Paleobathymetric grids of the Cenozoic Southern Ocean – an update on a community based project

Katharina Hochmuth[1], Karsten Gohl[2], German Leitchenkov[3], Joanne Whittaker[4], Laura De Santis[5], Elisabetta Olivo[5]

[1]Alfred-Wegener-Institut Helmholtz Center for Polar and Marine Research, Am Alten Hafen 26, 27568 Bremerhaven Email: Katharina.Hochmuth@awi.de
[2]Alfred-Wegener-Institut Helmholtz Center for Polar and Marine Research, Am Alten Hafen 26, 27568 Bremerhaven;
[3] All Russia Scientific Research Institute for Geology and Mineral Resources of the Ocean, Sankt Petersburg, Russia

[4] University of Tasmania, Hobart, Australia

[5] Instituto Nationale di Oceanographica e di Geofisica Sperimentale, Trieste, Italy

Abstract

Paleo-ocean circulation models of the Southern Ocean suffer from missing boundary conditions, which describe accurately the geometries of the seafloor surfaces at their geological epoch and their dynamics over long time-scales. The accurate parameterisation of these models controls the meaning and implications of regional and global paleo-climate models. Plate-kinematic models of the Southern Ocean have reached a state of almost closed geodynamic constraints, but paleobathymetric mapping of sedimentation and erosion patterns remains difficult. Previous studies consider only the top of oceanic basement or strongly simplify the sedimentary cover by using outdated isopach maps. The reassessment of existing and additional reflection seismic data revealed a strong underestimation of the sedimentary column throughout the Southern Ocean, but mainly along the continental margins. Incorporating sedimentary processes in paleobathymetric reconstruction grids is particularly important in reconstructing the opening of oceanic gateways, where the question of shallow to deep-water exchange determines the accuracy of paleo-ocean circulation and paleo-climate models. The dynamics of ocean currents in proximity of the continental margins is also controlled by the development of the regional morphology of the conjugate continental shelves, slopes and rises.
The ultimate aim of this project is – as a community based effort – to create paleobathymetric grids at various time slices throughout the Cenozoic to mimic the time steps used within the modelling community. By using this updated suite of paleobathymetric grids within Cenozoic climate reconstructions models a wide variety of issues can be addressed, ranging from the effect of the opening of ocean gateways and basins on the paleo-circulation patterns, the global carbon cycle and the nature of Antarctic ice sheet development.

Keywords: paleobathymetry, Cenozoic Southern Ocean