SMBHs and their host galaxies becomes uncertain at high redshifts. The HULQ project proposes to use gravitational lensing to measure the masses of QSO host galaxies, an otherwise difficult goal. SMBH masses of QSOs are relatively easy to determine using either reverberation mapping or the single-epoch method. These measurements, if made for a substantial number of QSOs at various redshifts, will allow us to study the co-evolution of SMBHs and their host galaxies. To determine the feasibility of this study, we present how to estimate the number of sources lensed by QSO hosts, i.e. the number of deflector QSO host galaxies (hereafter QSO lenses).

Method and results. Using SMBH masses measured from SDSS DR14 spectra, and the M_BH - Sigma relation, the Einstein radii are calculated as a function of source redshift, assuming singular isothermal sphere mass distributions. Using QSOs and galaxies as sources, the probability of a QSO host galaxy being a QSO lens is calculated, depending on the limiting magnitude. The expected numbers of QSO lenses are estimated for ongoing and future wide-imaging surveys, and additional factors that may affect these numbers are discussed.

우주론/암흑물질에너지

[포 CD-01] Mapping the real-space distributions of galaxies in SDSS DR7

Feng Shi
Korea Astronomy and Space Science Institute

Using a method to correct redshift space distortion (RSD) for individual galaxies, we mapped the real space distributions of galaxies in the Sloan Digital Sky Survey (SDSS) Data Release 7(DR7). We use an ensemble of mock catalogs to demonstrate the reliability of this extension, showing that it allows for an accurate recovery of the real-space correlation functions and galaxy biases. We also demonstrate that, using an iterative method applied to intermediate scale clustering data, we can obtain an unbiased estimate of the growth rate of structure $f\sigma_8$, which is related to the clustering amplitude of matter, to an accuracy of $\sim 10\%$.

Applying this method to the Sloan Digital Sky Survey (SDSS) Data Release 7 (DR7), we construct a real-space galaxy catalog spanning the redshift range $0.01 \leq z \leq 0.2$, which contains 584,473 galaxies in the North Galactic Cap (NGC). Using this data we, infer 0.376 ± 0.038 at a median redshift z=0.1, which is consistent with the WMAP9 cosmology at 1σ level. By combining this measurement with the real-space clustering of galaxies and with galaxy-galaxy weak lensing measurements for the same sets of galaxies, we are able to break the degeneracy between f, σ_8 and b. From the SDSS DR7 data alone, we obtain the following cosmological constraints at redshift $z=0.1$ for galaxies.

[포 CD-02] Alcock-Paczynski Test with the Evolution of Redshift-Space Galaxy Clustering Anisotropy: Understanding the Systematics

Hyunbae Park[1], Changbom Park[2], Motonari Tonegawa[2], Yi Zheng[2], Cristiano G. Sabiu[3], Xiao-dong Li[4], Sungwook E. Hong[5], Juhan Kim[2]
[1]*Kavli Institute for the Physics and Mathematics of the Universe*
[2]*Korean Institute for Advance Study*
[3]*Yonsei University*
[4]*Sun Yat-Sen University*
[5]*University of Seoul*

We develop an Alcock-Paczynski (AP) test method that uses the evolution of redshift-space two-point correlation function (2pCF) of galaxies. The method improves the AP test proposed by Li et al. (2015) in that it uses the full two-dimensional shape of the correlation function. Similarly to the original method, the new one uses the 2pCF in redshift space with its amplitude normalized. Cosmological constraints can be obtained by examining the redshift dependence of the normalized 2pCF. This is because the 2pCF should not change apart from the expected small non-linear evolution if galaxy clustering is not distorted by incorrect choice of cosmology used to convert redshift to comoving distance. Our new method decomposes the redshift difference of the 2-dimensional correlation function into the Legendre polynomials whose amplitudes are modelled by radial fitting functions. The shape of the normalized 2pCF suffers from small intrinsic time evolution due to non-linear gravitational evolution and change of type of galaxies between different redshifts. It can be accurately measured by using state of the art cosmological simulations. We use a set of our Multiverse simulations to find that the systematic effects on the shape of the normalized 2pCF are quite insensitive to change of cosmology over $\Omega_m=0.21 - 0.31$ and w=-0.5 - -1.5. Thanks to this finding, we can now apply our method for the AP test using the non-linear systematics measured from a single simulation of the fiducial cosmological model.