

Application of time-lapse ERT in active layer monitoring at Crater Lake, Deception Island, Antarctica

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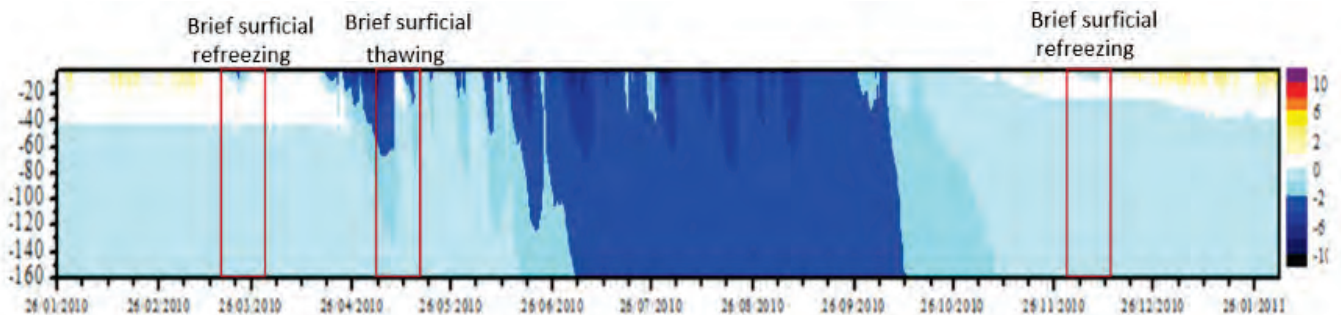
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An automatic ERT monitoring system was installed under the Circumpolar Active Layer

20 electrodes spaced 0.50 m and a Wenner electrode array were used in this experiment and a total of 56 points were collected for each dataset. The ERT measurements started at the beginning of 2010 and repeated each four hours during one year. Consequently, a total of 2200 datasets were obtained during the experiment. Ground temperatures in shallow boreholes down to 1.60 m were recorded simultaneously with ERT measurement in the site.

Both apparent resistivity and 2D inverted resistivity are analysed in space and time, and hourly, daily and monthly resistivity variations are investigated. A special attention is given to the specific events marked in figure 1. In addition, a virtual borehole analysis is carried out to compare the spatiotemporal resistivity changes with ground temperature fluctuations at several depths.



Monitoring (CALM) program in the Crater Lake CALM-S at Deception Island to study the active layer. The region is one of the hot spots of climate change and one of the most ecologically sensitive regions of Antarctica, where permafrost is near its climatic limits. The climate is polar oceanic, with high precipitation and mean annual air temperatures (MAAT) close to -3°C . The soils are composed by ashes and pyroclasts with high porosity and high water content, with ice rich permafrost at -0.8°C at the depth of zero annual amplitude, with an active layer of about 30 cm (Ramos et al., 2017).

Figure 1: Borehole temperatures are plotted for the 1.6 m borehole for the investigation depth of the ERT profile. The borehole is very close to the middle of ERT profile and was used for the virtual borehole analysis.

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REFERENCE: Ramos, M., Vieira, M.A., de Pablo, M.A., Molina, A., Abramov, A. and Goyanes, G. (2017): Recent shallowing of the thaw depth at Crater Lake, Deception Island, Antarctica (2006–2014), *Catena*. <http://dx.doi.org/10.1016/j.catena.2016.07.019>