

Mineral deposits and Cu–Zn–As dispersion–contamination in stream sediments from the semiarid Coquimbo Region, Chile

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Abstract This paper presents Cu–Zn–As geochemical data from stream sediment surveys carried out in the three main watersheds of the Coquimbo Region of Chile. This mountainous semiarid realm occupies an area of 40,656 km² between 29° and 32°S. Given that the area has a long historical record of mining activities, important environmental disturbances were expected. However, despite the detection of three major geochemical anomalies for Cu, Zn, or As, only one can be unmistakably linked to the development of mining–metal recovery procedures (Andacollo–Panulcillo). An investigation of the other two anomalies (Elqui and Hurtado) reveals

three major causes that fully or partially account for them: (1) the type of ore deposit and associated hydrothermal alteration; (2) the regional structural setting (intensity of fracturing); and (3) climate–landscape. Cu–Au–As epithermal deposits/prospects along the so-called El Indio belt are here regarded as the sources of both the Elqui and Hurtado anomalies. The strong advanced argillic alteration present in some of the epithermal deposits/prospects of the El Indio belt may have induced the loss of the buffering capacity of rocks, and therefore favoured metal dispersion during later oxidation–leaching of sulphides. This applies to the Elqui and Hurtado anomalies. Conversely, given that the potassic, propylitic and phyllic alterations do not affect the buffering capacity of rocks, only minor metal dispersion is observed in relation to the Los Pelambres porphyry copper deposit. Besides, the epithermal belt is located within a highly fractured Andean domain (3,000–4,000 m of altitude), which may have conditioned the fast unroofing of ore deposits, contributed to enhanced circulation of meteoric waters, and eventually, to strong oxidation, and leaching of metals. Metal dispersion is aggravated during rainy years in response to strong El Niño episodes.

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Study area

An introduction to the problem

This paper presents integrated results from stream sediment surveys carried out successively in the three