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Moho depth and age in southern Norway

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Moho ages beneath the Fennoscandian shield are highly variable due to the method of crustal accretion and to the long history of extensional and compressional tectonics. In southern Norway, the Moho and crust are inferred to be the youngest of the shield, however, it is likely that a large discrepancy between crustal age and Moho age exists beneath the high southern scandes where the Caledonian orogeny was in effect. Moho structure in southern Norway was targeted recently with a seismic refraction study (Magnus-Rex - Mantle investigations of Norwegian uplift Structure, refraction experiment). Three ∼400 km long active source seismic profiles across the high southern Scandes Mountains, the youngest section of the Fennoscandian shield were recorded. Moho depths beneath the high mountains are 36-40 km, thinning towards the Atlantic Margin and the Oslo graben. A new Moho depth map is constructed for southern Norway by compiling new depth measurements with previous refraction Moho measurements. Gaining better constraint on Moho depths in this area is timely, as debate over the source of support for the mountains has provided the impetus for a new focus project, TopoScandesdeep, to find the depth and mechanisms of compensation.

P and S-wave arrivals were recorded in the Magnus-Rex project, from which Poisson ratios for the crust in southern Norway are calculated. Unusually strong S-wave arrivals allow rare insight into crustal Poisson's ratio structure that is not normally available from active source data and are usually determined by earthquake tomography studies where only bulk crustal values are available. An average Poisson's ratio of 0.25 is calculated for the crust in southern Norway, suggesting it is predominantly of felsic-intermediate composition and lacks any significant mafic lower crust. This differs significantly from the adjacent crust in the Svecofennian domain of the Fennoscandian shield where Moho depths reach ∼50 km and an up to 20 km thick mafic lower crust is present. The vast difference in Moho depths in the Fennoscandian shield are, therefore, mostly due to the variation in thickness of the high Vp lower crust. These new data on Moho depth, lower crustal thickness and crustal composition provide new insights into the processes that have led to both the uplift and maintenance of the southern Scandes Mountains.