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Evidence for onset of convergent tectonics within the Continent-Ocean Transition zones of the Atlantic rifted margins

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At the onset of convergent tectonics, lithospheric contractional deformation precedes the stages of plate rupture and underthrusting that foster subduction initiation. It is widely agreed that pre-existing lithospheric structural variations favour localisation of deformation and may be critical for subduction inception. Along magma-poor rifted margins, the Continent Ocean Transition (COT) includes structurally complex zones of thinned continental crust and serpentinized exhumed mantle, which are prone to deformation. Incipient contractional deformation during the Alpine Orogeny resulted in the formation of thrusts and folds along the COT of the reactivated magma-poor Iberian Atlantic and Armorican margins. Numerical models testing subduction initiation at magma-poor margins also reproduce thrusting and folding along the COT prior to the formation of a lithospheric shear zone within serpentinized exhumed mantle that initiates underthrusting. However, the distribution of thrusts along thinned continental crust and serpentinized exhumed mantle remains unconstrained, although it may be critical to decipher the localisation of deformation that occurs prior to and during the underthrusting stage.

The North Iberian margin uniquely preserves fossilized Alpine thrusts along the COT that affected underthrust thinned continental crust and serpentinized exhumed mantle at the central part of the margin, and underthrust oceanic crust at its western corner. Thus, it represents an ideal setting for investigating the role of basement type on the formation and distribution of contractional tectonic structures prior to and during underthrusting at magma-poor margins. Based on 2D seismic reflection profiles, we describe the structure of thrusts sheets overlying transitional basement, consisting of highly thinned crust and serpentinized exhumed mantle, and oceanic crust. Our observations support the preservation of an accretionary prism overlying incipiently subducted oceanic crust. Contrastingly, large thrusts led to overthrusting of thinned continental crust and possibly serpentinized exhumed mantle resulting in crustal thickening, landward tilting and uplift of the crust and overlying sediments. Discrete thrusts deformed the upper ultra-thinned basement, leading to the deposition of wider syn-orogenic sediments. We integrate our structural observations with previous numerical and geophysical models to discuss

underthrusting vs intraplate deformation and localisation vs distribution of contractional deformation along thinned continental crust and serpentinized exhumed mantle at the onset of convergence.

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