Geophysical Research Abstracts
Vol. 17, EGU2015-6594-1, 2015
EGU General Assembly 2015

Elastic anisotropy and borehole stress estimation in the Seve Nappe Complex from the COSC-1 well, Åre, Sweden.

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The Caledonian orogeny, preserved in Scandinavia and Greenland, began with the closure of the Iapetus Ocean and culminated in the collision of Baltica and Laurentia cratons during the middle Paleozoic. The COSC scientific drilling project aims at understanding the crustal structure and composition of the Scandinavian Caledonides. The first well of the dual phase drilling program, completed in Summer of 2014, drilled through ∼2.5 km of the Seve Nappe Complex near the town of Åre, Sweden. Newly acquired drill core and borehole logs provide fresh core material for physical rock property measurements and in-situ stress determination.

This contribution presents preliminary data on compressional and shear wave ultrasonic velocities (Vp, Vs) determined from laboratory measurements on drill cores, together with in-situ stress orientation analysis using image logs from the first borehole of the Collisional Orogeny in the Scandinavian Caledonides project (COSC-1). An hydrostatically oil pressurized apparatus is used to test the ultrasonic Vp and Vs on three orthogonally cut samples of amphibolite, calcium bearing and felsic gneiss, meta-gabbro, and mylonitic schist from drill core. We measure directional anisotropy variability for each lithology using one sample cut perpendicular to the foliation and two additional plugs cut parallel to the foliation with one parallel to the lineation and the other perpendicular. Measurements are performed using the pulse transmission technique on samples subjected to hydrostatic pressure from 1-350 MPa at dry conditions. We present preliminary results relating Vp and Vs anisotropy to geologic units and degree of deformation. Additionally, we use acoustic borehole televiewer logs to estimate the horizontal stress orientation making use of well developed techniques for observed borehole breakouts (compressive failure) and drilling induced fractures (tensile failure). Preliminary observations show that very few drilling-induced tensile fractures are produced, and that borehole breakouts are episodic and suggests a NE-SW minimum horizontal stress direction