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Reflection seismic investigations of the Scandinavian Caledonides to help unravel its orogenic history

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The COSC (Collisional Orogeny in the Scandinavian Caledonides) project seeks to increase the understanding of collisional orogeny by focusing on the Scandinavian Caledonides which, after several hundred million years of erosion, provide an ideal setting for investigation of mid-crustal processes.
Geological investigations reveal the presence of three major allochthons (Särv, Seve and Köli) with different lithologies and that have been transported as much as 400 km eastward. The middle allochthon, the Seve, is a ductile high grade unit that is thought to have been transported as a hot extruding body, analogous to the channel flow process proposed for the Himalayas.
Previous seismic surveys (1987-1992) revealed the presence of a 150 km long basal décollement zone with a very gentle dip, reaching a depth of 6 km at the border between Norway and Sweden. Magnetic surveys suggest a relatively undeformed basement that is a continuation of the magnetite bearing granites of the Transscandinavian Igneous Belt. Other geophysical studies (seismic refraction, gravimetry, MT and petrophysics) have been performed in the area since the 1970's and all show good mutual consistency and agree well with geological observations.
Using a mechanical source, more than 1800 shots were recorded along an about 36 km long seismic profile in the Åre region in the western part of Sweden during the summer of 2010. With a nominal source and receiver spacing of 20 m, and using 300-360 active channels, we acquired a high-resolution, crooked line profile in a NE-SW direction. A shorter seismic profile was also acquired to connect our new profile with the long, trans-Caledonian profile acquired between 1987 and 1992 which lies around 10 km to the north. The processing of the new data is still ongoing, but preliminary results show several strong sub-horizontal to gently dipping reflections at about 500 ms, 1200 ms, 2000 ms and 2500 ms, which coincide well with the reflections observed in the previous regional seismic profile.
The new seismic data provide constraints and higher resolution images of subsurface structures, mainly in the upper few kilometers, and serve as a basis for the planning of two 2.5 km deep drill holes. The new data suggest that the planned drill depths are just enough to take us down through the interesting Seve nappe and the basal décollement zone.