"SHAPE-ing up" – A summary of the Southern Hemisphere Westerly Winds workshop

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This is a short summary of the 2 day workshop. The longer version can be downloaded from the AQUA website SHAPE project page (http://aqua.org.au/?page_id=56).

The primary aim of the workshop was to discuss Southern Hemisphere Westerly Winds (SHWW), and to develop several of the SHAPE deliverables that were discussed at the first SHAPE meeting in September 2013. It was also a good opportunity to check in with our SHAPE colleagues in South Africa and South America. A series of presentations were given on the first day of the meeting, including Helen Bostock talking about the Subtropical Front in the oceans around New Zealand and how changes in the front could be proxies for the strength and position of the SHWW. This was followed by a talk from Brian Chase (via Skype from Cape Town) about some work on developing climate records from Hyrax middens (piles of hyrax urine) in South Africa. These middens are sampled in a similar way to speleothems at a very high resolution, but can be analysed for a range of different proxies (stable isotopes, pollen, charcoal, phytoliths, ancient DNA). They have found that cooler periods are wetter, while warmer periods are dryer in this region and there is evidence for a Younger Dryas, rather than an Antarctic Cold Reversal. This suggests that there was a strong atmospheric teleconnnection between the Northern Hemisphere and South Africa during the Younger Dryas.

The focus of many of the talks was on potential precipitation proxies from lakes. Michael Shawn Fletcher reviewed some of the work that he was involved with determining precipitation from pollen data from South American lake cores and the implications for SHWW. He then showed some new records from Tasmania. Michael has been developing a pollen temperature calibration for Tasmania, but this has predicted a few suspiciously anomalous temperatures. They suggest this may be due to the fact that the vegetation has responded to changes in precipitation and fire (peak in charcoal), rather than temperature. Krystyna Saunders also discussed her work from Tasmania looking at a precipitation record for the last 2ka. She has also been involved in some ongoing work in the subantarctic examining lake sediments from Macquarie and Campbell Islands, which are directly influenced by the SHWW. A diatom-salinity transfer function is being used to look for changes in sea spray as a proxy for winds. This is part of a bigger project on the Subantarctic islands being led by Dominic Hodgson from the British Antarctic Survey. Marcus Vandergoes and Heidi Roop both showed data from New Zealand lakes, trying to understand changes in rainfall and evaporation, while Chris Moy presented work from South American lakes. These changes in lake level at a range of different lake sites are linked to rainfall and the position and strength of the SHWW.

Steven Phipps presented a suite of nine transient climate model simulations of the last 8ka, recently completed by the Palaeoclimate Modelling Intercomparison Project. All of the models show a long-term trend towards a more positive phase of the Southern Annular Mode (SAM). He highlighted a recent reconstruction led by Nerilie Abram and suggested the potential to extend her approach further back in time. Maisa Rojas (via Skype from Santiago) gave an overview of a recently funded 3 year multidisciplinary project to understand the link between SHWW and CO2 over the last 25 ka in South America. The project will involve model outputs, marine cores, lake cores, glacier records and a wide range of proxies. Fabrice Lambert (via Skype) is also part of this project and will focus on dust. Andrew Lorrey demonstrated a new palaeoclimate research platform that has been, and continues to be, developed at NIWA – PICT (Past Interpretation of Climate Tool; pict.niwa.co.nz; Lorrey et al., 2013). One of the main outputs produced from PICT are Southern Hemisphere spatial fields for different climate variables (geopotential, SSTa, precipitation etc). In addition, sampling the multiproxy reconstructions to determine the role different climate drivers (ENSO, SAM, IOD etc) had on generating past changes at local, regional and hemispheric scales is possible. Calculators that determine the contributions to local climate anomalies from GHG changes, insolation, solar variability and volcanism are being added at present and are required for investigating the role atmospheric circulation had on past climate changes on interglacial-glacial time scales. An operational version of PICT that can incorporate Australia and South Africa proxy data is anticipated by the end of 2014.

The rest of the meeting was dedicated to a discussion about a couple of major projects for SHAPE including: the last glacial-Interglacial transition (LGIT) paper that is a promised deliverable to be submitted by 2015. This paper, being led by Michael Shawn Fletcher, will look at the timing of the climate variability and changes from the LGM to the onset of the Holocene and focus on the ecological changes, especially the succession of vegetation. The timing and changes are likely to be asynchronous in different regions, with the aim of testing some of the leads and lags to understand how these spatial patterns may reflect climate driver activity. Steven Phipps will be leading a model-proxy comparison of changes in the SHWW over the last 8 ka, using both PICT and global climate model transient runs. While Andrew Lorrey will be revisiting the New Zealand last 2 ka paper, in association with the PAGES Aus2K team, but using the PICT models to analyse the atmospheric circulation changes in this region. If you think you can contribute to any of these projects then get in touch with the leads listed above.

We are looking forward to seeing some of the preliminary results from these SHAPE projects at the upcoming AQUA conference in Mildura. Other future SHAPE meetings and workshops in 2014 and 2015 for your diary: a workshop on tools for multi-proxy reconstruction and climate modelling in Brisbane, July 2014 – come and learn about state-of-the-art tools for palaeoclimate research. A potential workshop in Chile in early 2015 and of course the INQUA meeting in Nagoya, Japan in July 2015.

TOP – Figure 1. Steven Phipps, leading the discussion, with Helen Bostock, Marcus Vandergoes, Michael Shawn Fletcher, Chris Moy.

BOTTOM – Figure 2. Krystyna Saunders giving a presentation about a record from Macquarie Island.