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Testing if Cenozoic sediment in the South China Sea came from SE Tibet

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A model for palaeodrainage proposes that river capture and drainage reversal accompanied Neogene uplift of the SE margin of Tibet leading to a progressive reduction in drainage area to eventually form a catchment similar to that of the modern Red River. The model predicts that throughout the Oligocene to Miocene the bulk of sediment deposited in basins offshore the modern Red River came from the SE Tibet region, and that post uplift this source would have disappeared. To test for this we compared detrital zircon U-Pb ages from Cenozoic sediments deposited in the Yinggehai Basin, offshore Red River delta, with presumed palaeo-Red River sediments deposited in the Tianchuan Basin, inland near the modern day headwaters in China.

In the Yinggehai Basin Oligocene to mid Miocene (circa 25-13 Ma) sediments have a narrow ranges of zircon ages most which are concentrated at circa 250 Ma and 100-110 Ma. Zircon typology indicates tholeitic/alkaline I-type granite terrain for the Cretaceous ages. Zircon U-Pb data from Oligocene sediments collected from the onshore Tianchuan Basin are also dominated by 250 Ma zircon ages although Cretaceous grains are virtually absent. The narrow ranges of zircon ages seen in both basins points to a restricted drainage at this time. According to the large single drainage model a progressive reduction in drainage area initiated in the middle to late Miocene as the eastern margin of Tibet experienced surface uplift. We do find evidence for a major change in the marine basin sediment provenance at some time after 13 Ma when the range of zircon ages dramatically expands to include Palaeozoic and Proterozoic sources accompanied by loss of Cretaceous age sources but the narrow range of ages seen in pre-13 Ma sediments is hard to reconcile with a large river system draining a wide area that includes SE Tibet.