

the Sun's global magnetism with SONG

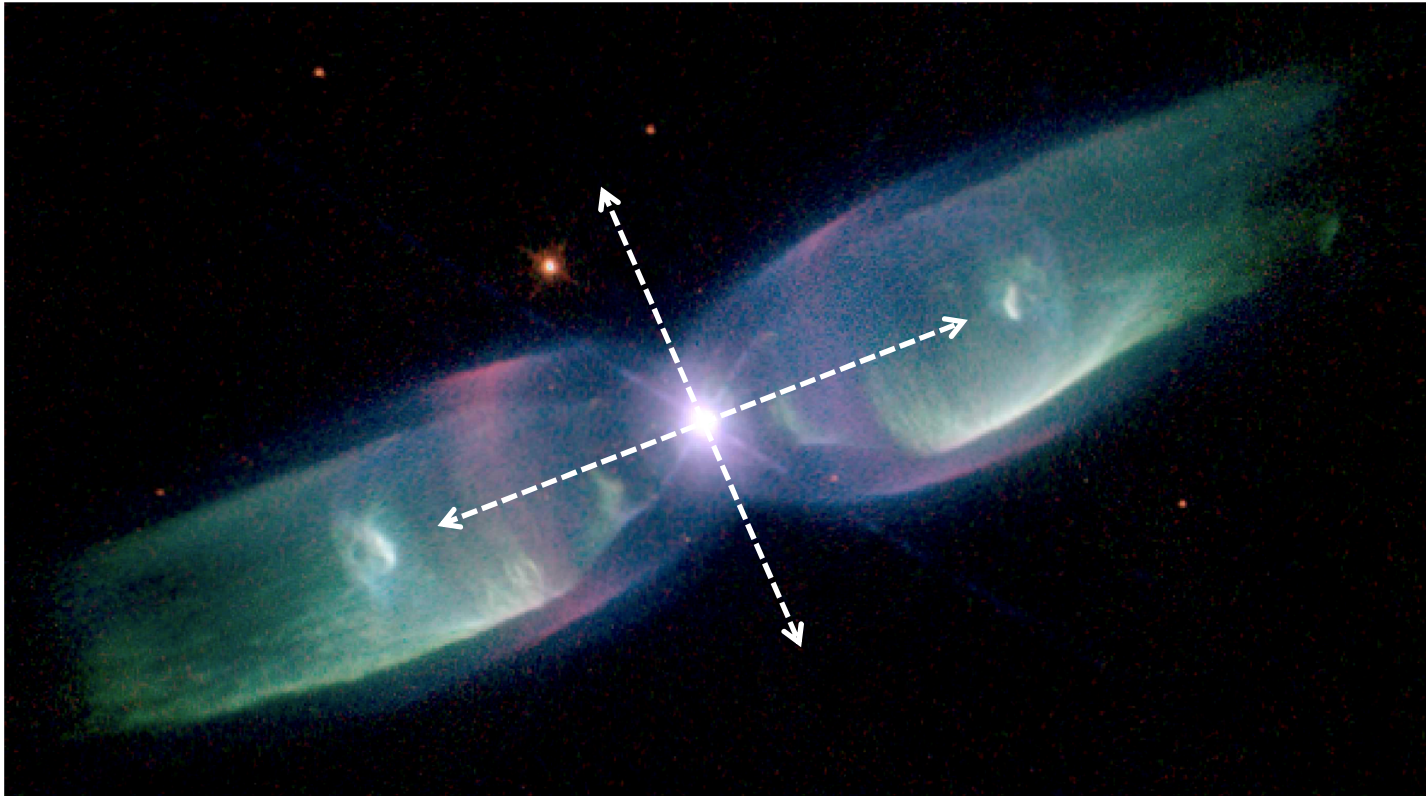
M. J. Martínez González



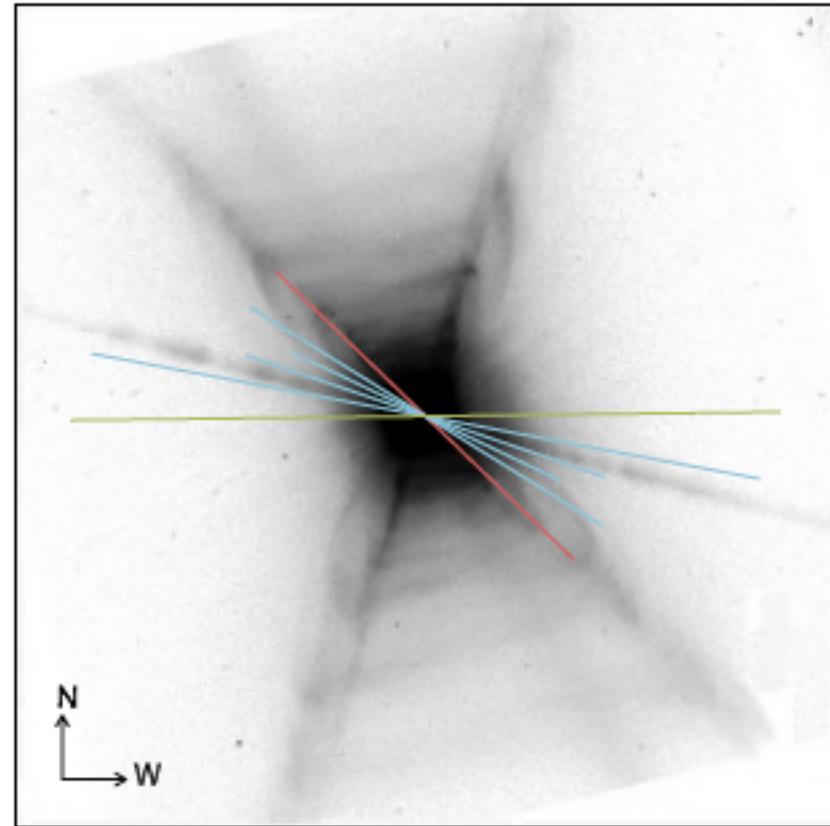
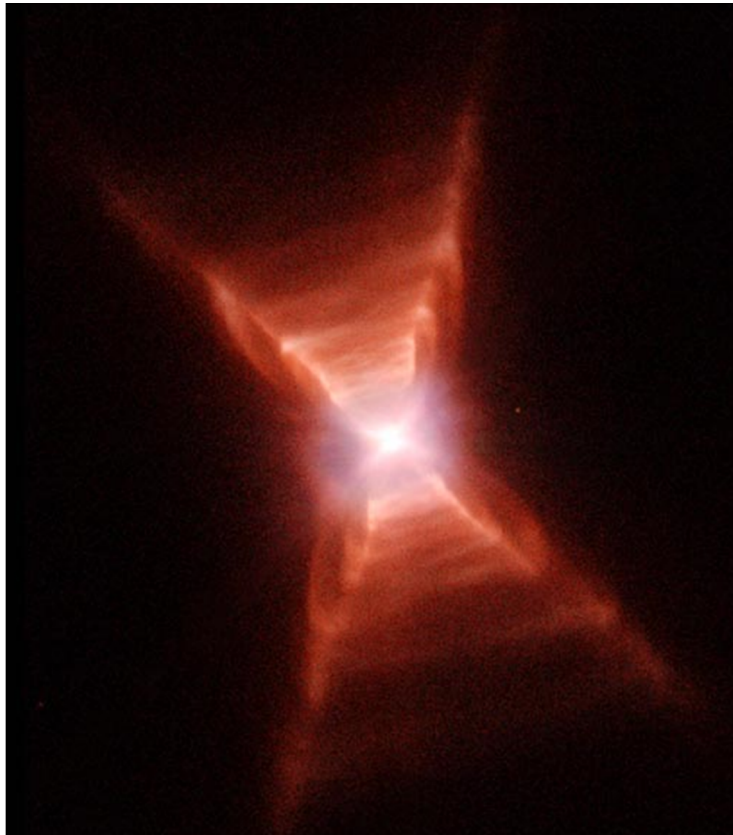


spectro-polarimetry at R10⁵⁻⁶

Stokes (I, Q, U, V)^t



polarisation
asymmetries of the emitting object & magnetic fields

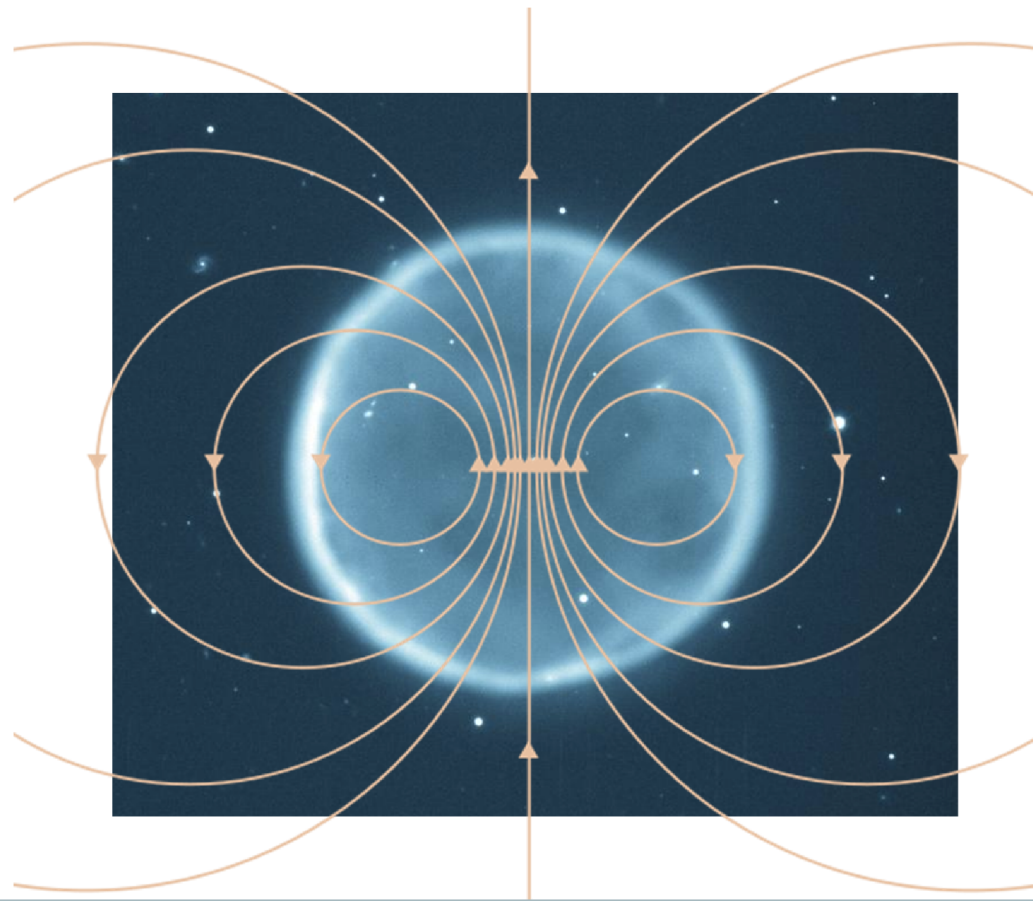


Martínez González et al. 2015, A&A, 574, 16

polarisation
asymmetries of the emitting object & magnetic fields

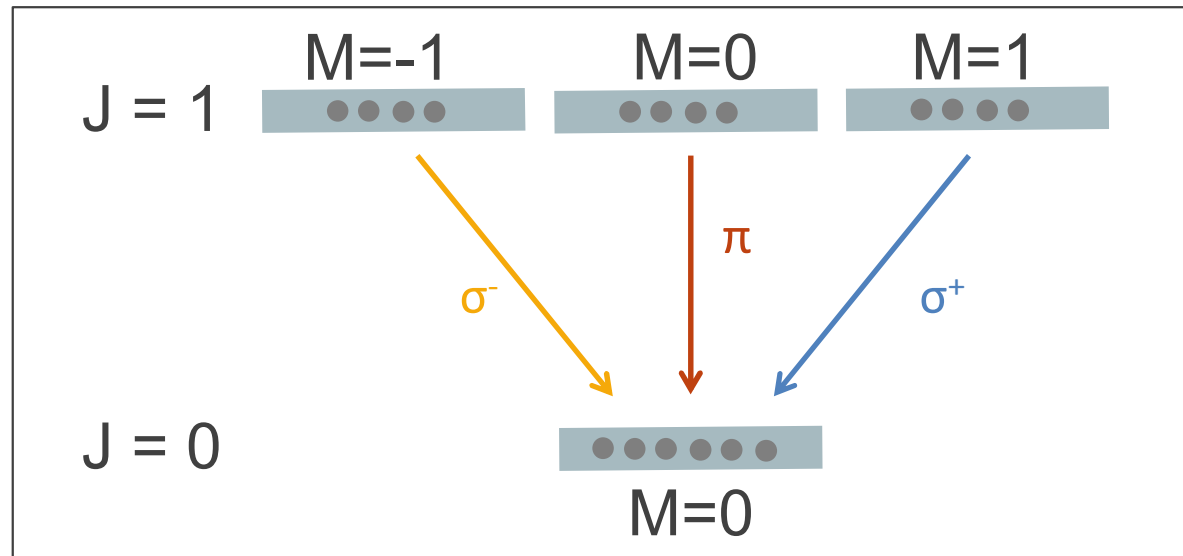


polarisation
asymmetries of the emitting object & magnetic fields

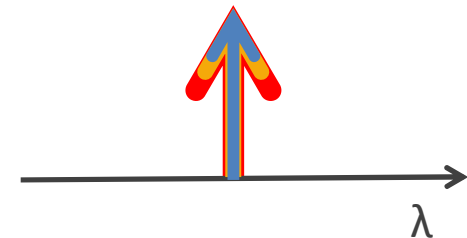


polarisation
asymmetries of the emitting object & magnetic fields

physical mechanisms that generate polarisation scattering & Hanle effect, Zeeman effect



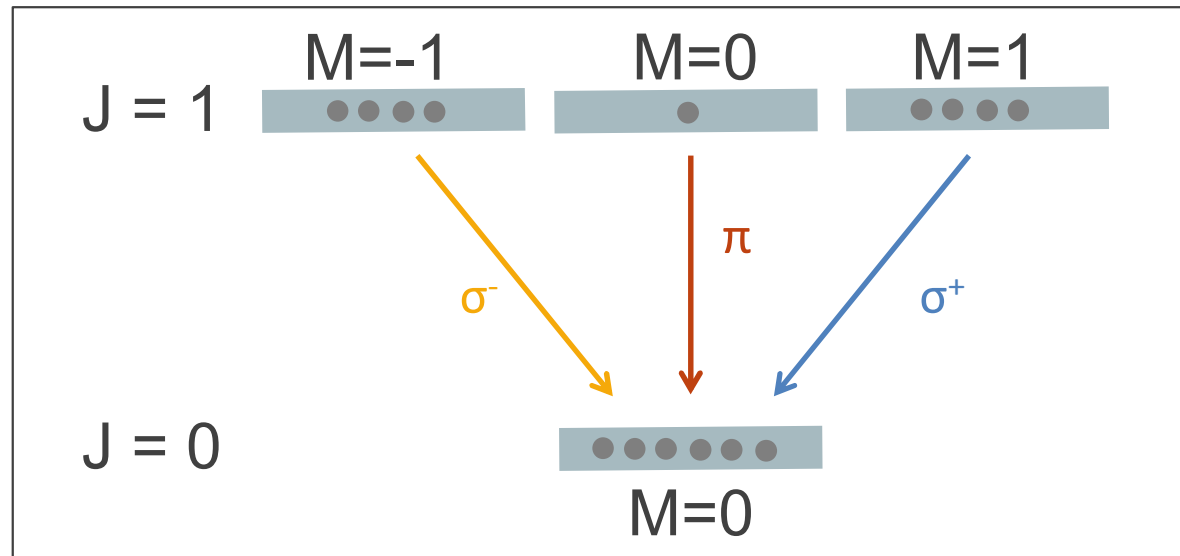
unpolarised atom \rightarrow unpolarised emitted radiation



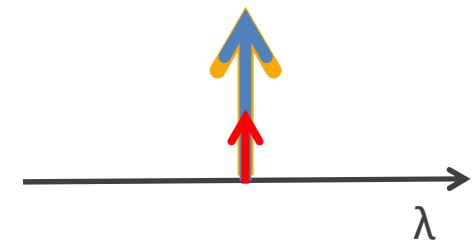
$$V = \sigma^+ - \sigma^- = 0$$

$$Q/U = \sigma^+ + \sigma^- - 2\pi = 0$$

physical mechanisms that generate polarisation
scattering & Hanle effect, Zeeman effect



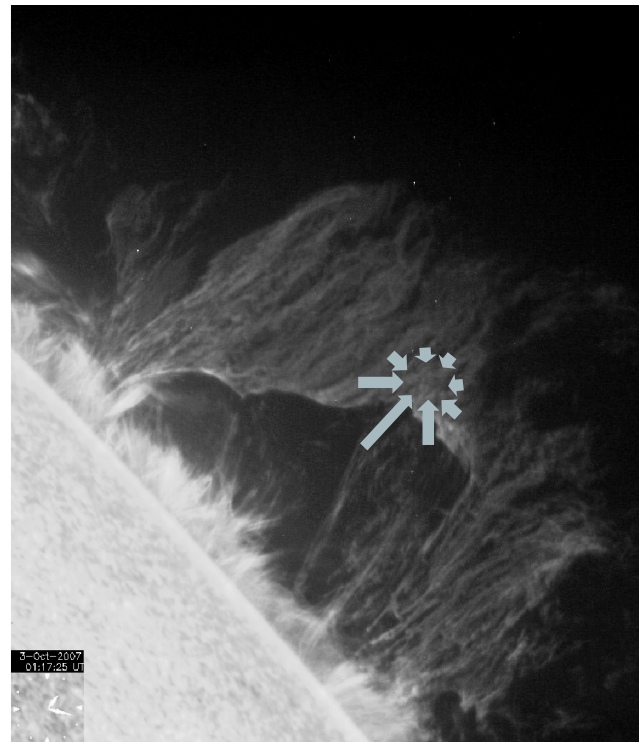
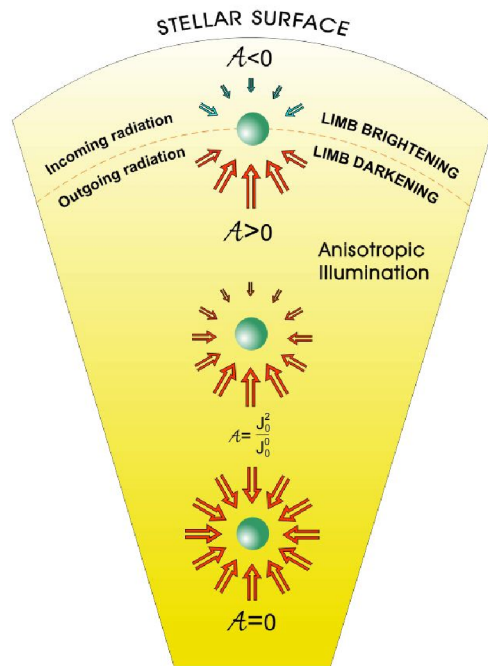
polarised atom \rightarrow polarised emitted radiation



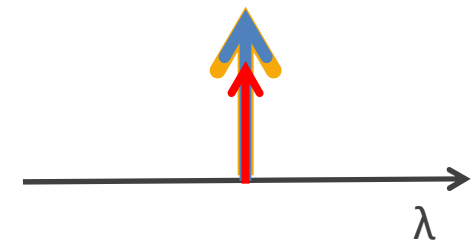
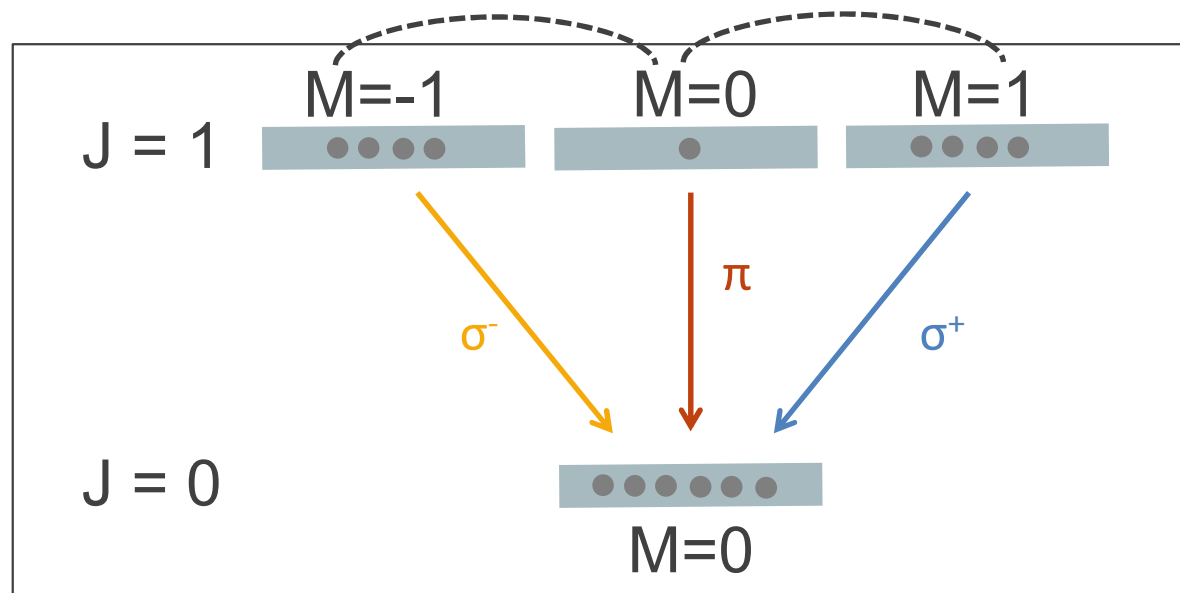
$$Q/U = \sigma^+ + \sigma^- - 2\pi \neq 0$$

because of
 population imbalances

physical mechanisms that generate polarisation
scattering & Hanle effect, Zeeman effect



physical mechanisms that generate polarisation scattering & Hanle effect, Zeeman effect

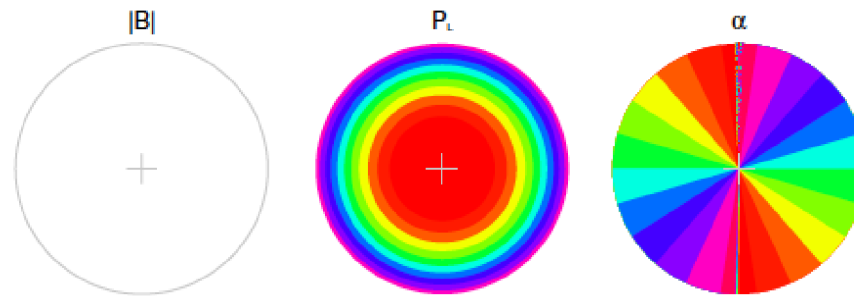


$$Q/U = \sigma^+ + \sigma^- - 2\pi \neq 0$$

because of
population imbalances

the presence of a magnetic field reduces and rotates
the induced polarisation

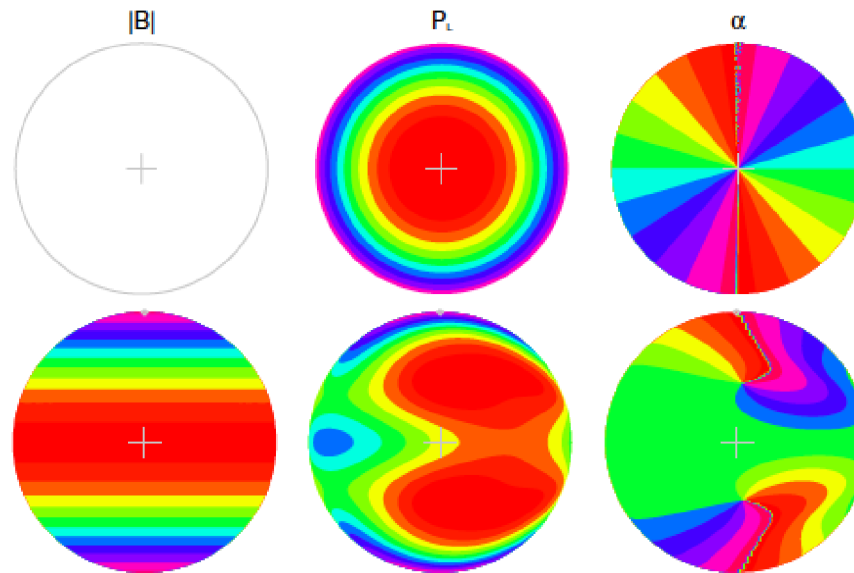
pure scattering case



Manso Sainz & Martínez González 2012, ApJ, 760, 7

the Hanle effect for stellar dipoles and quadrupoles

pure scattering case

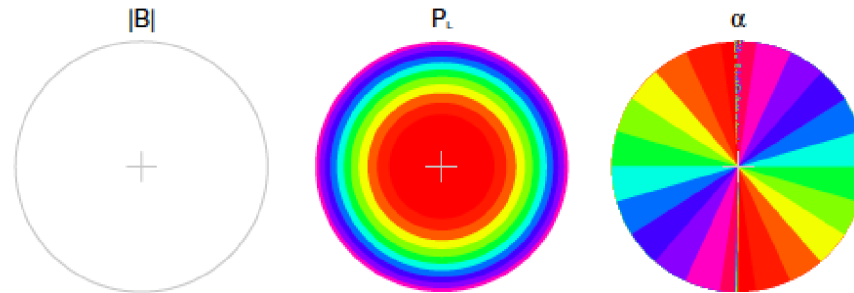


dipole and rotation
aligned

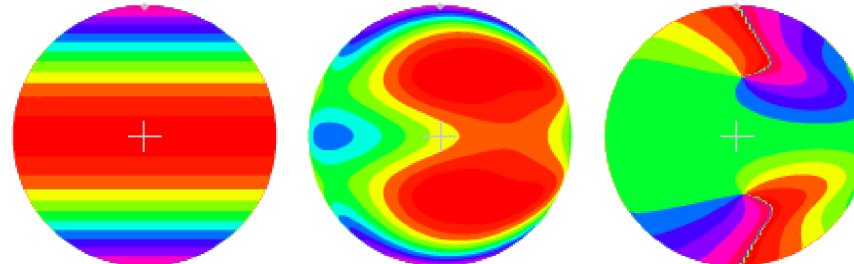
Manso Sainz & Martínez González 2012, ApJ, 760, 7

the Hanle effect for stellar dipoles and quadrupoles

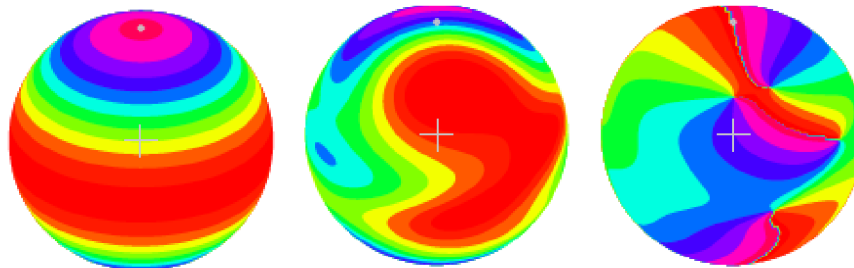
pure scattering case



dipole and rotation
aligned

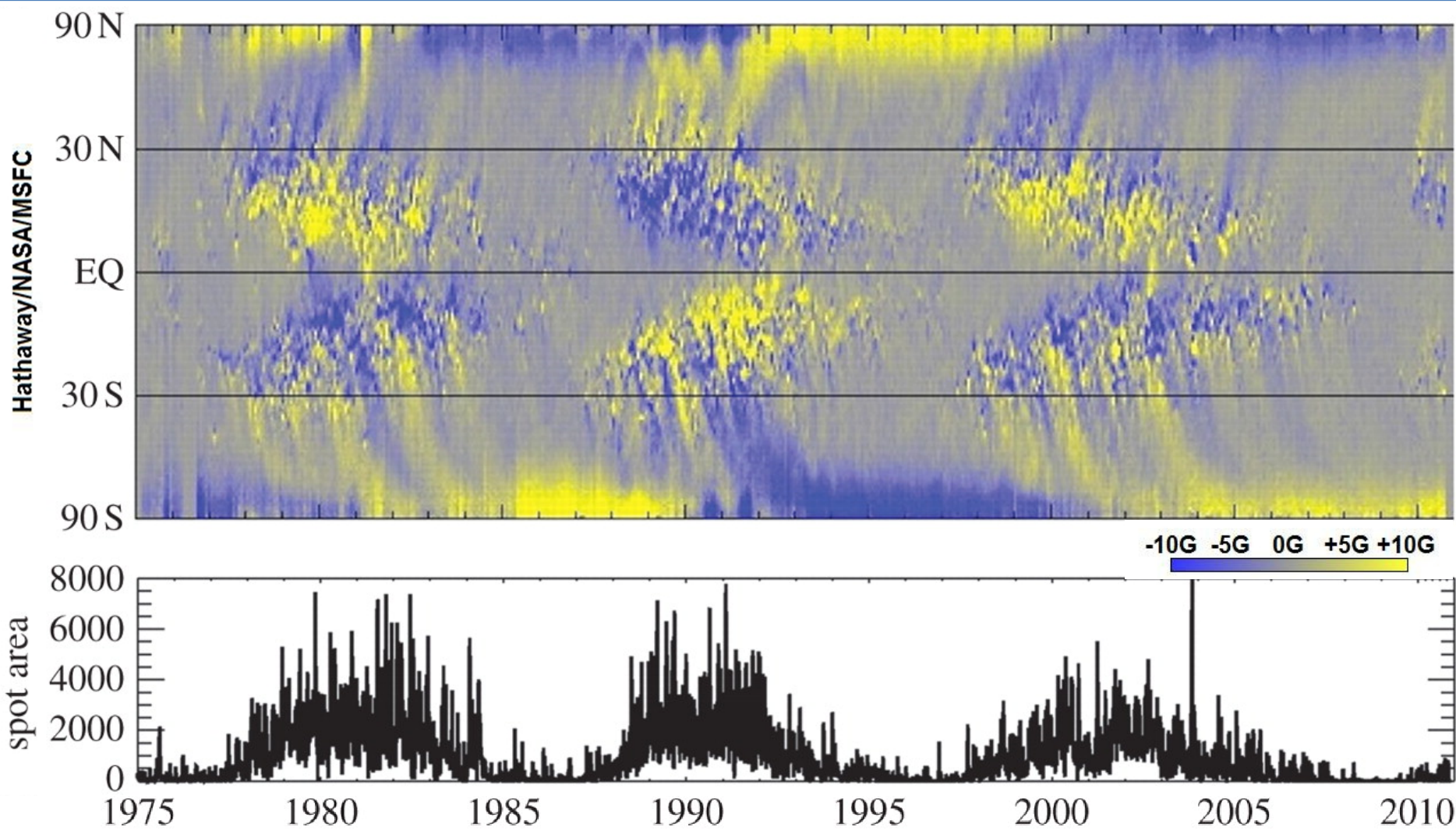


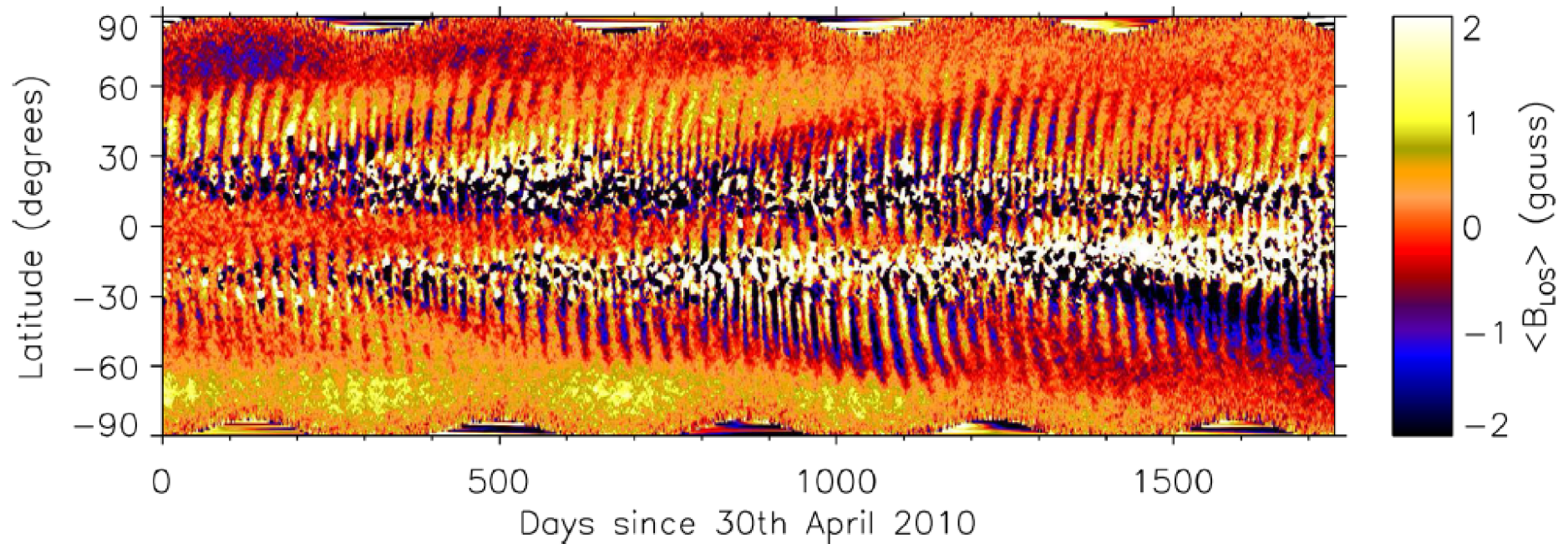
dipole and rotation
misaligned by 30 deg



Manso Sainz & Martínez González 2012, ApJ, 760, 7

the Hanle effect for stellar dipoles and quadrupoles

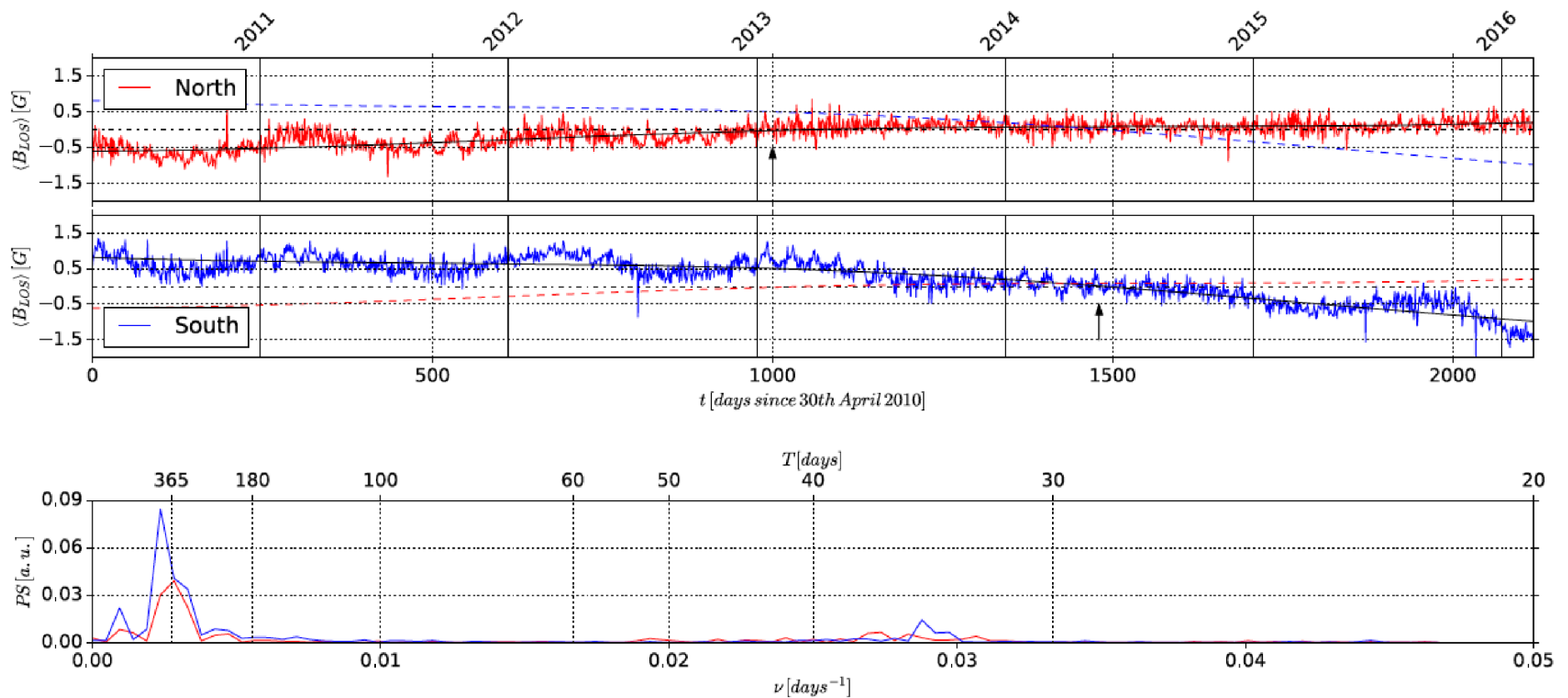




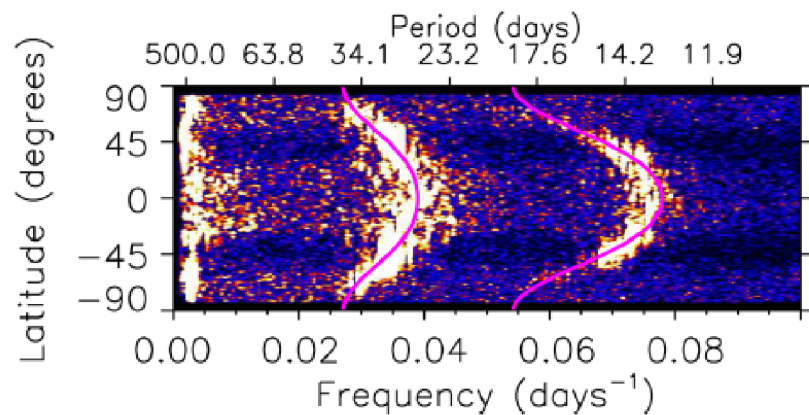
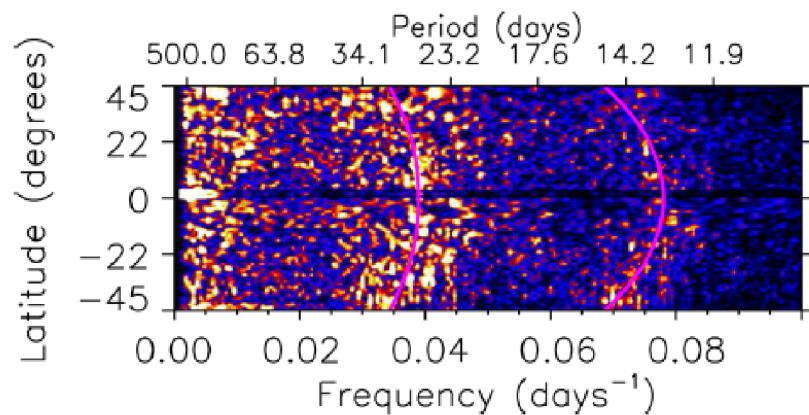
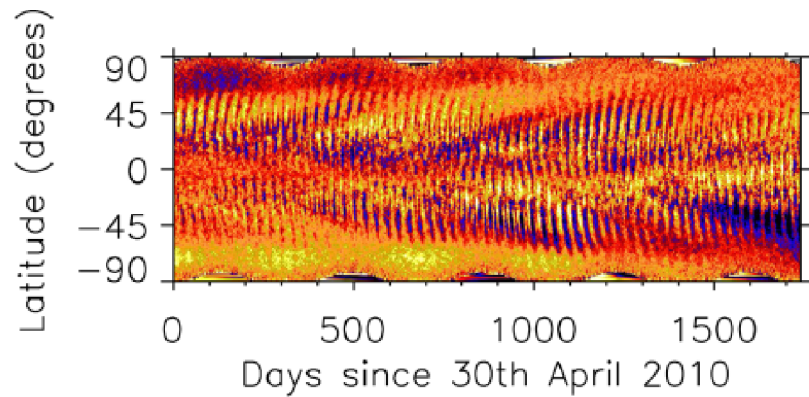
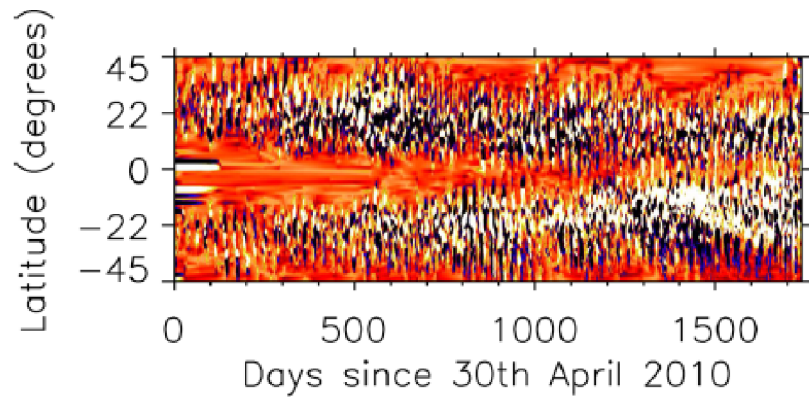
a pervasive monthly oscillation is observed at all latitudes

Pastor Yabar, Martínez González, & Collados, 2015, MNRAS, 453, L69

the Sun's global field presents a rotational modulation
the frequencies follow the latitude differential rotation

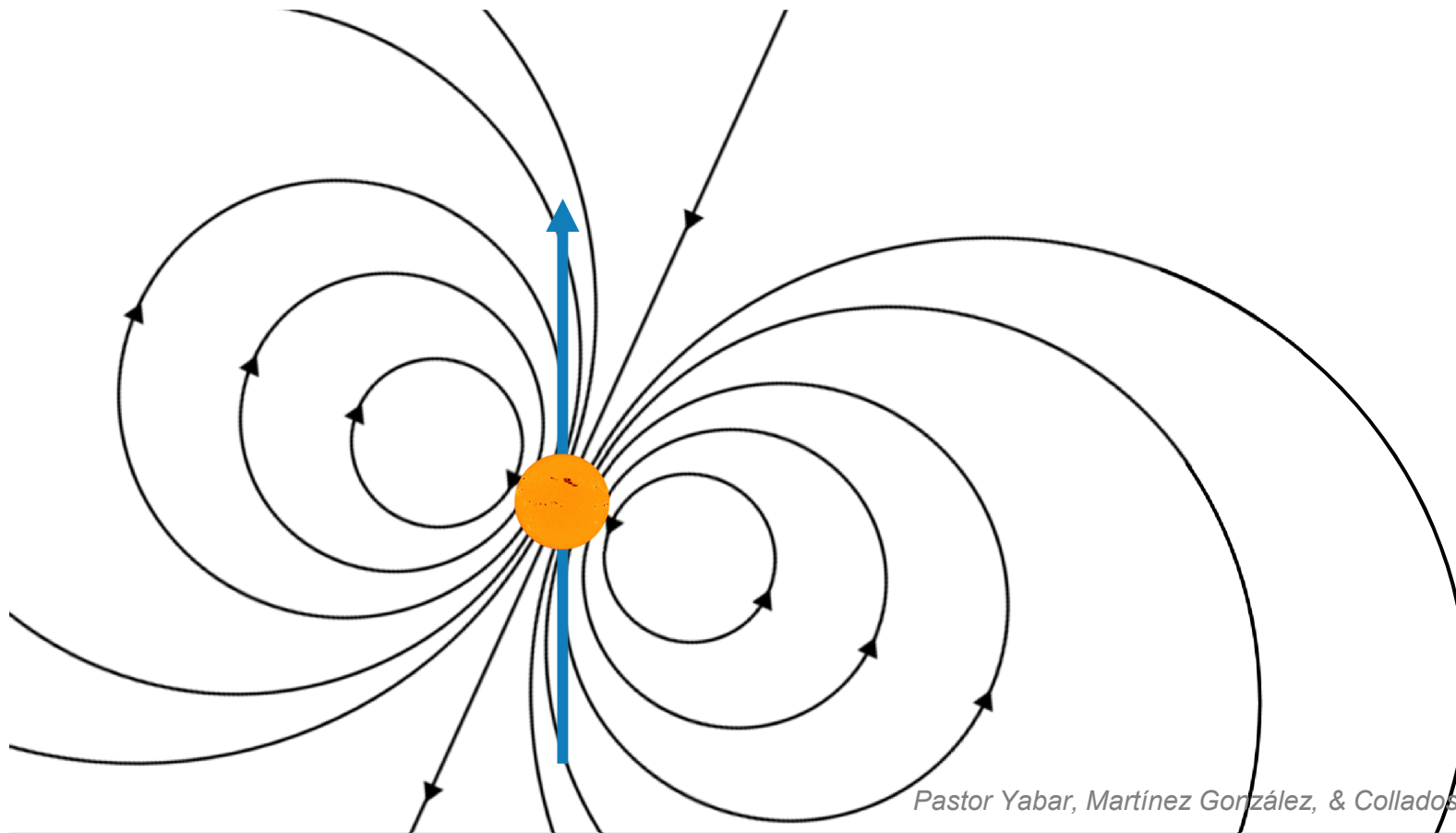


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Pastor Yabar et al. 2015, MNRAS, 453, L69

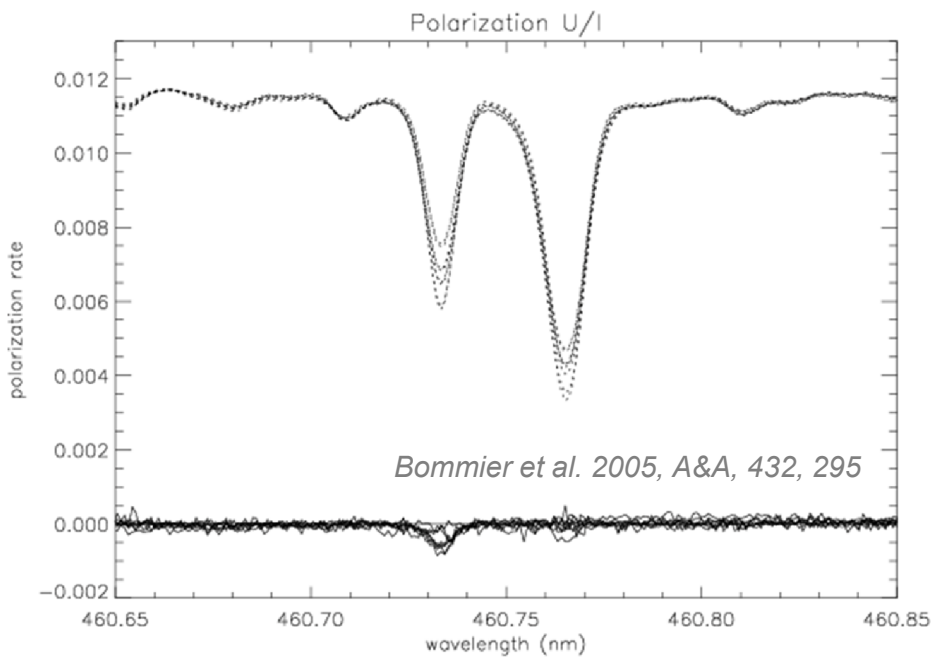
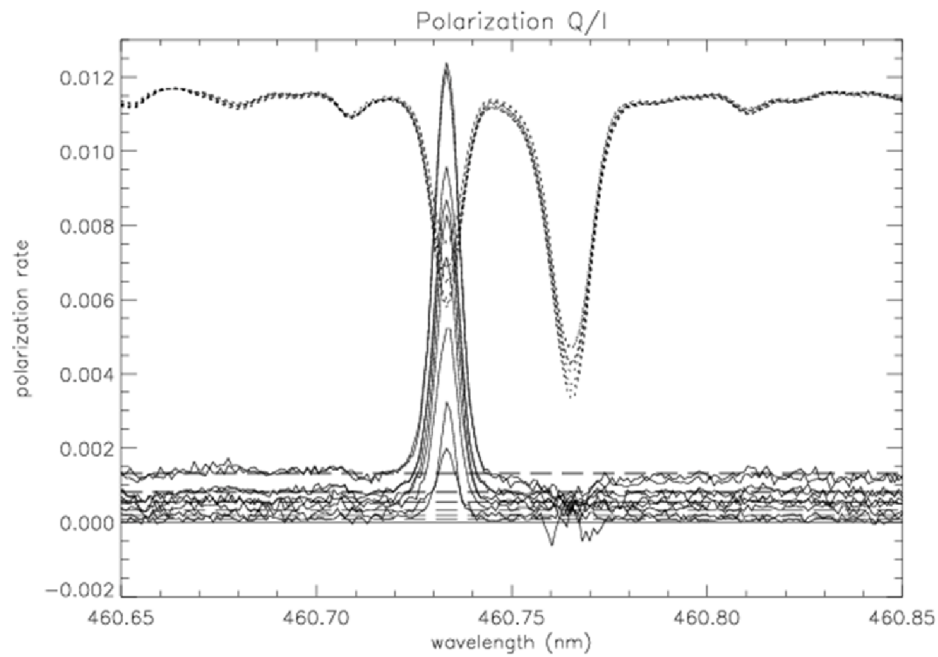
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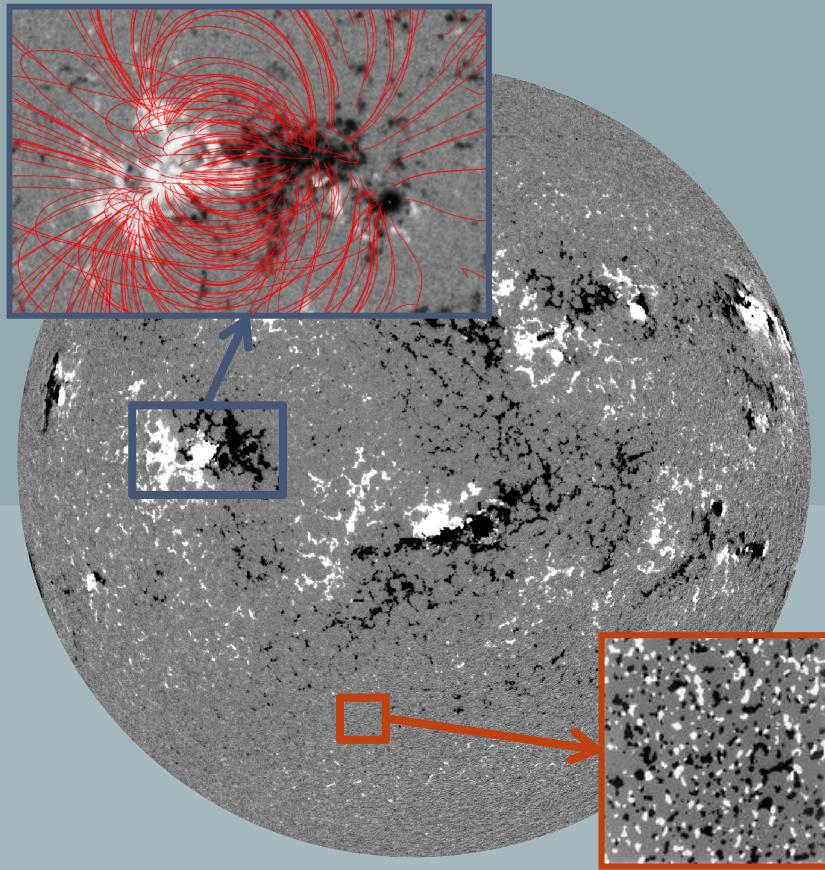
Pastor Yabar, Martínez González, & Collados, 2015, MNRAS, 453, L69

is the Sun an oblique rotator? (20-40 deg)

the Sr I line at 4607 Å a suitable line for Hanle (easy) diagnostics

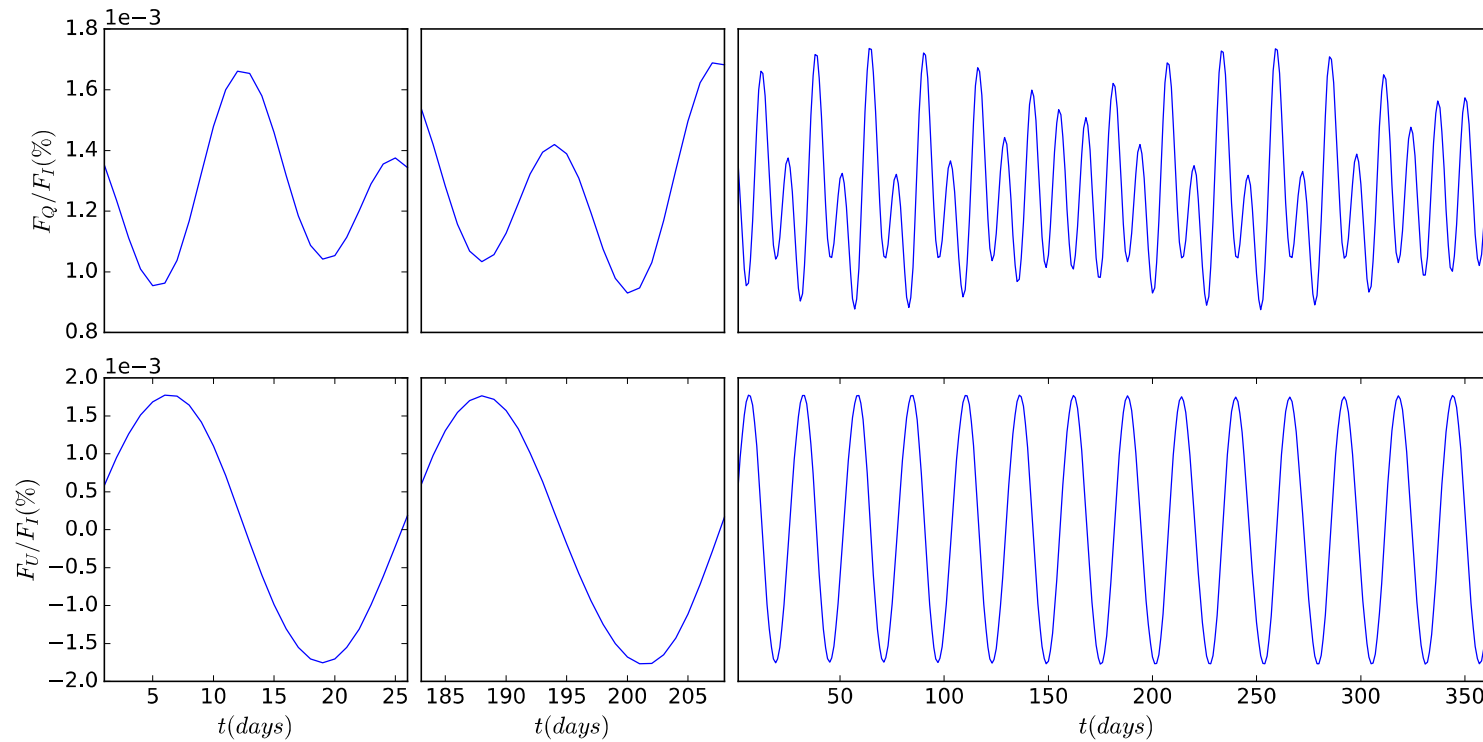


independent confirmation with Hanle effect measurements



the solar poles are very particular quiet regions since they are linked to the Sun's global field & activity cycle

observing integrated signals we minimise the effect of the photospheric field

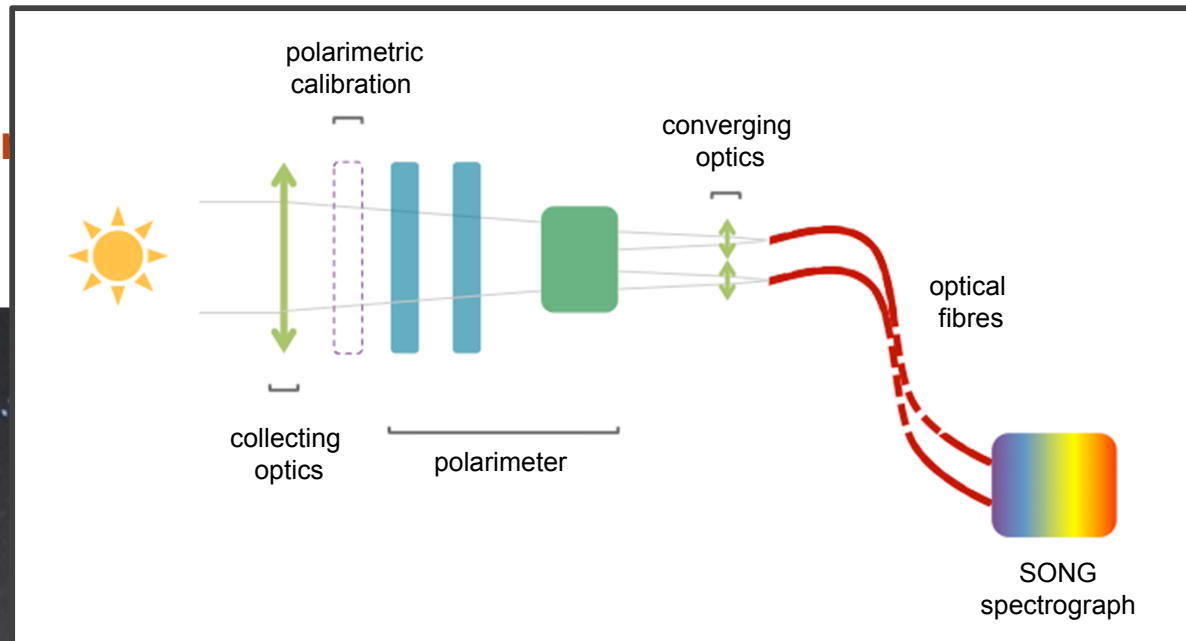


Vieu et al. 2015, MNRAS , 465, 4414

independent confirmation with Hanle effect measurements

the Hanle features of the global magnetic fields are detectable with a precision of 10^{-6} in disc integrated observations

construction of a disc integr



**the Hanle features of the global magnetic fields are detectable
with a precision of 10^{-6} in disc integrated observations**

**construction of a disc integrated polarimeter attached to the SONG spectrograph
[fundings requested]**



- test ZDI reconstructions using the Sun's integrated signal
- assess the validity of the technique for detecting weak fields in slow rotators

