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Constraining of Nuclear Matter Equation of States with Rotating Neutron Stars

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Since the advent of multi-messenger astronomy, nuclear physics constrains equation of state (EoS) for nuclear matter, particularly within neutron stars. Most studies attempting to impose such constraints have traditionally relied on spherical hydrostatic conditions described by the Tolman-Oppenheimer-Volkoff (TOV) equation. However, observational evidence shows that neutron stars are rotating, with some exhibiting very high angular velocities (milli-second pulsars). In 1989, Komatsu, Eriguchi, and Hachisu proposed a numerical method for modeling rapidly rotating general relativistic stars, now known as the KEH method, which initially used a polytropic EoS. In this research, we apply the KEH method using nuclear matter EoS derived from Skyrme and Gogny interactions. Additionally, through calculations of rotating neutron stars, we discuss implications to astrophysical constraints on these nuclear matter EoS in rapidly rotating neutron stars.

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