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Crustal properties in the continuum Baltic Shield-Scandinavian Mountains from seismic ambient noise and magnetotelluric analysis

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The Scandinavian passive margin is a good example of a region where a Precambrian shield is directly in contact with a younger mountain belt. Located along the Atlantic coast, the Scandinavian mountains, formed 440 Ma ago, show high peaks (> 1 km from the sea level) due to an uplift event 12 Ma ago. This topography contrasts strongly with the low topography of the Baltic shield (around 500 m from the sea level). If the mountain shows high topography compared to the shield, P-receiver functions analysis indicates that the Moho is deeper beneath the shield than beneath the orogenic belt. This result is surprising, as simple crustal isostasy would produce the opposite result. It is therefore likely that there is further variation in crustal and lithospheric properties between the shield and the mountain belt. In this perspective, several geophysical experiments (SCANLIPS2, POLENET-LAPNET, SCANLIPS3D, Norwegian National Seismic Network) have been deployed in the region in order to better understand the lateral variation in the crustal properties. From these different seismic arrays, we used the technique of ambient noise cross correlation in order to reconstruct the Rayleigh wave Green's function (R-R and Z-Z components) and produced a new Vs model of the upper crust in the transition between the Scandinavian mountains and Baltic Shield.

In addition of this study, a magnetotelluric survey was done in the framework of MaSCa (MAgnetotellurics in the SCandes) project between 2011 and 2013 in the same area of broadband seismic network (Northern Scandinavia Mountains and the Baltic Shield). This project shows higher resistivity in the crust beneath the Baltic shield than beneath the orogenic belt. The results of this study are used in a joint inversion with seismic ambient noise in order to improve existing models. We used the multi objective genetic algorithms (GA) to inverse in the same time seismological data (receiver functions and dispersion curves from seismic ambient noise analysis) and magnetotellurics data. This approach allows to constrain the crustal properties in this region in term of depth-velocity-resistivity. We will show here first 1D depth-velocity-resistivity profiles across the Northern Scandinavian mountains and the Baltic Shield using this technique.