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Changing provenance areas of the Cenozoic Central Myanmar Basin sediments discriminated using Hf values of detrital zircons

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The syntaxis region of the eastern Himalayas is a complex geological collision zone where uplift, deformation and erosion have influenced landscape evolution during the Cenozoic. The syntaxis region has several large river systems draining the present day configuration of catchments, including the Tsangpo, Brahmaputra, Irrawaddy, Salween, and Mekong. The Tsangpo follows a circuitous route around the Namche Barwa before draining into the Brahmaputra, and earlier connections to the large rivers of southern Asia have been suggested in the literature. Liang et al. (2008) used the εHf values of detrital zircons from a Late Miocene Central Myanmar Basin sample, and from two Himalayan batholiths in the syntaxis, to show that the Miocene sediment contain Gangdese-like zircons with positive εHf values from Tibet, rather than more negative εHf values of zircons from inside the syntaxis. They concluded that there was a Tsangpo-Irrawaddy connection in the Late Miocene.

Here we show, using U/Pb dating and εHf analyses of detrital zircons extracted from Eocene, Oligocene, and a suite of Miocene deposits, that the distribution of detrital zircon εHf values in the different aged rock units change through time, reflecting a change in provenance, as well as uplift, erosion and mixing of zircons from previously deposited sediments. We have compared all the published εHf data for the Transhimalayan batholiths in Tibet and Myanmar, and can identify the different provenance areas for the Cenozoic samples based on the range of εHf values and ages measured for the detrital zircons. Mostly positive εHf values for the detrital zircons contained in Eocene sediments are indistinguishable from Gangdese values and ages, supporting our hypothesis that the proto-Irrawaddy river was tapping the Gangdese batholith during the Eocene, and that the Tsango-Irrawaddy connection dates back to at least 43Ma, approximately the age of our oldest sample from the Myanmar Central Basin. The Oligocene samples also have a Gangdese provenance. Significantly, the εHf signature of detrital zircons changes in the Miocene deposits and negative εHf values similar to those of the Dianxi-Burma batholith are the dominant signature, with positive εHf values becoming less common for the younger Miocene samples. We interpret this change in provenance to signal the disconnection of the Tsangpo-Irrawaddy river system, and that it failed to keep pace with uplift in the syntaxis about 18-20Ma, coincident with major reorganisation in the orogen, the onset of strike-slip movement on the Sagaing Fault, and widespread magmatic events in the Gangdese batholith. It is also earlier than the Late Miocene timing suggested by Liang et al. (2008). Our results explain why Transhimalayan detritus arrives in the Bay of Bengal in the Early Miocene, and provides new palaeogeographic reconstructions and timing upon which landscape evolution tectonic-erosion coupling questions can be addressed. One such question is why did the Tsango-Irrawaddy connection fail at 18-20Ma?

Reference:

Liang, Y-H. et al. (2008) Detrital zircon evidence from Burma for reorganization of the Eastern Himalayan river system. American Journal of Science, 308, 618-638.