Contributed Talk

Splinter HotStars

Modeling hot star atmospheres: Challenges, applications, and the next generation

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Stellar atmosphere models are a key tool in order to understands stars. Not only do they yield synthetic spectra which can be compared to observations in order to obtain the stellar parameters, their stratification results are also used in a wide range of studies and simulations. For massive stars, winds are inherent and their proper accounting in atmosphere models is imperative. Unified model atmospheres that connect the quasi-hydrostatic and the supersonic wind regime in a consistent way are therefore essential. However, this requires complex calculations, including the radiative transfer in an expanding atmosphere and the solution of the statistical equations in a non-LTE situation for large model atoms having hundreds of levels. On top of these two major problems there are several further challenges, so that only very few codes exist worldwide which can accurately simulate an expanding stellar atmosphere and provide synthetic spectra that sufficiently reproduce observations.

One of them is the Potsdam Wolf-Rayet (PoWR) model atmosphere code. Originally developed to understand Wolf-Rayet (WR) stars, it has since been significantly extended and is nowadays applicable for any hot star. Using PoWR as an example, this talk will give a brief summary about the major tasks of modern unified atmosphere models and provide an examaple for a recent application of a next-generation model to the donor star of the high-mass X-ray binary Vela X-1.