Introduction to Polar Faculae

Polar Faculae (PFe) are small-scale bright magnetic features seen in the photosphere near the solar poles (|$\theta|$ $\geq$ $60^\circ$). They have a unipolar magnetic field in the kilo-Gauss range with an activity cycle shifted 5-6 years with respect to the sunspot cycle and a fast temporal evolution in the order of one minute.

Data Reduction

- Göttingen speckle reconstruction code applied to the images, yielding a still better resolution than provided by the use of KAOS.
- Analysis of spectropolarimetric data (Stokes I and V profiles) after alignment and destretching of the left and right channels (which correspond to the two circular polarisation states of the light) to remove local distortions.

Observations April/May and August 2005

- "Göttingen" 2D Fabry-Perot spectrometer at the VTT in the Observatorio del Teide, Tenerife. The instrument has been recently improved.
- New Fabry-Perot etalon and controller.
- New software.
- New CCD cameras.
- Use of a Stokes V polarimeter and the Kiepenheuer Adaptative Optics System (KAOS, Kiepenheuer-Institut, Freiburg).
- Quasi-simultaneous ($\Delta t \approx 30s$) observations in Fe $i$ 6173 Å and H$\alpha$ (6563 Å) lines.

Future Work

- Observations in Fe $i$ lines around 1.56µm with TIP II.
- Longer time series to estimate PFe life time.
- Study of the penetration of PFe into higher layers by means of images from SoHO, TRACE and Mauna Loa K-Coronameter taken at the same time as our data.
- Analysis of the possible relation between fast solar wind and PFe and the role of the latter as the potential origin of the wind.

Results

- Very high spatial resolution achieved. PFe are resolved as small bright points, while not appearing separated at lower spatial resolution.
- Many brilliant structures, much more than hitherto observed at one time, are detected as can be seen in Figure 3 and Figure 4.
- Life time of a PF is longer than 90 minutes. The PF was still present at the end of the observing sequence.

Magnetic field calculated with the center of gravity method. Contours of different field strength (line of sight components) are shown in Figure 5 superimposed on the speckle image.

LOS velocity map obtained by means of the center of gravity method (Figure 6). The most bright features visible in the speckle image are drawn as contours overlaid on the velocity map.