Ionized gas in the Smith Cloud

Alex S. Hill & L. Matthew Haffner
University of Wisconsin-Madison

Abstract

We present new observations of 10^8 K ionized gas in the Smith Cloud, a high velocity cloud thought to be interacting with the interstellar medium of the Galaxy. We have obtained Hα, [N II], and [S II] spectra of the cloud with the Wisconsin H-Alpha Mapper (WHAM). Previously, we have shown that the ionized component has a mass of > 3 x 10^6 M⊙, comparable to the mass of the neutral gas in the cloud, and is moving towards the plane at 73 ± 26 km s⁻¹ with a systemic velocity of +105 ± 5 km s⁻¹. These observations were obtained in 2009 from the Cerro Tololo Interamerican Observatory (CTIO).

Pointed spectra: For all pointed spectra, we alternated 120 s ON source observations and 120 s OFF source observations for a total of 480 s ON source and 480 s OFF source. These observations were obtained in 2009 from the Cerro Tololo Interamerican Observatory (CTIO).

Results

Kinematics: With typical widths of 30 km s⁻¹ and blending from the foreground Sagittarius Arm near 50°, the Hα line is not well suited to measuring the velocity of the cloud. The systemic velocity of the [S II] line is better suited for this task: note the relatively limited blending of the Smith Cloud [S II] line in Fig. 2. The velocity calibration of the new [S II] line is better suited for this task: note the relatively limited blending of the Smith Cloud [S II] line in Fig. 2. We fit position-velocity diagrams presented by Lockman et al. (2002) with an atmospheric model of the Smith Cloud that results in a systemic velocity of +111 ± 6 km s⁻¹.

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