HYDRODYNAMIC MODELS OF LOW-MASS PULSATING SUPERGIANTS WITH RADIATIVE TRANSFER

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Abstract. A method of calculating nonlinear stellar pulsations including nonstationary radiative transfer in a grey spherical atmosphere is described. With the help of this method eleven type II supergiant radiative models were constructed with masses of $0.6M_\odot$, luminosities ranging from $128L_\odot$ to $3123L_\odot$ and periods in the range from 1.123 to 46 days. A stable limit cycle was found to be accessible only by models with an effective temperature between 5700K and 6165K. The model with T_e = 6165K is stable, whereas the models cooler than 5700K show nonregular behavior. Transition from strictly periodic to nonregular pulsation arises when $M/R \lesssim 0.018$, due to high amplitudes, $\delta r/r \approx 1$, and strong shocks in the atmosphere. The radiative transfer effects lead to some decay in the radial amplitude, as well as to a more significant decrease, about 0.6 magnitudes, in the light variation. A photometric comparison between the light curves of the models calculated with and without transfer and the observed light curve of the variable star No. 154 in M3 shows that the results predicted by the transfer model are in much better agreement with obervational data.

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