Sp converted waves reveal the structure of the lithosphere below the Alps and their northern foreland

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DOI: http://dx.doi.org/10.17169/refubium-41047

The structure of the lithosphere is reflecting its evolution. The Moho of the European lithosphere has already been studied intensively. This is, however, not yet the case for the lower boundary of the lithosphere, i.e., the lithosphere-asthenosphere boundary (LAB). We are using S-to-P converted seismic waves to study the structures of the Moho and the LAB beneath Europe including the greater Alpine Area with data from the AlpArray project and the European networks of permanent seismic stations. We use plain waveform stacking of converted waves without deconvolution and compare the results with stacking of deconvolved traces. We also compare Moho depths determinations using S-to-P converted waves with those obtained by other seismic methods. We present more detailed information about negative velocity gradients (NVG) below the Moho. Its lower bound may be interpreted as representing the LAB. We found that the thickness of the European mantle lithosphere is increasing from about 50°N towards the Alps along the entire east-west extension of the Alps. The NVG has also an east dipping component towards the Pannonian Basin and the Bohemian Massif. The Alps and their northern foreland north of about 50°N are surrounded in the east, west and north by a north dipping mantle lithosphere. Along 50°N, where the NVG is reversing its dip direction towards the north, is also the area along which the volcanoes of the European Cenozoic Rift System are located. Our results possibly indicate that the Alpine collision has deformed the entire lithosphere of the Alpine foreland as far north as about 50°N.