東南極ナピア岩体トナー島におけるグラニュライト相シュードタキライトと間震期塑性変形
Generation of pseudotachylyte and interseismic plastic deformation under granulite facies conditions at Tonagh Island in the Napier Complex, East Antarctica

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Seismic faulting (pseudotachylytes-producing faulting) and plastic deformation (formation of ultramylonite) alternated under lower continental crustal conditions in Tonagh Island (Toyoshima et al., 1999). We illustrate interseismic plastic deformations related to the Tonagh pseudotachylytes as examples of ancient seismogenic zones in lower crust.
There are many granulite-facies mylonite zones in Tonagh Island, the Napier Complex, East Antarctica. In some of them, cataclastic zones occur. Cataclastic zones are composed of alternation of thin ultramylonites and pseudotachylytes formed under granulite-facies conditions. Cataclastic zones are pseudotachylyte-producing fault zones. Granulite-facies ultramylonites occur also abundant outside cataclastic zones. There are evidences for multiple generations of pseudotachylytes and ultramylonites under granulite facies conditions.
There are two different types of granulite-facies ultramylonites in microstructures of recrystallized plagioclase grains: type 1 and 2. Type 1 ultramylonites have polygonal medium grains, with abundant triplejunctions, of plagioclase with smooth grain boundaries and very weakly undulose extinction. Recrystallized quart grains of type 1 ultramylonites have polygonal shapes, accompanied by fine recrystallized quartz grains. Type 2 ultramylonites include very fine grains and elongated fine grains of plagioclase with strongly undulose extinction and irregular grain boundaries with bulges. Plagioclase grains were fractured and became cataclasites before formation of type 2mylonites. Quart of type 2 ultramylonites is strongly elongated quartz porphyroclasts with bulges and fine recrystallized grains. Quartz ribbons are also abundant in type 2 ultramylonites. Type 2 ultramylonites occur only in cataclastic zones (granulite-facies pseudotachylytes-generating fault zones) and have been cut by fault veins of pseudotachylyte. Type 2 ultramylonites include porphyroclasts of plagioclase aggregates of type 1 ultramylonites. Pseudotachylytes include fragments of plagioclase aggregates of both type 1 and type 2 ultramylonites. Some of the granulite-facies pseudotachylytes were mylonitized and became type 2 ultramylonites, which have also been cut by other granulite-facies pseudotachylytes. The microstructures of quartz of type 2 ultramylonites appear occasionally to have become polygons, which observed in type 1 ultramylonites. Many of pseudotachylytes were subjected to type 2 mylonitization and show a mylonitic foliation.
We clarified generation of pseudotachylytes occurred under high-temperature, lower crustal conditions in the Tonagh Island. We also recognized the following two interseismic plastic deformations under lower crustal, high-temperature conditions.
(1) Low strain rate or low differential stress plastic deformation
(2) High strain rate or high differential stress plastic deformation

The microstructural and petrological features of lower crustal shear zones point to locally and temporally, high strain rate or high differential stress at the cataclasitic zones immediately before and after seismic faulting. These features also suggest continuous low strain rate or low differential stress plastic deformation punctuated by episodes of high strain rate or high differential stress plastic deformation, leading of following to seismic events.
This is imaged acceleration of strain rate or stress relaxation before or after seismic events, respectively.

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