

X81a Cloud-scale variations in the $^{13}\text{CO}/\text{C}^{18}\text{O}$ abundance ratio and their connection to environments in NGC 1068

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Ratios of isotopologues provide valuable insights into the chemical evolution and star-formation history of star-forming regions in galaxies. We investigate the cloud-scale $^{13}\text{CO}/\text{C}^{18}\text{O}$ abundance ratio ($N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$) in the nearby barred spiral galaxy NGC 1068 and its connection to star formation and galactic structures (e.g., bar and starburst ring). Using the ^{13}CO and C^{18}O ($J=1-0$ and $2-1$) lines observed with ALMA, we map the gas temperature and column density variations of ^{13}CO and C^{18}O at 90 pc resolution under the LTE assumption. Based on these results, we obtain a map of the $N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$. By comparing $N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$ with the SFR surface density (Σ_{SFR}), we confirm a positive correlation between them on 90 pc scales, as suggested by previous 150 pc to sub-kpc studies based on the intensity ratio of single transitions. We discuss possible mechanisms that cause the variation of $N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$ in NGC 1068, especially in the bar region, where we find high $N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$ with low gas temperatures. We suggest that chemical fractionation is the dominant mechanism in the bar region of NGC 1068. This is the first case that a region has been identified in a nearby galaxy where chemical fractionation appears to dominate the cloud-scale $N_{^{13}\text{CO}}/N_{\text{C}^{18}\text{O}}$ ratio.