

***Interactive comment on* “Tracing groundwater salinization processes in coastal aquifers: a hydrogeochemical and isotopic approach in Na-Cl brackish waters of north-western Sardinia, Italy” by G. Mongelli et al.**

G. Mongelli et al.

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As suggested by the Referee #1 we have calculated the correct sea water-rain water mixing line based on oxygen-18 and chloride. We are going to correct Figure N-1 (corresponding to our Figure 6) and to change accordingly the related comment in the revised version of the manuscript. The mixing line supports the assumption that chloride and oxygen-18 in water may derive by mixing of rain water and sea water. Further, in the sulfate vs chloride Figure N-2 (corresponding to our Figure 4) the reviewer observes that only few sulfate values match the model of sulfate coming from mixing of

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rain water and sea water. A similar result is obtained working with sulfur-34 isotopes in sulfate in water versus sulfate concentration (Figure N-3, corresponding to our Figure 9) and the reviewer suggests that “The deviation from the mixing model could be explained by exchange with or addition of SO₄ from gypsum in the subsurface, since the values for solids reported in the table are around 15 ‰. However, binary diagrams showing $\delta^{34}\text{S}$ vs $\delta^{18}\text{O}$ in dissolved sulfate (Figure 8) and $\delta^{34}\text{S}$ vs SO₄ (Figure 9) clearly support the idea that the sulfate derives from dissolving sulfate from various rock sources of different age. More in general, it is interesting to observe that, as a general rule, the Na-Cl brackish waters from Nurra have contrasting features concerning both the elemental and the isotopic composition. Overall we strongly believe that the conclusions are sounded since: -the geology and the lithological features of the study area (see Figures 1 and 2), -the chemical composition of the investigated samples (see Figure 3, SO₄ vs Cl), -the lack of any correlation between distance from coastline and chlorine contents (see Figure 7), -the dual-isotope approach based on $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ in dissolved sulfate (see Figures 8 and 9), -the presence of halite in the gypsum levels all points toward water-rock interaction as the principal responsible for the Nurra Na-Cl brackish water composition. As concerns oxygen-18 isotopes in dissolved sulfate versus sulfate concentration along with mixing line between rain water and sea water (Figure 5), we agree with the reviewer: sulfate in water is trying to equilibrate its 18O isotopes with that in water, and this reaction would result in the $\delta^{18}\text{O}$ -SO₄ values becoming more positive until equilibrium is attained. The evaluation of groundwater residence times in the Nurra area is an interesting task and will be the subject of a future research. In summary, we are going to revise the manuscript as follows: 1. correct Figure 6; 2. deleted the sentences (page 7, lines 2-9) and add, as shown by the reviewer, the new sentence on the interpretation for the source of chloride, where some but not all of the data fit the calculated mixing lines between sea water and rain water; 3. show that although both mixing (between seawater and rain water) and rock-water interaction appear to be taking place for sulfate, the data reported allow us to confirm that rock-water interaction is more likely; 4. add the new

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Figure N-5 (oxygen-18 isotopes in dissolved sulfate versus sulfate concentration) in the text with comment; 5. modify accordingly the conclusions.

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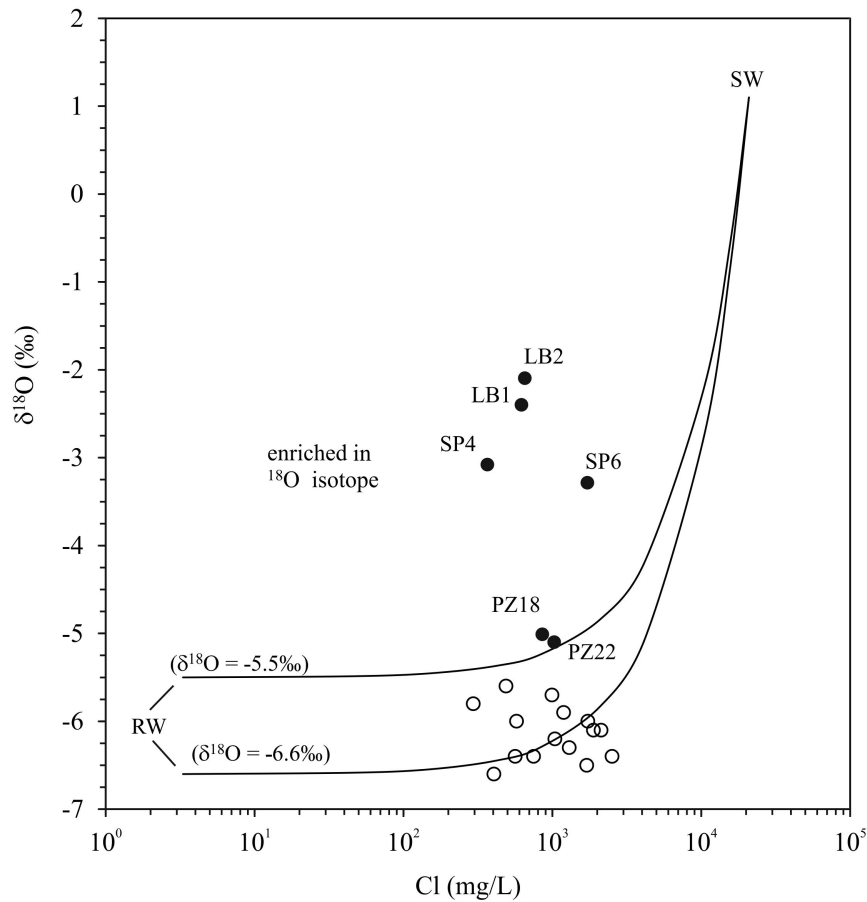


Fig. 1. This is the corrected version of the original Figure 6

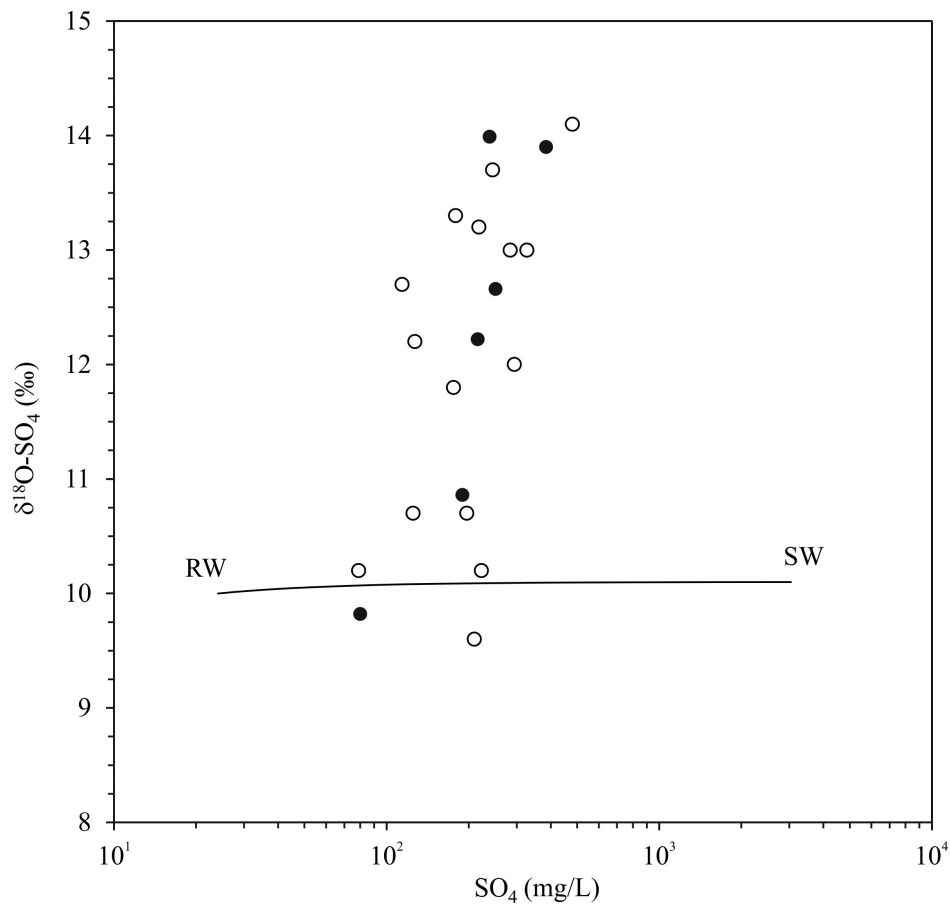


Fig. 2. This is the new version of the Figure N-5

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