

R27a **Spectral Line Survey toward GMCs in M51 with NRO 45 m telescope.**

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The formation and evolution processes of GMCs is a current important issue to be addressed in 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 GMCs studies, since the chemical composition reflects the past evolutionally history as well as the present physical conditions. With this motivation, we have conducted the spectral line survey toward GMCs in a spiral arm of M51 with NRO 45 m telescope.

In this survey, we have detected the spectral lines CCH, CH₃OH, HNCO, CS, ¹³CO, and C¹⁸O. It is remarkable that the spectral lines of relatively minor species such as CCH, CH₃OH, and HNCO are detected in the spiral arm of extra-galaxy, in addition to the optically thick lines such as CO, HCN, and HCO⁺. The detection of CCH would suggest the effect of the PDRs, because the CCH is thought to be formed from C₂H₂ or PAH by UV photons. CH₃OH can be an evidence of the shock, because this molecule is evaporated from the dust mantle by shock heating and/or sputtering. HNCO is also considered as a shock tracer, since their distribution is similar to that of CH₃OH in IC 342 (Meier & Turner 2005). From these results, the observed GMCs may be affected by the PDRs and outflow shocks associated with star formation activities within the GMCs. In addition to them, the cloud-cloud collision of GMCs would be another mechanism of shocks. In this talk, we discuss the chemical composition and excitation condition of GMCs averaged over the observed position.