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Earth Surface Dynamics Discussions

Interactive comment on "Observations and scaling of tidal mass transport across the lower Ganges-Brahmaputra delta plain: implications for delta management and sustainability" *by* Richard Hale et al.

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This study details field observations of tides and sediment transport in the tidal region of the Ganges-Brahmaputra-Mengha Delta system. This research is important because of the dearth of direct measurement in this vast system, and provides first insights about how the delta keeps pace with relative sea level rise, context for recent human-induced changes, and a baseline for proposed large scale water projects. The authors characterize tidal range, tidal prism, and sediment transport at a few key sites on primary and secondary distributary channels in the tidal region of the delta. This

manuscript significantly increases our understanding of this system. I have a few questions, but I think that this paper should be published in ESURF after minor revisions. The sediment concentration and transport data are the most important deliverable to me, but I have a hard time summarizing the findings, because they seem contradictory. Point 1: suspended sediment concentration in a secondary channel increases during the wet season by three fold, indicating a fluvial origin (Figure 2). Point 2: Surveys of net sediment discharge in a primary channel collected over all survey days reveal a net import of sediment (Figure 7), which suggests that sediment transport is primarily dependent on net water discharge, which suggests that freshwater arrival is of secondary importance. However, the flux variation here is also about a factor of three or four (Table 1), consistent with the secondary (BR) channel. I encourage the authors to test the hypothesis that the transport of sediments is really controlled by the same thing in both primary (Shibsa) and secondary (BR) channels. I understand that this is difficult to do given the varying data types, but that is a simpler and more tractable explanation.

Minor comments

L258: I think that this is a relatively weak reason to ignore bedload. My intuition is that lots of bed material sand can become suspended under achievable shear velocities and contribute to SSC measurements during velocity maxima, and be transported onto secondary channels or islands if there is enough water discharge. I would say you can neglect bedload if there are no bedforms in your multibeam surveys. Otherwise, I think you just need to say that it could be happening, but that it's is likely far less than the suspended component and necessarily neglect it from surveys.

L261: I do not know what "tiling observations" means. Perhaps a quick definition is in order.

L339: It took me a minute to figure out that the tidal prisms you are measuring are from integrating the discharge. I imagine prisms as a space filled, which would be impossible to measure. Consider defining how prisms are found.

L459: Total _annual_ mass transport

L496: I do not understand how sediment moving through the system could be “almost wholly derived from the river mouth,” but that the flux through the fiver major tidal channels could be estimated as roughly equal to the sediment flux of the main river (L486-487). I would suspect that there could also be significant re-entrainment of continental shelf or island sediments that were once river derived, but have been in the coastal zone for years or maybe far longer than that. I think that the case for re-entrained sediments can’t be disproved here.

L555: led to a reduction in tidal prism... assuming no feedbacks to tidal dynamics, correct?

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