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Gravitational waves from pulsars with measured braking index

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We study the putative emission of gravitational waves (GWs) in particular for pulsars with measured braking index. We show that the appropriate combination of both GW emission and magnetic dipole brakes can naturally explain the measured braking index, when the surface magnetic field and the angle between the magnetic dipole and rotation axes are time dependent. Then we discuss the detectability of these very pulsars by aLIGO and the Einstein Telescope.

A Task-based Discontinuous Galerkin Code for Solving Multiphysics Problems in General Relativity

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Multi-messenger observations of the merger of compact binary coalescences with matter and of supernova explosions will probe fundamental physics. Modeling these systems requires a relativistic treatment of hydrodynamics, including magnetic fields, as well as neutrino transport and nuclear reactions. The accuracy, efficiency, and robustness of current codes that treat all of these problems is not sufficient to keep up with the observational needs. We are building a new computational framework that uses a Discontinuous Galerkin method together with a task-based parallelization strategy, a promising combination that will allow multiphysics applications to be treated both accurately and efficiently on petascale and exascale machines. The code scales to more than 100,000 cores allowing for high-fidelity simulations and efficient exploration of the parameter space of potential sources and allowed physics. I will discuss the current status of the development of this new code as well as first applications.
