



AWSFL008-DS3

**NSF Award Abstract**  
**- #0215641**

**CSEDI: Collaborative Research: Thermal,  
Petrological, and Seismological Study of  
Subduction Zones**

**NSF Org** EAR

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**Program Manager** Robin Reichlin  
EAR DIVISION OF EARTH  
SCIENCES  
GEO DIRECTORATE FOR  
GEOSCIENCES

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**NSF Program** 1574 GEOPHYSICS

**Field Application** 0000099 Other Applications NEC

**Program Reference Code** 0000,1031,OTHR,

## Abstract

EAR-0215641 Bradley Hacker

Most of the world's earthquakes occur in subduction zones where oceanic lithosphere descends into the mantle. Intermediate-depth earthquakes, which occur at 40-300 km depth, and the transport of water into the mantle are intimately linked to metamorphic reactions in the subducting lithosphere. The researchers propose to better understand subduction-zone processes by integrating seismological observations with thermal and petrological models. In order to test the dehydration-embrittlement hypothesis for intermediate-depth seismicity, the investigators will construct two-dimensional kinematic-dynamical thermal models for a set of subduction zones that span a range in subduction parameters and that include regions with significant along-strike variations in observed seismicity. Events in global and regional seismicity data sets will be systematically evaluated and relocated in order to test the hypotheses that (a) upper seismic zones are confined to the subducting mafic crust, (b) lower seismic zones are related to dehydration reactions in the subducting mantle, and (c) the forearc mantle is aseismic. Petrologic models of subducting lithosphere will be created using new phase diagrams and rock property data bases and the resulting layered seismic-velocity models will be tested against observed dispersion of seismic body waves. The amount and distribution of forearc mantle hydration (serpentinization) will be quantified by integrating seismological observations with mineral physics calculations.

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