



Halo based reconstruction of the cosmic mass density field

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We present the implementation of a halo based method for the reconstruction of the cosmic mass density field. The method employs the mass density distribution of dark matter haloes and its environments computed from cosmological N-body simulations and convolves it with a halo catalog to reconstruct the dark matter density field determined by the distribution of haloes. We applied the method to the group catalog of Yang et al (2007) built from the SDSS Data Release 4. As result we obtain reconstructions of the cosmic mass density field that are independent on any explicit assumption of bias. We describe in detail the implementation of the method, present a detailed characterization of the reconstructed density field (mean mass density distribution, correlation function and counts in cells) and the results of the classification of large scale environments (filaments, voids, peaks and sheets) in our reconstruction. Applications of the method include morphological studies of the galaxy population on large scales and the realization of constrained simulations.

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