



[pages-igbp.org/workinggroups/2k-network](http://pages-igbp.org/workinggroups/2k-network)

## Contents

1. Status of the 2k Project	2
2. Release of Phase 2 Temperature database - call for projects	2
3. Update from the PAGES 2k regional groups	2
4. Update from the 2k trans-regional projects	4
5. New 2k products	5
6. Upcoming 2k meetings	5
7. Meeting support	6

This circular is sent to all 2k mailing lists subscribers. Feel free to forward it to interested colleagues with a link to the [PAGES 2k list](#) where they can sign up to receive future circulars. Also let Lucien know if you wish to be removed from the 2k mailing list.

All previous circulars are available online the

Best wishes from the 2k-coordinators,

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## 1 – STATUS OF THE 2K PROJECT

The PAGES 2k project is accelerating on multiple fronts. Excellent products have recently been published and are currently in the works (see sections 3-5). Besides the very active [regional groups](#), several [trans-regional projects](#) are busy developing synthesis products focusing on research questions that cut across regions. The 2k Network is larger than ever (with close to 600 mailing lists subscribers), prominent at meetings (e.g. upcoming sessions at AGU and EGU), and in the media.

The PAGES 2k project will wrap up at the end of 2016, with a special issue in the journal *Climate of the Past*. It's time now to plan the papers for this final product, which will be opened for contributions in June 2016. We asked the regional and trans-regional group leaders to describe the papers that their group is planning and to suggest additional topics for the special issue. Their replies are in sections 3 and 4, and we will discuss the wrap up of the project further during the next open Network Wide teleconference this September. More information on this meeting will be issued soon.

PAGES 2k is a community project and aims at being as integrative as possible. Your suggestions and ideas are always appreciated at every level and stage of the project. To participate in the shaping and coordination of the project, contact the [2k coordinators](#), participate at the 2k teleconferences, take an active part in one of the regional or trans-regional working groups, or suggest a new activity!

## 2 – RELEASE OF PHASE 2 TEMPERATURE DATABASE – CALL FOR PROJECTS

The updated version of the PAGES 2k temperature database is nearing completion (see section 4). This milestone paleo-data collection will undoubtedly be an important community resource for years to come. Quality-control plots have been distributed to regional groups for verification; including completion of metadata and certification that dataset is complete according to selection criteria. The project coordinators are now standardizing and debugging the database, and are preparing the “technical validation” section of the “data descriptor,” which is being written for the journal *Scientific Data*. This will include basic diagnostics of the dataset and a first-pass reconstruction of global mean (index) temperature.

We are aiming to distribute a draft of the data descriptor plus final quality-control plots to all potential co-authors that have been identified by regional group leaders next month. Co-authors will review data descriptor and forward comments and corrections to the primary authors. Following review and acceptance by *Scientific Data*, the digital data will be posted online ([NOAA Paleoclimatology PAGES 2k page](#)).

**We now invite proposals from the 2k community to use the new global temperature database.** The 2k Coordinators aim to facilitate and encourage use of the database. The intent is to coordinate use of the database by PAGES 2k participants prior to public release, while aiming for publication in a timely manner. We will make the digital version of the database available to 2k participants by request, with stipulations for non-release prior to publication. Please submit your proposal to [Lucien](#) at the PAGES IPO. Include a short (max 500 words) description of the key scientific questions, how you suggest addressing them, and a list of the individuals who will be involved. All proposals will be evaluated by the 2k Coordinators, then posted under the “Reconstructions Based on the PAGES 2k Temperature Database” section on the [Trans-regional projects website](#). This will allow others to see what is or is not being done with the dataset, and will provide contact information for those who would like to get involved in ongoing projects.

## 3 – UPDATE FROM THE PAGES 2K REGIONAL GROUPS

### Africa2k

The Africa 2k group is about to submit a review of African hydroclimate variability over the past 2000 years to *Quaternary Science Reviews*. The paleodata from this review will be used to produce a continental-scale statistically derived synthesis of moisture variability over Africa for the last 2k (focusing on time slices with map outputs). This will form the Africa 2k contribution to the PAGES 2k special issue. The Africa 2k group would like to engage with the climate modeling community, possibly via a workshop, to identify appropriate modeling questions, and is seeking to collaborate with archeologists and historians, and the PAGES LandCover6k Working Group to identify topics for research into 2k climate and archeology/land use change in Africa. During the AfQUA Conference in Cape Town (March 2015), the group identified a need to examine available evidence for past changes in the width, position, intensity and structure of the tropical rainbelt over Africa. Such a study could then be used to target future field-based investigations (e.g. lake-coring sites, areas for tree-ring and documentary reconstructions) across key climate boundaries (e.g. Malawi dipole, Sahel). Views on these plans are welcomed from all group members.

### **Antarctica2k**

The Antarctica2k working group intends to submit the following two papers for the 2k special issue: (1) A temperature reconstruction at decadal scale over the last two millennia using both high- and low-resolution records (isotopic records from ice cores, borehole temperature, lake records). (2) A snow accumulation rate reconstruction over the last 2k using firn and ice cores. 2k-long annual to pluri-annual snow accumulation reconstructions are currently only possible at very few sites in areas of high snow accumulation rate. Whereas, there are over 50 individual/composite sites from the region from medium to low accumulation area that can provide snow accumulation records at multi-decadal to century scale. In addition, the group aims to reconstruct sea ice for the last 2000 years using proxies from both ice cores and marine records. Possibilities for collaboration on this topic with the Arctic2k and Sea Ice working groups will be explored. However, this product might not be ready for the submission deadline of the 2k special issue. All these items will be discussed at the upcoming meeting in Venice (3-4 September 2015).

### **Arctic2k**

Arctic2k intends to produce spatial temperature and hydroclimate reconstructions for the Arctic region. Due to the diversity of the available hydroclimate proxies, the group will first prepare a comprehensive review of the available data and their interpretation to evaluate which hydroclimate parameters would be feasible to reconstruct. Although the spatial density of proxy records is relatively low, the group will attempt circumarctic spatial reconstructions, using data assimilation and Bayesian hierarchical modeling. Emphasis will be put on clearly communicating the uncertainties of the reconstructions. An additional reconstruction covering the North Atlantic region will be attempted to study atmospheric circulation changes. The data collection effort has shown that many records lack sufficient age control over the last 2000 years. Therefore the group is also attempting to secure funding for additional  $^{210}\text{Pb}$  and  $^{14}\text{C}$  measurements in existing and potentially interesting sedimentary records.

### **Asia2k**

The Asia 2k group has met this spring to discuss its phase 2 activities. Soon an updated version of the Monsoon Drought Atlas (MADA) will be published. To complement this drought index product, the group will produce a multi-proxy gridded precipitation reconstruction using a Bayesian approach. For this purpose, the group is currently collecting proxy records - great potential is expected from the Chinese and Japanese documentary records. Besides the main focus on hydroclimate, the group has also produced a first version of a multi-proxy spatial temperature reconstruction (Shi et al. 2015, *Climatic Change*). The final version of the temperature reconstruction will base on several reconstruction methods (e.g. Bayesian, GraphEM) and integrate high- and low-resolution records. Independent data, such as glacier extent records, will be considered for validation. The group aims at publishing both the precipitation and temperature reconstructions by the end of 2016.

### **Australasia2k**

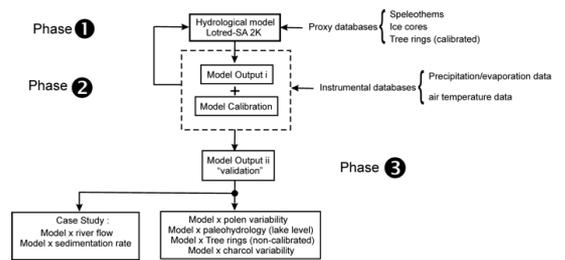
Aus2k projects are underway on drought, temperature and precipitation field reconstructions in Australasia using a variety of methods, as well as reconstructions of climate drivers influencing Australasian hydroclimate. The Aus2k committee is also preparing for the 4th Aus2k workshop, to be held in Auckland, New Zealand on 27-29 October 2015. The workshop will focus on data synthesis, reconstruction methods and paleoclimate data-model inter-comparison, with an emphasis on encouraging the involvement of early career researchers. The working groups will consider producing a journal special issue based on the outcomes of this workshop.

### **Euro-Med2k**

The group is pursuing at least four independent reconstructions of annual and lower resolution temperature and hydroclimate. A manuscript was just submitted to *Environmental Research Letters* ('European summer temperatures since Roman times'). This effort of 45 authors provides a new annually resolved, spatial reconstruction of the European summer temperature fields back to 755 CE, together with a mean summer temperature variation curve since 138 BCE. A manuscript entitled 'Causes and concurrences of Eurasia's unprecedented 6th century summer cooling' is also being prepared. It aims at (a) reconstructing summer temperature over Eurasia and the last 2000 years, (b) supplementing the newly derived proxy evidence with state-of-the-art climate model simulations, (c) defining the main pre-industrial climate forcing factors on inter-annual to multi-centennial timescales, and (d) investigating the role environmental change in social reorganizations that occurred simultaneously in Europe and Asia in the 6th and 7th centuries. EuroMed2k members are also undertaking model simulations for the last 2100 years with the new volcanic forcing from Sigl et al. (2015). Moreover, they will investigate changes in the marginal European seas that are important for continental climate dynamics on decadal- and multi-decadal time scales. First attempts in this direction involve paleo records from the clam *Arctica islandica*, for which relevant oceanic fields of the CMIP5 output are carefully investigated. EuroMed2k is seeking close collaborations with the Ocean2K group because of the strong connection between much of the proxy and model activities of both groups.

## LOTRED-South America

In two teleconferences in July, the group established a new [leadership team](#) and developed new goals and timeline, which will soon be submitted for review to the rest of the LOTRED-SA community, and contributions will be encouraged. The diagram summarizes the current (1) and next phases of the group. The group is currently collecting qualitative and quantitative proxy records and discussing reconstruction models to be used. It is aiming for two products for inclusion in the 2k special issue: a high-resolution multi-proxy spatial hydroclimate reconstruction and if possible, a lower-resolution hydroclimate reconstruction based on pollen records. A speleothem-based precipitation reconstruction for the tropical latitudes is being developed in collaboration with the France-Brazil-Peru-Chile partner project, Paleotracess2, and will likely be published earlier. Also, an update of the spatial temperature reconstruction and data-model studies will be considered.



## North America2k

NAm2k is planning several publications for the 2k special issue: (1) temperature reconstructions averaged over large subregions and based on multiproxies and compared with stand-alone pollen and borehole based reconstructions; (2) a new temperature field reconstruction using re-standardized signal free tree-ring chronologies; and (3) analysis of droughts and pluvials that will focus on key intervals and compare evidence from a range of proxy types to tree-ring-based reconstructions. A group meeting is being planned for October at the USGS Powell Center for Earth System Science Analysis and Synthesis.

## Ocean2k

A global synthesis of marine sediment-derived SST reconstructions and comparison to realistically forced simulations of SST from PMIP3 models in press in *Nature Geoscience*. The first in-person Ocean2k workshop will be held in Barcelona Oct 6-8, 2015. Over a dozen proposals were received involving several general research themes. All are expected to be supported and discussed in-person by their representatives in Barcelona. More information coming soon about the organization and planning for this workshop.

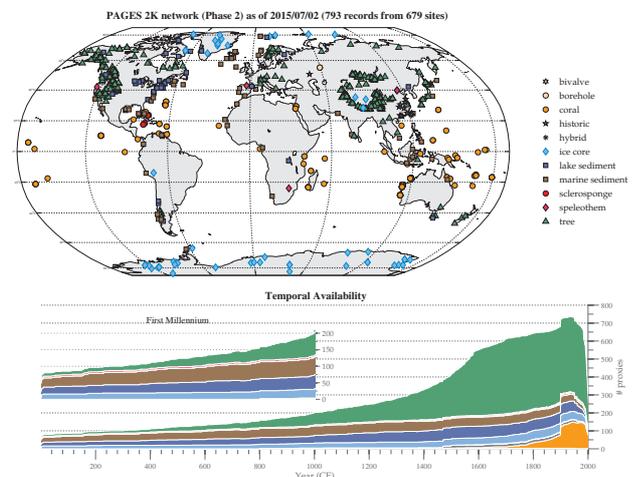
## 4 – UPDATE FROM THE 2K TRANS-REGIONAL PROJECTS

### Data-Model Comparison

On the basis of the discussions that have been taking place during the workshop joining PAGES 2k and PMIP3 communities in Madrid (Spain) in November 2013, a paper comparing the continental-scale PAGES 2k temperature reconstructions and an ensemble of model simulations driven by external forcings selected in the PMIP3 framework has been submitted to *Climate of the Past* (<http://www.clim-past-discuss.net/11/2483/2015/cpd-11-2483-2015.pdf>). A next step is to compare hydroclimate reconstructions developed in the framework of PAGES 2k with model results. To coordinate, the activities related to this topic, a workshop is planned for June 2016. Details about this event will be available soon.

### Global 2k Open-Access Proxy Climate Database

The updated version (v 2.0) of the PAGES 2k temperature database is nearing completion. It improves on the previous version used by the PAGES 2k Consortium (2013) by including records from the ocean, Africa and many other sites. In addition, it expands the database by incorporating more extensive metadata, including the primary geochronological data for non-annually resolved records. All records have now been assembled and formatted for the database using the new [Linked Paleo Data \(LiPD\)](#) framework and were then redistributed to the 2k community for quality control. For this purpose, “Quality Control” plots including maps of correlations to temperature grid points and proxy neighbors, and some basic metadata for each record were prepared to efficiently recognize and correct errors. Various diagnostics are now being developed for the “technical validation” section of the “data descriptor” that will be submitted along with the database to the journal *Scientific Data*. The data descriptor will include the selection criteria and basic diagnostics of the dataset, including a first-pass reconstruction of global mean



temperature. Reconstructions of spatial patterns of temperature variability will be tackled in a subsequent project.

### **Water Isotope Database**

Iso2k is in its early stages, but a rough timeline has been established, which includes the completion of a preliminary database to address key science questions by the end of 2015, with a database publication for *Scientific Data* to be submitted in early 2016. For the *Climate of the Past* special issue, Iso2k group members hope to address the group's highest priority research objectives, i.e. to identify global features in hydroclimate and atmospheric circulation during the past 2 kyr and their relationship with temperature reconstructions. In additional publications (which may or may not be on course for the special issue) the group plans to address several other key science questions, including how water isotope proxy records capture changes in the tropical water cycle, regional differences and stability in the dominant controls on water isotopes (circulation/hydrology vs. temperature) and how this might influence  $\delta^{18}\text{O}/\delta\text{D}$  records in the PAGES2k temperature database, and spatial and temporal patterns in global ocean  $\delta^{18}\text{O}$ . We welcome participation from the broader PAGES 2k community in these papers or in additional papers using the Iso2k database.

### **Onset of Industrial Warming in Terrestrial and Marine records**

A PAGES 2k consortium paper titled, "The onset of industrial-era warming across the oceans and continents" is in review with *Nature*. This research developed out of the Ocean 2k working groups and grew to incorporate participants from the terrestrially focused PAGES 2k community.

## **5 – NEW 2K PRODUCTS**

Tierney JE, Abram NJ, Anchukaitis KJ, Evans MN, Giry C, Kilbourne KH, Saenger CP, Wu HC & Zinke J (2015) *Tropical sea surface temperature for the past four centuries reconstructed from coral archives*, *Paleoceanography* 30(3): 226-252

Quansheng GE, Zheng J & Hao Z (2015) *PAGES synthesis study on climate changes in Asia over the last 2000 years: Progresses and perspectives*, *Acta Geographica Sinica* 70: 355-363 (in Chinese)

Shi F, Ge Q, Yang B, Li J, Yang F, Ljungqvist FC, Solomina O, Nakatsuka T, Wang N, Zhao S, Xu C, Fang K, Sano M, Chu G, Fan Z, Gaire N & Zafar M (2015) *A multi-proxy reconstruction of spatial and temporal variations in Asian summer temperatures over the last millennium*, *Climatic Change* 131: 663-676

To view all 2k products and upcoming 2k events, visit the respective regional 2k group's website:  
[www.pages.unibe.ch/workinggroups/2k-network](http://www.pages.unibe.ch/workinggroups/2k-network)

Please let us know if you see any gaps or errors, and send us any meeting documents (e.g. presentations and posters), to post on the 2k web page to create a complete online archive of an event or activity. See an example [here](#).

Don't forget to acknowledge PAGES or the 2k Network in publications that draw ideas arising from PAGES-funded meetings. Only articles with an acknowledgement are considered PAGES 2k products.

## **6 – UPCOMING PAGES 2K MEETINGS**

### **3-9 September 2015, Venice, Italy**

Antarctica2k Workshop

<http://pages-igbp.org/calendar/2014/127-pages/1471-antarctica2k-2015-meeting>

### **30 September - 2 October 2015, Auckland, New Zealand**

Australasia2k Workshop

<http://www.pages.unibe.ch/calendar/2014/127-pages/1490-4th-aus2k>

### **6-8 October 2015, Barcelona, Spain**

1<sup>st</sup> Ocean2k Workshop

<http://www.pages.unibe.ch/calendar/2014/127-pages/1481-1st-ocean2k-workshop>

### **14-18 December 2015, San Francisco, USA**

AGU Fall Meeting, 2k session "Climate of the Common Era" (8412)

<http://www.pages.unibe.ch/calendar/2014/127-pages/1455-agu-fall-mtng-2015>

**17-22 April 2016, Vienna, Austria**

EGU General Assembly, 2k session “Studying the climate of the last two millennia”

More upcoming meetings here: <http://www.pages.unibe.ch/calendar>

**7 - MEETING SUPPORT**

Regional 2k groups seeking support for meetings can submit a proposal to PAGES (visit [MyPAGES>Meeting Support](#)). **The next deadline for proposal submission is 15 November 2015.**