EGU21-12867
https://doi.org/10.5194/egusphere-egu21-12867
EGU General Assembly 2021


# Synchronous climate change between the Arctic and the Asian and Indo-Australian summer monsoon domains at the Younger Dryas termination

**Russell Drysdale**[1], Michael Griffiths[2], John Hellstrom[1], Ellen Corrick[1], Jon Woodhead[1], Kale Sniderman[1], Sune Rasmussen[3], Raimund Mueschler[4], and Emilie Capron[3]

[1]University of Melbourne, Melbourne, Australia (rnd@unimelb.edu.au)
[2]William Patterson University, Wayne NJ, USA
[3]Niels Bohr Institute, University of Copenhagen, Denmark
[4]University of Lund, Sweden

The end of the Younger Dryas (YD) was Earth's last major abrupt climate event and is most vividly preserved in the water-isotope (ice $\delta^{18}O$), calcium ($Ca^{2+}$) and methane-concentration ($CH_4$) series of Greenland ice cores. Although numerous palaeoclimate records span this transition, surprisingly few have the dating precision necessary to test whether or not abrupt warming in Greenland was accompanied by synchronous climate changes beyond the Arctic. Speleothems, with their exceptional absolute chronologies, are well placed to conduct such a test.

Here we apply a change-point detection algorithm to new and published speleothem $\delta^{18}O$ records of the YD from the Indo-Australian summer monsoon and Asian summer monsoon domains to compare the synchronicity of hydroclimate changes across the YD termination. The algorithm, which identifies the age (and its uncertainty) of a regime shift in a time series, was applied to the 13 - 11 ka interval of each speleothem record. The results yield an error-weighted mean YD-termination age of 11.55 ± 0.02 ka BP (2σ), supporting the hypothesis of a closely coupled monsoon seesaw. Analysis of the Greenland NGRIP ice-core $\delta^{18}O$ and $Ca^{2+}$ records on the GICC05 chronology for the same interval produces a YD-termination age of 11.63 ± 0.10 ka BP. Although the NGRIP and speleothem ages overlap within uncertainties, this hints at a possible Arctic lead over the tropics. However, if we apply a correction to the GICC05 chronology based on recent ice-core $^{10}Be$ and tree-ring $^{14}C$ synchronisation, the change-point analysis gives a NGRIP termination age of 11.57 ± 0.02 ka BP. This revised timing is consistent with the Cariaco Basin greyscale record (11.56 ± 0.02 ka BP). It also brings the NGRIP and Antarctic WAIS Divide ice-core $CH_4$ records into perfect alignment across the transition. This assemblage of ages from geographically dispersed regions suggests that hydroclimate changes associated with the YD termination were synchronous, at least to within a couple of decades. It also calls for a revision to the onset age of the Greenlandian Stage (the Pleistocene-Holocene boundary).