

Observing and modelling magnetic fields in white dwarfs

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Abstract: Our ongoing spectroscopic survey of white dwarf stars is a rich source of new magnetic white dwarfs (Kawka et al., 2012). Here we present a spectral atlas including some magnetic white dwarf prototypes and showing great diversity in the chemical composition and field structure affecting spectral line shapes. We focused our efforts on the class of polluted magnetic white dwarfs (DAZH): We describe the techniques employed to model the transfer of radiation in spectral lines for given (homogeneous, dipolar) surface field distribution with applications to a few cases of interest.

Spectral atlas of magnetic white dwarfs

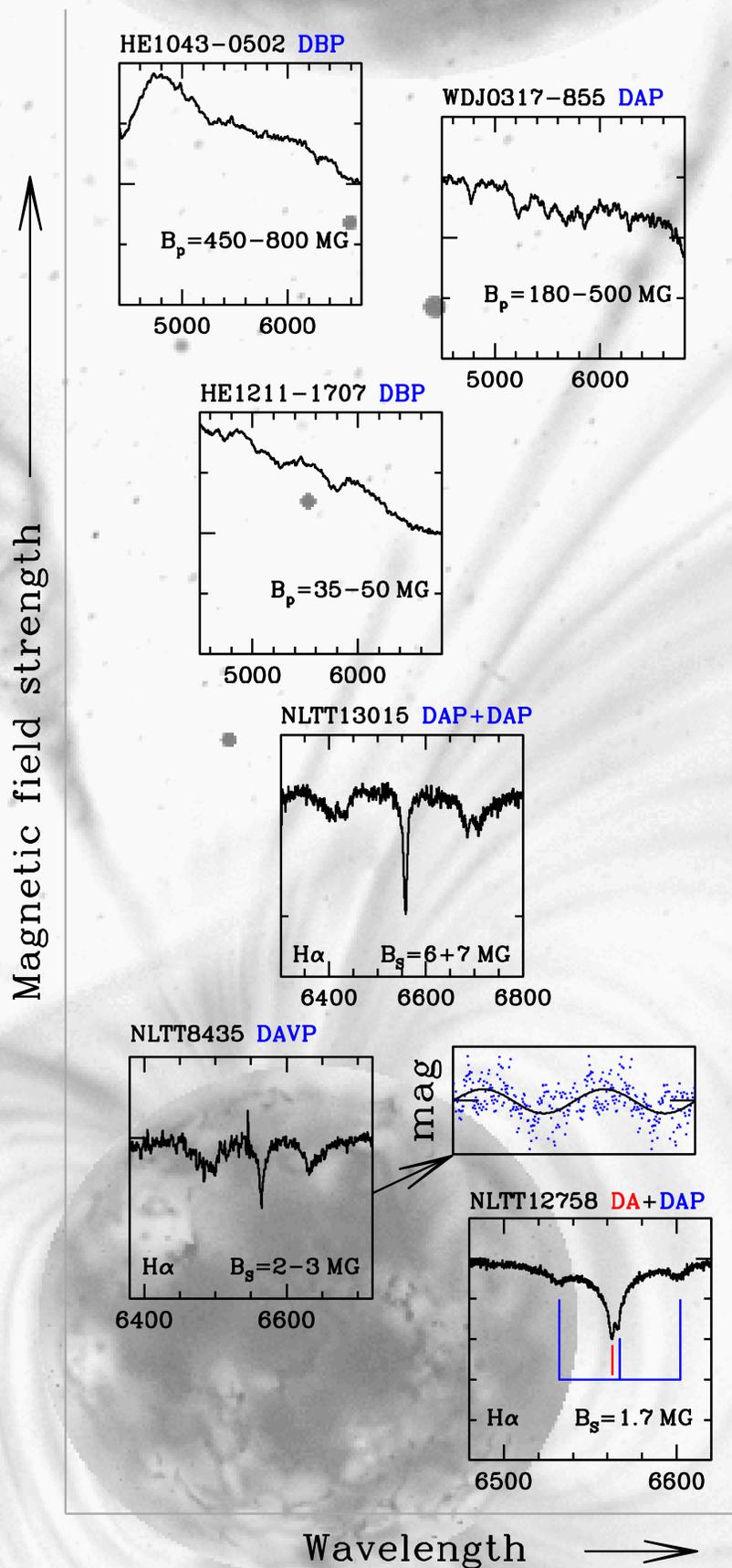


Figure 1: Spectral atlas showing various prototypes ordered from bottom to top with increasing field strength: the close hydrogen double degenerate (DA+DAP) NLTT12758 (Kawka et al., 2017). The low- to mid-field strength hydrogen white dwarf NLTT8435 and double degenerate NLTT13015 (Kawka et al., 2012), the high-field helium white dwarfs (DBP) HE1211-1707 and HE1043-0502 (Schmidt et al., 2001), and, finally, the high-field hydrogen white dwarf WDJ0317-855 (Ferrario et al., 1997). The DAP NLTT 8435 is photometrically variable on a period of ~ 90 minutes.

White dwarf properties: temperature, composition, field strength

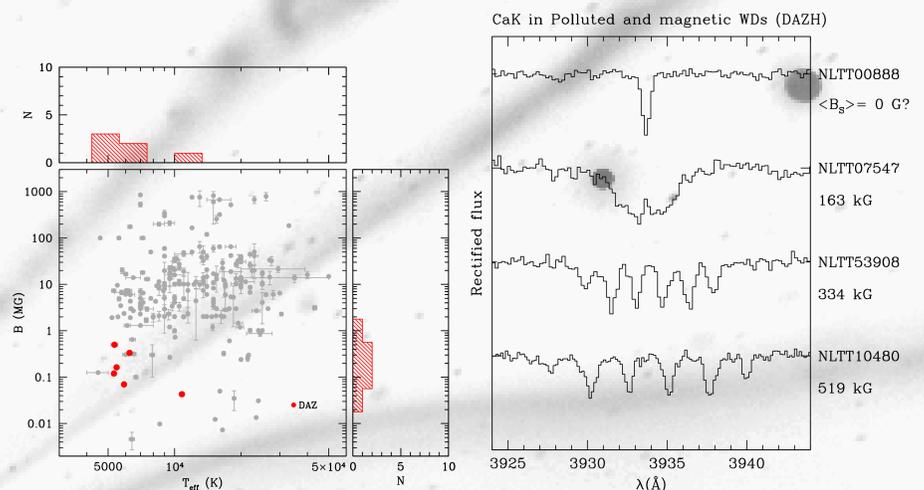


Figure 2: (Left) The complete sample of magnetic white dwarfs shown in the field strength versus effective temperature diagram and including (red symbols) the cool polluted DAZH among them NLTT53806. (Right) VLT/X-shooter spectra of CaK line in magnetic polluted white dwarfs.

Spectral line modelling: field strength, inclination

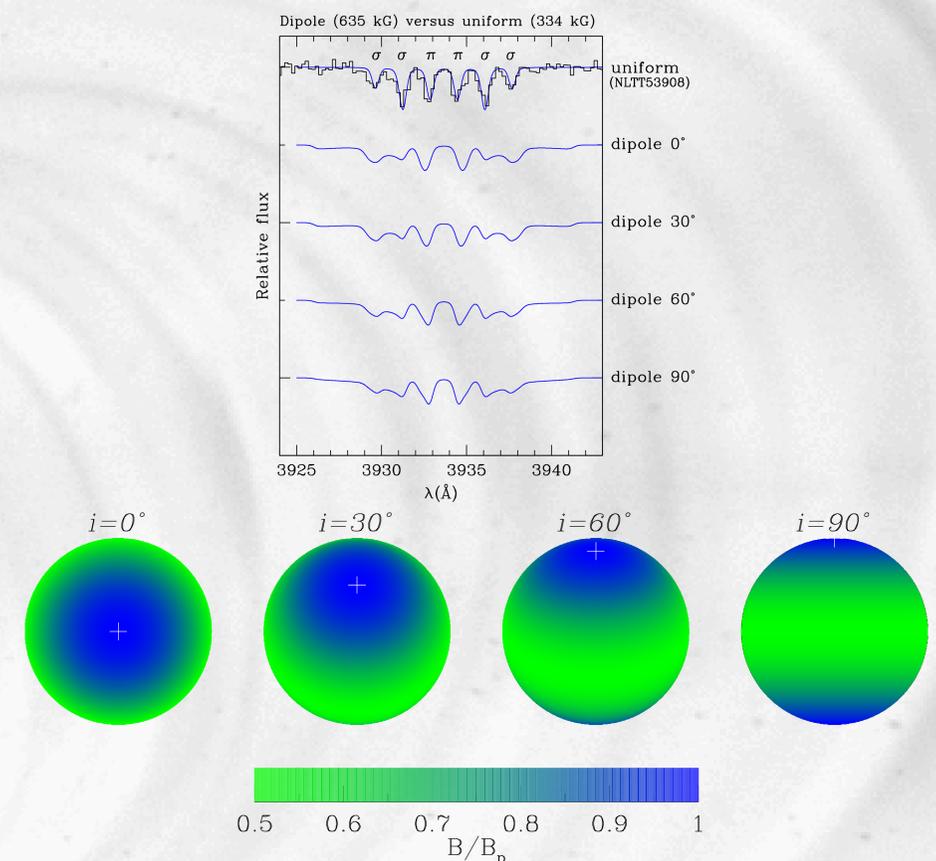


Figure 3: (Top) Modelling of the CaK line in NLTT53908 using a uniform model (334 kG) and dipolar models at various field inclination angles relative to the line-of-sight. The field appears homogeneously distributed on the surface. (Bottom) Beach balls showing the field distribution from the observer's point-of-view.

Objectives: Our aims are (1) to measure the distribution of magnetic field strength in the white dwarf population, (2) constrain the surface field geometry, and (3) explore the origin of magnetic fields in white dwarfs (fossil or merger).

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