*Molecular Gas, Dust, and Star Formation in Galaxies*
*Proceedings IAU Symposium No. 292, 2012*
*T. Wong & J. Ott, eds.*

doi:10.1017/S1743921313001579

# The Schmidt-Kennicutt Law of Matched-Age Star Forming Regions

**S. Komugi[1], K. Tateuchi[2], K. Motohara[2], T. Takagi[3], D. Iono[4], H. Kaneko[4], J. Ueda[4], T. R. Saitoh[5], and the miniTAO team**

[1]Joint ALMA Observatory, Alonso de Cordova 3107, Vitacura, Santiago, Chile.
email: skomugi@alma.cl

[2]Institute of Astronomy, The University of Tokyo, 2-21-1 Osawa, Mitaka, Tokyo, Japan

[3]ISAS, JAXA, 3-31-1 Yoshinodai, Sagamihara, Kanagawa, Japan

[4]Nobeyama Radio Observatory, 462-2 Nobeyama, Minamimaki, Minamisaku, Nagano, Japan

[5]Interactive Research Center of Science, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro, Japan

**Abstract.** We show that the dispersion in the Schmidt-Kennicutt (SK) law in galaxies is affected significantly by the evolutionary stage of star forming molecular gas, using narrow band Pa$\alpha$ imaging of Taffy I, an interacting pair of galaxies. Star forming regions in the system show very uniform ages except for the bridge region, and the SK law of regions at the same age show a exceptionally tight SK law.

Taffy I (VV254) is a pair of galaxies that collided 20 Myr ago (Condon *et al.*, 1993), with an almost completely face-on geometry (Giovanelli *et al.*, 1986). The triggering of star formation due to collision is therefore expected to be instantaneous, resetting conditions of the star forming gas. This system can be used to test a hypothesis that the dispersion in the SK law may come from variations in the evolutionary state of molecular clouds (Onodera *et al.*, 2010). In order to derive dust extinction free star formation rate estimates, we imaged the Taffy I system in the Pa$\alpha$ line using ANIR (Motohara *et al.*, 2010) on miniTAO (Yoshii *et al.*, 2010).

The total star formation rate in Taffy I derived from the Pa$\alpha$ luminosity was 22 $M_{\odot}yr^{-1}$, which is much larger than previous estimates. Age estimates of individual star forming regions derived from their Pa$\alpha$ equivalent widths showed that the ages are uniform all over the system at 7 Myr, except for a region in between the two galaxies. These regions were compared with high resolution $^{12}CO(J = 1 - 0)$ data (Iono *et al.*, 2005). The resulting SK law showed that regions with the same age have an exceptionally tight SK law with only 0.096 dex of dispersion (Komugi *et al.*, 2012). This is much less than the spread expected for comparable size resolution in other nearby galaxies, thus supporting strongly the view that evolutionary differences of star-forming gas are largely responsible for the dispersion in the SK law.

## References

Condon, J. J., Helou, G., Sanders, D. B., & Soifer, B. T. 1993, *AJ*, 105, 1730
Giovanelli, R., Myers, S. T., Roth, J., & Haynes, M. P. 1986, *AJ*, 92, 250
Komugi, S., Tateuchi, K., *et al.* 2012, *ApJ*, 757, 138
Motohara, K., Konishi, M., Toshikawa, K., *et al.* 2010, *Proc. SPIE*, 7735
Onodera, S., Kuno, N., Tosaki, T., *et al.* 2010, *ApJL*, 722, L127
Iono, D., Yun, M. S., & Ho, P. T. P. 2005, *ApJS*, 158, 1
Yoshii, Y., Aoki, T., Doi, M., *et al.* 2010, *Proc. SPIE*, 7733