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Investigating the sensitivity of the ice-sheet surface mass balance during glacial times using the IPSL GCM

Marie-Noelle Woillez (1), Masa Kageyama (2), and Gerhard Krinner (3)

(1) LSCE, France (marie-noelle.woillez@lsce.ipsl.fr), (2) LSCE,France (masa.kageyama@lsce.ipsl.fr), (3) LGGE,France (gerhard@lgge.obs.ujf-grenoble.fr)

Several abrupt climatic changes, Dansgaard-Oeschger and Heinrich events, occurred during the last glacial period. Shifts in the thermohaline circulation (THC) are often considered as playing a key role in these changes. Ganopolski & Rahmstorf (2001, 2002) showed that small changes in freshwater fluxes in the North Atlantic in the CLIMBER-2 climate model are able to trigger major shifts in the THC and subsequently in climate. The potential origin of such freshwater changes remains an open question. Since the Laurentide and Fennoscandian ice-sheets actually represent huge amount of freshwater, we use the IPSL_CM4 Atmopshere-Ocean general circulation model (AOGCM) to investigate the sensitivity of the ice-sheet surface mass balance to changes of vegetation and solar forcing during glacial times. Here we present results from simulations where we change vegetation from pre-industrial to glacial and from simulations with contrasting AMOC states. The glacial vegetation is obtained by forcing two different vegetation models, ORCHIDEE and BIOME4. The impact of total solar irradiance is studied by changing its value by several W/m2.