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Building and applying geographical boundary conditions to model the EOT and other climate transitions in the Cenozoic.

Michiel Baatsen (1), Douwe van Hinsbergen (2), Anna von der Heydt (1), Henk Dijkstra (1), Appy Sluijs (2), Hemmo Abels (2), and Peter Bijl (2)

(1) Utrecht University, IMAU, Physics, Netherlands, (2) Utrecht University, Geosciences, Netherlands

Studies on deep-time palaeoclimate using numerical model simulations are often considerably dependent on the implemented geographical boundary conditions. Because building the required palaeogeographic datasets for these models is often a time-consuming and elaborate exercise, such model studies frequently use reconstructions in which the latest insights have not yet been incorporated. We here provide a new method to efficiently generate global topography and bathymetry reconstructions that are suitable for palaeoclimate modelling. The workflow facilitates the interaction between experts in geology and paleoclimate modelling, while keeping the boundary conditions up to date and improving the consistency between different studies.

Using a plate-tectonic model, global masks are created that contain the distribution of land, continental shelves, shallow basins and the deep ocean. We then combine depth-age relationships for oceanic crust with adjusted present-day topography into a first estimate of the global geography at a chosen time frame. This estimate subsequently needs manual editing of areas where the available geological data indicates significant altimetry changes over time. Since the discussion regarding many of these regions of interest is still ongoing, we have made the incorporation of changes as easy as possible. As a result, complete reconstructions can be made with limited effort and are provided as a boundary condition for numerical models.

Results will be presented of simulations with both POP and CESM, covering both a late Eocene (38Ma) and an early Oligocene (30Ma) reconstruction. Changing boundary conditions are used to assess the impact of geography changes during the Eocene-Oligocene transition. Both the geographical reconstructions and validation of the results using proxies are being done in close collaboration with the Department of Geosciences at Utrecht University.