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Lower Yangtze drainage reorganization response to western Pacific Subduction

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The evolution of the longest river in Asia, Yangtze, provides a spectacular example to understand the Cenozoic interaction between tectonic, climate and surface processes. The oldest Yangtze deposits in southeast China, characterized by thick sequence of unconsolidated gravel, sand and silty clay, referred as “Yangtze Gravel”, has been recently found in its lower reach and dated back to > 23 Ma, indicating a pre-Miocene establishment of a through-going river. However, the link between river reorganization and tectonic evolution has never been well understood. Far-field effects of the Indian–Eurasia collision are often invoked to explain the widespread East Asia lithospheric deformations and the opening of the marginal, as well as the through-going of the large rivers. However, some geological and geophysical investigations challenge this model and suggest that the Pacific Plate subduction beneath Eurasia plays an much more active role in East Asia lithospheric deformation during the Cenozoic. Here, we study the sedimentology, chronology and provenance of the Yangtze Gravel based on 17 stratigraphic sections exposed along the Lower Yangtze River. Our results indicate a braided alluvial system (Paleo-Lower Yangtze) established since early Miocene across the Jiangnan Basin, North Jiangsu Basin and East China Sea Shelf Basin. Compared with the Early Cenozoic red-colored, halite-bearing lacustrine deposits, our results indicate a larger tectonically controlled shift from rifting to post-rift down-warping across these basins. During Early Cenozoic, the initial subduction of Pacific Plate may contribute to the back-arc extension and affect the continental deep interior of East Asia many thousands of kilometers from the subduction margin. During Oligocene to Miocene, the ongoing subduction of the Pacific plate produced a stagnant slab that may have significantly triggered the post-rift subsidence and the connection of these basins. The deposition of the “Yangtze Gravel” reflect the dynamic response of surface processes to western Pacific subduction in East Asia.