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Solid Earth Discussions

Interactive comment on "Erosion rates deduced from Seasonal mass balance along an active braided river in Tianshan" *by* Y. Liu et al.

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First of all I would like to congratulate the authors for the huge data acquisition work they performed. I've been working in the river canyons of northern Tianshan and thought the Urumqi river is not deeply incised I understand that it can be difficult or even dangerous to acquire those data.

Although not a specialist in hydrogeology I found this manuscript very interesting in that it provides, to my knowledge, a first and complete study on actual erosion rates in the northern Tianshan. This is especially important for people dealing with relief building and long-term topographic evolution of the range.

I am not a native English speaker but I found the manuscript quite well written and will

simply give a list of small editing errors at the end of my review.

Specific comments.

- In your introduction (page 543), when dealing with the problem of partitioning between solid and solute loads, you do not address the possible influence of lithology on the amount of chemical weathering. Even if the area you are working in is nearly free of plants I suggest you also put a general sentence on the influence of plant cover on mechanical erosion and chemical weathering. This would make your introduction more complete. - On page 544, line 18 you use the term "weathering rates" applied to both chemical and mechanical denudation. To my opinion "weathering" refers to chemical disruption of rocks. But I might be wrong on that. - Page 545, lines 20-22 : The Junggar is also filled with aeolian sediments, especially during the Late Tertiary - Quaternary periods. Altay is N and E of Tianshan. More importantly, water also flows into the Junggar basin from the Zhayier mountains to the west. - Page 545, line 24: tectonic deformation in the piedmont is not restricted to the Cenozoic and also occurred during Triassic, Jurassic and probably, to a smaller scale, during the Cretaceous (see for example Chen et al., 2011; Hendrix, 1992; Jolivet et al., 2010). - Page 549, first paragraph: I am not a specialist but variations in the width of the Urumqi river can be quite large from place to place. Does that have an influence on the point-to-point amount of sediment in the bed load and suspended fractions? - Page 553, line 20: You also have a number of minerals in your rock series (gneiss and volcanics) that contain Cl-. For example micas, feldspars or some phosphates are very sensitive to weathering and may deliver Cl. Is that really negligible? You have the same sort of discussion with Ca2+ which represents an important contribution to your dissolved fraction. Ca2+ can also be mobilized by etching of minerals like feldspars that are quite frequent in granitoids. - Page 554, line 24: similar comment: you seldom find calcite as a native mineral in granites. What you can get is calcite veins deposited by fluid circulation during metamorphic events. As I already said Ca can also be etched from other minerals in granitoids. - Page 555: sulfurs are very common

in the metamorphic arc series of northern Tianshan. For example the fault gouge corresponding to the surface expression of the basement thrust fault in the Kuitun area to the west has a very high sulfur content that can be easily mobilised by water. - Page 561: same comment as on page 553 and 554 about the source of Ca. - Page 563-564: I really appreciated this discussion on the present day erosion rates. Although I am a co-author of Charreau et al. (2011) I agree that sediment storage and recycling can introduce a significant bia in present day erosion rate calculations based on 10Be cosmogenic isotopes. Sediment storage is effectively occurring in the Kuitun river but also in several other rivers between the Kuitun and the Urumqi (the Manas river for example). However, the present study was conducted in a catchment area where catastrophic events like landslides for example are less frequent than in the deeply incised Kuitun canyon investigated by Charreau et al. (2011). I regret that in their manuscript, the authors do not take into account the fact that their measurements have been made in an area with a very different morphology compared to the other river catchments further west which show much steeper slopes. I think the representativity of the sampled area should be discussed further to allow the readers that are not familiar with the Tianshan piedmont to fully appreciate the results.

Copy-editing;

- There is confusion between figure 4 and 5. Figure 4 is never called. - Page 543, line 20 : larger THAN. - Page 544, line 28: Himalayan counter parts - Page 545, Line 15: Tianshan is also covering part of Kirghizistan. - Page 545, line 20: Dzunggar - Page 545, line 22: Altai to the northeast. - Page 546, line 9: consists - Page 547, line 17: through - Page 553, line 27 and page 554, line 2: Taklamakan instead of Takimaklan to be consistent with the introduction. - Page 554, line 4: INSIDE instead of between. - Page 556, line 3: CO instead of C0. - Page 558, line 22: Himalayas. - Page 561, line 18: Tianshan instead of Tien Shan. - Page 562, line 1: possible TO see. - Page 563, line 4: space after Taiwan. - Page 563, line 21: delete “reports suspended loads” at the end of the sentence. - Page 565, line 4: km2 - Figure 1: the horizontal scale on

figure 1c should be in meters not in kilometres. - Figure 2: I suggest placing picture 2e (the general view of the area) in position 2a for a better coherence between the text and the figure. - Figure 11: there are a lot of data points on that figure, especially on figure 11a. Would it be possible to split it in two? For example Suspended load + bed load on one side and Dissolved fraction on the other.

I hope those remarks will help improving the manuscript and I stay available to the authors and editors should you have any questions about my review.

Best regards,

M. Jolivet

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