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Characteristics of hybrid compact stars with a sharp hadron-quark interface SOPHIA HAN, MARK ALFORD, Washington University in St. Louis — We describe two aspects of the physics of hybrid stars that have a sharp interface between a core of quark matter and a mantle of nuclear matter. Firstly, we analyze the mass-radius relation. We describe a generic "CSS" parameterization of the quark matter equation of state (EoS), in which the speed of sound is independent of density. In terms of the three parameters of the CSS EoS we obtain the phase diagram of possible forms of the hybrid star mass-radius relation, and we show how observational constraints on the maximum mass and typical radius of neutron stars can be expressed as constraints on the CSS parameters. Secondly, we propose a mechanism for the damping of density oscillations, including r-modes, in hybrid stars with a sharp interface. The dissipation arises from the periodic conversion between quark matter and nuclear matter induced by the pressure oscillations in the star. We find the damping grows nonlinearly with the amplitude of the oscillation and is powerful enough to saturate an r-mode at very low saturation amplitude, of order 10^{-10}, which is compatible with currntly-available observations of neutron star spin frequencies and temperatures.

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