Hubble Space Telescope

Cycle 15 AR Proposal

HAGGLeRS: HST Archive Galaxy-Galaxy Lensing at high Resolution with Simulations

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Total Budget Amount: $53,000

Abstract

Galaxy-galaxy weak lensing is a powerful technique for probing (statistically) the mass distributions of galaxies. By correlating the signal with the properties of the visible matter, and comparing these results directly with high resolution, large scale numerical simulations, we can begin to fill in some of the gaps in our understanding of the physics of galaxy formation and evolution within the context of the LCDM model.

The ground-based studies in this field undertaken so far have been limited by their resolution and depth, with relatively few distorted background galaxies per lens. With the high resolution imaging afforded by ACS on HST, a much higher source density is available, with sources visible near the centers of galaxies where the signal is stronger. The ground-based studies have recovered their precision by increasing the number of lenses: we propose to do likewise and measure the galaxy-galaxy lensing signal in all suitable ACS images taken to date.

The repository of observations defined by the HAGGLeS Strong Lens Survey (Cycle 14 Legacy Archive proposal 10676; PI Marshall) is well-matched to this project: its legacy of high level science products for all deep multi-filter pointings, covering some 1.6 square degrees of sky, can be used directly here. The archive provides a range of lens galaxy environments, from underdense voids to overdense clusters, in which the galaxy-galaxy lensing signal may be investigated. The high satellite distribution of the lenses themselves may be probed using measurements of the higher order shape moments measurable with ACS; compiling results from the impressive sky area observed to date makes for a galaxy-galaxy lensing survey competitive with, yet complementary to, the wide-field surveys from the ground.

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