

surveys

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In the local Universe, the gravitational effects of mass density fluctuations exert perturbations on galaxies' redshifts on top of Hubble's Law, called 'peculiar velocities'. These peculiar velocities provide an excellent way to test the cosmological model in the nearby Universe. In this talk, we present new cosmological constraints using peculiar velocities measured with the 2MASS Tully-Fisher survey (2MTF), 6dFGS peculiar-velocity survey (6dFGSv), the Cosmicflows-3 and Cosmicflows-4TF compilation. Firstly, the dipole and the quadrupole of the peculiar velocity field, commonly named 'bulk flow' and 'shear' respectively, enable us to test whether our cosmological model accurately describes the motion of galaxies in the nearby Universe. We develop and use a new estimators that accurately preserves the error distribution of the measurements to measure these moments. In all cases, our results are consistent with the predictions of the Λ cold dark matter model. Additionally, measurements of the growth rate of structure, $f\sigma_8$ in the low-redshift Universe allow us to test different gravitational models. We developed a new estimator of the "momentum" (density weighted peculiar velocity) power spectrum and use joint measurements of the galaxy density and momentum power spectra to place new constraints on the growth rate of structure from the combined 2MTF and 6dFGSv data. We recover a constraint of $f\sigma_8=0.404\pm 0.082-0.081$ at an effective redshift $z_{\text{eff}}=0.03$. This measurement is also fully consistent with the expectations of General Relativity and the Λ Cold Dark Matter cosmological model.

[구 GC-17] High-resolution CMB bispectrum estimator for future surveys

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The Cosmic Microwave Background (CMB) contains a wealth of information about the perturbations in the early universe. Its bispectrum, the Fourier counterpart of three-point correlation functions, is a direct probe of primordial non-Gaussianity predicted by many physically well motivated inflation models. Motivated by the substantial improvement in sensitivity expected from future CMB surveys, we developed a novel bispectrum estimator capable of handling such high-resolution data. Our code, named CMB-BEST,

utilises a set of separable basis functions to constrain a wide variety of models simultaneously. Flexibility in the choice of basis enables targeted analysis on highly oscillatory inflation models, which are previously unconstrained due to the numerical and computational challenges involved. We present the results of our thorough validation tests, both internal and against conventional approaches. We provide a proof-of-concept example with Planck satellite data and sketch out the road ahead.

[구 GC-18] Identifying Lensed Quasars and measuring their Time-Delays in Unresolved Systems

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Detecting lensed quasar systems and estimating their time delays using the unresolved joint light curves can be the next frontier among the cosmological probes in the near future. One can get the independent measurement of the Hubble constant from the time delays but without requiring the systems to be resolved a priori followed by monitoring the image light curves using high-resolution telescopes for years. In this work, we propose a novel technique that can identify lensed quasars only using the observed unresolved light curves and without assuming a template or any prior information. Following a set of conservative selection criteria that gives zero false-positive outcome, we can accurately estimate the time delay for almost all the lensed systems with marginal noise in the data. For the case of noisy data, our approach can still correctly identify a substantial number of lensed systems with high certainty and measure the time delay accurately.

[구 GC-19] Excursion-Set Modeling of the Splashback Mass Function and its Cosmological Usefulness (Splashback 질량함수의 Excursion-Set Modeling과 우주론적 유용성)

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일반화된 excursion set 이론과 자기 유사 구형 유입 (Self-similar spherical infall) 모형에 기반하여 Splashback 질량함수에 대한 해석적 단일 매개변수 모델을 착안하였다. Planck/WMAP7 관측결과를 토대로 구축된 EREBOS N-Body 시뮬레이션의 수치적 결과의 해석적 모델을 이용한 회귀분석을 통해 단일 매개변수이자 Splashback 경계의 확산적 특성을 수치화하는 확산계수 (Diffusion Coefficient)의 추정치를 계산하였다. 계산된