

Temperature below the July 2015 pyroclastic density currents at Volcán de Colima (Mexico)

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On 10th and 11th July 2015, two successive sequences of PDCs travelled down the south flank of Volcán de Colima. The PDCs buried (and partly destroyed) a monitoring station and its solar panels, so that the surviving parts (batteries and data logger) simply ran out of power the day after and could be recovered later. The solar charging unit contained a thermometer that measured ambient temperature, which was then recorded by the data logger. This thermometer was buried below the sequences of PDCs, now giving a unique time line of the heating and cooling below a PDC.

Seismic data of a nearby seismometer shows the succession of discrete PDCs for 50 min on 10th July and almost 2 hours one day later. The duration of the seismic signals and the heating period nicely correlate, suggesting that most of the PDCs reached the monitoring station at 3km distance from the crater depositing hot material onto the thermometer. The monitoring station was installed on a crest between two runout channels so that the deposited material most likely corresponds to the more dilute upper part of the PDC overtopping from one channel into the other.

Here we make use of simple 1D analytic and numerical finite element models for thermal evolution in heterogeneous media with complex geometries coupled to non-linear inversion algorithms to invert the temperature history recorded by the thermometer for the history of successive deposition events during the sequences of PDCs, their layer thicknesses, and deposition temperatures.

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