geochronology for Upper Cretaceous deposits in Arkansas and Texas offers another method of dating geologic events in these areas and relating them to events elsewhere.

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Chemical Changes Associated with Propylitic Alteration of Two Ash-Flow Tuffs, Datil-Mogollon Volcanic Field, New Mexico

Large-scale propylitic alteration of two texturally distinct, Oligocene ash-flow tuffs has been investigated: the crystal-poor, one-feldspar, rhyolitic A-L Peak Tuff and the crystal-rich, two-feldspar, rhyolitic to quartz latitic Hells Mesa Tuff. Initial development of a petrographic criterion with which to separate samples into groups experiencing varying degrees of alteration was followed by univariate and multivariate statistical analyses of major and trace element data, including U and Th, to identify chemical trends accompanying alteration. The extent of alteration a sample displays can be petrographically characterized by several variables including the amount of replacement of the groundmass and feldspar phenocrysts with secondary minerals, the degree of bleaching of the groundmass and the appearance of the mafic minerals.

Both the A-L Peak Tuff and the Hells Mesa Tuff showed increases in K_2O, Rb, and FeO, increases in the Fe^{+2}/Fe^{+3} ratio, decreases in Th, and no systematic trend in U, Nb, or Zr with alteration. The two units displayed opposite behavior with alteration for MnO, Y, and Sr. Total iron, Al_2O_3, Fe_2O_3, TiO_2, MgO, CaO, and Na_2O content showed a trend in one unit but not in the other. The mobility with alteration of Th, considered to be immobile in most geologic processes, may have been caused by the reducing environment of the prophylitic process. Such a reducing system might also explain the immobility of U during propylitization.

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Volcanism and Uranium Mineralization at Spor Mountain, Utah

Uranium-beryllium-fluorine mineralization at Spor Mountain in western Utah accompanied basin-range faulting and alkali rhyolite volcanism after major episodes of caldera-related volcanism had ended. Volcanism began about 42 m.y. ago with eruption of intermediate-composition flows, breccias, and tuffs from small central volcanoes, and culminated with eruption of intermediate-composition ash flows and subsidence of the Thomas caldera about 39 m.y. ago. Intermediate-composition volcanism was accompanied by base- and precious-metal mineralization. Eruption of rhyolitic ash flows 38 to 32 m.y. ago largely filled the Thomas caldera; some of these eruptions caused subsidence of the Dugway Valley cauldron. Alkali-rhyolite volcanism, basin-range faulting, and uranium-beryllium-fluorine mineralization began at Spor Mountain about 21 m.y. ago, at least 11 m.y. after the last cauldron subsidence. Most faulting and mineralization had ended by 6 to 7 m.y. ago, when voluminous alkali rhyolite was erupted in the Thomas Range.

Extensional tectonism was the probable cause of both alkali-rhyolite volcanism and uranium-beryllium-fluorine mineralization at Spor Mountain. Vents developed along basin-range faults and fault intersections at 21 m.y. and 6 to 7 m.y. ago, and mineralizing fluids rose through a plumbing system of vents and faults after eruption of tuff and alkali rhyolite 21 m.y. ago. Mineralizing fluids invaded faults in Paleozoic rocks and deposited uraniferous fluorite; they pervaded dolomite clast-rich tuff, which is interleaved between relatively impermeable strata, and deposited uranium in the structures of fluorite and opal and beryllium in bertrandite. Precipitation of uranium and beryllium occurred in response to breakdown to beryllium fluoride, uranium fluoride, and uranium-silica complexes as fluorite and silica were precipitated from cooling fluids. Uranium of magmatic origin in glassy tuff and that added by hydrothermal fluids was remobilized by ground water to form secondary concentrations in tuff and tuffaceous sandstone; such concentrations comprise minable deposits at the Yellow Chief mine.

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Eocene Erosional "Surface" and Its Relation to Onset of Basin-Range Faulting

The widespread (2×10^5 km^2) infravolcanic, Eocene, allegedly planar "surface" in the Basin-Range (B/R) province is universally considered to indicate long-lasting erosion ("peneplanation"?) on vertically immobile crust deformed during the Laramide orogeny. This allegedly manifests secular tectonic stability between Laramide and B/R orogenies. Faults cutting this "surface" and the volcanic rocks overlying it are widely believed to demonstrate the onset of B/R faulting. I doubt this because: (1) the "surface" is not everywhere planar; its intrarange topographic relief exceeds 0.1 km; (2) its observed remnants lie on modern B/R range blocks; planar remnants of this surface may be parts of pediments formed on adjacent Eocene B/R ranges as regionally temporal but not necessarily widespread interrange hypsometric correlatives; (3) its unobserved alleged remnants in buried basin blocks may be depositional; (4) the pediments formed in warm, humid climates which possibly produced pedimentation rates high with respect to Eocene B/R range uplift rates, and few pediment gravels because of intense chemical weathering of mostly Paleozoic limestones; (5) in at least four B/R basins, the deeply buried (depositional) surfaces lie on drilled Eocene continental deposits over 2 km thick, but no Eocene deposits occur on adjacent B/R ranges between the Oligocene ignimbrites and the deeply eroded Paleozoic strata, thus indicating contemporaneity of B/R range uplift and adjacent B/R basin sinking in Eocene; and (6) the "surface" had been and was being formed up to the time of Oligocene volcanism. I conclude that the alleged Eocene "surface" was not one widespread static surface, but many local dynamic surfaces, formed in equilibrium with major Eocene B/R tectonism; throws of this "surface" are not necessarily manifestations of the onset time of B/R faulting.

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Geology and Volcanic Rocks Calera–Del Nido Block, Chihuahua, Mexico: Uranium Potential of Region

The Calera-del Nido block extends north from Chihuahua City for 140 km and from Highway 45 west to the next major valley. The block has a steep east-facing scarp and more gentle west-facing slopes. In Majalca Canyon, a rhyolite flow dome (oldest), rhyolite tuff, boulder conglomerates, and a felsic lava flow (Almireces volcanics, next oldest), and andesite-basaltic andesite flows (4+ km thick, Penas Azules volcanics) underlie a basal 45-m.y. old rhyolite tuff of the Rancheria volcanics. Above this, the Rancheria includes the Picos Gemelos andesite