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Modelling the effects of Eocene transpression on intraplate stress East of Svalbard

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The Barents Sea is located in the Northern European Arctic. Since Late Palaeozoic times the Barents Sea area has experienced several compressional events . The most important of such events are related to the Uralian orogeny in the East and the transpressional West Spitsbergen Orogeny in Eocene time when Greenland slid past Svalbard. Additional compressional stresses may be related to ridge push.
The transpression was partitioned into a major/narrow strike-slip component and a compressional component orthogonal to the sheared plate boundary (Leever et al., 2011). The contraction had both a thin-skin (Spitsbergen Fold-and-Thrust-Belt) and thick-skin component. The latter gave rise to reactivation of the deep-seated/long-lived Billefjorden and Lomfjorden fault zones. Similar zones of weakness east of Svalbard were most likely also reactivated by contraction/inversion.
A 2D thin-sheet elastic model of the lithosphere is used to explore the effects of far-field compressional forces on intraplate stress distribution in the Barents Sea. We especially focus on the effects of Eocene transpression West of Svalbard. The model is based on a Lagrangian finite element method. Elastic properties are given by an elastic thickness map of the Barents Sea which is constrained by the lithosphere structure of the Greater Barents Sea (Tesauro et al., 2009; Klitzke et al., 2014). The Greenland-Svalbard plate configuration at Eocene times is reconstructed using the G-plate plate tectonic reconstruction software (Boyden et al., 2011). Eocene transpression is then modelled and the resulting stress distribution and potential to re-activate zones of weakness East of Svalbard is evaluated.

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