VLT/UVES Observations of IS Molecules and DIBs in the Magellanic Clouds

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Abstract

We discuss the abundances of interstellar CH and CN in the Magellanic Clouds, derived from UVES spectra of stars observed in 2002–2004. Most of the southern Magellanic Clouds (SMC) CH and CN are located in the weak UV extinction foreground (SMC BR abundances), while the northern Magellanic Clouds (NGC) CH and CN are in the strong UV extinction foreground (SMC BR abundances). We find that the CH/ CN ratios in the NGC are significantly lower than those in the SMC, and are more similar to those for 1987A (VSL 10–1) than to 1987A (VSL 10–1).

Column Densities

Because the molecular lines observed toward these Magellanic Clouds targets are weak, with the exception of K I, we have estimated the column densities (summing the lines to be optically thin) by integrating the “apparent” optical depth over the line profile, and then dividing the result by the corresponding equivalent width. The column densities of the DIB carriers are assumed to be proportional to the corresponding equivalent width.

Molecular Lines

We now compare the column densities of several atomic and molecular species with each other and with the extinction properties of the interstellar medium. In each case, we first describe the general relationships found in the local Galactic ISM and in two more sensitive interstellar regions (B95) and (TIOT). We then compare the behavior of the DIBs with results obtained from the UVES spectra of DIBs at 5780, 5797, and 6284 Å.

DIB Intensity Ratios

The diffuse interstellar bands at 5780, 5797, and 6284 Å are typically among the strongest and most frequently observed DIBs in the Galactic ISM. Figures 3 and 4 show the strength of several DIBs toward the LMC 30 Dor and the Magellanic Clouds, respectively. For all of these data, weak, broad absorption features — which dominate the line profiles of the weak DIBs — are not included. The three DIBs generally appear to be present toward all the sightlines in each region, though their strengths vary from line of sight to line of sight.

DIB Strength vs. Extinction

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