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Ductile deformation with new chrysotile recrystallization as blocky serpentinite: Constraints on slip styles of aseismic areas in subduction zones

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Geophysical studies have verified that serpentinites are common along plate boundaries in some parts of forearc mantle wedge in subduction zones, particularly in the depth of several tens of kilometers, from their specific properties having low seismic velocity and high poisson's ratio. Such serpentinites are known to control slip styles along plate boundaries, because the serpentinite-rich zones coincide with aseismic areas, characterized by few large earthquakes and aseismic (silent) slip events. However, a deformation behavior of the serpentinites particularly under relatively shallow levels has little been known.

Serpentinite bodies in the Franciscan Complex (Mesozoic accretionary prism), California, U.S.A., display a unique deformation with new chrysotile recrystallization as blocky serpentinite. The full exposure there shows a block-in-matrix fabric. The preferred-oriented blocks in phacoidal shape are the result of the local replacement of serpentine minerals into new chrysotile to align along ductile shear planes such as S-C foliation, and are eventually reorganized as chrysotile schist. The platy chrysotile is shown through not brittle but ductile deformation as in the process of the "*in situ*" replacement in a solid-state reaction.

Thus, the blocky serpentinite processes in the study area may represent the slip style in the aseismic areas shallower in subduction zones than the stability field of antigorite. This conclusion is concordant with the geophysical interpretation that the existence of chrysotile is the primary reason of aseismic slip along plate boundaries.