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古い沈み込み帯での遠洋性珪質堆積物からの水の供給と挙動
Source, sink and pathway of fluid dehydration from pelagic siliceous sediments in cold subduction zone

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The fluid existing at plate boundaries in subduction zone makes a strong effect on seismicity and fault slip along the plate boundary megathrusts. Seismogenesisis controlled mainly by temperature which ranges from ˜150 degrees C to 350-450 degrees C (Hyndman and Wang, 1993; Hyndman et al., 1995, 1997; Oleskevich et al., 1999). Additionary, the dehydration at shallow zones cooler than ˜150 degrees C along plate boundaries is also important to understand the propagation of fault slip occurring at further deep seismogenic zones.In this study, we firstly evaluated the amount of dehydration from siliceous sediment on subducting plates. Siliceous sediments might be thick and abundant because of long-period exposure to the ocean far from the continents in the case of old oceanic plates, for example, the Japan Trench. The diagenesis and dehydration of siliceous sediments are calculated quantitatively introducing reaction kinetics and temperature profile models of the Japan Trench, a cold subduction zone, where the siliceous sediments dominantly subduct. As a result, structured water within silica minerals is released through the diagenesis much as ˜160 g/m2/year along shallow plate boundary (˜5-10 km depth), where the temperature is ˜100 degrees C.Second, we performed parameter sensitivity analyses of silica diagenesis to explain the depth variation of dehydration zone in above calculation and to evaluate the possible range of it. The analyses revealed that the dehydration from silica can proceed at various temperature ranges (80-120 degrees C) depending on subducting parameters. The most effective parameter is temperature gradient, gamma, and result dispersion in above estimation can be explained by the variation of it.To discover evidence of dynamic dehydration from silica diagenesis and to connect dehydrated water and rock deformation, we thirdly performed geological research in the Inuyama area, Mino-Tamba Belt, Jurassic accretionary complex in Central Japan as an on-land analog of the sediments on the old oceanic plates. As well as white chert recording focused fluid flow and silica precipitation, we investigated the pressure solution seam (PSS) evolved inside of a red chert and conducted element analyses using Electron Probe Micro Analyses (EPMA). Isocon method was introduced to the results and revealed that ˜530 vol% of silica had escaped from pressure solution seam. This result supports our calculation results and suggests the existence of abundant water in subducting sediments on the old oceanic crusts, although this estimation is too large to give a sufficient explanation from silica diagenesis. There are some ways to explain this problem, and we finally discussed the possible deformation mechanism depending on the diagenesis and dehydration of siliceous sediments with depth and temperature.

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