The spatial distribution of shock/dust-related molecules in the nearby starburst galaxy NGC 253 observed with ALMA

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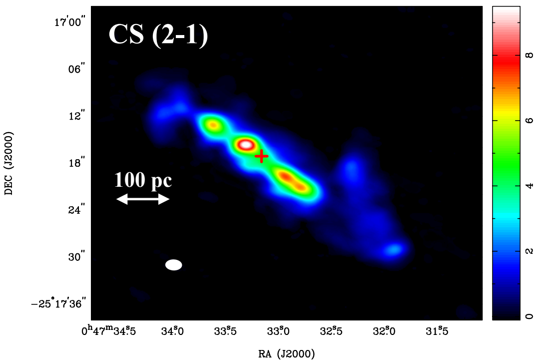
We present spatial distributions of typical dense gas tracers (CS J=2-1, 7-6), shock/dust-related molecules (HNCO $J_{Ka,Kc}=5_{0,5}-4_{0,4}$, CH_3OH $J_K=2_K-1_K$, and CH_3CN $J_K=6_K-5_K$) and 3 mm continuum emission in the central kpc region of the nearby starburst galaxy NGC 253, obtained with Atacama Large Millimeter/submillimeter Array (ALMA) cycle 0 observations. The achieved sensitivity was ~ 0.5 mJy per 30 pc beam, at a velocity resolution of 10 km s^{-1}. We found that CS emission is concentrated toward the very nuclear region, whereas CH_3OH and HNCO are more prominent in the "super bubble" (expanding bubble probably caused by super(hyper)novae) region [1] than in the nucleus. The existence of the expanding bubble is also confirmed in the channel map and the position-velocity diagram of CS, i.e., dense gas is also expanding. From our results, the abundances of CH_3OH and HNCO would be enhanced in the super bubble region likely due to shocks. In addition, we found shock/dust-related molecules are faint at the peak position of the 3 mm continuum emission. The initially high dust temperature would restrain the formation of these species there [2].



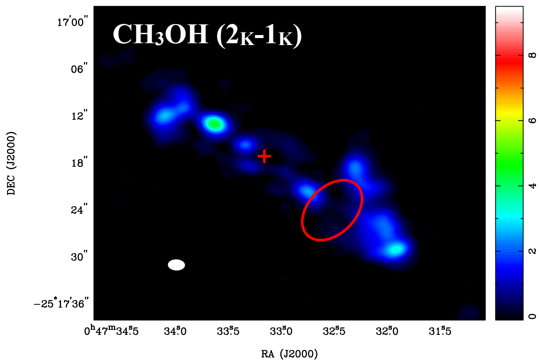


Figure 1: Integrated intensity maps of CS (left) and CH_3OH (right) in the central ~ 0.5 kpc × 1 kpc region of NGC 253. The central cross and the white ellipse in both panels indicate the peak position of the 3 mm continuum emission and the synthesized beams, respectively. In the right panel, the red ellipse indicates the location of the "super bubble" [1]. The CH_3OH emission is more prominent at the rim of the bubble. The color scales are in the unit of Jy beam^{-1} km s^{-1}.

References

[1] K. Sakamoto, et al., 2006, ApJ, 636, 685
[2] T. Nakajima, et al., 2014, submitted to PASJ