

PASS: Paying Attention to the Small Structure

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Abstract

One of the main predictions of the Cold Dark Matter (CDM) cosmology is the existence of structure formations on all mass scales. Gravitational lensing offers a powerful tool for exploring dark matter distributions. Weak-lensing methods proved to be a great success in detecting dark-matter large-scale structure, but there is still little known about small-scale structures on sub-galactic scales. Weak lensing traditionally measures galaxy ellipticities but it is clear that there is much more information contained in the galaxy shapes. We propose to extend gravitational lensing approach to detect small scale structures on cosmological distances using a new method of nonlinear gravitational lensing. This method is sensitive to higher derivatives of the gravitational potentials (also known as flexions), and can measure mass scales on the order of 10^9 Msun to 10^{10} Msun.

The Ultra Deep Field (UDF) and a new Ultra Deep Field Follow-Up (UDF05) are extremely well suited for detection of nonlinear lensing. Their high resolution is great for measuring the details of galaxy shapes. They also provide a detection of large number of background galaxies necessary for statistical measurements. We will construct our own super image of the fields, so that we can also model PSFs in the same frame, using the empirical library PSFs. These PSFs will allow us to better model the true morphology of the background galaxies. The images and PSF models created within the framework of this proposal will be made publicly available.

Investigators:

	Investigator	Institution	Country
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Number of investigators: 4

Dataset Summary:

Instrument	No. of Datasets	Retrieval Method	Retrieval Plan
ACS	3	FTP	all datasets at once