BOOK OF ABSTRACTS

José M. Fernández-Fernández · Josep Bonsoms
Julia Garcia-Oteyza · Marc Oliva
Editors

EUCOP6 PUIGCERDÀ
18-22 JUNE 2023

Diurnal and seasonal active layer and permafrost dynamics from boreholes of the Latin American permafrost network

Kenji Yoshikawa (University of Alaska Fairbanks), Gino Casassa (General Directorate of Water, Ministry of Public Works, University of Magallanes), Bolívar Ernesto Cáceres Correa (Instituto Nacional de Meterología e Hidrología), Hugo Delgado Granados (Instituto de Geofisica, UNAM), Edson Ramirez (Instituto de Hidráulica e Hidrología, Universidad Mayor de San Andrés), Jorge Luis Ceballos (Cooperación y Asuntos Internacionales), Pablo Masías Álvarez (Observatorio Vulcanológico del INGEMMET), Pool Vasquez Choque (Observatorio Vulcanológico del INGEMMET), Guillermo Azócar (Atacama Ambiente Consultores), Pablo Rodrigo Iribarren Anacona (Instituto de Ciencias de la Tierra, Universidad Austral), Victor Soto (Universidad Veracruzana), Dario Trombotto (IANIGLA-CCT CONICET Mendoza) and Jose Úbeda Palenque (Universidad Complutense de Madrid).

Abstract

Permafrost is present in the high-altitude mountains of the Trans-Mexican Volcanic Belt as well as the Andes, even in the extreme dry Atacama highland. The permafrost and active layer thermal state are characterized at Latin American Permafrost Network study sites. Ice rich or extremely dry permafrost was observed during drilling operations from Mexico (Pico de Orizaba, 5636m a.s.l. Iztaccíhuatl, 5230m a.s.l.), Colombia, Ecuador (Chimborazo, 6263m a.s.l.), Peru (Coropuna 5250 m a.s.l., Ampato 5850 m a.s.l., Chachani 5600 m a.s.l.) including the highest human habitation in the world: La Rinconada 5100 m a.s.l., Bolivia (Chacaltaya 5300 m a.s.l. where glacier disappeared in 2005), and the Chilean/Argentinian border (up to 6750 m a.s.l. including Parinacota, Aucanquilcha, Ojos del Salado, Llullaillaco, Tupungato and Tupungatito). The Lower Limit of Alpine Permafrost (LLAP) is redrawn from this study between latitude 19˚N and 40˚S where it is mainly in the tropical and arid Andes. This is not a rock glacier monitoring program that not mapping sporadic permafrost, but continuous permafrost terrains for long term temperature monitoring and understanding for local hydrological problems such as glacier/snow melt runoff or sublimation rate of higher elevations. The maximum active layer is typically influenced by the diurnal fluctuations which is between 12-30 cm deep however, maximum 2m depth of the seasonal active layer was observed at Ojos del Salado near the LLAP (5200 m a.s.l.). Daily severe frost shattering occurs near the ground surface, producing a dusty, fine-material horizon at an active layer near the LLAP, however a few freeze-thaw actions are higher than 6400 m. The snow-covered periods are important for providing protection from strong tropic solar radiation.