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## ***Interactive comment on “The permeability and elastic moduli of tuff from Campi Flegrei, Italy: implications for ground deformation modelling” by M. J. Heap et al.***

### **Anonymous Referee #3**

Received and published: 9 September 2013

I carefully read the paper titled “ The permeability and elastic moduli of tuff from Campi Flegrei . . . . .” also because I know one of the Authors so,I wanted to deepen the review as much as possible, always within my own specific competencies.

I cannot hide my perplexities on the scientific value of the paper as the objective of the Authors is the drawing of a model that can foresee and interpret the reasons of the soil deformations in Campi Flegrei, by means of laboratory data carried out on outcropping pyroclastic rock samples.

As you can note by the comments within the text the Authors evidence a very scarce knowledge of the most recent data ( the radiometric data of NYT and WGI are not those

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from a recent literature). Also, they do not cite a paper from Lima et al. (2009) – Earth Science Reviews, which contain a detailed model of the Campi Flegrei underground as well as a different hypothesis concerning the causes of bradyseism. This aspect could even invalidate their model.

The most puzzling aspects are hereafter shortly reported:

1 The authors use the term tuff as a lithological term, but they have to clarify the concept before the first use. They have to point out that they are considering a tuff as a pyroclastic rock lithified owing to post depositional processes. As a matter of fact, the usage they make of the word tuff should be avoided, because the meaning is confusing: better to use a lithified pyroclastic rock.

2 Laboratory tests carried out on very small specimens of such a high heterogeneous material is a shadow on the reliability of the results. The Authors do not report the number of specimens used for each test. Is that a mean value? Not reported. The amount of lithics, pumice, matrix strongly affects the physical and mechanical behavior of the rock and in such a small specimen as those used by the Author, you can find prevailing matrix vs. pumices and vice versa with values completely different.

3 One more aspect cannot be disregarded: the Authors hypothesize that the investigated samples undergo to mineralogical and physical modifications as a consequence of the increasing temperature and pressure. This can be modeled for outcropping materials but, if one considers the same pyroclastic materials buried for thousands years at different pressure and temperatures, they experienced a mineralogical evolution leading to the formation of an adularia-like feldspar and analcime. It cannot be excluded that the physical and mechanical features of the rocks are significantly different. This minerogenetic process was demonstrated to occur in the zeolitized phlegraean tuffs as described by de Gennaro et al., (2000) for samples of a deep borehole.

4 As far as the paper by Lima et al., the Authors should properly read it as the detailed model of the Campi Flegrei underground and the hypothesis on the causes of

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bradyseism could strongly invalidate their model.

5 The Authors refer to Campanian Ignimbrite as a non zeolitized counterpart of NYT. One should remember that a quite large portion of the Campanian Ignimbrite is also zeolitized!

6 The Authors report the porosity of zeolitized pyroclastic rocks from Albani Hill, as documented in Vinciguerra et al. I am very doubtful on the fact that a zeolitized material could have such a low porosity. The same rocks usually provide values of 40-45% of porosity.

The above considerations lead me to consider this paper not suitable for publication.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/5/C488/2013/sed-5-C488-2013-supplement.pdf>

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Interactive comment on Solid Earth Discuss., 5, 1081, 2013.

**SED**

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