Determination of slip parameters of subduction earthquake by using multiple analyses of carbonaceous materials

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Megasplay faults branching from megathrusts could play an important role in faulting systems in the plate-subduction zone. Because not only subduction megathrust but also megasplay faults could slip during an earthquake, possibly generating gigatic tsunami.
For understanding the slip behavior of these faults, maximum temperature recorded is one of the keys to estimate the slip parameters such as shear stress and displacement of the earthquake. Here we develop new multiple analyses to detect the heat signal recorded in the carbonaceous materials by performing heating experiments, spectroscopic analyses (IR and Raman), and chemical composition analysis (CHNSO element analysis). We targeted the carbonaceous materials retrieved from an ancient megasplay fault developed in the late Cretaceous Shimanto accretionary prism, southwest Japan.
Our results revealed that the fault zone had experienced 400–600 °C. By performing numerical temperature calculation, we found that any case of the earthquake events always accompany a slip displacement of ≤10 m, suggesting that several hundreds of events repeatedly took place.

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