R21a Development of the Multi-parameter Star Formation Law

Shinya Komugi, Rie E. Miura (NAOJ), Sachiko Onodera, Katsutoyo Uchima, Yuya Tsuda (Meisei Univ.), Tomoka Tosaki (Joetsu Univ. of Education), Kentaro Motohara, Ken Tateuchi, Yutaro Kitagawa, Kotaro Kohno (Univ. of Tokyo), Nario Kuno, Hiroyuki Kaneko (Tsukuba Univ.), Kazuyuki Muraoka (Osaka Pref. Univ.), miniTAO team, NGC300 team

The MAGiC project conducted at NRO 45m telescope mapped the whole molecular disk of the nearby galaxy M33 at angular scales of individual giant molecular clouds (GMCs). Combining this data with 12CO(J=3-2) and dust continuum maps obtained at ASTE, and archival data from *Spitzer* and 2MASS, we have identified a set of fundamental relations connecting the star formation rate, dust, gas and stellar masses. This can be interpreted as a multi-parameter expansion of the well known Schmidt-Kennicutt law, that can be applied to spatial scale of GMCs. The limitation of our results in M33 was that these sets of relations were obtained in only one galaxy. The next step, clearly, was to confirm the results in a separate galaxy.

We have embarked on a large scale CO survey of NGC300, a nearby late type spiral galaxy almost identical to M33, but in the southern hemisphere at a distance of 1.9 Mpc. Over 200 hours were spent mapping the central 5.5 kpc ($10'$) using the MOPRA telescope. The MOPRA angular resolution ($33''$) corresponds to 300 pcs, just enough to identify giant molecular complexes, and thus ideal for follow up observations with ALMA. Complimentary narrow band imaging in Paα emission line was conducted using the miniTAO telescope, identifying several star forming complexes. In this talk I summarize our current results from this new galaxy.