

Zeeman Doppler Imaging beyond the weak field approximation
M. Semel et al.

Zeeman Doppler Imaging (ZDI) was first based on the weak field approximation. The circular polarization of a spectral line, due to Zeeman effect, is approximated by the first derivative of the intensity line profile multiplied by a well known coefficient and by the longitudinal component of the magnetic field. In the past, this formula was used extensively in solar physics. ZDI based on this approximation lead to numerous detections of magnetic fields in solar type stars. These detections when performed over a full period of the star lead to magnetic mapping of several stars. Meanwhile, this simple approximation has been abandoned in the study of solar magnetism and has been replaced by full Stokes polarimetry and sophisticated inversion codes. Here we develop the same approach to multiline observations and careful calculations of spectral lines formed in presence of magnetic fields. The early techniques like LSD are replaced by the algebra of the Principal Components Analysis.

Meir Semel
Lesia
Observatoire de Paris
5 Place J. Janssen
92195 Meudon
semel@obspm.fr