Hinode-3: 3rd Hinode Science Meeting
Hitotsubashi Memorial Hall, Tokyo
1–4 December, 2009

Observations of vortex motion in the solar photosphere using HINODE and SST data

Judith Palacios
University of Valencia

Laura A. Balmaceda
University of Valencia

Santiago Vargas
Mullard Space Science Laboratory, University College London

Iballa B. Cabello
University of Valencia

Vicente Domingo
University of Valencia

Abstract. Vortex-type motions have been recently found by tracking bright points in high-resolution ground-based observations of the solar photosphere. Such small-scale motions are thought to be determinant in the evolution of magnetic footpoints and their interaction with plasma and therefore likely to play a role in heating the upper solar atmosphere by twisting magnetic flux tubes. Data from Hinode provide useful tools to investigate such phenomena given the high spatial and temporal resolution and continuous free-of-atmospheric-seeing observing runs.
In the present work, we report the observation of magnetic concentrations being dragged towards the center of a convective vortex motion in the solar photosphere using data taken on September 29, 2007 during the campaign coordinating Hinode instruments and the Canary Islands solar telescopes (HOP14).
We present the analysis of series of images at different solar atmospheric layers. Data from SOT in wideband, narrowband filters and SOT-SP instruments onboard Hinode and SST are required to identify the fine details of the small-scale motions which are also highly dynamic.
Applying the local correlation technique to SST data allowed us to calculate horizontal velocities and the divergence velocity field, making possible to evidence the presence of a vortex whose center appears to be the draining point for the magnetic concentrations detected in magnetograms and well-correlated with the locations of bright points as seen in G-band and CN images.
A sequence of high cadence SOT- SP data enable us to calculate the trajectories of the magnetic elements in the vicinity of the vortex center. Using inversion techniques, we estimated the line-of-sight velocity, magnetic field, inclination and azimuth of these elements.
Using simultaneous images in CaII, CN and MgI magnetograms from Hinode we

studied the dynamic evolution of these bright points, observing coalescence and splitting in two main magnetic patches.