
Determination of Temperature in Solar Prominences/Filaments Using FISS Observations

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Abstract

Determining the distribution and variation of temperature inside a prominence is fundamental to understanding its thermal structure and the relevant heating/cooling processes. The spectral analysis of the H alpha line and the Ca II 854.2 nm line that sense the same volume of the prominence may lead to the determination of Doppler widths which in turn results in the separate determination of temperature and non-thermal speed of the volume. Using the Fast Imaging Solar Spectrograph of the New Solar Telescope at Big Bear, we simultaneously recorded the two lines at prominences observed outside the solar limb and filaments on the disk. We applied the Becker's cloud model fit to the data, with zero background intensity profile in prominences and with carefully constructed background intensity profile in filaments. These observations with different perspectives and different analyses produce consistent results: temperature inside prominences/filaments ranges from 4500 to 14500 K (2 sigma range) with a mean of 9500 K. In addition, we find that the variation of temperature occur spatially and temporarily in each prominence. We expect that this kind of observation and analysis with higher spatial resolution and higher temporal resolution will provide us with a good chance for the detailed study of plasma processes in prominences.

Keywords: prominence, plasma, temperature, spectral analysis

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