Polarization in penumbral microjets

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Abstract

Penumbral microjets (PMJs) are short-lived, fine-structured and elongated brightenings in the chromosphere above sunspots penumbrae. They were firstly reported by Katsukawa et al. (2007) in wide-band Ca II H imaging from the Hinode satellite and were interpreted as signatures of reconnection in the interlaced penumbral magnetic field configuration. This scenario is supported by early observational studies and simulations. Thanks to studies at different heights between the chromosphere and the corona using high-resolution intensity filtergrams, we know that PMJs have a precursor phase (Reardon et al. 2013), heat to transition region temperatures (Vissers et al. 2015), and even some of them can be due to alternative reconnection scenarios (Tiwari et al. 2015, Samanta et al. 2017). Recently, Drews & Rouppe van der Voort (2017) characterized their main observational properties from a morphological and spectral point of view.

However, there are important elements still unknown: we do not know if PMJs leave any hint on all Stokes profiles (or just in Stokes I) and how their fine structure is. This work is focused on these aspects and our main goal is to study in-depth for the first time the polarization on PMJs at chromospheric heights. We are using simultaneous observations in the Fe I 630 nm pair, Ca II 854.2 nm and Ca II K 393 nm acquired with the CRISP and CHROMIS spectropolarimeters at the SST. Our first results reveal that PMJs have noticeable polarization signals that suggest the existence of two atmospheric components. Specifically, their circular polarization is remarkably, which can be used as a proxy to identify PMJs. We find that polarization signals along PMJs show different spatial distribution, depending on the behavior of the emission peaks of Ca II 854.2 nm. Each distribution reveals how the mixture of these components change and is affected by surrounding transients.