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Ground-penetrating Radar system development

The main aim is to develop a new ground-penetrating radar system, remotely controlled from a helicopter cabin. Airborne radar profiling is fundamental to be able to measure the ice thickness near the highly-crevassed areas of marine-terminating glaciers, where the crevasses make impossible the radar data acquisition form the glacier surface. Accurately knowing the glacier thickness near the marine-terminating fronts is essential to estimate the ice discharge from glaciers to the ocean.

The radar system components and its deployment for fieldwork are shown in figure 1 and 2. Two fieldwork tests of the equipment have been done in Livingston Island, Antarctica, during 2016-2017 and 2018-2019 campaigns (Fig. 3).

Figure 1. The radar system consists of a transmitter, a receiver and a control unit that also includes the digital recording system, together with transmitting and receiving antennas

Figure 2. Operating the radar system from a helicopter.

In the two field campaigns we performed helicopter-borne radar profiling, retrieving the glacier thickness along more than 200 km of radar survey lines. An example is shown in Fig. 3 where the vertical axis represents the radar wave travel time. The uppermost reflection corresponds to the glacier surface. The image reflects the difficulties of processing and interpretation, as reflections from surrounding mountain outcrops are overlapped to the surface and bed reflections, and multiple reflections are also observed.

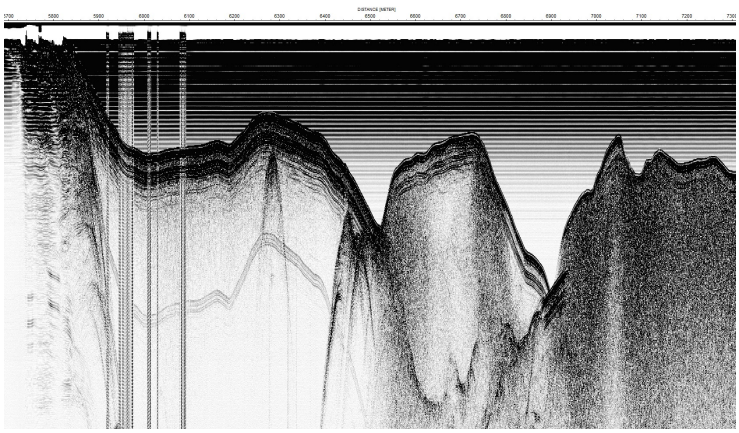

Figure 3. Example of a radar profile along a 1.5 km transect

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