



Moment tensors associated with the expansion and movement of fluid in ellipsoidal cavities

Nobuki Kame (1), Naoto Mizuno (2), and Mie Ichihara (1)

(1) Earthquake Research Institute, University of Tokyo, Tokyo, Japan, (2) Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo, Tokyo, Japan

Moment tensor representation is useful for interpreting source processes from seismic and/or geodetic observations. However, there remains difficulty to determine the source processes because some models cannot be distinguished from moment tensors and the range of moment tensor represented by particular process is generally limited. We examine magma movement between two ellipsoids with consideration of mass conservation and pressure balance. The resultant moment tensor component ratio (MTCR) range is clearly distinguished from that generated by expanding ellipsoids. However, there is a range of the MTCR that cannot be explained by either fluid expansion or movement; in such cases, partial pressure recovery after fluid movement provides a plausible explanation. The MTCR for fluid movement between two ellipsoids with randomly varying geometry and relative orientation is shown to exhibit a concentrated trend representing a linear combination of a double-couple source and an opening crack. Although such an MTCR is generally interpreted as a crack with both tensile and shear dislocations, we demonstrate that it can be generated by fluid movement between two thin ellipsoids. Our results provide a physically reasonable mechanism for interpreting the MTCR obtained from observed data with a comprehensive view of possible source processes.