Formaldehyde absorption line Survey of the Northern Galactic Plane

Jarken Esimbek[(1)] , Jianjun Zhou[(1)]， Gang Wu[(1)], Dalei Li[(1)], Xindi Tang[(1)]
(1)Xinjiang Observatory, CAS, P.R. China, jarken@xao.ac.cn

Formaldehyde (H_2CO) is an accurate probe of physical conditions in dense and low temperature molecular clouds towards massive star formation regions. In recent years our team has performed H_2CO (1_{10}-1_{11}) absorption and H110α RRL spectra mapped more than 10 extended GMCs and survey southern galactic plane with the Nanshan 25m radio telescope operated by Xinjiang Observatory, National Astronomical Observatories of China. H_2CO absorption and $H_{110\alpha}$ RRL spectra were simultaneously obtained using a 4096- channel digital autocorrelation spectrometer at a band width of 80 MHz. At this frequency, the half power width of the main beam was about 10′. The system temperature was about 23 K. The DPFU value was 0.116K /Jy.

We investigated morphologic relations among H_2CO contours, ^{12}CO and ^{13}CO contours (from 1.2-m CfA telescope and Delinha 13m telescope), 6-cm continuum brightness temperature and the 8.28 μm Midcourse Space Experiment (MSX) color scale map and found their peaks locate at the same position(Zhang et al.2012, Okoh et al.2014). Regions with a high CBT had much higher excitation rates for H_2CO. However, in the same small area, H_2CO and ^{12}CO, ^{13}CO peaks were not located at the same position. H_2CO distribution may be strongly biased by the background CBT, while the strong HII region of the background has a relatively weak impact on ^{12}CO and ^{13}CO emission. By analyzing width and intensity, we find that there exists good correlation between H2CO absorption line and ^{12}CO, ^{13}CO emission line, and ^{13}CO correlation better than ^{12}CO with H_2CO line, this may be that they trace the same ambient clouds of star formation region (Tang et al.2013,2014, Guo et al.2016). We give distribution of excitation temperature of H_2CO absorption line in Aquila molecular cloud (Toktarkhan et al submitted to ApJ,2018).

We are using 25m radio telescope of Xinjiang Astronomical Observatory to survey dense molecular gas in the northern Galactic plane. We will carry out unbiased survey on H_2CO absorption line in the northerne galactic plane (-1deg<b<1deg, 0 deg<l<230 deg). We will study the large-scale structure and physical properties of dense molecular gas which are closely related to star formation, and try to understand the large-scale structure and physical properties of giant molecular clouds as well as the large-scale physical environment of massive star formation in the Milky Way. We have completed more than 80% of the surveys and report initial results of this H_2CO absorption line survey.

Guo, Wei Hua; Esimbek, Jarken et al. The comparison between H2CO and OH in the Milky Way,2016,Ap&SS361,264G

Okoh, Daniel; Esimbek, Jarken et al. “Formaldehyde and H110α observations towards 6.7 GHz methanol maser sources” 2014,Ap&SS,350,657O

Tang.Xin.Di; Esimbek.Jarken et al. “The comparison of H2CO (110-111), C18O(1-0) and continuum towards molecular clouds”，2014，RAA,14,959

Tang,Xindi; Esimbek,Jarken et al. “The relation of H2CO,12CO,13CO and continuum in molecular cloud” 2013 A&A,551A,28T

Chuanpeng Zhang,Jarken.Esimbek et al. “Large area mapping of formaldehyde at 4.8GHz toward gaint molecular clouds”,2012 Ap&SS,337,283Z