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Earth Surface Dynamics Discussions

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Interactive Comment

Interactive comment on "Opportunities from low-resolution modelling of river morphology in remote parts of the world" *by* M. Nones et al.

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Dear Referee, Thank you for your comments on the manuscript. We appreciate your feedback and have accounted for your suggested corrections into the text. The main aim of our paper was to summarize the capacity of the 1-D model to reproduce the long-term evolution of rivers at watershed scale. A thorough discussion about the theoretical framework of the LUFM model was reported in other papers cited along the text. In our opinion, a detailed description of the model can result in a tedious repetition of the cited articles. On the other hand, we will try to better explain the principal concepts reported in Section 3. As cited in the comment published on October 31, the LUFM model was applied to the case of the Adige River, a quite small river flowing in Northern Italy. The input data used for this application were taken from a DTM (with resolution of 2 m) and

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a series of satellite images having a resolution of about 5 meters (taken from an Italian database). The model's results were compared to the measured variation of the river occurred during the 20th century, with a good correlation. Regarding the possibility of estimating sediment supply to coastal zones at the mesoscale, this model gives long-term estimations of the sediment yield from a catchment, which may be coupled to climate change scenarios. However, other forces form the long-term coastal morphology that was not addressed in our examples. As instance, it's our feeling that that sea level change and shelf subsidence may have noticeable effects. Regarding the alluvial plains morphology, it was considered as a constrains for the river channel morphodynamics. Indeed, the alluvial plains morphology changes take place at longer time scale (geological periods) and are affected by finest sediment (wash-load) deposition during floods recurring in thousands of years. These processes were not simulated. Consistently, the LUFM model computed the sediment transport in the river channel, i.e., the effective discharge that form the channel morphology during decades, while flooding discharges were disregarded. Actually, the wash-load was not computed by the model, but it may also affect the delta growth. Regarding the morphology of the Zambezi Delta, oceanographic processes were neglected. In this case the cumulate transport (simulated) of sediment that forms the river channel balances the delta morphology change evaluated from satellite images. Indeed, long-shore drift poorly affect the overall balance (maybe the position of delta channel outlets), moreover subsidence and sea level change may affect the delta morphology at longer time-scale (thousands of years). Regarding the underestimations of largest discharges in the Parana River, as reported in the manuscript, it is due to different time scales applied: the LUFM simulated yearly averages, while Amsler et al. studied monthly data. Notwithstanding, the model could also be applied to monthly data, however, our approach was aimed to simulate river channel morphodynamics that is related to inter-decadal climate oscillations. In this case, the flooding events (be aware that floods take months in the Parana River) appeared to be of a lower importance in forming the river channel morphology. Literature data may overestimate the actual effective discharge by including land-vegetated portion within the sediment transport computation.

Interactive comment on Earth Surf. Dynam. Discuss., 1, 407, 2013.

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