



Development of the igneous Logi Ridge, NE Atlantic, from seismic reflection data

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The Logi Ridge, located between the West Jan Mayen Fracture Zone (WJMFZ) and the Vesteris Seamount, is an E-W oriented ridge 170-180 km long, terminating in a few isolated seamounts in the east. In 2011, a seismic reflection survey was acquired over the Logi Ridge. We collected six single-channel reflection seismic (SCS) lines and combine that with two multi-channel reflection seismic (MCS) lines acquired by the Norwegian Petroleum Directorate (NPD) the same year across the WJMFZ and the Logi Ridge. Magnetic data suggest that the ridge was created by at least some magmatic overprint of older oceanic crust during a normal magnetic field, supporting an origin younger than the seafloor. Both the western and eastern parts of the Logi Ridge have flat tops, indicating these have been eroded at the sea surface. Three different basement reflection characters are observed along the profiles: a rough to very rough basement similar in shape and dimension as the abyssal hills typical for the Atlantic Ocean; a smooth basement, characterized by a continuous sheet-like body having parallel to subparallel high-amplitude reflections; and small-scale irregular basement, dominated by high amplitude, discontinuous to chaotic reflectors. Both smooth and irregular basement are well developed around the Logi Ridge. We suggest that the smooth basement is the result of late stage basalt flow deposited on the pre-existing basement or early sediments, representing a formation age not long after the underlying oceanic crust, while the irregular basement was formed as a consequence of shallow intra-basement intrusions. The sedimentary strata have two distinct sedimentary sequences. The lower sequence is semi-transparent north of the WJMFZ, but with some horizontal high-amplitude reflectors close to the Logi Ridge. The upper sequence is characterized by a sub-parallel cyclic pattern of alternating low- and high amplitude reflectors, and the deformation of the sequence becomes increasingly intense next to the Logi Ridge. The lower sedimentary sequence consists of pelagic sedimentation with basalt and/or gravity-driven debris flows close to the Logi Ridge, while the upper sequence contains pelagic sedimentation only. The change in character between the lower and upper sedimentary section may be related to the end of the main formation of the ridge. However, in the east there is deformation of the sediments up to the seafloor around the terminating seamounts, suggesting growth up to recent times there. Contourite deposits, which are formed by the East Greenland deep-water current coming from the north, are identified in the upper sequence along the northern flank of the Logi Ridge.