State and dynamics of a tropical rock glacier on the Altiplano (Bolivia, 21.5°S) during the last two decades

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On the Southern Bolivian Altiplano (Sur Lipez), glaciers are almost absent today whereas ice-rich permafrost affects numerous debris accumulation sectors and constitutes an unknown contributor to the hydrology of the region as well as a precious climatic indicator. In this tropical, but rather arid mountainous environment, the Caquella rock glacier, which develops between 5600 and 5400 m a.s.l., has been surveyed for more than 15 years by IRD. This paper intends to synthesise the main results regarding the state of the rock glacier and its dynamics, especially with respect to the warm decades of the 1980’s and 1990’s. First, geomorphological analysis allows us to understand the genesis and history of the rock glacier during the Quaternary. A model of internal structure of the landform obtained from geoelectrical soundings is also coupled with repeated geodetic measurement of boulders on the surface to assess the rock glacier dynamics. Topo- and micro-climatic records associated with climatic data analysis provide new insights of the short- and mid-term relations between permafrost and climate at tropical latitudes. The potential degrading state of the permafrost at this site and its hydrological significance for the Altiplano is finally discussed.