GCOE&AOB Seminar

Lecturer: Dr. Martin Reyners (GNS Science, New Zealand)

Title: The three-dimensional distribution of seismic anisotropy in the Hikurangi subduction zone beneath the central North Island, New Zealand

（ニュージーランド北島中央部下・ヒクランギ沈み込み帯における地震波速度異方性の三次元分布）

Date and Time: Nov. 28 (Fri.) 14:00-15:30

Place: Lecture Room #1, Annex of AOB

Abstract:

We use earthquake arrival time data from recent dense deployments of portable digital seismographs in the central North Island of New Zealand in an inversion for 3-D Vp azimuthal anisotropy. The inversion is parameterized with an isotropic component and two azimuthal anisotropy parameters for each node, and local earthquake shear-wave splitting observations are used to define the initial anisotropy model. We interpret the tectonic significance of the resulting 3-D distribution of anisotropy in terms of the 3-D structure of the subduction zone determined by previous studies of seismic velocities (Vp and Vp/Vs) and seismic attenuation (Qp-1). Our results suggest that mantle flow, either within the mantle wedge or below the subducted slab, is not the primary source of anisotropy in the Hikurangi subduction zone. The largest region of anisotropy that we image is within the subducted slab, where anisotropy is consistently trench-parallel and 5-9% in magnitude from 32-185 km depth. Beneath the Taupo Volcanic Zone, there is 1-4% trench-normal anisotropy within 30 km of the surface of the slab, consistent with downdip shearing within a fluid-rich blanket entrained with the motion of the slab. In contrast, only very weak (0-2%) anisotropy is imaged in the region of high temperature partial melt arising from active corner flow in the mantle wedge. Anisotropy within the crust of the overlying plate generally aligns with terranes, suggesting that geological structure is a primary cause, enhanced by fractures and fault systems. Our 3-D distribution of anisotropy is consistent with both local and teleseismic shear-wave splitting results, though our explanations for the shear-wave splitting differ from those previously proposed.

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