RENE-2: Sistemas de Pórfidos de Cu (±Mo? ±Au) e IOCG: de la petrogénesis a la exploración

Magnetic fabric of altered rocks at the Escondida porphyry Cu deposit: a record of hydrothermal fluid migration?

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The anisotropy of magnetic susceptibility (AMS) is a petrophysical property that quantify the shape and orientation of all minerals in a rock (magnetic fabric), which in many cases represents its petrologic fabric (e.g. Tarling and Hrouda, 1993). However, few studies have been focused in define the effects of hydrothermal alteration on magnetic fabric of rocks (e.g. Just et al., 2004).

In this contribution we investigate the effects of hydrothermal alteration on the anisotropy degree (P´), shape (T), and orientation of magnetic fabric of host rocks of the Escondida porphyry Cu deposit, and how magnetic lineation can be interpreted in terms of hydrothermal migration patterns. For this, a total of 275 oriented paleomagnetic standard specimens from 23 sampling sites in the Escondida stock, were subjected to AMS analyses using a MFK1-FA Kappabridge.

Results indicate that samples affected by potassic-chloritic alteration display a well defined oblate magnetic fabric (T=0.172), showing a high magnetic anisotropy degree (P´=1.119). Magnetic lineation exhibit a clear NE declination and is inclined toward the SW. Samples affected by an intense quartz–sericite alteration show a prolate magnetic fabric (T=-0.20) and experience a decrease in the magnetic anisotropy degree (P´=1.021). Magnetic lineation display a N-NE declination and inclinations toward the SW. Argilized samples exhibit a wide range for the shape parameter (1-1), suggesting the occurrence of samples with both oblate and prolate magnetic fabric, whereas the magnetic anisotropy degree displays similar values than quartz-sericite altered samples (P´=1.028). However the magnetic lineation is scattered, where is not possible to define a clear declination pattern.

NE orientation of magnetic lineation in potassic-chloritic and quartz-sericite altered rocks can reflects the main direction of hydrothermal fluid migration within the Escondida deposit. Mineralogical studies demonstrate that magnetic lineation is associated with Fe-rich multidomain hydrothermal magnetite precipited during the potassic alteration event. Results are consistent with tectonic evidences, which suggest that NE tensional structures, associated with sinestral activity of the Domeyko Fault System, controlled the emplacement of the Escondida stock (Vergara, 2002), whereas Mo-rich zones also display a NE anisotropy within the deposit (Romero et al., 2011).