Highlights of Spanish Astrophysics VII, Proceedings of the X Scientific Meeting of the Spanish Astronomical Society held on July 9 - 13, 2012, in Valencia, Spain. J. C. Guirado, L.M. Lara, V. Quilis, and J. Gorgas (eds.)

Study of small magnetic structures in the solar photosphere

I. Cabello[1], V. Domingo[1], J. A. Bonet[2,3], J. Blanco Rodríguez[1], and L. A. Balmaceda[4]

[1] Image Processing Laboratory, Universidad de Valencia, Spain
[2] Instituto de Astrofísica de Canarias, Spain
[3] Departamento de Astrofísica, Universidad de La Laguna, Spain
[4] Instituto de Ciencias Astronómicas, de la Tierra y del Espacio, CONICET, Argentina

Abstract

The study of small scale magnetic structures in the solar photosphere is of great relevance for the understanding of the global behaviour of the Sun. Because of the small spatial and temporal scales involved, the use of high resolution images and fast cadence is fundamental for their study. In order to obtain such images, sophisticated computational techniques that compensate for the atmospheric degradation and telescope aberration have been developed, improving in this way the spatial resolution.

In this work, we use G-band images obtained with the 1 m-Swedish Solar Telescope located at La Palma (Canary Islands, Spain). The images have been restored with MOMFBD (Multi-Object Multi-Frame Blind Deconvolution), a technique that combines multiple images acquired in a short time interval. The resulting images have a resolution close to the diffraction limit of the telescope ($0\farcs1$) allowing the study of very small bright structures present in the inter-granular lanes in the solar photosphere, known as Bright Points.

It is highlighted the great presence of magnetic structures in quiet Sun regions analyzed from different observational campaigns. The density of BPs in the quiet Sun shows a decrease as we approach the limb, with values of $\simeq 1\%$ at the centre ($\mu \approx 1$), and $\simeq 0.2\%$ at $\mu \approx 0.3$. We also present the discovery of small vortexes detected in the solar surface through the movement of BPs, with radii around 241 km and lifetimes longer than 5 minutes.

Further analyses, comprising longer time series and information from different solar layers, are being performed aiming at a more in-depth knowledge of these phenomena.