

A New View of Dust at Low Metallicity: The First Maps of SMC Extinction Curves

Scientific Category: ISM IN EXTERNAL GALAXIES

Scientific Keywords: Galaxy Formation And Evolution, Interstellar And Intergalactic Medium, Magellanic Clouds, Stellar Populations In External Galaxies

Instruments: WFC3, ACS

Proprietary Period: 12

Proposal Size: Medium

UV Initiative: Yes

Orbit Request

Prime

Parallel

Cycle 22

54

54

Abstract

In order to constrain basic dust physics and anchor the interpretation of both UV/optical extinction and IR emission at low and high redshifts, we propose seven-filter photometry of a key region in the Small Magellanic Cloud (SMC). Via a cutting-edge technique demonstrated to work in M31 we will use these data to construct the first ever maps of the extinction curve shape (R_V), 2175 Angstrom bump strength, and dust column (A_V) across a low metallicity environment. These maps will allow us to (1) measure the true distribution of extinction curves in the SMC, which is frequently used as a template for low metallicity extinction; (2) rigorously test whether PAHs are the carriers of the 2175 Angstrom extinction feature; and (3) place the estimation of dust masses from IR emission in low metallicity systems on a firm empirical and observational footing. Dust regulates the structure and evolution of interstellar medium (ISM) and shapes the optical and ultraviolet emission of galaxies. Its emission at infrared and mm wavelengths represents a powerful tool to probe the ISM out to the highest redshifts. Understanding the physics and interpretation of dust absorption and emission as a function of metallicity is critical to a vast range of science and mapping key dust properties is a new application, uniquely possible with UV through NIR imaging from HST. As such, we expect this program to have wide ranging scientific impact.