The evolution of the Irrawaddy River as recorded in the detrital record of the Central Myanmar Basin: Implications for the use of palaeodrainage network reconstructions to document Tibetan tectonics

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The unusual geometry of the drainage basins of major rivers of Asia has been proposed to be the result of either (1) their distortion due to India-Asia collision; thus they may be used as passive markers of crustal strain (Hallet and Molnar 2001) or (2) the result of various captures and flow reversals within a previously continental-scale palaeo-Red River drainage network; drainage reorganisation may constrain the timing of uplift of East Tibet (Clark et al., 2004).

We take one strand of this proposed palaeodrainage network, namely that of the proposed Yarlung-Irrawaddy-Red River connection, and investigate the proposal that these rivers used to be connected. We apply an integrated provenance approach to sedimentary rocks of the Central Myanmar Basin (CMB) along which the Irrawaddy River flows today. We document the initiation and development of the palaeo-Irrawaddy River. Our data show a major change in provenance around the time of the Late Oligocene to Oligo−Miocene boundary. Paleocene and Eocene samples have characteristics similar to the proximal Western Myanmar Arc (WMA) of the Central Myanmar Basin. Around the time of the Late Oligocene to Oligo-Miocene boundary, samples attain characteristics of the Mogok Metamorphic Belt (MMB), which is located in the headwaters of the Irrawaddy catchment. The provenance change by the Miocene is likely to reflect establishment of the palaeo-Irrawaddy through-going river, which began to flow from the MMB highlands in the north of the drainage basin at this time. The timing of initiation of the Irrawaddy as a through-going river is consistent with the time of uplift of the Indo-Burman Ranges (see presentation by Najman et al, EGU 2019), which form the western margin of the CMB and were necessarily uplifted prior to routing of the Irrawaddy along the length of the basin.

We see no evidence that the palaeo-Yarlung River flowed into the Irrawaddy drainage. Instead, we infer that the Indus-Yarlung Suture Zone was an internally-drained basin during the Paleogene prior to the Yarlung River's initiation as a major through-flowing river to the Bay of Bengal via the Brahmaputra in the Miocene. Similarly, by comparison of provenance data with those from co-eval rocks from the palaeo-Red River, we see no evidence that the Yarlung or Irrawaddy headwaters ever flowed into the Red River.