

CENTRAL 300 PC OF THE GALAXY PROBED BY THE INFRARED SPECTRA OF H_3^+ AND CO PART II. MORPHOLOGY AND DYNAMICS OF THE GAS

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Velocity-resolved spectra of infrared lines of H_3^+ at $3.7\ \mu\text{m}$ and CO at $2.3\ \mu\text{m}$ have been obtained toward ~ 40 stars in the Central Molecular Zone (CMZ), a region of radius ~ 150 pc centered on the Galactic center. Although the coverage of the region is limited by the available number of suitable stars for absorption spectroscopy, the rich Doppler profiles of the H_3^+ lines in warm ($T \sim 250$ K) and diffuse ($n \leq 100\ \text{cm}^{-3}$) clouds^a have allowed us to draw a longitude-velocity (l - v) plot to reach the following conclusions.

(1) Based on the blue-shifted profiles of H_3^+ absorption lines, which are dominantly in the velocity range from $-200\ \text{km s}^{-1}$ to $10\ \text{km s}^{-1}$, the warm diffuse gas is moving outward from the center.

(2) Although limited in uniformity of longitudinal coverage, the observed (l - v) plot for H_3^+ suggests that the outer surface of the expanding gas forms a ring of radius of ~ 140 pc and has a velocity of expansion of $\sim 140\ \text{km s}^{-1}$. This finding revives the idea of the expanding molecule ring proposed by Kaifu et al.(1972)^b and Scoville (1972)^c which contrasts with a more recent interpretation of the overall gas kinematics as due to a barred gravitational potential (Binney et al. 1991).^d

(3) The results revive the idea of an explosion or overall expulsion of gas from the center within the last few million years. Unlike the original proposals that the EMR is also rotating, the H_3^+ l - v plot indicates purely expanding gas.

^aOka, T., Geballe, T.R., Goto, M., Usuda, M., McCall, B.J., Indriolo, N. to be submitted (2018)

^bKaifu, N., Kato, T. Iguchi, T., 1972, Nature, 238, 105

^cScoville, N.Z. 1972, ApJ, 175, L127

^dBinney, J., Gerhard, O.E., Stark, A.A., Bally J., Uchida, K.I. 1991, Mon. Not. R. astr. Soc. 252, 210