Evidence of the K-Pg Impact in California

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Empirical evidence and modeling indicate that the following events occurred as a result of the K-Pg impact at Chicxulub, Mexico: Impact blast, ejecta fallout, tsunami sequences, acidic aerosol generation and rain-out. We theorize that evidence of these events is preserved in the sedimentary record in California.

Paired clay-rich “melt ejecta” and Iridium-rich “fireball” layers occur globally (Pollastro and Bohor, 1993; Evans and others, 1994; Smit, 1999; Croskell and Collins, 2002). Impact-tsunami deposits are documented in the Gulf of Mexico (Yancey, 1997; Bralower and others, 1998). Elsewhere, tsunamis would likely be generated by seismically induced submarine landslides along the Atlantic and Pacific coasts (Norris and others, 2000; Busby and others, 2002), and possibly by antipodal geoid displacement (southeast Asia).

Researchers have quantified a volumetric-range for acidic aerosols generated by the K-Pg impact into Yucatan’s anhydrite target rocks (D’Hondt and others, 1994; Guangqing and others, 1994; Lyons and Aherns, 2002; Kring, 2007). The estimated volume of acid is deemed sufficient to have produced, via enhanced weathering, the “spike” in sea-water strontium isotope values across the K-Pg boundary (Martin and Macdougall, 1991; MacLeod and others, 2001; Kring, 2007). These acidic solutions would likely reside in basins and lagoons until neutralized.

In California (and elsewhere), Paleocene rocks are characterized by kaolinite. Examples include: the Paleocene Simi Conglomerate, Silverado (Sutherland, 1935; Engel, 1959; Engel and others, 1959; Schoellhamer and others, 1981), and Goler (Dibblee, 1952; Cox, 1982; Cox, 1987) Formations; and basal units of the “Eocene” Ione (Allen, 1929; Creely and Force, 2007), Walker (Bartow and McDougall, 1984), and Maniobra (Crowell and Suzuki, 1959; Squires and Advocate, 1986; Ingersoll and others, 2014) Formations. Features common to these formations include laterization, pisolitic claystone, kaolinitized sediment and basement (saprolite), and lignite.

The classical interpretation is that these lateritic “paleosols” result from an extended period of weathering in a warm, humid environment (Peterson and Abbott, 1973; Peterson and Abbott, 1975; Abbott and others, 1976; Retallack, 1981; Abbott and others, 1993; Kraus, 1999). However, the laterite-bearing Silverado Formation and Simi Conglomerate are bracketed between Danian and Maastrichtian marine strata (Saul, 1983; Miller and Busch, 2016), which suggests a period of lowered sea level — and a cooler, drier climate.

We propose a model in which the observed intensive corrosion and kaolinitization of sediment and basement resulted when impact-generated acidic solutions collected in and saturated sediment-filled fluvial channels, basins, and lagoonal environments.

In this model, economic clay deposits in the Alberhill area (Sutherland, 1935; Engel, 1959; Engel and others, 1959) represent sediment and basement variably altered by ponded acidic run-off. The Claymont Clay Bed, which consists exclusively of kaolinite and angular sub-mm quartz (Schoellhamer and others, 1981), may represent a deposit from a down-range ray of the clay-rich K-Pg impact "ejecta layer."

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