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Anisotropic structure beneath the Western Alps as inferred by the analysis of anomalously deep earthquakes

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The Western Alps result from the Late Cretaceous oblique subduction of the European plate under the Adriatic microplate, which evolved into continental collision during the Cenozoic. Notwithstanding the availability of local and teleseismic tomographic models depicting the overall structure and geometry of the Alpine belt, the structure of the region beneath the Western Alps need to be further investigated.
Here, we study the seismic anisotropic properties beneath the Western Alps exploiting the earthquakes that occurred within the lithospheric mantle down to 75 km depth. We benefit from the catalogue of accurate location of the deep earthquakes recorded since 1990 by the permanent seismic stations operating in the study area. We then compare the obtained results with the high-resolution tomographic images and with the SKS shear wave splitting in order to improve and integrated the regional tectonic model. We use the cross-correlation method to obtain the S-wave splitting parameters, fast polarization direction and delay time. Fast directions of deep earthquakes show variable orientation, from E-W to ENE-WSW and NNE-SSW with delay time value ranging between 0.02 sec and 0.62 sec. The splitting measurements reveal strong anisotropy into the lithosphere beneath the Western Alps.