

We thank the reviewer for the very constructive revision. We implemented all the suggestions, and we think that the manuscript has overall improved significantly.

In particular, we thoroughly revised all citations, also thanks to the important suggestions given by the reviewer. We improved the presentation of the method, and we now better specify the effective assumptions behind the model, by specifying both the assumptions of Rivalta et al. (2019) and those assumptions that are inherited in our study. We also significantly updated the discussion, making more quantitative and explicit the comparison with both previous models and the ongoing seismicity.

Regarding the assumptions, as now better discussed in Section 2, we note that they are somehow looser than the one adopted in Rivalta et al. (2019). Indeed, we empirically track potential propagation of dykes from a central area of the caldera toward the position of past vents, but we do not need any assumption about depth and shape of the source (like in Rivalta et al. 2019), as we do not model dyke propagation, but we simply empirically analyze past vent positions. In other words, our model is inspired by the physical process described in Rivalta et al. (2019), which stands for an independence between distance from the center and direction of the propagation of dykes, but we do not adopt any physical modelling here. This very important point is now better described in the manuscript.

Overall, we think that the manuscript significantly improved thanks to this revision. All these improvements are specifically discussed in the attached file.

<p>Dear Editor,</p> <p>I have completed a thorough review of the manuscript entitled “Brief Communication – Vent Opening at Campi Flegrei: Clues from Dyke Propagation Patterns” by Selva and Mangone.</p> <p>This work provides a concise overview of the current understanding of vent-opening maps at Campi Flegrei. It introduces a novel empirical methodology that incorporates the spatial distribution of past vent locations along with the influence of topographic relief on dyke trajectories. The results, presented as vent opening probability maps, suggest two</p>	<p>We thank the reviewer for the very constructive revision. We tried to implement all the suggestions, and we think that the manuscript has overall improved significantly.</p> <p>We now also significantly improved the discussion, making more quantitative and explicit the comparison with both previous models and the ongoing seismicity (Fig. 3).</p>
---	--

<p>concentric annular maxima at approximately 2 km and 4 km radial distances, with a general peak toward the northeast and additional local maxima corresponding to topographic highs. The authors also note a qualitative correspondence between their results and the epicentral distribution of recent seismicity. While this point is briefly mentioned in both the abstract and the discussion, it is not explored in depth, particularly regarding the significant variation in the depth distribution of seismicity across different sectors of the caldera.</p> <p>Overall, the manuscript is clearly written and logically structured. Nonetheless, there are several areas in which the presentation could be improved, particularly concerning the manuscript's structure, the accuracy and placement of literature citations, the clarity of the figures, and certain aspects of the wording.</p>	
<p>The proposed approach is both interesting and promising; however, the manuscript would benefit from a more explicit articulation of the underlying assumptions. For instance, the authors adopt a similar assumption to that of Rivalta et al. (2019) regarding the dyke source, While this assumption is consistent with certain modeling efforts, it simplifies the broader volcanological literature, which often supports the existence of a sill-like</p>	<p>Thank you for this comment. We now better specify the effective assumptions behind the model, by specifying both the assumptions of Rivalta et al. (2019) and those assumptions that are inherited in our study.</p> <p>To this end, we now specify that</p> <p><i>“Rivalta et al. (2019) assumed that the origin at depth of the magma is located at the centre of the caldera, below the location of the maximum observed uplift (Amoruso et al. 2014, Rivalta et al. 2019, Buono et al. 2025), originated at 3 km depth and</i></p>

<p>source. Furthermore, the presumption of a fixed source depth of 3 km for all post-NYT eruptions may lack robust petrological justification. The model also assumes predominantly lateral dyke propagation, a simplification that may not hold uniformly throughout the post-NYT eruptive period. It would be beneficial for the authors to state these assumptions more explicitly at the outset.</p>	<p><i>producing mostly lateral propagations with trajectories controlled by the structure of the caldera and the consequent stress field. The physical process described in Rivalta et al. (2019) suggests a potential independence between direction of dyke propagation and distance from the caldera center, as they are controlled by two different features of the caldera, potentially leaving an empirical track in past vent positions. Assuming a magma origin located around the center of the caldera, independently of its specific depth and geometry, this empirical track may be retrieved by studying the distribution of past vents around the caldera centre...</i></p>
<p>The referencing of literature requires refinement, as several citations appear either outdated or incorrectly positioned—particularly those pertaining to the structural evolution of the caldera and its eruptive history. More recent studies have revised the temporal framework of Campi Flegrei's activity, extending it beyond 200 ka, and have updated interpretations of the caldera structure. For instance, the structural rims are now understood to be primarily associated with the CI eruption and subsequently reactivated during the NYT phase (e.g., Natale et al., 2022, Journal of Structural Geology). Additionally, recent investigations into the physical properties of dykes within the Campi Flegrei system should be acknowledged (e.g., Buono et al., 2025, AGU Advances; Natale and Vitale, 2025, Nature Communications).</p>	<p>The number of references is limited 30 in "Brief Communications", and this influenced us a bit in the writing. However, we agree with the reviewer and we added several more, as suggested. We hope the Editor will agree with this.</p>
<p>In summary, I find the manuscript to be of overall high quality and recommend it for publication pending moderate revisions.</p>	<p>We carefully reviewed and also implemented all line-by-line suggestions.</p>

<p>Please find below line-by-line minor suggestions and comments.</p> <p>Best regards</p>	
<p>[...] Line 9: Consider adding the term “azimuth” to clarify the reference to the orientation of the dykes.</p>	<p>Added</p>
<p>Line 10: The two principal peaks should be more clearly emphasized in Figure 2, which is currently difficult to interpret.</p>	<p>We modified Figure 2, and now the peaks are more evident.</p>
<p>[...] Line 14: The earliest volcanic activity observed in outcrops within and beyond the caldera is estimated at approximately 80 kyr, based on Pappalardo et al. (1999) and Scarpati et al. (2013). However, recent studies of widespread tephra layers in Italy and the Mediterranean extend the chronology of CF activity to nearly 200 kyr (e.g., Monaco et al., 2022 - GPC; Fernandez et al., 2024 - QSR). This includes a recently identified large-magnitude eruption at 109 ka (e.g., Fernandez et al., 2025 – Communications Earth and Environment). Tephra deposits of comparable age and composition have also been retrieved from boreholes (e.g., Sparice et al., 2024 – JVGR). These more recent contributions should be acknowledged.</p>	<p>Thank you for this comment. We corrected the text accordingly, and we added the references.</p>
<p>Line 15: Please include a reference to the Campanian Ignimbrite eruption/age.</p>	<p>Added</p>
<p>Line 15: The statement that all</p>	<p>We removed the sentence, as not</p>

eruptions occurred within the CI caldera rim is not accurate. For example, eruptions took place at Procida Island (De Astis et al., 2004) and at CFc, such as the Torregaveta eruption.	necessary.
Line 17: The citation of Sbrana et al. (2021) is inaccurate, as these authors attribute the caldera structure solely to the CI eruption.	We removed the sentence, as not necessary.
Line 18: The term "inner caldera" has a specific structural meaning, yet many post-NYT vents are located beyond this boundary. Orsi et al. (2004) is incorrectly referenced here, as it does not address volcano-tectonic structures.	We removed the word 'inner', as not necessary.
Line 19: A citation to Di Vito et al. (1999) would strengthen this statement.	Added, thanks
Line 19: Consider modifying the sentence to read "comprises at least 33 eruptions."	Corrected, thanks
Line 19: Correct "spaning" to "spanning."	Corrected, thanks
Line 20: Adjust 15,000 to 14,000 for consistency with line 16.	Corrected, thanks
Line 22: Revise 9.200 to 9.100.	Corrected, thanks
Line 23: Revise 28 to 26.	Corrected, thanks
Lines 23–25: Consider dividing the sentence after "3,800 years ago." A	Corrected and integrated, as suggested

<p>more precise description could be: “Its activity was predominantly concentrated in the northeastern part of the caldera (Agnano area), secondarily in the northwestern sector (Averno area), and concluded with peripheral distal eruptions (Nisida, Capo Miseno, and Fossa Lupara).” Recent works provide additional context (Natale et al., 2025 – GSA Bulletin).</p>	
<p>Line 27: Update the reference to Di Vito et al. (1987 – Bulletin of Volcanology).</p>	<p>To avoid too many additions, we added directly Di Vito et al. 2016 (Scientific Report)</p>
<p>Line 28: It would be useful to cite recent studies on caldera resurgence at La Starza cliff (Isaia et al., 2019 – JVGR; Natale et al., 2022 – Basin Research).</p>	<p>We added the suggested citations, thanks</p>
<p>Line 31: The history of ground deformation since 35 BCE has been reconstructed by Di Vito et al. (2016 – Scientific Reports). Vitale and Natale (2023 – Earth, Planets, and Space) describe the long-term deformation pattern.</p>	<p>We added the suggested citations</p>
<p>Line 33: Correct the date to 1982–84.</p>	<p>Corrected, thanks</p>
<p>Lines 34–35: Suggested rephrasing: “which fully recovered the subsidence in 2021, and now exceeds the uplift peaks observed in the last century.” If this statement refers exclusively to deformation, cite Bevilacqua et al. (2024). If it encompasses seismicity and degassing, please include additional references accordingly.</p>	<p>We modified the text accordingly.</p>

Line 40: Suggested revision: “[...] parameters, focusing on the tectonic structures recognized at that time, to track [...].”	Corrected, thanks
Line 45: Update to Charlton et al. (2020), not 2018.	Corrected, thanks
Line 46: Replace with “corresponding to the caldera rim.”	Corrected, thanks
Line 52: Suggested rephrasing: “Rivalta et al. (2019) analyzed the effects of caldera unloading, as well as those of topographic peaks, [...].”	Corrected, thanks
Line 55: Insert “may”: “[...] creates a stress field that may favor magma trajectories [...].”	Corrected, thanks
Line 56: Add “(unloading effect)”: “[...] of the caldera (unloading effect) significantly [...].”	Corrected, thanks
Line 57: Clarify the intended wording: “Geometric centre at a given distance”?	We mean ‘geometric centre of the caldera’. Corrected, thanks.
Line 60: Replace with “left a trace.”	Corrected, thanks
Line 66: Correct citation to Amoruso et al. (2014).	Corrected, thanks
Line 67: Refer also to the general comment above regarding assumptions on the dyke source.	As suggested, we added here the assumptions, as discussed above.
Line 68: Verify coordinates, as longitude (Easting) appears to contain one digit	Corrected, thanks

too many, while latitude (Northing) appears to be missing one.	
Line 76: Please ensure consistent use of terminology ("dyke" vs. "dike") throughout the manuscript.	Corrected, thanks
Line 85: Among the cited works, only Rivalta et al. (2019) appear to state this explicitly.	Corrected, thanks
Line 88: The assertion regarding topographic control seems to be treated as a fact, whereas it should be presented as a working hypothesis.	Now the assumption is better stated in the previous section, and it is recalled here as "Under the assumption of propagation from the caldera center, this distance represents the length of the horizontal propagation of the dykes that alimented such eruptions."
Line 101: Consider expanding the statement: "[...] the stress field is mainly controlled by unloading."	Added
Line 102: Please clarify whether Figure 1c represents simple topographic profiles or averaged swath profiles. The latter would provide a more representative average topography.	They are the maxima in radial swath profiles with specific length. Now we added this in the caption and in the main text.
Line 107: Use "La Starza marine terrace."	Corrected, thanks
Line 107: Clarify orientation: If La Starza terrace is located NW of the center, it should correspond to ~340° azimuth, not 50°.	La Starza is at NE of the caldera center (as now specified in the text), thus it is at around 50°.
Line 108: Correct to "Camaldoli Hill." General: These locations should be shown on a map, as readers unfamiliar with Campi Flegrei may otherwise be	Corrected, thanks

confused.	
Line 112: This observation indicates an anticorrelation, or at least underscores the need to state at the outset that the spatial distribution of vents is hypothesized to be controlled by topography.	The peak toward NNW is present only for small radii, up to 5 km, while it is almost negligible for larger radii. This is in agreement with the results of the test that we describe in the following lines. Now we made this point clear in the text.
Line 120: Invert the order of this sentence and the next, so that it follows the order presented in the formula.	Done
General comment on Figure 2: Figures could be made more legible by using a lighter, more uniform background (e.g., shaded relief). The seismic hypocentre dots currently obscure the NE peak within the inner circle.	We followed this suggestion, and indeed Figure 2 improved significantly.
Line 142: Consider renaming this section "Discussion and Conclusions," as the final sentences are conclusive in nature and a separate Conclusions section is absent.	Done
Line 149: The reference to "E and SE" is unclear. Does it pertain to Baia and Bacoli, or to Bagnoli and Nisida? Please clarify and specify locations.	The direction is W and SW referred to Baia and Bacoli.
Line 151: It would be appropriate to include the map from Alberico et al. (2002) to illustrate similarities and differences, rather than requiring the reader to consult that paper independently.	We now removed all the original maps and we report the map of the differences, including Alberico et al. (2002). In particular, we added the comparison in Fig. 3A,D and the original maps in Supplementary Figure 7.
Line 170: The difference in the Solfatara peak is not particularly pronounced; it	We now made a specific and more quantitative comparison with both models

is already visible in Selva et al. (2012) and Bevilacqua et al. (2016).	(new Fig. 3), making the comparison much more explicit. This comparison highlights that in the Solfatara area, the peaks of the models developed here are more pronounced than in all previous studies, especially for model M1 (empirical without topography)
Comment on Figure 3F: According to the caption in Tizzani et al. (2024) and cited references, the rims shown in Tizzani et al. (2024) correspond to the CFc caldera rims, not the CI and NYT rims. Revising accordingly would improve consistency throughout the text.	Corrected, thanks
Line 172: The directions are unclear. By "E and SE," do you, in fact, mean "W and SW," referring to the topographic highs at Baia and Capo Miseno?	Yes, W and SW. Corrected, thanks.
Line 178: Natale et al. (2025) is not included in the reference list.	Added, thanks.
Final comment: A dedicated "Concluding Remarks" section is missing and should be provided if the name of the section is not updated as suggested above.	We updated the section's name as suggested.
I trust that these comments will assist the authors in enhancing the clarity, accuracy, and overall quality of their manuscript.	They helped improve the text a lot indeed. Thank you for this very constructive revision