

Structure and Mechanism of Phayao Fault Zone: Understanding the origin of 5th May 2014, M_w 6.5, Pan earthquake and its aftershocks

Tuesday 22 May 2018 10:45 (15 minutes)

The 5th May 2014 Chiang Rai earthquake is the largest earthquake in Thailand. The mainshock followed by thousands of aftershocks which located in both Pan segment (PS) and Mae Lao segment (MLS) of Phayao Fault Zone (PFZ). This complication of aftershock pattern leading to the intriguing question about the origin of mainshock whether it's come from MLS or PS. The seismological and electromagnetism methods were integrated to study the PFZ fault zone structure and its earthquakes behavior. We applied the moment tensor inversion to the seismic waveform generated by earthquakes with local magnitude (M_L) greater than 4. The earthquake moment tensor solutions indicate that fault is moving in a horizontal plane as strike-slip faulting. However, because of the non-uniqueness of the solution, using only earthquake moment tensors cannot answer whether those earthquakes were derived from MLS or PS. From regional earthquake analysis, the regional stress field orientation is dominated in NNE-SSW with uniaxial horizontal compression. The combination of fault plan and stress field orientation indicate that MLS segment has higher shear stress than PS. We applied 3-D magnetotelluric (MT) survey (31 sited) around the PFZ to reveal the deep crustal resistivity structure beneath the fault. The most important feature of the subsurface image is the conductive anomalies beneath the MLS. Granitic rock and hot springs in an area suggest that conductive body is fluid-rich rock. This fluid-rich body reduces the normal stress and effective friction along the MLS fault plane. The interpretation of structure and mechanism can be concluded that fault plane of MLS has a high instability in the regional stress field. Also, the fluid underneath MLS also weakens the fault segment by reducing its effective stress friction. The source time function of mainshock presents a multi-stage rupture behavior. Thus, the initial motion of mainshock may start in Pan segment but the main energy of M_w 6.5 was radiated by Mae Lao segment.

Author: Dr NOISAGOOL, Sutthipong (Department of Physics, Faculty of Science, Mahidol University)

Co-authors: Dr AMATYKUL, Puwis (Department of Physics, Faculty of Science, Mahidol University); Dr BOONCHASUK, Songkhun (Geoscience Program, Mahidol University, Kanchanaburi Campus); Prof. SIRIPUNVARAPORN, Weerachai (Department of Physics, Faculty of Science, Mahidol University)

Presenter: Dr NOISAGOOL, Sutthipong (Department of Physics, Faculty of Science, Mahidol University)

Session Classification: A14: Environment

Track Classification: Environmental Physics, Atmospheric Physics, Geophysics and Renewable Energy