YET ANOTHER PROGRESS REPORT: NEW MODEL ATMOSPHERES SOON

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ABSTRACT: I am working hard to improve model atmospheres because existing models have numerical errors, an unphysical treatment of convection, an inadequate or non-existent treatment of statistical equilibrium, an arbitrarily chosen microturbulent velocity, an arbitrarily chosen helium abundance, and a greatly underestimated line opacity for iron group elements. To solve some of these problems I have computed a new line list for the iron group elements using a large grant of time at the San Diego Supercomputer Center. Now I have started to compute opacities for the temperature range 2000 K to 200,000 K, for abundances ranging from 0.0001 solar to 10 times solar, for microturbulent velocities 0, 1, 2, 4, and 8 km/s. Then I will compute corresponding grids of models, fluxes, colors, and spectra.

[As this paper is substantially the same as "Atmospheres for Population II Stars", pp. 129-136 in IAU Colloquium No. 95, The Second Conference on Faint Blue Stars, A. G. Davis Philip, D. S. Hayes, and J. W. Liebert, eds., L. Davis Press, Schenectady, 1987, it is not printed here.]

DISCUSSION

JOHNSON: What value will you use for the mixing length in treating convection in the cooler models?

KURUCZ: I'll use 1.0 - I like round numbers. But I will be able to compute whole grids at any mixing length you like. The opacities take computer time, models do not.

GENET: Can you contrast the accuracy of model results with observational results?

KURUCZ: If you recall the plot for Vega, the stated errors are 2 and 3% for the spectrophotometry. I think the models must be similar. These are systematic errors. The scatter is much smaller. I would like to see both models and observations better than 1%.

WEAVER: What is the lowest Teff model you will calculate?

A. G. Davis Philip, D. S. Hayes and S. J. Adelman, (eds.)
New Directions in Spectrophotometry 25 - 26
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KURUCZ: I have only diatomic molecules, so only K stars.

JONER: With the addition of the molecular lines and the opacity changes incorporated in the new models, will you still use Vega as the zero point for the photometric grids?

KURUCZ: If the photometric system is perfectly known only one star should be necessary. In the real world, using several stars produces an empirical correction to the theoretical photometric system, to make it more like the actual system. To test the models (and photometry) I would use Vega. To make useful calibrations I would use several stars.

JONER: Will you now be able to predict an accurate solar color?

KURUCZ: When my models can reproduce the solar spectrum they should easily be able to predict the colors. I would use a multiple star calibration.

BOHLIN: For the comparison of your models with UV observations of hot stars, what models would you have the most confidence in?

KURUCZ: None. I am always surprised that there is such good agreement. Maybe there are canceling errors - not enough line opacity, but too much microturbulence.

WHITE: With what solar flux observations did you compare your model?

KURUCZ: First Labs and Neckel. Now Neckel and Labs.

WHITE: Lockwood, Tüg, and myself have made a direct Vega-Sun calibration and we find a discrepancy similar to that on your diagram. That is, blueward of the peak flux or redward of the peak flux can be made to fit with a flux zero shift, but not both at the same time. The point is that the observations may not be doing justice to the model rather than the other way around. Are we at a stage of precision where both the models and the observations need equal improvements?

KURUCZ: Yes.

PETERS: For two early B stars that I am familiar with, γ Her and τ Sco the flux shortward of 1100 Å is observed (from Voyager UVS) to be more intense than your 1979 models predict. There is apparently not a deficiency of opacity in the models but rather too much of the flux is absorbed. Do you have an explanation for this?

KURUCZ: Increasing the line opacity raises the flux anywhere there are no lines. Perhaps most of the additional lines are in the Fe III region around 1500 Å and there happens to be only a small increase at 1100 Å.