Dear Referee

we have answered to your suggestions (you can also have a look to the attached new revised paper):

1R: 1- pag. 8259. At the end of the page the authors should add uncertainties for 18O, D, and 3H;

A: We agree and we have added the uncertainties for 18O and D, whereas for 3H values the uncertainties already was reported in table 3. [with analytical reproducibility within ±0.2‰ for $\delta^{18}O$ and within ±1‰ for δD, and ^{3}H concentrations in terms of tritium units (TU) whose analytical reproducibility is reported in table 3.]

1R: 2- pag 8262, line 14. The statement " The majority of groundwater............., and readily diluted by the infiltration of rainwater" as it stands has no mean. I suggest to compute the best 18O-D linear fitting and to compare the slope of the best fit line for groundwater with that of the LMWL. After this the authors may assess to what exent secondary processes, including evaporation, evapo-transpiration, and water-rock interaction, affect the isotope ratios of shallow groundwater;

1R: 3- pag 8262, line 17. In the statement "some groundwater samples do show a higher 18O and D content (Table 3)"......" the authors should explain which of these waters show higher 18O and D. Furthermore the authors explain this phenomena trough evaporation and "leaching from the rock to the groundwater". I suggest to add something more about the leaching process in order to better explain its relevance.

1R: 4- pag. 8262, lines 21-22. The authors declare that at higher altitude stable isotopic content is moderately depleted. The statement is unclear: depleted to what? Do they observe more negative isotopic values with increasing altitude?

A: Thanks a lot; we have followed the referee's advice and added the answer in a new comment in the text

[The majority of groundwater samples lay between GMWL and LMWL in the isotope diagram (Fig. 6), which implies relatively depleted levels of ^{18}O and ^{2}H, relatively unaffected by evaporation, and readily diluted by the infiltration of rainwater, as can be expected given the high hydraulic conductivity within the Mt. Meru recharge zone.

Nevertheless, some groundwater samples do show a higher ^{18}O and ^{2}H content (Table 3), and this is thought to reflect a stronger influence of evaporation, along with a slower rate of infiltration or an appreciable return flow of irrigation water (particularly in sediment and lahar formations), as well as some leaching from the rock into the groundwater. At higher altitudes, with only few exceptions, the water had a high ^{3}H content and a moderately depleted stable isotope content (Fig. 7). Here, the groundwater was likely to have been largely recharged via the infiltration of rainwater through fractures, in line with hydrogeologic evidence (Ghiglieri et al., 2010). On the slope and in the lowland area, the waters were characterized by a rather low ^{3}H content, suggesting a longer residence time. Most of these samples plot below the LMWL, indicating the importance of evaporation during recharge, and suggesting pounding effects in less

permeable soil horizons. These same samples showed the greatest degree of ^{18}O depletion, and some originated from the Uwiro graben, the main tectonic depression in the area. In the high eastern part of the study area, the groundwater temperature was more elevated, and its stable isotope and ^{3}H contents were both depleted. So here, recharge could have occurred either through rainwater carrying a depleted isotope content, and/or the current meteoric water has been circulating at a deep level, during which time its isotopic content has become altered by isotope exchange with volcanic CO_2.

Plot of Fig. 7 shows two major water groups: the first, containing the majority of samples, falls on the local meteoric water line (LMWL) and the second below this line.

Figure 7

The equation related to the first group gives a line (Fig. 8) that basically overlaps that reported by Dettman *et al.* (2005), despite the limited number of samples collected only in the *masika* period.

Figure 8

However, the sample derived from local recharge (2 OLD) differ from groundwater with deep circulation which infiltrate in the Mt. Meru highs; clearly those waters reflect a depletion in δD and $\delta^{18}O$. The most depleted samples (10 OLD, 6 OLD, 26 ENG) also provide the lower values in ^{3}H (Fig. 9).

The second group which shifts below the LMWL (3 OLD, 5 OLD, 3 ENG, 8 ENG, 29 ENG) gives a regression line with different slope (Fig. 8) . Such a slope ranging between 3–6, according to Craig (1961) and Clark and Fritz (1997), is representative of a non-equilibrium evaporation responsible for higher enrichment of ^{18}O with respect of D.

As reported in Fig. 8 these waters, probably came from an original water (10 OLD), that recharge at great altitude and spring up in the Oldonyo Sambu slope, shows a more negative isotopic value of $\delta^{18}O$ (-6.7 ‰) and rather low ^{3}H content suggesting a long residence time (Fig. 9).

In general, on the slope and in the lowland area, the waters were characterized by a rather low ^{3}H content. At higher altitudes, with only few exceptions, the water had a high ^{3}H content (Fig. 9). Here, the

groundwater was likely to have been largely recharged via the infiltration of rainwater through fractures, in line with hydrogeologic evidence (Ghiglieri et al., 2010).]

1R: 5- pag. 8264, line12 and line. The positive correlation between bicarbonate content and metals can also be properly estimated by the Pearson coefficient.

A: We agree that the perfect correlation is greatly influenced by the sum of major cations. Now we have compared the relationships separately. [as demonstrated by the positive correlation between alkalinity (bicarbonate content) and (Na^+ + K^+) of Fig. 11. On the contrary (Fig. 12) no correlation was observed between alkalinity and alkali earth metals (Ca^{2+} + Mg^{2+}).]

1R: 6- pag. 8264, lines 22-23. The statement about Fig. 10 is unclear. I believe that the significance of Na++K+-Cl- -F- and Ca2++Mg2+-HCO3- -SO42- relatively to the ionic exchange have to be explained.

A: Igneous rocks are able to interact with groundwater depending on their porosity and on the amount of mineral phases capable of ionic exchange and/or dissolution. The plot of figure 10 (now renamed fig. 11) highlight the gain or the lost of cations taking in account the weathering of study area and the related mineral phases their solubility and / or cation exchange capacity. Particularly If cation exchange is a meaningful process, the plot should exhibit a negative slope.

We acknowledge that we did not specify which mineral phases (responsible for the releasing of the plotted ions) are involved in ionic exchange or dissolution. In any case, the geology reported in the text is exhaustive enough. Glass from volcanic ash, lahar with both clay and zeolite all contain the considered ions. Moreover calcium precipitation/dissolution is testified by widespread calcrete. Also magadi crust (see mineral phase of this concretion in table --) is widespread in the area.

1R: 7- pag. 8265, lines 22-23. Can the authors really support the idea of a negative correlation between calcium and fluoride?

A: This correlation seems obvious considering that:

1)   It is known that, when the exchangeable ions have different valences, the selectivity of a zeolite for cations of higher valence increases with dilution (Pabalan & Bertetti, 2001). Consequently, in low concentrated waters (the highest ionic strength recorded attains 0.055 - Fig. 14) the zeolites can act as a "trap" for the Ca2+ ion;

2)   Calcrete and CaCO3 concretion are widespread in the area.

Those two factors of Ca-abatement reduces the possibility for nucleation of Ca-bearing phases, obviously including fluorite and fluorapatite in supergenic environment;

1R: 8- In Table 1 please add altitude.

A: Thanks, weadded it.

1R: 9- In Table 3 one decimal place for 18O and no decimal place for D.

A: Thanks, we have provided.