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Fault kinematics and localised inversion within the Troms-Finnmark Fault Complex, SW Barents Sea

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1 **Fault kinematics and localised inversion within the Troms-Finnmark Fault Complex,**  
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8 **Abstract**

9 The areas bounding the Troms-Finnmark Fault Complex are affected by complex tectonic  
10 evolution. In this work, the history of fault growth, reactivation, and inversion of major faults  
11 in the Troms-Finnmark Fault Complex and the Ringvassøy Loppa Fault Complex is  
12 interpreted from three-dimensional seismic data, structural maps and fault displacement plots.  
13 Our results reveal eight normal faults bounding rotated fault blocks in the Troms-Finnmark  
14 Fault Complex. Both the throw-depth and displacement-distance plots show that the faults  
15 exhibit complex configurations of lateral and vertical segmentation with varied profiles. Some  
16 of the faults were reactivated by dip-linkages during the Late Jurassic and exhibit polycyclic  
17 fault growth, including radial, syn-sedimentary, and hybrid propagation. Localised positive  
18 inversion is the main mechanism of fault reactivation occurring at the Troms-Finnmark Fault  
19 Complex. The observed structural styles include folds associated with extensional faults,  
20 folded growth wedges and inverted depocentres. Localised inversion was intermittent with  
21 rifting during the Middle Jurassic–Early Cretaceous at the boundaries of the Troms-Finnmark  
22 Fault Complex to the Finnmark Platform. Additionally, tectonic inversion was more intense at  
23 the boundaries of the two fault complexes, affecting Middle Triassic to Early Cretaceous  
24 strata. Our study shows that localised folding is either a product of compressional forces or of  
25 lateral movements in the Troms-Finnmark Fault Complex. Regional stresses due to the uplift  
26 in the Loppa High and halokinesis in the Tromsø Basin are likely additional causes of  
27 inversion in the Troms-Finnmark Fault Complex.

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29 **Keywords:** Barents Sea, TFFC, Extension, Localised inversion, displacement plots

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