Climate control on erosion distribution over the Himalaya during past ~100 ka: COMMENT

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Rahaman et al. (2009) inferred a climate control on Himalayan erosion using a sedimentary core from the Ganga Plain. Using prior sedimentological and chronological investigations done on the same core by their co-workers (Sinha et al., 2007), their study extends the work using Sr and Nd isotopes. An implicit assumption is that at the core site a 50-m-thick sequence accumulated from the sediments brought by rivers like the Ganga during the past 100 k.y., and where the sedimentation is not interfered by any autocyclic processes of the Ganga foreland.

Difficulties arise due to the fact that (1) the same authors use one set of ages in the first paper (see Sinha et al., 2007) and ignore an age in the second paper (Rahaman et al., 2009), replacing it by a radiocarbon age derived from a carbonate nodule and using it as a surrogate for sedimentation age, and (2) they use different sedimentation scenarios in different publications without providing an additional supporting database.

The age model of Rahaman et al. is based on a set of four luminescence ages and one 14C age on a carbonate nodule. With these four luminescence dates in a 50 m core, Sinha et al. (2007) extrapolated to obtain an age of ca. 100 ka for the base and ca. 15 ka for the top of the core. However, the top age of 15 ka is not mentioned in Rahaman et al.’s work, and instead a new 4C age of 5.4 ka on a carbonate nodule from 2.3 m below the surface is given. Which one is correct is not known, but the use of either results in different age models that affect the interpretations significantly (as discussed below). Furthermore, the 14C date on a carbonate nodule does not represent a depositional age of the sediment but dates a nodule formation process, and therefore cannot be used to construct an age model for sedimentation. This needs to be addressed if one of the crucial age controls of the original study has been replaced.

Figure 1 provides 87Sr/86Sr values of the core stratigraphy with ages of 15 ka and 100 ka at the top and base, respectively. This new plot (using the age model of Sinha et al.) indicates Higher Himalayan Crystallines (HHCs) being a major source of sediment during the Last Glacial Maximum (LGM), and the same happening at ca. 70 ka. This alternative age model explains why Rahaman et al. and Clift et al. (2008) apparently show completely opposite trends in sediment source since the LGM for two South Asian river systems. Rahaman et al. never addressed this issue in their paper.

Rahaman et al. hypothesize extensive glacier cover in order to explain the Lesser Himalayan provenance. This is a curious statement because most studies of regions of excessive and focused precipitation contribute higher sediment proportion. Hodges et al. (2004) showed that erosion in Nepal is fastest where the monsoon rains are heaviest, and Clift et al. (2008) demonstrated that Holocene erosion in the neighboring Indus Basin switched to the Lesser Himalaya driven by the strong monsoon, not glaciation. The authors should explain why the erosion history captured by the isotopes in the Indus delta and at this core site are completely the reverse of one another. Could it simply be due to the assumed age model? Also, the Sharma and Owen (1996) study pertaining to Late Quaternary glaciation in the Himalaya suggests that due to a weak summer monsoon, glaciers were limited in extent during the LGM (MIS-2), but were relatively extensive during the MIS-3. In view of this, hypothesizing extensive glacier cover in order to explain the Lesser Himalayan provenance, at least during the LGM, is incorrect.

On the stratigraphy and origin of the core, Rahaman et al. may hold more realistic views, but it would be worth explaining how a relation between the core site and source region is established. The whole story of Rahaman et al. will be worthless if the core was in the floodplain of a small plain-fed river, as suggested in the original study on this core (Sinha et al., 2007).

REFERENCES CITED

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