AOB Seminar

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所　　属: U.S. Geological Survey
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場　　所: 地震・噴火予知研究観測センター　A 棟 3 階 第二講義室
講演題目&要旨：

Water Release from Cold Serpentinized Forearc Mantle During Subduction Associated with Warming Changes in Incoming Oceanic Plate Thermal Structure and Plate Boundary Kinematics: New Insights into Non-Volcanic Tremor (NVT) and Low-Frequency Earthquakes in Subduction Zones

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Kirby, Wang, and Brocher (Earth Planets and Space, 2014) show how the change in kinematics of the California margin from subduction motion to continental transform motion with the birth and growth of the San Andreas Fault System (SAFS) beginning at about 33 Ma BP likely led to a warming of the former forearc mantle and the release of water from serpentinized mantle by dehydration and a likely increase in fluid pressures along the SAFS. Such a mantle sources of pressurized water gives insights into both the low sliding resistance for the SAFS and the mobilization and ascent of some serpentinized mantle peridotites through the crust. Thermal modeling by others has also shown that changes in the incoming plate age and subduction rate can also lead to warming of the forearc mantle during subduction and subsequent water release. Recent mineralogical and geochemical observations of serpentinite blocks in serpentinize mélange bodies in the San Francisco Bay Area (Uno and Kirby, 2015; Lewis and Kirby, AGU 2015) suggest that these rocks sustained multiple stages of serpentinization that are broadly consistent with this model.

A recent paper by McCrory, Hyndman and Blair (GGG, 2014) suggest that NVT in Cascadia (Fig.1) and other subduction systems tends to occur along the inter-plate thrust boundary just up dip of serpentinized forearc mantle during the subduction of lithosphere of Tertiary age. Kirby (AGU Abstract, 2015) argues that subduction systems heat up and dewater under certain subduction inputs or changes in interplate kinematics, such as when spreading centers approach trenches, a condition that applies to much of the Pacific margins of the Americas. Such a rapid flux of water up dip of warming serpentized forearc mantle may lead to high fluid pressures and low effective normal stresses, low friction, and NVT as a means of accommodating interplate motions.

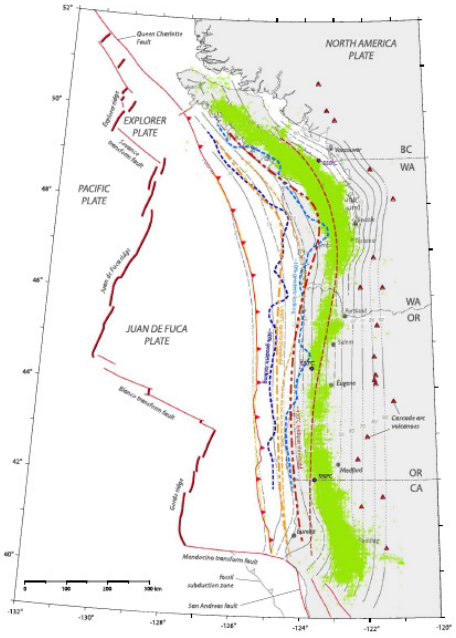

Fig.1 Distribution of non-volcanic tremor in Cascadia (McCrory, Hyndman and Blair, GGG, 2014).