



The Greenland-Iceland-Faroe Ridge Complex

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The Greenland-Iceland-Faroe Ridge Complex GIFRC covers 480.000 km² of a thick volcanic crust that stretches 1150 km across the central Northeast Atlantic Ocean between the central East Greenland and the Northwest European margins. It incorporates the Iceland plateau, the aseismic Greenland-Iceland ridge, and the Iceland-Faroe ridge. GIFRC has been in development since the opening of the NE-Atlantic around 55 Ma. It appears as a prominent feature in all geological and geophysical data sets. Synclines and anticlines in the area will be summarised and, among others, several new ones that were revealed in seismic reflection data near to Iceland. Specifically, the offshore anticlines and synclines may be related to old rift systems prior the forming of Iceland as an insular shelf region (>24 Ma). Synclines are suggested to be manifestations of former rift axes that have been abandoned by rift jumps. These rift jumps appear to be more common inside the GIFRC region than in the ocean basins south and north of the area. They can be confirmed by the observation of cumulative crustal accretion through time as well.

The GIFRC represents a complex region of crustal accretion in 3 dimensions due to overlapping rift systems, complex interlinked rift and transform zones, and several unconformities that suggest a variable uplift and subsidence history for the ridge complex. An excellent example to visualise such processes of vertical crustal accretion and rift jumps is seen in seismic reflection data that extends along the southwestern slope of the Iceland-Faroe Ridge. They clearly display the internal structures of basement blocks, separated by a syncline and younger rift system, and the formation of an anticline across the deeply buried basement blocks that are overlain by seaward dipping reflectors (SDR).

We suggest a major hiatus (40 Ma – 24-20 Ma) and a related unconformity at the boundary of the volcanic insular shelf edge of East Iceland and the Faroe Ridge, buried beneath thick layers of sediments, 8-10 km inside the bathymetric shelf break.

Several seamounts were observed on multibeam datasets from the Vesturdjúp Basin West of Iceland, just south of the Greenland - Iceland Ridge at around 1200 m depth. Most of them are cone shaped but ridges and table mountains are also found. These seamounts appear to be much less eroded and younger than the neighbouring ocean floor and might indicate a still active flank or intra plate volcanic zone. Young tectonism with faults, grabens and transverse ridges also characterize the area and most of the volcanic cones are located along fault plans or/and within the grabens of the Vesturdjúp, giving a good example of the complexity of the GIFRC in comparison to simple ocean floor areas.