*Session: Seismic Siting for Nuclear Power Plants*

## OBJECTIVE DETERMINATION OF THE GEOMETRY OF THE SHORELINE AND HOSGRI FAULTS, NEAR POINT BUCHON, CALIFORNIA, FROM SEISMICITY RELOCATIONS

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Earthquake locations can illuminate fault structures at seismogenic depth, but their interpretation is often subjective as fault planes are usually interpreted from the earthquake locations by eye. The Optimal Anisotropic Dynamic Clustering (OADC) algorithm [Ouillon et al., JGR 2008] can be used to objectively identify the simplest fault geometry that fits all earthquakes to within the average location uncertainty. The average earthquake location uncertainty is the only parameter, and it is obtained objectively from the location algorithm. There are no parameters that can be tuned. We relocate ~100 earthquakes near Point Buchon using the double-difference program hypoDD [Waldhauser and Ellsworth, BSSA 2000]. Differential arrival times are found from waveform cross-correlation, and all waveforms are inspected for quality. We use the hypoDD SVD solver to obtain reliable location uncertainty estimates. We apply the OADC algorithm, with repeated runs to avoid local minima, and select the solution with the lowest RMS misfit to the earthquake locations. The best-fitting solution consists of just two planes, one corresponding to the Shoreline Fault and one to the Hosgri Fault. These planes are stable over all low-misfit solutions and across catalogs with different hypoDD parameters. The Shoreline plane is near vertical, while the Hosgri plane dips ~70° to the NE. The two planes meet at an angle of ~30°, like the seismicity. There is no objective evidence for any discontinuities or segmentation of the Shoreline Fault at seismogenic depths, as all earthquakes along its known length fall on a single plane to within the location uncertainty. Discontinuities smaller than the location uncertainty of ~1 km may be undetected, but would be too small to be barriers to earthquake rupture [Wesnousky, BSSA 2008]. The Shoreline plane is ~25 km long, and its NW end extends to the mapped trace of the Hosgri Fault, indicating that there is no gap between these faults at seismogenic depths.

*Friday, April 15th / AM Poster / Ballroom B*

*Session: Seismic Siting for Nuclear Power Plants*

## UNANTICIPATED EXCEPTIONAL GROUND MOTIONS AT A NUCLEAR POWER PLANT DURING THE 2007 CHUETSU-OKI, JAPAN, EARTHQUAKE

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The 2007 Chuetsu-oki, Japan, earthquake occurred on July 16 with a moment magnitude (*Mw*) of 6.6. This event is significant as the world's first major earthquake upon a source fault that extends beneath a nuclear power plant. Seven reactors within the Kashiwazaki-Kariwa nuclear power plant experienced much stronger ground motions and longer periods than those anticipated at the time of plant design. In addition, such exceptional ground motions (Anderson, 2010) could not be anticipated from the standard equation for siting of nuclear power plants in Japan. It is therefore important for the seismic safety of all nuclear power plants that the reasons for these underestimates in hazard assessment are investigated by analyzing the observed ground motions. Since the source effects, that are the rupture directivity effect and combination of radiation pattern and high stress drop, have been investigated in detail by Miyake et al. (2010), we next investigated the path effects by modeling a velocity structure and simulating ground motions. We used the Japan Integrated Velocity Structure Model (Koketsu et al., 2008) and the 2008 JNES model for constructing an initial model, and revised it by comparing observed and synthetic seismograms from an aftershock of the Chuetsu-oki earthquake. We then carried out simulations of ground motions at the plant during the mainshock. Preliminary results indicate that the obtained velocity structure can double the amplitudes and response spectra, compared with those by a typical velocity structure for the standard equation for siting of nuclear power plants in Japan.

*Friday, April 15th / 2:15 PM Oral / Ballroom D*