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DECREASE IN WEATHERING OVER TIME OBSERVED IN PALEOSOLS OF THE COLUMBIA RIVER BASALT GROUP, SE WASHINGTON AND NE OREGON, USA

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Flood basalts of the Columbia River Basalt Group erupted in the middle to upper Miocene between 16.8 and 5.5 Ma, covering 210,000 km2 of southeast Washington, northeast Oregon, and west central Idaho. Between flows, paleosols developed, reflecting environmental conditions at the time they formed before being covered by basalts from subsequent eruptions. We can compare soils and how they changed through time. We focused on paleosols formed atop three different basalt flows: (1) The Sentinel Bluffs member of the Grande Ronde N2 basalt (exposed at the surface between ~15.6 and 15.0 Ma), (2) the Frenchman Springs member of the Wanapum Basalt (exposed at the surface between 15.0 and ~13.0 Ma) and (3) the Martindale flow of the Ice Harbor member of the Saddle Mountains Basalt (exposed at the surface between ~8.5 and 5.5 Ma)

For each site, we excavated, cleaned, and photographed the outcrop, made 3D models of the sites, and collected samples for thin sections and geochemical analysis. We observed a decline in weathering indicators between 15.0 and ~13.0 Ma, and between ~13.0 and 5.5 Ma. The thickness of the soil (the distance between the flow contacts and the unweathered parent material) decreased from ~4 meters on the Sentinel Bluffs basalt to less than a meter on the younger Martindale flow. Paleosols developed on the Sentinel Bluffs were extremely red and sub-friable while as the soil material atop the Martindale flow is grey and the soil morphology exhibits lithified columnar aggregates. In the thin section, the older soils were clay-dominated while clay was largely absent in upper-Miocene basalts. All sites showed extensive depletion of mobile base cations (Na, K, Ca, Mg), as chemical analysis on samples taken from the contacts showed an average depletion of ~75% for Sentinel Bluffs while the value was ~85% for the Martindale flow.

The limited weathering exhibited on the flowtops of younger contacts reflect changes in climate on either a global or regional scale. The ending of the Mid Miocene Climatic Optimum means upper Miocene basalts developed in a cooler and drier climate than earlier flows. Limited precipitation due to the development of the Cascade volcanic arc could also reduce the chemical weathering of a younger basalt.

Session No. 26--Booth# 33

T27. Undergraduate Research (Posters)
Thursday, 16 May 2024: 9:00 AM-5:30 PM

Grand Ballroom (Davenport Grand Hotel)

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