

This is a very interesting paper, in which historical data are thoroughly revised to propose a revisited chronology of the ground (vertical) displacement over a long period time preceding the Mte Nuovo eruption (1538 CE) at Campi Flegrei (CF). I appreciate the historical background on which the study is founded, particularly the analysis of the relative position of the Roman artifact in Via Herculaea, which puts constraints to the maximum uplift.

First of all, the new reconstruction is interesting because it shows a steeper but rather continuous ground uplift prior to eruption. This steep uplift actually looks like the one observed in recent times, during the 1982-84 unrest episode. Here is my first comment: this similarity is not discussed and perhaps it should be in the double-scenario section. Worth noting is the long duration (about 100 years prior to eruption) of such a steep uplift, with implications also for uplift rates observed during the current crisis and the 1982-84 one.

**Reply: We thank the reviewer for the suggestion. We agree and will address this point more thoroughly in a revised version of the paper.**

Secondly, the new reconstruction of the pre-1538 uplift and seismicity highlights the two and half scenarios that should be expected. I say "... and half" because the phreatic eruption is considered somehow apart in case the system does not reach the threshold for a magmatic eruption. This is correct and it should be a scenario "per se", which should be more emphasized by the Authors. In my view we do not know of many phreatic events at CF simply because they were soon erased by the following magmatic-explosive activity. However, phreatic eruptions must have occurred and likely few of them have represented some kind of peak activity for longtime, before the culmination in an magmatic-explosive eruption. The phreatic scenario deserves a lot of attention for the current evolution of the CF unrest.

**Reply: We appreciate the suggestion and agree. In a revised version we will certainly discuss the possibility of a phreatic eruption in greater detail.**

Thirdly, the new reconstruction offers a semi-quantitative criterium to establish the evolution of seismicity as uplift continues: the M 5 event from historical sources is put into the evolutionary context of the 1538 CE eruption. Also worth noting, although from a qualitative point of view, the role of thermal cracking which accompanies the steep uplift.

Although the Vinciguerra et al paper is a central one, note that thermal cracking was also invoked in previous papers, particularly Chiodini et al. (2015, EPSL) and Moretti et al. (2018, SciRep), in which thermal cracking was approached from different perspectives. Also past papers from the same Authors of this study mentioned it.

**Reply: We agree, and will include these references along with additional ones relevant to this point.**

Of particular interest is also the role attributed to a resurgent block (see also below), which is the same as the one nowadays active, and which in literature was already described. I wonder whether the resurgent block which the Authors refer to corresponds to that in Capuano et al. (2013) : just see their figure 6 and the text part in which its descriptions starts by saying : "We refer to the South-western deeper sector as the 'undeformed-to-subsiding portion of the Pozzuoli Bay," and to the North-eastern shallower sector as the "resurgent portion of the caldera' (Figure 6)". The descriptions which follows of the resurgent block refines previous findings by Orsi et al. on JVGR (1999; vol. 91, pp 415-451).

Reply: We agree to include more references and to emphasize the similarities between our hypothesis and previous ones. However, our definition of the resurgent block, while similar to the mentioned ones, is somewhat different and, more importantly, better constrained by geological evidence, earthquake locations and active seismic soundings.

Let me remark that in this paper the cause of unrest at CF - also the current one, if I understood well - is attributed to some hybrid mechanism of heat and fluid release from a magma batch ascending from the deep regional body (Zollo et al., 2008 GRL) and percolating through the caldera bottom. How significant is this view for the advancement of the current scientific debate around the causes of unrest at CF ?

Reply: The source of present unrest a critical factor For the 1430-1538 pre-eruptive unrest, we propose, a hybrid mechanism involving both the inflow of hot magmatic fluids into the shallow hydrothermal system, and episodes of direct magma injection at shallow depths. A key observation is that, after the uplift of 16 m., only about half was recovered through subsequent subsidence. This suggests that approximately 8 m of non-recovered uplift can be attributed to direct magma intrusion. This is strikingly similar to the 1982-1984 unrest, where about half of the total uplift (1.8 m in that case) was recovered after 21 years of ground subsidence. Another notable observation is that, despite such a significant uplift, implying the intrusion of about 1 km<sup>3</sup> of magma at shallow depths, only 0.02 km<sup>3</sup> were erupted. This suggests that most of the intruded magma had already crystallized into mush, and was no longer fluid by the time of the eruption. We can elaborate further these arguments in a revised version, as they are central to understanding the problem.

Finally, I appreciated the reconstruction of the low-energy pyroclastic flow that reached the Pozzuoli temple (Serapeum). It is in line with the rationale of the study and its title, but it seems a bit disconnected from the main text flow. This is just about text organization and perhaps the Authors could harmonize the whole thing by recalling in the Conclusions that the spectrum of phenomena which result from this study and apply to the eventual evolution of the present-day unrest include 1) increasing seismic activity and M 5 events , 2) phreatic eruption and 3) pyroclastic flows reaching Pozzuoli in case of an eruption like the 1538 one.

Reply: We thank the reviewer for the suggestion, and we will certainly address this in a revised version.

The paper requires an attentive English revision and also more attention to previous work, which should be properly cited. I understand that there is a bunch of literature, but this can be improved.

Some minor points:

- With ref. to Troise et al. 2019, at line 863 the Authors say "The same authors calculated that such a sill intrusion should have solidified, in form of mush, after about 20 years, i.e. around 2003. Closely related are the statements also reported at lines 609-10 and 518-519. Actually, rapid solidification of a thin sill like magma in the order of 10 to 20 years was put in evidence by Woo and Kilburn (2010 JGR), Moretti et (2013 EPSL) and it was modelled by Moretti, Troise et al. (2018 Sci Rep).

**Reply:** Yes, we included the more recent publications along with their references. However, we agree that it is more appropriate to cite all the previous works on this matter, especially since they reached the same conclusions.

- At line 849 the M 4.2 event on October 2023 is reported as the maximum one recorded at the time of writing, but somewhere in the Introductory part the Authors refer to a M 4.4 occurred in 2024

**Citation:** <https://doi.org/10.5194/egusphere-2024-2035-RC2>

**Reply:** Yes, at the time of the first draft, the M=4.4 event had not yet occurred. However, we will certainly correct this oversight in a revised version.