

**Geochemical mapping of the
Collahuasi District, N. Chile:
A pilot study for a geochemical atlas
of the Andes**

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A geochemical baseline survey of the Collahuasi District, N. Chile has been completed based on systematic regional rock and soil sampling. The Collahuasi district hosts 3 major Cu porphyry centres, Rosaria, Ujina and Quebrada Blanca which are now being mined for Cu and Mo. Approximately 1100 lithochemical whole rock samples were collected on a grid averaging 1-2 sq. kms. over an area of 1500 sq. km and about 250 soil samples were collected over part of the grid, centred on Rosario and covering about 650 sq. km. Approximately 74 chemical elements were determined on whole rock samples by ICPMS and ICPOES and 65 elements on soil samples after aqua regia extraction. All the methods used were those specified by the global geochemical baseline programme for mountainous terrains.

The data are shown to be of value for exploration, lithochemical mapping and understanding the geochemical and metallogenic evolution of the district as well as for environmental purposes. For example high field strength elements can be used to prepare lithological maps in areas where the bedrock geology is poorly known while large ion lithophile elements can be used to map regional hydrothermal alteration. The rock and soil data have been compared to international soil guideline values for chemical elements from N. America and Europe and the ratio of the concentration in soils has been compared to that in rocks for all elements. The results show that even in rock samples away from mineralisation values for several elements exceed all guidelines for part of or the entire district. This observation is critically important in setting guideline values which should more fully take account of bedrock geology.

The results show that a lithochemical atlas of the Andes would define the chemistry of mineralised districts, and the potential for new exploration targets as well as providing an environmental baseline against which to study human health and environmental impacts, including from future mining.

**Constraints on the exhumation
history of the Torres del Paine**

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During field investigation on the contact metamorphism and intrusion emplacement on the Torres del Paine laccolith we found samples of suspiciously fresh scoria. These scoria were only found in two distinct steep gullies in the Eastern part of the Torres del Paine laccolith. They occur in the side valleys of Valle Ascencio, Northeast of Monte Almirante in Valle del Mirador as well as North of the Torre del Paine peaks in Valle del Silencio. The two localities relate to each other by a NW-SE running fault system. In Valle del Silencio the scoria is found close to a dike that can be followed from the southern side moraine in the valley running steeply upwards to form a steep cut just north of Torre Monzino. The same holds true for the Valle del Mirador. A dike is running into a notch giving access to the east crest of Monte Almirante. Samples can only be found along the dike gullies above the moraine deposits and below an altitude of 1760 m. At both sampling locations this altitude corresponds roughly to a position in the middle of the intrusion. Since we find scoriae this altitude marks a paleosurface and thus allows using the age constraints by Ar/Ar dating of the scoria in combination with data on age and the depth of intrusion of the Paine laccolith to constrain the exhumation history of the Paine laccolith. The finding of scoria indicates a surface that must be discussed in the light of the glaciation history.