

The Lithosphere-Asthenosphere Boundary below the Alpine Chain

I. Bianchi¹, M. S. Miller², G. Bokelmann¹

¹*Universität Wien, Institut für Meteorologie und Geophysik, 1090 Wien, Austria*

²*Department of Earth Sciences, University of Southern California, 3651 Trousdale Pkwy, MC 0740, Los Angeles, CA 90089-0740, USA*

The Alps are the result of long term convergence between the Eurasian and African plates, which began around 120 Ma ago, and are currently converging at roughly 2 cm/y (De Mets et al., 1994). Plate collision and subduction started ~65 Ma ago, which was followed by uplift of the Alpine orogenic belt after 23 Ma (Schmid et al., 1996; Castellarin and Cantelli, 2000). As expected, such a long series of tectonic processes have led to the formation of a highly complex and heterogeneous structure of the crust (Hirn et al., 1980; Giese, 1985; Pfiffner, 1990; Ye et al. 1995; Bleibinhaus & TRANSALP Working Group 2001; TRANSALP Working Group 2001, 2002) and the upper mantle (Hirn et al., 1984; Panza et al., 1986; Pfiffner et al., 1988; Kissling 1993; Lippitsch et al., 2003). Tomographic models of the upper mantle beneath the convergent zone, (Wortel and Spakman, 2000; Piromallo and Morelli, 2003; Giacomuzzi et al., 2011) have determined the current position of ancient suture zones by imaging high-velocity anomaly bodies running parallel to the Alpine chain axis that extend into the mantle transition zone. Regional tomographic models (Lippitsch et al., 2003; Mitterbauer et al., 2011) show that the positive velocity anomalies (ascribed as the Alpine slab) are interrupted along the Alpine chain, testifying to the presence of fragmented subduction. Seismic models based on P-wave residuals (Babuska et al., 1988), MT and electromagnetic studies (c.f. Jones et al., 2010; Korja, 2007), and geothermal (mostly steady-state) models (Artemieva et al., 2006 and references therein) describe the lithosphere thickness below Alps.

The surface expression of the arcuate Alpine belt can be divided into two distinct blocks: the arcuate western Alps, and the eastern Alps, which extends towards the east to the Carpathians. Here is presented an overview of the lithosphere thickness below the Alpine chain with a particular focus on variations in lithospheric thickness that occur over length scales of several tens of kilometers below the Eastern Alps.