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Near Surface Tectonics in the Baltic Sea Sector of the North German Basin and the Tornquist Zone

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The Late Cretaceous to recent tectonic evolution of the North German Basin and the transition zone to the Baltic Shield/southwest Baltic Sea are discussed on the basis of a dense grid of ca. 800 reflection seismic profiles. The study area covers the transition from the salt floored North German Basin (Bay of Kiel) to the salt free Tornquist Zone (Pomeranian Bay). The geological structure was studied by individual seismic sections and derived high-resolution time-structure maps of the main horizons, the Upper Cretaceous, Tertiary and Pleistocene. Numerous significant faults could be identified in the Upper Cretaceous and Tertiary layers throughout the study area. Several of the faults propagate upwards across the unconsolidated Pleistocene sediments and penetrate the seafloor topography. In the salt floored North German Basin, three major fault trends are observed: NW-SE, N-S and NNE-SSW striking faults. Several of the faults are located directly above basement (sub-salt) faults and salt pillows. The majority of these faults are trending N-S to NNE-SSW and parallel the direction of the Glückstadt Graben faults. Basement tectonics controls supra-salt tectonics, but the ductile salt layer causes an offset between the sub- and supra-salt faults. In the salt free Pomeranian Bay, two major fault trends are found: NW-SE and NE-SW striking faults. The majority of these faults are located above basement faults following the Tornquist Zone direction. The fault movements are interpreted as a reactivation of pre-existing faults and vertical salt movement due to major plate reorganisation related to the Africa-Iberia-Europe convergence and later Alpine Orogeny (ca. 90 Ma). The faults and salt tectonics were afterward reactivated between Late Eocene and Middle Miocene when the principal horizontal stress orientation changed from a NE-SW to a NW-SE direction, the present-day orientation. We suggest that the recent tectonics and upward propagation of the faults resulted from ice-sheet loading and/or present-day stress field interaction.