R21a Spectral Line Survey toward GMCs in M51

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Recently, formation and evolution processes of GMCs are becoming important topics in observational studies on star formation in nearby galaxies. In addition to conventional studies focusing on gas dynamics of GMCs, a chemical approach would bring a new insight into the GMC studies, since the chemical composition reflects past the evolutionally history as well as the present physical conditions. With this motivation, we have been conducting the spectral line survey toward two positions in a spiral arm of M51 with IRAM 30 m telescope.

In this survey, we identified 13 normal molecular species, including the quiescent dense gas tracer like N_2H^+, the shock tracers like CH_3OH, and HNCO, and the PDR tracers like CCH and CN. We also detected 8 isotopologues of the major species. On the other hand, the deuterated species like DCN and DCO^+ were not detected. The estimated deuterium fractionation ratios are found to be less than 3.0 % which are less than those found in the galactic star forming cores. By comparing the results of the two positions with different star formation activities, we found that the chemical compositions do not strongly depend on star formation activities, except for CN and N_2H^+. Star formation activities would not play an important role in the kpc-scale chemical composition.