Spectropolarimetric forward modelling of the lines of the Lyman-series using a self-consistent, global, solar coronal model

A. Khan, L. Belluzzi, E. Landi Degl'Innocenti, S. Fineschi, and M. Romoli

Context. The presence and importance of the coronal magnetic field is illustrated by a wide range of phenomena, such as the abnor- mally high temperatures of the coronal plasma, the existence of a slow and fast solar wind, the triggering of explosive events such as flares and CMEs.
Aims. We investigate the possibility of using the Hanle effect to diagnose the coronal magnetic field by analysing its influence on the linear polarisation, i.e. the rotation of the plane of polarisation and depolarisation.

Methods. We analyse the polarisation characteristics of the first three lines of the hydrogen Lyman-series using an axisymmetric, self-consistent, minimum-corona MHD model with relatively low values of the magnetic field (a few Gauss).
Results. We find that the Hanle effect in the above-mentioned lines indeed seems to be a valuable tool for analysing the coronal magnetic field. However, great care must be taken when analysing the spectropolarimetry of the Lα line, given that a non-radial solar wind and active regions on the solar disk can mimic the effects of the magnetic field, and, in some cases, even mask them. Similar drawbacks are not found for the Lβ and Lγ lines because they are more sensitive to the magnetic field. We also briefly consider the instrumental requirements needed to perform polarimetric observations for diagnosing the coronal magnetic fields.

Conclusions. The combined analysis of the three aforementioned lines could provide an important step towards better constrainting the value of solar coronal magnetic fields.

Key words. polarisation – scattering – Sun: corona – magnetic fields

A&A 529, A12 (2011)
DOI: 10.1051/0004-6361/201015551