Hubble Space Telescope

Cycle 16 AR Proposal

Determining O star mass loss rates from Sulfur wind lines.

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Scientific Category: HOT STARS

Scientific Keywords: WINDS/OUTFLOWS/MASS-LOSS, RADIATIVE TRANSFER, MAGELLANIC CLOUDS, MASSIVE STARS

Total Budget Amount: $85,000

Abstract

The winds of massive stars power and enrich the ISM, control the evolution of the stars, determine their ultimate fate and the nature of their remnants, determine the appearance of HRDs in young, massive clusters and star-bursts, and play a major role in the initial stages of massive star cluster formation and evolution. Thus, recent suggestions that O star mass loss rates are up to ten times less than previous observational determinations or theoretical expectations warrant further investigation. Perhaps the most compelling evidence for reduced mass loss rates comes from analyses of the far UV P V 1118, 1128A resonance doublet, which has become widely accessible since the launch of FUSE. Because Phosphorus has a low cosmic abundance, this doublet never saturates, providing accurate estimates of the mass loss rate times the ionization fraction. By examining the strength of this doublet as a function of temperature for a large sample of stars, it is argued that the ion fraction of P V must be near unity somewhere in the O star range. If this conjecture is correct, then the mass loss rates inferred from P V never exceed 10-15% of previous expectations.

In this proposal, we intend to verify this important result by analyzing HST and FUSE data for the wind lines of three adjoining stages of Sulfur (S IV, V and VI) in a sample of LMC O stars. We show how the analysis of these lines can furnish a direct measurement of the mass loss rate from UV wind lines alone, without the need to assume an ion fraction. As a result, they provide a powerful verification of the P V results. Furthermore, we argue that our results should not be strongly affected by clumping in the winds, a mechanism often invoked to explain the differences between different observational measures of mass loss rates.

Investigators:

	Investigator	Institution	Country
PI	Dr. Derck L. Massa	SGT, Inc.	USA/MD
CoI*	Dr. Raman K. Prinja	University College London	UK

Number of investigators: 2

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Dataset Summary:

Instrument	No. of Datasets	Retrieval Method	Retrieval Plan
FOS	25	FTP	Retrieve over the course of a week
GHRS	4	FTP	Retrieve over the course of a week
STIS	9	FTP	Retrieve over the course of a week