地震の化石：シュードタキライトの形成と保存

Fossil earthquakes: the formation and preservation of pseudotachylytes

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It is well known that direct evidence of earthquakes within fault zones is limited to the occurrence of tectonic-generated pseudotachylyte. Pseudotachylyte is formed when frictional and strong abrasion that are generated during rapid seismic faulting are sufficient to melt and/or crush rock within the fault zone and fluidize ultra-fine-grained material. Since the 1970s, fault-related pseudotachylyte has become widely accepted as an indicator of high-velocity slip during earthquakes that occurred within seismogenic fault zones; consequently, pseudotachylyte can be thought of as a fossil earthquake. Most of the fault-related pseudotachylyte reported to date is cataclasite-related, having formed at shallow depths in brittle-dominated seismogenic fault zones by both frictional melting and crushing mechanisms. Pseudotachylyte has also been described in association with mylonitic rocks and granulite facies rocks, having formed in deep-level fault shear zones within the semi-brittle to crystal-plastic regimes even in the lower crust (Lin, 2008).

Although many studies have investigated the nature and significance of pseudotachylyte over the past century, fault-related pseudotachylyte is still rarely found within exhumed fault zones throughout the world. It remains unclear as to whether this scarcity is merely apparent or whether seismic frictional melting within fault zones is inhibited by other mechanisms. It is also unclear as to whether fault-related pseudotachylyte can form from the passage of shock waves associated with hypervelocity impact, as with impact-originated pseudotachylyte. Frictional melt may well play an important role during coseismic slip as a lubricant on the fault plane. Current research on pseudotachylyte and related fault rocks will provide improved insight into the generation of earthquakes and the process of seismic rupture within fault zones located with the brittle and crystal-plastic regimes of the upper and lower crust.

In this presentation, I will give a review on pseudotachylyte and its related veinlet cataclastic rocks and also show our recent high-velocity frictional experimental results on the pseudotachylyte-related project.