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Memorie della

VVV high proper motion survey

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Abstract. Here we present survey of proper motion stars towards the Galactic Bulge and an adjacent plane region base on VISTA-VVV data. The searching method is based on cross-matching photometric K_s-band CASU catalogs. The most interesting discoveries are shown.

Key words. Stars: low-mass stars and Brown dwarfs – Proper motion – Infrared: Surveys

1. Introduction

High proper motion searches is the most widespread method of revealing new solar neighbors, as nearby stars generally have larger proper motions than those more distant. The Galactic bulge and plane are referred as the zone of avoidance, because they contain very high stellar densities down to faint limiting magnitudes, and also regions of dark molecular clouds, nebulosity, as well as regions of current star formation. Most of nearby stars are found outside these regions. However, recent discoveries of nearby UCDs in Galactic plane, DENIS J081730.0-615520 (Artigau et al. 2010), UGPS J072227.51-054031.2 (Lucas et al. 2010) and Luhman 16 (Luhman 2013), show that these regions may contain other highly interesting, unusual, and nearby objects.

2. VISTA-VVV

The ESO public survey VISTA Variables in the Vía Láctea (VVV) targets 562 square degrees in the Galactic Bulge and an adjacent plane region (Minniti et al. 2010; Saito et al. 2012). VVV provides multi-epoch K_s-band images

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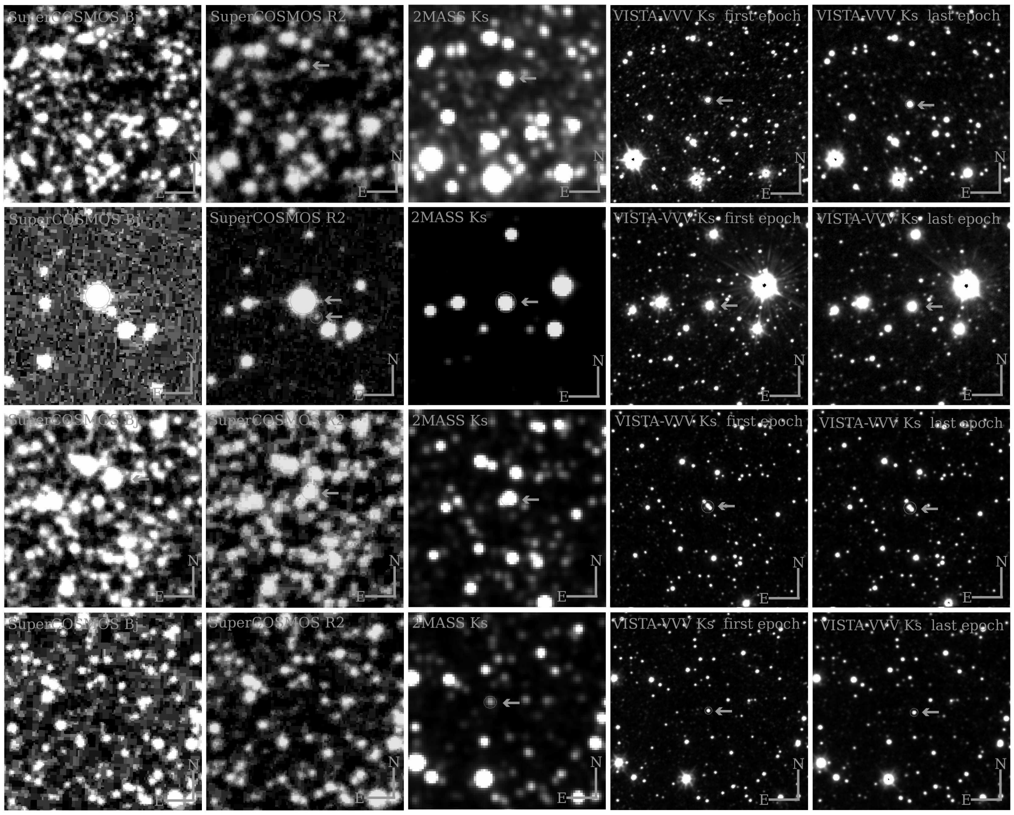

Fig. 1. Examples of most interesting discoveries. Row 1: High proper motion ($0\farcs81$ yr^{-1}) M dwarf towards the Galactic Bulge. Row 2: dM+WD common proper motion binary, WD is visible only on SuperCOSMOS images (B_j=20.3, R_2=21.1). Row 3: Close common proper motion dM+MD binary (d = $1\farcs6$) resolved on VISTA-VVV images. Row 4: Brown dwarf towards the Galactic Bulge, object is not visible on SuperCOSMOS images.

which allow searching for high proper motion objects. Providing better spatial resolution and deeper (4) magnitude range than 2MASS, VVV has bigger potential of finding free floating very low-mass stars, brown dwarfs and also common proper motion companions of previously known high proper motion stars. The VVV data are processed by the Cambridge Astronomical Unit[1] (CASU). CASU provides images and catalogs with aperture photometry and astrometry for VVV users. The VVV data are also publicly available through the VISTA Science Archive[2] (VSA). More technical information about the VVV survey can be found in Saito et al. (2012) and Soto et al. (2013).

3. Method

The searching method we used is based on cross-matching, with a scaled radius of 5 arcsec per year, photometric K_s-band CASU catalogs obtained for 4 different epochs. Method was developed by Folkes et al. (in preparation).

[1] http://casu.ast.cam.ac.uk/vistasp/

[2] http://horus.roe.ac.uk/vsa/index.html

Next, the candidates were visually inspected on VVV, 2MASS and SuperCOSMOS images.

4. Current status

Until Jun 2013, we have examined ∼ 31% of VVV area and we have detected ∼ 400 objects with proper motion higher than 0.05 arcsec per year and K_s <13.5. This sample includes dozens of completely new high proper motion stars and common proper motion pairs, some common proper motions companions of previously known high proper motion stars, and one spectroscopically confirmed brown dwarf (Beamín et al. 2013). During visual inspection of SuperCOSMOS images we have also identified 3 white dwarf common proper motion companions of previously known high proper motion stars.

The examples of most interesting discoveries are presented on Figure 1. SuperCOSMOS B_j ans R_2, 2MASS K_s and VISTA-VVV first and last K_s epoch images were obtained around 1974, 1992, 2000, 2010 and 2012, respectively.

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