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The climate in Antarctica during the Middle Eocene: a modelling perspective

Frederic Fluteau[1], Delphine Tardif[1], Guillaume Le Hir[1], Yannick Donnadieu[2], Pierre Sepulchre[3], Jean-Baptiste Ladant[4], Fernando Poblete[5], and Guillaume Dupont-Nivet[6,7]

[1]Université de Paris, Institut de physique du globe de Paris, CNRS UMR7154, Paris, France (fluteau@ipgp.fr)
[2]Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE), Aix en Provence, France (donnadieu@cerege.fr)
[3]LSCE/IPSL, CEA-CNRS-UVSQ, Université Paris-Saclay, Gif-sur-Yvette, France (pierre.sepulchre@lsce.ipsl.fr)
[4]Department of Earth and Environmental Sciences, University of Michigan, Ann Arbor, MI, USA (jbladant@umich.edu)
[5]Departamento de Geología, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Chile (ferpoble@uchile.cl)
[6]Geosciences Rennes, Univ. Rennes, CNRS, 35042 Rennes, France (guillaume.dupont-nivet@univ-rennes1.fr)
[7]Institute of Geosciences, Potsdam University, 14476 Potsdam, Germany

The Middle Eocene represents the last ice-free period of the Cenozoic. Vegetation proxy data (wood, leaves, palynomorphs) discovered in the Antarctica peninsula and neighbouring islands or hosted in sedimentary sequences deposited on the continental margin reveal the presence of paratropical rain forests which thrived along the Antarctica coast during the Early Eocene. During the Middle and Late Eocene these flora have been progressively replaced by temperate *Nothofagus*-dominated rainforests (Contreras et al., 2013). Jacques et al. (2012) proposed, using a physiognomic approach (CLAMP), that a warm temperate and wet climate (with a marked summer rainy season) prevails until the middle Eocene (43±2 Ma) on the tip of the Antarctica Peninsula.

To better constrain the climate in Antarctica and understand processes governing the polar climate during the Middle Eocene, we performed a set of experiments using the IPCC-like Earth System Model (IPSL-CM5A2-VLR) forced with a Middle Eocene (~40 Ma) paleogeography reconstruction and a 4 times pre-industrial atmospheric CO_2 level (1120ppm). To highlight the importance of the seasonality, we launched 6 orbital configurations exploring end-members situations. To complete the procedure, simulated sea surface temperatures and sea ice extents were then employed as boundary conditions to force the Atmospheric General circulation model LMDz6 (run at higher spatial resolution) coupled with a soil and vegetation model ORCHIDEE to simulate the corresponding vegetation over Antarctica. The 6 end-members Earth's orbital configuration allows exploring the full climatic spectrum which would have been recorded by proxy data. Simulated changes in atmospheric circulation will be discussed and the simulated climate and vegetation will be confronted to paleoclimatic indicators and vegetation data.