The Cenozoic pre-glacial tectono-sedimentary development of the western Barents Sea margin: implications for uplift and erosion of the sediment source areas

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The Cenozoic development of the western Barents Sea continental margin is strongly related to the rifting and seafloor spreading between Norway and Greenland. The margin is characterized by a series of highs and basins that formed as part of the development of a mega-transform zone (Faleide et al., 2008). To the north, the Spitsbergen Fold-and-Thrust Belt and the Eocene clinoform development in the Central Basin that were initiated in the Paleocene-Early Eocene are the evident of compression/transpression, and sediment erosion, transport and deposition respectively. At that time, the Vestbakken Volcanic Province and the Sørvestsnaget Basin to the south experienced a period of subsidence. A marginal high and an intrabasinal high in the Sørvestsnaget Basin, as well as the Senja Ridge and the Veslemøy High are identified as positive bathymetric features that acted as local source areas. Seismic data also shows a set of Eocene clinoform in the eastern part of the Sørvestsnaget Basin that probably was sourced from the Stappen High area (Safronova et al., 2014). Available well data show an overall deep-water paleoenvironment during the Paleocene-Eocene in the southwestern Barents Sea, probably shallowing north of Bjørnøya (Ryseth et al., 2003).

During the Oligocene, a period of plate reorganization occurred that resulted in the onset of extension also in the northwestern Barents Sea including sea floor spreading west of Svalbard. Here, the Forlandsundet and Bellsund grabens as well as most of the extensional faults show a significant growth. In the southwestern Barents Sea, traces of compression structures are seen on seismic data suggesting a period of tectonic inversion. An overall shallow marine paleoenvironment characterized the southwestern Barents Sea shelf during the Oligocene being deeper towards the west (Eidvin et al., 1993). Seismic data shows contourite development in the continental slope area contemporaneous with the opening of the Fram Strait that connected the oceanic circulation of the Atlantic and the Arctic Ocean.

Seismic mapping of the Paleogene-Neogene strata shows an eastward and northward increasing uplift trend in the western Barents Sea that was amplified in the late Cenozoic due to glacio-isostatic subsidence and uplift due to sediment loading/unloading process. This study suggests also a period of pre-glacial's subsidence and uplift during the Eocene due to the rifting and seafloor spreading between Norway and Greenland. A local secondary uplift in the Oligocene with lesser magnitude is also identified. Erosion estimates for the western margin is calculated to be 900-1400 m in the southwestern and probably more than 2000 m in the northwestern Barents Sea. The sedimentation rates and erosion rates for the Cenozoic pre-glacial period shows values one order of magnitude lower than during the Late Cenozoic.

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Relation between seismicity and tectonic structures offshore and onshore Nordland, northern Norway

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The largest earthquake in northwestern Europe over the past 200 years took place in Rana, Nordland, Norway, and the region still exhibits persistent earthquake activity. A temporary network of 27 stations was deployed from 2013 to 2016 along the Nordland coast of northern Norway. The NEONOR2 project was aimed to improve the understanding of neotectonic movements, stress regime and overall seismicity pattern in Nordland and the adjacent offshore areas. The recorded seismic events were located using data from both, the temporary NEONOR2 deployment and the permanent stations of the Norwegian National Seismological Network (NNSN) as well as other relevant stations from the neighboring seismological networks.

A more detailed understanding of the seismicity has been obtained and efforts to relate the earthquakes with the tectonic structures, and, finally, hypothesize the cause of the earthquakes have been made. The most seismically active area in