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The evolution of Davis Strait, a polar gateway – seismic data and tectonic modelling

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Davis Strait is a bathymetric high, located between Canada and Greenland. With a water depth of only 500 m, it acts as a gateway for the exchange of polar water from Baffin Bay in the north to the Labrador Sea and the Atlantic in the south. The Davis Strait region has undergone a complex tectonic evolution and the nature of crust is disputed. In a first stage the strait was characterized by extension due to the separation of the North American plate and Greenland. In a second stage transpression was the dominating force. The most prominent geologic feature is the Ungava Fault Complex, a major transform fault that cuts Davis Strait. To investigate the role of Davis Strait as a polar gateway during the opening of the Labrador Sea and Baffin Bay rift system, we analyse recent seismic reflection and refraction data in combination with potential field data. This information is incorporated into a plate tectonic model. On a 230-km-long east west line in central Davis Strait, a P-wave velocity and a density model were obtained by forward modelling. The models show several blocks of continental crust that are separated by major faults of the Ungava Fault Complex. High velocities in the lower crust indicate intense intrusions of mafic material, which we relate to the arrival of the Iceland mantle plume beneath Greenland in the Paleocene. Seismic reflection data were used to model the complex basement morphology and to develop a sediment stratigraphy. The tectonic modelling reveals that an overlap of 70 km of stretched continental crust needs to be compensated for in the transpressional stage of Davis Strait. We are now working on displaying the evolution of Davis Strait from the initial opening of the Labrador Sea to today and will present new results of this study.