Dinner Creek Tuff Eruptive Center, eastern Oregon

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Understanding of the Yellowstone hotspot and its connection to flood basalts of the Columbia River Basalt province (western and northwestern USA) has grown tremendously over the past decades since the model was first proposed in 1972. Despite strong support for a plume origin of the entire Yellowstone-Columbia River Basalt magmatic province, new non-plume models have emerged to explain early flood basalt volcanism.

Unresolved issues of the early flood basalt stage include the location of crustal magma reservoirs feeding these voluminous eruptions and to what extent these were associated with contemporaneous silicic reservoirs.

This study focuses on the newly defined 15 to 16 million-year-old Dinner Creek Tuff Eruptive Center that overlaps in time and space with flood basalt volcanism of the Columbia River Basalt Group. New work on distribution, lithologic variations, geochemical compositions, and eruption ages indicates that the extensive Dinner Creek Welded Tuff (herein Dinner Creek Tuff) and associated mapped and unmapped ignimbrites include a minimum of four discrete cooling units that spread out over an area of approx. 25,000 square kilometers.

Widespread fallout deposits in northeast Oregon and the neighboring states of Nevada, Idaho, and Washington have now been compositionally correlated with the redefined Dinner Creek Tuff. Compositional coherence between the ignimbrite sheets and fallout deposits indicate a common source, herein referred to as the Dinner Creek Tuff eruptive

center (DITEC).

Major and trace element compositions of the more mafic components match the compositions of nearby Grande Ronde Basalt (GRB) flows and dikes. Compositional similarities between cognate mafic components and GRB flows are direct evidence for coeval mafic and silicic magmatism linking DITEC and GRB eruptions.

Furthermore, finding GRB magmas as co-eruptive component in Dinner Creek Tuff suggests that GRB magmas were stored beneath Dinner Creek Tuff rhyolites, thereby providing the first direct evidence for the location of a storage site of Columbia River Basalt magmas. Shallow crustal rhyolitic reservoirs active during approx. 15 to 16 million years ago that yielded tuffs of the DITEC and other surrounding contemporaneous and widespread rhyolites of the area likely imposed control on timing and place of eruption of Columbia River Basalt Group lava flows.

More information: Large, persistent rhyolitic magma reservoirs above Columbia River Basalt storage sites: The Dinner Creek Tuff Eruptive Center, eastern Oregon
Martin J. Streck et al., Portland State University, Portland, Oregon, USA. Published online on 17 Feb. 2015; dx.doi.org/10.1130/GES01086.1

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