Talk at Splinter Meeting

Splinter I

Hydrodynamic modelling of massive star atmospheres

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For more than two decades, expanding stellar atmosphere codes are used to obtain the stellar and wind parameters of massive stars with significant outflows. Although they have become a powerful tool and sufficiently reproduce the observed spectral appearance, they still make use of several approximations. One of them is the usage of a prescribed velocity field. Although mostly adequate for reproducing observed spectra, it introduces an inconsistency between the calculated radiation field and the wind stratifications.

Due to this approximation, it is not guaranteed that a model is used to describe a certain star also yields the amount of acceleration that would be required to actually drive the wind predicted for this object. This limitation prevents the usage of modern stellar atmosphere codes as a diagnostic for the wind physics, even though their detailed calculations of the main processes in an expanding atmosphere would make them an ideal tool for such studies.

To overcome this gap, a new branch of the Potsdam Wolf-Rayet model atmosphere (PoWR) code for expanding stellar atmospheres, a code whose first parts were made in Kiel, has been developed. The new branch allows to consistently obtain the velocity field and the density stratifications by solving the hydrodynamic equation throughout the stellar atmosphere. The talk will show the impact of hydrodynamically consistent modelling in comparison to conventional models and discuss the potential benefits of these kind of models.