SSS02-06 会場:国際会議室 時間:5 月 25 日 10:20-10:35

遠洋性堆積作用とプレート境界断層運動のリンケージ
Linkages between pelagic sedimentation and plate-boundary faulting

氏家 恒太郎[1*] ; 田畑 皓輝[1] ; 木下 貴裕[1] ; 斎藤 翼[1] ; 三宅 亮[2] ; 纐纈 佑衣[3]
UJIIE, Kohtaro[1*] ; TABATA, Hiroki[1] ; KINOSHITA, Takahiro[1] ; SAITO, Tsubasa[1] ; MIYAKE, Akira[2] ; KOUKETSU, Yui[3]

[1] 筑波大学, [2] 京都大学, [3] 東京大学
[1]University of Tsukuba, [2]Kyoto University, [3]The University of Tokyo

Pelagic sediments may constitute input materials for plate-boundary faults in subduction zones but have been received little attention. Here, we show two examples of the fault localization onto the specific intervals in pelagic sediments. The Japan Trench Fast Drilling Project (JFAST) revealed that the cumulative interplate motion and the large shallow slip during the 2011 Tohoku-Oki earthquake were accommodated by the smectite-rich pelagic clay of less than 5 m thick. Similar ~5 m-thick, smectite-rich pelagic clay layer was recognized in the incoming sediments of the Japan Trench, which is caused by authigenesis and slow sedimentation rate in pelagic environment. Friction experiments revealed that pelagic smectite is weak over a wide range of slip rates, which is consistent with the concentration of interplate motion and coseismic slip. Although coseismic deformations have not been identified, high-velocity friction experiments and permeability measurements on pelagic smectite suggest that thermal pressurization potentially occurred during the shallow coseismic slip. In the coherent chert-clastic sequence of the Jurassic accretionary complex in central Japan, the thrust faults are considered to branch from the plate-boundary fault at temperature of ~220 ℃ in a region of the prehnite-pumpellyite facies metamorphism. The stratigraphy at the base of the thrust sheet (i.e., carbonaceous claystone and black chert in the base, gray chert, and red chert in ascending order) represents the mid-Triassic recovery from the deep-sea anoxic event that occurred across the Permo-Triassic boundary. The thrust faulting is highly concentrated into ~5 cm-thick black cataclasite defined by fragments of black chert in the carbonaceous clay matrix, where total carbon content increases to 8.5 wt%. The cataclasite is sharply cut by a few millimeters-thick, chert-derived pseudotachylyte, which is marked by fault and injection veins, rounded and embayed vein boundaries, cracked quartz clasts, and the presence of muscovite microlites in amorphous matrix. The localization of deformation onto the black cataclasite may represent that carbonaceous claystone is weaker than surrounding siliceous rocks, thereby facilitating concentration of faulting. However, seismic faulting appears to occur in stronger chert rather than carbonaceous claystone, which could result in frictional melting under higher frictional strength. In summary, concentration of pelagic smectite and deposition of carbonaceous clay during deep-sea anoxia control the localization of plate-boundary fault and subduction earthquakes at shallow and deep depths, respectively.

キーワード: 遠洋性堆積物, プレート境界断層, 日本海溝緊急地震調査掘削, シュードタキライト, チャートー砕屑岩シーケンス
Keywords: pelagic sediments, plate boundary fault, JFAST, pseudotachylyte, chert-clastic sequence