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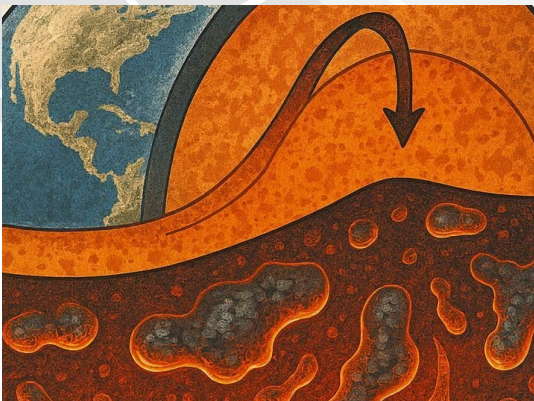
2026.2.27 (Fri.) 16:30 ~

### Venue: Meeting Room #486

Science Research Bldg. 1, 4th floor.  
Ehime Univ.

#### Keywords

1. (Al, H)-bearing stishovite
2. post-stishovite transition
3. mid lower-mantle scatterers



## Unraveling the Complex Features of the Seismic Scatterers in the Mid-Lower Mantle Through Phase Transition of (Al, H)-Bearing Stishovite

Seismic studies have identified various small-scale scatterers in the mid-lower mantle, characterized by low  $V_s$  anomalies and complex depth variations ranging from 700 to 1900 km. Constraining the mechanisms of formation for these features is essential for understanding mantle dynamics and the chemical evolution of subducting slabs. While previous research suggests these scatterers are linked to the structural phase transition of  $\text{SiO}_2$  from stishovite to post-stishovite in subducted oceanic crust, earlier experiments on (Al, H)-bearing stishovite were primarily conducted at high pressures and a constant temperature of 300 K. This limitation has hindered our ability to accurately quantify the relationship between compositional variations and the depth of seismic scatterers under mantle-relevant conditions. In this study, we investigated the phase transition of (Al, H)-bearing stishovite across four distinct compositions at simultaneously high pressure and temperature (P-T) conditions using a combination of Raman spectroscopy and X-ray diffraction. Our experimental results suggest that the incorporation of 0.01 a.p.f.u. Al into stishovite, with an H/Al ratio of approx. 1/3, lowers the transition pressure by 6.7(3) GPa. Furthermore, we determined that the Clapeyron slope of this transition is nearly unaffected by changes in Al content, maintaining a value of 12.2–12.5(3) MPa/K. By integrating these P-T constraints, we demonstrate that variations in Al content ranging from 0 to 0.07 a.p.f.u. in  $\text{SiO}_2$  can effectively explain the observed depth distribution (800 to 1,900 km) of seismic scatterers in the circum-Pacific region. These findings provide critical experimental evidence for the origin of mid-lower mantle heterogeneity and offer new insights into the complex dynamic processes governing subducted oceanic crust.