



## Mobility of pyroclastic density currents

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Mobility of pyroclastic density currents is a hot topic largely still poorly understood.

Here we review three case studies of low aspect ratio (10-4) ignimbrites that encompass the spectrum from small to large volume, from basic to felsic in composition and from hot magmatic to cold phreatomagmatic endmembers. The 0.87 km<sup>3</sup>, phreatomagmatic, K-foiditic, Peperino Albano ignimbrite (Colli Albani, Italy), was erupted from the Albano maar at < 23 ka. The ignimbrite displays both thick valley pond and veneer facies. The juvenile component is 30-40% of the total volume and is highly fragmented to ash, with only a very minor proportion of small, vesicular lapilli. The unit reaches 10 km from vent, where it is confined in major valleys. Emplacement temperatures retrieved from paleomagnetic data and field data are at 350°-100°C.

The 69 km<sup>3</sup>, tephritic, Pozzolane Rosse ignimbrite was erupted from the caldera of Colli Albani at 460 ka. The succession starts with subplinian fallout of poorly vesicular scoria lapilli. The overlying ignimbrite cover more than 2000 km<sup>2</sup> and relate to pyroclastic flows with significant mobility, able to surmount hills at more than 20 km from vent. The facies is almost ubiquitously massive and chaotic. Juvenile pyroclasts are made of variably porphyritic, poorly to moderately vesicular scoria and spatter lapilli, and coarse ash. The texture of juvenile clasts indicates that the presence of little fine ash is not due to elutriation but to weak fragmentation of poorly vesicular and poorly viscous magma.

The > 500 km<sup>3</sup>, rhyodacitic Galan ignimbrite (Altiplano Puna, Argentina) was erupted at 2.1 Ma. There is no basal fallout deposit. The ignimbrite is lithic poor, very crystal rich, massive and chaotic throughout, emplaced above Curie temperature, and develops valley confined facies, but no veneer facies, from proximal to distal (> 80 km) locations.

The three cases show that:

- the mobility of pyroclastic flows does not necessarily relate to the conversion of potential energy into kinetic energy during the collapse of an initially buoyant column;
- extreme fragmentation and entrapment of fine ash does not seem to be a pre-requisite for mobility;
- temperature also seems not to be a pre-requisite.