

Jayanti Prasad

Research Summary:

For the last one year I have been working on some problems related to non-linear gravitational clustering in an expanding universe. The main motivation behind this study has been to understand how cosmological perturbations which lead to galaxy formation at various scales couple to each other. It has been known for quite a long time that the cosmological perturbations at small scales do not affect the growth of perturbations at large scales in any significant way. This means that in cosmological simulations the truncation of initial power spectrum at small scales due to the limitation of resolution at small scales does not contribute any significant error in the final results. However, that is not true for the truncation of power spectrum at large scales due to finite box size.

With my supervisor Jasjeet Singh Bagla I have developed an analytic technique to quantify the errors in various physical quantities due to finite box size in cosmological N-body simulations. We have shown that the errors in most of the physical quantities of interest like two-point correlation function and mass function can be related to the errors in the mass variance or any second moment of the density contrast. We have shown that the mass variance is suppressed at all scales when we reduce the size of the simulation box and this results in the overproduction of the low mass haloes at the expense of the underproduction of large mass haloes in cosmological N-body simulations.

In one of the studies I have shown that using the Press-Schechter formalism we can write the rate of change of the number density of haloes of a given mass in terms of the formation and destruction rates. Using the technique which we have developed I have obtained the corrections due to finite box size in the cosmological N-body simulations for the rate of change of density, formation and destruction rates for a power law and LCDM models.

Publications:

1. J. S. Bagla and Jayanti Prasad, *Effects of the size of cosmological N-body simulations on physical quantities-I. Mass function*, MNRAS **370**, 993, (2006)

Preprints:

1. Jayanti Prasad, *Effects of finite box size in cosmological N-body simulations II : Halo formation and destruction rates*, astro-ph/0702557)

Conference/Workshops Attended:

1. *Summer School in Cosmology and Astroparticle Physics*, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, July 2006.
2. *Workshop on study of emission from hot diffuse gas with ASTROSAT*, Bangalore, India, January 2007.

Visits to other Institutes:

1. The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, July, 2006

Other Activities:

1. Gave a short presentation in the ICTP Summer school in Cosmology and Astroparticle physics, July, 2006.
2. Gave seminar in the Astrophysical Journal Club at HRI, February, 2007.
3. I have been involved in the Talent Search Examination conducted by HRI for school students.