

## **The Nares Strait Problem Re-examined - A Large Left-lateral Displacement or Vast Frontal Shortening along the Eurekan Orogen due to the Palaeogene Northward Drift of Greenland?**

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The “Nares Strait problem” refers to a debate about the existence and magnitude of left-lateral movements along the proposed Wegener Fault within this seaway that links Baffin Bay with the Arctic Ocean. The majority of plate models predict a large amount of left-lateral displacement along the Nares Strait in the range of 350 km, as a consequence of the Palaeogene northward drift of Greenland relative to North America related to the opening of the Baffin Bay and the North Atlantic. On the other hand, geological evidence from the NE Nares Strait reveals only 80-100 km of left-lateral displacement that gradually dissipates towards the SW.

We used a plate modelling approach, supported by a geophysical dataset, to build a tectonic model that accounts for the following geological constraints: (1) no strike-slip displacement along the SW section of the Nares Strait, in accordance with the continuous outcrop of the Thule Supergroup across the strait, and (2) c. 100 km of strike-slip displacement along the NE section of the Eurekan deformation front between chrons 27 and 21 (c. 61.2 - 47.9 Ma) after Saalman et al. (2005). For the North Atlantic we adopted isochrons derived from the age grid of Müller et al. (1997). For the Labrador Sea we use magnetic anomalies identifications from Roest & Srivastava (1989), as they best fulfil geological constraints from the broader Greenland region despite the controversies concerning the origin of transitional crust. There is little publically available data on the age of the ocean floor in Baffin Bay, so newly interpreted fracture zones were used to constrain the plate motions between Greenland and North America in conjunction with magnetic anomaly data from the Labrador Sea.

Adopting low values of left-lateral strike-slip displacement along the Nares Strait, results in a simultaneous increase in predicted shortening of the Eurekan orogen. These two parameters are linked, changing one value results in a change in the other i.e. the lower the strike-slip displacement the larger the amount of shortening across the Eurekan orogen. Our model predicts 150-300 km of total shortening for the Eurekan orogen (increasing northeast) between chrons 27 and 13. In our model sea floor spreading in Baffin Bay commenced at 66 Ma and produced up to 200 km of oceanic crust until cessation of spreading at the beginning of the Eocene (chrons 27-25).