

Interactive comment on “Groundwater flow processes and mixing in active volcanic systems: the case of Guadalajara (Mexico)” by A. Hernández-Antonio et al.

Anonymous Referee #3

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The manuscript describes a very interesting study on a hydrothermal volcanic system with the aim to assess the hydrological processes occurring within the Atemajac–Toluquilla aquifer unit by means of a combination of different techniques. In particular, the combination of geochemical and statistical methodologies based on a huge dataset is a valuable approach to understand the complex dynamics taking place in the volcanic aquifer. The overall manuscript is well written, structured and referenced. Nevertheless, the paper has two main weak points: 1) the definition of the reference values for the different groundwater typologies; 2) the missing estimate of the overall uncertainty associated to the mixing proportions. From the reported data, the authors

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estimations of mixing proportions cannot be considered accurate, since, as they write in the text, they do not use “real” end-members. Nevertheless, if they wanted to use the most representative groundwaters (as supposed end-members), the estimations of the mixing proportions should be reported with amplified uncertainties, which are not even mentioned in the text. Moreover, since they are using data from one single campaign, the temporal variability of their reference values, which is another term contributing to the overall uncertainty, cannot be estimated. The output numbers of the model M3 in the Table 4 should be reported with the overall associated uncertainties. In summary, the overall associated uncertainty should include, besides the sampling and analytical uncertainty, the variability associated to the supposed “end-members” considering also their seasonal variability. Only in the case of the uncertainty assessment, it would be possible to give accurate estimation of the mixing proportions. I would suggest to include in the Abstract at least the isotopic techniques used and the relative purpose. Regarding the study area, I couldn't find a reference in text about its extension. Due to the number of wells monitored (about 40) it would be desirable to have a water table reconstruction at the time of the sampling, since from the text it is not pointed out this kind of survey has been realized in the study area. Moreover, I would suggest to write a sentence about the goodness of chemical analyses (e.g. reporting the range of the ion balance values for the acceptance of chemical analyses). Summarizing, the manuscript can be accepted only if major revisions will be done by the authors, regarding the main points previously illustrated and remarked.

Specific comments: See attached document.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/12/C747/2015/hessd-12-C747-2015-supplement.pdf>

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