“Formation and Fill of Continental Margin Basins Around the South China Sea: A New Form of Climate-Tectonic Interaction”

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The continental margins around the South China Sea largely formed in response to rifting after the Eocene and are infilled by sediment delivered by both small rivers, as well as the Pearl, Mekong and Red Rivers, draining the SE flank of the Tibetan Plateau. Presently sediment flux in Taiwan dominates the northern parts of the basin, although this is presumed to only date from around 5 Ma, prior to which time significant sediment flux came from continental Asia. The Red and Mekong Rivers at least have experienced major reorganization, which has been tied to topographic uplift and the retilting of Asia to the east during the Cenozoic. The Pearl River appears to be relatively undisturbed by this process but has experienced a more gradual increase in its drainage since the rifting of the basin. Sediment volumes in the offshore basins broadly correspond to the eroded depths onshore within the Pearl catchment suggesting no major capture. Current estimates indicate that much of the current drainage system was established by ~24 Ma, although recent work in SE Tibet now indicates that initial surface uplift there could have been even older, which may make a simple linkage between surface uplift and drainage reorganization more difficult to demonstrate. The Mekong in particular is enigmatic because marine seismic data indicate that it may only have been in its present location since the Late Miocene. Prior to that time it likely drained into the Gulf of Thailand via the modern Chao Phraya.

The sedimentary basins themselves do not only passively receive sediment but their tectonic evolution is also influenced by the loading in the basin centers, as well as the associated erosion and rock uplift in the onshore source regions. This is particularly the case along the southern margin of China where a number of super-deep basins have been identified within the continental margins, most notably the Baiyun Sag and Song Hong-Yinggehai Basins. These basins are unusual because they appear to have experienced significant tectonic subsidence of the basement well after the end of active extension. The correspondence between rapid sediment deposition and tectonic subsidence suggests that the crystalline crust is being thinned as a result of the sediment loading. Combined uplift onshore and loading offshore in the presence of a weak ductile middle crust has resulted in middle crustal flow and a much thinner than normal middle and lower crustal section under these sedimentary basins. In this new and unusual form of climate-tectonic interaction surface processes onshore have resulted in the thinning of the crystalline basement in the offshore regions. Similar subsidence anomalies would be anticipated in other areas of extension in the presence of heart and week crust such as an arc type settings.