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台湾チェルンプー断層における地震サイクルに伴う小断層の分類とラフネス変化
Microfault classification and difference in roughness with seismic cycles exampled from the Chelung-pu fault, Taiwan

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Change in stress with seismic cycle was strongly related to stress drop. Just after Tohoku-Oki earthquake, the stress orientation was changed from horizontal compressional stress to vertical compressional stress. The change in stress orientation with seiscmic cycle can be detected also in paleostress using slip data from microfault close to seismic faults in on-land accrationary complex. In addition, after the change in paleostress is detected, we can classify the microfault into two. One is related to the stress state before earthquake and another is related to the stress state after earthquake. Furthermore, we also observed the classified microfault directly. In this study, we examined the paleostress in the Chelung-pu fault, Taiwan, which was a seismogenic fault at the time of the Chi-Chi earthquake, 1999 and then we analyzed roughness of the classified micro-faults.

We have conducted paleostress analysis using multiple inversion method for slip data from microfault in cores drilled in Taiwan Chelung-pu Fault Drilling Project (TCDP). Two stress orientations were classified; one is the horizontal maximum principal stress and another is the others are the horizontal minimum or intemediate principal stresses in the compressional stress orientation at the time of the Chi-Chi earthquake, which is the switch in stress orientation similar to that in Tohoku-Oki earthquake. Combining the estimated stress orientations with stress polygons, the stress magnitude for each stress state was constrained. Stress magnitude for the horizontal compressional stress is larger than that for the horizontal extensional stress, which support the idea that the change in stress state can be related to seismic cycles.

On the basis of the stress inversion results, we classified the microfaults into that related to horizontal compressional stress and that related to horizontal extensional stress. We have collected samples of microfault for each stress state and identified that the roughness of the fault surfaces is different between them. Relief of slicken lines on microfault for horizontal compressional stress is deeper than that for horizontal extensional stress. To examine the topography of microfault surface quantitatively, we have conducted topographical analysis using a confocal microscope. Power Spector Density (PSD) was obtained from topographical data. Higher PSD value was detected in the samples for horizontal compressional stress than that for horizontal extensional stress. The slope angle of trend in PSD vs wavelength is shallower in horizontal compressional stress than that in vertical compressional stress. The differences in roughness of microfault surface can be related to the difference in stress magnitude as identified above.

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