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Deglaciation, ground temperature and volcanic activity in Popocatépetl (México).

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From 2001 to 2011 we monitored the soil temperature at different depths down to 1 m and the air temperature from 4100 to 5000 m asl over the Northern slope of the active volcano Popocatépetl (19º02′N, 98º62′W; 5.424 m asl). During this time period the volcano has been active, especially until the end of 2003, presenting periods of short activity thereafter. This eruptive activity has triggered the melting of the glacier situated on the Northern slope, frequently generating lahars. Finally, the glacier has been reduced to isolated ice islets. In this work we have analysed air and soil temperature data in order to differentiate the influence of solar and geothermal energies on the soil energy balance. We also compared these data to the soil temperature data from the nearby Iztaccíhuatl volcano, located just 15 km away and inactive since the late Pleistocene. The disappearance of the glacier has left large areas exposed on the Northern slope. Snow remains very few days per year and does not isolate the slope from periglacial processes. The results indicate a certain influence of geothermal activity on the soil related to periglacial processes and to the distribution of permafrost. As an example, the models elaborated to study the distribution of permafrost on Popocatépetl from soil temperature data indicate the existence of discontinuous permafrost above 5100/5200m asl, 200 m higher than on Iztaccíhuatl. However, the disappearance of glaciers on these altitudes could be favouring the formation of permafrost, also promoted by the relative eruptive calm of the last few years. In any case, the influence of geothermal activity on the superficial soil temperature of the volcano is vague as we have not detected specific warming events directly related to the most intensive eruptive periods.

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