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Dynamical Tidal Response of a Rotating Neutron Star PHILIPPE LANDRY, ERIC POISSON, University of Guelph — The gravitational wave phase of a neutron star (NS) binary is sensitive to the deformation of the NS that results from its companion's tidal influence. In a perturbative treatment, the tidal deformation can be characterized by a set of dimensionless constants, called Love numbers, which depend on the NS equation of state. For static NSs, one type of Love number encodes the response to gravitoelectric tidal fields (associated with mass multipole moments), while another does likewise for gravitomagnetic fields (associated with mass currents). A NS subject to a gravitomagnetic tidal field develops internal fluid motions through gravitomagnetic induction; the fluid motions are irrotational, provided the star is non-rotating. When the NS is allowed to rotate, the situation is complicated by couplings between the tidal field and the star's spin. The problem becomes tractable in the slow-rotation limit. In this case, the fluid motions induced by an external gravitomagnetic field are fully dynamical, even if the tidal field is stationary: interior metric and fluid variables are time-dependent, and vary on the timescale of the rotation period. Remarkably, the exterior geometry of the NS remains time-independent.

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