GSA Data Repository G22679

This data repository document is intended to give additional details for the area described in manuscript G22679, Propagation of surface uplift, lower crustal flow and Cenozoic tectonics of the southeast margin of the Tibetan Plateau by L. Schoenbohm, B.C. Burchfiel and Chen L. This is redundant with some of the detail provided in the manuscript. Further details can be found in Schoenbohm et al., 2006.

Geologic description:
The Ailao Shan shear zone terminates near the small village of Wudingshan and just to the north of a slightly larger city, Damagie. Patches of relict landscape (Clark, 2003; Schoenbohm et al., 2004) are easy to identify in this area and are at elevations of around 2500 m. The Red River has deeply incised this landscape, creating a canyon ~800 m deep. The Red River approaches the area from the west, appears to be offset ~5.5 km where it crosses the Red River fault (Allen et al., 1984), cuts through Triassic rocks of the South China block in a northeasterly direction and then makes a 90 degree bend to continue towards the southeast. The degree of alluviation along the river is greater in this area than elsewhere along the Red River. Because of the H-shaped geometry of the river and its major tributaries in this region, two hills have been isolated by incision north and south of the river.

Triassic rocks to the northeast of the Ailao Shan shear zone and Red River fault are dominated by cliff-forming limestones and well-bedded brown sandstones and siltstones, mildly deformed and metamorphosed to a low grade (Bureau of Geology, Yunnan, 1990). Sediments to the southwest of the shear zone and fault are Paleozoic or Cretaceous, with affinity to the Lanping-Simao redbed basin (Bureau of Geology, Yunnan, 1990). The shear zone itself consists of well-foliated, nearly-vertical amphibolite grade gneisses, similar to elsewhere along the shear zone (Leloup et al., 1995; 2001)

Previous mapping of Neogene age deposits in this area (Bureau of Geology, Yunnan, 1990) suggested a continuous cap of sediment from the hill to the north of the Red River, down slope into the river valley and up again onto the hill south of the river. Our mapping, however, revises this interpretation. Instead of a continuous deposit, we map two distinct units, one which caps the opposing hills, and one which outcrops at low elevations along the Red River valley.

The unit of indeterminate age along the Red River consists of an angular, clast-supported conglomerate dominated by cobbles of adjacent Triassic limestone. We were unable to observe any clasts of Ailao Shan gneiss. On the basis of the close association of this unit with the adjacent limestones and the absence of metamorphic clasts, we argue that deposition of this unit predates exhumation of the Ailao Shan shear zone. It is probably related to exposure of Triassic units to weathering processes, and should be interpreted as a basal conglomerate or karst deposit. We have observed similar units elsewhere along the Red River (Schoenbohm et al., 2005). We found no Pliocene aged fossils in this unit. Fossil localities in this region are not well indicated on existing geologic maps, but we assume that the Pliocene fossils which have been identified are confined to the unit which caps this hills, and previous incomplete mapping led to the erroneous association of the two units and the assignment of a single age to both. The age of this unit is therefore unknown, but must fall between first sub-aerial exposure of Triassic rocks and the exhumation of the Ailao Shan shear zone in Miocene time.

The capping unit is typical of Pliocene deposits in Yunnan. It consists of alternating siltstones and sandstones with fossil rich horizons and inter-bedded conglomerates. The conglomerates are generally clast supported, with well-rounded cobbles of varying lithology, including a significant component derived from the Ailao Shan gneisses. The basal contact appears to be originally horizontal, but is

disturbed locally by deformation along the Red River fault and more extensively by pervasive down-slope sliding in areas which have been steepened and undermined from the side by incision along tributaries to the Red River. Bedding generally dips gently and broad, open folds are common. In places where slope processes are most active, internal shearing and deformation can be intense, particularly along slope-parallel detachment surfaces. This unit is of Pliocene age, and fossils collected include: *Juglans sp.; Elatocladus sp.; Quercus pannosa H.-M., Ulmus cf. miopumila Huet Chaney*; and *Ulmus hedini Chaney.*

The active Red River fault bounds the northeastern edge of the Ailao Shan shear zone, and to the northwest of the termination of the shear zone it separates Triassic rocks of the Yangtze Block from redbed sediments of the Lanping-Simao basin. The fault is clearly active in a right-lateral sense and some strands display a significant component of normal displacement. Active traces of the faults are clearly indicated by weak zones along which tributaries to the Red River have incised, offset tributaries, offset hills and ridgelines, and, particularly to the southeast near Damagie, a broad gouge zone. To the northeast, there is morphologic evidence for two active fault strands parallel to the course of the river and slightly oblique to the main fault, but the amount of displacement, age and the significance of these faults is unclear. They do not appear to cause any vertical displacement.

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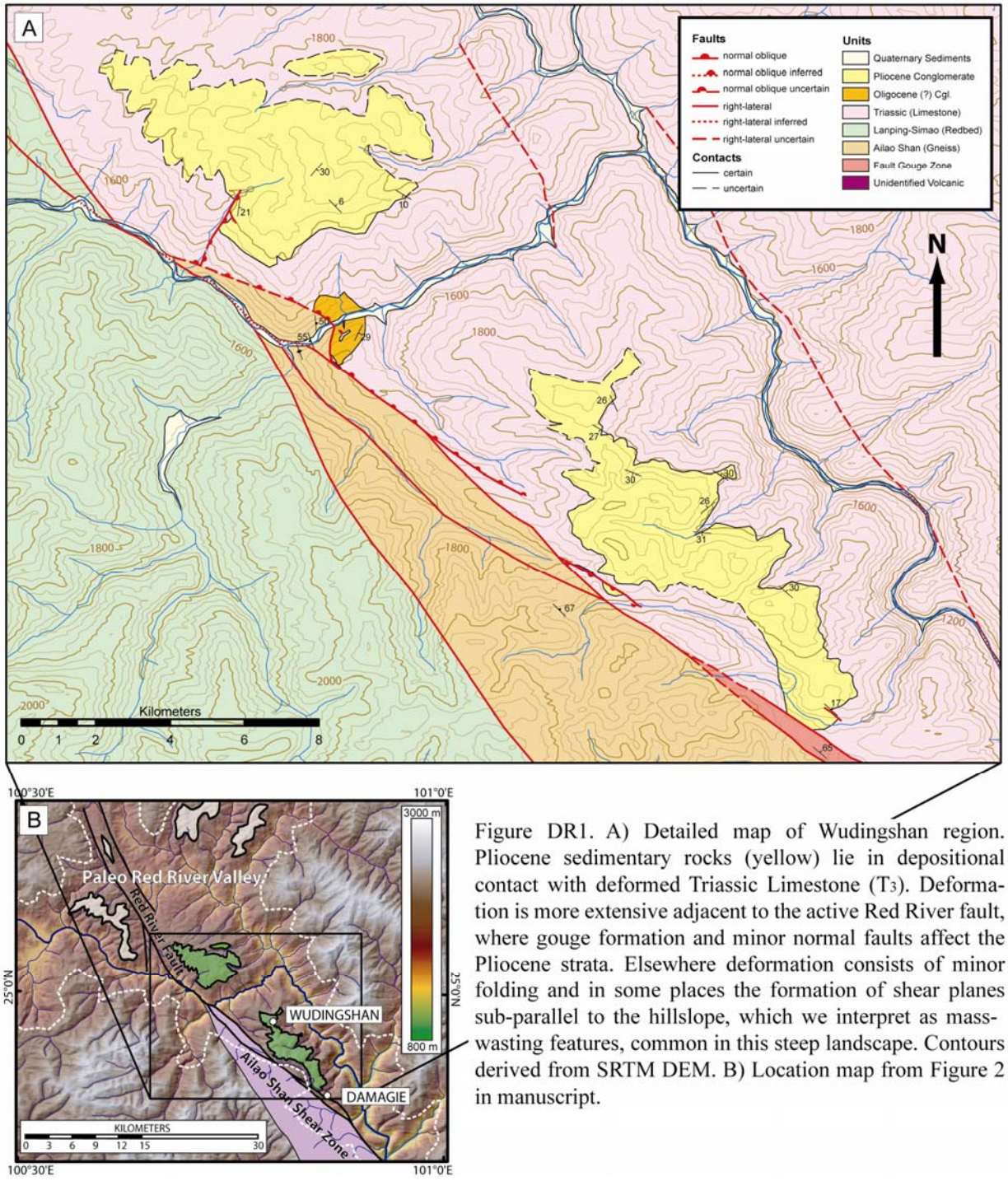

Figure DR1. A) Detailed map of Wudingshan region. Pliocene sedimentary rocks (yellow) lie in depositional contact with deformed Triassic Limestone (T_3). Deformation is more extensive adjacent to the active Red River fault, where gouge formation and minor normal faults affect the Pliocene strata. Elsewhere deformation consists of minor folding and in some places the formation of shear planes sub-parallel to the hillslope, which we interpret as mass-wasting features, common in this steep landscape. Contours derived from SRTM DEM. B) Location map from Figure 2 in manuscript.

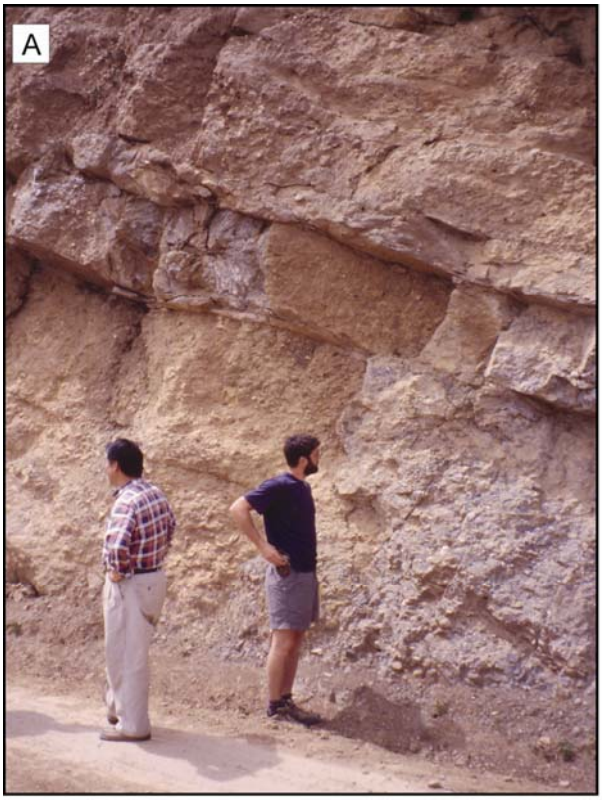

Figure DR2. Field photos of Pliocene sedimentary rocks. A) Typical outcrop of Pliocene rocks. Beds are gently tilted and bedding is well defined. Facies is dominantly conglomerate with some finer interbeds. B) Outcrop of Pliocene rocks in which shearing has occurred. Bedding is disrupted, but can still be identified. Michael Stewart has his hands on a shear plane. C) Typical course-grained, conglomeratic facies. Prominent gray clasts are derived from Triassic rocks to the northeast, and the high carbonate content may be responsible for the degree of lithification of this outcrop. D) Typical fine-grained facies. Fossils have been identified in layers similar to these.