A multi-source-to-sink system in a dynamic plate tectonic setting: the Cenozoic of the Barents Sea, Norwegian Arctic

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When multiple source areas are located on a continuously moving plate margin relative to a sink, the signal propagation in the source-to-sink system may vary significantly in time and space. How fast and severe the impact of tectonics and climate is on sediment erosion-transfer-deposition in this dynamic setting is still not well understood. Similarly, how do we quantify the relative sediment contribution from each source area? Here, we use a forward stratigraphic modelling technique to constrain key controlling parameters in basin filling in relation to the Cenozoic successions of the Barents Sea in the Norwegian Arctic.

The Cenozoic evolution of the Barents Sea shelf is strongly linked to the breakup between the Greenland and the Eurasian plates at c. 55 Ma, which led to the development of highs and basins along the margins of the Barents Sea. This configuration resulted in the deposition of progradational wedges and submarine fans (c. 40 Ma) in the Sørvestsnaget Basin. Subsequent plate reorganization caused a major shelf uplift (c. 33 Ma) and opening of the Fram Strait (c. 17 Ma) and affected the sedimentary processes and deposits in the sink (including contourites) now observable in seismic and borehole data.

Moreover, Cenozoic successions were deposited under different extreme climate settings ranging from the Paleocene-Eocene Thermal Maximum (PETM) to icehouse conditions during the Quaternary glaciations (c. <2.7 Ma). A major increase in sediment supply resulting from glacial erosion is reflected in the deposition of a series of trough mouth fans along the continental margin. We present preliminary results of an ongoing project modelling this source-to-sink system, and discuss what factors control sediment erosion, transfer, and basin filling.