A CYCLIC THERMAL INSTABILITY IN CONTACT BINARY STARS*

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Abstract. Contact binary stars coupled by a common convective envelope in which the entropy is constant, the Lucy model, are unstable against mass exchange: if either component begins to transfer mass, it will continue to do so. A detailed sequence of models is calculated which follows the thermal evolution of a $2M_{\odot}$ contact binary of normal Population I abundances ($X=0.70$, $Z=0.02$), starting at nearly equal mass. The initial instability develops into a cyclic mass-exchange with the mass fraction oscillating between $0.56 \leqslant m_2/(m_1+m_2) \leqslant 0.62$ with a period of $\sim 10^7$ yr. Throughout the cycle the component stars are not in thermal equilibrium. The instability is of a general nature, and such oscillating systems can satisfactorily populate the short period, red region of the period color relation for W UMa stars.

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