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Nearshore half-grabens as analogues for offshore, early Carboniferous rift basins along the SW Barents Sea Margin

Jean-Baptiste Koehl (1,2), Steffen G. Bergh (1,2), Kjetil Indrevær (2,3), Halldis Lea (1), Espen Bergø (1), Tormod Henningsen (4), Tore Forthun (4), Jan-Inge Faleide (2,3)

(1) Department of Geology, University of Tromsø, N-9037 Tromsø, Norway, (2) Research Center for Arctic Petroleum Exploration (ARCEx), University of Tromsø, N-9037 Tromsø, Norway, (3) Department of Geosciences, University of Oslo, P.O. Box 1047 Blindern, NO-0316 Oslo, Norway, (4) Statoil Nord-Norge, Postboks 40, N-9481 Harstad, Norway

The present study focuses on the onshore-offshore correlation of brittle faults along the SW Barents Sea Margin, northern Norway. Several studies indicate that the SW Barents Sea Margin experienced a pulse of extensional deformation in the Late Devonian?-early Carboniferous, shortly after the Caledonian contractional deformation ended. The formation of major brittle faults and associated offshore basins that represent targets for hydrocarbon exploration, such as the NE-SW trending Nordkapp Basin, are thought to have initiated during this rifting event. Half-graben structures similar in shape and orientation to the southern segment of the Nordkapp Basin have been identified on the Finnmark Platform and in nearshore areas in coastal Finnmark, northern Norway. Although relatively smaller, these half-graben structures display the same asymmetric, sigma-shaped to triangular architecture in map view as the Nordkapp Basin and also initiated in the earliest Carboniferous, as confirmed by fossiliferous assemblages from shallow cores. The triangular shape of these half-graben structures is related to the presence of possible fault segments of the Trollfjord-Komagelv Fault Zone that trend WNW-ESE and partly truncate the NE-SW trending, sometimes arcuate, extensional brittle faults that bound the half-graben structures. High-resolution bathymetry data show that these half-graben structures internally display minor, NE-SW trending brittle faults and relatively high seafloor relief, thus possible fault displacement, at the intersection between these minor faults and the major, arcuate bounding faults. Microstructural analysis of fault-rocks in nearby onshore fault zones showed multiple generations of cataclasite, suggesting several episodes of faulting in the region. A major goal for future work will be to constrain the exact timing of the faulting event(s) with K/Ar radiometric dating of onshore fault-rocks. This may help estimating the timing of potential fluid migration routes along major, offshore brittle faults in Late Devonian?-early Carboniferous rift structures in the region. Complementary studies will be undertaken to estimate P/T conditions from the mineralogical assemblages of fault-rocks in coastal Finnmark in order to assess the amount of exhumation in this part of the margin.