Comprehensive picture of quasi-periodic oscillations in X-ray binaries

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We present a comprehensive, physical framework for interpreting spectral/temporal characteristics (QPOs, PDS breaks) of accreting black hole (BH), neutron star (NS) and white dwarf (WD) systems as gravity wave (g-mode) oscillations. It incorporates features of earlier models by the authors and collaborators in a general scheme that reduces in one limit to a classical treatment by Chandrasekhar (1961). It goes beyond his treatment by inclusion of radial dependence, incorporation of magnetospheric rotation, and application to X-ray timing phenomenology. The physical picture starts with disk accretion onto a BH; accretion in geometries where axisymmetry is broken by magnetic fields is treated as extension of this case. Pairs or groups of QPOs with correlated frequency drifts are treated as splitting of eigenfrequencies in a fluid dynamics analysis, rather than a beat phenomena. One particular QPO is identified with the gravitational (essentially Kepler) frequency and other QPOs are related to that one. Having the basic frequency be the gravitational frequency, which is Newtonian and not a General Relativistic, helps to explain how certain relationships can extend over $>$ five orders of magnitude in frequency, linking WDs, NSs and BHs. The explanatory range of the model is considerable: it addresses the magnetic field strength and configuration near the compact object, extension of the Keplerian disk near the central object (and the location of transition layer between Keplerian and non-Keplerian flow. Many of these topics which have been addressed in earlier papers are background of this model. Successes of earlier treatments, for example fitting the correlated drifts of as many as six persistent PDS features (QPOs and breaks) with minimal parametrization are preserved.