Geophysical Research Abstracts
Vol. 21, EGU2019-16534, 2019
EGU General Assembly 2019

Dynamic hydrological discharge modelling for coupled climate model simulations of the last glacial cycle

Thomas Riddick (1), Victor Brovkin (1), Stefan Hagemann (1,2), and Uwe Mikolajewicz (1)

(1) Max Planck Institute for Meteorology, Hamburg, Germany , (2) Institute of Coastal Research, Helmholtz-Zentrum Geesthacht, Geesthacht, Germany

The continually evolving large ice sheets present in the Northern Hemisphere during the last glacial cycle caused significant changes to river pathways both through directly blocking rivers and through glacial isostatic adjustment. Associated with these changing river pathways was the formation and evolution of large glacial lakes such as Lake Agassiz. Studies have shown these river pathway changes had a significant impact on the ocean circulation through changing the pattern of freshwater discharge into the oceans. A coupled Earth system model (ESM) simulation of the last glacial cycle thus requires a hydrological discharge model that uses a set of river pathways that evolve with Earth's changing orography while being able to reproduce the known present-day river network given the present-day orography. Here, we present a method for dynamically modelling river pathways that meets such requirements by applying predefined corrections to an evolving fine-scale orography (accounting for the changing ice sheets and isostatic rebound) each time the river directions are recalculated. The corrected orography thus produced is then used to create a set of fine-scale river pathways and these are then upscaled to a coarser scale on which an existing present-day hydrological discharge model within the JSBACH land surface model simulates the river flow. We also present first results of work on modelling the associated glacial lakes.