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沈み込み地震発生帯におけるアモルファスシリカの脱水
Dehydration of amorphous silica in subduction seismogenic zone

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Generally, a shallow part of a plate boundary megathrust has been considered as aseismic. However, in the 2011 Tohoku-oki earthquake, the seismic fault slip propagated close to the axis of the Japan Trench and caused an extremely large tsunami. It is considered that ductile deformation of unconsolidated sediments is common deformation mechanism prominent in this aseismic region of the shallow part of the subduction zone. Accordingly, it is still unknown how the seismic rupture reached to nearby the trench axis.

The megathrust is characterized by a prominent reflector. Therefore it has been pointed out that the megathrust may host highly pressurized fluids (Kimura et al., 2012). Moreover, based on the result of mineral analysis by Deep Sea Drilling Project (DSDP) in 1977, it is supposed that the subducting sediments mainly consist of vitric diatomaceous and radiolarian silt with pelagic clay intervals.

Opal-A in the vitric diatomaceous silt transform to quartz, and smectite in the pelagic clay to illite. These diagenetic reactions accompany dehydration reactions. The dehydration rates become maximum at 50-60 km horizontally from the deformation front, where the temperature along the megathrust is 100-120?C. This region coincides with the locus with a prominent reflector, and this suggests that the main source of highly pressured fluids is dehydration of sediments (Kimura et al., 2012).

However, few studies have conducted mineral analysis of sediments along the Japan Trench, and detailed dehydration process of hydrous minerals and the reality of fluid pressure have been poorly constrained. Therefore, in this study, we examined by X-ray diffraction whole rock composition of sediments including opal-A, which was recovered from outer rise of the Japan Trench during DSDP Leg56. In this talk, we present calculations of the diageneses of opal-A and smectite, and discuss development mechanism of fluid pressure in the shallow portion of the megathrust in the Japan Trench.

References

Kimura et al. (2012) Runaway slip to the trench due to rupture of highly pressurized megathrust beneath the middle trench slope: The tsunamigenesis of the 2011 Tohoku earthquake off the east coast of northern Japan. Earth and Planetary Science Letters, 339-340, 32-45

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