

Upper mantle melting and the Lithosphere-Asthenosphere Boundary

GUILLAUME C. RICHARD¹ MALCOLM
MASSUYEAU² FABRICE GAILLARD³

¹guillaume.richard@univ-orleans.fr, ISTO, OSUC,
University of Orleans

²malcolm.massuyeau@cnsr-orleans.fr, ISTO, OSUC,
University of Orleans

³fabrice.gaillard@cnsr-orleans.fr, ISTO, OSUC,
University of Orleans

Small amounts of H₂O and CO₂ are predicted by petrological models to produce small degree melting in mantle regions where the geophysical signals of the lithosphere-asthenosphere boundary (LAB) is scrutinized. However, mantle melt dynamics cannot be described as a petrological process alone, since the melt migrates in response to density contrasts with the surrounding solid mantle that, in turns, can undergo compaction. We simulate these coupled dynamics of mantle melting and conclude that they lead to episodic melt focusing that explain most geophysical observations so far attributed to the LAB. The magnitude of the LAB geophysical signal must be related to up-welling motion in the asthenosphere implying that up-welling is common but not a universal rule since several regions display a very weak or no LAB signal.