Hubble Space Telescope

Cycle 15 AR Proposal

The Unresolved Stellar Populations of Galaxies in the HUDF: Constraints on Hierarchical Formation

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Abstract

We propose a systematic Archival study of the stellar populations of >200, well-resolved galaxies with spectroscopic redshifts in the Hubble Ultra-Deep Field (HUDF).

By fitting stellar population synthesis models to the six-filter (BVi'z'JH) HST observations on a pixel-to-pixel basis, we can measure their stellar masses, star formation rates, ages, and internal extinction on sub-kiloparsec scales within each of the galaxies. This proposal has TWO major science goals:

(1) Measure the stellar population parameters on a pixel-to-pixel basis within well-resolved galaxies at z<2. For reliable the SED fitting, we will concentrate on the ~200 galaxies with i'(AB)<26 mag and spectroscopic redshifts from the Very Large Telescope. For an extended sample of ~50 bright galaxies without spectroscopic redshifts, we will allow the redshift to be a fifth free parameter and generate an additional map of best-fit photometric redshifts. This project will significantly improve upon previous work by extending it to higher redshift for a much larger sample and wider wavelength coverage --- ensuring more reliable statistics;

(2) Use the stellar population maps resulting from (1) to understand observed color gradients and strongly constrain galaxy assembly as a function of Hubble type and redshift. Given the broad spectral coverage provided by ACS and NICMOS, we will break the infamous age-extinction-metallicity degeneracy which has plagued more common single or two color observations.

Only the HUDF data provide the sufficiently high resolution and S/N per pixel at the critical wavelengths necessary to robustly measure the stellar SEDs on sub-kpc scales and constrain galaxy formation scenarios.

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