Examining “The Room Problem” through geochronology and geochemistry analysis of zircon and titanite from the Western Idaho Shear Zone, USA
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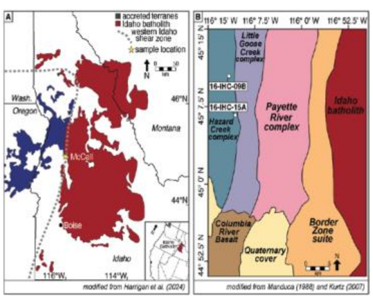
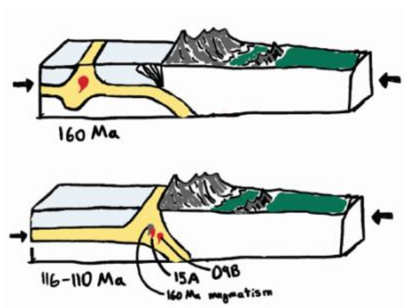
When oceanic crust slides underneath continental crust at a tectonic boundary, the intense pressure generates magma that rises to the Earth’s surface and forms an arc of igneous islands. If the oceanic crust keeps moving, this island arc will eventually collide with the continental crust, producing magma and deforming the rocks. Despite the contractional nature of this terrane, magma often finds a way to move upwards and solidify at the surface – this is known in geology as the “Room Problem.”

To address this problem, we analyzed the temporal relationships between magmatism and deformation in the Western Idaho Shear Zone (WISZ), a region where the present-day Pacific Northwest collided with the rest of North America. The minerals zircon and titanite, which reliably record the magmatic and deformational history of the rocks they are found in, allow us to reconstruct this geologic history. We dated WISZ minerals from two sample locations using an LA-ICP-MS instrument, which takes advantage of the uranium-lead radioactive decay scheme that occurs in zircon and titanite to provide reliable ages. In addition, we measured the concentrations of various elements present in the minerals, which gives supporting information about their environment of formation.

The age and chemistry data suggest that two episodes of magmatism in the WISZ occurred 160 and 115 million years ago, and that high temperature deformation was ongoing throughout this entire time. These findings indicate that deformation can facilitate magmatism in contractional tectonic settings; this information expands our understanding of the relationship between processes involved in the Room Problem. In addition, because the collision of the Pacific Northwest with the rest of North America was a continent-building event, our data provide insight into the timescales involved in continental formation. Within the field of geology, this data can be used to interpret geologic history in other locations, and can be applied in other scientific disciplines to understand past climates and evolutionary history.

Figures





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