Cretaceous flysch in the eastern Tethyan Himalaya

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Detailed investigation of stratigraphic sections in the region of the Nieru Valley and Gyantse, eastern Tethyan Himalaya, reveal that the Jurassic–Cretaceous-early tertiary of this region contains a section of lithic-rich turbidite greywackes, which possess all the visual characteristics of typical convergent orogenic flysch. The deposition of this flysch can be demonstrated, from its original intact stratigraphic position, to have been within the Cretaceous of the outer Indian passive margin. This section is best preserved in the Nieru Valley, where it is approximately 220 m thick. It conformably overlies several hundred meters of section consisting of black shales, cherts and argillites, containing horizons with ammonites. There is a prominent coarsening-upwards section about 10 m thick at the base of the flysch unit, with an abrupt change from black cherts to olive-coloured argillites and micaceous siltstones. Bouma-sequence sedimentary structure assemblages are well-developed in the flysch arenites, which display beds ranging up to several meters thick (amalgamated), many with sharp bed bases displaying flute and groove-type scour marks. Restored paleocurrents are dominantly towards the east in the Nieru Valley section. Preliminary investigation of the clastic provenance suggests that a volcanic-dominated source was mixed with material of highly quartzose composition, since feldspar is a relatively small proportion of the whole, and much of it is plutonic/metamorphic origin. Volcanic clasts contained in the arenites are both mafic and silicic in composition, although the larger clasts perhaps tend to be mafic. No serpentine, and no chromite clasts have been seen in thin sections. In the western stratigraphic sections of the northern Nieru Valley, the basal arenites are greenish or pale quartzites, and first occur as strongly channelised lensoidal bodies within the uppermost 25 m of the dark cherts and argillites. More lithic arenites succeed these quartzites, although a few of the beds within the flysch section are also somewhat quartz-rich compared with the average. Arenites cease abruptly at the top of the unit at a sharp contact with greenish-grey burrowed shales. A few thin sideritic carbonate beds occur within the first 30 m above the top of the flysch arenites, 60–70 m above this contact the shales contain outsize (up to 1 m across) calcareous nodules. Rare belemnites and an ammonite demonstrate that these shales are Cretaceous. Full exposure shows that the flysch-shale contact is stratigraphic and that no faults of significance occur within the shale section as far up as the large calcareous nodules. There is a significant fault above this level, carrying Cretaceous pink limestone and melange over the dipping, and folded stratigraphic sections described, but the flysch itself is unquestionably within an intact Cretaceous stratigraphic section.

This section was investigated as part of a study to attempt to determine as precisely as possible the age of initiation of the India–Asia collision in the eastern Himalaya, for comparison with the well-determined eocene age in Zanskar (Gaetani and Garzanti, 1991; Rowley, 1996). The fact that the Nieru Valley flysch is Cretaceous, and does not appear to contain ophiolitic-derived detritus suggests to us that it is not connected with the India–Asia collision, nor with any pre-collision ophiolite emplacement event on the Indian passive margin (contra Searle et al., 1997). We favor the idea that it is associated with the Rajmahal flood basalt event, and we think that the occurrence of basal quartzose arenites followed by more dominantly volcanic-derived material supports this suggestion, but demonstration of this correlation awaits more precise determination of the macro- and microfossil collections.

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More about the missing Tethys in the Yarlung Zangbo suture

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The Yarlung-Zangpo suture zone, the youngest in Tibet, marks a site of collision of the Eurasia continent and Indian subcontinent. It is characterized by a discontinuous line of ophiolitic bodies in southern Tibet and beyond. Terranes of different tectonic affinity are scattered along this line and represent remnants of the Tethys, a wide oceanic expanse existed throughout the Mesozoic and eventually closed along the suture in the Eocene. These terranes are targets of an extensive study by the Tibet Research Group, HKU aimed at more comprehensive understanding of the Tethys closure and tectonic evolution of the suture. Here results of structural and biostratigraphic investigation of the Bainang terrane are presented. The Bainang terrane, distinguished in the central part of the suture, comprises rock units previously referred to as infra-ophiolitic thrust sheets of radiolarites or Upper Jurassic–Lower Cretaceous red radiolarites. It is situated between the ophiolitic suite of the Dazhuqu terrane to the north and Indian passive margin series to the south. The terrane is characterized by a pile containing numerous north-facing and chiefly south-verging imbricated slices. These tectonic slices incorporate various lithologies: chert, siliceous and tuffaceous mudstones, limestone, siliceous and calcareous shales. The most complete and well-exposed piece of the terrane near Bainang has been mapped and sampled for radiolarian biostratigraphic study. Five litho-tectonic units are discriminated on the basis of characteristic lithologies and structural styles. From north to south they are: Bangga, Zongxia, Maniga, Yalongmai and Renchingang units.

The Bangga unit is mostly composed of red ribbon chert with minor siliceous mudstone and is characterized by scattered shear zones bounding tectonic slices and lenses several tens of meters thick. The Zongxia unit comprises predominant siliceous mudstone with numerous tectonic lenses of red ribbon chert. Conjugate tectonic lenses bounded by shear zones is a dominant structure. In both units obtained radiolarians indicate that chert is Late Triassic to Early Cretaceous and siliceous mudstone accumulated in a short interval from middle to upper Aptian. Random distribution of radiolarian ages along several profiles

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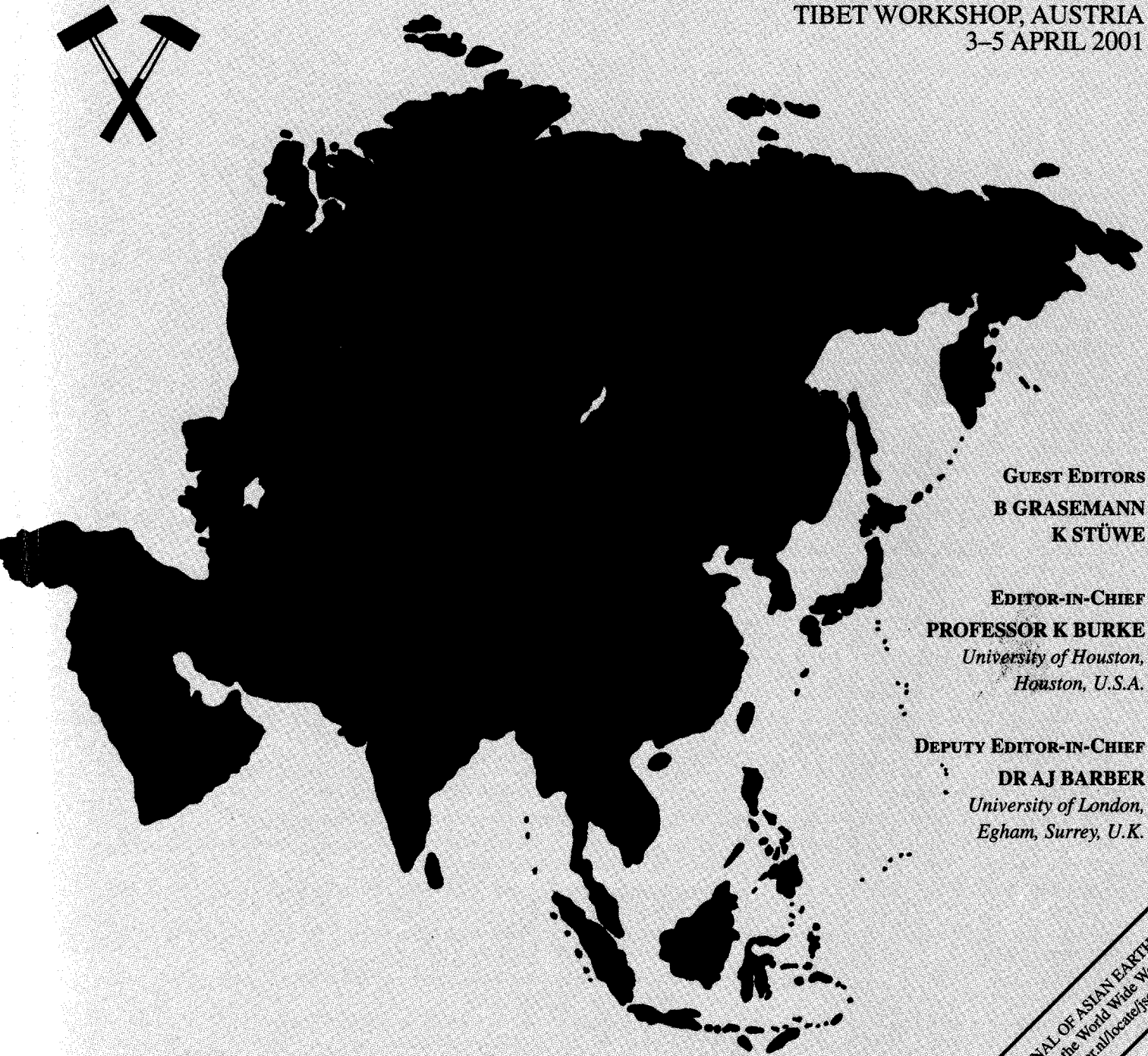

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