Structural Restoration of Cretaceous Inversion Events in the Bjørnøyrenna Fault Complex, Western Barents Shelf

Muhammad Armaghan Faisal Miraj[1], Christophe Pascal[1], Roy Helge Gabrielsen[2], Jan Inge Faleide[2]
[1]RUHR University Bochum; [2]University of Oslo

9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

Inversion structures including folds, reverse faults are observed along the Bjørnøyrenna Fault Complex in the western Barents Sea, although the fault complex is extensional in origin and developed in mid-Jurassic to Early Cretaceous. Subsidence along the fault complex was interrupted in Early Cretaceous (Valanginian to early Barremian) because of syn-rift localized tectonic inversion, itself related to the uplift of the Loppa High. The Early Cretaceous inversion caused dextral transpression along the boundary faults adjacent to the Loppa High. The second phase of inversion is interpreted to be Late Cretaceous (mid-Cenomanian) in age, coeval to the deposition of the Kolmule Formation in the Bjørnøyrenna Fault Complex. The later phase of compression is of regional significance and related to NW-SE directed far field stresses in Late Cretaceous which caused head-on inversion in the study area. The aim of present study is to identify and decipher eventual Cretaceous inversion structures in the Bjørnøyrenna Fault Complex by means of structural restoration. To these aims, 2D MOVETM, a structural modeling and analysis software by Midland Valley Exploration Ltd, is used and three key seismic lines crossing the central and northern segments of the Bjørnøyrenna Fault Complex are restored. Key profiles 1 and 2 reveal null point positions at the base of the Cretaceous (Hekkingen Formation). Null point positions show progressive compressional inversion of syn-rift Early Cretaceous deposits (Knurr Formation). Below and above null points the geometries of the restored faults show normal and reverse faulting respectively. The results of the

restored key profiles 1 and 2 confirm reverse faulting at the Lower Cretaceous triggered by inversion of the study area. The restored sections also show positive inversion features associated with folding of the hangingwall of the base of the Upper Cretaceous (Kolmule Formation). The reconstruction of the amount of eroded material on the footwall block also suggests reverse faulting of the base of the Upper Cretaceous. In key profile 3 the footwall block is eroded up to the base of the Upper Cretaceous (Kolmule Formation) due to the uplift of the Loppa High. The corresponding restored section shows a compressional anticline associated with both Early and Late Cretaceous inversion events.