AOB Seminar

講演者名: Emile A. Okal 教授
所　　属: Northwestern University
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講演題目:

SURPRISES FROM THE OKHOTSK SEA DEEP EARTHQUAKE:
From an isotropic component to a minuscule tsunami

The Sea of Okhotsk event of 24 May 2013 is the largest deep earthquake (h = 603 km) ever recorded; with a GlobalCMT seismic moment of 3.95×10^{28} dyn*cm, it is larger than even the 1994 Bolivian earthquake. As part of a systematic investigation of the very-long-period behavior of the source of mega earthquakes, we studied the spectral amplitudes of the gravest normal modes of the Earth, including many overtones. We find that the Okhotsk source does not exhibit any trend towards an increase of seismic moment with period, characteristic of a "hidden" slow component to the source, as evidenced in the case of the 2004 Sumatra earthquake.

Ever since the work of *Bridgman* [1945], it has been suggested that the source of deep earthquakes may somehow be related to variation in crystalline structure now associated with phase transformations in the transition zone, and which would be expressed as implosive isotropic components to their moment tensors. Their identification had fueled passionate debates in the 1970s, but modern work following the 1994 Bolivian earthquake had concluded that such components could not be identified. In the case of the Okhotsk Sea earthquake, we repeat our investigation of the excitation of the radial modes ${}_0S_0$ and ${}_1S_0$, along the exact same lines as for the 1994 event. The simulataneous modeling of their spectral amplitudes resolves both any implosive component and the relevant deviatoric component of the moment tensor. We conclude that the 2013 earthquake features an implosive component amounting to 2% of the scalar moment (but 9% of the lone deviatoric component exciting radial mdoes). An implosive component (albeit of greater amplitude) is also found during CMT inversions with a relaxed zero-trace condition [*M. Nettles*, pers. comm., 2013].

In addition, records of the 2013 event at two DART sensors deployed off the Kurile Island chain feature a weak oscillation of millimetric amplitude, tentitavely identified as a tsunami generated by the event; this constitutes the first such observation from a deep earthquake. Using both standard and normal mode approaches, we justify the order of magnitude of the amplitudes observed. Presently ongoing research uses data from a network of permanent GPS stations in the epicentral area to recover the three-dimensional static displacement generated by the event, and model it under a variety of scenarios. Very preliminary results would tend to rule out an implosive component of the size suggested by the full GlobalCMT inversion, but cannot resolve one way or the other the source obtained from our radial mode study.