ABSTRACT FINAL ID: T43K-02;

TITLE: Mantle dynamics beneath the Pacific Northwest and the generation of post-20 Ma volcanism

SESSION TYPE: Oral

SESSION TITLE: T43K. The Origin of Intraplate Volcanism: Hotspots, Nonhotspots, and Large Igneous Provinces I

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ABSTRACT BODY: The Pacific Northwest (PNW) has a complex recent tectonic history and over the past ~17 Ma has played host to several major episodes of intraplate volcanism. These include the Steens/Columbia River flood basalts (CRB) and the striking spatiotemporal trends of the Yellowstone/Snake River Plain (Y/SRP) and High Lava Plains (HLP) regions. Several different models have been proposed to explain these features, which variously invoke the putative Yellowstone plume, the rollback and steepening of the Cascadia slab, extensional processes in the lithosphere, or a combination of these. Here we integrate seismological, geodynamical, petrological, and geochemical results from the multidisciplinary HLP project and associated efforts related to EarthScope data to propose a conceptual model for mantle dynamics beneath the PNW and the relationships between mantle flow and surface tectonomagmatic activity. The model invokes rollback subduction as the main driver for mantle flow beneath the PNW; a major pulse of upwelling due to the initiation of rollback drove melting associated with the Steens/CRB volcanism and continuing trench migration enabled hot, shallow melting beneath the HLP. A buoyant mantle upwelling is required to explain the Y/SRP volcanism, but subduction-related processes likely played a role in controlling its timing and location. This conceptual model makes predictions that are broadly consistent with seismic anisotropy measurements, tomographic velocity models, geodynamical modeling experiments, petrological constraints, and geochemical observations.

KEYWORDS: [8120] TECTONOPHYSICS / Dynamics of lithosphere and mantle: general, [8137] TECTONOPHYSICS / Hotspots, large igneous provinces, and flood basalt volcanism.

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Additional Details

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