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Parameterizing the Third Dredge up in AGB Stars

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We present new evolutionary sequences for low and intermediate mass stars ($1M_{\odot}$ to $6M_{\odot}$) for three different metallicities, $z = 0.02$, 0.008 and 0.004. We evolve the models from the pre-main sequence to the thermally-pulsing asymptotic giant branch (AGB) phase. We have two sequences of models for each mass, one which includes mass-loss and one without mass-loss. For an overview of AGB evolution and nucleosynthesis, see Herwig (2002) and Lattanzio (2002)

It is on the AGB that carbon, nitrogen (Lattanzio & Boothroyd, 1997) and s-process elements produced in the interior of the star can be mixed to the surface, via the third dredge-up (TDU) process. The efficiency of the TDU is quantified by the parameter λ, which is the ratio of mass dredged-up by the convective envelope, $\Delta M_{\rm dredge}$, to the amount by which the core-mass increased due to hydrogen burning during the preceding interpulse period, ΔM_H,

$$\lambda = \frac{\Delta M_{\rm dredge}}{\Delta M_{\rm H}}. \quad (1)$$

Using the results from this large and homogeneous set of models, we present an approximate fit for the TDU efficiency parameter, λ, and the core-mass at the first dredge-up episode, $M_{\rm c}^{\rm min}$ as a function of total mass, pulse number and metallicity (Karakas, Lattanzio, Pols, in preparation).

References

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