

Search for High-Extinction Regions in the Small Magellanic Cloud

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We have applied the unsharp-masking technique to the 24 μm image of the SMC, obtained with the *Spitzer*, to search for high-extinction regions. Fifty-five candidate regions of high-extinction (namely high-contrast regions, HCRs) have been identified from the decremental contrast image. HCRs have a size of 8–14 pc and a peak contrast at 24 μm of 2–2.5%. To constrain physical properties of HCRs, we have performed observations of NH_3 , N_2H^+ , HNC , HCO^+ , and HCN toward one of the HCRs, HCR LIRS36–east, using the ATCA and the Mopra telescope. No molecular line emission detected, but upper limits to column densities of molecular species suggest that HCRs are moderately dense with $n \sim 10^3 \text{ cm}^{-3}$. Two interesting properties of HCRs are shown below.

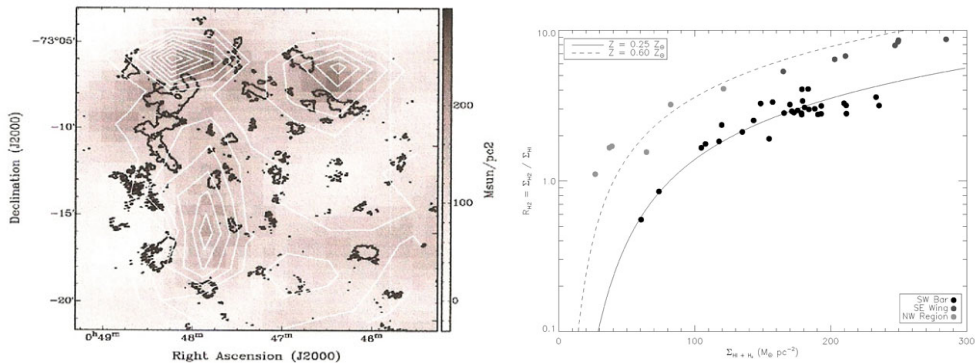


Figure 1. (Left) Selected HCRs in the southwest bar of the SMC overlaid in black contours on the H_2 surface density image from Leroy *et al.* (2007). $\text{CO}(1-0)$ emission is overlaid in white contours. HCRs are located in the outskirts of CO clouds but in regions with significant amount of H_2 . For details, see Lee *et al.* (2009). (Right) Molecular fraction (R_{H_2}) as a function of total gas surface density ($\Sigma_{\text{HI}+\text{H}_2}$) for HCRs. Based on the similar amounts of H I and H_2 surface densities, HCRs most likely represent the regions where atomic-to-molecular hydrogen transition occurs in the SMC. Their molecular fraction is in agreement with the theoretical prediction from Krumholz *et al.* (2009) for metallicity of $1/4 \sim 1/2 M_{\odot}$.

References

- Krumholz, M. R., McKee, C. F., & Tumlinson, J. 2009, *ApJ*, 693, 216
 Lee *et al.*, 2009, *AJ*, 138, 1101
 Leroy *et al.*, 2007, *ApJ*, 658, 1027