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PALEOSOLS OF THE COLUMBIA RIVER BASALT GROUP AS A WINDOW INTO THE HISTORY OF MIOCENE CLIMATE AND CASCADE UPLIFT

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The Miocene Columbia River Basalt group (CRBG) in the inland Pacific Northwest is the most recent terrestrial flood basalt province on Earth. While many flows occurred rapidly, some flows were separated in time by periods of quiescence that allowed soils to develop in equilibrium with contemporaneous climate conditions. Subsequent flows preserved these weathering environments, making the Columbia River Basalt Group a detailed repository of Miocene terrestrial paleoclimate data. We studied differences in weathering intensity in a time series of CRBG paleosols spanning the Middle to Late Miocene to identify long-term climate change trends. We identified basalt contacts in the field using a combination of published maps and *in situ* pXRF measurements of discriminant elements. In addition to excavating, cleaning, describing, and sampling each paleosol, we also used structure from motion photogrammetry to generate a 3D model of each contact. We determined the degree of weathering for each paleosol using multiple lines of evidence: observations in the field, thin section observations, geochemical mass balance calculations from WDXRF measurements of weathered basalt samples, and the identification of secondary clay minerals via powder XRD. We observe a significant decrease in weathering with time, with highly weathered paleosols developed on the Grande Ronde Basalt and the Lookingglass member of the Wanapum Basalt, and comparatively unweathered paleosols developed on the younger flows of the Saddle Mountains Basalt. A transitional period between these extremes is evidenced by moderate weathering on the 15.0 Ma Frenchman Springs member of the Wanapum Basalt covered by ~13 Ma Umatilla member of the Saddle Mountains Basalt. Two plausible explanations for this decrease in weathering are: (1) global cooling following the peak of the Mid-Miocene climate optimum, and (2) local orographic aridification caused by the uplift of the central Cascades. Because pedogenic weathering in the inland Pacific Northwest is currently limited by moisture rather than by temperature, we propose that Cascade uplift would have been a more effective mechanism for reducing paleosol weathering, implying that Cascade uplift was completed between 15 and 13 Ma.

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T155. Recent Advances in Soil and Paleosol Science
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