Contributed Talk

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Multi-wavelength observations of an arch filament system

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In this study, we present multi-wavelength observations of an arch filament system (AFS) using high-resolution data of the Dunn Solar Telescope (DST) covering different regions in photosphere and chromosphere. The AFS was observed close to active region NOAA 11658 on 2013 January 20 with the camera system Rapid Oscillations in the Solar Atmosphere (ROSA) and the Interferometric BIdimensional Spectrometer (IBIS) providing imaging and spectropolarimetric data, respectively. Examining the temporal evolution of the fibril system shows that a clumpy and an elongated part separated and a third structure formed at the same location. All three structures of the AFS are likely rooted in bright regions, as observed in the Fraunhofer G-band $\lambda 4308\,\text{Å}$ and the near-infrared (NIR) chromospheric absorption line Ca II $\lambda 8542\,\text{Å}$, which are typically associated with footpoints of magnetic flux loops. In particular, we calculate horizontal and line-of-sight velocities of the plasma. The results show up- and down-streaming flows within the system. Especially, down-streaming flows in the lower part of the AFS increased to supersonic flow speeds towards the end of observations. The comparison of spectropolarimetric data obtained in the NIR Ca II line with satellite data of the Helioseismic and Magnetic Imager (HMI) demonstrates that the filamentary structures form Ω-loops by connecting positive polarities in the upper half with the dominating negative polarity in the lower half of the field-of-view (FOV). The clumpy structure resides at lower heights than the other elongated fibril structures and connects the positive polarity in the middle of the FOV with a strong negative polarity in the upper part of the region. Evolution and height dependence of different morphological structures in an AFS provided insight into the complex interaction between cool chromospheric plasma and magnetic fields.