



Preliminary results obtained by the most recent field campaign to the Subglacial Lake Ellsworth Area in West Antarctica

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In December 2010 Centro de Estudios Científicos (CECS) and the private company Antarctic Logistic and Expeditions (ALE), the main operator in this part of Antarctica, conducted a snowmobile survey at the Subglacial Lake Ellsworth (SLE) area, West Antarctica. The operation was carried out from ALE base camp at Union Glacier (79°46'S/83°24'W, 730 m a.s.l.), where a Twin Otter airplane carrying personnel, two snowmobiles and cargo, departed to the upper part of Pine Island Glacier, to a place located 20 km downstream from SLE (78°53'S/91°27'W 1850 m a.s.l.). A low frequency impulse radar system was used to collect the total ice thickness of the glacier as well as the upper hundreds of metres of the internal structure of the ice. The transmitter and receiver systems were installed on sledges tied together by ropes, which were towed by a snowmobile. The system operates at a central frequency of 2.5 MHz (20 m half dipole antennae length) and a 7 KV impulse transmitter was used. Two JAVAD dual frequency GPS receivers were used for geo-positioning of the radar data and for navigating along the previously designated tracks. A total profile length of more than 90 km was surveyed in an area where limited previous ice thickness data were available. Among the previous data are airborne radar profiles collected by the British Antarctic Survey (BAS) during the DELORES mission of 2007/2008. These profiles suggested the possibility of a second subglacial lake downstream SLE. Our mission was to confirm or dismiss this possibility. The collected data allowed to detect the bedrock topography in several spots of the studied area, indicating a rough subglacial topography with a corresponding internal structure of the ice clearly visible from the surface down to 1200 m of the ice thickness. In spite of the above, several profiles were difficult to be interpreted due to a low overall gain of the system and a low pulse repetition frequency (PRF). Part of undetected bedrock are located where the internal structure of the ice showed isochrones layers with steep slopes toward a deeper area where all the isochrones layers are almost parallel to the surface or with a gentle slope. This area of the record is the more likely location of the subglacial lake, suggesting that the lake is surrounded by very steep flanks, similar to the observed slopes at the margins of SLE. In the area surveyed in the last campaign, the steep slopes are much closer, and therefore the existence of a lake is constrained to a narrow fjord like valley of only 2 km width. A new campaign to the area is under preparation for next austral summer, in order to survey the area in more detail, this time from a snow cat type of tractor, where a 150 MHz pulse compression radar, with 10 KHz PRF and 12 dB gain antennae will operate.