



## **Western U.S. Volcanism due to Intruding Hot Oceanic Mantle Driven by Ancient Farallon Slabs**

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The origin of intraplate volcanism, like that related to the Yellowstone Volcanic Province, remains debated. One important reason is the lack of a clear understanding of the associated mantle dynamics. We reconstruct the mantle thermal states beneath the western U.S. since 20 million years ago using an inverse geodynamic model with data assimilation. The model simultaneously satisfies the past subduction kinematics around the western U.S., present mantle tomographic image, observed seismic anisotropy, and its volcanic history. We find that volcanisms in both the Yellowstone Volcanic Province and the Basin & Range Province correspond to similar eastward intruding oceanic mantle driven mostly by the sinking Farallon slab below central-eastern U.S. The hot mantle forming the Columbia River flood basalt and subsequent Yellowstone-Newberry hotspot tracks first enters the western U.S. through tears within the Juan de Fuca slab. Subsequent coexistence of westward asthenospheric flow above the retreating Juan de Fuca slab and eastward propagating mantle beyond the back-arc region reproduces the bifurcating hotspot chains. A similar but weaker heat source intrudes below the Basin & Range around the southern edge of the slab, and can explain the diffuse basaltic volcanism in this region. This thermal history of intraplate volcanism does not require a deep mantle plume.