[EE] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS06]CSEP, earthquake forecast testing, and the role of SSE in earthquake occurrence.

convener:Danijel Schorlemmer(GFZ German Research Centre for Geosciences), Naoshi Hirata(Earthquake Research Institute, the University of Tokyo), Matt Gerstenberger(共同), Hiroshi Tsuruoka(Earthquake Research Institute, Tokyo Univ.)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The Collaboratory for the Study of Earthquake Predictability (CSEP) has expanded over the years to many different testing areas hosted at multiple testing centers. One of which is the Japan testing center at the University of Tokyo, operated in collaboration with GFZ Potsdam. Hundreds of earthquake forecast models have been submitted to CSEP and are being tested. New testing metrics were developed and implemented and a lot of progress was made to establish CSEP as an institution that cannot be ignored when issuing earthquake forecasts. Its rigor and independence became the standard in evaluating earthquake forecasts and in reporting on the results.

Although the tests CSEP has conducted have been successful and well-received, they have also shown the limitations of the CSEP approach. What is a sufficient testing period for models? Are time-invarying models really describing the long-term seismic activity? Are long-term models testable at all? Do short-term models provide significant information for the forecasting problem or do they only model aftershock sequences? What other signals should be included in forecasting models to improve them? Do improvements in forecasting models translate into improvements of hazard models? Many aspects of seismic hazard or earthquake forecasting remain inherently untestable if only the model forecasts are tested and not the model ingredients. We propose to create new areas of activity for CSEP, namely targeted experiments that cannot be conducted with the current CSEP software system.

We solicit contributions addressing forecasting models, forecast testing problems, new ideas for CSEP experiments, possibilities of further CSEP developments, ways of expanding CSEP into the hazard and risk domain, and more general views on the forecasting problem. This is aimed at fostering the discussion in the community about further goals of earthquake forecasting experiments.

[SSS06-P05]**Characterization of VLF earthquakes in the Colombian Pacific subduction zone**

Juan Carlos Bermudez[1], *Hiroyuki Kumagai[1] (1.Graduate School of Environmental Studies, Nagoya University)

Keywords:VLF earthquakes, Colombian pacific subduction zone

Colombia located in the northwestern corner of South America is tectonically and seismically active due to the convergence of the Nazca and Caribbean plates as well as the movement of the Choco-Panama and North Andean blocks. Two large earthquakes, the Ecuador-Colombia earthquake in 1906 (Mw 8.4) and the Tumaco earthquake in 1979 (Mw 8.2), occurred in the Colombian subduction zone between the Nazca and South American plates.

Earthquake monitoring in Colombia has been performed using the network of broadband seismometers deployed and maintained by the Colombian Geological Survey (SGC). Very low frequency (VLF) earthquakes, which have been reported in various subduction zones around the world such as Nankai, Cascadia, and Mexico, are important to understand rupture processes in subduction regions because they might increase the stress on faults that are capable of generating large, damaging earthquakes. VLF earthquakes, however, have not been found in the Colombian subduction zone.

In this study, we used continuous data from the broadband seismometer networks in Colombia and Ecuador. Continuous seismograms were filtered in low and high frequency bands of 0.02-0.05 and 2.0-8.0 Hz, respectively, to visually find VLF waveforms in time windows of 40 min. We found a VLF earthquake on February 10 2016, which was characterized by a distinct phase in the low frequency band without visible phases in the high frequency band. The waveforms of this VLF earthquake were used as the template to detect other VLF events in a systematic process using the matched filter technique for continuous data between January 2016 to June 2017. Several events were detected in this procedure and we confirmed that these events are not local ordinary or teleseismic earthquakes by checking the bulletins of SGC, Geophysics Institute of Ecuador, and US Geological Survey.

Power spectral densities of the VLF earthquakes showed higher energy contents in a frequency band of 0.02-0.05 Hz, which corresponds to the dominant frequency band of VLF earthquakes reported by Ito et al. (Science, 2007). We found that the VLF waves propagated from a region near Tumaco in the southwest of Colombia. We performed waveform inversion of five relatively large VLF earthquakes using the SWIFT method (Nakano et al., GJI, 2008) and assuming an initial source location off Tumaco. Our waveform inversion results indicate that these VLF earthquakes were located in the southern Colombian pacific subduction zone, which corresponds to the source region of the Tumaco earthquake in 1979. Our estimated source depths and moment magnitudes ranged between 5 and 45 km and 3.6 and 4.5, respectively, although the accuracy of the depth estimates may not be good. Since we could use data from only a few stations for our inversion, our estimated focal mechanisms were not stable. However, the estimated depth and magnitude ranges and the VLF waveform features are similar to those of VLF earthquakes in Cascadia, Nankai, and Guerrero subduction zones, and the VLF earthquakes found in this study may be generated by Nazca plate subduction processes along the Colombia subduction zone.