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Magnetorotational instability in protoneutron stars: the regime of high magnetic Prandtl numbers

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The birth of a neutron star with an extremely strong magnetic field, called a magnetar, has emerged as a promising scenario to power a variety of outstanding explosive events. This includes gamma-ray bursts, supernovae with extreme kinetic energies called hypernovae and super-luminous supernovae. The origin of these extreme magnetic fields (of the order of 10¹⁵ Gauss) is not fully understood and requires an amplification over several orders of magnitude during the formation of the neutron star. I will describe our current understanding of one of the physical processes that may lead to this magnetic field amplification: the magnetorotational instability. I will show results from the first numerical simulations exploring the regime of high magnetic Prandtl numbers relevant to protoneutron stars.

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