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Physical properties of rocks from a 15 m deep borehole in Reina Sofia Mountain, Livingston Island, Maritime Antarctica

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In permafrost environments, such as the Shetland Islands of Maritime Antarctica, the thermal conductivity and the thermal diffusivity of the uppermost ground are two very important properties to understand time and space evolution of temperature as well as freezing and thawing.

In order to estimate the heat flow density (which depends on the local thermal conductivity of the rocks and the local geothermal gradient), the time evolution of permafrost in the Reina Sofia Mountain in Livingston Island, Maritime Antarctica, cores from a 15 m deep borehole were collected for measurement of physical properties such as thermal conductivity, thermal diffusivity, and porosity. The values from thermal conductivity and thermal diffusivity were obtain on TCS Lippmann & Rauen GbR by transiet methods, the values from porosity were obtain by water saturation techniques.

The values of thermal conductivity dry cores vary between 3.02W/m.K and 3.32 W/m.K; the values of the thermal diffusivity vary between 1.42 x 10^{-6} $m^2s^{-1}$and 1.64x 10^{-6} m^2s^{-1}; the average heat production for the entire borehole is 1.698 μWm^{-3}. Because thermal properties of rocks are highly dependent on porosity, this parameter was also measured, in the cores giving values that vary between 1.1% and 1.8%.

These new data will allow estimating for the first time the heat flow density for the area near the Reina Sofia Mountain.