The Physical Properties and Effective Temperature Scale of O-type Stars as a Function of Metallicity. III. More Results from the Magellanic Clouds

Philip Massey (1), Amanda M. Zangari (1,2), Nidia I. Morrell (3), Joachim Puls (4), Kathleen DeGioia-Eastwood (5), Fabio Bresolin (6), and Rolf-Peter Kudritzki (6)

(1) Lowell Observatory; (2) MIT; (3) Las Campanas Observatory; (4) Universitats-Sternwarte Munchen, Germany; (5) Northern Arizona University; (6) Institute for Astronomy, University of Hawaii

In order to better determine the physical properties of hot, massive stars as a function of metallicity, we obtained very high SNR optical spectra of 26 O and early B stars in the Magellanic Clouds. These allow accurate modeling even in cases where the He I 4471 line has an equivalent width of only a few tens of mA. The spectra were modeled with FASTWIND, with good fits obtained for 18 stars; the remainder show signatures of being binaries. We include stars in common to recent studies to investigate possible systematic differences. The ``automatic'' FASTWIND modeling method of Mokiem and collaborators produced temperatures 1100 K hotter on the average, presumably due to the different emphasis given to various temperature-sensitive lines. More significant, however, is that the automatic method always produced some ``best'' answer, even for stars we identify as composite (binaries). The temperatures found by the TLUSTY/CMFGEN modeling of Bouret, Heap, and collaborators yielded temperatures 1000 K cooler than ours, on average. Significant outliers were due either to real differences in the data (some of the Bouret/Heap data were contaminated by moonlight continua) or the fact we could detect the He I line needed to better constrain the temperature. Our new data agrees well with the effective temperature scale we presented previously. We confirm that the ``Of'' emission-lines do not track luminosity classes in the exact same manner as in Milky Way stars. We revisit the the issue of the ``mass discrepancy'', finding that some of the stars in our sample do have spectroscopic masses that are significantly smaller than those derived from stellar evolutionary models. We do not find that the size of the mass discrepancy is simply related to either effective temperature or surface gravity.

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Comments:

Email: phil.massey@lowell.edu