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Permafrost and active layer monitoring in the Maritime Antarctic. First results from CALM sites in Livingston and Deception islands

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In the Antarctic continent the 50 last years of meteorological data show us that the climate variability is not homogenous. In this context, the climate of the Antarctic Peninsula has experienced a major warming behaviour over the last 50 years with temperatures at Faraday/Vernadsky station having increased at a rate of 0.56 C/decade in the annual means and 1.09 C/decade during the winter. These changes have occurred along with an increase in the mean annual air temperature (MAAT) that in Faraday station show the largest temperature increase measured on Earth over the last 50 years (+2.5 C in 50 years). While glaciers and ice-shelves are being monitored to evaluate the effects of climate change, permafrost, which is another important component of the Antarctic cryosphere has been neglected. In order to develop permafrost research in the Antarctic, two core-projects of the International Polar Year 2007-08 have been approved: Antarctic and Sub-Antarctic Permafrost, Soils and Periglacial Environments (ANTPAS - SCAR/IPA) and Permafrost Observatory Project - A Contribution to the Thermal State of Permafrost (TSP - IPA). Important objectives of these projects are to install a network of boreholes for permafrost temperature monitoring in the Antarctic, and also a network of sites for monitoring the active layer characteristics and to study the energy fluxes between ground and atmosphere. These networks will become part of GTN-P and CALM-S. The project PERMAMODEL - Permafrost and active layer monitoring and modelling in Livingston and Deception Islands is part of ANTPAS and TSP and will contribute to the monitoring strategy with the installation of new 20-25m deep boreholes in Livingston and Deception Islands and also of CALM-S sites. In Deception Island we have installed a CALM-S site in Crater Lake at 90 m asl, in flat terrain with volcanic debris and ashes on the surface. Geophysical measurements suggest that permafrost is thin and vary between 15 and 30 m thick, maximum active

layer thickness is around 40 cm. The study parcel is one hectare (100 x 100 m) and ground and air temperature monitoring complement the mechanical probing and snow layer monitoring. Two other candidates for CALM-S sites were selected in Livingston Island: Reina Sofía Hill at 275 m asl and Ramos Col at 150 m asl. These sites are in the vicinity of the Incinerador borehole (2.4 m deep - seasonal frost, with permafrost probable) and Reina Sofía Hill (1.1 m deep - permafrost) that were installed in the year 2000 and therefore a 7-year ground temperature series is available. Preliminary results on maximum active layer thickness, active layer temperature evolution, snow thickness and air temperatures obtained in 2006 allow a first characterization of the energy exchange mechanism between ground and atmosphere in the CALM-S sites will be presented.