

**R12b      ASTE Dense Gas Imaging Survey of Star-forming Galaxies: ADIoS Project**

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We are now conducting a large scale CO(3-2) spectroscopic imaging survey project of nearby star-forming galaxies using the Atacama Submillimeter Telescope Experiment (ASTE) 10-m dish. The beam size of ASTE at 345 GHz is  $\sim 22''$  or  $\sim 500$  pc at  $D = 5$  Mpc, which is high enough to spatially resolve the major structures of galaxies, i.e., spiral arms, bars, and nuclear starburst regions. This project, ADIoS (ASTE Dense gas Imaging of Star-forming galaxies), aims to (1) obtain global views of dense molecular gas distributions traced by CO(3-2), (2) understand large scale spatial variations of star formation efficiencies (SFEs) from view points of dense gas fraction traced by CO(3-2)/CO(1-0) ratios, and (3) investigate large scale phase evolution of interstellar medium, i.e., from diffuse atomic gas (HI and/or CI) to dense molecular gas (and eventually ionized gas due to formed massive stars). We have already mapped 5 galaxies/regions (M 83,  $5' \times 5'$ ; NGC 253,  $9' \times 3'$ ; NGC 986,  $3' \times 3'$ ; NGC 604/M 33,  $5' \times 5'$ ; a GMC in M 31,  $1'.5 \times 1'.5$ ), revealing (1) good spatial coincidence between dense molecular gas distribution and massive star forming regions, (2) quantitative correlation between dense gas fraction (or average gas density) and SFEs, and (3) hints for dense gas formation processes.