Propagating waves transverse to the magnetic field in a solar prominence

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Abstract

We have observed a quiescent prominence with the Hinode Solar Optical Telescope (SOT, in Ca II and H-alpha lines), Sacramento Peak Observatory (in H-alpha, H-beta and Sodium-D lines), and THEMIS/MTR (Télescope Héliographique pour l'Étude du Magnétisme et des Instabilités Solaires/MulTi Raies, providing vector magnetograms), and SDO/AIA (Solar Dynamics Observatory Atmospheric Imaging Assembly, in EUV) over a 4 hour period on 2012 October 10.

The small fields of view of SOT, Sac Peak and THEMIS are centered on a large pillar-like prominence footpoint extending towards the surface. This feature appears in the larger field of view of the 304 A band, as a large, quasi-vertical column with material flowing horizontally on each side.
The THEMIS/MTR data indicate that the magnetic field in the pillar is essentially horizontal and the observations in the optical wavelengths show a large number of horizontally aligned features on a much smaller scale than the pillar as a whole.
The data are consistent with a model of cool prominence plasma trapped in the dips of horizontal field lines.

The SOT and Sac Peak data show what appear to be moving wave pulses. These pulses, which include a Doppler signature, move vertically, perpendicular to the field direction, along quasi-vertical columns. The pulses have a velocity of propagation of about 10 km/s, a period about 260 sec, and a wavelength around 2000 km.

We interpret these waves in terms of fast magneto-sonic waves and discuss possible wave drivers.

Keywords: oscillations prominence magnetic field

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