

# ***Interactive comment on “Eruptive history and $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology of the Milos volcanic field, Greece” by Xiaolong Zhou et al.***

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Review of manuscript gchron-2020-30 “Eruptive history and  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology of the Milos volcanic field, Greece” by X. Zhou, K. Kuiper, J. Wijbrans, K. Boehm, and P. Vroon

Dear authors and editor,

I have now completed my review of the above-mentioned manuscript. The authors report groundmass, biotite and amphibole  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronological data for tephra deposits and lavas from the Milos volcanic field (MVF) in Greece. The data is used to reconstruct the eruptive history and eruptive flux of the MVF. Geochemical data is used to further track the compositional evolution of this volcanic center.

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General comments: The manuscript reports a large amount of high-quality geochronological data and the interpretations are generally justified. Much of the Ar/Ar data is quite complex with complicated release spectra and age distributions. This is discussed in sufficient detail and the reliability of the data is assessed carefully. Considering that  $^{40}\text{Ar}/^{39}\text{Ar}$  dating of such rather young deposits that lack alkali feldspars is rather difficult, the final interpretation of the data appears to be robust and agrees well with field relationships.

After reading the other review (which maybe I should not have done), I think I very much agree that the subdivision into different phases and intervals of quiescence is somewhat artificial and doesn't really reflect the eruption dynamics of the MVF. There seem to be "gaps" within some of the "phases" that are as long as the intervals of quiescence (e.g. 0.3 Ma between Mavros Kavoslava dome and Triades dome and 0.3-0.4 Ma between Dhemenegaki and Kontaro). I feel like this subdivision is not really justified based on the data, neither the geochronology nor the geochemical data. The cumulative eruptive volume versus time figure (Fig. 12) is much more revealing and I would say that there are secular variations in eruptive flux and eruption frequency with an early low-flux interval, a short high-flux interval followed by an extended low-flux interval. I find that this represents the dynamics of the MVF more naturally than assigning these artificial "phases". In this context I would recommend to combine figures 11 and 12 to display the eruptive flux and compositional variations together on the same scale. I think this would be quite illustrative (e.g. it seems like the transition from the high-flux to late low flux interval coincides with a rather sudden change in magma composition, crystal content etc. This has some important petrological implications and reveals some important change in the magma plumbing system from producing crystal-rich (20-40%) intermediate eruptions to crystal-poor (<5%) rhyolitic magmas that represent the extracted residual liquids. Describing and discussing this in detail in a short paragraph on the petrologic implication I think would be very interesting.

Figures: There seem to be significant differences in effort that went into the different fig-

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ures and some are a bit repetitive and not necessary, Fig. 5-8 look like supplementary figures that I think need some editing to make them even useful. The Ar release spectra are alright but they are many and in many cases are shown as individual samples and as combined spectra. Maybe it would be more useful to have larger panels only with the combined data and move the individual ones into the supplementary material. It would just make things less messy. Similarly, the ranked age plots for total fusion analyses have loads of text in each panel but the scaling of the axes is so stretched out, that it is difficult to assess the dispersion of the data. As mentioned above, Fig. 11 and 12 could be combined but need some general editing. I don't think Fig 13 is necessary and could be deleted or moved to the supplementary material. Fig. 15 is a bit of a mess and I don't find that this figure is doing the amount of new high-quality data justice. A better-quality summary figure that integrates all the new and published data would sum up this work nicely for any reader.

In summary, this manuscript reports abundant high-quality data for the Milos Volcanic Field that significantly improves the temporal calibration of this volcanic center. I think it needs some revisions especially regarding the eruption dynamics and relationship with compositional variations. A paragraph on the petrologic implications would make this more interesting for a wider magmatic petrology community. Ultimately, I recommend publication of this interesting manuscript in Geochronology after some moderate revision.

I hope the authors find my comments useful and that they will improve the paper.

Kind regards, Jörn-Frederik Wotzlav (Zurich, 13.11.2020)

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