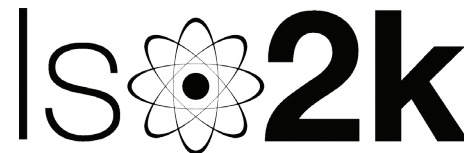


# Assessing hydroclimate patterns of the past 2000 years with paleo- $\delta^{18}\text{O}$ and $\delta\text{D}$ records



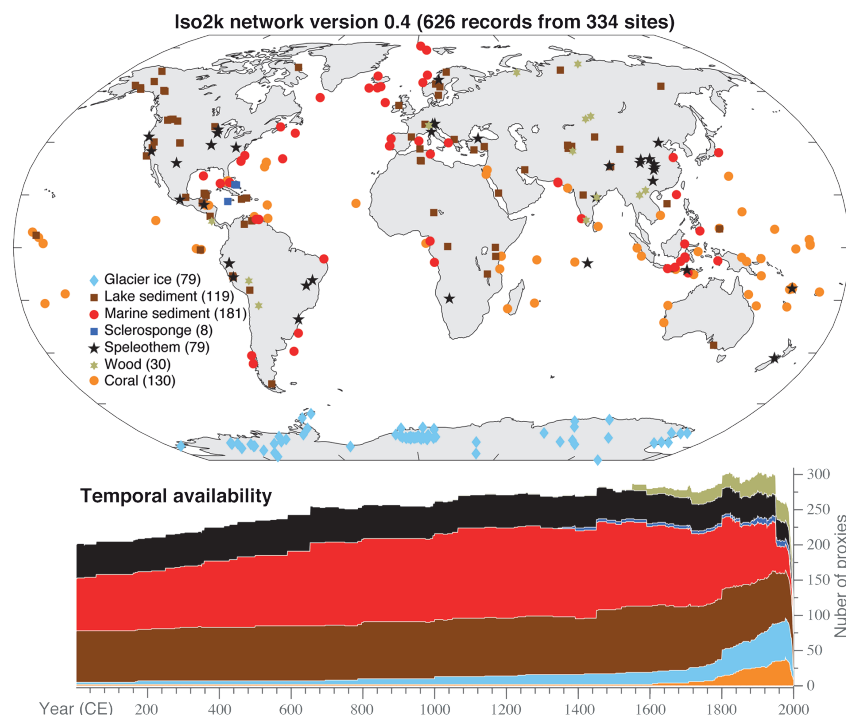
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Much of our understanding of Earth's hydro-climate history comes from proxies for the  $\delta^{18}\text{O}$  and  $\delta\text{D}$  of environmental waters (e.g. precipitation, seawater, groundwater, lake water, permafrost, ice; Smerdon et al. 2017). The  $\delta^{18}\text{O}$  and  $\delta\text{D}$  of environmental waters are recorded by sensors in a range of natural archives, such as glacier and ground ice, speleothems, corals, sclerosponges, lake and marine sediments, and tree rings. Despite this diversity, reconstructed  $\delta^{18}\text{O}$  and  $\delta\text{D}$  can track common environmental signals such as moisture source and air mass transport history, precipitation characteristics, and temperature (Dansgaard 1964), and thus provide invaluable comparison targets for global climate models (Schmidt et al. 2014). However, no comprehensive synthesis of proxy  $\delta^{18}\text{O}$  or  $\delta\text{D}$  yet exists in a format suitable for regional-scale climate reconstructions or for data-model comparisons.

The PAGES Iso2k project is creating a global database of paleo- $\delta^{18}\text{O}$  and  $\delta\text{D}$  records for the Common Era based on a range of archives, with resolutions from annual to centennial, and with extensive metadata fields to facilitate interpretation and uncertainty quantification of the emergent hydroclimate signal(s). The database is being used to identify regional- and global-scale features in hydroclimate and atmospheric circulation as well as their relationship with temperature reconstructions. As a formal project within the framework of PAGES 2k Network Phases 2 and 3, the Iso2k effort is currently the only global, multi-archive hydroclimate database being constructed for the Common Era, with strong ties to other archive and climate target-specific groups within PAGES. Iso2k comprises the first steps towards a broader "Hydro2k" synthesis.

Twenty-eight Iso2k members from ten countries, including 15 early-career scientists, met for the first in-person Iso2k Science Team Meeting. This meeting followed two years of productive, consensus-driven, tele-collaboration. The meeting took place at the CSIC (Consejo Superior de Investigaciones Científicas) Offices in Zaragoza, Spain, directly following the 5th PAGES Open Science Meeting. The main goals of the workshop were to evaluate climatic/isotopic patterns that are emerging from the "beta" version of the database (Fig. 1), which was created in early 2017, and to troubleshoot metadata and quality control issues.



**Figure 1:** Status of the beta Iso2k database in June 2017. Symbols: records that have been both entered and quality-controlled. Figure courtesy of Nick McKay.

To stimulate the most productive discussion possible, prior to the workshop five small "buddy groups" were formed, each containing workshop participants and other Iso2k members who shared similar interests. These groups explored themes of broad interest for the Iso2k community: modes of variability in the high latitudes, the tropical Pacific, and the Atlantic; global comparisons with PAGES 2k temperature reconstructions; and isotope-enabled model-data comparisons. On Day 1, each group shared preliminary figures using the Iso2k database to evaluate climatic and isotopic patterns in space and time. These presentations formed the basis of the ensuing group discussion, in which participants identified the highest-priority scientific questions that will be addressed using the database. Participants also strategized about pressing metadata and data quality issues that needed to be resolved in order to address each scientific question.

Day 2 of the workshop was dedicated to the "nitty-gritty" of Iso2k: quality control, metadata, and future plans. Key points were drafted to serve as the structure for the group's first scientific papers. A mini "hackathon" allowed participants to revisit

and expand on analyses presented on Day 1. Next, the group broke out into small metadata and data quality "task forces" to tackle pressing quality control issues that surfaced the previous day. After a final wrap-up discussion of next steps and a project timeline, the workshop adjourned.

For more information about Iso2k or to get involved, visit our website at [www.pastglobalchanges.org/ini/wg/2k-network/projects/iso2k](http://www.pastglobalchanges.org/ini/wg/2k-network/projects/iso2k)

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