AOB & COE Seminar

Dr. Laura Wallace (Institute of Geological and Nuclear Sciences)

Title: GPS evidence for subduction zone coupling, tectonic block rotations, and slow slip events in the North Island, New Zealand

Research Center for Prediction of Earthquakes and Volcanic Eruptions
August 25, 2005 (Thu) 14:00-16:00
Lecture Room #1 (AOB annex)

Abstract :

The GPS velocity field in the North Island, New Zealand is dominated by the long-term tectonic rotation of tectonic blocks and elastic strain from stress build-up on faults in the region, particularly the Hikurangi subduction zone. We simultaneously invert GPS velocities, earthquake slip vectors, and geological fault slip rates in New Zealand for the angular velocities of elastic crustal blocks and the spatially-variable degree of coupling on faults separating the blocks. This approach allows us to estimate the distribution of interseismic coupling on the subduction zone interface beneath the North Island, and the kinematics of tectonic rotation of the eastern North Island. In the North Island, we have found that tectonic blocks rotate rapidly (~2-4 degrees/Myr) about nearby poles of rotation, and this rotation accommodates much of the margin-parallel component of motion between the Pacific and Australian plates. We also suggest a new driving mechanism for the rotation of the eastern North Island. I will also present some GPS results from New Zealand's GeoNet network, which is an extensive network of continuous GPS instruments and seismometers currently being installed throughout NZ. Approximately 20 continuous GPS sites exist in the eastern North Island, several of which have experienced displacement due to slow slip events on the Hikurangi subduction zone. As many as 80 continuous GPS sites will be installed within the next several years to monitor and document transient deformation at the Hikurangi margin. Thus far, we have observed at least 5 different slow slip events, occurring in at least three different locations along the Hikurangi margin, since October 2002. The duration of these events varies greatly, ranging from between 10 days to six months. All of these events appear to occur at the down-dip end of the interseismically coupled portion of the Hikurangi subduction zone.

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