

## Ductile fracture as an earthquake source nucleation mechanism under brittle-plastic transition

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A ductile shear zone where localized strained parts are crushed was found. In this zone, the plastic deformation was quantified, and the quartz was observed by transmission electron microscopy (TEM). The crush zones are also strongly strained plastically, indicating that the plastic strain localization induced the formation of the crush zones. TEM observations revealed microcavities along the grain boundaries. The dislocation densities in strongly and weakly deformed domains are not significantly different. Thus the process of dislocation pile up is not important but the microvoids induce ductile fracture. Ductile fracture mechanism during the plastic strain localization, therefore, is of fundamental importance in the earthquake source nucleation under brittle-plastic transition.