

The Angular Momentum Dichotomy

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Abstract. In the context of the formation of spiral galaxies the evolution and distribution of the angular momentum of dark matter halos have been discussed for more than 20 years, especially the idea that the specific angular momentum of the halo can be estimated from the specific angular momentum of its disk (e.g. Fall & Efstathiou (1980), Fall (1983) and Mo *et al.* (1998)). We use a new set of hydrodynamic cosmological simulations called *Magneticum Pathfinder* which allow us to split the galaxies into spheroidal and disk galaxies via the circularity parameter ε , as commonly used (e.g. Scannapieco *et al.* (2008)). Here, we focus on the dimensionless spin parameter $\lambda = J|E|^{1/2}/(GM^{5/2})$ (Peebles 1969, 1971), which is a measure of the rotation of the total halo and can be fitted by a lognormal distribution, e.g. Mo *et al.* (1998). The spin parameter allows one to compare the relative angular momentum of halos across different masses and different times. Fig. 1 reveals a dichotomy in the distribution of λ at all redshifts when the galaxies are split into spheroids (dashed) and disk galaxies (dash-dotted). The disk galaxies preferentially live in halos with slightly larger spin parameter compared to spheroidal galaxies. Thus, we see that the λ of the whole halo reflects the morphology of its central galaxy. For more details and a larger study of the angular momentum properties of disk and spheroidal galaxies, see Teklu *et al.* (in prep.).

Keywords. dark matter – galaxies: evolution – galaxies: formation – galaxies: halos

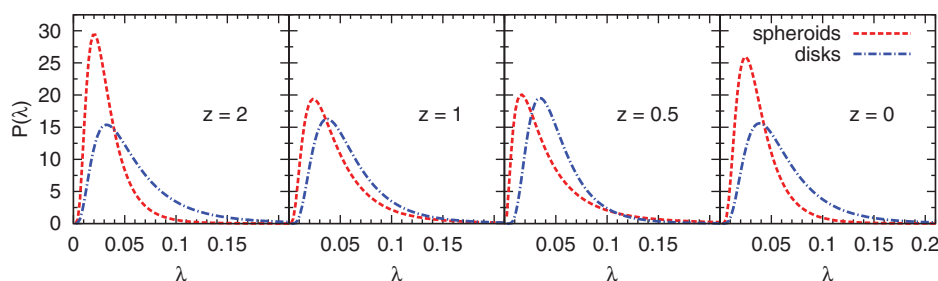


Figure 1. λ -distribution for spheroids (red dashed) and disk galaxies (blue dash-dotted) at four different redshifts. The dichotomy occurs at all redshifts. The spheroids have generally lower λ -values and thus less specific angular momentum than the disks.

References

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