Advances in varved sediment studies during the last 10 years
1st PAGES Varves Working Group workshop, Palmse, Estonia, 7-9 April 2010

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A varve is a sequence of layers deposited in a water body within 1 year. Therefore, varved sequences have been the object of a lot of attention from the paleoscience community because they provide the highest-resolution paleoenvironmental and paleoclimatic records with accurate chronologies independent of radiocarbon reservoir complications and because they enable one to resolve interannual trends in average and even seasonal climate. Iconic paleoclimatic records, such as the Cariaco Basin or Holzmaar in the German Eifel, are famous varved sequences.

Recently, the PAGES Varves Working Group (VWG) was established within the frame of Cross-Cutting Theme 1 (Chronology) and 2 (Proxy development, calibration, validation) to provide a further impetus for the study of varved sediments. The VWG has the objectives of reviewing what has been accomplished during the last 10 years in terms of new methodological developments and improvements in calibration of records, as well as making an inventory of varved records. Other VWG topics are detailed at http://www.pages.unibe.ch/science/varves/index.html

A group of 41 scientists from 11 countries (including 8 students and 4 young scientists) met for the first VWG workshop in the Palmse Manor House, in Lahemaa National Park Centre, Estonia. The workshop was divided into four oral and one poster sessions (for abstract volume see http://www.pages.unibe.ch/science/varves/publications.html). The first session was devoted to the study of the processes responsible for the formation (and preservation) of varves from various environments in the Canadian Arctic, Western Europe and the Middle East. The second session reviewed advances in the improvement of chronologies of varved records using independent dating techniques, such as paleomagnetic secular variation, tephra horizons and radiocarbon dating, as well as the detailed analysis of internal structures of varves (Fig. 2). The third session was devoted to technological advances in the study of varved and other laminated sediments. It focused on the increasing application of micro-XRF techniques and the development of new softwares helping scientists in the analysis of the large datasets obtained by varve counting. Environmental and climate history case studies from lacustrine and marine sites were discussed during the fourth session. During the poster session, covering all the topics mentioned above, authors briefly introduced their papers to the group.

The workshop participants discussed several practical topics during 3 plenary sessions. They first identified the needs of the VWG community, which included the need for advertising methodological and technical services that can be provided from within the community (e.g., making of thin-section), establishing standards for best practice, promoting systematic comparison of methods, and organization of specialized training courses (e.g., spectral analysis, Bayesian chronological correc-
The 1st Australasia 2k regional workshop: Towards data synthesis

Melbourne, Australia, 31 May–2 June 2010

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Australasia spans from the tropics to the sub-Antarctic, and straddles several major oceanographic and atmospheric systems that are of global significance and potentially sensitive to anthropogenic-driven climate change. For instance, northern Australasia is influenced by the Indo-Pacific Warm Pool (Hansen et al., 2006), which is a major source of latent heat and hence drives global atmospheric and oceanic circulation. Towards higher latitudes, the Southern Ocean (south of 45˚S) plays a key role in global climate (Caldeira and Duffy, 2000). Although considerable progress has been made in developing quantitative reconstructions of temperature change for the Northern Hemisphere over the past two millennia (Mann et al., 2009), significantly more work is required in Australasia (and the Southern Hemisphere as a whole) (Nicholls et al., 2006).

The first Australasia 2k (Aus2k) regional network workshop aimed to fill this critical gap in climate science by reviewing annually-centennially resolved climate reconstructions for Australasia for the past 2 ka, towards synthesis in the planned PAGES Regional 2k Network synthesis book. 73 scientists from around the world, representing the proxy, modeling and dynamics communities, met to present the latest datasets and interpretations from across the region.

The first day focused on short presentations and posters of single proxies from the full range of natural archives spanning ice, marine and terrestrial records of the past 2 ka. Not surprisingly, tree rings underpin the terrestrial annual resolution record for Australasia (Antarctic ice is great for teleconnections (Fig. 1) but not local variability). However, the majority of well-replicated records are less than 500 years and only Tasmania and NZ have records extending for the full 2 ka (i.e., a classic “fading record problem”). A surprise was the number of “new” species used in tree-ring reconstructions being developed from throughout the region—vital for understanding geographic variability. A good example is the Western Australian

Figure 1: A) Atmospheric water vapor and wind anomalies for years with high precipitation at Law Dome. Blue regions show wet anomalies; tan regions show dry anomalies, which can be seen to extend across southwest Western Australia (SWWA) (Data from NCEP/NCAR reanalysis) (Credit: Tas van Ommen). B) Comparison of SWWA winter rainfall (blue) and Law Dome snowfall (black) since the beginning of reliable rainfall data for WA. The two regions are connected via large-scale meridional flow (van Ommen and Morgan, 2010). The positive precipitation anomaly at Law Dome over the past four decades, corresponding to extended drought in SWWA, is the largest such anomaly in 750 years of snowfall data (Credit: Tas van Ommen/Mat Oakes, Australian Antarctic Division).