

SEMINAIRE GEO-OCEAN

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Mantle exhumation at magma-poor rifted margins controlled by frictional shear zones

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The transition zone from continental crust to the mature mid-ocean ridge spreading center of the Iberia-Newfoundland magma-poor rifted margins is mostly composed of exhumed mantle characterized by highs and domes with varying elevation, spacing and shape. The mechanism controlling strain localization and fault migration explaining the geometry of these peridotite ridges is poorly understood. Here we show using forward geodynamic models that multiple out-of-sequence detachments with recurring dip reversal form during magma-poor rifting and mantle exhumation as a consequence of the strength competition between weak frictional-plastic shear zones and the thermally weakened necking domain beneath the exhuming footwall explaining geometry of these peridotite ridges. Model behaviour also shows that fault types and detachment styles vary with spreading rate and fault strength and confirm that these results can be compared to other magma poor passive margins such as along Antarctica-Australia and to ultra-slow mid-ocean spreading systems as the South-West Indian Ridge.

