

Radar surveys of ice thickness and snow stratigraphy at Tupungatito Glacier, a high altitude glacier site in the central Chilean Andes

Rodrigo Zamora[†]; Jose Uribe; Gino Casassa; Mariusz Potocki; Bjorn Grigholm; Paul Mayewski

[†]Centro de Estudios Científicos, Chile

Leading author: rzamora@cecs.cl

We present Ground Penetrating Radar (GPR) measurements at 400 MHz for the determination of shallow internal stratigraphy, and impulse radar data at 5 and 10 MHz to determine the subglacial topography of the upper accumulation area of Tupungatito Glacier. The glacier is located on a large former crater of Tupungatito Volcano, central Chilean Andes (33°24' S 69°48' W, 5,600 m a.s.l.). Radar files were collected on February 2010 (5 MHz) and February 2011 (10 and 400 MHz). The data derived from GPR profiles show a clear layered structure in the shallow snow and firn in the upper 40 m. The first 25 m show prominent reflectors every 5 m approximately. Below 25 m and until 40 m prominent internal layers are much closer, less than 2 m apart, probably as an effect of firn compaction. A spatial analysis of GPR data shows relevant variations in snow and firn layering across the glacier. Correlation of GPR data is attempted with stratigraphic, isotopic and chemical information obtained from a shallow (16 m) firn core drilled in February 2010. Results are important for a detailed assessment of the snow accumulation, which are basic data needed for glacier mass balance calculations, and extrapolation into the past. Ice thickness from the 5 and 10 MHz radar data show that the glacier thickness ranges between 15 and 190 metres. The combination of the ice thickness data and the GPR stratigraphy information is used for selecting the optimal location of a deep ice coring site on the glacier to be performed in February 2012.