Work on A supergiants is now underway opening up the prospect of spectroscopic distance determinations over cosmologically significant ranges with the coming generation of 8 m ground-based telescopes.

In constructing the model atoms and calculating the atomic data needed, it soon becomes apparent that one of the most serious deficiencies is the small number of energy levels and wavelengths available for many of the iron group ions. These are important for spectral synthesis. Moderately accurate collisional data, partial photoionization cross sections and many more line broadening data would also be most welcome.

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WHAT NEBULAR OBSERVATIONS AND PHOTOIONIZATION MODELS CAN TELL US ABOUT ATMOSPHERES OF HOT STARS

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A major purpose of this paper is to emphasize to the stellar atmosphere community

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that there are tests of stellar atmospheres modeling that result from observations of nebulae associated with hot stars, and which are usually overlooked. We illustrate this point with a specific example where there is a persistent problem matching certain observed nebular emission line fluxes with photoionization models of H II regions. Evidence is presented for what is called the [Ne III] problem - that is, the H II region models predict significantly less flux in the [Ne III] lines than is measured. The predicted nebular fluxes are affected not only by the representation of the stellar emergent ionizing spectra but also by the prodigious set of atomic data, that is an input ingredient in such calculations. However, it is argued that difficulties with matching [Ne III] fluxes are most likely due to the use of LTE stellar atmosphere models to represent the hot stars ionizing the observed H II regions.

Post-meeting calculations utilizing atmospheres by Kunze that do not assume LTE permit us to directly test the above conjecture. When these new atmospheres are used in the model nebula code, there are significantly enhanced [Ne III] fluxes compared with those run using the LTE atmospheres. When we consider a reasonable range of nebular parameters as well as reasonable expectations for Kunze models with effective temperature T_{eff} = 35000 - 40000 K, the [Ne III] problem is likely resolved. As an additional benefit of the model nebula calculations with Kunze non-LTE and Kurucz LTE atmospheres, we are able to also examine several criteria that have been used to estimate a characteristic T_{eff} for H II regions. Three indicators of "ionization" based on measured line ratios are examined. Two are from far-infrared data: [O III]52 μm/[S III]33 μm and [N III]57 μm/[N II]122 μm; the other is the ratio of adjacent radio recombination lines of helium and hydrogen. For a given line ratio in any of these three cases, the T_{eff} inferred will be lower for the non-LTE stellar atmosphere compared with the LTE one. Likewise, a non-LTE stellar atmosphere will be more highly ionized than the corresponding (same T_{eff}, surface gravity, and composition) LTE atmosphere.

OPACITIES IN STRONG MAGNETIC FIELDS

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White dwarfs are one of the most readily studied end products of stellar evolution. Their observed properties have provided and continue to provide important constraints for the theory of stellar evolution. Likewise, a study of magnetism in white dwarfs provides unique insights into the origin and evolution of magnetic fields in stars.

Spectacular progress has been made on the specific problem of the structure of the

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