Geophysical Research Abstracts
Vol. 21, EGU2019-13854, 2019
EGU General Assembly 2019

From orogen to rifted margin: successive modes of extension in the proximal margin offshore Norway

Per Terje Osmundsen (1,2), Gwenn Péron-Pinvidic (3), and Halvor Bunkholt (4)

(1) Norwegian University of Science and Technology, Institute of Geoscience and Petroleum, Trondheim, Norway (per.t.osmundsen@ntnu.no), (2) University of Oslo, Institute of Geosciences, Oslo, Norway (per.t.osmundsen@ntnu.no) , (3) Geological Survey of Norway, Solid Earth Geology, Trondheim, Norway , (4) Equinor ASA, Stjørdal Office, Stjørdal, Norway

Based on 2D and 3D seismic reflection data from the proximal margin offshore Norway, we document for the first time how Devonian transtensional collapse tectonics gave way to a Late Paleozoic into Early Triassic style of rifting which continued to facilitate removal of large parts of the Caledonian crust. The style of faults and basins partly resemble those associated with Devonian post-orogenic transtension but the crust is much thinner than under onshore post-orogenic basins and the associated basins are younger. It is, however, unclear how much of this system represents reactivation of structures formed originally in Devonian time. Structural evidence indicates, however, that Late Paleozoic-Early Mesozoic detachment faults cut a template consisting of folded Caledonian and Devonian rocks. A substantial part of the Late Paleozoic-Early Mesozoic extensional system was characterized by necking of brittle crust over deep-seated, domal core complexes and by sedimentation in broad, structurally complex supradetachment basins. Laterally, this deformation style gave way to steeper, landwards dipping faults and to areas of less extended crust, indicating regional-scale relay of extensional strains. In the next main deformation stage, necking of the entire crust took place across faults that cut deeper into the lithosphere and that combined into seawards-dipping necking breakaway complexes. The new data and interpretations open for a revised view on the Late Paleozoic-Early Mesozoic rift phase offshore Norway and its relations both to older Devonian ‘orogenic collapse′ structures as well as to the younger generation of necking breakaway complexes. On the more conceptual level we demonstrate how the brittle crust was necked in at least two major stages and how the ductile crust became redistributed and molded into core complexes and extensional culminations. The geometry of these deep features and their flanking detachment faults successively affected the style of sedimentary basins that formed in the process. The data and interpretations from the proximal Norwegian margin fill a gap in our understanding of how proximal margins may form after orogenic collapse and how early rifting paved way for the large magnitudes of finite extension that characterizes the more distal parts of the Norwegian margin.