Multidisciplinary Impact of the Deep Mantle Post-perovskite Phase Transition

All minerals undergo phase transitions with increasing depth into the Earth. The changes in material properties across such transitions often give rise to detectable contrasts in seismic velocities and density. Strong velocities inhomogeneities are detected by seismology near the mantle's base, in a region several hundred kilometers thick called the D" region. Many processes could contribute to create these seismic anomalies at the boundary of two chemically distinct regions, the iron core and the silicate mantle. In 2004 experiments and theory demonstrated the existence of a phase transition in MgSiO_3-perovskite, the major lower mantle mineral. Computations now predict that such phase transition can produce some of the enigmatic seismic anomalies observed in the D" region. These findings suggest that the new post-perovskite phase should be provide a new paradigm for interpreting the properties of this region. Multi-disciplinary scientific workshops held since this discovery and special sessions at 2004 Fall, 2005 Spring and Fall meetings of the American Geophysical Union are just the initial indicators of the broad impact across many fields that this intriguing new discovery is having.