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Holocene fluvial terraces in the Gangkou River Basin of Hengchun Peninsula, Taiwan: implications for sea-level and tectonic controls

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The Gangkou River basin is the largest basin in the eastern Hengchun Peninsula, which is the most latest emerged region of the Taiwan orogen. The width of the active channel of Gangkou River is narrow but the valleys from middle to downstream are remarkably wide, which indicates the features of underfit stream. Based on the 14C dates of buried tree trunk and terrace sediments, the preliminary model for the geomorphic evolution of Gangkou River is proposed as: Stage I: The wide spread fine-grained sediments of more than 30-meter-thick was found in the downstream area of drainage basin. The large-scale aggradation event was formed between 12000 to 7000 yr BP in response to the rapid sea-level rise during the late Pleistocene and early Holocene. Stage II: The 15 to 20-meter-high terraces of Gangkou River were formed by the incision and lateral erosion between 7000 to 400 yr BP. The 14C dates of marine terraces, beach rocks and sand dune near the estuary also indicate this erosional stage which could be related to the mid-Holocene climatic shift, tectonic uplift and the stabilized sea-level. Stage III: The 3 to 5-meter-high terraces were formed around 400 yr BP which indicated the low incision rate and the modern fluvial processes. The uplift rates are estimated by the height of river and marine terraces as 1.0 to 1.5 and 1.5 to 2.5 mm/yr respectively. The results indicate the low uplift rate maybe contributed to the underfit stream feature, and the fluvial terraces are responding to sea-level, tectonic and climate controls with different timescale in the Gangkou River. The low uplift rate found in the Gangkou River contradicted to the idea of high tectonic uplift rate in Taiwan.