



AWSFL008-DS3

NSF Award Abstract
- #0208456

**Following the Water: H₂O in Subducting Slabs
and Mantle Wedges**

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Abstract

Following the Water: H₂O in Subducting Slabs and Mantle Wedges EAR-0208456 PI: Holloway

H₂O (water) greatly influences many processes in the Earth. It is the most important factor in determining if a volcanic eruption will be explosive or not. The presence of small amounts of water in the minerals making up the Earth's mantle can weaken normally rigid minerals allowing the mantle to flow at geologically high velocities. In this project, we will conduct experiments at high temperatures and pressures to determine which hydrous minerals, if any, can be present in subducting oceanic crust, and at what depths those minerals dehydrate. Such dehydration ultimately results in the formation of water-rich magmas that often erupt very explosively. We also will do experiments to determine how much water can dissolve in the crystal structure of the common minerals (olivine, pyroxene, garnet) in the Earth's upper mantle that do not contain specific structural sites for H₂O. The presence of even small amounts of water in such minerals is important because the minerals are so abundant in the Earth's mantle that the aggregate water contained in them may equal one or more times the total volume contained in the world's oceans. Additionally, the effect of dissolved water in those minerals causes drastic changes in their strength (or viscosity) and the velocity of seismic waves travelling through the mantle. We will use a variety of modern very high-pressure devices and advanced techniques for chemical analysis to complete the objectives of this project.

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