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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Sr isotopic characteristics in two small watersheds draining typical silicate and carbonate rocks: implication for the studies on seawater Sr isotopic evolution" *by* W. H. Wu et al.

Anonymous Referee #2

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Wu et al. investigated Sr isotopic characteristics of a silicate watershed (Xishui River) and a carbonate one (Guijiang River). They gave Sr and its isotopes for the Xishui river together with major ions. For the Guijiang river, the data for the major ions are incomplete. They also provide data for the sediments and soils with regards to the Sr isotope systematics. Finally they used the Sr isotope data for the bedrocks from the literature as well as those for anthropogenic inputs. I read twice the ms. and I'm still dubitative on the way the authors treated the data. There is a need of some reworking in the interpretation and use of the data as the data bank must e published. In

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Interactive Discussion
Discussion Paper

the first part of the discussion, the authors discussed the temporal and spatial variations of the Sr isotopes of the Xishiu river and their first remark concerns the shift between the observed Sr isotopes (around 0.708) and the supposed one as the river drains maily silicate. This can be observed in catchment draining low-Sr isotope rocks as the table summarized the bedrock highlights. This must be discussed in this way and not comparing to the theoretical values. Thus I fully disagree with the sentence "However, as silicate rocks exposed in the Xishui River catchment have similarly low 87Sr/86Sr ratios with carbonate rocks (Table 4), it is difficult to distinguish between the influence of climate on silicate and carbonate weathering rates and then on their Sr isotopic compositions". If the authors consider their data as representative of water rock interaction, they can interpret them in this sense and complete the interpretation with the help of the major ions. In the following of this section, the authors, quite suddenly without having look at the major ions, for anthropogenic pressure. Even if present, the discussion must be robust here before applying the inversion model. For the inversion model application, even if equations are right, this is a wrong way to apply this model. I know well this model and to my mind the main blocking step is to consider that Sr in this river is linked with the inputs from rain, anthropogenic activities, agricultural ones and weathering of carbonate, evaporite and silicate. Looking at the presentation of the catchment, the authors stated that "The catchment is covered with ultrahigh pressure metamorphic rocks mainly composed of eclogite and gneiss and some granite", no evidence of carbonate, no evidence of evaporate...Thus the inversion cannot be computed in this way as it will give results for all used endmembers. Secondly, for the inversion calculation Cl is a major criterion and seems not to be used here. This can be found in the original publication. I suggest either redrawing this part or deleting it. The second part of the discussion deals with the Guijiang River. Again, the Sr isotopes, in a supposed carbonate catchment did not match with the supposed values. Looking at the graph between the Sr isotope and the reverse of Sr content, one can see a linear relationship with one external point, such linear relationship being the illustration of a binary mixing between two endmembers. This was claimed by the authors as a

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mixture between silicate and carbonate weathering. This can be right as the geology of the catchment encompasses granites, shales and mud rocks intercalated carbonate rocks. However the investigation of the sources of Sr using the binary mixing model would need a stronger characterization of the endmembers either for the lower one than for the used value for the higher endmember. Moreover there is a need to use content in the equation as the budget cannot be computes as it is. The last part of the discussion aimed at investigate the influence on the Sr evolution of seawater. This part remains strange to me. As the two rivers are small and tributaries of major ones, I cannot see any influence on the seawater budget. To my mind, this part must be deletes or fully redraw. As the data set is interesting to be used I strongly suggest the author to improve the presentation and the use or their data. Some references on Sr and small catchments are missing.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8031, 2013.