1. Introduction

Seismic “X” discontinuity:
- Depth range: 240-340 km
- Shear impedance increase: 3-7.5%
- Widespread, but not global
- Large depth variation
- Potential relationship to ortho-enstatite (Oen) transitions

![Diagram of mineral volume fractions in the mantle's top 1000 km based on the pyrolite model (Frost, 2008)]

2. Methodology

Nuclear Resonant Inelastic X-ray Scattering: APS Sector 3-ID
X-Ray Diffraction: APS Sector 3-ID & ALS Sector 12.2.2

First-principle Density Functional Theory calculation

![Diagram of NRXS and XRD setup](image)

3. Results

![Graph showing variations in sound velocities](image)

4. Conclusions

- Experiments done at high-pressures to determine $V_p$, $V_s$, and density of iron-bearing enstatite
- Phase transition occurs around 12 GPa (360 km depth), characterized by low velocities
- Note global models do not agree – regional studies are crucial to understand chemistry
- Enstatite-rich rocks not as low as active tectonic regions, but lower than stable regions

Selected references


Acknowledgements