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Fault-scarp knickpoint recession and subsequent riverbank widening in central Taiwan

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Along the Chelungpu thrust fault in central Taiwan whose surface rupture emerged by the 921 Chi-Chi Earthquake on September 21, 1999, knickpoints were formed in the rivers crossing the fault and some of them have continued to recede upstream by fluvial erosion. The rates of recession of these knickpoints have been extremely high as noted in our previous reports. Also, as the knickpoints recede very quickly, inner channels were formed downstream of such knickpoints with a depth of several meters. The inner channels seem to expand their width after the passing of the knickpoints. Here the temporal changes in the morphology of the bedrock rivers around the fault scarp are examined by means of field topographic measurement and satellite imagery investigations. The rates of the knickpoint recession vary through the time; for instance, the knickpoint in the Ta-chia River shows recession rate 3.3 m/y in the earlier 6 years (1999-2005) and 220 m/y in the last 4 years (2005-2009). Such variations in the recession rates could be mainly caused by the variations in flood intensity and frequency and artificial modifications, rather than the bedrock strength variability.

Keywords: knickpoint, bedrock erosion, field measurement, satellite imagery