When Did Shortening Cease Within the Tibetan plateau?

Erchie Wang[1], Dalai Zhong[1], Jiwen Teng[1], Eric Kirby[2]

[1] Institute of Geology and Geophysics, CAS, Beijing, 100029, China, erchie-wang@mail.iggcas.ac.cn
[2] Penn State University, University Park, PA 16802, U.S.A.

With an average elevation of near 5000 m in the west and 4000 m in the east, the low-relief surface of the Tibetan plateau is perhaps the most striking of geomorphic and geologic features within the Indo-Asian collision zone. Understanding how and when this surface developed is central to the geodynamic evolution of the plateau. Here, we undertake a regional synthesis of geologic constraints on the "age" of the plateau surface. Recognizing that even low-relief landscapes are dynamic features, evolving in response to erosion and/or deposition, we attempt to answer the question – when did shortening of Tibetan crust terminate?

By using simple stratigraphic arguments, we attempt to bracket the termination of deformation with strata beveled beneath the plateau surface and with undeformed strata deposited on the surface. Our preliminary compilation reveals that the oldest undeformed strata range in age from the Late Oligocene – Miocene. These strata are of Neogene age in the Hol Xil basin (northwest Tibet), Miocene age in the Wudaoliang area (northern Tibet), Oligocene-Miocene age along the southern slope of the Gangdise (southern Tibet), Oligocene through Pliocene age in the Langping-Simao basin (southeastern Tibet), and Miocene age in the Anduo region (central plateau). These results suggest that no significant shortening has occurred within the plateau since early Miocene time. This observation contrasts sharply with the peripherial regions of the plateau, most of which began to be active in the middle part of the Miocene.

The coincidence of the cessation of shortening within the high plateau with the onset of deformation around the margins and with widespread (yet small volume) alkalic volcanism is intriguing and suggests a potential genetic link. We suggest that these changes in the distribution of upper-crustal shortening and volcanism herald the onset of widespread flow of the lower crust, perhaps in response to changing mantle thermal structure. Outward flow of lower crust was associated with the disruption of the plateau surface by the north-south striking graben systems, by major strike-slip faults (Ganzi – Xianshuihe – Xiaojiang and Kunlun fault systems), and by the incision of the major rivers in eastern Tibet.

Cite as: Wang, E., Zhong, D., Teng, J. and Kirby, E., 2010, When Did Shortening Cease Within the Tibetan plateau?, *in* Leech, M.L., and others, eds., Proceedings for the 25th Himalaya-Karakoram-Tibet Workshop: U.S. Geological Survey, Open-File Report 2010-1099, 1 p. [http://pubs.usgs.gov/of/2010/1099/wangerchie/].