



Identification of the Storegga Tsunami offshore Shetland: implications for seabed infrastructure hazard risk assessment

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The Shetland Islands (UK) are a seminal location for investigating palaeo-tsunami deposits. Onshore evidence suggests three tsunamis have occurred during the Holocene: the Storegga tsunami *ca.* 8175 cal yr BP, the Garth tsunami *ca.* 5500 cal yr BP and the Dury Voe tsunami *ca.* 1500 cal yr BP. However, to date no research has been published on the impact of tsunami on the subtidal shelf where a large amount of North Sea hydrocarbon infrastructure is located. During the SEACHANGE research cruise DY150 (2022), cores were recovered offshore east Shetland from the Fetlar Basin. The cores contained distinct sand and shell lenses within a Holocene mud sequence, indicating increases in bed shear stress. We test the hypothesis that these lenses represent the subtidal expression of North Sea tsunamis. Radiocarbon dates bracketing the sand lenses overlap with the published dates for the Storegga tsunami, suggesting these sand lenses result from processes related to the Storegga tsunami. Dates *within* the deposit are older than the Storegga tsunami, indicating reworking and deposition of older sediments at the core site by the tsunami. Particle size analysis, ITRAX and MSCL data evidence increases in grain size, a reduction in sorting capacity, increased shell concentrations and peaks in associated elements ($\log(\text{Ca}/\text{Fe})$, $\log(\text{Ca}/\text{Ti})$ and Sr) and magnetic susceptibility. These attributes are typical of both palaeo and modern offshore tsunami deposits. No evidence was found within the cores for any later Holocene tsunami, due to either bioturbation, active currents, or lack of initial deposit. The data indicate that sediments in the Fetlar Basin were disturbed by the Storegga tsunami to palaeo-water depths of at least 88 m. This highlights the need to assess the potential impact of any future tsunami on existing or proposed hydrocarbon infrastructure.