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Geophysical structure of the Barents Sea crust and upper mantle compared to Western Siberia

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The East Barents Sea Basin is one of the deepest offshore sedimentary basins with an estimated depth of 15-20 km. The 400 km wide and more than 1000 km long basin is characterized by limited signs of faulting and an extensive slab-like high-velocity body in the upper mantle below. The tectonic style in the adjacent western Barents Sea is very different, showing a narrow array of typical rift basins and basement horsts. Further to the east the East Barents Sea Basin is bounded by the late Triassic Novaya Zemlya Fold Belt and the West Siberian Basin with depths of 10-12 km. The upper mantle below the latter basin shows in contrast no pronounced velocity anomaly. The East Siberian Traps further east are partly located on the cold and thick cratonic lithosphere of the East Siberian Platform. Here, the upper mantle is fast and dense and structurally very similar to the observations below the East Barents Sea Basin. The Permo-Triassic Siberian Trap volcanism is simultaneous with the onset of major subsidence in the East Barents Sea Basin.

On the basis of a comprehensive compilation of basin architecture from seismic data, crustal velocity models and upper mantle tomographic models we focus on the temporal and spatial links between the sedimentary basin styles and distributions, the deeper crustal compositions below the basins and the regional upper mantle structure. We base our study on a transect extending from the Norwegian-Greenland Sea, across the Barents Sea and the West Siberian Basin towards the Siberian Platform. Our results and interpretation are further backed up by 2D-2.5D gravity modelling along this transect. The gravity modelling provides refined geophysical parameterization for the

deeper crustal and upper mantle structure. This enables the separation of compositional and thermal contributions to prominent anomalies in the upper mantle.

Linking the basin, crustal and upper mantle structures provides important constraints for a better understanding of the plate tectonic setting and paleogeography, and the influence of pre-existing structures on the sedimentary basin evolution.