

S01a ALMA View of the Circum-nuclear Disk of the Galactic Center

Masato Tsuboi, Yoshimi Kitamura (JAXA), Kenta Uehara (Univ. Tokyo), Takahiro Tsutsumi (NRAO), Ryosuke Miyawaki (J.F. Oberlin Univ.), Makoto Miyoshi (NAOJ), and Atsushi Miyazaki (JSF)

The Galactic Center is the nuclear region of the nearest spiral galaxy, Milky Way Galaxy. We present the high angular resolution and high sensitivity spectral line images of the ‘‘Circum-Nuclear Disk (CND)’’ and its surrounding region of the Galactic Center in the CS $J = 2 - 1$, SiO $v = 0$ $J = 2 - 1$, $\text{H}^{13}\text{CO}^+ J = 1 - 0$, $\text{C}^{34}\text{S } J = 2 - 1$, and $\text{CH}_3\text{OH } J_{K_a, K_c} = 2_{1,1} - 1_{1,0} A_{--}$ emission lines using the Atacama Large Millimeter/Submillimeter Array (ALMA).

The CND is recognized as a torus-like molecular gas with gaps around the Galactic Center Black Hole (Sgr A*) in these emission lines except for the CH_3OH emission line. The inner and outer radii of the CND are estimated to be $R_{\text{in}} \sim 1.5$ and $R_{\text{out}} \sim 2$ pc, respectively. The velocities of the rotation and radial motion are estimated to be $V_{\text{rot}} \sim 115 \text{ km s}^{-1}$ and $V_{\text{rad}} \sim 23 \text{ km s}^{-1}$, respectively. These are consistent with those derived in the previous observations

We analyzed the physical parameters of the CND using also the CS $J = 7 - 6$ emission line images retrieved from the JVO portal by the RADEX LVG program. The CS $J = 2 - 1$ emission line is thermalized, $T_{\text{ex}} \sim 200$ K, although the CS $J = 7 - 6$ emission line is sub-thermally excited, $T_{\text{ex}} \sim 18 - 25$ K. The LTE molecular gas mass of the CND is estimated to be $M_{\text{LTE}} \sim 3 \times 10^4 M_{\odot}$ assuming the fractional abundance of CS molecule is $X_{\text{CS}} \sim 1 \times 10^{-8}$. The LTE mass is consistent with those derived in the previous observations.