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Gravitational "Magnus" Effect

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It is well known that a spinning body moving in a fluid suffers a force orthogonal to its velocity and rotation axis – it is called the Magnus effect. Recent simulations of spinning black holes and (indirect) theoretical arguments suggest that a somewhat analogous effect may occur for purely gravitational phenomena. The magnitude and precise direction of this “gravitational Magnus effect” is however still the subject of debate. Starting from the rigorous equations of motion for spinning bodies in General Relativity (Mathisson-Papapetrou equations), we show that indeed such an effect takes place. We compute it explicitly for some astrophysical systems of interest: galactic dark matter haloes, black hole accretion disks, and the cosmological FLRW background. It is seen to lead to secular orbital precessions potentially observable by future astrometric experiments and gravitational-wave detectors.

Summary

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