DIAGNOSIS OF LOW DENSITY REGIONS THROUGH THE Fe II LINE PROFILES

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By means of a semi-empirical modeling we study the physical structure of the extended atmosphere of the Be stars computing line profiles of Fe II.

We suppose that the circumstellar medium of the star is in expansion and it can be described by a sequence of atmospheric regions with different thermodynamic and kinematic characteristics (a photosphere, a chromosphere and a cool envelope). We deal with a self-consistent solution of the radiative transfer problem in the comoving-frame, for expanding flows with spherical symmetry, and the statistical equilibrium equations for multi-level atoms. The rate equations are solved for a Fe II atomic model consisting of 14 energy levels plus continuum.

We compute visible and UV Fe II line with different velocity distributions, considering high and low velocity gradients in the regions next to the photosphere of the star. The extent of the line formation region is about 1.5 stellar radii and is placed close to the photospheric region.

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DETAILED ANALYSIS OF ζ^1 AND ζ^2 RETICULI

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We have analyzed the solar-type stars ζ^1 and ζ^2 Ret to determine their atmospheric parameters and abundances of various chemical elements. Our analysis was based on high resolution ($\lambda/\Delta\lambda = 50\,000$) and high S/N ($\sim 300$) spectra.

The effective temperatures were estimated according to 4 different criteria: excitation equilibria (using Fe I lines), photometric calibrations of five different color indices and fits of theoretical and observed Hα and Hβ profiles. Surface gravities were estimated by the ionization equilibria (using Fe and Ti lines). Equivalent widths of 65 absorption lines were measured in 6 spectral regions. These lines comprised the following elements: Al, Ce, Cr, Fe, Ni, Si, Ti, and V. The adopted atmospheric parameters are the following:

	ζ^1 Ret	ζ^2 Ret
T_{eff} (K)	5,746 ± 27	5,859 ± 28
log g	4.60 ± 0.13	4.42 ± 0.06
ξ (km/s)	1.20 ± 0.19	1.02 ± 0.14

Both stars were found to be metal deficient ([Fe/H] = -0.22 ± 0.05) and their abundances of all analyzed elements (relative to iron) are compatible with one another and the Sun. For the heavy element Ce, however, the agreement between ζ^1 and ζ^2 Ret is only marginal (within 2 σ). The internal probable errors of the abundance determinations range from 0.03 dex to 0.06 dex.

The fact that ζ^1 Ret is located below the zero-age main sequence of its metallicity suggests that it could be helium rich, relatively to the Sun.

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THE MAGNETIC FIELD TOWARDS HD 62542 IN THE GUM NEBULA

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Magnetic fields can align dust grains in the interstellar medium. As a fraction of the grains is not spherical, the light of the stars could be partially linearly polarized. Consequently, the directions of linear polarization of the background stars give us the direction of the magnetic field between the observer and the stars.

An interesting austral region is the big Gum Nebula, with size of 250 pc and distance of 400 pc. The line-of-sight towards HD 62542 shows one of the walls of the nebula interacting with the winds of two stars Zeta Puppis and Gamma Velorum. We present preliminary results of the magnetic field geometry of this wall using measurements of optic polarization of background stars of the region. The images were acquired with a CCD Imaging Polarimeter.

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