ABSTRACT

Clustering of galaxies in Pisces-Perseus: Structural order and spatial correlations

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The three-dimensional spatial-velocity distribution of the counts-in-cells for galaxies in the Pisces-Perseus region has been analyzed. This is done for the total sample, for subsets containing the most conspicuous galaxies (brightest members with large intrinsic linear diameters), and the least conspicuous galaxies (faintest members with small intrinsic linear diameters). The distribution functions for the samples are remarkably similar to those found for the Zwicky, CfA, ESO and IRAS catalogues. For Pisces-Perseus, the best fit value of b, the ratio of gravitational correlation energy to the kinetic energy of peculiar motions, is 0.8. The most conspicuous galaxies are somewhat more uniformly distributed than the least conspicuous ones which tend to trace the finer structure. Dendrogram analyses show that groups of the most conspicuous galaxies tend to be located near groups of the least conspicuous ones.

The velocity distribution in different parts of the supercluster has also been investigated. There is a dense region of about 750 galaxies which shows an overall Gaussian velocity distribution around the mean of 5260 km s^{-1}. However this region is not completely relaxed since it contains subgroups which do not have Gaussian distributions. Moreover, in most subgroups the crossing time exceeds the Hubble time, indicating incomplete relaxation. Irregular galaxies tend to concentrate in this region, possible indication of tidal interactions. Our results appear consistent with the supercluster forming gravitationally as an accumulation of smaller clusters.

Minimal Spanning Trees statistics have been used to determine the presence of filamentary structure in Pisces-Perseus and its subsamples. The filaments in the Least Conspicuous subsample show a greater amount of coiling as compared to the Most Conspicuous sample. The supercluster stands out as a high density region once again. Reducing procedures on the samples such as pruning make this statistic suitable also as void finding procedure.