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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Inner structure of the Puy de Dôme volcano: cross-comparison of geophysical models (ERT, Gravimetry, Muonic Imagery)" *by* A. Portal et al.

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The paper interestingly addresses the comparison of preliminary muon radiography of the Puy de Dôme with gravity and electrical resistivity data.

On the overall, the paper lacks of bibliographic references and the reference list is astonishingly short. Following are some remarks that might hopefully help to clarify some cursory parts of the paper.

Section 2.1 - ERT processing:

p 706, line 24: you mention that Ohm law is used to derive apparent resistivity. Please

indicate the geometrical correction used to perform the conversion.

Could you please give typical values of rock samples?

p 707, line 13: "the raw data were filtered out": could you please give more details about the filtering that was applied to the data and which consequences are expected on the inverted resistivity structure?

Figure 1 shows that the 3D topography of the dome has characteristic length scale of the order of the two ERT lines shown in Figure 2. We may then expect important 3D effects in the 2D inversion whose results are shown in Figure 3. Which part of the inverted resistivity structure can be attributed to unaccounted 3D effects? Which noise model was used to invert the data?

Section 2.2 - "High resolution gravity survey" and Section 3.2 "Bouguer map"

A discussion concerning the measurement noise due to both instrument drift and topography uncertainty is necessary. Is the "high-resolution" term used to qualify the 80m mesh of the survey or the precision of the data ?

The various corrections listed at the end of the section should be justified. A figure showing the effects of these corrections would help the reader to get an idea of their influence on the residuals so obtained. It seems that these corrections may remove some information concerning the density structure of the dome. Is it right? For instance, in section 3.3, it is explained that the density used to compute the Bouguer anomaly is chosen to minimize the correlation between the topography and the anomaly. Does that mean that the inverted density structure is then decorrelated from topography? This assumption seems false since we may expect a strong correlation between density structure and topography.

What is the uncertainty of the inverted density structure shown in Figure 4? Could you please give an idea of the model variability due to non-uniqueness ?

Section 4.1 "Comparison of resistivity and density models"

The authors indicate that the resistivity and density images do not strongly correlate, and they seem give more confidence to the inverted density structure instead of the resistivity structure. No explanation is given to this choice. For instance, the statement "In our opinion, the density model is robust enough to interpret D1 as a massive trachytic structure" should be discussed on more quantitative arguments. Why is the density model qualified as "robust"? Is this because it better agrees with the muon radiography than the resistivity images do?

Section 4.4 "Comparison of gravity and muonic models"

What is precisely "muon imagery" and what Figure 5 represents? For instance, does the "non-standardized attenuation" accounts for topography effects, acceptance of the muon telescope, More details should be given. According to the interpretation made by the authors, I understand that "red" is considered as "dense" in Figure 5. If correct, what is the origin of the "dense" margin along the topography profile?

Thank you for considering my remarks,

Dominique Gibert

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 2, 703, 2012.