# NONLINEAR RR LYRAE MODELS AND DOUBLE MODE PULSATION

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Abstract. Nonlinear models of RR Lyrae variables were calculated in the region of the HR diagram containing double mode pulsation. In all models $T_{eff}$ = 7000 K, the luminosity was 60 times solar, X = 0.70, Y = 0.299, and $P_1/P_0$ = 0.746, characteristic of double mode RR Lyrae variables in M15 (Cox, Hodson, and Clancy, 1983). Models of 0.65 solar masses were calculated using standard opacities and models of 0.75 solar masses were calculated with opacities artificially enhanced by a factor of 1.2 between log(T) = 5.2 and log(T) = 5.9 (Andreasen and Petersen, 1988).

Incorporating time dependent convection generally decreased fundamental mode growth rates and increased first overtone growth rates. However, the first overtone enhanced opacity model appears to be exceptional. Although higher opacities lowered linear growth rates for both the fundamental mode and the first overtone, the growth rates were found to increase in the nonlinear regime. In particular, preliminary calculations indicate that the enhanced opacity model exhibits a positive fundamental mode growth rate near the first overtone limit cycle and a positive first overtone growth rate near the fundamental mode limit cycle. Apparently these models show double mode behavior.

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