Contributed Talk

Splinter HiRes

High-resolution imaging and near-infrared spectroscopy of penumbral decay

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Combining high-resolution spectropolarimetric and imaging data is key to understanding the decay process of sunspots as it allows to examine the velocity and magnetic fields of sunspots and their surroundings. Active region NOAA 12597 emerged on 2016 September 22 in the southern hemisphere of the solar disk. The region was observed two days later on 2016 September 24 with the GREGOR solar telescope. High-resolution imaging, spectroscopic, and spectropolarimetric data in various spectral lines revealed the physical properties of the photosphere and chromosphere. These data were complemented by synoptic line-of-sight magnetograms and continuum images obtained with the Helioseismic and Magnetic Imager (HMI) onboard the Solar Dynamics Observatory (SDO). The leading sunspot was at its maximum growth and slowly started to disintegrate at the time of GREGOR observations. We discuss the photospheric and chromospheric flow fields along with the magnetic fields during the decay of a large penumbral sector. The penumbral filaments of the leading spot facing the site of ongoing flux emergence started to decay first. However, they do not simply vanish but intermingle with nearby granules and even temporarily form darkened areas resembling umbral cores. The interaction between newly emerging and already established flux systems likely

played a role in the penumbral decay and additionally resulted in rotation of the leading sunspot, releasing subphotospheric twist in the flux system.