

Precession of magnetars: dynamical evolutions and modulations on polarized electromagnetic waves

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Magnetars are conceived to be highly magnetized neutron stars (NSs). Strong internal magnetic field and elasticity in the crust may deform the star, which lead to the precession of magnetars. We first study the free precession of triaxially-deformed NSs and give the fully analytical solutions. Then we consider the forced precession endowed with electromagnetic torques. The dynamical evolutions of the wobble angle and the magnetic inclination angle are obtained. We apply previous results to study the polarized radio and X-ray emissions that are modulated by precession. For radio signals, we give the timing residuals, the change of pulse width, and the evolutions of the position angle. For X-ray coming from the surface of magnetars, we present the evolution of the Stokes parameters and the spectrum. Our results are ready to be used to search the precession of magnetars with radio and X-ray observations. Observating of precessing magnetars will definitely give us valuable information on the geometry and the strength of the strong magnetic fields, as well as the EoS of NSs.

Topic

非吸积脉冲星、磁星和快速射电暴

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