

Cool material from the lower atmosphere in a quiescent prominence

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Abstract. A prominence consists of relatively cool chromospheric plasma found above the solar limb at coronal heights where the temperature and density are typically two order of magnitude higher and lower, respectively. Prominences are frequently associated with larger coronal structures known as coronal cavities. There are numerous observational studies on prominences with multi-wavelength and with high-spatial resolution and also on the relationship between cavities and coronal mass ejections, while less analyses on activities inside dark cavities.

Multi-hour observations were performed of a quiescent prominence with the Hinode satellite. In the Ca II H-line channel of SOT we observed a peculiar slowly-rising column of cool material from the chromosphere. The column stabilized to form a typical “tree-like” prominence that lasted throughout the observation. The apparent upward growth speed of the column was 2 km/s, while fine structures that constituted the column showed speeds of up to 20 km/s. Associated with the appearance of the column, an overlying coronal cavity seen in the X-ray and EUV showed some activities that moved up with 5 km/s. We discuss the relationship between these episodes, considering the dynamics of the fine structures in the column and of the coronal cavity. We suggest one possibility that there is an emergence of a helical flux rope that reconnects with lower coronal fields to carry cool materials into the corona continuously for maintenance of the magnetic structures of the cavity as well as mass supply to the prominence.