

A consensus-seeking session was held at the end of the meeting, in which the current state of the science and emergent issues were raised. Most of the discussion revolved around formulating common best practices among the different scientific communities and establishing common data archiving and retrieval mechanisms. Best practices were discussed in terms of sample collection and laboratory treatment. With respect to data archiving and retrieval, the discussion revolved largely around databases, what is currently available, their use, and development of common standards for submission and data format.

Outputs from the Tephra 2014 Workshop, Portland:
Workshop website: http://geohazards.buffalo.edu/documents/Tephra2014.shtml
Vhub materials (Vhub.org is a site for collaborative volcano research and risk mitigation, and tephra studies)
Tephra 2014 group home page: https://vhub.org/groups/tephra2014
Workshop questions list: https://vhub.org/groups/tephra2014/wiki/QuestionsToAddress
Tephra 2014 wiki page with workshop report: https://vhub.org/groups/tephra2014/wiki
Field trip guidebook: https://vhub.org/resources/3723/download/KuehnTephra2014 Field Guide.pdf
Index to videos talks (36 items on YouTube): https://vhuborg/groups/tephra2014/wiki/PresentationVideos

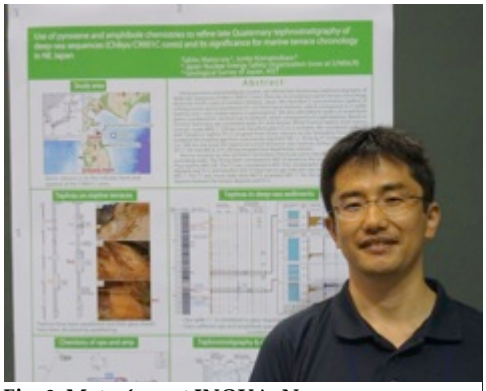

Fig. 9. Matsu'ura at INQUA, Nagoya.

Video of working group summary presentations: https://www.youtube.com/watch?v=ZnfvhkS6N1I

INQUA Congress, Nagoya

The recent XIX INQUA Congress held in Nagoya, Japan featured a very successful series of tephra-related papers on 31st July 2015. Nearly 50 papers were presented in two sessions (23 oral presentations and 26 posters). The audience was pleasingly strong for all sessions, and the very high quality of papers was remarked upon. Sessions were (1) 'Studies on tephras and cryptotephras and their use as isochrons in palaeoenvironmental and palaeoclimatic reconstructions' (convened by D.Lowe and V.Smith), and (2) 'Tephras and cryptotephras and their use in studies of natural hazards and archaeology' (convened by T.Suzuki and C.Lane). The three outstanding keynote speakers were P.Abbott (UK) 'Tracing North Atlantic tephras 25-8 ka', C.Lane (UK) 'Tephrostratigraphy of East Africa', and B.Alloway (New Zealand) 'Tracing earliest hominins in SE Asia using tephrochronology'.

The INTAV Executive Committee held a 1-hour business meeting at the end of the tephra session followed by an enjoyable dinner out for 26 tephra specialists. About half the faces were new to INTAV. D.Lowe (outgoing president) presented a summary of the work of INTAV over the past four

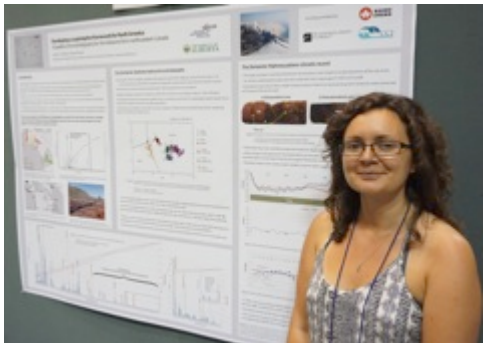

Fig. 10. L.Davies at INQUA, Nagoya.

years and his presentation (as a pdf file) is available on the web in the JISCMail archives. All in all, the INTAV Executive Committee and session convenors felt very satisfied with the sessions and organisation and with INQUA as a whole, and commend the Local Organising Committee for a terrific conference.

Key points for future activities of INTAV are:

(i) a new 5-strong Executive Committee has been developed to help guide INTAV over the next inter-Congress period (2015-2019): President, T.Suzuki; three Vice Presidents: V.Smith, P.Abbott, and B.Jensen; and immediate past president, D.Lowe.

(ii) a special issue on tephras in *Quaternary Geochronology* will be derived from the Nagoya sessions, provisionally entitled " 'Advancing tephrochronology as a global dating tool: applications in volcanology, archaeology, and palaeoclimatic and geohazard research', and with possible guest editors C.Lane (lead), T.Suzuki, V.Smith, S.Blockley, and D.Lowe. Deadlines are (tentatively) 1st December 2015 for receipt of papers and publication by the end of 2016.

(iii) David Lowe will re-bid INTAV as an INQUA IFG (within SACCOM) later this year with the aim to establish the group through to 2023 (eight years). The re-bid is needed because IFGs in INQUA are project-based, and exist for a maximum of two INQUA terms (8 years). D.Lowe prepared/submitted a case in Jan 2014 that was strongly endorsed by >75 tephrochronologists. If you are not on that list of endorsors, and want to support the re-bid, then please send a note and name/affiliation to D.Lowe (email d.lowe@waikato.ac.nz) as soon as possible (before 10th November, 2015).

(iv) B.Alloway (Victoria University of

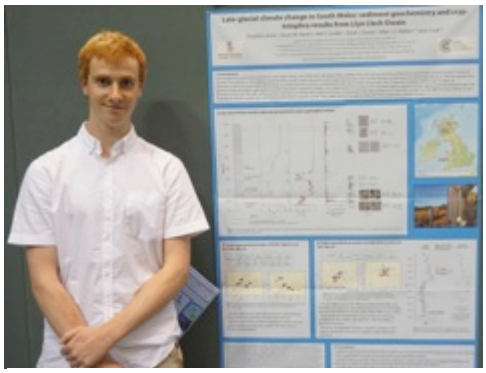

Fig. 11. G.Jones at INQUA, Nagoya.

Wellington) and colleagues in Chile and Argentina are working on plans to hold the next inter-INQUA tephra field conference in southern South America (based at Bariloche, Argentina) around mid-December, 2017. The inter-INQUA field conferences are a very successful and fruitful tradition of the tephra group INTAV and earlier equivalent groups dating back to 1961 (see Lowe et al., 2011b). The conference will likely comprise a format encompassing a pre-conference trip in Chile over several days, the conference itself in Bariloche, and a post-conference trip in Chile and Argentina over several days. Please mark your calendar now and keep an eye out for further details on our INTAV Facebook site (developed and run by P.Abbott: https://www.facebook.com/groups/INTAV/permalink/695883540515482/) and JISCMail (TEPHRA).

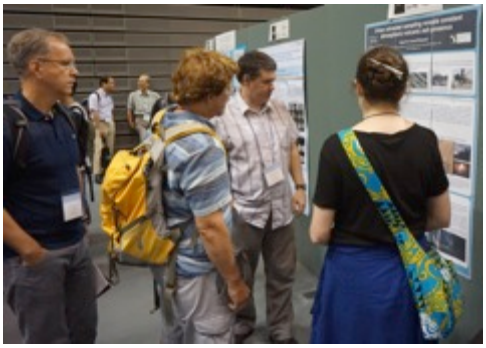

Fig. 12. S.Pyne-O'Donnell explaining his poster at INQUA, Nagoya.

References and list of papers (marked *) that relate to and specifically acknowledge the INTREPID Tephra-2 project (INQUA-1307s). There are likely to be more papers in addition to these.

Abbott, P.M. Austin, W.E.N., Davies, S.M., Pearce, N.J.G. Rasmussen, T.L., Wastegård, S. & Brendryen, J. (2014) Re-evaluation and extension of the Marine Isotope Stage 5 tephrostratigraphy of the Faroe Islands region: the cryptotephra record. *Palaeogeography, Palaeoclimatology, Palaeoecology* 409, 153-168*.

Abbott, P.M., Austin, W.E.N., Davies, S.M., Pearce, N.J.G. & Hibbert, F.D. (2013). Cryptotephrochronology of the Eemian and the last interglacial–glacial transition in the north-east Atlantic. *Journal of Quaternary Science* 28, 501-514*.

Abbott, P.M., Bourne, A.J., Purcell, C.S., Davies, S.M., Scourse, J.D. & Pearce, N.J.G. (in review). Last glacial period cryptotephra events in an eastern North Atlantic Ocean marine sequence: exploring linkages to the Greenland ice-cores. *Quaternary Geochronology**

Alloway, B.V., Lowe, D.J., Larsen, G., Shane, P.A.R., Westgate, J. A. (2013). Tephrochronology. In: Elias, S. A. & Mock, C.J. (eds), "*Encyclopaedia of Quaternary Science*, 2nd edition" Vol. 4. Elsevier, Amsterdam, pp. 277-304.

Blegen, N., Tryon, C.A., Faith, J.T., Peppe, D.J., Beverly, E.J., Li, B. & Jacobs, Z. (2015). Distal tephras of the eastern Lake Victoria basin, equatorial East Africa: correlations, chronology and a context for early modern humans. *Quaternary Science Reviews* 122, 89-111

Blockley, S.P.E., Bournem A.J., Brauer, A., Davies, S.M., Hardiman, M., Harding, P.R., Lane, C.D., MacLeod, A., Matthewsm I.P., Pyne-O'Donnell, S.D.F., Rasmussen, S.O., Wulf, S. & Zanchetta, G. (2014). Tephrochronology and the extended intimate (integration of ice-core, marine and terrestrial records) event stratigraphy 8–128 ka b2k. *Quaternary Science Reviews* 106, 88-100*.

Bourne, A.J. Cook, E., Abbott, P.M., Seierstad, I.K., Steffensen, J.P., Svensson, A., Fischer, H., Schüpbach, S. & Davies, S.M. (2015). A tephra lattice for Greenland and a reconstruction of volcanic events spanning 25–45 ka b2k. *Quaternary Science Reviews* 118, 122-141*.

Danišík, M., Shane, P.A.R., Schmitt, A.K., Hogg, A.G., Santos, G.M., Storm, S., Evans, N.J., Fifield, L.K. & Lindsay, J.M. (2012). Re-anchoring the late Pleistocene tephrochronology of New Zealand based on concordant radiocarbon ages and combined $^{238}U/^{230}Th$ disequilibrium and (U-Th)/He zircon ages. *Earth and Planetary Science Letters* 349-350, 240-250.

Davies, S.M. (2015). Cryptotephras: the revolution in correlation and precision dating. *Journal of Quaternary Science* 30, 114-130*.

Green, R.M., Bebbington, M.S., Cronin, S.J. & Jones, G. (2014). Automated statistical matching of multiple tephra records exemplified using five long maar sequences younger than 75 ka, Auckland, New Zealand. *Quaternary Research* 82, 405-419.

Griggs, A.J., Davies, S.M., Abbott, P.M., Rasmussen, T.L. & Palmer, A.P. (2014). Optimising the use of marine tephrochronology in the North Atlantic: a detailed investigation of the Faroe Marine Ash Zones II, III and IV. *Quaternary Science Reviews* 106, 122-139*.

Griggs, A.J., Davies, S.M., Abbott, P.M., Coleman, M., Palmer, A.P., Rasmussen, T.L. & Johnston, R. (in review). Visualising tephra deposits and sedimentary processes in the marine environment: the potential of X-ray microtomography. *Geochemistry, Geophysics, Geosystems**

Hall, M. & Hayward, C. (2014). Preparation of micro- and crypto-tephras for quantitative microbeam analysis. In: Austin, W.E.N., Abbott, P.M., Davies, S.M., Pearce, N.J.G. & Wastegård, S. (eds), "Marine Tephrochronology". *Geological Society, London, Special Publications* 398, 21-28.

Howe, T.M., Lindsay, J.M., Shane, P., Schmitt, A.K. & Stockli, D.F. (2014). Re-evaluation of the Roseau Tuff eruptive sequence and other ignimbrites in Dominica, Lesser Antilles. *Journal of Quaternary Science* 29, 531-546.

Jensen, B.J.L., Pyne-O'Donnell, S., Plunkett, G., Froese, D.G., Hughes, P.D.M., Sigl, M., McConnell, J.R., Amesbury, M.J., Blackwell, P.G., van den Bogaard, C., Buck, C.E., Charman, D.J., Clague, J.J., Hall, V.A., Koch, J., Mackay, H., Mallon, G., McColl, L., & Pilcher, J.R. (2014). Transatlantic distribution of the Alaskan White River Ash. *Geology* 42, 875-878.

Kuehn, S.C., Bursik, M.I. & Pouget, S. (2013). Improved integration and discoverability of tephra data for multidisciplinary applications: American Geophysical Union Fall Meeting, paper V13A-2591, DOI: 10.13140/RG.2.1.4551.1524*.

Kuehn, S.C., Pouget, S., Wallace, K. & Bursik, M.I. (2014). Results of the Tephra 2014 Workshop on Maximizing the Potential of Tephra for Multidisciplinary Science: American Geophysical Union Fall Meeting, paper V31C-4758, DOI: 10.13140/RG.2.1.2454.0002*.

Lane, C.S., Cullen, V.L., White, D., Bramham-Law, C.W.F. & Smith, V.C. (2014). Cryptotephra as a dating and correlation tool in archaeology. *Journal of Archaeological Science* 42, 42-50.

Lowe, D.J. (2014). Marine tephrochronology: a personal perspective. In: Austin, W.E.N., Abbott, P.M., Davies, S.M., Pearce, N.J.G. & Wastegård, S. (eds), "Marine Tephrochronology". *Geological Society, London, Special Publication* 398, 7-19*.

Lowe, D.J. & Alloway, B.V. (2015). Tephrochronology. In: Rink, W.J. & Thompson, J.W. (eds), "Encyclopaedia of Scientific Dating Methods". Springer, Dordrecht, pp. 783-799*.

Lowe, D.J., Moriwaki, H., Davies, S.M., Suzuki, T. & Pearce, N.J.G. (eds) (2011a). Enhancing tephrochronology and its application (INTREPID project): Hiroshi Machida commemorative volume. *Quaternary International* 246, 1-395.

Lowe, D.J., Davies, S.M., Moriwaki, H., Pearce, N.J. & Suzuki, T. (2011b). (Preface) Enhancing tephrochronology and its application (INTREPID project): Hiroshi Machida commemorative volume. *Quaternary International* 246, 1-5.

Lowe, J.J., Bronk Ramsey, C., Housley, R.A., Lane, C.S., Tomlinson, E.L., RESET Team & RESET Associates (2015). The RESET project: constructing a European tephra lattice for refined synchronisation of environmental and archaeological events during the last c. 100 ka. *Quaternary Science Reviews* 118, 1-17*.

Moriwaki, H., Nakamura, N., Nagasako, T., Lowe, D.J. & Sangawa, T. (2015). The role of tephras in developing a high-precision chronostratigraphy for palaeoenvironmental reconstruction and archaeology in southern Kyushu, Japan, since 30 cal. BP: an integration. *Quaternary International* (in press)*.

Pearce N.J.G. (2014). Towards a protocol for the analysis of rhyolitic glass shards in tephra deposits by laser ablation ICP-MS. *Journal of Quaternary Science* 29, 627-640*.

Pearce N.J.G., Abbott P.M. & Martin-Jones C. (2014). Microbeam methods for the analysis of glass in fine grained tephra deposits: a SMART perspective on current and future trends. In: Austin, W.E.N., Abbott, P.M., Davies, S.M., Pearce, N.J.G. & Wastegård, S. (eds), "Marine Tephrochronology". *Geological Society, London, Special Publication* 398, 29-46*.

Ponomareva, V., Portnyagin, M., Derkachev, A., Juschus, O., Garbe-Schönberg, D. & Nürnberg, D. (2013a). Identification of a widespread Kamchatkan tephra: a middle Pleistocene tie-point between Arctic and Pacific paleoclimatic records. *Geophysical Research Letters* 40, 3538-3543.

Ponomareva, V., Portnyagin, M., Derkachev, A., Pendea, L.F., Bourgeois, J., Reimer, P.J., Garbe-Schonberg, D., Krasheninnikov, S. & Nurnberg, D. (2013b). Early Holocene M~6 explosive eruption from Plosky volcanic massif (Kamchatka) and its tephra as a link between terrestrial and marine paleoenvironmental records. *International Journal of Earth Sciences* 102, 1673-1699.

Pouget, S., Bursik, M., Cortés, J. A. & Hayward, C. (2014a). Use of principal component analysis for identification of Rockland and Trego Hot Springs tephras in the Hat Creek Graben, northeastern California, USA. *Quaternary Research* 81, 125-137.

Pouget, S., Bursik, M. & Rogova, G. (2014b). Tephra redeposition and mixing in a Late-glacial hillside basin determined by fusion of clustering analyses of glass-shard geochemistry. *Journal of Quaternary Science* 29, 789-802.

Pyne-O'Donnell, S.D.F., Hughes, P.D.M., Froese, D.G., Jensen, B.J.L., Kuehn, S.C., Mallon, G., Amesbury, M.J., Charman, D.J., Daley, T.J., Loader, N.J., Mauquoy, D., Street-Perrott, F.A. & Woodman-Ralph, J. (2012). High-precision ultra-distal Holocene tephrochronology in North America. *Quaternary Science Reviews* 52, 6-11.

Riede, F. & Thastrup, M.D. (2013). Tephra, tephrochronology and archaeology – a (re-)view from northern Europe. *Heritage Science* 1 (15), 1-17.

Shane, P.A.R., Gehrels, M., Zawalna-Geer, A., Augustinus, P., Lindsay, J. & Chaillou, I. (2013). Longevity of a small shield volcano revealed by

crypto-tephra studies (Rangitoto volcano, New Zealand): change in eruptive behavior of a basaltic field. *Journal of Volcanology and Geothermal Research* 257, 174-183.

Smith, V.C., Staff, R.A., Blockley, S.P.E., Bronk Ramsey, C., Nakagawa, T., Mark, D.F., Takemura, K., Danhara, T. & Suigetsu 2006 Project Members (2013). Identification and correlation of visible tephras in the Lake Suigetsu SG06 sedimentary archive, Japan: chronostratigraphic markers for synchronising of east Asian/west Pacific palaeoclimatic records across the last 150 ka. *Quaternary Science Reviews* 67, 121-137.

Stevenson, J.A., Millington, S.C., Beckett, F.M., Swindles, G.T. & Thordarson, T. (2015). Big grains go far: understanding the discrepancy between tephrochronology and satellite infrared measurements of volcanic ash. *Atmospheric Measurement Techniques* 8, 2069-2091.

Tomlinson, E.L., Smith, V.C., Albert, P.G., Aydar, E., Civetta, L., Cioni, R., Cubukcu, E., Gertiser, R., Isaia, R., Menzies, M.A., Orsi, G., Rosi, M. & Zanchetta, G. (2015). The major and trace element glass compositions of the productive Mediterranean volcanic sources: tools for correlating distal tephra layers in and around Europe. *Quaternary Science Reviews* 118, 48-66.

LOESS IFG: LoessFest 2016

22nd – 25th September 2016

Wisconsin, US

Website

LoessFest will commence 22nd – 25th September 2016, in western Wisconsin, United States. Michigan State University and the University of Wisconsin-Eau Claire are the official hosts for the event. The format for the conference is traditional: two days of papers/posters (Thu-Fri), followed by two field trip days (Sat-Sun), by coach. Participants will be back in Eau Claire each night. The event is being held at the beautiful Davies Conference Centre on the UW-Eau Claire campus. Each night will feature a different type of social event, and prizes will be awarded for the best student papers and posters.

Six keynote speakers will deliver presentations at the conference. In alphabetical order they are: A.Bettis - University of Iowa, USA; K.Fitzsimmons - Max Planck Inst. for Evolutionary Anthropology, Germany; S.Marković - University of Novi Sad, Serbia; Ian Smalley - University of Leicester, UK; A.Timar-Gabor - Babeş-Bolyai University, Romania; and S.Yang - Chinese Academy of Sciences.

Attendees are welcome to speak on all topics related to loess, although we are especially welcoming papers on (1) Thin loess deposits, (2) Loess sources – traditional and other, (3) Dating of loess deposits, (4) Loess on slopes, (5) Loess and palaeoenvironments, (6) Soil development in loess, (7) Systems of loess transportation, and (8) Spatial variation in loess landscapes.

R.Schaetzl, Michigan State University (soils@msu.edu), is the host for the conference. He thanks the UW-EC faculty for help with local arrangements and field trips: D.Faulkner, G.Running, K.Syverson, H.Jol, and P.Kaldjian.

A first circular will be sent out in November. We hope to see you in Wisconsin!

Welcome to TERPRO

The new inter-Congress period is expected to be full of scientific challenges for TERPRO, the Commission on Terrestrial Processes, Deposits and History. In fact, TERPRO arguably is the Commission which A) covers the wider spectrum of Quaternary disciplines, B) coordinates the largest number of IFGs and Projects, C) received a major share of INQUA funding and D) generated an abundance of relevant results between 2011 and 2015 in terms of both scientific production and quality/quantity of international meetings. Please visit the TERPRO webpage and join our Commission, if you are working in soil and palaeosols, floods and their Quaternary record, lakes and palaeolimnological records, glaciated mountain belts and periglacial environments, active tectonics and palaeoseismicity, dust and deserts, global large aquifers and palaeogroundwater, and the interaction between these terrestrial processes and society. TERPRO supported the participation of a very relevant number of young scientists from all over the world at scientific events in the past four years, and is planning to further involve ECRs in the Commission's Executive Committee. We work towards continuing the growth of this scientific network, increasing the international outlook, and the cross-disciplinary perspective: we are ready to host your contribution. This is the time for preparing new proposals for IFGs and projects, please contact us if you are willing to do this in TERPRO. Let us make Quaternary Science stronger and useful for everyone.

Alessandro Michetti,
President of TERPRO

Palaeoseismology and active tectonics research presented at the XIX INQUA Congress in Nagoya, Japan

Authors: Christoph Grützner[1], Pablo G. Silva[2], Klaus Reicherter[3], Hisao Kondo[4].

[1]University of Cambridge, UK; [2]University of Salamanca, Spain; [3]RWTH Aachen University, Germany; [4]National Institute of Advanced Industrial Science and Technology, Japan.

The INQUA congress in Nagoya was a great opportunity to present studies in the fields of palaeoseismology, Quaternary tectonics, and earthquake geology. Three sessions were devoted to recent advances in these disciplines. The TERPRO IFG Palaeoseismology and Active Tectonics (PALACTE) organised two of them: T05 (Palaeoseismology and earthquake environmental effects (EEEs) parameterisation for seismic hazard analyses) and T06 (Quaternary research on past seismic records). Session T19 (Recent progress in the field of active tectonics and palaeoseismology) was organised by our friends and colleagues from Japan and mainly focused on earthquake science in Eastern Asia.

Session T05 included 13 presentations. It focused on the application and the improvement of the ESI2007 macroseismic scale. The development of this scale was one of the main achievements of PALACTE in recent years and it is now becoming more and more accepted in the earthquake and seismic hazard community. The scale is based on the intensity and distribution of EEEs. Its main advantages are that it is not biased by population density and building style, that it does not saturate with high intensities, and that it can be applied to ancient earthquakes as well, thus bridging the gap between pre-historic and modern seismicity. Recently, this approach was extended to archaeological effects.

Fig. 13. Mid-Congress excursion to a nuclear power plant.

Fig. 14. Pre-Congress geomorphology excursion to Kyoto.

Session T06 comprised 29 presentations. The main session was characterised by the large geographic distribution of the study areas (Lesser Antilles, Turkey, Czech Republic, Latvia, Poland, Finland, Greece, California, Alaska, Israel, Spain, Italy, Venezuela, Indonesia, China, Germany, Taiwan, Japan, Korea, Kazakhstan, Italy, and Lebanon) that offered a unique worldwide perspective. Overall the presentations were divided in two major thematic topics: One regarded the study of active faults, and therefore was fault-specific, whereas the other topic was the study of the sedimentary record in order to extract info on palaeoearthquakes. Many different approaches to assess pre-historic seismicity have been presented, among them the analysis of lacustrine and marine sediments, turbidites, geomorphological analyses using high-resolution elevation data, tsunami studies, and geophysical prospecting. Novel methods and especially improved dating and mapping techniques have recently allowed us to analyse past earthquakes in unprecedented detail.

In Session T19, numerous presentations dealt with active tectonics and palaeoseismology in East Asia, the Middle East and Eastern Europe. The main topic was to establish new recurrence models in order to contribute to long-term

forecasts of large earthquakes. The recurrence intervals of active faults generally range between several hundreds of years and a few tens of thousands of years. Therefore geological and geomorphic records are essential to estimate the repetition of large earthquakes produced by hazardous active faults. Sustainable accumulation and world-wide exchange of knowledge on active faults and palaeoseismology will be needed in the future. In this session researchers demonstrated how to achieve this goal with new Quaternary dating methods, remote sensing, palaeoseismology, and tsunami studies among other techniques. The session was also a great opportunity to learn about the state of the art in Japanese earthquake science.

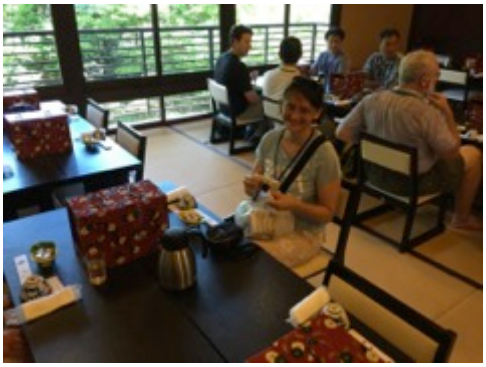

Fig. 15. Mid-Congress excursion to the Neodani fault scarp.

At the TERPRO business meeting the different IFGs reported their activities over the past inter-Congress period. More than 40 researchers from 21 countries participated in the meeting. The new Commission structure for the inter-Congress period 2015 - 2019 was presented. A.Michetti was re-elected as President, R.Amit and T.Azuma were elected as Vice Presidents. D.Kröhling will continue as Secretary. TERPRO will be represented in the INQUA ECR committee by E.Alarcón and N.Hoffmann.

The IFG PALACTE organised a number of very successful workshops on three continents, bringing together hundreds of scientists and ECRs. We published several special issues in

Fig. 16. A tsunami-evacuation hill, visited during the mid-Congress excursion.

international journals, and again ECRs were involved as authors and editors. The EEE catalogue is growing and now hosts hundreds of earthquake data sets spanning 20,000 years. A new IFG leadership was determined for the upcoming inter-Congress period. I.Papanikolaou is the new President, P.Štěpančíková and C.Grützner (UK/GER) are Vice Presidents. Y.Braun, B.Whitnes and J.Stemberk will be the IFG secretaries. We discussed how to continue our successful work in the future and decided to improve collaboration with other IFGs. Our main focus is to support ECRs and to help them establish a broad scientific network.

We thank the past IFG leaders for their hard and very successful work and we look forward to a very exciting new inter-Congress period. All interested researchers and especially ECRs are cordially invited to participate in our activities.

Report from the INQUA M-2 Excursion

Author: Christoph Grützner (University of Cambridge, UK).

Many great field trips took place during the XIX INQUA congress in Nagoya, Japan. For palaeoseismologists and people interested in active tectonics, mid-Congress excursion M-2 was certainly a highlight. This trip led to the 1891 Nobi earthquake surface ruptures and the Neodani Fault Museum. The M7.5-M8 earthquake of 1891 did not only cause huge damage, but it also produced amazing surface ruptures which are nicely preserved. The quake occurred in a mountainous area in the Neo valley. Its mechanism was mainly strike-slip (more than 8 m offset), but significant vertical uplift was created at step-over zones, too. The strike-slip motion offset rice paddies, roads, hedges, fences and other geomorphological and anthropogenic markers, some of which can still be found nowadays as some fields and roads remained displaced and were not rectified afterwards. (Just imagine what kind of problems this would cause to a modern land register…). In 1991, the wonderful Neodani Fault Museum opened to the public. The museum is built on top of the fault, with a palaeoseismological trench exhibiting more than 5 m of vertical offset as its main attraction. The trench was excavated in order to find out about subsurface structures and to see if possible predecessors of the 1891 quake could be identified. The fault zone is vertical in the trench and offsets the bedrock and overlying Quaternary layers, mainly fluvial deposits. The museum also hosts amazing fault-rupturing models that illustrate strike-slip and dip-slip motion and their surface expressions, historical photos and documents, and it informs seismic hazard and earthquake protection. Drop, cover, and hold!

Many publications deal with the 1891 Nobi earthquake, its causes and its effects, and it is worth mentioning a paper that was published in 1893 by B.Koto. In this remarkable work the author states the following:

"The sudden elevations, depressions, or lateral shiftings of large tracts of country which take place at the time of destructive earthquakes are usually considered as the effects rather than the cause of subterranean commotions; but in my opinion, in can be confidently asserted that the sudden formation of the 'great fault of Neo' was

Fig. 17. Participants of the M-2 excursion, with our excellent field guides at the front.

the actual cause of the great earthquake of the 28th of October, 1891 […]."

This can certainly be considered a milestone in modern earthquake research.

All participants are very grateful to our field trip leaders A.Okada, H.Kaneda and Keitaro.

Fig. 18. The Neodani Fault Museum with its main attraction – a palaeoseismological trench that exhibits the 1891 vertical offset in a step-over zone.

Further reading

Fukuyama, E., & Mikumo, T. (2006). Dynamic rupture propagation during the 1891 Nobi, central Japan, earthquake: a possible extension to the branched faults. *Bulletin of the Seismological Society of America*, 96(4A), 1257-1266.

Kaneda, H., & Okada, A. (2008). Long-term seismic behaviour of a fault involved in a multiple-fault rupture: Insights from tectonic geomorphology along the Neodani fault, central Japan. *Bulletin of the Seismological Society of America*, 98(5), 2170-2190.

Koto, B. (1893). On the cause of the great earthquake in central Japan, 1891.

Rydelek, P. A., & Sacks, I. S. (2003). Triggering and inhibition of great Japanese earthquakes: the effect of Nobi 1891 on Tonankai 1944, Nankaido 1946 and Tokai. *Earth and Planetary Science Letters*, 206(3), 289-296.

Sato, H., Okada, A., Matsuda, T., & Kumamoto, T. (1992). Geology of a trench across the Midori fault scarp, from the Nobi earthquake of 1891, central Japan. *J. Geogr*, 101(7), 556-572.

SAQint3: Interactions between climatic forcing, tectonics and volcanism during the Late Quaternary: a multidisciplinary approach applied to key regions of South America - 1311 P

Sam-GeoQuat IFG: The South American Project towards an integration and improvement of Quaternary geological data - 1310F

Project Leader: Daniela Kröhling (CONICET & Universidad Nacional del Litoral, Argentina).

SARA (South America Risk Assessment Project) Workshop on "Inventory of Quaternary deformation of South America" (Global Earthquake Model, GEM) & INQUA 1311 Project Workshop. Santiago (Chile), 17th - 20th November 2014.

Authors: Daniela Kröhling[1], Carlos H. Costa[2].

[1]CONICET & Universidad Nacional del Litoral, Argentina; [2]Universidad Nacional de San Luis, Argentina.

This was the main meeting for the Sam-GeoQuat IFG in 2014 and the 1311 Project. This was organised under the framework of GEM (http://www.globalquakemodel.org/) and sponsored by the INQUA Project. It took place at the Pontificia Universidad Católica de Chile, Santiago, which was the departure point for the scheduled activities as part of the Project "Inventory of Hazardous Structures of South America" (Project Leader: C.Costa) – part of the SARA effort. The goal of the meeting was to set up common agreements within the region for compiling seismogenic structures under uniform standards. The database compilation, that covers ~ 900 Quaternary faults, is organised through national working groups that provide geological data for consideration in seismic hazard analysis.

The first day was devoted to setting up basic guidelines and criteria, plus general presentations on neotectonic knowledge in the South American countries. Over the next two days an open discussion followed, regarding strategies for compiling hazardous structures in different tectonic settings. Hazardous structures comprise one of the data layers, which will feed the creation and calculation of an updated probabilistic seismic hazard model for South America; geological information will be merged for the first time at a regional scale with data provided by the seismic catalogue, tectonic geodesy and ground motions prediction equations.

Participants with a wide range of expertise in neotectonics and palaeoseismicity attended the SARA meeting (~30 participants, including participants from South American countries, Italy and France). Travel grants were awarded to PhD students and ECRs (covered by the 1311 INQUA project). In this way, young researchers were trained, interacted with colleagues, exchanged data and interpretations and discussed common and new methodological approaches for mapping active structures along tectonic settings.

The one-day INQUA 1311 Project Workshop was coordinated by D.Kröhling and F.Audemard. The programme comprised: (i) An introduction to the project including a presentation of the general guidelines, a statement of the long-term objectives and of the proposed tasks, and the activities of INQUA. (ii) Keynote presentations by invited senior geoscientists from Chile. These included analysis of Late Quaternary surficial processes and interpretations in term of tectonic and climatic forcing. It permitted more detailed discussions on the influence of neotectonics, sea level changes and climatic driven processes on the Late Quaternary environmental evolution of Chile. (iii) Oral presentations by ECRs who were awarded INQUA travel grants. They presented on their specific studies in order to enhance the exchange of information. (iv) A round-table discussion led by formal members of the SAmGeoQuat IFG.

Common efforts to improve our knowledge on Late Quaternary processes were deeply analysed. The central point for discussion was the possibility of adapting common criteria in the sub-group of neotectonics and those sub-groups dedicated to the research of climatically driven processes in different geologic settings; all to be used in the analyses of landscape evolution. All these activities led to mutual benefit both for SARA and the SAm-GeoQuat IFG & the INQUA 1311 Project – there are great advantages of finding links and synergies with similar ongoing initiatives in the continent.

PALACTE International Focus Group

FUCINO 2015: 6th INQUA International Workshop on Active Tectonics, Palaeoseismology and Archaeoseismology

Authors: Luca Guerrieri[1], Anna Maria Blumetti[1].

[1]ISPRA, Geological Survey of Italy, Italy.

The workshop took place in April 2015 in the Fucino Basin (Abruzzo, Central Apennines, Italy) to mark the centenary of the 1915 M7 earthquake (about 30,000 casualties); one of the largest and devastating earthquakes in Central Italy.

Fig. 19. The village of Pescina. In the background, behind the village, is one of the fault escarpments, reactivated during the 1915 earthquake.

It was the 6th Workshop organised within the activities of the PALACTE IFG, following previous similar workshops (i.e. "PATA" (Palaeoseismology, Active Tectonics and Archaeoseismology) events) organised in Baelo Claudia (Spain), Corinth (Greece), Morelia (Mexico), Aachen (Germany) and Busan (South Korea).

The conference was organised by ISRPA (Geological Survey of Italy), INGV (Istituto Nazionale di Geofisica e Vulcanologia) and the University of Insubria. Scientific sessions were held in the unique historical and cultural atmosphere of Pescina, a small village which was devastated by the 1915 earthquake and affected by extensive co-seismic surface faulting.

About 180 scientists from 25 countries, with expertise in the fields of palaeoseismology, active tectonics, and archaeoseismology, participated. More than 150 extended abstracts were submitted and presented as oral communications (about 50) or posters (about 100) in six sessions on Quaternary geology, palaeoseismology, earthquake engineering, seismic hazard, tsunami hazard and archaeoseismology.

Fig. 20. Fucino 2015 participants in Pescina.

A robust scientific committee (composed of about thirty experts in the aforementioned topics) has guaranteed a careful review of the extended abstracts before their publication in a Special Volume of the journal *Miscellanea INGV*.

During the workshop was a business meeting organised for the PALACTE IFG. This meeting verified results of the on-going INQUA Project 1299P within the IFG ("EEE parametrisation"). Moreover, some preliminary ideas for potential joint research activities for the 2016-2019 inter-Congress period were proposed and discussed.

Before the workshop commenced a one-day archaeoseismic tour of downtown Rome was organised. Specific attention was given to the traces of historical earthquakes on the Roman monuments.

Fig. 21. Pre-Workshop archaeoseismic tour downtown Rome.

After the conference, a two-day field trip focussing on Quaternary geology, palaeoseismology and archaeoseismology took

place in the Fucino and L'Aquila basins. The field trip itinerary in the Fucino basin focussed on the trace of the 1915 surface ruptures, with particular reference to the Quaternary evolution of the related fault scarps. As part of the Fucino 2015 field trip, two new palaeoseismological trenches were excavated across two main strands of the 1915 surface faulting trace. The second day was dedicated to the 2009 April 6th L'Aquila earthquake: after some stops on the Quaternary faults in the epicentral area, participants had the opportunity to visit the city of L'Aquila, which was strongly damaged by the 2009 earthquake.

Fig. 22. The Mt. Serrone fault escarpment, where palaeoearthquakes were identified through 36 Cl dating.

For both the field trips, the organisers prepared a guidebook that will be published in the journal *Geological Field Trips* edited by ISPRA.

Fig. 23. The palaeoseismological trench along the San Benedetto fault, showing evidence of previous seismic events at the base of the 1915 fault scarp.

Although the organisation of this international workshop was challenging in such a remote site (in the inner part of the Abruzzi Apennines), logistical difficulties were overcome with the help of a very qualified international community, composed of a great number of scientists from many parts of the world. This should encourage the organisation of workshops in less-known venues, far away from big cities, but located exactly where Quaternary geology is e clearly visible.

RAISIN – 1216P

Project Leaders: Daniela Sauer (University of Göttingen, Germany), Sergey Sedov (UNAM University City, Mexico), Dennis Dahms (University of Northern Iowa, USA), Markus Egli (University of Zurich, Switzerland), Fabio Scarciglia (University of Calabria, Italy), Pauline da Costa (University of Lomé, Togo), Mike Akaegbobi (University of Ibadan, Nigeria).

Website
https://ppsg2011.uni-hohenheim.de/94175

Workshop "Soils and Palaeosols of Brazil", 24th - 29th August 2015 in Campinas/Cananéia, with field trips to São Paulo and Minas Gerais, Brazil.

Organisers: Alessandro Batezelli[1], Francisco Ladeira[1], Daniela Sauer[2].

Additional field trip leaders: Pedro H. de Moraes Martinez[3], Pablo Vidal Torrado[3].

[1]UNICAMP, Campinas, Brazil; [2]University of Göttingen, Germany; [3]Univeristy of São Paulo, Brazil.

Mon (24th Aug) - Tue (25th Aug):
Pre-workshop field trip to Ilha Comprida (São Paulo State, Brazil)
Wed (26th Aug):
Presentations at Hotel Golfinho Plaza, Cananéia (São Paulo State)
Thu (27th Aug) - Fri (28th Aug):
Post-workshop field trips to Piracicaba and Itaqueri da Serra (São Paulo State) and Poços de Caldas (Minas Gerais)
Sat (29th Aug, 9.00-11.00):
Final discussion

Pre-workshop excursion (24th - 25th August): Spatial variability of Podzols on Ilha Comprida influenced by soil age, relief and hydrology
Ilha Comprida is a Holocene sandy barrier island (except for one hill that is comprised of a Mesozoic alkaline intrusion). Ilha Comprida is 3-5 km wide and 70 km long and stretches along the Cananéia-Iguape coastal plain. It is separated by the "Mar Pequeno"; a 400-1200 m-wide estuarine channel. The climate is humid-tropical, with 2261 mm mean annual precipitation.

The island developed along a longitudinal vector (ENE-wards) and a transversal vector (SES-wards) into a long and narrow island running parallel to the coastline. Wave action has created a cliff at the southern coast of the island that is continuously retreating. Along the south cliff, the age of parent material decreases from west to east. The original plan for the pre-workshop excursion had been to walk along the beach to study the soil chrono-toposequence that is exposed in the cliff. However, due to an unexpected storm tide this was impossible. Hence, the two westernmost soil profiles were approached from the west and the easternmost profile from the east.

Instead of visiting the profiles along the central part of the south cliff, another profile exposed in the west cliff was included in the excursion programme. In addition, we augered beach ridge highs and lows in the inner part of the island in order to compare the soils in the inner part of the island (not influenced by cliff dynamics) to those exposed in the cliffs.

As well as the soil-forming factor – time – another factor - relief - was a key topic in the discussions, with a special emphasis on hydrology. Soils in the inner part of the island are less well-drained than those exposed in the cliffs. The groundwater level under the swales between the beach ridges is high, and even peat formation can be observed in places. The soil profiles exposed in the cliffs must have started forming as inland soils, and thus

Fig. 24. Participants at dinner in Cananéia.

under less well-drained conditions, too. They became better drained when the retreating cliff got closer and finally cut through them. Well-developed Podzols with Ortstein occur especially in the western zones of the island, characterised by high beach ridges separated by narrow swales, whereas less developed hydromorphic Podzols and Histosols occur in areas with lower beach ridges and wider swales. Apparently, interflow running down from the beach ridges, carrying abundant dissolved organic carbon becomes concentrated in narrow swales and leads to the

Fig. 25. Stop 1 – Western part of the south cliff of Ilha Comprida: The sharp, even E/Bh boundary indicates Podzol formation under poorly drained conditions.

formation of thick Ortstein horizons. This effect is less pronounced in the wider, flatter ridge-swale systems further east.

Key issues that were discussed and take-home messages

- Hydrology and relief influence the spatial pattern of the morphology of Podzols at a similar order of magnitude as soil age.
- Spatial distribution of Ortstein is largely controlled by dissolved organic carbon fluxes leading to concentration and precipitation of organic compounds in lower landscape positions.
- Rates of soil formation: under the given conditions (texture: 96-97% sand, climate: humid-tropical) mature Podzols may develop within about 1000 years.

- Model of progressive/regressive pedogenesis that was discussed during the indoor workshop is applicable here: Micro-organisms eat up soil organic matter after aeration (regressive process).
- There is a close link between the geomorphological development of the island and the soils; erosion changes the hydrology and leads to aeration of soils that were formerly poorly drained.
- Influence of parent material: very pure quartz sand together with high permeability of sandy material leads to rapid acidification.
- Vegetation is adapted to acid and nutrient-poor conditions; litter also contains low amounts of bases and nutrients, resulting in incomplete decomposition.
- Podzols, that developed under poorly drained conditions, are characterised by a sharp, even boundary between E and Bh horizons; they lack a Bs horizon because iron has been reduced and removed under poorly drained conditions.

Fig. 26. Morphology is largely influenced by erosive features and persistent Ferricretes and Silcretes (Photo: R.Jahn).

Presentations held during the workshop

Introductory lectures related to the pre-workshop excursion (24th - 25th August)

A.Batezelli (24th August) 'Quaternary evolution of the Cananéia and Ilha Comprida Complex'.

P.Henrique Rodrigues de Moraes Martinez, J.Milane Lopes, P.Cesar Fonseca Giannini, P.Buurman, P.Vidal Torrado (25th August) 'Relationship between geomorphology, sedimentology and hydrology and its effect on Podzol genesis under Resting a vegetation at Ilha Comprida, SP, Brazil.'

Regular workshop presentations (26th August)

J-P.Nguetnkam, E.Solleiro Rebolledo, A.AGanwa, D.L.Bitom 'Morphological and geochemical characterisation of buried palaeosols and its covers in the Adamoua region of Cameroon (Central Africa): evidence of slope inversion.'

I.Akaegbobi, D.Sauer, R.Njokuocha 'Geomorphological and palaeopedological development on Cretaceous parent source rock around Nsukka Southeastern Nigeria.'

P.DaCosta, K.Togbé 'Pedologic cover and landscape evolution in northern Togo: a tropical weathering evidences since the Precambrian.'

Carlos Hinojosa, Kees Nooren, Elizabeth Solleiro-Rebolledo, Sergey Sedov: Holocene soil chronosequence on beach ridges in the coastal plain of the Gulf of Mexico: an insight into landscape development

R.Jahn, K.Stahr 'Soil formation and soil forming rates on volcanic materials of the Canary Islands.'

T.Sprafke, C.Thiel, B.Terhorst, S.Sedov 'Moisture vs. time – Evaluating the development of polygenetic loess palaeosols in the Krems region, Lower Austria.'

D.Sauer 'Soil chronosequences and pedological concepts.'

M.Calegari, P.Vidal Torrado 'Occurrence and palaeoenvironmental significance of humic horizon in Latosols (Oxisols).'

Lectures in preparation for the post-workshop excursion (26th August)

F.Ladeira, A.Batezelli 'Soils of Brazil.'
A.Batezelli 'Preparing for the post-workshop field trip: Geological settings, palaeosols and soils.'
F.Ladeira 'Lateritic profiles - chronology and importance in geomorphological evolution.'

Fig. 27. Stop 3 – Well-aerated Podzols like, this one exposed in the west cliff, show an irregular E/Bh boundary, with white tongues penetrating into the Bh. Tongues develop due to preferential flow e.g. along former tree roots.

Post-workshop excursion (27th - 28th August): Palaeosols in the Itaqueri Hill and Poços de Caldas region, including Ferricretes, Silcretes and Bauxite

The first part of the post-workshop excursion focused on the typical palaeosol sequence of the Itaqueri Hill region. It includes a sequence of Oxisol (Ferralsol) – Laterite (Ferricrete) – Silcrete. Several sites, where typical sections of this sequence are exposed, were visited. The first stop was a lookout point on the landscape that is strongly influenced by the ferricretes and silcretes that belong to this sequence, protecting the underlying parts of the landscape from erosion. At this stop yellow laterite, forming the surface at the lookout point, was examined. In addition, a profile exhibiting silicified root channels and a thick, dark red Oxisol (Ferralsol) near Piracicaba were visited.

Key issues that were discussed based on the soils visited during the post-workshop excursion

- Many tropical soils developed in reworked soil sediments or in saprolite of older soils.
- The solum and saprolite of a tropical soil profile do not necessarily belong to the same cycle of soil formation; the solum may have formed much later, just representing the very last cycle of soil formation; an unknown number of soil formation cycles may not be recorded because its products have been completely eroded.
- Laterite formation does not occur at present in this region.
- Rates of soil formation are extremely difficult to assess in tropical landscapes.
- Tertiary lateritic palaeosols are widespread in Brazil; they formed from different parent materials, by the same processes; lateritic soils do not form today in this region.
- Intensity of biological activity in Ferralsols (termites, ants, microorganisms) is important: slight changes will lead to a different profile.
- Factors that control iron oxide formation towards red (hematitic) soils vs. yellow (goethitic) soils:
  1) Strong micro-aggregates lead to very good aeration and water permeability, thus supporting pedogenesis towards red soils; less permeable soils tend to be yellow.
  2) Hematite favours the development of stable micro-aggregates more than goethite; thus, there is a positive feedback between micro-aggregate development and hematite formation.
  3) In addition, iron availability and original mineralogy are important.
  4) Aggregate formation depends on drainage that in turn also depends on mineralogy and slope morphology.

5) The same parent material under differing temperature conditions (tropical vs. subtropical climate) has produced the same soil types (Oxisol/Ferralsol), but with different mineralogy (tropical = hematite vs. subtropical = goethite).

Sand seas and dune fields of the world: a digital Quaternary atlas – 0704

Project Leader: Nicholas Lancaster (Desert Research Institute, Reno, Nevada, USA).

Inland or continental dune systems are dynamic geomorphic and sedimentary environments that respond directly or indirectly to climate change and variability and/or human impacts on a variety of temporal and spatial scales. Their sedimentary and geomorphic record therefore provides a valuable source of information on past climate conditions and land use, including evidence for periods of aridity (Bateman et al., 2003; Singhvi and Porat, 2008) human impacts (Tolksdorf and Kaiser, 2012), and past wind regimes (Lancaster et al., 2002; Schmeisser et al., 2010; Sridhar et al., 2006).

Periods of aeolian sand deposition have been dated indirectly by their stratigraphic or geomorphic relationships to deposits or features dated using radiocarbon methods (e.g. lacustrine deposits; buried soils). The development and application of luminescence dating techniques provides the means to directly date periods of aeolian deposition, by determining the time elapsed since burial of sediment (Duller, 2004) and has transformed studies of geomorphic and sedimentary environments in deserts and drylands ((Singhvi and Porat, 2008).

The INQUA Dunes Atlas Project (http://www.dri.edu/inquadunesatlas) has developed a global digital database of chronologic information for periods of sand dune accumulation and stabilisation, based on data in publications, reports, theses and dissertations, compiled by project members. The database currently contains over 4000 luminescence and more than 500 radiocarbon records of directly dated periods of aeolian sand accumulation and stability from sites throughout the world, representing all dune types. Additional data are continually being added as they become available.

In addition to chronologic data, the database includes information on the site location (including coordinates), dune type, and stratigraphic context, pertinent analytical information (e.g. luminescence procedures), and literature citations to the original data source (with URLs).

The database has so far enabled: (1) analysis of patterns of dated dune deposits at multiple temporal and spatial scales; (2) correlation of these patterns with other palaeoclimatic proxies; and (3) assessment of the palaeoclimatic and palaeohydrologic implications of periods of aeolian deposition. The results of these studies are being published in a special issue of *Quaternary International* edited by Lancaster and Thomas. Papers published so far cover Australia (Hesse, 2014), Southern Africa ((Thomas and Burrough, 2013), the Southern Sahara ((Bristow and Armitage, 2015), North and South America ((Halfen et al., 2015; Tripaldi and Zárate, 2014), and China (Li and Yang, 2015). Additional papers, including a detailed description of the database and its metadata are in preparation or review.

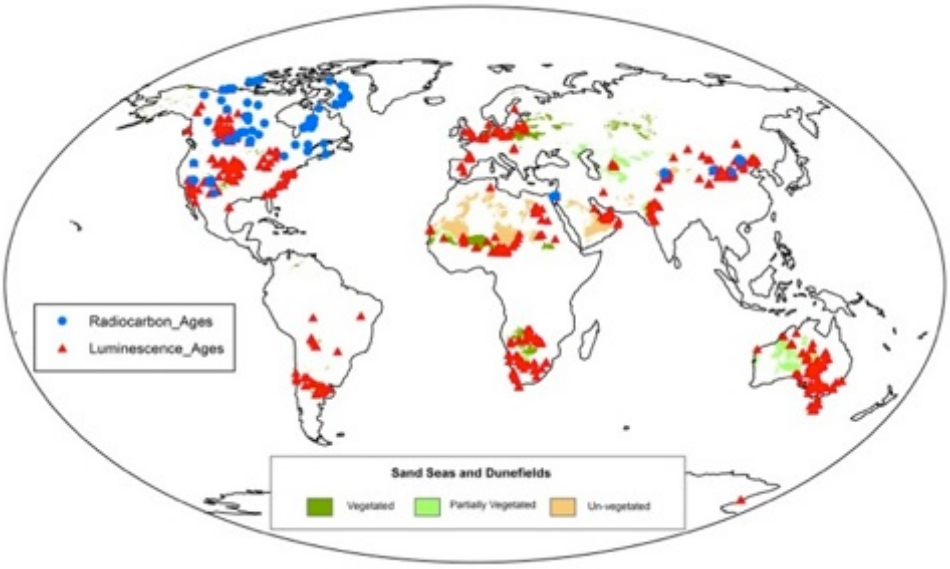

Fig. 28. World distribution of sand seas and dunefields.

Currently, we are developing a web interface for the database, which will permit searches using multiple criteria, and provide for a variety of options for visualisation of the data. The web interface will also enable uploading of new datasets, as well as downloading of existing information, so that the database will be a sustainable and living resource for the Quaternary community.

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References

Bateman, M.D., Thomas, D.S.G. & Singhvi, A.K. (2003). Extending the aridity record of the Southwest Kalahari: current problems and future perspectives. *Quaternary International* 111, 37-49.

Bristow, C.S. & Armitage, S.J. (2015). Dune ages in the sand deserts of the southern Sahara and Sahel. *Quaternary International*.

Duller, G.A.T. (2004). Luminescence dating of Quaternary sediments: recent developments. *Journal of Quaternary Science* 19, 182-192.

Halfen, A.F., Lancaster, N. & Wolfe, S.A. (2015). Interpretations and common challenges of aeolian records from North American dune fields. *Quaternary International*.

Hesse, P.P. (2014). How do longitudinal dunes respond to climate forcing? Insights from 25 years of luminescence dating of the Australian desert dunefields. *Quaternary International*.

Lancaster, N., Kocurek, G., Singhvi, A.K., Pandey, V., Deynoux, M., Ghienne, J.-P. & Lo, K. (2002). Late Pleistocene and Holocene dune activity and wind regimes in the western Sahara of Mauritania. *Geology* 30, 991-994.

Li, H. & Yang, X. (2015). Spatial and temporal patterns of aeolian activities in the desert belt of northern China revealed by dune chronologies. *Quaternary International*.

Schmeisser, R.L., Loope, D.B. & Mason, J.A. (2010). Modern and late Holocene wind regimes over the Great Plains (central U.S.A.). *Quaternary Science Reviews* 29, 554-566.

Singhvi, A.K. & Porat, N. (2008). Impact of luminescence dating on geomorphological and palaeoclimate research in drylands. *Boreas* 37, 536-558.

Sridhar, V., Loope, D.B., Swinehart, J.B., Mason, J.A., Oglesby, R.J. & Rowe, C.M. (2006). Large Wind Shift on the Great Plains During the Medieval Warm Period. *Science* 313, 345-347.

Thomas, D.S.G. & Burrough, S.L. (2013). Luminescence-based dune chronologies in southern Africa: Analysis and interpretation of dune database records across the subcontinent. *Quaternary International*, 1-16.

Tolksdorf, J.F. & Kaiser, K. (2012). Holocene aeolian dynamics in the European sand-belt as indicated by geochronological data. *Boreas* 41, 408-421.

Tripaldi, A. & Zárate, M.A. (2014). A review of Late Quaternary inland dune systems of South America east of the Andes. *Quaternary International*.

7th International Workshop on Palaeoseismology, Active Tectonics, and Archaeoseismology - 7th PATA Days

Crestone, Colorado USA

31st May – 4th June 2016

Venue: Most workshop activities will be held on the Baca Campus of Colorado College.

Tentative deadlines:

Abstracts Due: 1st February 2016
Pre-registration: 1st March 2016
Four-page extended abstracts: 1st March 2016

Excursions:

- Pre-meeting field trip: will be a drive from Denver to Crestone on 31st May.

- Intra-meeting field trip on the afternoon of 2nd June will be a visit to fault scarps within 10 km of Crestone.

- Post-meeting field trip will view neotectonic and climatic landforms of the Upper Arkansas graben.

- 1st PATA road trip "Faults of the Wild West" will be from 24th - 30th May. The road trip is a six-day, 2000 km loop led by Jim McCalpin to visit famous historic surface ruptures and earthquake-induced landslides of the "Wild West" of Utah-Idaho-Wyoming. Attendance limited to ~15, first come-first served.

More information soon at www.pata-days.org

OBITUARIES

In memoriam Augusto Azzaroli (1921 - 2015)

Augusto Azzaroli

On 20th July 2015, at the age of 93, Augusto Azzaroli, a Quaternary Vertebrate Palaeontologist, among the greatest of the second half of the last century, and Honorary President of the European Quaternary Mammals Research Association, EuroMam (a working group under the auspice of Section for European Quaternary Stratigraphy (SEQS) of the Commission of Stratigraphy and Chronology (SACCOM) of INQUA) passed away.

Augusto Azzaroli was born in Bologna on 28th September 1921. He graduated in Natural Sciences at the University of Florence (1945) presenting a thesis on "The foraminifera of the surroundings of Florence". Once graduated, Azzaroli continued his scientific journey by attending the Institute of Geology and Palaeontology at the University of Florence, with a particular interest in vertebrate palaeontology. In 1946 he published his first work, describing the remains of a new species of fossil monkey from Sardinia, *Macaca majori*. In 1947 Azzaroli was appointed Assistant Professor of Geology at the University of Florence, a role he held for a decade. In those years he worked actively at the Geological Survey on a Geological Map of Italy for several sectors of the northern Apennines. From 1950 to 1952, Azzaroli received a fellowship from the Italian National Research Council that funded a long stay in London at the British Museum (Natural History), publishing an extensive report on deer fossils of eastern England. Between 1953 and 1956 he undertook several field missions in northern Somaliland conducting geological surveys on behalf of AGIP Mining company. Having gained good field experience in Africa, in 1958 he was commissioned by the British Government to begin a course of Geology and Palaeontology at the University of Khartoum (Gordon College). Azzaroli remained in Sudan between 1958 and 1959, when he was appointed chair of Geology at the University of Bari, and left Karthoum returning back to Italy. The following year, November 1960, he was appointed Full Professor of Palaeontology at the University of Florence. Azzaroli remained in this position for the rest of his career teaching General Palaeontology and Vertebrate Palaeontology for thirty years until his retirement in 1996. Azzaroli always was attentive to the collections at the Museum of Geology and Palaeontology (now a section of the Museum of Natural History, University of Florence), which he directed from 1976 until 1994. During this time Professor Azzaroli enthusiastically engaged major restructuring and modernisation of the museum. His background in natural sciences with a strong geological perspective markedly influenced his approach to scientific problems. This is particularly relevant in the number of papers such as those dealing with studies of endemic Quaternary vertebrates in the Mediterranean islands, and biogeography and palaeogeographic reconstructions of the circum-Mediterranean realm. His research interests in the early years of his university career (1950-1960) focused on marine faunas of the Eocene, Oligocene and Miocene of northern Somaliland and on the reconstruction of geological events in the Italian peninsula during the early Tertiary and the Miocene. When he returned to the University of Florence (1960) his research shifted to Vertebrate Palaeontology, with particular emphasis on Pliocene and Pleistocene mammals. In over 40 years of activity at the University of Florence Azzaroli brought substantial contributions to the systematics and stratigraphic distribution of artiodactyls (deer, pigs), perissodactyls (horses, rhinos), and proboscideans. Meanwhile, this has substantially contributed to the clarification of the Pliocene-Pleistocene continental stratigraphy in Italy and Europe (the Villafranchian), taking care of the definition and the dating of the major crises of terrestrial vertebrates fauna in this chronological interval. In the review of continental faunal complexes of the Plio-Pleistocene, Azzaroli realized that the so-called " Villafranchian faunas " were neither uniform nor contemporary, but represented instead a relatively large amount of time. A first attempt to divide the Villafranchian faunas is already outlined in some papers in the early 60s, and in the following years Azzaroli sets the stage for a formal division of Villafranchian, which substantially corresponds to the one still in use today.

In the late 60s and early 70s Azzaroli trained a number of students who subsequently became his collaborators and closest colleagues: Pier Luigi Ambrosetti (with whom he shared an interest in Plio-Pleistocene elephants), Danilo Torre, Giovanni Ficcarelli, and Claudio De Giuli (who followed an interest in the evolutionary history of equids). Continuing in the tradition of the geo-palaeontological Florentine school, Azzaroli conducted field research in several countries in Africa, Asia and South America. In 1977 he led, along with fellow zoologists (his wife Maria Luisa Puccetti, and Alberto Simonetta), a natural history field expedition in northern Afghanistan. In 1980, he surveyed the succession of the Pliocene and early Pleistocene of North-Western India, undertaking a palaeomagnetic dating of the sediments thus determining the age of onset of the final stage of uplift of the Himalayan system at the boundary between the Early and Middle Pleistocene. Between 1990 and 1998 he took part in some of the geological and palaeontological field campaigns in South America organised by the Universities of Camerino and Florence. Between 1995 and 1998 he took part in the geo-palaeontological missions of the University of Florence in the Danakil Depression in Eritrea, contributing to the first description of the skull of Early Pleistocene Homo erectus found in the site of Buia, and published in Nature in 1998. Finally, one can readily recall Professor Azzaroli's passion for riding and for the history of equids and the domestic horse. Since the early 1970s he began to devote himself to the history of equestrian art in the ancient world, from the early beginnings of domestication to its spread across the Old World. This research is summarised in a book published by Bryll in 1985. His interest in the horse evolutionary history is also tracked within its activities as a palaeontologist, having devoted much research on fossil species, as demonstrated by various studies on systematics and evolution of Plio-Pleistocene equids from Eurasia, Africa and the Americas.

Upon initial contact with Professor Augusto Azzaroli, he gave the impression of being a shy person of few words, and a bit "enigmatic". However, once you got to know Azzaroli, it was clear he was a great humanist and consummate professional. I have particular appreciation for Professor Azzaroli having been his student in my early career development and knowing him through my own career pursuit. Since his appointment as Professor Emeritus I had, in fact, the privilege of sharing an office with him, in addition to having had the opportunity to undertake some shared field missions in Eritrea. The discovery of Augusto Azzaroli as a person (something much more than "the Professor", or a professional reference) made me understand why Professor Azzaroli was highly regarded both professionally and personally.

With the passing of Professor Augusto Azzaroli, Italian palaeontology loses one of its most distinguished representatives, and the University of Florence loses one of the founders of the Geo-Palaeontology school of the last century. Throughout his career Azzaroli's quiet advice has influenced so many people across many countries and in many different disciplines (not limited to biostratigraphy or Quaternary mammalian evolution). He leaves a significant legacy of research and publications that will undoubtedly continue to influence the direction of future Quaternary researchers.

Lorenzo Rook
Director of Earth Sciences Department, University of Florence

In memoriam Bob Pieter Hageman (1924 - 2015)

Bob Pieter Hageman

Bob Hageman, former director of the Geological Survey of the Netherlands and honorary life fellow of INQUA passed away on 17th May 2015 at the age of nearly 91 years. Trained as a mining engineer at the Technical University of Delft Bob started his career at the Geological Survey in 1955 as a field geologist and in the following years he made his mark on the geological mapping of the Holocene coastal and river plains.

Bob developed profile-type legend for the geological map, which is still a benchmark in geological mapping. This legend was specifically designed to display the vertical sequence of Holocene coastal deposits and intercalated peat layers on a 2D map. The main aim was to provide users of the map insight into the spatial distribution of deposits and their genesis.

Bob Hageman always underlined the relevance of geological knowledge and expertise to a great number of societal demands such as, infrastructural building works, water safety, groundwater resources, and the storage of waste material in the subsurface. He was seen as an advocate of Quaternary geology with a strong emphasis on applied geoscience. He propagated the importance of applied geological research even more when he became Director of the Geological Survey of the Netherlands (1975-1987). Under his leadership investments were made to strengthen the geological mapping programme but also to improve the field survey, by introducing new coring techniques and geophysical methods for the shallow subsurface. In the 1980s he took initiatives to digitise the Survey's extensive geological data files and encouraged the development of ICT-technology in geological mapping. Eventually this resulted in a public nation-wide geological database and 3D geological modelling of the subsurface.

Bob Hageman was also active in INQUA for many years. At first in Holocene coastal geology but later he supported the initiation of a Commission in Applied Quaternary geology. Bob served INQUA as treasurer of the Executive Committee 1987-1991.

We will remember him as a unique person with a clear vision in the significance of Quaternary geological knowledge and expertise for societies all around the world.

Wim Westerhoff
TNO, Geological Survey of the Netherlands

In memoriam Michel Hermelín Arbaux (1937 - 2015)

Michel Hermelín Arbaux

Michel Hermelín Arbaux, the great Colombian geomorphologist, passed away on 15th August 2015 at the age of 78 years.

He was a responsible and committed professional that contributed to the development of Colombian geomorphology. With his efforts as both author and as editor he facilitated the sharing of scientific studies in geomorphology.

He was interested in the history of the development of Colombian geology and geomorphology and made great effort to divulge the first studies made by European scientists that were published in languages other than Spanish.

He valued highly the dissemination of scientific knowledge. He was always available to talk about scientific knowledge with an easy language that anyone could understand.

He was a government assessor. As part of this role he provided geomorphological knowledge to find solutions for e.g. landslides, natural hazards and land use.

He was a great friend, friendly host, and a family person. He liked to share a glass of good wine or a cup of Aguardiente (typical Colombian liqueur).

His departure is a great loss for the Colombian geomorphological community. We believe that the best tribute is continuing our work in the development of Colombian geomorphology and share our knowledge about our findings.

OTHER NEWS

Past anthropogenic land use and land cover change at the global scale for climate modelling studies: PAGES LandCover6k Working Group

Working Group Leaders: Marie-José Gaillard (Linnaeus University, Department of Biology and Environmental Science, Sweden), Kathleen D. Morrison (University of Chicago, Archeology/Anthropology, USA).

Website

Authors: Marie-José Gaillard[1], Kathleen Morrison[2] and Nicki Whitehouse[3].

[1]Linnaeus University, Department of Biology and Environmental Science, Sweden, [2]University of Chicago, Department of Anthropology, USA, [3] Plymouth University, School of Geography/Earth and Environmental Sciences, UK.

The great challenge of PAGES LandCover6k

The major goal of the new PAGES Working Group LandCover6k is to achieve reconstructions of past land use and anthropogenic land cover change for the purpose of climate modelling studies (Gaillard et al., 2015a), and in particular for questions related to land use change as an anthropogenic climate forcing (e.g. Gaillard et al., 2010; 2015b). LandCover6k focuses on the period of the Holocene for which anthropogenic deforestation is significant i.e. from 6 ka ago or earlier depending on the continent/region. LandCover6k has links to other research programmes, in particular IHOPE (Integrated History and Future of People on Earth), GLP (Global Land Project), PMIP (Palaeoclimate Modelling Intercomparison Project), and PAGES-GPWG (Global Palaeofire Working Group), as well as with the INQUA Commissions on Palaeoclimate (PALCOMM) and Humans and Biosphere (HABCOM). LandCover6k involves a large network of palaeoecologists, archaeologists and historians, as well as major international actors within the fields of anthropogenic land cover change (ALCC) modelling (Klein-Goldewijk et al., 2011; Kaplan et al., 2009) and climate modelling. The work is organised into three main activities, i) pollen-based reconstructions of past land-cover change and mapping, ii) land-use reconstructions and mapping based on archaeological and historical data, and iii) ALCC modelling using i) and ii) as evaluation tools and constraining proxy data of ALCC. The great challenges of this initiative are:

- to upscale historical and archaeological data on land use and anthropogenic land cover to the global scale i.e. to categorise land use over of the earth using a standardised approach
- to obtain the necessary parameters to reconstruct land cover in the past using pollen data and models of the pollen-vegetation relationship including models of pollen dispersal and deposition
- to build databases of pollen records as well as historical and archaeological data from all parts of the world where anthropogenic activities have modified vegetation significantly over time
- to coordinate three large communities of scientists, namely palynologists, archaeologists and historians

The scientific background – why this initiative?

Climate change is due to a number of forcings, natural and anthropogenic. Changes in vegetation cover on the globe can be natural (mainly climate-induced), or anthropogenic (due to various land-uses and their changes). Vegetation on land impacts climate by modulating exchanges of energy, water and greenhouse gases with the atmosphere through biogeochemical and biogeophysical processes. These effects either feed back into climate (if due to natural, climate-induced vegetation) or they represent a climate forcing (if due to anthropogenic land use changes, e.g. deforestation). Through these processes, land use change may amplify or reduce climate change due to other forcings (natural or anthropogenic forcings). A land use change can lead to decreased temperatures, in which case it can be a "mitigating factor" as it can reduce climate warming. Biogeochemical forcing from land use change, especially involving the carbon cycle, has received much attention. Biogeophysical forcing from land use change has received less attention although it can have an effect of comparable magnitude in the opposite way i.e. it can cancel the biogeochemical

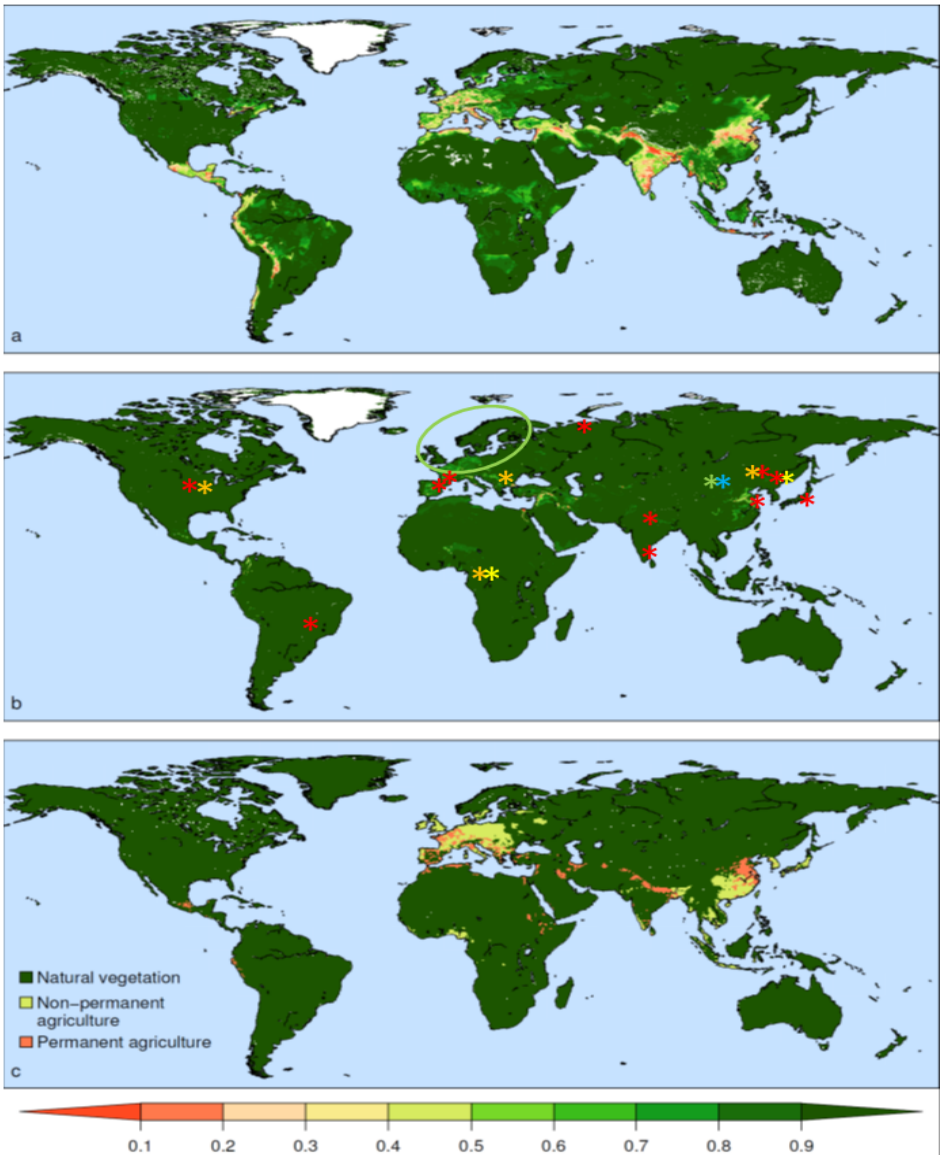

Fig. 29. A comparison of human land use estimates (fraction of deforestation) around AD 1 from a) t KK[10] scenario (Kaplan et al., 2009), and b) HYDE 3.1 (Klein Goldewijk et al., 2011), and c) Olofsson a Hickler (2008). Note that the color scale is relevant for maps (a) and (b). Map (c) has its own color leger The green circle shows the part of Europe for which REVEALS estimates of the cover of open land a available (Trondman et al., 2015), and the stars indicate the regions for which estimates of poll productivity are available (green, published; yellow, unpublished) or in progress (red) and for which t REVEALS model has been tested (blue, published; orange, unpublished) (modified from Gaillard et a 2010). LandCover6k's goal is to improve the KK and HYDE scenarios and decrease their discrepanc using i) land use reconstructions based on archaeological and historical data, and ii) land cov reconstructions based on pollen records and various methods that translate pollen assemblages in quantitative land cover (forested versus deforested land in particular).

effects of e.g. tree planting (see references in Gaillard et al., 2015b). Quantifying the net result of both biogeochemical and biogeophysical forcing is thus of prime importance if those processes are to be used in climate mitigation strategies.

Past anthropogenic land cover reconstructions for climate modelling

Climate models have been developed and tested over many decades and have resulted in complex earth-system models (ESMs) in which the atmosphere, the ocean and land surface processes are coupled. By using a model-data comparison approach, i.e. comparing model outputs with actual climate data over decades, centuries, and millennia back in time (palaeoclimate data), models can be evaluated and improved. In order to account for anthropogenic land use in climate-modelling studies of the past, approaches were developed that use models of human population growth in the past and evidence from historical and archaeological sources to produce scenarios of past anthropogenic land cover change (ALCC, or anthropogenic deforestation) (e.g. Klein-Goldewijk et al. 2011; Kaplan et al., 2009; Pongratz et al., 2008). However, these ALCC scenarios show very significant differences in the fraction of past deforested land depending on the method used (Gaillard et al., 2010); which seriously hampers studies of interactions between land use change and climate in the past. Thus, there is an imminent need for independent descriptions of past vegetation cover based on empirical data and an improved ALCC history at both regional and global scales.

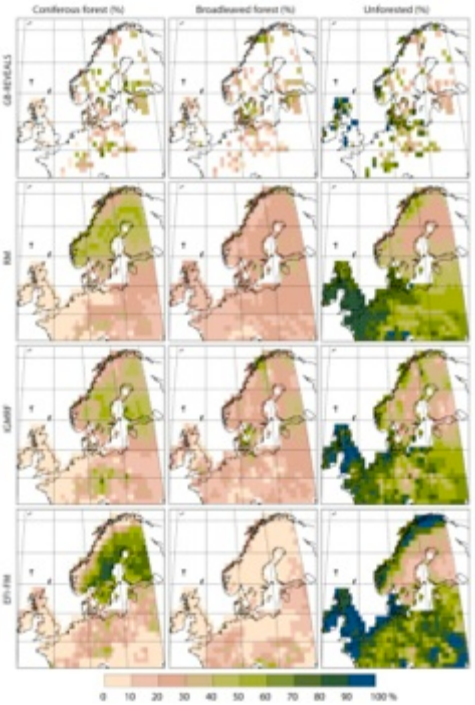

Fig. 30. Reconstructions of proportion (% cover) of the three land cover types (coniferous forest, broadleaved forest and unforested) for the time window AD 1850 (from Pirzamanbein et al., 2014). From top to bottom, the pollen-based REVEALS estimates (from Trondman et al., 2015) the reconstructions from the standard linear regression model (RM) and the intrinsic Gaussian Markov Random Field model (IGMRF), respectively, and the present day land-

Objective, quantitative long-term records of past changes in vegetation cover are still limited in space. Until a few years ago, it was not possible to translate fossil pollen found in lake sediments or peat into a quantitative description of the past vegetation. Sugita (2007) developed an algorithm for inverse modelling of the relationship between pollen and vegetation (Regional Estimates of VEgetation Abundance from Large Sites: REVEALS) that makes it possible to translate fossil pollen data into vegetation cover (in % cover of individual plant taxa or groups of plant taxa) at regional spatial scales. The REVEALS model was tested and validated in several parts of Europe (e.g. Hellman et al., 2008), and in North America (Sugita et al., 2010). REVEALS reconstructions were achieved for part of Europe (Trondman et al., 2015), and can be used to evaluate and improve ALCC scenarios. Beside Europe, the application of REVEALS is now in progress in other parts of Europe.

Climate change: anthropogenic deforestation matters at both global and regional spatial scales

The effect of historical land use change on global climate was studied in many climate modelling studies, of which those by Pongratz et al. (2010) and de Noblet-Ducoudré et al. (2012) are among the most interesting in this context (see review in Gaillard et al., 2015). De Noblet-Ducoudré et al. (2012) used seven global atmosphere–land models with a common experimental design. All models that underwent a change in their forest fraction greater than 15 % simulated cooler ambient air temperature in all seasons. Pongratz et al. (2010) studied the relative strength of biogeochemical versus biogeophysical effects from ALCC during the past millennium using a coupled atmosphere–ocean general circulation model (AOGCM) and by applying the historical ALCC according to Pongratz et al. (2008). The results suggest that the climate response to historical ALCC, both globally and in most regions, was dominated by the rise in CO_2 due to ALCC emissions. However, the biogeophysical temperature response was found to be greater at the regional scale than its global mean. The global versus local effectiveness of biogeochemical versus biogeophysical effects was also demonstrated by the fact that, at the global scale, the entire land area was more strongly influenced by biogeochemical warming than the ocean, while biogeophysical cooling was particularly pronounced over agricultural areas.

A study using a regional climate model and the ALCC scenarios of Klein-Goldewijk et al. (2011) and Kaplan et al. (2009; KK[10]) suggests that deforestation at 0.2 ka BP as simulated in the Kaplan et al. (2009) KK[10] scenario had significant biogeophysical forcing on regional climate (temperatures and precipitation). During winter, simulated temperatures are up to 1-1.5ºC lower in eastern Europe when land is deforested than when it is not; during summer, simulated temperatures are up to 1º higher in eastern Europe, and up to 1º lower in the Mediterranean region when land is deforested than when it is not (Strandberg et al., 2014).

The PAGES LandCover6k Working Group and its implementation

The LandCover6k Working Group aims to capitalise on the developments of pollen-based reconstructions of past vegetation cover in Europe in a large, globally coordinated effort. The ultimate goal of LandCover6k is to produce useful outputs for climate/earth system modellers in particular, but also for ecologists, conservation bodies, land use managers, and policy-makers. The specific aims are to:

- produce pollen-based land cover reconstructions for regions of the world where human impact has been particularly intense over the Holocene in the past.

- produce maps of generalised land use over the globe based on historical and archaeological data. An example of how such a land-use categorisation might look is the categorisation proposed for sub-Saharan Africa by Kay and Kaplan (2015).

- evaluate the existing ALCC scenarios with the combined information from the pollen-based reconstructions (land cover reconstructions), archaeological and historical data (land use reconstructions).

- improve the ALCC models and produce spatially continuous land cover descriptions integrating all the available empirical information.

We strive to achieve this final product within six years. The ambitious and challenging plan of LandCover6k requires a large, well-organised group of devoted scientists. The group is coordinated by experts in pollen-based reconstructions of vegetation cover, pollen databases, historical and archaeological data on land use, mapping of recent land cover change, modelling of anthropogenic land cover change, and climate modelling. Moreover, the Working Group is divided into nine subgroups, of which five are regional subgroups, each with two to three coordinators (a minimum of one palynologist and one historian or archaeologist), i.e. North America, Latin America, Europe, Africa, and Asia with Oceania.

References

de Noblet-Ducoudré, N., Boisier, J.P., Pitman, A., Bonan, G.B., Brovkin, V., Cruz, F., Delire, C., Gayler, V., Van den Hurk, B.J.J.M., Lawrence, P.J., van der Molen, M.K., Müller, C., Reick, C.H., Strengers, B.J. & Voldoire, A. (2012). Determining robust impacts of land-use-induced land cover changes on surface climate over North America and Eurasia: results from the first set of LUCID experiments. *Journal of Climate* 25, 3261-3281.

Gaillard, M.-J., Sugita, S., Mazier, F., Trondman, A,-K., Broström, A., Hickler, T., Kaplan, J. O., Kjellström, E., Kokfelt, U., Kuněs, P., Lemmen, C., Miller, P., Olofsson, J., Poska, A., Rundgren, M., Smith, B., Strandberg, G., Fyfe, R., Nielsen, A. B., Alenius, T., Balakauskas, L., Barnekow, L., Birks, H.J.B., Bjune, A., Björkman, L., Giesecke, T., Hjelle, K., Kalnina, L., , Kangur, M., van der Knaap,

W.O., Koff, T., Lagerås, P., Latałowa, M., Leydet, M., Lechterbeck, J., Lindbladh, M., Odgaard, B., Peglar, S., Segerström, U., von Stedingk, H. & Seppä, H. (2010). Holocene land-cover reconstructions for studies on land cover-climate feedbacks. *Climate of the Past* 6, 483-499.

Gaillard, M.-J. & LandCover6k Steering group members (2015a). LandCover6k: Global past anthropogenic land-cover change and its role in past climate. *PAGES MAGAZINE* 23/1: 38-39.

Gaillard, M.-J., Kleinen, T., Samuelsson, P., Nielsen, A.B., Bergh, J., Kaplan, J.O., Poska, A., Sandström, C., Strandberg, G., Trondman, A.K. & Wramneby, A. (2015b). Causes of Regional Change—Land Cover. Chapter 25 In BACC II Author team: *Second Assessment of Climate Change for the Baltic Sea Basin* (BACC II). Springer Open, ISSN 1862-0248 ISSN 1865-505X (electronic), Regional Climate Studies, pp. 453-477. ISBN 978-3-319-16005-4 ISBN 978-3-319-16006-1 (eBook). DOI 10.1007/978-3-319-16006

Hellman, S., Gaillard, M.-J., Broström, A. & Sugita, S. (2008). The REVEALS model, a new tool to estimate past regional plant abundance from pollen data in large lakes: validation. *Journal of Quaternary Science* 23, 21-42.

Kaplan, J.O., Krumhardt, K.M. & Zimmermann, N. (2009). The prehistoric and preindustrial deforestation of Europe. *Quaternary Science Reviews* 28, 3016-3034.

Kay, A.U. & Kaplan, J.O. (2015). Human subsistence and land use in sub-Saharan Africa, 1000 BC to AD 1500: A review, quantification, and classification. *The Anthropocene*: doi:10.1016/j.ancene.2015.05.001.

Klein Goldewijk, K., Beusen, A., van Drecht, G. & de Vos, M. (2011). The HYDE 3.1 spatially explicit database of human-induced global land use change over the past 12,000 years. *Global Ecology and Biogeography* 20, 73-86.

Olofsson, J. & Hickler, T. (2008). Effects of human land-use on the global carbon cycle during the last 6,000 years. *Vegetation History and Archaeobotany* 17, 605–615.

Pirzamanbein, B., Lindström, J., Poska, A., Sugita, S., Trondman, A., Fyfe, R., Mazier, F., Nielsen, A.B., Kaplan, J.O., Bjune, A.E., Birks, H.J.B., Giesecke, T., Kangur, M., Latałowa, M., Marquer, L., Smith, B. & Gaillard, M.-J. (2014). Creating spatially continuous maps of past land cover from point estimates: A new statistical approach applied to pollen data. *Ecological Complexity* 20, 127-141.

Pongratz, J., Reick, C., Raddatz, T. & Claussen, M. (2008). A reconstruction of global agricultural areas and land cover for the last millennium. *Global Biogeochemical Cycle* 22, GB3018. doi:10.1029/2007GB003153

Pongratz, J., Reick C., Raddatz, T. & Claussen, M. (2010). Biogeophysical versus biogeochemical climate response to historical anthropogenic land cover change. *Geophysical Research Letters* 37, L08702. doi:10.1029/2010GL043010

Strandberg, G., Kjellström, E., Poska, A., Wagner, S., Gaillard, M.-J., Trondman, A.-K., Mauri, A., Davis, B.A.S., Kaplan, J.O., Birks, H. J. B., Bjune, A.E., Fyfe, R., Giesecke, T., Kalnina, L., Kangur, M., van der Knaap, W.O., Kokfelt, U., Kuneš, P., Latałowa, M., Marquer, L., Mazier, F., Nielsen, A.B., Smith, B., Seppä, H. & Sugita, S. (2014). Regional climate model simulations for Europe at 6 and 0.2 ka BP: sensitivity to changes in anthropogenic deforestation. *Climate of the Past* 10, 661-680.

Sugita, S. (2007). Theory of quantitative reconstruction of vegetation I: Pollen from large lakes REVEALS regional vegetation composition. *Holocene* 17, 229–241.

Sugita, S., Parshall, T., Calcote, R. & Walker, K. (2010). Testing the Landscape Reconstruction Algorithm for spatially explicit reconstruction of vegetation in northern Michigan and Wisconsin. *Quaternary Research* 74, 289–300.

Trondman, A.-K., Gaillard, M.-J, Mazier, F., Sugita, S., Fyfe, R., Nielsen, A. B., Twiddle, C., Barratt, P., Birks, H. J. B., Bjune, A. E., Björkman, L., Broström, A., Caseldine, C., David, R., Dodson, J., Dörfler, W., Fischer, E., Van Geel, B., Giesecke, T., Hultberg, T., Kalnina, L., Kangur, M., van der Knaap, P., Koff, T., Kuněs, P., Lagerås, P., Latałowa, M., Lechterbeck, J., Leroyer, C., Leydet, M., Lindbladh, M., Marquer, L., Mitchell, F. J. G., Odgaard, B. V., Peglar, S. M., PERSSON6, T., Poska, A., Rösch, M., SEppä, H., Veski, S. & Wick, L. (2015). Pollen-based quantitative reconstructions of Holocene regional vegetation cover (plant-functional types and land-cover types) in Europe suitable for climate modelling. *Global Change Biology* 21, 676-697.

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The Regional Conference is the annual meeting of the International Geographical Union. The conference in Moscow, 2015, focused on five main themes: Urban Environment, Polar Studies, Climate Change, Global Conflict and Regional Sustainability. The programme was rooted in the principals of diversity and interdisciplinary exchange. It featured a variety of meetings, including plenary sessions, lectures, panel discussions, workshops and other events. It also provided opportunities for sharing ideas on IGU projects and on the role of geographers in international initiatives such as Future Earth.

Studies of Quaternary palaeoenvironments were included in the conference programme as special sessions in the IGU Commission on Environment Evolution. The main goal of the Commission is to study human and environmental interaction including climate, landscapes and culture in the Late Quaternary. The principal lines of research are: landscape dynamics, natural processes and human impact. The Commission is focused also on assessing the role of climate and landscape in the development of human society evolution as well as anthropogenic influences on environmental conditions.

The Commission on Environment Evolution was organised into three special sessions: (1) Environment evolution and human activity in the Late Quaternary (conveners: A.Velichko and T.Boettger); (2) Landscape dynamics and human impacts during the last millennium (conveners: E.Yu.Novenko and D.Koslov); (3) Climate - vegetation interaction under current and future climate change scenarios (convener: A.Olchev). The program included 55 oral presentations and 19 posters. Participants from Russia, Denmark, Kazakhstan, Rumania, India, China, Egypt, Saudi Arabia, Israel, Brazil and Peru took part in these special sessions.

The main topics that were discussed in the special sessions included: landscape and climate dynamics in the Pleistocene and the Holocene in different parts of the World, initial occupation of Eurasia by humans, human and environmental interaction and land use in the Holocene and in the recent past, modern forest ecosystems and the prognosis of their dynamics in the future. Special attention was paid to the problems of the palaeoeogeography of Caspian basin and environmental evolution of arid zones in the Late Quaternary.

The 33rd International Geographical Congress

Beijing, China

21st – 25th August 2016

The International Geographical Union (IGU) Environment Evolution Commission will organise two special sessions at this Congress:

- Environment evolution and human activity in the Late Quaternary
- Climate - vegetation interaction under past and future climate conditions

Important Dates
Call for abstracts/papers: **until 15th Jan 2016**
Early registration: **15th Aug 2015 – 15th Mar 2016**
Regular registration: **16th Mar 2016 – 15th July 2016**
Late registration: **after 15th July 2016**
More information http://www.igc2016.org

GLOSSARY

AAR: Amino Acid Racemization

ALCC: anthropogenic land cover change

AMQUA: American Quaternary Association

AMS: Accelerator Mass Spectrometry

AOGCM: atmosphere–ocean general circulation model

ASQUA: Asian Quaternary Stratigraphy

CANQUA: Canadian Quaternary Association

CMP: Coastal and Marine Processes Commission (INQUA)

CPD: Climate of the Past Discussions

EAAPP: East Africa Association of Palaeoanthropology and Palaeontology

EASAC: European Academies Science Advisory Council

ECR: Early Career Researcher

EEEs: earthquake environmental effects

ESms: Earth-system models

ESR: Electron Spin Resonance

EVA: Finnish Business and Policy Forum

GEM: Global Earthquake Model

GI: Greenland Interstadial

GLP: Global Land Project

GMSL: Global Mean Sea Level

HABCOM: Humans and Biosphere Commission (INQUA)

ICS: International Commission on Stratigraphy

ICSU: International Council for Science

IFG: International Focus Group

IGBP: International Geosphere-Biosphere Programme

IGU: International Geographical Union

IHOPE: Integrated History and Future of People on Earth

INGV: Istituto Nazionale di Geofisica e Vulcanologia

INTAV: International Focus Group on Tephrochronology and Volcanism

INTIMATE: INTegrating Ice-core, MArine, and TErrestrial records

ISRPA (Geological Survey of Italy)

LIG: Last interglaciation

LFG: Loess and Pedostratigraphy

MPR: Mid-Pleistocene Revolution

NORDFORSK: Nordic Committee on Bioethics

OSL: Optically Stimulated Luminescence

PAGES: Past Global Changes

PAGES-GPWG: Global Palaeofire Working Group

PALACTE: Palaeoseismology and Active Tectonics

PALCOMM: Palaeoclimate Commission (INQUA)

PALSEA: (PALeo constraints on SEA level rise)

PATA: Palaeoseismology, Active Tectonics and Archaeoseismology

PBEs: palaeobiogeographical events

PMIP: Palaeoclimate Modelling Intercomparison Project

QI: *Quaternary International*

QP: *Quaternary Perspectives*

REVEALS: Regional Estimates of VEgetation Abundance from Large Sites

RM: Regression Model

ROCEEH: Role of Culture in Early Expansions of Humans

SACCOM: Stratigraphy and Chronology Commission (INQUA)

SARA: South America Risk Assessment

SCAR: Scientific Committee on Antarctic Research

SEQS: Section (formerly 'Sub-Commission') on European Quaternary Stratigraphy

TERPRO: Terrestrial Processes, Deposits and History Commission (INQUA)

USGS: United States Geological Survey

YD: Younger Dryas