

FORMATION MECHANISM OF HIERARCHICAL ASTRONOMICAL OBJECTS IN THE COSMIC STRING SCHEME

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Because of the angular deficit around cosmic string, cold dark matter(CDM) gets the velocity toward the plane of moving string and wake is formed there. It means that CDM body is cut by string, two blocks move each other, and the overlapped region becomes wake. The wake and/or block size is determined by the horizon size at z_i when the wake is triggered by the string. The nonlinearity and/or thickness of the wake depends on the moving length of CDM toward the wake which depends on z_i , the line density and velocity of string.

The main assumption in our prototype model are:

- A) There are a few long and fast ($v \sim 0.7c$) strings passing through the universe during each e-folds expansion, where v and c are the string velocity and velocity of light, respectively.
- B) Astronomical objects are formed in the intersection of three wakes triggered at suitable epochs of redshift z_i . Using the spherical approximation, we have already investigate the distribution of dark matter around the crossing site together with its time evolution (Hara et al. 1996).

The characteristic features of this scheme is that smaller objects are accreted to larger ones: small blocks within a large blocks moved as a whole as a large block, however small blocks moved each other and form a small wake and small object.

- a) Dwarf galaxies are accumulated to the galaxies. Some of the globular clusters would be the remnants of the nuclei of accumulated dwarf galaxies as E and SO galaxies in clusters are the remnants of the accumulated galaxies in clusters of galaxies.
- b) At present, galaxies are accreting to clusters of galaxies ($z_i \sim 10^4$). It will continue until three times expansion of the universe from now on.
- c) Almost it has begun the accumulation of clusters to super-cluster ($z_i \sim 10^3$). It will continue ten times expansion of the universe from now on.

Although it is very primitive stage, this scheme has the possibility to explain the observed hierarchical structure of astronomical objects such as dwarf galaxies ($z_i \sim 10^6$), galaxies ($z_i \sim 10^5$), clusters of galaxies ($z_i \sim 10^4$), and super clusters of galaxies ($z_i \sim 10^3$).

References

1. T. Hara, H. Hideki, P. Mahonen, and S. Miyoshi *Astrophys. J.* **461**, 1 (1996).