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Deglacial hydrological and thermal evolution of subtropical South America

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The hydrology of South America has changed dramatically during the rapid climate fluctuations of the last deglaciation, being the focus of several studies in recent years. However, much attention has been paid to the tropics, leaving an almost complete lack of data for the subtropical latitudes. Here we present high-resolution biomarker-based records of terrigenous organic matter input (as an indicator of hydrological changes on land) and of continental mean annual temperatures (MAT) from subtropical South America covering the last deglaciation. These data were obtained from marine sediment core GeoB6211-2, retrieved from the Brazilian continental margin at 32.51°S, 50.24°W, 657 m water depth. The core is characterized by high sedimentation rates (ca. 70 cm/kyr) for most of the deglaciation, likely fostered by high supply of terrigenous materials. We applied recently developed indices based on the relative abundances of several species of soil- and marine-derived tetraether molecules. The results are then compared with stable oxygen isotope data from planktic foraminifera from the same core. Using the BIT index (Hopmans et al., 2004) we estimated the supply of terrigenous organic matter to the core site. BIT values are generally high during the deglaciation and decrease rapidly at the early Holocene, in accordance with other parameters. However, terrigenous biomarkers exhibit strong centennial to millennial scale variability during deglacial times, displaying distinct maxima near 14.5 kyr BP, between 17 and 16 cal kyr BP coincident with Heinrich event 1, and around 18.5 cal kyr BP. These variations indicate a strong link between oceanic conditions and continental climate in South America. Continental MAT estimated using the method of Weijers et al. (2007) shows a warming of 5°C across the deglaciation, generally parallel to the temporal evolution of Antarctic ice-core records. But centennial to millennial scale variability with amplitudes of 1-2°C observed in our MAT record seem to be unrelated to Antarctic climate. In our presentation we will discuss the data in context of changes in the Atlantic meridional overturning circulation, and resulting changes in South American precipitation, as well as in relation to global sea-level rise.

Hopmans EC, Weijers JWH, Schefuß E, Herfort L, Sinninghe Damsté JS & Schouten S (2004) A novel proxy for terrestrial organic matter in sediments based on branched and isoprenoid tetraether lipids. Earth and Planetary Science Letters 224: 107-116

Weijers JWH, Schouten S, van den Donker JC, Hopmans EC & Sinninghe Damsté JS (2007) Environmental controls on bacterial tetraether membrane lipid distribution in soils. Geochimica et Cosmochimica Acta 71: 703-713