R33b Diffuse and Gravitationally Stable Molecular Gas in the Post Starburst Galaxy NGC 5195

○濤崎智佳 (ぐんま天文台)、河野孝太郎 (東大天文センター)、松下聡樹 (CfA)、B. Vila-Vilaro (SMTO)、芝塚要公 (東大天文/NRO)、川辺良平 (NAOJ)

NMA has been used to make CO(1−0) observations of the post-starburst galaxy NGC 5195. CO(1−0) and HCN(1−0) observations using the 45 m telescope are also presented. High-resolution ($1''.9 \times 1''.8$ or 86 pc × 81 pc at $D = 9.3$ Mpc) NMA maps show a strong concentration of CO toward the central a few × 100 pc region of NGC 5195, despite the fact that the current massive star formation is suppressed there. The face-on gas surface density within the $r < 2''$ or 90 pc region reaches $3.7 \times 10^3\ M_\odot\ \mathrm{pc}^{-2}$. The HCN-to-CO integrated intensity ratio, $R_{\mathrm{HCN/CO}}$, is about 0.02 within the central $r < 400$ pc region. This $R_{\mathrm{HCN/CO}}$ is smaller than those in starburst regions by a factor of $5 - 15$. These molecular-gas properties would explain why NGC 5195 is in a post-starburst phase; most of the *dense* molecular cores have been consumed away by past starburst events, and therefore a burst of massive star formation can no longer last, although a large amount of *low density* gas still exists. The critical gas surface density for a local gravitational instability of the gas disk becomes very high ($\Sigma_{\mathrm{crit}} \sim 6.9 \times 10^3\ M_\odot\ \mathrm{pc}^{-2}$), suggesting that the molecular gas in the central region of NGC 5195 is gravitationally *stable*, in contrast to that of starburst galaxies. We propose that dense molecular gas can not be formed from remaining diffuse molecular gas because the molecular gas in the center of NGC 5195 is *too stable* to form dense cores via gravitational instabilities of diffuse molecular gas.