

The Cenozoic stratigraphy of the Jan Mayen Micro-Continent from breakup to present time.

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The Jan Mayen micro-continent (JMMC) lies within the central North-East Atlantic region. To date, most research into the development of the JMMC has focused on its geodynamic evolution, which has largely included: (1) large-scale Paleozoic–Cenozoic tectonostratigraphic modelling; (2) delineation of the extent of the micro-continent; and, (3) pre- to post-breakup Cenozoic kinematic reconstruction, based on magnetic anomalies. By way of contrast, very little attention has been given to the preserved rock record and its potential utilisation as a sensitive recorder of the geodynamic processes involved both in plate breakup and in passive-margin development. We present an interpretation of the Cenozoic stratigraphy of the JMMC with reference to its conjugate margins, from continental breakup to present time.

Our study is based on new (2008-2012) and vintage geological and geophysical datasets collected offshore Iceland since the early 1970s. These datasets comprise seismic reflection profiles, seismic refraction interpretations, borehole control, seafloor sample data, and multibeam seafloor imagery data. The JMMC Cenozoic stratigraphy can be subdivided into eleven distinct seismic-stratigraphic sequences, which are separated by unconformity and/or disconformity surfaces. We are able to provisionally correlate six of these hiatuses with published regional unconformities on adjacent conjugate margins, including the central East Greenland coast, the Vøring continental slope and margin, the Iceland and Iceland shelf domain, the Faroe Islands, and the Faroe-Shetland region.

These unconformities are linked to igneous and tectonic events, as well as sea-level changes within the central North-East Atlantic region, and include: (1) the Early Eocene (early Ypresian: C24) event linked to breakup extension and emplacement of the North Atlantic igneous province flood basalts, as well as the syn-breakup rift-to-drift seafloor spreading and formation of seaward dipping reflectors; (2) the Mid-Eocene (Lutetian: C20) hiatus linked to rift-transfer across the Iceland plateau rifts south of the JMMC; (3) the ‘Mid’-Oligocene hiatus (Rupelian: C11) linked to the formation of the southwest Jan Mayen ridge igneous province, the proto-Kolbeinsey ridge, the initial stage of the West Iceland shelf, co-eval with the onset of uplift and erosion in East Greenland at ~35 Ma; (4) the ‘top Palaeogene’ (C8) unconformity linked to the final separation of the JMMC from East Greenland along its western margin, and the emplacement of flood basalts during full breakup at 24-21 Ma; (5) the Mid-Miocene hiatus (Serravalian: C5); and (6) the Late Miocene (Messinian: C3) unconformities formed during the formation of the Kolbeinsey Ridge, the rift transfer events on the Iceland Plateau, and the crustal cooling and subsidence of the JMMC.