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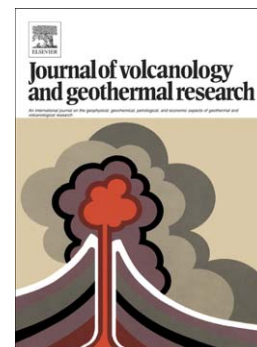
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Geophysical imaging of the inner structure of a lava dome and its environment through gravimetry and magnetism

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\* Corresponding author at: Laboratoire Magmas et Volcans, Campus Universitaire des Cézeaux, 6 Avenue Blaise Pascal, TSA 60026 - CS 60026, 63178 Aubière Cedex, France Tel.: +33633052243 E-mail address: a.portal@opgc.univ-bpclermont.fr Keywords: Lava dome; Puy de Dôme volcano; Gravimetry; Magnetism; Inverse modelling.

## Abstract

Volcanic lava domes are compound edifices resulting from complex growth processes including intrusion and extrusion phases, explosions and collapses. Here, we present the study of a complex volcanic system, located in the Chaîne des Puys volcanic field (French Massif Central, France) and centred on the Puy de Dôme volcano, an 11,000 year old volcano. Our approach is based on a morpho-structural analysis of a high resolution DTM (0.5 m) and geophysical imaging methods. Both gravity and magnetic high resolution surveys have been carried out on the lava dome and the nearby volcanic structures. We computed 3D inverse and 2D forwards models. Based on our current knowledges about volcanic dome structure, the geophysical models allow us to propose a synthetic geological model of the inner structure of the Puy de Dôme and surrounding areas. This model suggests a scenario for the formation of the lava dome and the inferred intrusions located on both sides. The Puy de Dôme could possibly be the southern tip of the northern intrusion.

## 1. Introduction

Lava domes are volcanic constructions formed by both magma intrusion (endogenous growth) and extrusion of spines, lobes and short lava flows (exogenous growth). The magmas of volcanic domes are too viscous to flow over significant distances, so they accumulate above and near the vent. Their high viscosity is due to a combination of different characteristics: silica content, degree of cooling, crystallization and gas exsolution (*e.g. Giordano et al., 2008*). Lava domes exhibit a wide range of shape and size, depending on their construction history (*e.g. Fink et Griffiths, 1998; Watts et al., 2002*). In the early stage of volcanic dome growth, if emplaced on a more or less flat surface, it forms a roughly circular mound. The lava dome surface is often fragmented, forming talus on the sides. The inner

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