

GEOCHRONOLOGIC AND PALEOCLIMATOLOGIC INTERPRETATIONS OF PLIOCENE INTERTRAPPEAN PALEOSOLS, TAOS PLATEAU, NEW MEXICO

Gage Richards Lamborn¹, Victor French² and Kevin M Hobbs³

¹Student University of New Mexico Valencia, 280 La Entrada, Los Lunas, NM, 87031, glamborn@unm.edu

²Lecturer II UNM-Valencia, 280 La Entrada Rd, Los Lunas, NM, New Mexico, 87031

³Assistant Professor of Geology UNM-Valencia, 280 La Entrada Rd, Los Lunas, NM, 87031

In northern New Mexico on the Taos Plateau there are a series of basalt lava flows that formed at ~4 Ma. Atop some of these lava flows, sediments were deposited and over time soils formed in these sediments. These soils were subsequently buried by later lava flows, becoming encased and incorporated into the rock record as paleosols. In this study, our goal is to determine the climate conditions under which these soils formed, the duration of pedogenesis, and the overall geomorphic setting of the Taos Plateau during the Pliocene epoch. To do this, we analyzed the elemental composition of the paleosols with XRF spectroscopy and color indexed the paleosols using the Munsell soil color chart. We then used these data to perform a geochemical climate analysis on the samples, the results of which are incongruent with all other paleosol characteristics. In addition to this, we obtained thin-sections of the paleosols and used a polarizing light microscope to investigate the individual grains so that we could study the mineral composition and micromorphological features found within the paleosols. Paleosol B horizons are dominated by silt-sized quartz and sand-sized primary minerals ranging from 20 μ m – 1mm in diameter respectively. Since quartz is unlikely to be formed in the silicate series for basalt, we interpret these grains to have been delivered via eolian processes during pedogenesis. Our results suggest that these paleosols formed in a semi-arid environment, similar to what is found in present day New Mexico. The presence of stage III-V pedogenic carbonate horizons suggest a duration of pedogenesis of up to 10⁶ years under reasonably stable semi-arid paleoclimate conditions. Within several of the paleosol layers we observed inflationary horizons with well-preserved desert pavement. Radiometric dating of encapsulating basalts will provide further constraints on duration of pedogenesis and timing of pedogenic events.

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