Tracing changes in Neogene Antarctic hydrology using a data-model approach

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With the advancement of both isotope-enabled climate models and our understanding of water isotope proxies, the hydrological cycle is becoming an increasingly important focus of paleoclimate studies. Of particular interest are periods of warmth and reduced ice cover such as the middle Miocene [1] or the Pliocene [2], where exploring changes in hydrodynamics can constrain fundamental questions around the climate system.

Wood fossils and terrestrial sediments in the late Neogene (3-14 Mya) Sirius Group in the Transantarctic Mountains provide a unique insight into Antarctic palaeoclimate during a period of Antarctic ice sheet retreat. We use plant compound isotopes ($\delta^{18}O$) to reconstruct precipitation isotopes, suggesting that ancient precipitation was ~8‰ enriched relative to the modern. This result is consistent with reconstructed Antarctic summer paleotemperatures of 5 °C and implies increased moisture delivery to the continent with a shorter vapour transport pathway relative to the modern. We then present data from atmospheric tracer experiments using isotope-enabled general circulation model (HadCM3) to explore in detail changes in moisture source and atmospheric circulation during a vital period of Antarctic climate history.

[1] Feakins et al (2012), *Nature Geoscience* 5(8), 557-560
[2] Tindall & Haywood (2015), *Paleoceanography* 30, 1183-1201