

Morphological Number Counts of Galaxies in the Hubble Deep Field South

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We present a study of morphological number counts and redshift distribution for the galaxies in the Hubble Deep Field South (HDFS), based on the deep *UBVI* photometry.

UBVI photometry are obtained for about 2500 galaxies in the Wide Field and Planetary Camera 2 (WFPC2) images of the HDFS. *UBVI* photometry are obtained also for about 2700 galaxies in the Hubble Deep Field North (HDFN) for comparison using the same method. Color-magnitude diagrams of the HDFS are in general similar to those of the HDFN.

We have classified morphological types of the galaxies with $I_{AB} < 26$ mag, using visual classification supplemented by the surface brightness profile fitting. It is found that there are 344 galaxies (87 early types, 102 late types(spirals), 102 peculiar and irregular types, and 53 mergers) and that there are about 20 star candidates. The ratio of early to late type galaxies in the HDFS is found to be 0.73, which is slightly smaller than that of the HDFN. The luminosity functions for peculiar and irregular types are steeper than those for early types and late types both of which are similar.

The luminosity functions for each type of galaxies in the HDFS are found be similar in general to those of the HDFN.

Then we have estimated the redshifts of about 340 galaxies with $I_{AB} < 26$ mag using the empirical training set method.

The redshift distribution of these galaxies in the HDFS shows that there are four distinguishable peaks: two prominent peaks at $z \sim 0.5$ and $z \sim 1.0$, one weaker peak at $z \sim 1.9$, and one weakest peak at $z \sim 2.7$. The first two peaks of the HDFS correspond to one prominent peak at $z \sim 0.8$ of the HDFN, and the other two peaks of the HDFS agree with the two very weak peaks of the HDFN. However, the redshift distribution of the HDFS at $z < 2.2$ is much broader than that of the HDFN, showing that there is a significant difference between the two fields. This indicates that there might have been some differences in the galaxy formation history between the two fields.

Variations of colors, magnitudes, and size of the galaxies depending on the redshift are also investigated.