

R06a **CO ( $J = 3 \rightarrow 2$ ) Emission in the Starburst Galaxy NGC 1808**

Salak, D., Nakai, N., and Kitamoto, S. (University of Tsukuba)

We report observations of  $^{12}\text{CO}$  ( $J = 3 \rightarrow 2$ ) and  $^{13}\text{CO}$  ( $J = 3 \rightarrow 2$ ) molecular lines in the galaxy NGC 1808. At a distance of 10.8 Mpc, NGC 1808 is one of the nearest starburst galaxies with a superwind - outflow of the interstellar matter evidenced with polar dust filaments and broad emission lines. The observations of CO (3-2) were carried out in 2013 using the 10-m Atacama Submillimeter Telescope Experiment (ASTE). We mapped a region of  $80'' \times 60''$  ( $4 \times 3 \text{ kpc}^2$ ) with an angular resolution of  $22''$  (1.1 kpc) at the observed frequency of 345 GHz (wavelength 0.9 mm).

Emission of CO (3-2) and  $^{13}\text{CO}$  (3-2) was detected at  $> 5\sigma$ . These are the first map of CO (3-2) and the first detection of  $^{13}\text{CO}$  (3-2) in NGC 1808. In the galactic center, the main-beam brightness temperature and integrated intensity of CO (3-2) were  $0.49 \pm 0.02 \text{ K}$  and  $127.1 \pm 1.0 \text{ K km s}^{-1}$ , respectively, and the ratio of the integrated intensities of  $^{12}\text{CO}/^{13}\text{CO}$  (3-2) was  $19.8 \pm 0.6$ . The distribution of CO (3-2) shows extended structure along the galactic bar and in the direction of polar dust filaments, suggesting a molecular-gas outflow. The state of gas in the central 1 kpc was investigated with the radiative transfer program RADEX by using the data of six lines: CO (1-0), CO (2-1), CO (3-2),  $^{13}\text{CO}$  (1-0),  $^{13}\text{CO}$  (2-1), and  $^{13}\text{CO}$  (3-2). The beam-averaged kinetic temperature and molecular-gas density were constrained to  $T = 15 - 55 \text{ K}$  and  $n(\text{H}_2) = 10^{3.0} - 10^{4.6} \text{ cm}^{-3}$ , indicating the presence of warm molecular gas.