

Pattern analysis of young stellar clusters

L. Viktor Tóth¹, Sarolta Zahorecz¹, Gábor Marton^{1,2},
Toshikazu Onishi³, Lajos G. Balázs², Orsolya Fehér¹,
Akiko Kawamura⁴, Yoshimi Kitamura⁵, Mónika Lisztes¹,
Atsushi Nishimura³, László Pásztor⁶, Sándor Pintér¹, Istvan Racz¹,
Motohide Tamura⁴, and Munetaka Ueno⁵

¹Lorand Eotvos University, Department of Astronomy, Pazmany P.s. 1/a, 1117 Budapest, Hungary, email: l.v.toth@astro.elte.hu

²Konkoly Observatory of the Hungarian Ac. of Sci., PO Box 67, 1525 Budapest, Hungary

³Department of Physical Science, Osaka Prefecture University, Gakuen 1-1, Sakai, Osaka 599-8531, Japan

⁴National Astronomical Observatory of Japan, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan

⁵JAXA, 3-1-1 Yoshinodai, Sagamihara, Kanagawa, 229-8510, Japan

⁶Research Institute for Soil Science and Agricultural Chemistry of the Hungarian Academy of Sciences, GIS Lab, Budapest, Hungary

Abstract. We revealed a statistically significant clustering in the all sky distribution of AKARI-WISE young stellar objects with large groups of elongated and bush types.

Keywords. stars: formation — ISM: individual (Orion molecular cloud complex)

We applied statistical pattern analysis methods on the YSOs selected from the AKARI FIS (Yamamura *et al.* 2010) and WISE (Wright *et al.* 2010) point source catalogues (Tóth *et al.* 2012). The internal structure of the YSO clusters were investigated using the minimum spanning tree method of Cartwright & Whitworth (2004), as described in Gutermuth *et al.* (2009). Cluster morphology parameters such as elongation and clumpiness were derived. Two cluster types were separated: the elongated or filamentary type (no side-branches or simple side-branches) and the bush type (small elongation parameter, complicated side-branches with sub-branches). We found and investigated 2606 YSOs in the Orion region ($180 < L < 225$, $-25 < B < -1$), and located 229 YSO groups, 75 groups with $N > 3$ of which there were similar number of elongated and bush types. The YSO groups are mostly seen in association with the main clouds of the Orion molecular cloud complex, the large ones are all close to the density peaks.

Acknowledgement. The European Union and the European Social Fund have provided financial support to the project under the grant agreement no. TAMOP-4.2.1/B-09/1/KMR-2010-0003. This research was partly supported by the Hungarian Research Fund (OTKA) and the HAS-JSPS mobility program.

References

- Cartwright, A. P. 2004, *MNRAS*, 348, 589
Gutermuth, R. A. *et al.* 2009, *ApJS*, 184, 18
Tóth, L. V., Zahorecz, S., Marton *et al.* 2012, in *prep.*
Wright *et al.* 2010, *AJ*, 140, 1868
Yamamura *et al.* 2010 AKARI/FIS All-Sky Survey Point Source Catalogues (ISAS/JAXA, 2010) *PASJ*, 59, 389