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# Locating and Dating the Ping River's Journey Across the Chiang Mai Basin, Thailand

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In Northern Thailand, records of past environmental hazards are limited. Except for events in the past century, possible hazards remain "unknown". Avulsions (i.e. abrupt channel rerouting across a floodplain) of the Ping River are one such hazard – previously, only one avulsion event was scientifically confirmed from the excavation of the ancient city of Wiang Kum Kam. While the Ping's past mobility remain anecdotally amongst villagers (the entire floodplain is now settled), information is inconsistent and lapsing, thus avulsions are not incorporated into river and disaster management. This research reconstructs the geomorphic history of the Ping River to further understand avulsions in the Chiang Mai Basin.

A combination of 2D electrical resistivity tomography, GIS and augering revealed at least five paleochannels (in-filled with coarse sand) running parallel along the east of the present north-south flowing Ping River, the furthest channel being ∼10 km away. The paleochannels indicate that the Ping River was formerly a multichannel anastomosing river system. Beneath the paleo-anabranches, electrical resistivity and augering also revealed a ∼7 km wide unit of coarse sand-gravel that appears to vertically connect with the overlying paleo-anabranches. From the established cross-section of the basin, the following landscape evolution model is presented: 1) a former large braided river evolved into an anastomosing system, 2) anabranches were then abandoned to form a primarily single-channel system that 3) avulsed to the present-day Ping River location.

Using a custom auger method, OSL samples were collected from the top sections of each of the 5 paleo-anabranches and the braided channel. From the east-most paleo-anabranch, samples become sequentially younger towards the west, with the youngest paleo-anabranch being immediately adjacent to the present Ping River. Age estimates range from 360 to 60 years old, which may be underestimates of the channels' ages due to partial flow post-abandonment. Nevertheless, these dates indicate a westward abandonment of the paleo-anabranches that occurred relatively recently. The tops of the braided system were dated to be ∼3000 years old, suggesting that this was approximately when the river evolved from a braided to an anastomosing system. Most samples were dated using standard CW-OSL of quartz. An optimised pulsed OSL protocol was also used to obtain quartz-dominant signals from feldspar-contaminated samples.

Comparisons with historic data reveal a link between avulsions with tectonic activity and large floods. The unidirectional migration of the river suggests the influence of westward basinal tilting from the basin's half-graben structure. It is likely that tilting increased channel instability, while large floods and/or earthquakes triggered channel breaches that led to avulsions. The large sandy in-fills of the former anastomosing and braided systems are likely to have facilitated avulsions through paleochannel reoccupation. Based on this model, the Ping River has currently reached the limit of westward movement, as it now flows along the base of alluvial fans. However, avulsion risk may be higher for the Kuang River, a major tributary of the Ping River, which currently flows along the eastern edge of the sandy braided deposits.