Hydrol. Earth Syst. Sci. Discuss., 10, C5751–C5754, 2013
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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.

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Received and published: 22 October 2013

We thank the referee for his constructive comments. Please find below a quick response to the major comments of the paper. Detailed revisions can be found in a revised version.

Answer to general comments

1. About the referee's comments "This (Silicate weathering remarkably raises the

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87Sr/86Sr ratios of the Guijiang River owing to high Sr isotopic compositions) is not remarkable at all! Nor is it counter to the basic interpretation of the Sr isotope record of seawater. This seems totally consistent with the classic picture for weathering at the global scale, mixing non-radiogenic carbonate sources with radiogenic silicate sources. In this case it happens to be in a catchment in a karst region with interspersed silicate rocks, but I am remain puzzled by what is remarkable about these observations".

We partly agree with them. Firstly, we agree with the comment on the basic interpretation of the Sr isotope record of seawater. Indeed, high 87Sr/86Sr ratios of the Guijiang River essentially result from silicate weathering and are not counter to the common interpretation of the Sr isotope evolution of seawater. This section has been deleted in the revised version. However, the Sr isotopic characteristics of the Guijiang River are not found in other karst rivers, we think that it is interesting and noteworthy. Some tributaries of the Yangtze and Pearl River in the karst area draining predominant carbonate rocks but with interspersed silicate rocks have obviously lower 87Sr/86Sr ratios than the Guijiang River in the neighborhood karst area (Please see Page 16, lines 389–394 in the revised version). Therefore, we suppose that the high 87Sr/86Sr ratios of the Guijiang River are not entirely attributed to the interspersed non-silicate components, such as sand rocks, shale rocks, and mud rocks, another main contributor may be scarce granitoids exposed in the catchment (their Sr isotopic compositions can reach up to 1).

2. About a wider range of uncertainty in the inversion calculation and the error propagation.

This is a very good suggestion! By repeating inversion calculation many times for a same sample, average values and relative standard deviations of the contributions from different sources to the dissolved Sr in the Xishui River have been obtained in the revised version.

3. About the comment "It would also be nice to see a more convincing justification

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for using major element ratios that are from global compilations in the inversion that is specific to the Xishui data; it seems to me that the specific silicate lithologies in the Xishui basin (e.g. including the basic and ultrabasic rocks) may deviate significantly from the ratios that global Wu et al. have used. This could bias the calculation of the proportion of Sr from silicate sources."

The reasons did not use directly the major element ratios of the Xishui River include: (i) Because the Xishui River has a length of 157 km and a drainage area of 2670 km2, it is not a really small watershed. In this large area, influence from anthropogenic activities and other lithologies is hardly excluded. In comparison, most of the small watersheds from white and Blum (1995) and Oliva et al. (2003) have drainage area less than several km2. Moreover, these watersheds are limited generally to the basin head, and located in more mountainous zones, so influence from anthropogenic activities can be neglected. Endmember ratios got in this situation are more reliable; (ii) In studies from white and Blum (1995) and Oliva et al. (2003), only watersheds underlain by predominantly plutonic granitic rocks, high grade metamorphic gneisses, and schists were considered. Considering the predominant gneisses and few basic/ultrabasic rocks in the Xishui River catchment, we think that the data from white and Blum (1995) and Oliva et al. (2003) can be used to represent the silicate endmember for the Xishui River.

Answer to minor comments

1. About the opening paragraph of the abstract is confusing and is not worded very clearly. We also think so and have rewritten this section in the revised version.

2. About to report the charge balance on anion and cation analyses. This is a good suggestion and the NICB (the normalized inorganic charge balance) has been added in the section and Table 2.

3. About the analytical procedures for the anion and cation analyses and what kind of Millipore filter was used. The relative corrections have been done in the revised

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version.

4. About to use the adjective “typical” to describe study watersheds, the referee thought it should be “atypical”. It is a good opinion and relative corrections have been done in the revised version.

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