Biogeosciences Discuss., 10, C5764–C5766, 2013
www.biogeosciences-discuss.net/10/C5764/2013/

Biogeosciences Discussions
Open Access

Interactive comment on "Erosion-induced massive organic carbon burial and carbon emission in the Yellow River basin, China" *by* L. Ran et al.

Z. Wang

zhengang.wang@uclouvain.be

Received and published: 7 October 2013

Z. Wang, K. Van Oost

zhengang.wang@uclouvain.be

A quantification of sediment and C fluxes for the Chinese Loess plateau is a significant contribution to the literature. The authors make a good case that sediment fluxes in this river system are large, relative to other basins. There are still very few studies that attempt to quantify the magnitudes of the component sediment and C fluxes. However, the main conclusion of the study is not fully supported by the data:

Firstly, the conceptual framework (Eq. 3) only considers one single atmospheric C flux between the soil system and the atmosphere, i.e., Dc (decomposed OC). The decom-

posed OC is derived from the difference between the OC in the mobilized sediments and that in various sediment sinks along the sediment trajectory (Eq. 5). However, soil erosion not only affects the cycling of the OC in mobilized sediments but that SOC dynamics of eroding or depositional environments of the whole basin have been changed due to the lateral SOC fluxes by soil erosion. For instance, it was found that removal of SOC by erosion at the eroding environment causes dynamic replacement of in situ SOC resulting in C fluxes from the atmosphere to the soil system, i.e., a C sink (e.g., Harden et al., 1999;Billings et al., 2010). Therefore, a budget that only takes into account the C dynamics of the mobilized sediments while neglecting the effects of soil erosion on the soil system of the whole basin is only a partial assessment of the role of soil erosion as a C source or sink. The conclusion of the study that erosion on the Chinese Loess Plateau represents a C source then simply reflects the omission of a sink term in their analysis. Several examples of frameworks to assess both the sink/source behavior of eroding basins are available in literature (e.g., Stallard, 1998;Berhe et al., 2007).

Secondly, while the authors acknowledge the limitations of their data, the assessment of the uncertainties is rather arbitrary. This study could benefit from a formal analysis of the uncertainties associated with the estimates of the component fluxes and the assertion of a 20% source. This should include all components of Eq. 3 and account for the propagation of errors.

In summary, this paper presents an excellent synthesis of the component fluxes on the Loess Plateau using a broad range of sources and approaches, but a careful reconsideration of their conceptual framework is needed.

References:

Berhe, A. A., Harte, J., Harden, J. W., and Torn, M. S.: The significance of the erosion-induced terrestrial carbon sink, Bioscience, 57, 337-346, 2007. Billings, S. A., Buddemeier, R. W., Richter, D. D., Van Oost, K., and Bohling, G.: A simple method for esti-

BGD
10, C5764–C5766, 2013

mating the influence of eroding soil profiles on atmospheric CO2, Global Biogeochem. Cycles, 24, Doi 10.1029/2009gb003560, 2010. Harden, J. W., Sharpe, J. M., Parton, W. J., Ojima, D. S., Fries, T. L., Huntington, T. G., and Dabney, S. M.: Dynamic replacement and loss of soil carbon on eroding cropland, Global Biogeochem. Cycles, 13, 885-901, 1999. Stallard, R. F.: Terrestrial sedimentation and the carbon cycle: Coupling weathering and erosion to carbon burial, Global Biogeochem. Cycles, 12, 231-257, 1998.

Interactive comment on Biogeosciences Discuss., 10, 13491, 2013.