



Borehole logging at the COSC-1 drill hole: a new dataset of in-situ geophysical properties through the lower Seve Nappe Complex

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The Collisional Orogeny in the Scandinavian Caledonides (COSC) drilling project supported by the International Continental Drilling Program was designed to study mountain building processes in a deeply eroded Paleozoic orogen. The first half of this project, COSC-1, targeted the lower part of the high grade Seve Nappe Complex and its basal thrust zone near Åre in the Jämtland county, Sweden. From May to August 2014, the COSC drilling crew drilled to a depth of 2496 m from the surface with an almost fully recovered core sample. During this drilling period, four borehole-logging runs have been conducted by Lund University with a low impact on drilling schedule and two supplementary ones once the drilling was completed. Three-Arm Caliper, Electrical Logging, Sidewall Density, Flowing Fluid Electric Conductivity, High Resolution Acoustic Televiewer and Full Waveform Sonic sondes have been used to investigate in-situ physical properties of the borehole. In addition, the ICDP operational support group has conducted two continuous borehole-logging runs from the surface to the bottom of the COSC-1 borehole in September and October. Due to technical problems, some of the planned logging have not been completed, however natural gamma, rock resistivity, magnetic susceptibility, K/Th/U concentration, temperature and fluid conductivity have been measured all along the borehole. We used the continuous natural gamma log from the ICDP logging group as the depth reference to depth-match and stack the composite borehole logging done during the drilling. These borehole logging operations result in reliable continuous data of resistivity, density, velocity, magnetic susceptibility, K/Th/U concentration, temperature, fluid conductivity, pressure, diameter as well as an image (amplitude and travel time of reflected ultrasounds) of the borehole till its bottom. Only the density, velocity and image datasets stop at 1600 m depth due to instrumentation limits. Preliminary conclusions from the borehole logging data show a stripped pattern of density correlated with velocity, which underlines the varying composition of the gneisses observed in the first 1600 m core. Pressure and temperature condition at the bottom of the borehole reach almost reach 55°C and 25 MPa. Moreover, some of the fracture zones observed in the borehole image provided by the acoustic televiewer seem to be associated with hydraulic active zones detected by spikes in the fluid conductivity logs and can also be correlated to those seen in the drill core.