A consistent modeling of the out from the O-rich Mira IRC-20197

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We present a consistent time-dependent model for the oxygen-rich star IRC-20197. This model includes a detailed treatment of the interactions among hydrodynamics, thermodynamics, dust formation, and chemistry. It is determined by the stellar parameters of the initial hydrostatic model with stellar mass $M_*= 1.3\ M_\odot$, stellar luminosity $L_*= 1.4\times10^4\ L_\odot$, stellar temperature T_*=2,400 K, and carbon to oxygen abundance ratio $\varepsilon_C/\varepsilon_O=0.5$. The pulsation of the star is simulated by a piston approximation at the inner boundary where the velocity varies sinusoidally with a period of P= 636 d and an amplitude of Δu = 8 kms^{-1}. This model yields a time averaged out velocity of 11.9 kms^{-1} slightly lower than the observed value (14 kms^{-1}) and an average mass loss rate of $7.3\times10^{-6}\ M_\odot\ yr^{-1}$ which is in a good agreement with the value derived from observations. Based on the atmospheric structure resulting from this hydrodynamic calculation, we have performed angle and frequency dependent continuum radiative transfer calculations, which provide the spectral energy distributions at di erent phases of the pulsation cycle and synthetic light curves of the dust shell model at di erent wavelengths. The computed spectral energy distributions and the synthetic light curves are in good agreement with the observations of IRC-20197. We derive a distance to IRC-20197 of 1,100 parsec. Furthermore, properties of the resulting grain size distribution are discussed.