

Investigation of Star Clusters found in 2MASS Catalog

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INTRODUCTION

We have launched the program of UBV CCD photometric investigation of new clusters detected in 2MASS catalog by an automatic method, which is based on convolution with a density function (Kopusov et al. 2008, A&Ap 486, 771).

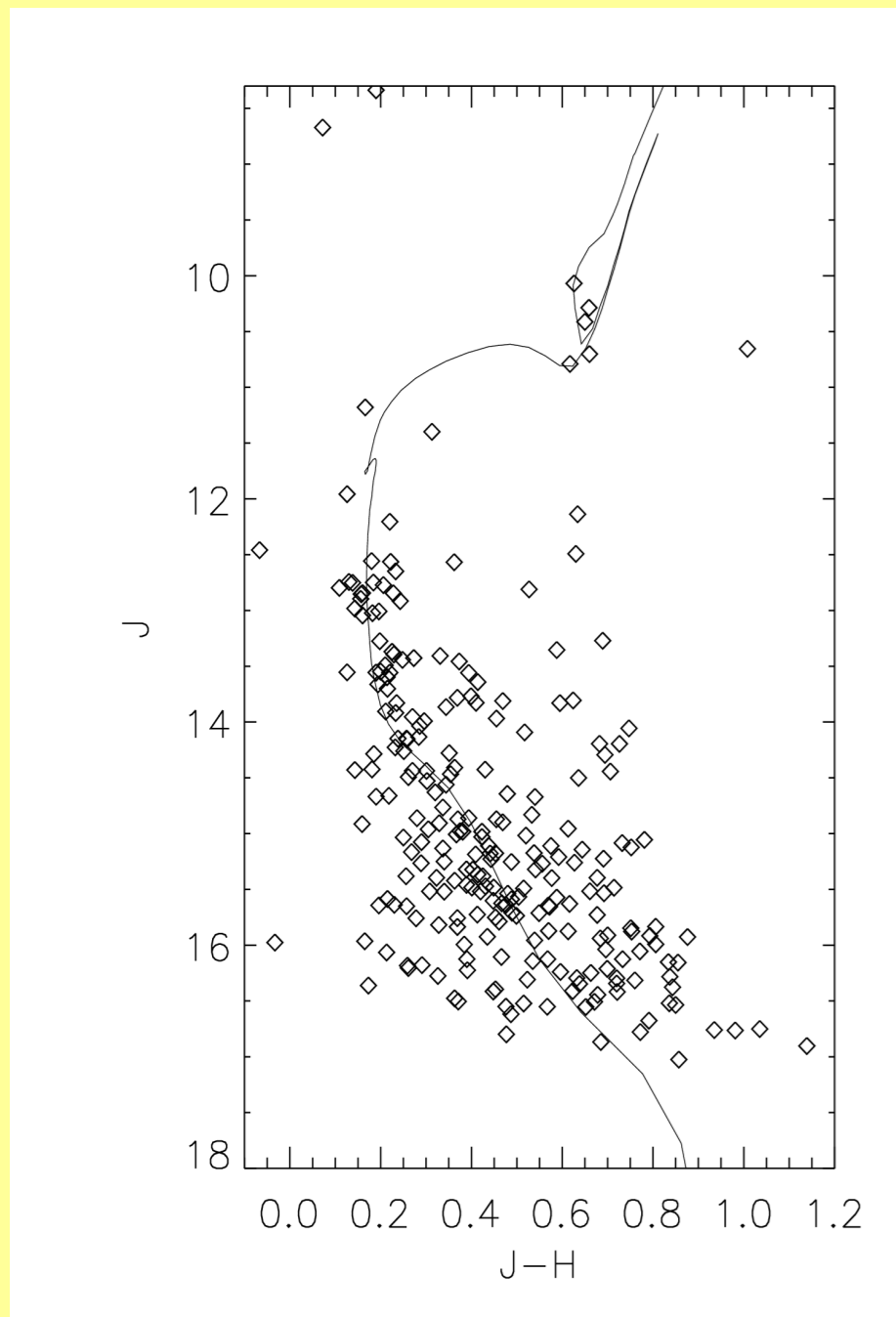


Fig.1 Color-magnitude diagram for cluster Koposov 12 inside the radius of 4'.

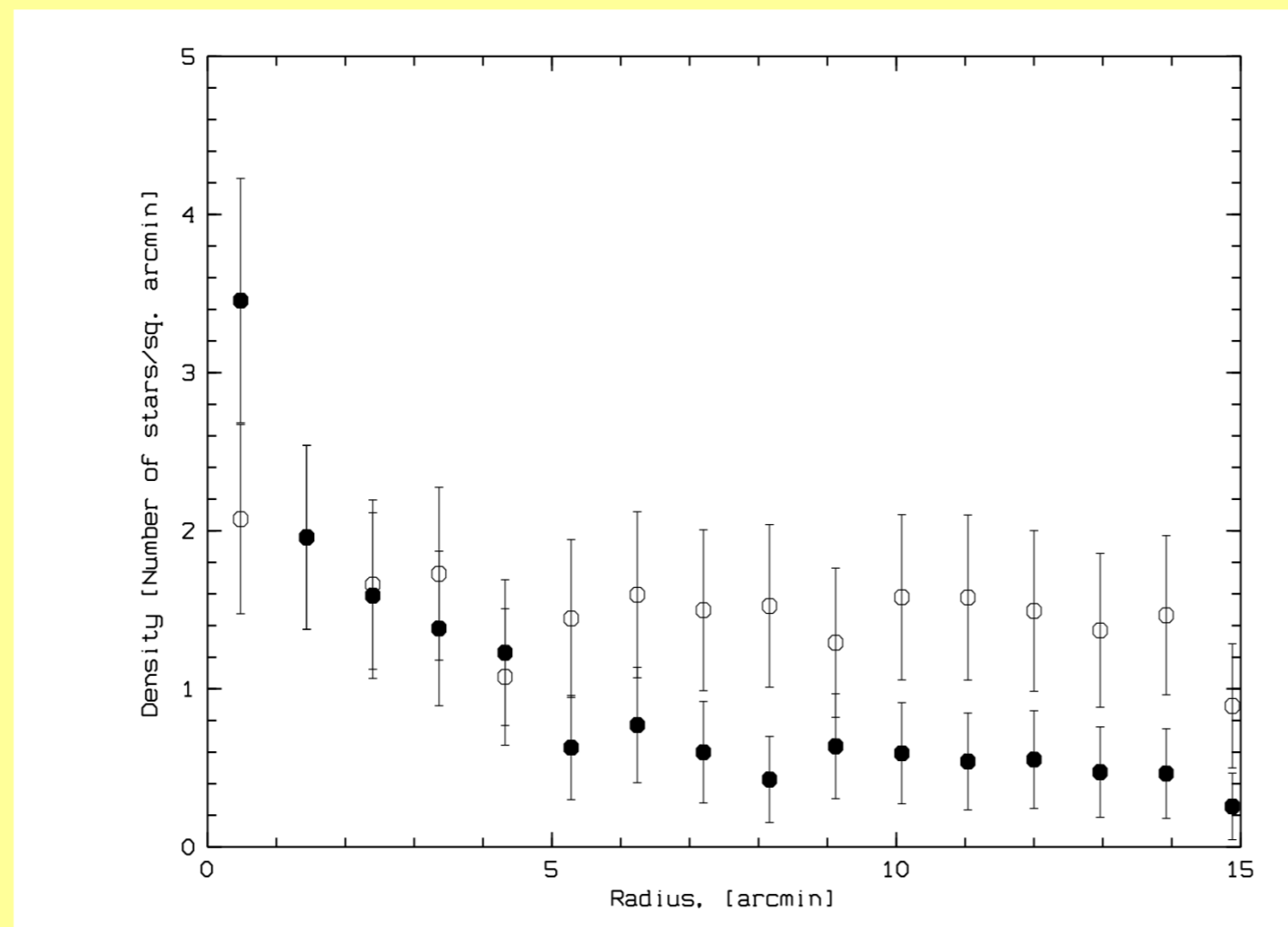


Fig.2 Radial density distribution for stars in the field of Koposov 12. Solid circles represent the density of the stars lying closely to the isochrone. Open circles denote the density of the field stars lying far from the isochrone.

OBSERVATIONS AND DETERMINATION OF CLUSTER PARAMETERS

The clusters are observed in UBVI_c filters with a 104-cm Sampurnanand telescope located in ARIES, Manora Peak, Nainital, India. To determine the distances to the clusters, their ages and color excesses in the direction toward the clusters, we use isochrones by Girardi et al. (2002, A&Ap 391, 195) and the method by Koposov et al. (2008). Isochrone is shifted along the magnitude and color axes, and the radial distribution is plotted for cluster members (the star lying apart from the isochrones at a distance less than 0.05^m in color) and for background stars (all other stars) in a single plot. Correct position of the isochrone is characterized by simultaneous meeting two conditions: (1) the distribution of star members along the cluster radius features the maximum in the cluster center (2) the distribution of background stars is flat along the cluster radius (Fig.1 and Fig.2).

To fit an isochrone in the $(U-B, B-V)$ diagram, we shift it along the line $E(U-B) = 0.72 \times E(B-V)$ and also plot the radial distributions for star-members and background stars. Because in this case, we have the number of parameters lesser by one, we are able to estimate the clusters metallicity by exhausting isochrones with different chemical abundance Z (Fig.3). Employing this technique and data from 2MASS catalog we study the clusters in $(U-B, B-V)$, $(V, B-V)$, $(V, V-I)$, $(J, J-H)$, and $(K, J-K)$ coordinates and find their physical parameters.

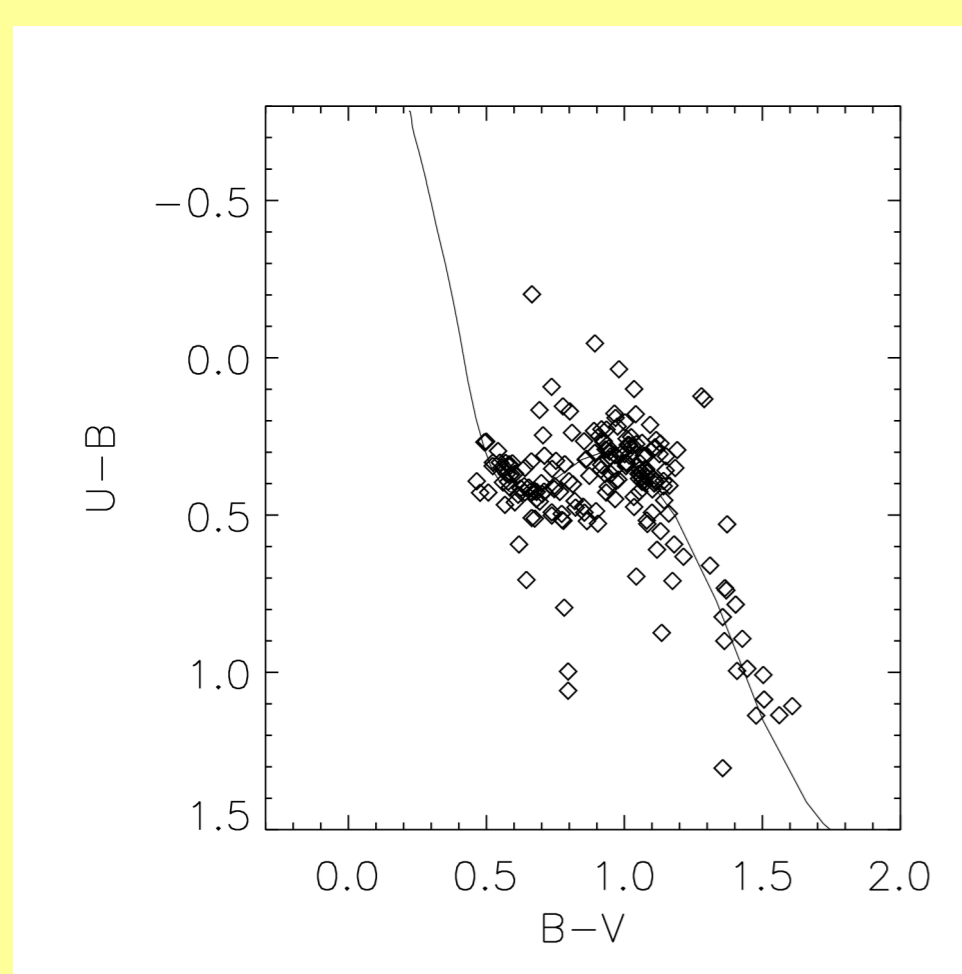


Fig.3 Color-color diagram in the field of Koposov 12 with the fitted isochrone with $Z = 0.008$

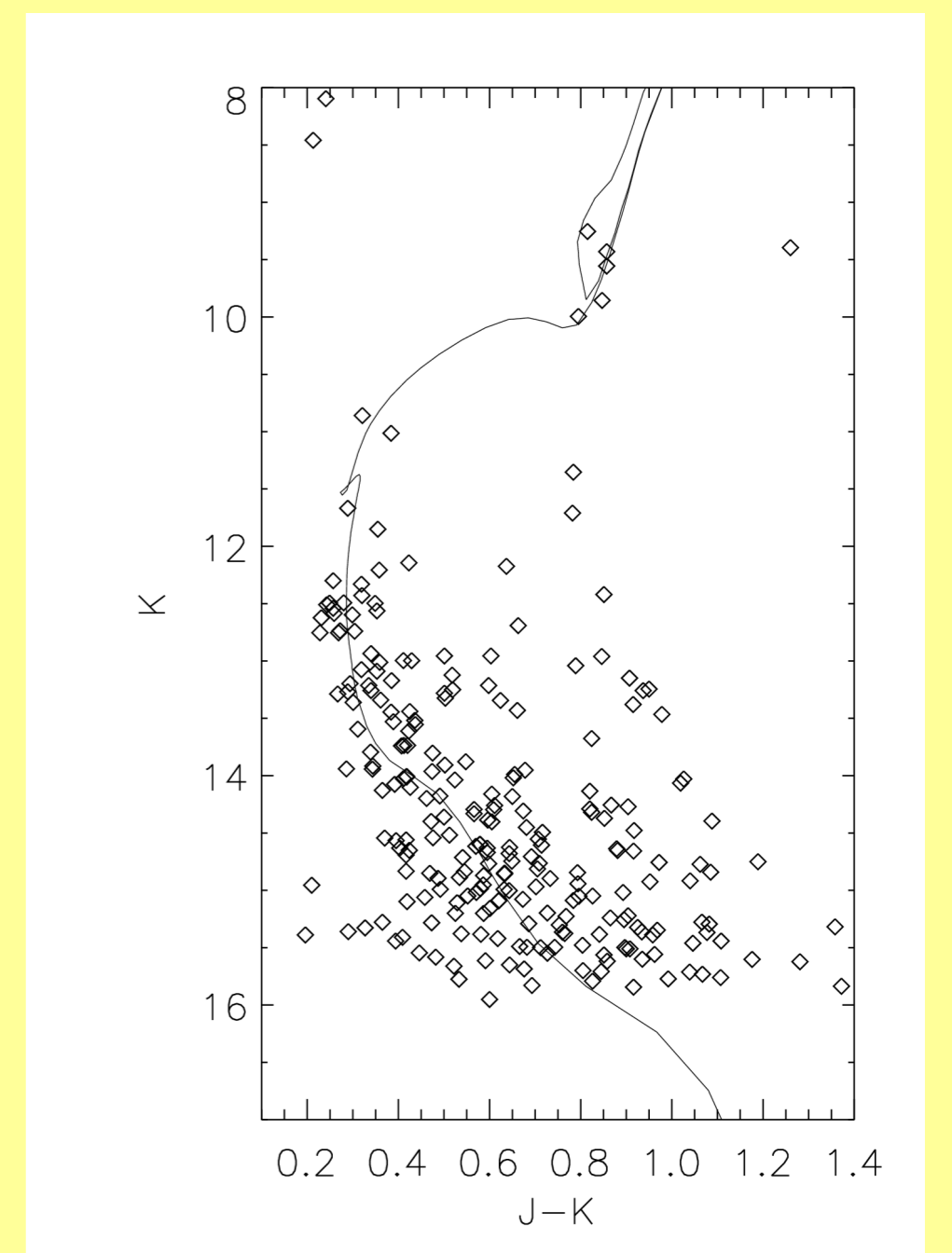
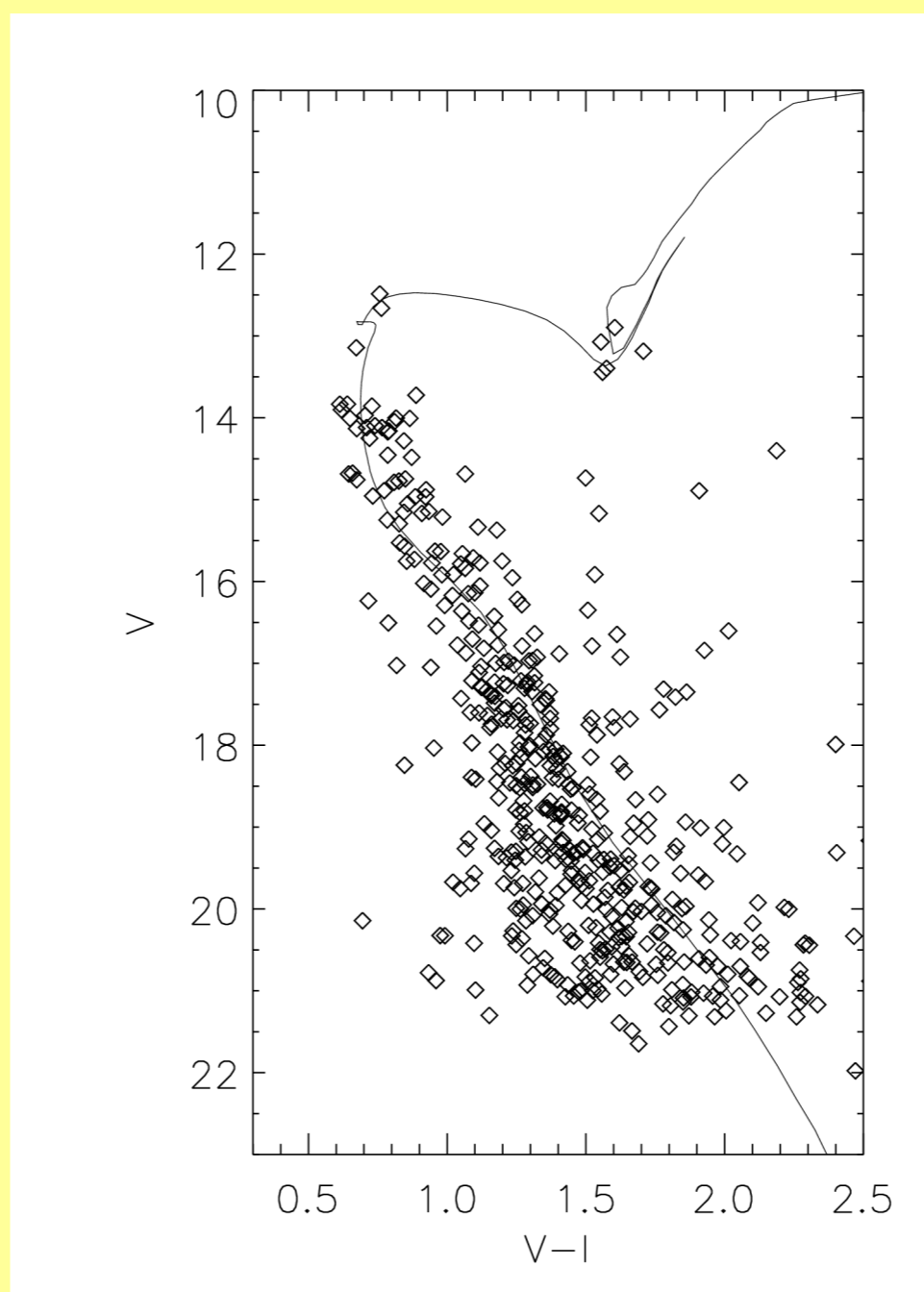
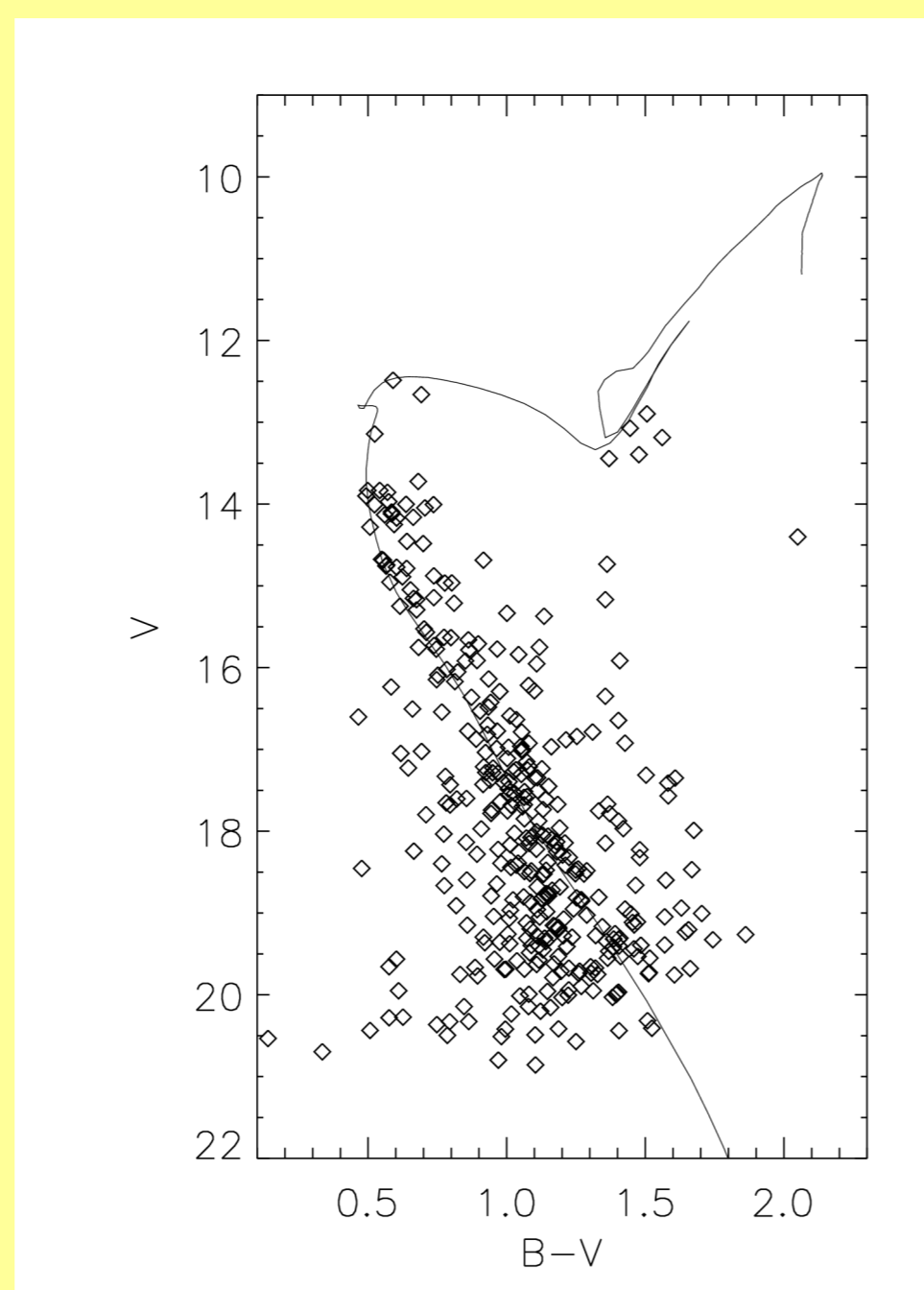


Fig.4 Color-magnitude diagrams of the stars within 4' from the center of the Koposov 12 with the fitted isochrone.

FIRST RESULTS

The use of deep UBVI CCD photometry allowed us to significantly improve estimations of the age, distance, color excess, and metallicity of three clusters discovered by processing the 2MASS catalog data.

Name	$E(B-V)$ mag	$(m-M)_0$ mag	Distance pc	$\log(t)$	Z
Kopusov 12	0.53 ± 0.02	11.44 ± 0.01	1950 ± 50	8.65 ± 0.05	0.008
Kopusov 53	0.40 ± 0.02	13.13 ± 0.14	4250 ± 250	7.90 ± 0.05	0.008
Kopusov 77	0.63 ± 0.03	12.64 ± 0.16	3400 ± 250	9.35 ± 0.05	0.004