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Modelling Bio-Geophysical Land-Ocean Interactions During the Miocene

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The Neogene is characterized by substantial alterations in paleo-topography, including changes in the ocean gateway configuration. It has been hypothesized that these changes had profound impacts on vegetation and ocean circulation pattern, and hence on the poleward heat-transport. Reconstructions of Cenozoic temperatures point to a strongly reduced meridional temperature gradient. As yet, the simulation of this characteristic feature is one of the long standing challenges in climate sciences. A key to a deeper comprehension of this problem may be obtained from a perspective which integrates the land surface, as well as the terrestrial and marine carbon pools. Hence, a better understanding of the versatile interaction between these components are important to explain the strongly reduced temperature gradient. Here we use the comprehensive earth system model COSMOS in time-slice simulations for the Miocene. Our objective is to evaluate the importance of the individual earth system components and to estimate the synergy of the fully coupled system. In particular we discuss the effect of land surface changes and the role of the carbon cycle on the poleward heat transport during the Miocene.