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River pattern planform dynamics as satellite-derived locational probabilities

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Alluvial rivers adjust their planform as they shift across valley floors, but classification schemes used to describe river patterns often rely on static descriptions of dynamic morphology. River patterns are more diverse and dynamic than sometimes implied by discrete river classification approaches. Here, we quantify satellite-derived locational probabilities for 600 km^2 of riverbed in 10 Philippine catchments to explicitly account for lateral dynamism within river pattern classification. We leverage Google Earth Engine (GEE) to apply image-based analyses at large spatial scales and high temporal frequencies. Using archives of Landsat imagery (1988-2019), we assess dynamism across the whole active width of rivers including the wetted channel and unvegetated alluvial deposits. Locational probabilities show the landscape- and reach-scale behaviour of the active river channel. We find that along-valley patterns of river planform mobility are spatially non-uniform; zones of relative stability are interspersed with zones of relative instability. Hotspots of mobility vary in magnitude, size and location between catchments. To better understand the temporality of planform mobility we investigate biennial changes in active river channel extent. In doing so, we re-appraise river pattern as a spatially continuous dynamic metric of fluvial geomorphology; useful for predicting and developing resilience to river-related hazards in dynamic landscapes.

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