# Chromospheric dynamics of a solar active region

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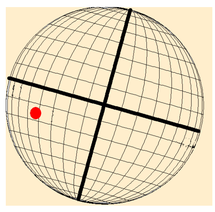
## observations

⇒ **Instrument.**
*Göttingen Fabry-Perot Interferometer, Göttingen FPI, at Vacuum Tower Telescope, VTT, "Observatorio del Teide", on May, 31$^{st}$, 2004.*

⇒ **Data acquisition.**
*Broadband images (FWHM = 50 Å) at 6300 Å.*
*Narrowband images (FWHM= 55 mÅ) at 18 positions between 6562 Å and 6564 Å ($\triangle\lambda$ = 125 mÅ)*
*Image scale is 0.1″/pixel.*

⇒ **Area under study.**
*NOAA AR0621 ($\mu = 0.68$ ).*
*Mosaic of overlapping subfields*
*( 33″x23″ ). Total FOV ∼ 103″x 94″.*
*5 scans per subfield → 4 min evolution.*



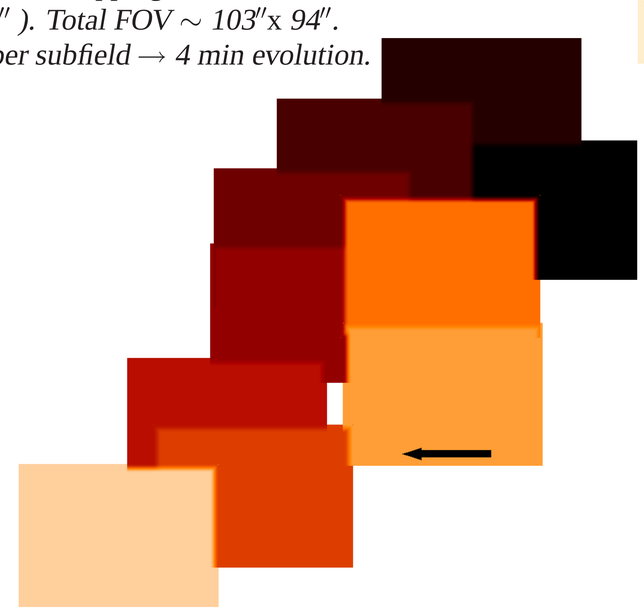


Fig.1- Subfield composition of the mosaic. Black solid arrow indicates position and direction of the dark fast moving clouds discussed in this poster.

## data reduction

⇒ **Speckle reconstruction** *to minimize earth atmosphere distortions.*
*Spectral ratio and speckle masking methods to restore broad- and narrowband images.*

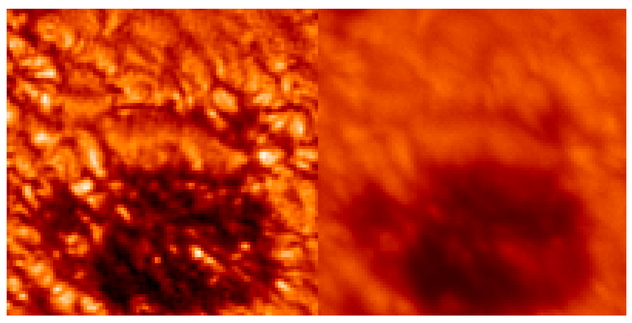


*Fig. 2.- Example of the speckle technique image improvement.* Left: *speckle reconstructed image.* Right: *Best short-exposure image (30 ms).*

⇒ *Mosaic reconstruction: subfield apodisation; medium-large scale features on broadband used for best cross-correlated positions.*

⇒ *Further destretching techniques for analysing the time series of individual subfields.*

## wave-like feature

⇒ *Images aligned and destreched for temporal comparison.*

⇒ *Dopplergrams (Al et al., 2003) calculated for different wing distances.*

⇒ *Character of a propagating wave found along a dark filament (Fig. 4)*

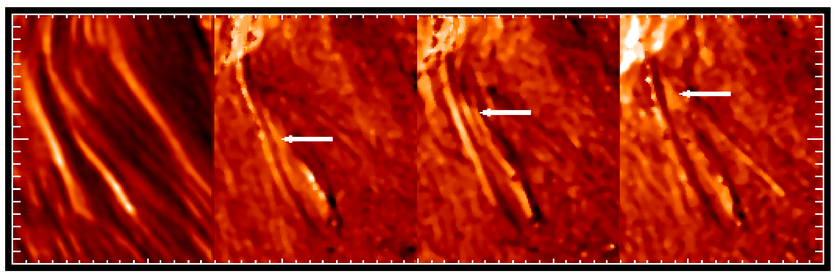


*Fig. 4.- Downflowns (bright and marked by arrows in the Doppler maps) propagating horizontally along and at the side of a dark filament. From left to right: line core intensity, 3 consecutive ($\Delta t = 45$ s ) Doppler maps. Tickmarks are separated by 0.92″*

## fast moving feature

⇒ *Fast differentially moving dark cloud found.*

⇒ *∼51 km/s vertical downflows*

⇒ *Horizontal surface velocities: ∼90 km/s*

⇒ *Clouds disappear in the 2 last frames.*

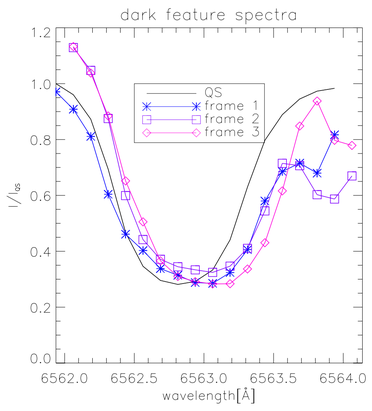



Fig. 6.- Temporal evolution of H$\alpha$ profile averaged around the cloud fragment marked by white crosses on Fig. 4 (profiles in different colors). Black solid line: mean profile from the surrounding quiet sun.

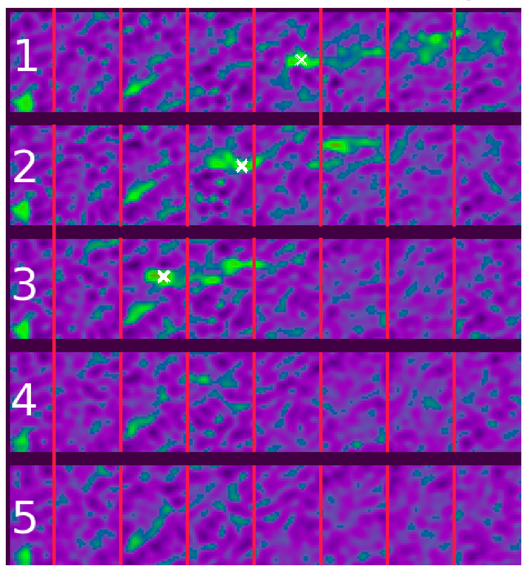



Fig. 7.- Panel 1-5: Time evolution of a dark feature seen at 6563.6 Å, in false color to increase contrast. Vertical red lines separated by 3.15″ ( 2280 Km). Time step between consecutive images ∼ 45 s

## future plans

⇒ Further studies on current dataset.

⇒ Analysis of the H$\alpha$ data taken with the new G-FPI (Puschmann et al., 2005), with greater resolution under better conditions, both in disc center and limb.

⇒ Simultaneous observations in H$\alpha$ and magnetic lines ( Fe I 6173 Å or Fe I 6302 Å)

⇒ Extended time series of chromospheric features to follow their temporal evolution.

⇒ Application of Beckers' cloud model (Al et al, 2004) for further studies and comparisons.

## references

○ N. Al, C. Bendlin, J. Hirzberger, F. Kneer, and J. Trujillo Bueno., 2004 "Dynamics of a enhanced network region observed in H$\alpha$", A&A 418, 1131-1139 (2004)

○ K. G. Puschmann, F. Kneer, T. Seelemann, and A. D. Wittmann, 2005 "The Göttingen Fabry-Pérot spectrometer for two-dimensional observation of the Sun". submitted

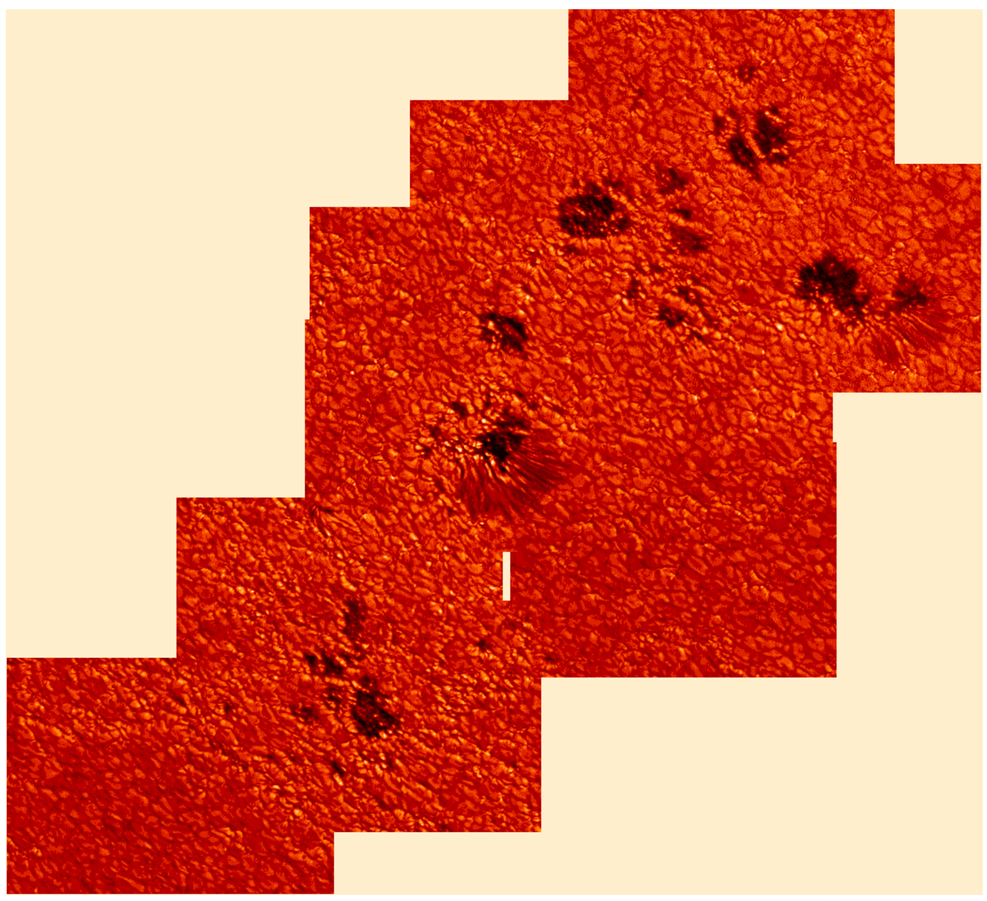


Fig. 3.- Speckle reconstructed broadband mosaic of the active region (resolution 0.2″, diffraction limit). Central yellow rectangle is a not observed region, as seen in Fig. 1

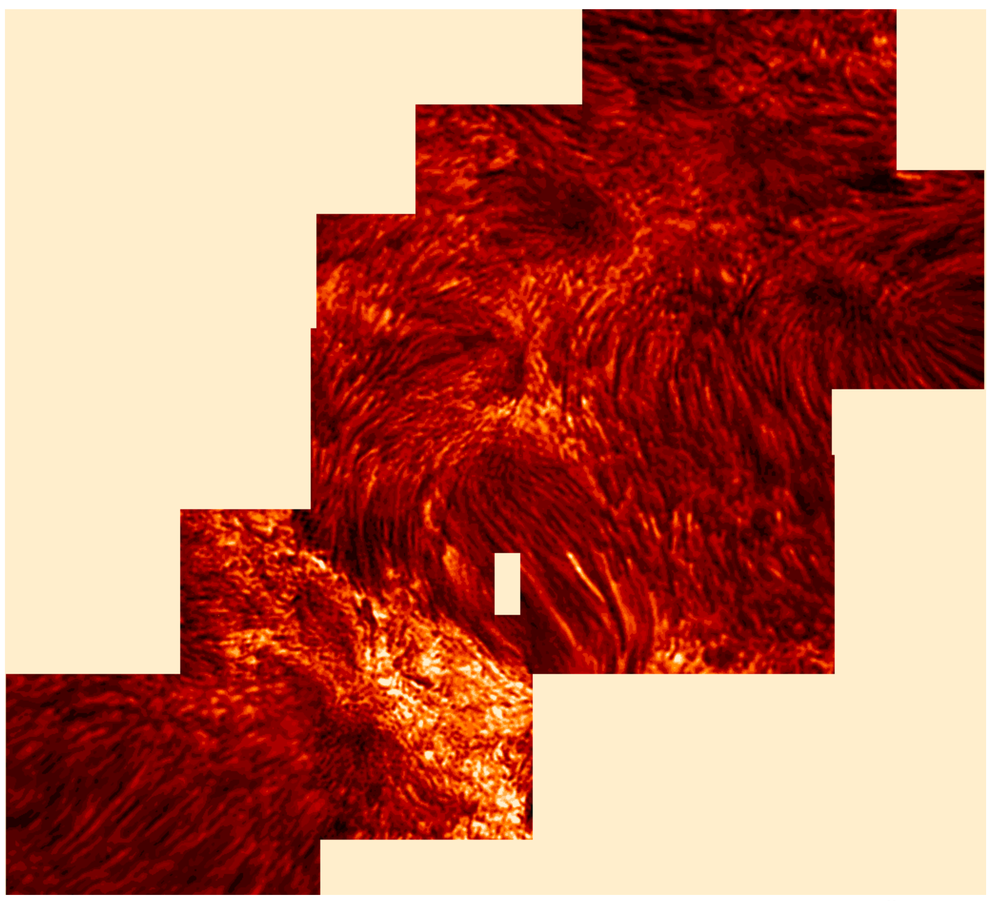


Fig. 4.- Reconstructed narrowband mosaic image in the H$\alpha$ line center. Resolution $< 0.5''$.