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Interactive comment on "Magma storage and plumbing of adakite-type post-ophiolite intrusions in the Sabzevar ophiolitic zone, NE Iran" *by* K. Jamshidi et al.

Anonymous Referee #1

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This manuscript presents whole rock geochemical and mineral chemistry data on the Tertiary adakitic magmatism in Sabzevar Range (NE Iran). Based on the presented data sets, Authors discriminate two major magmatic clusters: intermediate and acidic compositions in the northern and southe-eastern part of the Sabzevar Range, respectively. Authors, then, proposed a P-T reconstruction of the different magma storage levels of the adakitic plumbing system using different conventional thermo-barometric equations based on different phenocrysts phases (amphibole, plagioclase and clinopyroxene) compositions.

The topic of this work is interesting and could represent a good addition to the knowledge of the Tertiary tectono-magmatic evolution of Central Iran. However, data are not

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presented in an exhaustive way (as required for an international readership; se specific comments below), therefore hampering a full comprehension of the results. Moreover, references is not always appropriate or up-to-date: the paper of Rossetti et al. (2014) is not quoted despite the tectonic and petrogenetic scenario of the Sabzevar adakite magmatism has been presented and discussed in the Tertiary geodynamic framework. I therefore suggest to reconsider the manuscript after a major revision

Specific comments

TEXT

1- At page 2323 (lines 4,5,6), Authors assert that there is no work on Sabzevar post-ophiolitic rocks: I suggest reading Rossetti et al. (2014) and cited references therein. A proper discussion of the tectono-magmatic scenario presented therein is compulsory

2- Section 3.1 Analytical Techniques and Table 1: Authors do not explain how whole rock iron content has been obtained. A classical ICP-OES + ICP-MS, after lithium metaborate/tetraborate fusion, produces results with iron expressed as Fe2O3 ($\pm$ 0.01 wt.%). Definition of FeO is generally obtained with a Titration, but such method produces major uncertainties ($\pm$ 0.1 wt%). Consequently, if Titration has been used, it has to be specified;

3- Table 1: For the fast comprehension of the whole rock data and a better evaluation of the whole rock geochemistry section, I suggest to insert additional information such as: a. A.S.I. (or A/CNK) index; b. #Mg; c. Classical Trace and REE ratios [Eu*, (La/Yb)N, (La/Sm)N, (La/Nb), (La/Yb), (Sr/Y)] used in the paper but not presented. It is not easy follow a geochemical discussion without a friendly table;

4- The main core of the work is the thermo-barometric discussion, and it has been developed on 438 microprobe analyses on amphibole, plagioclase and clinopyroxene. Presenting only 14 mineral compositions is not exhaustive unless justified by their representativeness.

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5- 3.2, 3.3, 3.4 Sections: Since thermo-barometric formulations are from Ridolfi and Renzulli (2012) and/or Putirka (2008), maybe it could be useful for readers not familiar with such topics to have an Appendix in which selected equations are reported

6- Section 3.5: it is not clear how Fe and Mg partition coefficient has been selected for the clinopyroxene-melt equilibrium test;

7- Section 4.1, page 2328, line 26: Authors define a plagioclase with An5-An15 as Albite. It is Oligoclase! I suggest to avoid the use of Albite, Oligoclase, Andesine, Labradorite... and just report/comment on the An-Ab-Or content

8- Section 4.2: As indicated in point 3, it is very hard to follow the geochemistry section, without the used key ratios indicated in table;

9- Section 4.3.1 Amphibole: Authors do not specify which calculation scheme was used to recalculate the amphibole formula, i.e. 13eCNK or 15eNK or 15eK or 16CAT. The scheme used is 23(O), but with or without Fe-normalization? Then authors discussed and discriminated amphiboles using cations expressed in number of atom per formula unit (apfu) but in the table2 is just presented Mg and four-fold Al. Moreover authors presents only 7 analyses without any indication on rock sample provenience. Please specify calculation schemes, report in table all cations used in the discussion (it is necessary also to better understand/evaluate the thermobarometric results).

10- Section 4.3.2 Plagioclase: Avoid terms as labradorite or andesine if they are not in accordance with An % values. Please expand the Table, 5 analyses presented on 212 are not sufficient. Add for every analysis the ternary feldspar composition, i.e. An-Ab-Or.

11- Section 4.3.2 Plagioclase, Sieved texture plagioclase: Authors state that inverse chemical zonation in plagioclase (rimward Anorthite enrichment) is accompanied by an increase in Fe and Mg (page 2333 lines 22-23). Looking at figure 11e there is no compositional trend in MgO and values presented in table 3 (0-0.4 wt%) are better ex-

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plained as microprobe imprecision than MgO assimilation from melt. Moreover, Authors suggest to compare their plagioclase data to the work of Troll and Schmincke (2002) where, instead, analyses of alkali-feldspars (An <20%) from a peralkaline trachytoid-rhyolitoid system (a completely different petrogenetic setting with respect to the adakitic aluminous calc-alkaline magmatism) are presented. I suggest to eliminate this paragraph or improve it with a better explanation.

12- THERE IS NO 4.3.3 SECTION: Where is clinopyroxene description? How we can consider the P-T results from Cpx with only two analyses (in the same table of plagioclase) and no discussion in text?

13- At the moment I cannot evaluate sections 4.4, 4.5, 4.6 because of: a. Few mineral analyses b. Textural relationships? c. No cation scheme or mineral moleculas expressed d. No linkage between single mineral analyses and rock samples

14- Regarding the Discussion (Section 5) and The Magma Plumbing System (Section 5.1), Authors start a long discussion to claim for an extensive fractionation of amphibole in the evolution of the northern intermediate magmas. Then, They conclude that the southern acidic melts could derived from a different magmatic differentiation processes since the Sr content is not as expected (many sentences, few references). I suggest the authors to use the Dy/Yb ratio as presented in many works (i.e. Xiao-Long Huang et al. 2010) focused on amphibole fractionation in TTG and Adakite suites. See also Rossetti et al (2014) on this regard and the cited references therein. Moreover in the work of Rossetti et al. (2014), it has been already demonstrated through the Dy/Yb and Rayleigh fractionation equation that it is possible to generate a rhyolitic adakitic melt in the Sabzevar belt via differentiation, only considering calcic-amphibole extraction.

15- In Section 6 Conclusions. It has been affirmed that is not possible to compare northern adakites with southern ones since they are calc-alkaline and peraluminous respectively. Calc-alkaline is a term used for magmatic series, peraluminous is a term used to define Alumina saturation in a specific melt. They are not comparable terms.

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Could we correct sentence in this way “northern suite is metaluminous and southern is peraluminous”?

16- In Conclusions – Point 2, authors suggests a primitive calc-alkaline magma with a water content up to 10.3 wt%. References are requested.

17- Conclusions Point 6 must be eliminated. The sentences is presented as a conjecture and not demonstrated.

FIGURES

18- Figure 5: Trachyte Fied in TAS seems little strange and Irvine and Baragar boundary seems upward shifted. The K2O vs SiO2 diagram is not from Rollinson 1993, but from Peccerillo and Taylor 1976. Control typing of #Mg. Improvement on symbols is requested in all diagrams.

19- Figure 6: Authors present Harker diagrams. What about the Fe content? (see above)

20- Figure 7: Please present Trace and REE elements with classical diagrams without mixing them. In Sample/Chondrite spider diagrams present only the REE patterns.

21- Figure 9,11,12,13: Symbols change every time. Select a symbol (shape and colour) for every rock-type and then use it consistently in every diagrams. Minerals from a rock types must have the same shape and colour of the rock-type itself.

22- Figure 16: the same suggestion about symbols in diagrams.

One more consideration: Since the Amphibole and Plagioclase thermo-barometers are assumed as key to evaluate and constrain the adakite magmatism, why Authors have not tested their results with Hornblende-Plagioclase (melt-independent) P-T model?

I Hope that such suggestions can help the authors to improve the manuscript.

Interactive comment on Solid Earth Discuss., 6, 2321, 2014.