



Glacier monitoring in the semi-arid Andes of Chile (29°S), projections for their future evolution

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Since several decades, climatic variations at global scale induce important changes on hydrological systems. Due to its high sensitivity to climatic change, the cryosphere strongly reacts to these and an important decrease in snow and ice covered areas is observed worldwide.

In the semi-arid Norte Chico region of Chile (27°S to 33°S), annual precipitation is very low (between 30 and 300 mm w.e. per year). Consequently, the evolution of the cryosphere is an important concern for local populations due to the impact on local water resources. Although the total extent of glaciation is small, when combined with snow coverage; solid water resources represent an important component of the water cycle in this area. Glacier behavior and evolution in this area and their links with climatic fluctuations are poorly known because of the scarcity of snow and ice monitoring and research in the region.

Ablation processes at the glacier surface depend on the components of the surface energy balance (SEB). For instance, estimating the ratio of energy used for sublimation or melting is crucial in determining glacier response under dry climates. Studies of the SEB are scarce in the semi-arid Andes of Chile, but the findings so far indicate that the SEB in the ablation area is dominated by the net short-wave radiation. Hence, the albedo of the glacier surface is a key variable in explaining glacier mass balance variations. Deposition of airborne dust on the glacier surface significantly lowers the

albedo, and hence alters the SEB. As a consequence, variations in dust deposition should strongly impact melting and thus glacier recession.

This study presents the glacier monitoring realized by the CEAZA on six glaciers located in the Pascua Lama mining area where activities performed at the glaciers' boundary led to an important polemic. This led to a controversy on the potential impact of dust and earth deposition due to the exploratory mining activities on glaciers evolution. Consequently, studying the recent evolution of glaciers in the Pascua Lama area appears necessary in order to know whether their evolution is natural or related to exploratory mining activities.