Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Seismic velocity and attenuation structures in the Earth's inner core

By

Wen-Che Yu

I study seismic velocity and attenuation structures in the top 400 km of the Earth's inner core along equatorial paths, velocity-attenuation relationship, and seismic anisotropy in the top of the inner core beneath Africa. Seismic observations exhibit an "east-west" hemispheric difference in seismic velocity, attenuation, and anisotropy. Joint modeling of the PKiKP-PKIKP and PKPbc-PKIKP phases is used to constrain seismic velocity and attenuation structures in the top 400 km of the inner core for the eastern and western hemispheres. The velocity and attenuation models for the western hemisphere are simple, having a constant velocity gradient and a Q value of 600 in the top 400 km of the inner core. The velocity and attenuation models for the eastern hemisphere appear complex. The velocity model for the eastern hemisphere has a small velocity gradient in the top 235 km, a steeper velocity gradient at the depth range of 235 - 375 km, and a gradient similar to PREM in the deeper portion of the inner core. The attenuation model for the eastern hemisphere has a Q value of 300 in the top 300 km and a Q value of 600 in the deeper portion of the inner core. The study of velocity-attenuation relationship reveals that inner core is anisotropic in both velocity and attenuation, and the direction of high velocity corresponding to that of high attenuation. I hypothesize that the hcp (hexagonal close packed) iron crystal is anisotropic in attenuation, with the axis of high velocity corresponding to that of high attenuation. Anisotropy in the top of the inner core beneath Africa is complex. Beneath eastern Africa, the thickness of the isotropic upper inner core is about 0 km. Beneath central and western Africa, the thickness of the isotropic upper inner core increases from 20 to 50 km. The velocity increase across the isotropic upper inner core and anisotropic lower inner core boundary is sharp, laterally varying from 1.6% - 2.2%. The attenuation model has a Q value of 600 for the isotropic upper inner core and 150 to 400 for the anisotropic lower inner core.

Date: May 7, 2007 **Program**: Geosciences
Time: 01:00 PM **Dissertation Advisor**: Lianxing Wen
Place: Earth and Space Science Building, room 123