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Systematic observations on Galactic Interstellar isotope ratios

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Abstract. We are performing systematic observation studies on the Galactic interstellar isotopic ratios, including $^{18}O/^{17}O$, $^{12}C/^{13}C$, $^{14}N/^{15}N$ and $^{32}S/^{34}S$. Our strategy focuses on combination of multi-transition observation data toward large samples with different Galactocentric distances. Our preliminary results show positive Galactic radial gradients of $^{18}O/^{17}O$ and $^{12}C/^{13}C$. In both cases, the ratio increases with the Galactocentric distance, which agrees with the inside-out scenario of our Galaxy. Observations of other isotopes such as $^{14}N/^{15}N$ and $^{32}S/^{34}S$ are on-going.

Keywords. ISM, isotopic ratios, systematic observations, gradient

1. Our works & Preliminary results

We have performed a $C^{18}O$ and $C^{17}O$ mapping of molecular clouds in Galactic center (Zhang *et al.* 2015) and single pointing of a small sample of Galactic disc molecular clouds with the Delingha 13.7m telescope (DLH) in Purple mountain observatory (Li *et al.* 2016). Now we are performing $C^{18}O$ and $C^{17}O$ multi-transition observations toward a larger sample. Through observations obtained with ARO12, SMT and IRAM 30m, JCMT and DLH13.7, We detected the J=1-0 lines of $C^{18}O$ and $C^{17}O$ in 122 out of 192 sources, and the J=2-1 lines in 270 out of 359 sources. Our preliminary results

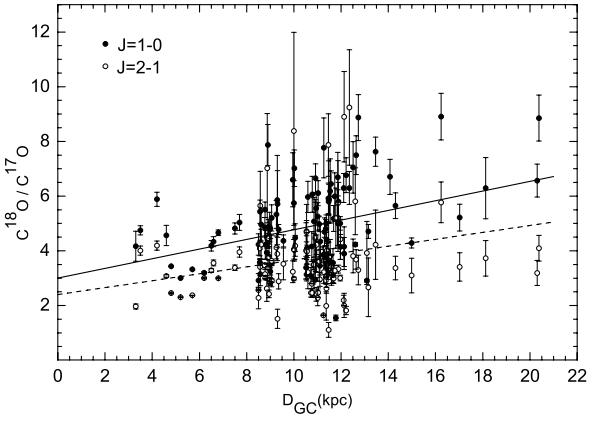

Figure 1. The Galactic radial gradient of $^{18}O/^{17}O$, from observations of $C^{18}O$ and $C^{17}O$ J=2-1 and J=1-0. The solid and dashed line show linear fits for J=1-0 and J=2-1 results, respectively.

support a positive Galactic radial gradient of $^{18}O/^{17}O$, i.e., the ratio increasing with the Galactocentric distance (Figure 1), which agrees with the inside-out formation scenario of our Galaxy. Other projects on different isotopic ratios are mainly based on observations at the Tianma radio telescope (TMRT) in Shanghai. Through TMRT observations of H_2CO and $H_2{}^{13}CO$ absorption lines and of the continuum in C and Ku bands, we determined the isotopic ratio $^{12}C/^{13}C$ for whole sample. We obtained a linear relation between the C isotopic ratio and the Galactocentric distance $^{12}C/^{13}C = (5.50\pm1.15)\,D_{GC}+4.70\pm6.91$. TMRT observations on $^{14}NH_3$ and $^{15}NH_3$ for isotopic ratio $^{14}N/^{15}N$, and $C^{32}S$ and $C^{34}S$ for $^{32}S/^{34}S$ will been soon available.

References

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