

Master's thesis – Astronomy and Astrophysics ***'Massive-star winds in the Tarantula Nebula'***

Abstract:

The role of stellar winds is of paramount importance in massive stars: it shapes their evolutionary tracks, it affects the upper limit to their mass, and it determines the end product of their lives (neutron stars, black holes, possibly LGRBs). A key unresolved issue is how to reconnect the relatively well understood winds of OB-type stars with those of more extreme objects: the Of, Of/WN and WN stars. Growing evidence seems to point at these high-luminosity objects having radiatively-driven winds just like their less massive counterparts, but a unified parametrization of mass loss over such a broad range of stars still lacks. Using VLT-FLAMES spectra of a sample of 31 of the brightest stars in the Tarantula Nebula, we investigated the possibility that the Eddington factor Γ_e , which measures the importance of the radiation field, is the main parameter of a mass-loss recipe encompassing O, Of, Of/WN and Wolf-Rayet stars altogether, as well as the setter for the boundaries between these different stages. Our fastwind-based fitting method proved excellently in fitting O-type stars spectra and yielded acceptable results for the intermediate Of and Of/WN stages, but ultimately failed to reproduce WN spectra, which means that the highest Γ_e regime could not be explored. Regarding the successfully constrained 0.2-0.4 Γ_e range, we only observe a weak agreement with the theory, as a significant spread in mass-loss rates is present in our sample, although this may be due to the rather large photometric uncertainties that affect our estimate of the luminosity.