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Title: Tidal friction, tidally excited oscillations, and heartbeat stars
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Abstract: The evolution of eccentric binary star systems is strongly influenced by stellar tidal processes, which remain poorly understood. Kepler is revolutionizing the study of tidal interactions by allowing for the direct observation of tidally excited stellar oscillations, which typically produce mmag luminosity variations with periods on the order of a day. These tidal effects are most pronounced in the growing class of eccentric binaries known as heartbeat stars, of which more than one hundred such systems have been identified in Kepler data. We present preliminary analyses of a collection of interesting heartbeat stars. Furthermore, we review the theory of the tidal excitation of stellar oscillations and compare it with Kepler observations, which show evidence for complex tidal processes such as resonance locking, non-linear mode coupling, and three-body tidal effects. We discuss the implications of these observations, and demonstrate how existing data can be used to constrain stellar models and tidal friction theories.