[GC03] Dynamical Friction of a Circular-Orbit Perturber in a Gaseous Medium

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We investigate the gravitational wake and dynamical friction of a perturber moving on a circular orbit in a uniform gaseous medium. This work extends Ostriker (1999) that studied the case of a perturber on a straight-line trajectory. The circular orbit causes the density wake to bend backward along the orbit, forming a long trailing tail. This gives rise to drag force in the direction opposite to the perturber's motion as well as in the perpendicular direction, although the latter component does not cause the orbital decay of the perturber. For a subsonic perturber, the density wake takes the shape of a comma and does not exhibit the front-back symmetry of the wake inherent in the straight-line trajectory case. The tail in the subsonic wake is weak, resulting in drag force similar to the case of a straight-line trajectory perturber. On the other hand, a supersonic perturber develops a very pronounced tail that spirals around the perturber and thus provides significant density enhancement not only at the back side but also front side of the perturber. Consequently, the dynamical friction force due to a circularly-orbiting supersonic perturber becomes smaller than the straight-line trajectory case. We provide fitting formulae for the numerically-found drag force, which is surprisingly in good agreement with the Ostriker's formula provided $V_p t$ is taken to be the orbital diameter of the perturber.

[GC04] Strong Lensing Constraints on Cosmological Parameters Using SDSS DR5 Galaxies

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We use the SDSS DR5 velocity dispersion function of early-type galaxies by Choi, Park & Vogeley for the statistical analysis of strong lenses. The new SDSS function is more reliable than previously published functions and improves significantly the strong lensing based determination of cosmological parameters. We find the present cosmological matter density $\Omega_{m,0}=0.25^{+0.12}_{-0.08}$ for a flat universe with an Einstein cosmological constant. For a flat universe with the generalized dark energy of a non-evolving equation of state w_x, we find $w_x<-1.2$.