

Signatures of moving magnetic features in and above the photosphere

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Abstract. Hinode/SOT observations of NOAA AR 10933 from 2007 Jan 4 16:14 UT - Jan 6 22:20 UT are used to study MMFs (moving magnetic features) in the periphery of the region's large sunspot and the surrounding moat. The data consist of a nearly continuous set of Fe 6302 Å Stokes V images with sets of G band and Ca II H filtergrams at various cadences, FOV's, and resolutions plus some SpectroPolarimeter (SP) scans. We also used TRACE images in 171 Å to follow any possible signatures at higher temperatures. Several approaches are used and combined to characterize properties of the MMFs. We applied automatic object recognition and tracking to the MMFs as seen in the Fe 6302 Å Stokes V images and we generated photospheric flow maps from the G band filtergrams using LCT (local correlation tracking) to compare with the generally faster MMF motions. An SP scan was used to determine the line profiles for several paths. Reliable inversions have not yet been done, but we find a few locations of possible supersonic downflows from the Stokes IQUV line profiles. The population of MMFs on the East side of the sunspot is much higher than on the opposite side, mostly involving a large number of mixed polarity MMFs. Consequently, the chromosphere shows strongly enhanced brightenings with a clear pattern: enhanced brightenings in Ca H outline the locations where opposite polarity MMFs meet. In some cases chromospheric micro-flares are observed. This activity does not prevent formation of active low lying closed loops at coronal temperatures seen in the TRACE 171 Å line. The other side, with fewer MMFs, shows a pattern that we found earlier: regions with an MMF deficiency show long living open coronal loops.

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