



An integrated gravity, magnetic and seismic model of the Brande Graben, Denmark

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North-South striking rift systems characterize the northern part of Europe where the pre-Mesozoic evolution and rift dynamics are poorly known. We investigate the on-shore Brande Graben, Jylland, Denmark by use of integrated potential field- and reflection/refraction seismic data. 20 reflection seismic profiles are interpreted and the Zechstein fault system is mapped. A $2^{1/2}$ D gravity and magnetic model is constructed along the crustal refraction seismic EUGENO-S profile 5, constrained by the results from the reflection seismic interpretations. This gives information on densities and susceptibilities of the whole crust and allows us to investigate for rift related magmatic activity. The $2^{1/2}$ D model, combined with the construction of subcrop- and isopack maps and backstripping along selected reflection seismic profiles, is used in the interpretation of the rift dynamics.

A 3D depth-density model constrained by the previous results is constructed and we apply a 3D gravity stripping technique. The gravity effect of all sedimentary layers as well as the effect of the Moho topography is calculated and subtracted from the observed Bouguer gravity anomaly field. The resulting residual field is then inverted for the topography of the crystalline basement.

Our results show a graben structure characterized by two North-South striking, opposing halfgrabens divided by a shift in polarity in the central part and linked by NW-SE striking systems of normal faults. The fault systems show indications of transtensional, dextral movements during the Carboniferous-Permian. The entire graben system is modelled as a pull-apart structure which developed during rifting in a regional extensional-transtensional regime that rotated during the Early Devonian-Jurassic from SW-NE over W-E to NW-SE causing rotation of a series of individual basement

blocks of the Ringkøbing-Fyn High.

The model along EUGENO-S, profile 5 shows that rifting in Brande Graben was associated with mafic intrusions in the lower-mid crustal level as well as an upper crustal dike system cutting Lower Palaeozoic sediments. The mafic activity was concentrated in two pulses, both constrained to late Carboniferous-early Permian.