[EE] Evening Poster | S (Solid Earth Sciences) | S-CG Complex & General

[S-CG56]Asian Earthquakes, Volcanoes and Tectonics

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The geological structures and tectonics are complex in the Asian region. Many orogenic belts and active faults exist within the Asian continent, and active subductions occur in its surrounding regions. In the east, the Pacific and Philippine Sea plates are subducting beneath East Asia, causing the development of trench-arc-backarc systems. In the southwest, the Indian plate is subducting beneath the Eurasian plate, forming major topographic features, such as the Himalayan mountain chain and the Tibetan Plateau. Due to the intense interactions among the four tectonic plates, large earthquakes take place frequently, such as the 2008 Wenchuan earthquake (M 8.0), the 2011 Tohoku-oki earthquake (M 9.0), the 2015 Nepal earthquake (M 7.9), and the 2016 Kumamoto earthquake (M 7.3). In addition to many arc volcanoes caused by plate subductions, some active intraplate volcanoes exist in Asia, but their origin and relationship with the intraplate tectonics are still not very clear. In this session, we welcome original or review presentations from fields of geology, geophysics, petrology and geochemistry addressing issues of geological structures, seismotectonics, volcanism and geodynamics of the Asia region.

[SCG56-P04]Particle Size Distribution of the active fault zone of Chelungpu fault and its implication for slipping and energetics of large earthquakes

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Keywords:Particle size distribution, Fractal dimension, Faulting mechanism, Fracture energy

The 1999 Mw7.6 Chi-Chi Earthquake occurred and produced ~10m slip along the northern Chelungpu fault in Taiwan. This study tries to estimate the fracture energy in past coseismic events and understands the plausible faulting mechanism within the active fault zone by obtaining the particle size distribution of fault gouge from the Taiwan Chelungpu-fault Drilling Project (TCDP). By means of Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) and ImageJ analysis, we recognize the distinguished fracture and grain size within the 12-cm-black gouge and divide it into six layers. The particle diameter (D) and number of particles (N(D)), displaying as a log power-law distribution, mainly showed two values of fractal dimensions (FD) in the six layers. The first characteristic, including three layers, shows low FD values of ~2.7 and is characterized with big mineral grains and small total particle surface area, while the other shows high values of ~3.0 characterizing with aggregates down to dozens to hundreds of nanometer in size. Coincidentally, one layer of the high FD values has been recognized as the principal slip zone (PSZ) of the 1999 Mw7.6 Chi-Chi earthquake. It seems likely that the high FD layers may be experienced the similar processes during faulting, e.g., thermal pressurization. It is interesting that one high-FD-value layer displays identical textures to the PSZ showing a similar thickness, undeformed massive structure and a similar estimation of the fracture energy of 0.15 MJ/m^2. Our evidence strongly implies that the large slip in the northern Chelungpu fault may be a consequence of the contribution of two PSZs. Finally, given the contribution of estimated fracture energy to the breakdown work which is 1.3%, the huge remaining part of breakdown work will be frictional heat which triggered several dynamic weakening processes such as thermal pressurization and melt lubrication.