

mmod

Interpolates linearly a model atmosphere for the desired values of effective temperature, surface gravity and metallicity using 8 surrounding models from the MARCS theoretical grid, available online at <http://marcs.astro.uu.se>. Models are read by another subroutine, `rd_mmod.pro`, and the correct path for the input model files needs to be specified there (using the `path` variable). The models should be in the `krz` format, occupy all stellar parameter nodes defined internally (see variables `availteff`, `availlogg`, and `availmetal` in the code), and have a “standard” mixture of metals, as defined by the MARCS group. Also, below $\log g = 3.0$ the models should be spherical, but for $\log g \geq 3.0$ models should be plane-parallel. This routine was adapted from `kmod`, the Kurucz model interpolator.

Syntax

`MMOD,teff,logg,metal,model`

Return Value

MMOD produces a plain-text file with a single MARCS model atmosphere

Arguments

`teff` - (float) Effective temperature (K)

`logg` - (float) \log_{10} of the surface gravity (g in cm/s/s)

`metal` - (float) [M/H] overall metallicity relative to solar

`model` - (string) Name for the output model atmosphere file

Keywords

- None.

Discussion

This code interpolates all quantities in the model to the same logtau scale, and then interpolates linearly, using the nearest 8 models defined in the grid (not necessarily those available, but those in the equidistant grid defined internally), each quantity (T, Pg, etc.) at each depth.

The Kurucz version of the code (kmod) has been used in a number of studies, e.g. in the Reddy et al. (2003,2006) papers published on MNRAS. Only recently we have performed a study in depth of the errors involved, and compared those with errors the result from interpolated in grids of high-resolution continuum-normalized fluxes with the same density (see paper by Mészáros to appear in late 2012). Interestingly, it is much better to interpolate fluxes than structures. The Marcs version (mmod) has been used in Ramírez, Allende Prieto & Lambert (2013).

References

Gustafsson, B., Edvardsson, B., Eriksson, K., et al. 2008, *A&A*, 486, 951

Mészáros, Sz., Allende Prieto, C. 2012, in preparation (on the linear interpolation of model atmospheres and fluxes)

Ramírez, I., Allende Prieto, C., & Lambert, D. L. 2013, *ApJ*, in preparation

Example

To produce a model for $T_{\text{eff}}=5777$ K, $\log g=4.437$ and solar metallicity:

```
IDL> mmod,5777.,4.437,0.0,'sol.mod'
```

Version History

C. Allende Prieto, UT, initial version coded in 1999

Bug fixed in 2005

I. Ramírez, mmod coded at Carnegie Observatories in 2010