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Cenozoic paleosurfaces reconstruction and erosion quantification for northeastern Tibetan plateau using SRTM DEM

Mingxing Gao (1,2), Shaofeng Liu (2), Gerold Zeilinger (1)

(1) Institute of Geosciences, University of Potsdam, Germany (mingxing@geo.uni-potsdam.de), (2) China University of Geosciences in Beijing, Beijing, China

The collision of Asia with the Indian subcontinent about 40-50 m.y. ago resulted in a broad zone of intracontinental deformation. The northeastern margin of the Tibetan Plateau represents the front of this collision zone. It has been actively growing from Neogene through Quaternary time.

The availability of 90 meters resolution DEM data provides new opportunities to study surface processes. However, understanding the complexity between tectonic activity and its expression in the topography is the main challenge in studying surface processes. In this study, we use SRTM DEM data and regional-scale geological maps to reconstruct paleosurfaces for different geological times. The minimum magnitude of erosion is eventually calculated.

The widely dispersed Cenozoic basin fill remnants are extracted for the reconstruction of paleosurfaces for different geological periods in the Cenozoic. Other methods of extracting remnants are compared with the method used in this work. Depending on the density and the location of the samples, different interpolation methods have been tested, and the results are analyzed and compared with previous studies. Finally, Natural Neighbor Interpolation is adopted to reconstruct the paleosurfaces for the individual geological periods.

The analysis of the regional geomorphological pattern suggests that the strongest up-

lift of the northeastern Tibetan plateau occurred during Miocene to Pliocene. Before uplifted, this area was a wide foreland basin formed due to the thrusting of the north frontal fault zone of the west Qinling. As the new thrusts developing further to the north, the Paleogene depositional surface was folded and deformed up to the Liu Pan-shan area. During Miocene, the depression in front of the thrust fault was filled with sediments. Since Pleistocene, the river is the main driving force shaping the landscape of the study area.

The DEM analysis, combined with geological data is an effective method to reconstruct paleosurfaces. Comparing the individual paleosurfaces provide estimates for the timing of transition from sedimentation to erosion, the process of uplift after deposition, the uplift rate, and the erosion rate, therefore give insights into uplift mechanisms and continental dynamics.