[구SF-05] A Multi-Epoch, Simultaneous Water and Methanol Maser Survey Toward Intermediate-Mass Young Stellar Objects

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We report multi-epoch, simultaneous 22 GHz water and 44 GHz Class I methanol maser line survey towards 180 intermediate-mass young stellar objects, including 14 Class 0, 19 Class I objects, and 147 Herbig Ae/Be stars. We detected H_2O and CH_3OH maser emission towards 16 (9%) and 10 (6%) sources with one new H_2O and six new CH_3OH maser sources. The detection rates of both masers rapidly decrease as the central (proto)stars evolve, which is contrary to the trends in high-mass star-forming regions. This suggests that the excitations of the two masers are closely related to the evolutionary stage of the central (proto)stars and the circumstellar environments. H_2O maser velocities deviate on average 9 km s-1 from the ambient gas velocities whereas CH_3OH maser velocities well match with. For both maser emissions, large velocity difference ($|v_{H2O}-v_{sys}| > 10 kms^{-1}$ and $|v_{CH3OH}-v_{sys}| > 1 kms^{-1}$) is mostly confined to Class 0 objects. The formation and disappearance of H_2O maser lines are frequent and the integrated intensities of them change up to two orders of magnitude. In contrast, CH_3OH maser lines usually show no significant change in the intensity, shape, and velocity. This consistent with the previous suggestion that H_2O maser emission originates from the base of an outflow while 44 GHz Class I CH_3OH maser emission arises from the interaction region of the outflow with the ambient gas. The isotropic maser luminosities are well correlated with the bolometric luminosities of the central the objects.

The fitted relations are $L_{H2O} = 1.71*10^{-9}(L_{bol})^{0.97}$ and $L_{CH3OH} = 1.71*10^{-10}(L_{bol})^{1.22}$.

[구SF-06] Spectroscopic Identification of Massive Young Stellar Objects in the Galactic Center

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I present results from the Spitzer/IRS study to identify massive young stellar objects (YSOs) in the Galactic Center (GC). Our sample of 107 YSO candidates was selected based on Spitzer/IRAC colors in the central 300 pc region of the Milky Way Galaxy. We obtained IRS spectra over 5 μm to 35 μm, and identified massive YSOs by the presence of a 15.4 μm shoulder on the absorption profile of 15 μm CO_2 ice, suggestive of high CH_3OH abundance on CO_2 ice grains. This 15.4 μm shoulder is clearly observed in 16 sources and possibly observed in an additional 19 sources. We further show that 9 massive YSOs reveal molecular gas-phase absorption from CO_2, C_2H_2, and/or HCN, which traces warm and dense gas in YSOs. Our results provide the first spectroscopic census of the massive YSO population in the GC.