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Star formation in Taurus Auriga Perseus and California nebulae

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Abstract. Star formation and interstellar medium (ISM) structure were investigated in the Taurus, Auriga, Perseus and California (TAP) nearby star forming regions. Properties of the cold ISM was derived using AKARI FIR all sky maps, the Osaka-1.85m CO survey focusing to the all-sky Planck catalogue of Galactic Cold Clumps (PGCC). As many as 1041 infrared point sources were classified as young stellar object (YSO) based on multiband photometric data, and 384 of those are associated to a PGCC object. About 30% of the TAP PGCC clumps have associated YSOs.

Keywords. ISM: clouds, stars: formation

1. PGCCs in the TAP region

The Planck1 survey (Planck Collaboration 2011) covered the submm-to-mm range with high sensitivity and wide wavelength coverage. The first all sky catalogue of cold clump candidates with a mean temperature around 14K (PGCC catalogue, Planck Collaboration (2015a)) allows unbiased investigations of the cold ISM. Due to the selection methods, the nature of PGCC objects varies from cloud cores to large cloud complexes depending on the distance. The Taurus Auriga Perseus and California (TAP) region harbors 610 PGCCs with distance estimates and high quality flux densities, and most of these are cloud cores.

As many as 425 PGCCs were covered by the Osaka-1.85m CO survey of the TAP region as part of a survey of nearby star forming regions (Onishi *et al.*2013). Observations of the J=2-1 transition of ^{12}CO, ^{13}CO and C^{18}O were carried out using the 1.85m telescope installed at Nobeyama Radio Observatory with a velocity resolution of 0.08 kms^{-1}. The 425 TAP PGCCs were sorted into 3 ISM layers based on their average CO line velocities. The clump distances were then revised using the velocities, and known distances. We have used the Minimal Spanning Tree method (MST, Cartwright & Whitworth (2004)) to identify groups of PGCCs in the 3 ISM layers. We located 132 PGCC clusters, 57 of them contains at least four members, their average radius is 2.7 pc.

2. Star formation in the TAP PGCCs

An all-sky catalogue of Class I/II, and Class III type YSO candidates were compiled applying a statistical method on WISE and 2MASS data by Marton *et al.*2015. We accepted the YSO nature of 1041 YSO candidates based on their SED slopes and bolometric temperatures. The surface density distribution of YSO candidates as a function of the distance from the centre of the nearest PGCC clump indicates a strong concentration, while the MS stars have a generally constant surface density that decreases at the PGCCs (see Fig.1).

1 http://www.esa.int/Planck

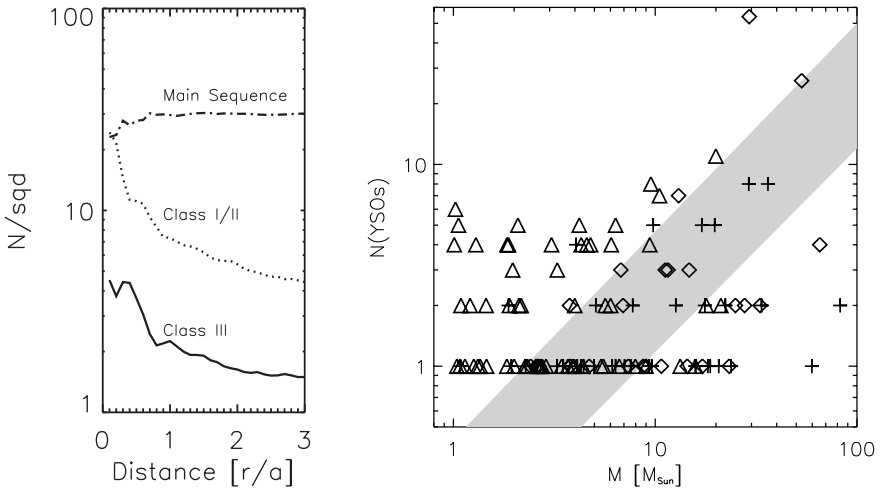

Figure 1. a) Surface density distribution of Class I/II (dashed line), Class III (solid line) and MS stars (dashed-dotted line). **b)** Relation between N(YSOs) and PGCC masses for the TAP region. Triangles, diamonds and pluses indicate the PGCC clumps with available distance and mass estimation in the Taurus-Auriga, Perseus and California regions, respectively. Grey shaded area shows the linear relation for the Lada *et al.*(2010) sample.

Star formation activity of a PGCC object was measured as N(YSO), the number of YSOs within a search radius equal to the diameter of the PGCC. In total, 384 associated YSO candidates were found, 25% of them are Class III sources. Most of the TAP PGCCs (337) are starless, 85 has one associated YSO candidate and 64 clumps more than one, that is below the all sky frequency of star forming PGCCs (50%, Marton *et al.*2015). Fig.1b shows the relation between N(YSO) and the Mclump mass (revised using our revised distances), but we do not see the correlation noted by Lada *et al.*(2010).

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References

Cartwright, A., & Whitworth, A. P. 2004, *MNRAS*, 348, 589
Lada, C. J., Lombardi, M. & Alves J. F. 2010, *ApJ*, 724, 687
Marton G., Tóth, L.V. *et al.* 2015, *MNRAS* submitted
Onishi, T., Nishimura, A., Ota, Y. *et al.* 2013, *PASJ*, 65, 78
Planck Collaboration *et al.* 2011, *A&A*, 536,23
Planck Collaboration *et al.* 2015, arXiv:1502.01599

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