2006 Fall Meeting
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HR: 10:35h
AN: **T32B-02**
TI: Geochronological Evidence for the Tectonic and Topographic Evolution of SE Tibet

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AB: We report an extensive suite of (U-Th)/He and Ar-Ar cooling ages on zircon, apatite, biotite and K-feldspar from terranes in SE Tibet, as well as U-Pb ages on zircons from basement gneisses and melt phases of the Namche Barwa-Gyala Peri massif. U-Pb ages and growth textures from accessory minerals along with metamorphic phase relations indicate that the largely Precambrian basement rocks of this massif have been experiencing a protracted anatectic and metamorphic episode marked by near-isothermal decompression paths; this episode likely

continues at present. Neogene exhumation of current outcrop exposures amounts to some 10-15 kb over the past 10 m.y., corresponding to long-term rock-uplift rates of about 3-5 mm/yr. Ar-Ar biotite ages of less than 2 Ma are entirely confined within the bounding structures of the Namche Barwa - Gyala Peri massif. Zircon helium ages range from 0.3 Ma near the Tsango-po river's Big-Bend knickzone to over 50 Ma at distal and higher-elevation locations. In contrast to the biotite ages, the zircon cooling-age low extends across terranes and structures. Apatite helium ages and thermal histories derived from K-feldspar age spectra document divergent cooling histories above and below the knickzone: ages from drainages graded to the knickzone and below document accelerated Quaternary incision, whereas ages from drainages located upstream of the knickzone suggest relatively little erosion over the past 5 - 7 Ma. This pattern of ages and cooling histories suggests pinning of the Tsangpo knickpoint by rapid rock uplift within the massif at about 7 Ma, and is also consistent with late-Tertiary capture of the Tsangpo and its diversion into the Brahmaputra system. Ongoing rock uplift at Namche Barwa establishes a high local base level of ~3,000 meters for the Tsangpo watershed in SE Tibet, resulting in the lower recent exhumation rates. Because of the extreme topography, sharp changes in erosion rate, and unknown initial conditions and rock properties, it is not realistic to use cooling ages to make precise estimates of erosion and incision rate within the Namche Barwa massif and the Tsangpo gorge, but simple thermal modeling suggests that rates of at least 5 mm/yr must have been in play over the past 1-2 million years. When combined, the petrological, U-Pb, and cooling-age data indicate that over the past 10 m.y. the Namche Barwa-Gyala Peri massif has been a locus of rapid rock uplift and erosion that requires both a focused mechanism for uplift as well as the mass-evacuation power of a river like the Tsangpo. Geodynamic models for the eastern terminus of the Himalayan orogen need to account for inception of anatexis in Indian-crust protolith at 10 Ma and then its continuation until exposure during rapid erosional exhumation.

DE: 1115 Radioisotope geochronology
DE: 1140 Thermochronology
DE: 1240 Satellite geodesy: results (6929, 7215, 7230, 7240)
DE: 6924 Interferometry (1207, 1209, 1242)
SC: Tectonophysics [T]
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