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Permafrost and slope evolution in an active volcanic area (Deception Island, Maritime Antarctic)

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Deception Island (South Shetland Islands, Antarctic Peninsula region) is an active stratovolcano with a large collapse caldera and with most recent eruptions in 1967, 1969 and 1970. In some places there are fumaroles and ground temperature anomalies. Mean annual air temperature at sea-level is close to -2žC. The volcano rim rises to 539 m a.s.l. at Mount Pond and the island is glaciated to a large extent. However, as a result of the recent eruptions the island was covered by volcanic ash and debris and many of the glaciers are still ash covered today. Pyroclasts covered the seasonal snow and buried snow is still present under pyroclastic deposits in different sites. These deposits are very porous and insulating, and give origin to a thin active layer varying from 30 to 90 cm thick. In the lower parts of valley slopes it is possible to observe exposures showing fossil snow covered with perennially frozen volcanic debris indicating post-eruption permafrost aggradation. Permafrost also occurs under the buried snow. However, most low altitude slopes (<100 m) show ground subsidence in the upper slope sector. These thermokarst features are widespread and prevail in slopes with a concave plan-profile suggesting favourable conditions for pre-eruption snow accumulation. The pyroclastic deposits are thicker in the basal parts of slopes as a result of erosion and transport from upslope. The degradation in the upper slope sector is a result of the thinning of the insulating sedimentary cover and melting of the buried snow, while in the lower slope permafrost aggradates as a result of sediment accumulation and increasing insulation. Results from ground temperature and climate

monitoring obtained during different campaigns, as well as 2D Electrical Resistivity Tomography data, active layer probing, outcrop and geomorphological analysis are presented and used to propose a conceptual model of slope evolution.