The First Cloud-by-Cloud Dense Gas Map of an External Galaxy

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We will present first results from the ongoing observations for the NOEMA+30m large program mapping emission from dense gas tracers (HCN, HCO+, HNC, 13CO, C18O) in the iconic nearby grand-design spiral galaxy M51. The resulting 2" resolution data will be combined with data from two other IRAM large programs, namely the cloud-scale 1" CO(1-0) map of M51 by PAWS (Schinnerer et al. 2013) and IRAM 30m dense gas maps by EMPIRE (Bigiel et al. 2016) to bring critical insights for current models of star formation theory. While highly resolved Milky Way observations link dense gas with immediate sites of star formation, extragalactic works find systematic variations in the dense gas fraction and dense gas star formation efficiency (SFE) on global and kpc-scales. The final cloud-scale dense gas mapping will allow us to test proposed drivers of the dense gas SFE and dense gas fraction, and address how the molecular gas density distribution relates to the local star formation activity, molecular cloud properties and galactic environment of the morphologically rich central 5 kpc of M51.

References

Schinnerer et al. 2013, ApJ, 779, 42
Bigiel et al. 2016, ApJ, 822L, 26