

Properties of small-scale jets in a sunspot chromosphere revealed through spectroscopic observations

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High-resolution observations with HINODE Solar Optical Telescope (SOT) revealed that small-scale jets frequently occur in a sunspot chromosphere though their driving mechanism is not well understood yet because of lack of spectroscopic information, such as temperatures and Doppler velocities, in the chromospheric observations with Hinode SOT. Spectroscopic observations of the small-scale jets were attempted using an Interferometric Bidimensional Spectrometer (IBIS) at the National Solar Observatory (NSO), and suggested that temperature enhancements associated with the jets happened in the lower chromosphere though their upward flows were not clearly detected (Reardon, Tritschler, Katsukawa 2013). We've tried obtaining another spectroscopic data set of a sunspot chromosphere with better spectral resolution with IBIS, and carried out careful analysis of spectral profiles and their temporal evolution. The study shows majority of the heated plasma in the lower chromosphere has a bulk flow slower than the sound speed in the chromosphere. The spectral profiles indicate enhancements in the blue wing, which suggests a part of the heated plasma has a supersonic upflow. In addition, small temperature enhancements are also found in the upper chromosphere near the end of the duration of the jets. The supersonic upflows are possibly responsible for heating in the upper chromosphere. This study provides an important observational support for slow-mode waves as acceleration and heating mechanism in the chromospheric jets. We are going to present a new spectroscopic observation of chromospheric jets made by the Interface Region Imaging Spectrograph (IRIS) spacecraft that has just started observations since 2013.

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