

Billions of stars: the near infrared view of the Plane with UKIDSS and VISTA

Philip W. Lucas^{1,*} and David Samuel¹

¹Centre for Astrophysics, University of Hertfordshire, College Lane, Hatfield, AL10 9AB, UK

Abstract. The UKIDSS Galactic Plane Survey (GPS) is surveying the northern and equatorial plane in the J, H and K bands. Here we report initial results from searches for new clusters and star formation regions. 248 clusters have been detected by our Bayesian search, of which 127 are new. A visual inspection of the images is also proving successful. A cross match with *Spitzer*-GLIMPSE to find clusters of Young Stellar Objects is being attempted. No new globular clusters are detected except for two likely candidates already detected by Mercer *et al.* in GLIMPSE.

Keywords. surveys, stars: formation, (Galaxy:) open clusters and associations: general

The UKIDSS GPS is surveying the northern and equatorial plane at Galactic latitudes $-5 \text{ deg} < b < 5 \text{ deg}$, in the J, H and K bands, see Lucas *et al.* (2008); Lawrence *et al.* (2007). Modal depth is $K \approx 18.0$ in uncrowded fields and typical spatial resolution is 0.8 arcsec. Source confusion reduces these depths slightly in the midplane in the first Galactic quadrant, leading to a “needle in a haystack” problem when searching for clusters.

We are conducting a search for new clusters using 3 methods: (i) a Bayesian search for overdensities in the source catalogue; (ii) visual inspection of the jpeg “quick-look” images during quality control of the GPS; (iii) a cross match with *Spitzer*-GLIMPSE to detect Young Stellar Objects with red $K-4.5 \mu\text{m}$ colours. The main aim of this search is to construct a large sample of pre-main sequence clusters and star formation regions (SFRs) in order to permit a statistical investigation of the star formation process. Recent successful searches for new clusters include those by (citeBica03, Mercer *et al.* (2005) and Froebrich, Scholz & Raftery (2007).

The Bayesian algorithm is similar to that of Mercer *et al.* The first scan includes only “extended” sources. This detects clusters and SFRs because nebulae and close stellar pairs and can appear as extended sources in the catalogue. 248 clusters have been detected so far in UKIDSS DR4, of which 127 are new. A large fraction are SFRs. The visual search is proving similarly successful, though there is overlap with the Bayesian list. We also detect many new SFRs with no associated cluster. Success in the GPS-GLIMPSE cross match must await efforts to improve the completeness of the catalogues in nebulous SFRs.

References

- Bica, E., Dutra, C. M., Soares, J., & Barbuy, B. 2003, *A&A* 404, 223
Froebrich, D., Scholz, A., & Raftery, C. L. *MNRAS* 374, 399
Lawrence, A. *et al.* 2007, *MNRAS* 379, 1599
Lucas, P. W. *et al.* 2008, *MNRAS* 391, 136
Mercer, E. P., Clemens D.P. *et al.* 2005, *ApJ* 635, 560

*We thank the staff of UKIRT, the Cambridge Astronomical Survey Unit and Wide Field Astronomy Unit at Edinburgh University for making this project possible.