Sierra Nevada - Great Valley Foothills, 36N to 37N: He apatite thermochronometry along a new horizontal transect

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Abstract:
Preliminary field reconnaissance indicates that a bedrock pediment landscape exposed locally between 36N and 37N along the western Sierra Nevada Foothills ramp spans these latitudes in lateral continuity. New apatite helium thermochronologic data from this landscape suggest a Late Cretaceous rapid exhumation event. Stratigraphic relations and geomorphology support the hypothesis that this bedrock landscape is pre-Eocene and was preserved through Cenozoic time under shallow burial by Eocene strata which have subsequently been removed between 36N and 37N.

Figure 1. Location map of study area. Blue/black crosses show sample sites along the new He apatite horizontal transect. Deep red T1 and T2 lines show approximate locations of published He apatite horizontal transects (House et al., 2001). Expected pediment exposures are mapped in yellow based on preliminary field reconnaissance and DEM analysis using a 7° slope mask (Twidale, 1981) derived from 1/3 arc-second National Elevation Data Set (USGS). Cross section A-A’ is shown in figure 5.

Figure 2. Mean corrected He apatite ages from new horizontal transect. Errors are 1σ amongst data closest to cross section. Total exhumation from Al in hornblende data (Nadin and Saleeby, 2008) is drawn as thickness above smoothed modern topography assuming 1 kb ≈ 3.3 km. ~5 km additional exhumation of the GVB and western SNB relative to the eastern SNB is neither explained by low Cenozoic erosion rates nor the Cenozoic west-down tilt model, and requires >5 km of Cretaceous exhumation along the San Joaquin River.