

**PAGES 2k Network wide teleconferences  
January 2018**

*Meeting Notes*

**WELCOME**

**What**

PAGES 2k Network coordinators (Helen McGregor, Belen Martrat, Nerilie Abram, Scott St George, Raphael Neukom, Oliver Bothe, Hans Linderholm, Steven Phipps and Lucien von Gunten) organized the teleconferences to present the current status of the 2k Network and its projects, and to discuss ideas and opportunities for new activities, products and collaborations.

**When**

24 January 2018 8am CET and 25 January 2018 8pm CET; the teleconferences were held on two days and at different times to encourage participation from both eastern and western hemispheres. They ran for ca. 90 minutes and had the same agenda.

**Who**

Anyone interested in PAGES 2k was welcome to join.

Participants, meeting 24 January: Lucien von Gunten (coordination-PAGES IPO), Raphi Neukom (coordination-moderator), Anaïs Orsi, Belen Martrat (coordination-taking notes), Carin Andersson Dahl, Quentin Dalaiden, Elaine Lin Kuanhui, Feng Shi, Fernando Jaume-Santero, Fidel Gonzalez-Rouco, Hans Christian Steen-Larsen, Elena Garcia-Bustamante, Helen McGregor (coordination), Hong-Wei Chiang, Hugues Goosse, Juan José Gomez-Navarro, Julie Jones, Keith Potts, Marie-France Loutre (PAGES IPO), Oliver Bothe (coordination), Paul Butler, Purna Sandakantha Yahampath, Rakesh Saini, Susanne Fietz, Thomas Felis.

Participants, meeting 25 January: Lucien von Gunten (coordination-PAGES IPO), Raphi Neukom (coordination-moderator), Amy Cromartie, Amy Hessel, Arto Miettinen, Bethany Coulthard, Bronwen Konecky, Carin Andersson Dahl, Caroline Ummehofer, Connor Nolan, Darrell Kaufman, Dmitry Divine, Eugene Wahl, Gladys Bernal, Hali Kilibourne, Jeannine St-Jacques, Kim Cobb, Liz Thomas, Marie-France Loutre (PAGES IPO), Martin Hadad, Matt Fischer, Michael Erb, Mike Evans, Nathalie Goodkin, Nick McKay, Oliver Bothe (coordination), Scott St George (coordination-taking notes), Vincent Hare, Wendy Gross.

**How**

PAGES IPO hosted the teleconference using the online platform Adobe Connect (<https://collab.switch.ch/pages2k>)

**AGENDA**

- 1. Brief overview of the status of the PAGES 2k initiative**
- 2. Short presentation of active Phase 3 projects**
- 3. Open Discussion**

## (10 min) Brief overview of the status of the PAGES 2k project

For background, see [2k Network overview](#)

Raphi: The 2k Network is now in its third phase. Phase 3 was launched in May 2017 at the PAGES OSM meeting and will last until 2020. The main aim of Phase 1 (2008-2013) was to develop regional reconstructions with an emphasis on temperature [e.g. PAGES 2k Consortium (2013) Nature Geoscience]. During Phase 2 (2014-2016), the focus was broadened from the regional phase to explore trans-regional subjects, including data-model comparison and global data collections [e.g. Abram et al., (2016) Nature; PAGES 2k Consortium (2017) Scientific Data]. Now Phase 3 is structured around collaborative projects led by the community, which allow collaborations from different regions and varying career stages. Up-to-date list of 2k [publications](#) is available. Active [collaborative projects](#) are structured around three themes [see Figure 1 below, taken from the [PAGES 2k AGU poster](#) (Dec 2017)]:

- (i) Methods and Uncertainties (reduce uncertainties in the interpretation of observations imprinted in paleoclimate archives by environmental sensors)
- (ii) Proxy and Model Understanding (identify and analyse the extent of agreement between reconstructions and climate model simulations)
- (iii) Climate Variability, Modes and Mechanisms (further understand the mechanisms driving regional climate variability and change on inter-annual-to-centennial time scales)

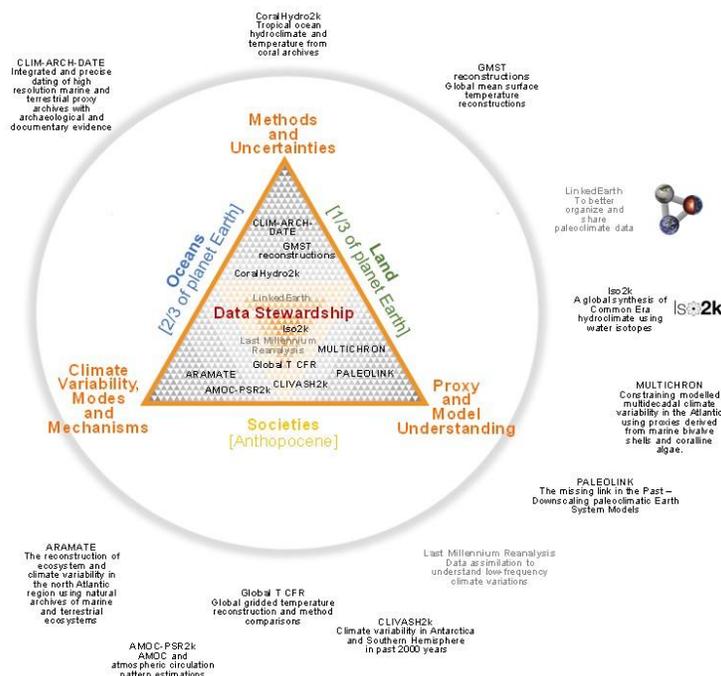


Figure 1. The 2k Network universe Phase 3. Key aspects of all PAGES 2k projects are end-to-end workflow transparency, open data, and knowledge access. Partner projects are shown in grey.

And along with those comes the [Data Stewardship](#) integrative activity, which is a priority in Phase 3 projects to ensure credit to data generators and increase the transparency of our scientific efforts. See the [technical note](#) [Kaufman et al. (2017) CP] at the [PAGES 2k special issue of Climate of the Past](#) “Climate of the past 2000 years: regional and trans-regional syntheses”.

**(60 min) Short presentation of active Phase 3 projects (3 to 5 minutes each)**

Presentations on 2k projects active in Phase 3 followed order from older projects to the newer ones, with the most senior projects having started in Phase 2. Brief introduction of the topic, status and options to contribute for each project are provided.

**GMST reconstructions**

**Global mean surface temperature reconstructions**

**(R. Neukom and 19 2k members)**

Raphi: It is a relatively large project, aiming to reconstruct temperature over the Common era based on the latest version of the PAGES 2k proxy database.

**Global T CFR**

**Global gridded temperature reconstruction and method comparisons**

**(R. Neukom and 4 2k members)**

Raphi: It has a smaller team, once again aiming to reconstruct temperature but focused on climate fields, with an emphasis on gridded datasets and spatial patterns.

Both GMST, and Global T CFR were trans-regional projects in previous Phase 2 and are nearly finished with publications expected to come out this year. There will be follow-up projects that are actively soliciting new participants. Contact Raphael Neukom [neukom@giub.unibe.ch](mailto:neukom@giub.unibe.ch) for more information.

**Iso2k**

**Iso2k: A global synthesis of Common Era hydroclimate using water isotopes**

**(B. Konecky, J. Partin and 64 2k members)**

Anais / Bronwen: Iso2k has been part of PAGES2k in some form for 2 years. The main objective is to focus on hydroclimate during the last 2000 years. Started with records tracking the oxygen isotope concentrations of water, including multiple proxies tracking  $\delta^{18}O$ . Has more than 60 people on the mailing list, 30 of which actively contributing and cleaning data. Archive expert sub-groups (coral, glacier and ground ice, marine and lake sediments, speleothems, sclerosponges, wood) work on tons of metadata and compile information in LIPD files. The team has monthly teleconferences where everyone provides updates, raises questions, while ensuring a common language is used. The Iso2k database includes 629 records globally, which is the 'Science Beta' version 0.6 (Nov 2017). Not enough to be published but advanced enough to start making queries for scientific questions. One of the major goals is to learn how to blend high-resolution records (which are limited and short) with low-resolution archives, in order to avoid a huge drop off in data available over the pre-industrial period. First in-person meeting followed the PAGES OSM (May 2017). Presented initial results at PMIP meeting in Stockholm (Sep 2017) and AGU (Dec 2017). The goal for the next few months is to complete quality control on dataset. Also important to standardize age-control metadata.

Slides available [here](#). Contact Bronwen Konecky [bkonecky@wustl.edu](mailto:bkonecky@wustl.edu) and Jud Partin [jpartin@ig.utexas.edu](mailto:jpartin@ig.utexas.edu) for more information.

## **AMOC-PSR2k**

### **AMOC and atmospheric circulation pattern estimations**

**(C. Saenger, M. Evans and 4 2k members)**

Mike Evans: this effort uses the proxy reconstruction method with marine archives (like Mg/Ca and stable isotope data), linking those two sources of information using proxy systems models of marine archives and the foraminifera sensors. The team has received help from Kaustubh Thirumalai to standardize age models and make other contributions. Have been focused on the North Atlantic to focus on overturning and having a hard time with validation. Applying calibration statistics in space, rather than time, drawing methods from tree-ring climate reconstructions. Want to borrow other methods from hydrological or oceanographic literature. May be difficult to extract patterns from a non-optimal network of proxies in the North Atlantic. People interested in statistical questions, proxy system modelling (especially for observations that are not currently used) would be welcomed to participate. Mike will (tentatively) attend EGU (April 2018), with an abstract submitted to that meeting.

Contact Casey Saenger [csaenger@uw.edu](mailto:csaenger@uw.edu) and Mike Evans [mnevans@umd.edu](mailto:mnevans@umd.edu) for more information.

## **CLIVASH2k**

### **Climate variability in Antarctica and Southern Hemisphere in past 2000 years**

**(E. Thomas, A. Orsi, Z. Yu, P. A. Mayewski, A. Moy, B. Stenni and 11 2k members)**

Anaïs / Liz Thomas: This is a group focused on climate variability of the Southern Hemisphere, building onto the Antarctic 2k project of previous Phases 1 and 2. In that work, there were two main goals: reconstructing snow accumulation or precipitation, and focusing on stable isotopes. Two papers contributed to the [PAGES 2k special issue of Climate of the Past](#) [Thomas et al. (2017) CP, Stenni et al. (2017) CP]. Now it is time to broaden the project to address PAGES 2k interest in climate variability and modes. The group has seen key changes in some parts of Antarctica. They want to bring together as many people as possible and include a broader set of proxies (peat bogs, other terrestrial sources, and marine records). One of the aims is to combine the high- and low-resolution records and bring in sub-Antarctic proxies. Team members cover proxy and climate archives. The team will have a meeting set-up as part of Polar 2018 in Davos (June 2018) and want to host a 2-day workshop in Cambridge (Sep 2018), targeted at climate reconstructions.

Mike Evans: it seems like the small cooling over the pre-industrial 2k interval is independently being found in CLIVASH2k, semi-independently found in 2k temperature database as well as Ocean2k LR (low resolution) synthesis [McGregor et al. (2015) Nature Geoscience].

Liz: We do see a cooling in the 1600s, but some of the data overlap with the larger reconstruction, so may not be an entirely new result.

Slides available [here](#). Contact Elizabeth Thomas [ekthomas@buffalo.edu](mailto:ekthomas@buffalo.edu) and Anaïs Orsi [anais.orsi@lsce.ipsl.fr](mailto:anais.orsi@lsce.ipsl.fr) for more information.

## **CoralHydro2k**

### **Tropical ocean hydroclimate and temperature from coral archives**

**(T. Felis, N. Abram, K. Cobb and 10 2k members)**

Thomas Felis / Kim Cobb: Seeking to compile deltaO18 records and Sr/Ca from corals to understand climate and hydroclimate changes in the tropics during the last 2k. Coral O18 can be difficult to interpret as temperature proxies but Sr/Ca can help address those deficiencies. Just published in the PAGES 2k special issue of Climate of the Past a paper that lays the foundation for this new coral PAGES 2k working group [PAGES Hydro2k consortium et al. (2017) CP]. New contributions from the Indian Ocean, and other new records will be incorporated into the expanded database, again constituting paired O18 and Sr/Ca records to identify dynamical drivers, changes on seasonal-to-multidecadal scales, resolve anthropogenic interferences in the global hydrological cycle and marine-terrestrial linkages by using tree records for comparison purposes. But still a lot to learn even for the last 100 years. The team will meet at a CoralHydro2k session at the EGU (April 2018) and a site meeting at the next ICP in Sydney Australia (Sep 2019). Hope to have a more polished dataset at both those meetings, and more records are warmly welcomed. The group also needs people interested in statistical analysis of coral proxy records. Also involved with a new working group under US Clivar focused on atmospheric isotopes, including the use of model simulations in tracer exercises. First time that US-Clivar has even considered funding a working group that involves paleoclimatology.

Slides available [here](#). Contact Thomas Felis [tfelis@marum.de](mailto:tfelis@marum.de), Nerilie Abram [nerilie.abram@anu.edu.au](mailto:nerilie.abram@anu.edu.au) and Kim Cobb [kcobb@gatech.edu](mailto:kcobb@gatech.edu) for more information.

## **MultiChron**

### **Constraining modelled multidecadal climate variability in the Atlantic using proxies derived from marine bivalve shells and coralline algae**

**(C. A. Dahl, O. H. Otterå and 10 2k members)**

Carin: This projects comes from the marine sclerochronology community, and is tied to prior activities over the past 4 years, such as ARAMACC, which used shells of very long-lived molluscs as a record of environmental change in the northeast Atlantic ocean over the past thousand years. These activities included training the next generation of specialists on the science of sclerochronology. This new project will build on North Atlantic bivalve records with modelling (CMIP5 + CMIP6 model output) to examine the dynamical mechanisms that drive multidecadal-scale variability and control the wider responses in the atmospheric and oceanic circulation (e.g. teleconnections). They are going to look into these records widening the spatial and methodological perspective. The team will meet interested parties in EGU in Vienna (April 2018).

Contact Carin Andersson Dahl [carin.andersson@uni.no](mailto:carin.andersson@uni.no) and Odd Helge Otterå [Odd.Ottera@uni.no](mailto:Odd.Ottera@uni.no) for more information.

## **CLIM-ARCH-DATE**

**Integrated and precise dating of high resolution marine and terrestrial proxy archives with archaeological and documentary evidence  
(P. Butler, J. Scourse and 12 2k members)**

Paul / Carin: This project will try to improve dating constraints of archaeological sites. Participants mix paleo-scientists and archaeologists. Want to align high-resolution records (tree rings, corals, bivalves, lake sediment, peat bogs). Focus on method development in archaeology, seeking driving factors behind societal changes. Deal with accurate and precise dating of events in the past, which remains a significant challenge for archaeology and palaeoclimatology (uncertainties associated with the marine radiocarbon reservoir effect, proxy archives from less well resolved sediment cores, etc). Development of annually-resolved and absolutely-dated marine proxy archives derived from annual growth increments in bivalve shells are used to address the timing of events in coastal communities with much greater precision than previously and dating certain archaeological events (for instance, Norse settlement in Greenland or the disappearance of the Rapanui civilization of Easter Island in the Pacific Ocean). The team is receiving expressions of interest for joining (e.g. Rakesh Saini and others) and some comments on how that function in practice are posed.

Lucien: There are different ways to contribute: from subscribing to the mailing list (to know what it is going on only) to active involvement with role assignation, which will be taken in consideration when dealing with paper authorship. To highlight different types of contributions in manuscripts, there are previous PAGES 2k examples subdividing authors into tiers [e.g. PAGES 2k Consortium Scientific Data in 2017: (tier 4) principal data analysers, manuscript writers and project coordinators; (tier 3) principal regional data managers compiling and formatting large number of proxy records; (tier 2) secondary regional data managers; (tier 1) other contributions, etc].

Contact Paul Butler [p.g.butler@bangor.ac.uk](mailto:p.g.butler@bangor.ac.uk) and James Scourse [j.scourse@exeter.ac.uk](mailto:j.scourse@exeter.ac.uk) for more information.

## **ARAMATE**

**The reconstruction of ecosystem and climate variability in the north Atlantic region using natural archives of marine and terrestrial ecosystems  
(P. Butler, U. Buentgen and 7 2k members)**

Paul / Carin: The team wants to transfer comparisons of climate and ecology in southern California to the North Atlantic. They foresee potential cooperation with other active projects such as AMOC-PSR2k (Casey Saenger, etc). Following some previous studies [Black et al., (2014) Science], the project uses a combination of multiple proxy indicators of ecosystem and environmental variability to give insight into the dynamical mechanisms associated with the reconstruction target. Interpretation of tree-ring based reconstructions are validated by independent responses in different marine and terrestrial ecosystems (fish otoliths, phytoplankton, seabird activity and seabird population records, etc).

Contact Paul Butler [p.g.butler@bangor.ac.uk](mailto:p.g.butler@bangor.ac.uk) and Ulf Buentgen [ulf.buentgen@geog.cam.ac](mailto:ulf.buentgen@geog.cam.ac) for more information.

## **PALEOLINK**

### **The missing link in the Past – Downscaling paleoclimatic Earth System Models (J. J. Gomez-Navarro, P. Ludwig, E. Zorita and 19 2k members)**

Juan José: Coordinating efforts to bridge the scale gap between Earth System models and climate reconstructions. Want to look at regional climate models (RCM) in a paleo context while addressing the question: Does the increased modelling detail make better comparisons with proxies? Evaluation of dynamical versus statistical downscaling and forward modelling are as yet to explore. The project has 20 people directly involved after launching last month. A review paper is in preparation [Ludwig et al., ANYAS]. The team has also submitted their work at EGU (April 2018) in the 2k session and it is open to new members.

Slides available [here](#). Contact Juan José Gomez-Navarro [jjgomeznava@um.es](mailto:jjgomeznava@um.es), Patrick Ludwig [patrickludwig@kit.edu](mailto:patrickludwig@kit.edu) and Eduardo Zorita [eduardo.zorita@hzg.de](mailto:eduardo.zorita@hzg.de) for more information.

### **(20 min) Open Discussion**

Raphi: We may have 2 new additional projects connected to the Arctic (led by Maxime Debret) and Asia (led by Elaine Lin Kuanhui), the latter focused mainly on historical documents from east Asia. It's also important to note there are no deadlines, so PAGES2k is always open to new submissions and new initiatives. Guidelines for proposing a new 2k project available [here](#).

Elaine: The new Asian PAGES 2k initiative is in progress. The team has been focusing on REACHS (Reconstructed East Asian Climate Historical Series), working on the construction of a high spatiotemporal resolution East Asian historical climate database over the past 2k period (using Chinese historical documents, together with thousands of meteorological records to support high resolution temperature/precipitation reconstruction and analysis on extreme hydroclimate events). They plan to release the dataset during 2018. The team will have a meeting soon in Taiwan (Feb 2018; <http://reachs.rcec.sinica.edu.tw/ICHCC2018/>) to work on the subjects of climate change in (late) Holocene, paleo-hydroclimate and extreme events, data merging, reconstruction methods/modelling and climate change and human societal evolution.

### **PARTNER projects: Last Millennium Reanalysis and LinkedEarth**

Lucien: There are partner projects closely related to 2k: LMR, the Last Millennium Reanalysis project, which is US-NSF funded project that uses data assimilation to understand low-frequency climate variations; and also the LinkedEarth project, which is linked to data management initiatives. The LinkedEarth data repository is centred around the Linked Paleo Data (LiPD) framework, empowering scientists to curate their own data/compilations and to build new tools centred around those (e.g. GeoChronR, Pyleoclim). LinkedEarth was designed with the needs of PAGES-style data syntheses in mind, as exemplified by the PAGES 2k compilations.

## **Comments on Data Stewardship**

Lucien: The colleagues at NOAA Paleo have been working closely with PAGES 2k to create new standards for data sharing.

Gene Wahl: New brief announcements related to Data Stewardship. NOAA has been working with a NSF project here and advisory panels to set control panels for measured variables and the full implementation is about to be finalized. Also want to implement those terms into NOAA's search capabilities. NOAA will ask contributors to use controlled vocabularies to commit metadata. For example, NOAA has also been working recently with the PAGES Hydro2k consortium, and now is asking PAGES 2k groups to create a liaison person to communicate with them at the early stage of the project. We'll send a notice within the next month. Please contact [paleo@noaa.gov](mailto:paleo@noaa.gov) for details about the new metadata standards at NOAA.

Raphi: Data hosting and data stewardship is a key focus for the third phase. Has been a key aspect of the publication process for the PAGES 2k special issue of the *Climate of the Past*. There are straightforward options to assist with the publication of data and metadata.

Oliver: Some datasets from modelling runs are big and difficult to archive, but can be stored at World Data Center for Climate (<https://www.dkrz.de/up/systems/wdcc>).

## **Final remarks**

Lucien: PAGES 2k wants to encourage people to propose new ideas. As long as the projects are integrative, international, and fits the 2k spirit, new initiatives are welcome. Also make sure you make use of the 2k Network. The 2k Network has more than 1200 subscribers, which constitutes a huge group of potential collaborators. There is a 2k session at EGU and people are encouraged to attend if you're in Vienna (April 2018).