GCOE&AOB Seminar

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Date : June 17, 2009 (14:00-15:30)

Place: Research Center for Earthquake and Volcanic Eruption, Annex Bldg, Meeting Room #1

Title: Present-Day Tectonics and Dynamics of the Canada-Alaska Cordillera

Abstract

The North America Cordillera mobile belt has accommodated relative motion between the North America plate and various oceanic plates since the early Mesozoic. The northern half of the Cordillera (Canada-Alaska Cordillera) extends from northern Washington through western Canada and central Alaska and can be divided into four tectonic domains associated with different plate-boundary interactions, variable seismicity, and seismic hazard. We present a quantitative tectonic model of the Canada-Alaska Cordillera based on an integrated set of seismicity and GPS data for these four domains: South (Cascadia subduction region), Central (Queen Charlotte-Fairweather transcurrent region), North (Yakutat collision region), and Alaska (Alaska subduction region). This tectonic model is compared to a dynamic model that accounts for lithosphere strength contrasts and internal/boundary force balance. We argue that most of the Canada-Alaska Cordillera is an orogenic float where current tectonics are mainly limited to the upper crust, which is mechanically decoupled from the lower part of the lithosphere. Variations in deformation style and magnitude across the Cordillera are mostly controlled by the balance between plate-boundary forces and topography-related gravitational forces. In particular, the strong compression and gravitational forces associated with the Yakutat collision zone are the primary driver of the complex tectonics from eastern Yukon to central Alaska, resulting in crustal extrusion, translation, and deformation across a 1500x1000 km2 region. This tectonic-dynamic model can be used to provide quantitative constraints to seismic hazard models. We present a simple example of mapping MW=7 earthquake return periods throughout the Cordillera.

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