Source Analysis of the Memorial Day Explosion, Kimchaek, North Korea

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A series of source inversions are performed for the 25 May 2009 (Memorial Day) North Korean seismic event using intermediate period (10-50s) complete waveform modeling. An earthquake source is inconsistent with the data and the best-fit full seismic moment tensor is dominantly explosive ($\sim$60%) with a moment magnitude (MW) of 4.5. A pure explosion solution yields a scalar seismic moment of 1.8×10^{22} dyne-cm (MW4.1) and fits the data almost as well as the full solution. The difference between the full and explosion solutions is the predicted fit to observed tangential displacement, which requires some type of non-isotropic (non-explosive) radiation. Possible causes of the tangential displacement are additional tectonic sources, tensile failure at depth, and anisotropic wave propagation. Similar displacements may be hidden in the noise of the 2006 event. Future analyses of this type could be used to identify and characterize non-earthquake events such as explosions and mine collapses.