

The evolution of Miocene ocean circulation controlled by the Greenland-Scotland Ridge

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Abstract

The Greenland-Scotland Ridge (GSR) is a crucial hydrographic barrier for the exchange of water masses between the Polar Seas and the North Atlantic Ocean. Through the Miocene (5-23 Myrs; Myrs=million years ago), the Greenland-Scotland Ridge deepened at 18 Myrs and 15.5 Myrs, and again at 12.5 Myrs by changes of the Icelandic mantle plume activity, which has direct consequences for the evolution of Northern Component Water. In a sensitivity study, we investigate the effect of GSR depth variations with a global atmosphere-ocean-vegetation General Circulation Model. Oceanic characteristics of the quasi-enclosed Nordic Seas and Arctic Ocean are analyzed, as well as the critical depth threshold for the evolution of the North Atlantic Current and the East Greenland Current is examined and linked to changes in global ocean circulation.