CRUSTAL STRUCTURE STUDIES BENEATH THAILAND USING A RECEIVER FUNCTION AND AMBIENT NOISE TOMOGRAPHY, AND THE REGIONAL MOMENT TENSOR OF 5 MAY 2014, MW 6.5, CHIANG RAI EARTHQUAKE AND ITS AFTERSHOCKS

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Ph.D. (PHYSICS)

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ABSTRACT

In this thesis, seismic stations operated by Thailand Meteorological Department and Mahidol University were used for three seismological analyses. The crustal structure of Thailand was investigated using two seismological methods, receiver function and ambient noise tomography. For the receiver function analysis, crustal thickness and average Poisson's ratio of the crust beneath seismic station were the measures. On average, the result indicates that the crustal thickness of Thailand increased from the west in Shan-Thai (about 30 km) to east in Indochina terrane (about 40km). Compared to the global average, the crust of Thailand is relatively high in felsic composition. However, the lower crust beneath Khorat plateau of Indochina has a higher mafic composition than other regions. High Poisson's ratio anomalies agree with the geological features. In the second method, Rayleigh and Love wave tomography were constructed from the ambient seismic noise field. Group velocity dispersion curves were measured from inter-station travel time of empirical Green's function. Tomographic maps clearly show the differences in the upper to middle crust between the two major terranes of Thailand. The Shan-Thai terrane has a high velocity, which is associated with a metamorphic and granitic rock while the low velocity in Khorat plateau should be an effect of the thick sedimentary layer. The division of the seismological province and velocity model are essential details for data processing and waveform modeling. Regional moment tensor inversion was applied to the 30 earthquakes of the Chiang Rai 2014 earthquake sequence. Focal mechanisms of the main shock and aftershocks are mostly strike-slip motions with a small amount of normal and reverse slip. Principle stress axis derived from the earthquakes are consistent with the seismic pattern in the region. From the analysis of fault instability, The Mae Lao segment has higher shear stress and controls the main characteristics of the earthquake sequence. The relationship between local magnitude and moment magnitude is non-linear, thus, a magnitude correction is suggested.

KEY WORDS: CRUSTAL STRUCTURE / RECEIVER FUNCTION / TOMOGRAPHY / EARTHQUAKE / MOMENT TENSOR

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