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The Redshift Evolution of LCDM Halo Parameters

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We present a detailed study of the redshift evolution of dark matter halo structural parameters in a LambdaCDM cosmology. We study the mass and redshift dependence of the concentration, shape and spin parameter in Nbody simulations spanning masses from 10^{10} Msun/h to 10^{15} Msun/h and redshifts from 0 to 2. We present a series of fitting formulas that accurately describe the time evolution of the concentration-mass relation since z=2. Using arguments based on the spherical collapse model we study the behaviour of the scale length of the density profile during the assembly history of haloes, obtaining physical insights on the origin of the observed time evolution of the concentration mass relation. We also investigate the evolution with redshift of dark matter halo shape and its dependence on mass. Within the studied redshift range the relation between halo shape and mass can be well fitted by a power law. Finally we show that although for z=0 the spin parameter is practically mass independent, at increasing redshift it shows a increasing correlation with mass.

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