

# Galaxy Environments and Evolution in the GOODS-N Field

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## Abstract

In the spirit of a Legacy archival program, we propose to develop a publicly-available, non-proprietary tool allowing the measurement of the local density of galaxies (i.e., the "environment") for any object in the GOODS-N field with  $0.2 < z < 1.4$ , provided only RA, dec, and redshift. Recent studies have shown that the properties and formation histories of galaxies depend strongly on the environment in which they are located. By adding environment information to the uniquely deep multiwavelength dataset available in the GOODS-N field, it will be possible to uncover many new pieces of the galaxy evolution puzzle. Measuring environments over the entire GOODS-N field will require a small amount of additional Keck/DEIMOS spectroscopy surrounding the field; we will make all Keck data and redshifts public as soon as they are reduced. We can use the resulting 3d environment measurements to calibrate the use of neighbor counts from the deep GOODS-N (original + SN search) imaging as a second measure of environment. We will use the environment tool ourselves for two projects that utilize the nearly-unique GOODS-N HST/ACS and Chandra/ACIS data: (1) studying the morphology-density relation at  $z=0.5-1$  down to faint luminosities; and (2) determining the typical environments of low-level AGN and testing for relationships with host galaxy properties.

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