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Control of hyper-extended passive margin architecture on subduction initiation with application to the Alps and present-day North Atlantic ocean

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Hyper-extended magma-poor margins are characterized by extremely thinned crust and partially serpentinized mantle exhumation. As this can act as a zone of weakness during a subsequent compression event, a hyper-extended margin can thus potentially facilitate subduction initiation.
Hyper-extended margins are also found today as passive margins fringing the Atlantic and North Atlantic ocean, e.g. Iberia and New Foundland margins [1] and Porcupine, Rockwall and Hatton basins. It has been proposed in the literature that hyper-extension in the Alpine Tethys does not exceed ∼600 km in width [2]. The geodynamical evolution of the Alpine and Atlantic passive margins are distinct: no subduction is yet initiated in the North Atlantic, whereas the Alpine Tethys basin has undergone subduction.
Here, we investigate the control of the presence of a hyper-extended margin on subduction initiation. We perform high resolution 2D simulations considering realistic rheologies and temperature profiles for these locations. We systematically vary the length and thickness of the hyper-extended crust and serpentinized mantle, to better understand the conditions for subduction initiation.

References:
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