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Sedimentary processes within fjord systems – evidence from Fensfjorden, western Norway

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Norwegian fjord systems represent unique sediment archives that mirror land- and marine-based processes and depositional environments during deglaciation and interglacial periods. Here, we focus on Fensfjorden, on the west coast of Norway, in order to study these relationships. Fensfjorden is an asymmetrical fjord. The fjord is located in a low relief landscape and it was ice sheet-covered during the Younger Dryas. The data base used consists of a dense grid of TOPAS high-resolution seismic profiles, bathymetric records, a CTD profile and a 2.6 m long gravity core. These data were all collected during a University of Bergen cruise in January 2010. A detailed analyse program has been performed on the sediment core and includes shear strength measurements, ITRAX core scanning, Multi Sensor core logging and grain size analyses. Four intervals in the gravity core have been sub-sampled for AMS 14C dating. The Fensfjorden system comprises four sediment basins. These basins host sediment packages that reach a maximum sediment thickness of up to c. 100 m. The TOPAS seismic data show that these deposits are characterised by acoustic well laminated glacimarine sediments, most likely deposited during Allerød. The glacimarine sediments are overlain by several acoustic transparent units. We interpreted these units to represent slide debrites deposited during the isostatic rebound of the Fennoscandian landmass after the retreat of the Younger Dryas ice sheet. The slide debrites reach a maximum thickness of about 8 m. Two turbidite sequences are indentified in the thin sediment unit deposited above the upper identified slide debrite. The radiocarbon dates show that these sequences were deposited during the late Holocene, i.e. around 2000 and 1800 cal. yr BP. This suggests that turbidite currents are a recurrent fjord process during interglacial periods. Turbidite events of similar age as the oldest one in Fensfjorden have been identified in several other west and mid-Norwegian fjord systems. It has been inferred that these turbidite events have been triggered by an earthquake.