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A High-Velocity Motion of Active Region Loops Triggered by a 2011 Feb 18 Flare

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We report a high-velocity plasma motion near the lop-top region of large-scale active-region loops after the occurrence of the M-class flare at the solar active region NOAA 11158 on 2011 Feb 18.

The motion was detected during the impulsive phase of the M-class flare by the Doppler-shift measurement in Fe XXIV line at 192A with the Hinode EUV imaging spectrometer (EIS). Hinode/EIS continuously observed this region with a raster scanning mode and a strongly blue-shifted Fe XXIV line was observed in a period of 10:11 to 10:16 UT. We performed a spectral fitting using double Gaussian functions to estimate Doppler velocity and have found that the Doppler velocity near the loop-top region reaches 200-400 km/s.

In order to identify the high-velocity component from the temporal evolution of the coronal structures, we use high-cadence EUV images from Atmospheric Imaging Assembly (AIA) on Solar Dynamics Observatory (SDO), which provides high-resolution full-disk images taken at nine EUV wavelengths bands. The high-velocity motion was clearly recorded in the sequence of images at the AIA 131A band. Before the appearance of the high-speed plasma, we have found that one of the loops that rose vertically up to ˜300 km/s interacted with other loop structures located above it. The configuration between these loops allows the occurrence of a magnetic reconnection in the loop-top region.

We interpreted the high velocity motion in the loop-top region, detected with EIS and AIA, as a bulk motion of reconnected loops toward a relaxed state.