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## SPACE RESEARCH AT THE BALDONE OBSERVATORY



*The Baldone observatory deals with the U-, B-, V-, R-, I-photometry and low resolution spectroscopy of carbon stars, the monitoring of small bodies of Solar system, and with the digitizing and processing of 24 300 plates from the Schmidt wide field telescope archive. The astronomers from the observatory are working to popularize astronomy.*

*Keywords: carbon stars, asteroids, and astronegatives.*

### INTRODUCTION

The astronomers of Baldone observatory work with Schmidt-type 1.2 meter telescope installed with four degree objective prism and one square degree STX-16803 CCD. It is the twelfth largest Schmidt telescope in the world manufactured in Germany, in 1966. The studies of space at the observatory are defined by capacity of the Baldone Schmidt telescope. Carbon stars are traditional field of investigation there.

### CARBON STAR PHOTOMETRY AND SPECTROSCOPY

Photometry of carbon stars has showed that some stars have periods of light variation of the first and second order and enabled to discover a new type of variability of late stars – DY Per.

The investigation of properties of carbon stars in Large Magellanic Cloud by Mauron [1] has enabled estimating the absolute magnitude  $M_k$  of late carbon stars. The study of dust distribution in the Milky Way galaxy by Schlegel et al. [2] and distribution of interstellar absorption by Arenou et al. [3] allow researchers to detect values of interstellar absorption  $A_k$  for carbon stars. Thus, it

makes possible to determine the distances to the carbon stars by the following equation:

$$5 \lg r = K - M_k - A_k - 10$$

and to study the carbon stars distribution in the Galaxy [4, 5].

The low resolution spectroscopy of carbon stars at the Baldone observatory has given methodology to obtain  $T(\text{eff})$  [6] of their atmospheres and thus enabled to detect the evaluation phases of these stars. Over 450 carbon stars have been discovered at the observatory, including 53 ones found most recently.

### STUDY OF SOLAR SYSTEM SMALL BODIES

Solar system small bodies have been monitored at the Baldone observatory since 2008. Forty eight new asteroids have been discovered, 11 have been numbered and labeled; 3511 astrometric positions of 826 asteroids have been calculated in cooperation with the Institute of Theoretical Physics and Astronomy, Vilnius University. Orb-Fit v.4.0 program which takes into accounts the planets and Ceres, Pallas, Vesta perturbations, is used for ephemerides calculations in the case of Main belt asteroids, while Orb-Fit v.4.2 taking into consideration perturbations of 25 objects applies to the Trojan and Centaurus asteroids [7, 8].

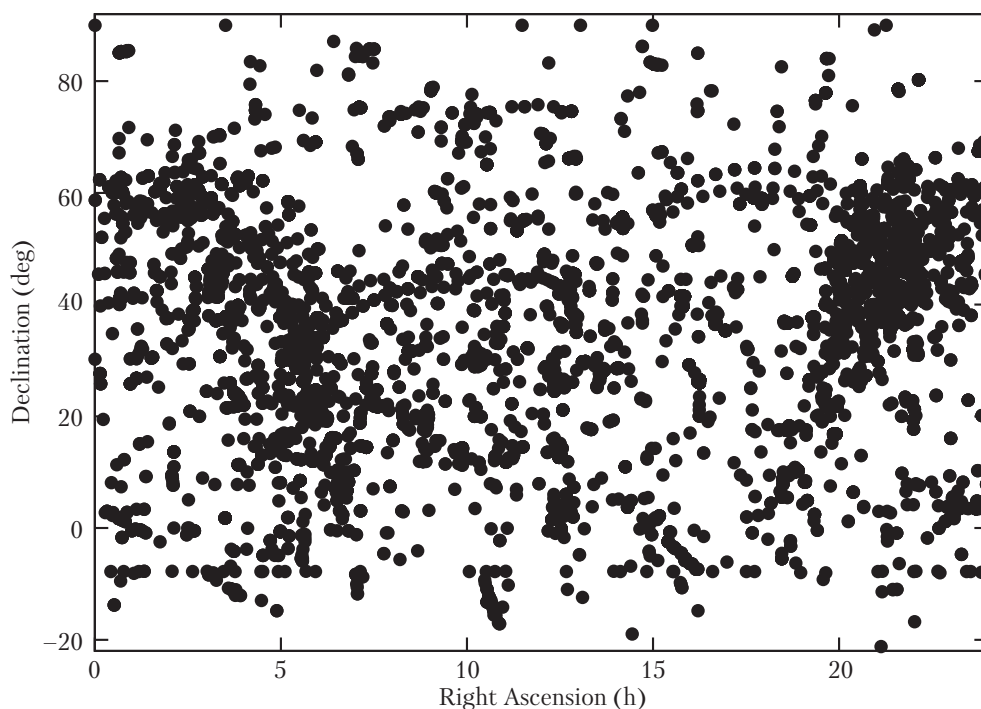


Fig. 1. Distribution of the 22000 direct observations on sky

#### BALDONE OBSERVATORY ARCHIVE

The Baldone archive contains astrophotos of Schmidt telescope of the Institute of Astronomy of the University of Latvia for the period 1967 – 2006. The archive comprises more than 22000 direct and 2300 spectral photos of various sky regions (Fig. 1). Detailed information on the types of photographic materials and color filters used as well as on the most frequently photographed sky fields or objects are given in [9].

The images were digitized by the scanners EPSON EXPRESSION 11000XL. Standard image processing was performed in LINUX/MIDAS/ROMAFOT environment with an advanced set of original programs developed at the Main Astronomical Observatory of the National Academy of Sciences of Ukraine [10] and at Research Institute «Mykolaiv Astronomical Observatory». The equatorial coordinates and magnitudes of all objects on the plates have been obtained. Additional studies of mechanics and optical distortion have been conducted [11]. Now, two projects have been

being implemented in cooperation with Main Astronomical Observatory (Kyiv) using Baldone archive data. They are aimed at searching for asteroids and comets and obtaining U magnitudes of stars and galaxies in the North celestial sphere.

#### POPULARIZATION OF ASTRONOMY

Since 2013, Planetarium has been operating at the Baldone observatory, in Schmidt telescope pavilion. The visitors have a possibility to travel to stars, nebulae, galaxies, and Solar system planets. Over 3000 visitors attend the popular lectures in astronomy every year.

Astronomers of observatory are engaged in issuing *Starry Sky* popular journal, the oldest Latvian edition which has been published for more than 50 years.

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#### КОСМІЧНІ ДОСЛІДЖЕННЯ В ОБСЕРВАТОРІЇ БАЛДОНЕ

В обсерваторії Балдоне проводиться U-, B-, V-, R-, I-фотометрія і спектроскопія низької роздільної здатності вуглецевих зір, моніторинг малих тіл Сонячної системи, оцифровка і обробка 24 300 фотопластинок архіву телескопа Шмідта з широким полем зору. Астрономи обсерваторії також проводять роботу з популяризації астрономії.

*Ключові слова:* вуглецеві зірки, астероїди, астронегативи.

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#### КОСМИЧЕСКИЕ ИССЛЕДОВАНИЯ В ОБСЕРВАТОРИИ БАЛДОНЕ

В обсерватории Балдоне проводится U-, B-, V-, R-, I-фотометрия и спектроскопия низкого разрешения углеродных звезд, мониторинг малых тел Солнечной системы, оцифровка и обработка 24 300 фотопластинок архива телескопа Шмидта с широким полем зрения. Астрономы обсерватории также проводят работу по популяризации астрономии.

*Ключевые слова:* углеродные звезды, астероиды, астронегативы.