



## The timing and geometry of the Fram Strait opening

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The northern branch of the world's mid-ocean ridge system is located in the northern Norwegian-Greenland Sea (Fram Strait) and the central Arctic Ocean (Gakkel Ridge). The initial phase of the opening of the North Atlantic and the Arctic Ocean started some 55 Ma. While the timing and geometry of the opening of the Arctic Ocean and North Atlantic are well known, this is not true for the Fram Strait. The Lena Trough, a mid-ocean ridge in the centre of the Fram Strait, is the only deep water connection of the Arctic Ocean, and believed to have played a critical role in the development of global climate. The lack of seismic and magnetic data in this critical area prevented any detailed model for the geodynamic history of this gateway.

We present new geophysical data, which provides an enhanced model of the timing and geometry of the Fram Strait opening. Seismic data, together with new aeromagnetic information, show that the strait had opened already around 16 Ma as far south as 81°N. Then, the rift slowly propagated southwards, allowing the development of a shallow water connection between the Arctic and the North Atlantic. Large drift deposits are found on oceanic crust younger than 10 Ma, indicating the starting and continuous strong erosion of the surrounding shelves and those south of the gateway (e.g. Barents Sea, Svalbard). The new data show that the Fram Strait was in place long before the high frequency glacial/interglacial cycles started in the northern hemisphere at around 3 Ma. Furthermore, they indicate that although the gateway most likely played an important role in the long-term cooling of the northern hemisphere, it is unlikely to have been solely responsible for the intensification of the northern hemisphere glaciations in the Late Pliocene/Pleistocene.