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THE SPECTRA OF MASSIVE STARS WITH GAIA

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ESA's cornerstone mission Gaia is scheduled to be launched in late 2011. It will determine the positions and distances of more than 24 million stars within 3 kpc of the Sun with a 1% relative accuracy. About 150,000 O and B-type stars are expected in the whole sample, as well as additional peculiar stars such as Be, B[e], and WR stars. Gaia will also provide spectrophotometry over the spectral range 330–1150 nm (RP/BP bands) and medium-resolution spectroscopy in the domain ranging from 847 to 874 nm (RVS spectral range). A large effort is now under way to develop the necessary software aiming at automatically derive the astrophysical parameters and radial velocities. One component of this development is the computation of grids of synthetic spectra for different types of stars and, in particular, for massive stars.

We started by gathering existing grids, computed with TLUSTY (Lanz & Hubeny 2003, 2007) and FASTWIND (Puls et al. 2005; Lefever et al. 2006). We have also computed unified model atmospheres with CMFGEN (Hillier & Miller 1998). Our main objectives are to test the parameters derived with these NLTE model atmosphere programs and to determine to what extent the line lists are consistent between these codes. This will allow us to select the code(s) best suited for the analysis of Gaia's data for different classes of stars. We summarize our present results:

• Figure 1 displays a comparison of RVS model spectra calculated with TLUSTY and CMFGEN for $T_{\rm eff}$ = 35,000 K and different surface gravities (or luminosities). This comparison shows that the atomic models of He I and N III need to be extended in CMFGEN, with respect to the models used in TLUSTY. We further note that the O III 5874 Å line is never present in CMFGEN synthetic spectra, even when the corresponding levels are included in our models. We are presently addressing these issues by revising the model atomic data, and we will calculate soon a revised grid of CMFGEN models.

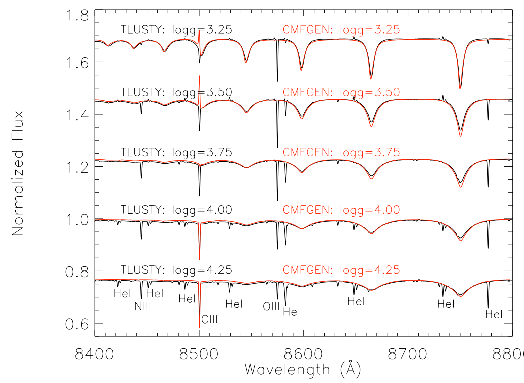

Fig. 1. Comparison of TLUSTY (black lines) and CMFGEN (red lines) models for $T_{\rm eff}$ = 35,000 K.

• FASTWIND and CMFGEN deliver very similar H I and He I-II line profiles in the optical range, although we do not have FASTWIND computations to validate this result directly in the RVS domain.

• Using stellar parameters derived in the classical optical domain, we find that spectra computed with TLUSTY match well observed spectra in the RVS spectral range.

• We have not identified any conspicuous wind contribution in the RPBP/RVS spectra of OB stars; TLUSTY is thus best suited for the analysis of these stars, while CMFGEN and FASTWIND will be preferred for more extreme objects (WRs, LBVs, etc.).

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