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Physical conditions of the warm molecular gas in the star-forming region N159

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The interaction between stars and their surrounding interstellar medium is of critical importance for the evolution of galaxies (Hopkins et al. 2014). In this contribution, we present our investigation of the physical properties and excitation mechanisms of the warm molecular gas in N159, one of the most active star-forming regions in the Large Magellanic Cloud (LMC). CO rotational transitions up to CO($J = 12 \rightarrow 11$) have been detected in Herschel SPIRE FTS observations and our non-LTE radiative transfer analyses on $\sim$10 pc scales have revealed the presence of very warm ($\sim$400 K) and moderately dense ($\sim 2 \times 10^3$ cm^{-3}) molecular gas in the LMC for the first time. In combination with other gas and dust tracers, we have examined the observed CO line ratios using Meudon PDR and XDR models (Le Petit et al. 2006), finding that both models fail to reproduce in particular high-J CO observations (upper $J > 6$). Our results suggest that UV and X-ray photons are not sufficient to heat the warm CO-emitting gas in N159 and shock likely dominates the gas excitation. Our study is one of the first attempts to examine the excitation mechanisms of the warm molecular gas on scales of individual molecular clouds and provides insights into the role of stellar feedback.

REFERENCES

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