TIDAL TORQUES DYNAMICAL FRICTION AND THE STRUCTURE OF CLUSTERS OF GALAXIES

A. DEL POPOLO, AND M. GAMBERA
Istituto di Astronomia Viale A.Doria, 6 - I 95125 Catania, ITALY

Abstract. We study the joint effect of tidal torques and dynamical friction on the collapse of density peaks solving numerically the equations of motion of a shell of barionic matter falling into the central regions of a cluster of galaxies. We calculate the evolution of the expansion parameter, $a(t)$, of the perturbation using a coefficient of dynamical friction η_{cl} obtained from a clustered system and taking into account the gravitational interaction of the quadrupole moment of the system with the tidal field of the matter of the neighboring proto-galaxies. We find that the tidal torques and the dynamical friction slow down the collapse of low-ν ($\nu < 3$) peaks producing an observable variation of $a(t)$ (Del Popolo & Gambera 1996,1997). As consequence we have a reduction of the mass bound to collapsed perturbations and a raising of the critical threshold, δ_c. Besides, we have a bias of dynamical nature arises because high-density peaks preferentially collapse to form halos within which visible objects. We calculate the selection function and using it and the prescriptions given by Bardeen et al. 1986 we find a value of the coefficient of bias, $b = 2.25$ on clusters scales for $R_f = 4h^{-1}Mpc$ comparable both with that obtained from the mean mass-to-light ratio of clusters, APM survey, or from N-body simulations combined with hydrodynamical models and with the values of b given by Kauffmann et al. 1996. This means that non-radial motions and dynamical friction play a significant role in determining the bias level.

References

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