Raman spectra of carbonaceous materials within the black fault rocks in Kodiak accretionary complex

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Estimation of frictional heat generated in the principal slip zone (PSZ) of a fault is a key to understand fault mechanics. Recently, analyses on carbonaceous material (CM) such as vitrinite reflectance and Raman spectroscopy, which were widely used as geothermometer, have been applied to fault rocks and products of friction experiments (e.g Sakaguchi et al., 2011; Kitamura et al., 2012; Furuichi et al., 2015; Kaneki et al., 2016; Kouketsu et al., 2017). Raman spectroscopy of CM has an advantage in 2-dimentional mapping, and therefore useful for quantifying high temperature zone along PSZ generated by thermal diffusion of frictional heat. However, distribution of Raman spectra of CM within a PSZ has not considered well. In this presentation, we show the result of Raman spectra of CM within the PSZ of the Pasagshak Point Thrust in the Kodiak accretionary prism. The thrust is characterized by ultrafine-grained black fault rocks (BFR) including weakly molten pseudotachylyte formed during seismic slips (Rowe et al., 2005; Meneghini et al., 2010; Yamaguchi et al., 2014).
Raman spectra were obtained using a Renishaw InVIA Reflex microspectrometer (ISTO-BRGM; Orléans) with 514 nm laser. The laser beam power at sample surface was set to ~0.5 mW. Analysis was performed to traverse internal textures of the BFR. Spectra was decomposed into five peaks, center positions around 1350 cm^{-1} (D1, D3 and D4) and graphite bands centered around 1580-1600 cm^{-1} (D2 and G). Microstructures of the BFR were observed under cathodoluminescence microscope.
Although D1-band develops within the crystalline microlayers of aphanitic BFR, which is thought to be melt-origin pseudotachylyte (Meneghini et al., 2010), development of G-band was not detected even in the crystalline microlayers. This observation suggest that Raman spectra of CM do not reach the equilibrium in the case of short-time heating, as pointed out by Nakamura et al. (2017). An alternative possibility is that Kodiak BFR has formed temperatures of <400 degrees C, without frictional melt.

