DSEP has been modified to accept surface boundary conditions and low temperature opacities derived from PHOENIX model atmospheres. Currently, results are available at Solar metallicity only. In addition, color transformations have been produced at Solar metallicity. Together, these allow the construction of isochrones which can then be compared to observations of stars with $[\text{Fe}/\text{H}] \gtrsim 0$ (for example, M67) as well as isochrones that use other inputs and color transformations.

In this report, I will briefly discuss the stellar models and isochrones made so far and conclusions that can be drawn from them. The semi-empirical color transformation tables of Vandenberg & Clem (2003) have been used throughout as a standard against which the PHX colors can be judged.

Figure 1 shows the evolutionary tracks of two $1 \, M_\odot$ models. The red track uses PHOENIX inputs while the green uses the Eddington $T\tau$ BC and low-T opacities from Alexander & Ferguson. Note two things: 1) the PHX RGB is distinctly flatter, and 2) the location of the RGB tip is (if you extrapolate) nearly identical. A model computed using the $T\tau$ BC and PHX opacities has the same curvature as the green track but the RGB tip is cooler by $\sim 100$ K. The differences in $\log(L)$ and $T_{\text{eff}}$ are largely erased when color transformations are applied.

M67 has an age of $\sim 4$ Gyr and roughly Solar metallicity. Michaud et al. (2004) demonstrate that the use of convective core overshoot (CCO) is not necessary to reproduce the M67 CMD. The isochrones presented here are in agreement with Michaud et al. Figure 2 shows the CMD of Montgomery et al. (1993) in B–V. Isochrones were constructed using PHX inputs and then transported to the color-magnitude plane using both PHX colors (green) and those of V & C (blue). In both cases, CCO was not used. The ages are 3.7 Gyr. The purposes here are to show that CCO is not required to accurately model the young-intermediate aged stars near the main sequence turn off and to show the quality of the color transformations. The question of whether or not CCO will be used in the finished product is still open and will require further study.

The location of the convective "hook" in the CMD is better represented by an isochrone that does not use CCO (green) than one that does (blue), see Figure 3. The apart from the location of the hook the two isochrones in Figure 3 are identical. Ignoring the quality of the fit, the best-fit isochrone with CCO has an age of 4 Gyr.

With the possible exception of the too-red RGB, the PHX inputs and colors perform well granted that all synthetic colors have trouble with the low-mass main sequence.

References:
Vandenberg & Clem 2003, AJ, 126, 778
Figure 1: Comparison of 1 M⊙ star with PHOENIX surface BC (red) and the T-τ relation (green).
Figure 2: M67 B-V color-magnitude diagram with 3.7 Gyr isochrones overlaid. No core overshoot was used in either isochrone. Note the isochrones’ RGB’s are redder than the data points. (PHX: green; V&C: blue)
Figure 3: The MS turn off in M67 showing the behavior of isochrones with (blue) and without (green) CCO. V&C colors were used in both cases.