Using UV-bright Milky Way Halo Stars to Probe Star-Formation Driven Winds as a Function of Disk Scale Height

Scientific Category: ISM AND CIRCUMSTELLAR MATTER
Scientific Keywords: Galactic Halo, Metal Absorption Systems, UV-Bright Stars, Winds/Outflows/Mass-Loss
Instruments: COS

Proprietary Period: 12 Proposal Size: Small UV Initiative: Yes

Orbit Request	Prime	Parallel
Cycle 23	30	0

Abstract

Galactic-scale winds driven by star formation are a common feature of galaxy formation models, and are observed ubiquitously from the local Universe to z~6. However, empirical constraints on the radial density profile and total spatial extent of these winds have been very challenging to obtain. We have devised a simple experiment using blue horizontal branch (BHB) stars in the halo of the Milky Way that will directly map the extent and density of diffuse, ionized outflows from the Galactic disk to the halo. We propose to take COS FUV spectra of 7 BHB stars that evenly sample the range of scale heights from 3 - 13 kpc, lying perpendicular to the disk of the Milky Way, extending from the position of the sun. This study will allow us to unambiguously track inflowing and outflowing material from the Milky Way via absorption component blueshifts and redshifts, respectively. This program will yield the first direct observational determination of the scale height to which star-formation-driven winds propagate in the halo. We will additionally probe the change in the gas density as it extends into the halo, and approximate a mass of metals as they leave the disk and become integrated into the halo. Our proposed experiment will yield the most detailed constraints on the physical state and energetics of gas in a large-scale galactic wind to date. Such constraints are fundamental to understanding the impact of feedback processes on galaxies and in fueling the buildup of their gaseous environments.