Source analysis of November 15, 2017 Pohang earthquake sequences: The first Non-Double Couple event reported in South Korea

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On November 15, 2017, a moderate earthquake (Mw 5.4) occurred in Pohang, which locates on the southeastern part of the Korean Peninsula. The mainshock was followed by aftershocks including Mw 4.3 event. A preliminary source analysis of the mainshock shows completely different features from previous events occurring in the Korean Peninsula. To better understand the source processes of the mainshock and following aftershocks, we determined the full moment tensor (FMT) solutions for the events with Mw > 3.5 and focal mechanism solutions for smaller events. The FMT solution of the mainshock shows a high portion of compensated linear vector dipole (CLVD, 69%) in comparison with double couple (DC, 26%) and minor isotropic component (ISO, 5%). A faulting type of the mainshock determined by DC component is thrust. The large CLVD component is also observed for the largest aftershock (33% of CLVD, 65% of DC, and 2% of ISO), whereas DC components are dominant for the three smaller earthquakes ($\sim$ Mw 3.5) and their faulting types are strike slip. Most of the focal mechanisms obtained from the manually measured P-wave first-motion polarities are classified as thrust events, which is similar to the DC component of the mainshock and largest aftershock. The mainshock and largest aftershock can be categorized as Non-Double-Couple (NDC) events and the mainshock is the first NDC event reported in South Korea. In general, the rupture on complex fault planes or involvement of high pressure fluids can generate NDC events, but the actual cause of the NDC events in this region is not fully understood yet.