Valley Slope Response to Fluvial Incision in the upstream Minjiang River, Western Sichuan, China

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The intense river incision, caused by the strong tectonic uplifts during the orogenic activity of Longmenshan belt, could destabilize hillslopes and induce gravitational deformations and catastrophic failures.

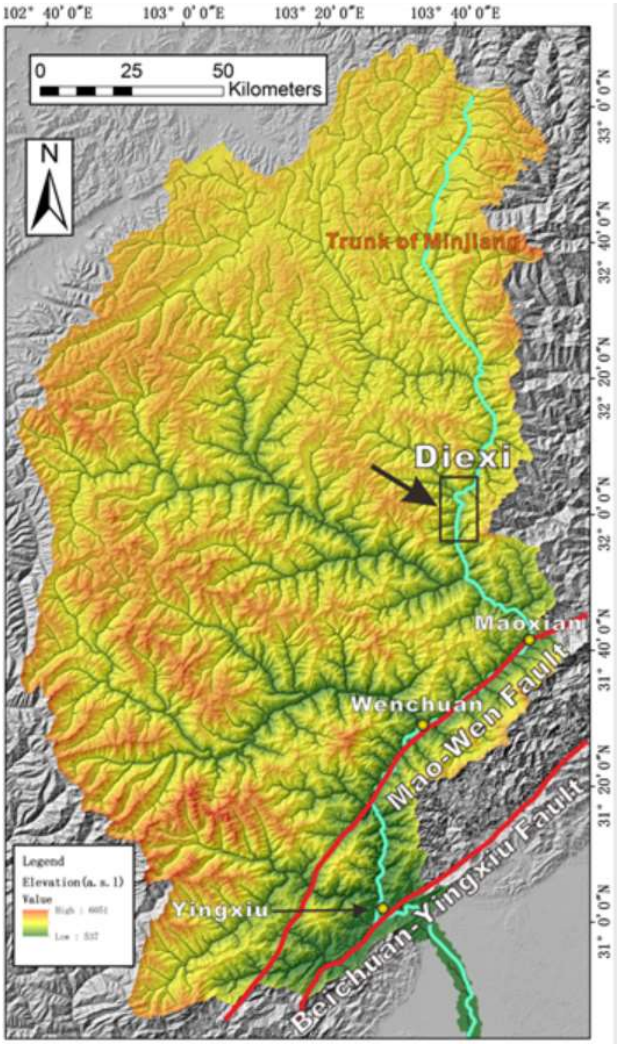

Fig. 1. Topographic and tectonic setting of the study area

In our study area, Diexi, a number of large landslides aligning along the trunk river of upstream Minjiang, Sichuan were investigated by detailed geological field survey and topographic analysis. These catastrophic landslides are considered to be related to river rejuvenation because knickpoints and pronounced slope breaks in the upstream Minjang River were found during the investigations. It's notable that a highly outstanding knickpoint is exactly located just upstream of a couple of catastrophic landslides including the largest one (Diexi landslide) along the trunk river of Minjiang.

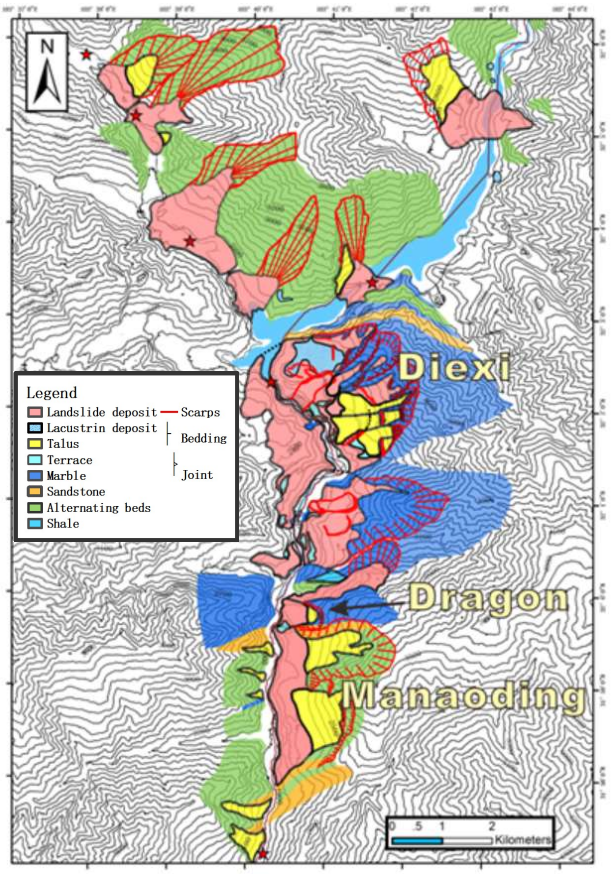

Fig. 2. Geological map and landslide inventory in Diexi area

The long-river profile analysis and geologic investigation suggest that this outstanding knickpoint might be formed not by landslides but by tectonic activity and that they propagated upstream. We studied the typical examples of landslides in Diexi area responding to the river undercutting, mapped the

widespread landslides along Minjiang River and described the fluvial incision activity by investigating the major knickpoint and its corresponding slope break. The migration of the major knickpoint made an inner gorge along the river, which would result in the redistribution of topographic stress of valley. Combined with the geological and geomorphological characteristics of prehistoric landslides in Diexi, the distribution features of catastrophic landslides indicates that long-term incision by the Minjang River undercut the hillslopes and finally caused large landslides with structural defects under the context of knickpoint migration.

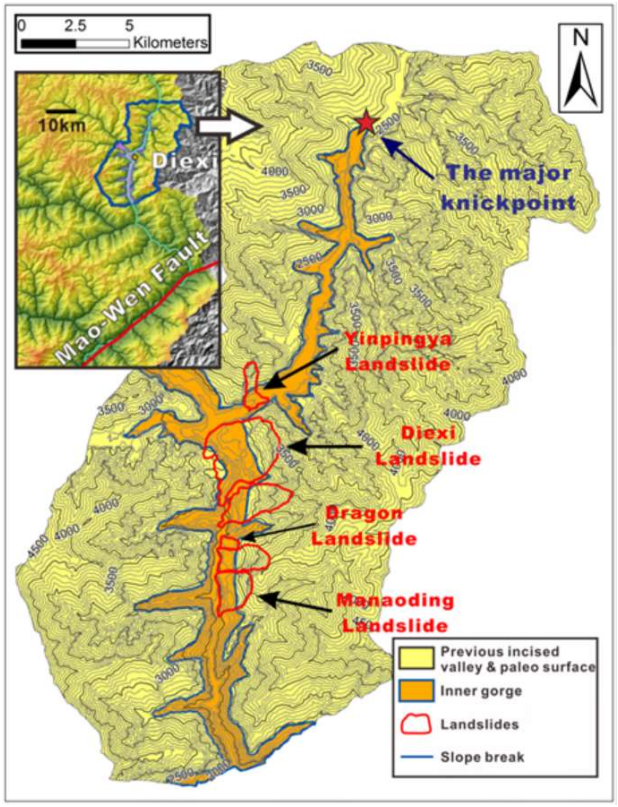

Fig. 3. The key slope break and inner gorge that plays a significant role in contolling occurrence of catastrophic landslide

The understanding of geological and fluvial history in hillslope processes could provide a conceptual model of geohazard prediction and mitigation in the Minjiang drainage basin.