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ICDP drilling in the Scandinavian Caledonides: the SDDP-COSC project

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The Swedish Deep Drilling Program (SDDP) Collisional Orogeny in the Scandinavian Caledonides (COSC) project is a multidisciplinary investigation of the Scandian mountain belt. Cenozoic uplift of the Scandes has exposed a lower- to middle-crustal level section through this Himalaya-type orogen, providing unique opportunities to better understand not only the Caledonides, but also on-going orogeny and the earthquake-prone environments of modern mountains belts. COSC will also contribute to our knowledge of mountain belt hydrology, provide the first information about deep thermal gradients for paleoclimate modeling and potential geothermal energy resources, contribute new information about the deep biosphere, and improve our understanding of the Cenozoic uplift history of the Scandes.

The drilling program targets the far-traveled (> 400 km) allochthons of the Scandinavian Caledonides and their emplacement across the Baltoscandian foreland basin onto the platform of continent Baltica. Two 2.5 km deep holes are planned. COSC-1, to be drilled in the summer of 2013, will target the high-grade metamorphic complex of the Seve Nappes (SNC) and its contact to underlying allochthons. COSC-2 will start in the lower thrust sheets, pass through the basal décollement and investigate the character of the deformation in the underlying basement. An international science team, including expertise on Himalaya-Tibet and other young orogens, is running the science program.

New high-resolution reflection seismic data provide excellent images of the upper crust. Alternative interpretations of the reflectors' origin, particularly those in the basement, will be tested. The site of COSC-1 is based on a 3D geological model, constructed from surface geology, recent and vintage regional reflection seismic profiles, regional and local gravity data, and high-resolution aeromagnetics, acquired recently by the Geological Survey of Sweden.

The drilling will be carried out utilising the new Swedish scientific drilling infrastructure, located at Lund University, an Atlas Copco CT20 diamond core-drilling rig, with versatile drilling equipment (see EGU2012-7379), providing the ideal platform for core-drilling to 2.5 km depths. Existing drilling, sampling and testing techniques (e.g. triple-tube core drilling for best core quality) will need to be adapted to highly variable lithologies and new techniques will be developed, as necessary.

COSC-1 drilling operations and the directly related on-site investigations are financed by ICDP and the Swedish Research Council. All drill cores will be transferred to the core repository of the Geological Survey of Sweden, and a sampling party will be announced later this year. Researchers who want to participate in COSC and contribute their expertise are encouraged to inform us of their interests.