Hydrology and Earth System Sciences

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Discussions

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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 #2

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The manuscript deals with a challenging issue concerning the geochemical characterization of a complex volcanic hydrogeological system in which a mixing of different groundwater occurs. Given the hydrogeological and anthropogenic features of the studied area, temperatures, geochemistry and isotopic compositions of groundwater are complexly controlled by an active surficial circulation, a deeper circulation of volcanic origin, and by polluted groundwater. At this scope, a significant dataset of geochemical and isotopic analyses is provided and results of comprehensive statistical analyses are reported.

GENERAL COMMENTS The manuscript appears not well finalized to the scope of

the research due to the scarce integration of geochemical analyses with a consistent conceptual hydrogeological model of the area. This scarce connection limits the significance of the research just to the geochemical aspect. Following, some specific comments are reported that would finalize the manuscript more clearly to the scope of the research (title).

SPECIFIC COMMENTS

Section 2:

a) a classification of the climate type, by means of known system (e.g. Köppen-Geiger), would improve the description of the area;

b) the estimate of the mean annual actual evapotranspiration (e.g. by the Turc or Coutagne formulas) could give, together the mean annual rainfall, a general assessment of the groundwater recharge of the area.

Section 2.1:

c) This chapter reveals some discrepancies respect the declared scope of the research (title):

a. regional geological setting and local hydrogeological setting should be described separately; in detail, the first aspect should be reduced respect to the present form, while the second one should be expanded.

b. hydrogeological description of the area is very scarce and limited to surficial aquifers only; moreover it does not correspond to what is shown in Figs 2 and 8;

c. hydrostratigraphic units should be described and characterized in terms of hydrogeological properties (e.g. type and degree of porosity and permeability, transmissivity, etc.);

d. data regarding groundwater levels and altitude of springs should be illustrated and interpreted in order to support a conceptual model of groundwater flow of the area.

Section 3.2:

d) "Techniques of analysis" seems describe better the contents of this paragraph instead of "Interpretation".

Section 4.4:

e) spatial distribution of groundwater types should be discussed consistently with the conceptual hydrogeological model and vice versa.

Figures 2 and 8:

f) Fig. 2 seems to be not an ordinary hydrogeological map because it does not represent hydrostratigraphic units with a description of the related hydrogeological characteristics;

g) Fig. 2 should be associated to a hydrostratigraphic column provided with information about their hydrogeological characteristics, etc.;

h) groundwater flow paths are too approximate, not supported by explanations of a related conceptual groundwater flow model and not indicating to which aquifer they are related (e.g. surficial or deep);

i) topographic contour lines are not well visible.

Figures 3 and 5:

j) results reported in these geochemical graphical analyses should be reported in Fig. 2 or in other figures showing geographical distribution of groundwater types.

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Discussion Paper