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Discussion

A comment on “Orogen-parallel, active left-slip faults in the eastern Himalaya: Implications for the growth mechanism of the Himalayan arc” by Li and Yin (Earth Planet Sci. Lett. 274 (2008) 258–267)

J. Van der Woerd [a,*], Ph.-H. Leloup [b], J. Liu-Zeng [c], R. Lacassin [d], P. Tapponnier [d]

[a] Institut de physique du Globe de Strasbourg, UMR CNRS/UdS 7516, 5, rue Descartes 67084 Strasbourg, France
[b] Laboratoire des Sciences de la Terre, CNRS UMR 5570, UCB Lyon1-ENS Lyon, Lyon, France
[c] Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing, China
[d] Institut de Physique du Globe de Paris, CNRS UMR 7154, Paris, France

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1. Introduction

Understanding how convergence is partitioned in the Himalayan arc and across the entire Tibetan plateau provides critical kinematic constraints on mechanical models of continental lithospheric deformation. Based on geomorphic evidence, Li and Yin (2008) recently claimed to have discovered several active E–W trending left-lateral faults in south Tibet. These faults, interpreted to be part of a ~100 km-wide and >500 km-long Dinggye–Chigu fault zone (DCFZ), would follow the Himalayan arc from ~88°E to the eastern syntaxis (95°E). The total slip-rate across this zone would be at least 4 to 8 mm/yr, and possibly up to 25 to 70 mm/yr (when summing given slip-rate on each fault). The rates are then compared with the right-lateral slip-rate along the Karakorum fault in western Tibet, inferred to be between 1 and 10 mm/yr from the literature. It is concluded that, since 4 Ma, oroclinal bending is the dominant process in Himalayan tectonics (Klootwijk et al., 1985).

This article has major implications on the mechanics of the Himalayas and of the collision belts in general. Our fieldwork, geomorphic and geodetic analysis of the region studied by Li and Yin (2008) suggest that: 1) the geomorphic offsets interpreted by these authors are better explained by landform alignments with no

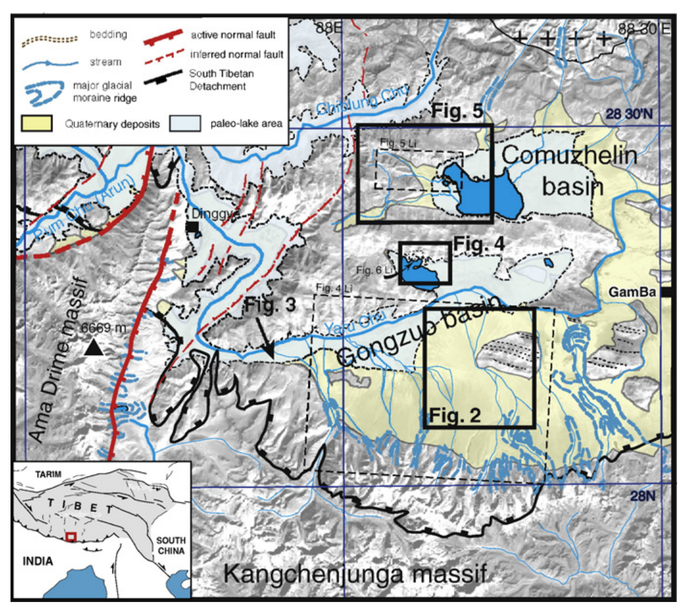

Fig. 1. Simplified geological and active fault map of the Dinggye region (see inset for location within Indo-Asia collision framework). The Gongzuo and Comuzhelin basins are characterized by folds, trending on average EW, of the Tethysian sediments in the hanging wall of the north dipping south Tibetan detachment system (e.g., Burg et al., 1984). Present-day active faults are NS trending normal faults (e.g. Armijo et al., 1986). Note the extension of high lake stands (at 4400 and 4460 m asl) marked by clear shorelines (sand bars, steep cliffs, etc…). Arrow is location of Fig. 3. Rectangles are Figs 2, 4 and 5.

* Corresponding author.
E-mail address: jeromev@eost.u-strasbg.fr (J. Van der Woerd).

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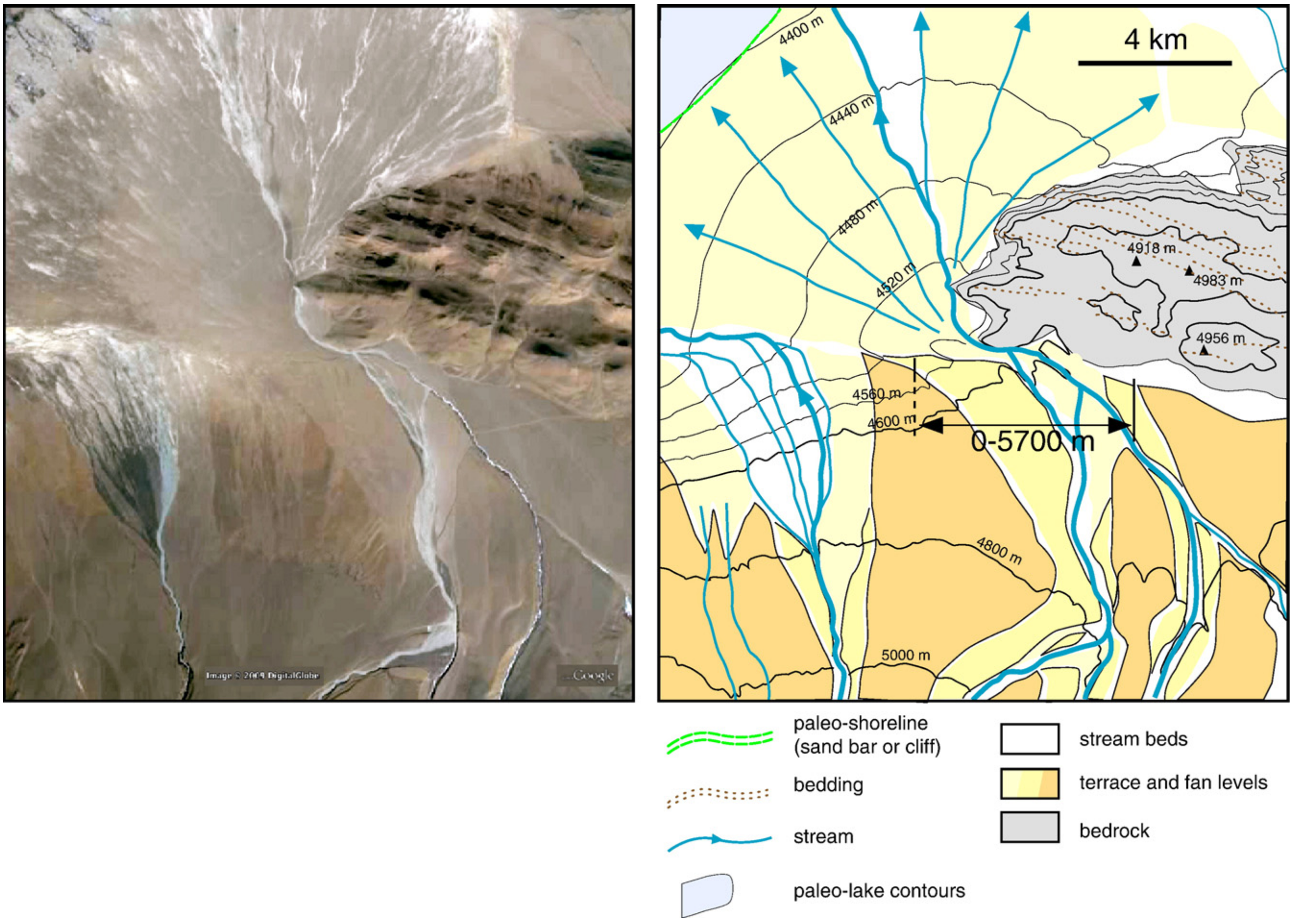

Fig. 2. Large river bed cannot be used to infer tectonic left-lateral displacement. River is deflected due to the bedrock outcrop partially damming the valley at the foot of the bajada (note ~E–W bedding in bedrock). Unconstrained bounds of the deflection range from 0 to 5.7 km.

tectonic origin, 2) GPS and earthquake data do not support E–W left-lateral shear in south Tibet and 3) there is no evidence for active left-lateral shearing so far in the region west of the eastern Himalayan syntaxis.

2. Active fault mapping and geomorphic offsets

A first and fundamental step in the study of Li and Yin (2008) is to map five previously unrecognized active faults. We suggest that

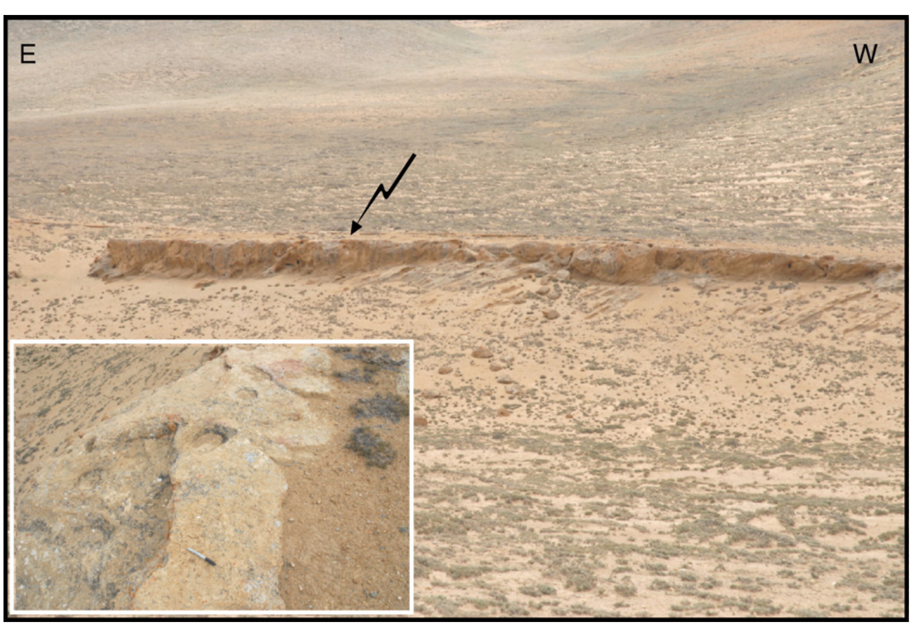

Fig. 3. Example of colluvial slope-deposits indurated by a calcareous matrix along the 4400 m asl paleo-lake shore line (see Fig. 1 for location). These are typical around the paleo-lake and have been mis-interpreted by Li and Yin (2008) as a scarp along an active fault trace. Arrow is location of inset.