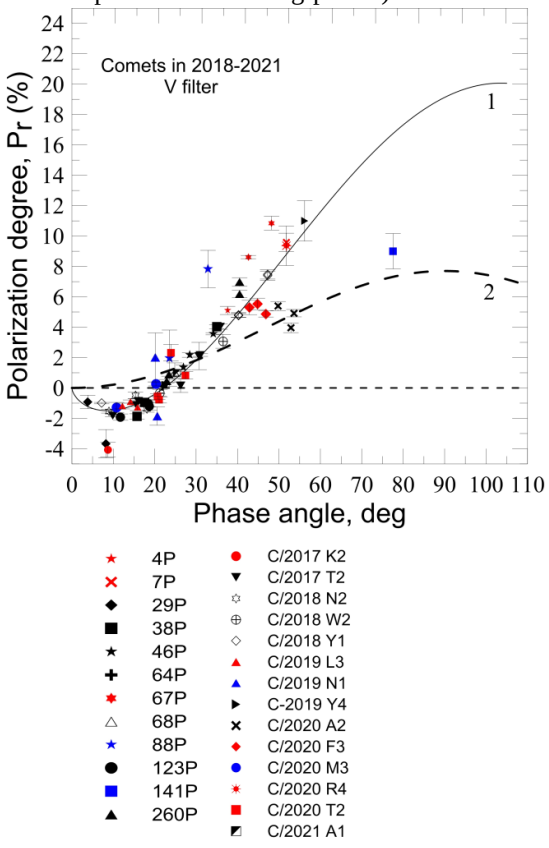
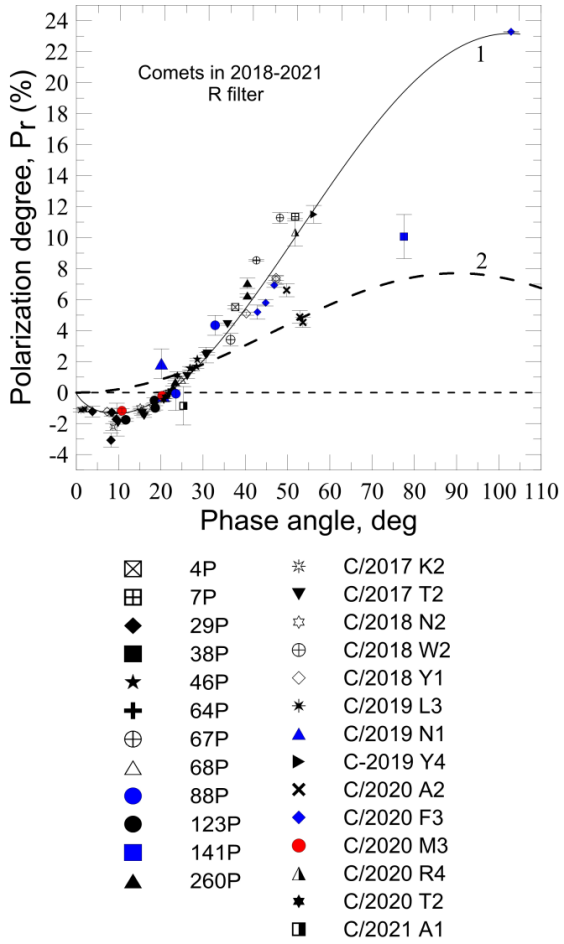
POLARIMETRIC OBSERVATIONS OF COMETS. E.A. Zhuzhulina[1], N.N. Kiselev[1], D.V. Petrov[1], A.A. Savushkin[1], N. Karpov[2]. [1] Crimean Astrophysical Observatory of Russian Academy of Science (CrAO RAS), Crimea, [2] Terskol Branch of Institute of Astronomy of the Russian Academy of sciences (INASAN), Russia

Introduction: The study of the physical characteristics of small bodies such as comets is an important part of the study of the solar system origin. One of the effective methods for studying the physical properties of comets is polarimetry. Using the phase dependence of the linear polarization of comets (PDP), it is possible to determine a number of important characteristics of cometary particles such as albedo, chemical composition, size, shape and etc. This makes it possible to establish the similarity and diversity in comets having different sources of origin and evolution. Therefore, additional observations are required to expand the existing base of polarimetric observations of comets [1], which currently contains 3441 observations of linear and circular polarization of 95 comets observed from 1881 to 2016. For this goal we used two identical two-channel polarimeters created for the Cassegrain foci of the 2.6m (*F*/16) and 2m (*F*/8) telescopes of the CrAO and Terskol Observatory, respectively. These polarimeters made it possible to significantly expand the brightness range of the observed comets to 16 magnitudes and to carry out observations not only in standard UBVRI filters, but also in narrow-band "cometary" filters.

Observations: Polarimetric observations of 26 comets (12 short-period and 14 long-period) were carried out during 2018 - 2021, with the 2.6-meter Shajn telescope at the CrAO and the 2-m telescope of the Peak Terskol Observatory. The integral brightness of comets was 8-16 magnitudes, and phase angles were changed in the range from 3° up to 102°. For many comets, polarimetric data were obtained for the first time. The figures 1-3 show the phase dependence of linear polarization of comets obtained in the V, R, and I bands respectively.



Figs. 1- 2. Synthetic phase dependences of the linear polarization of comets in the V (left panel) and R (right panel) bands obtained in 2018 - 2021. Solid curves (1) are data approximation by trigonometric expressions [2]. Curves 2 are the theoretical phase dependence of polarization for diatomic molecules according to Öhman's expression in [4].



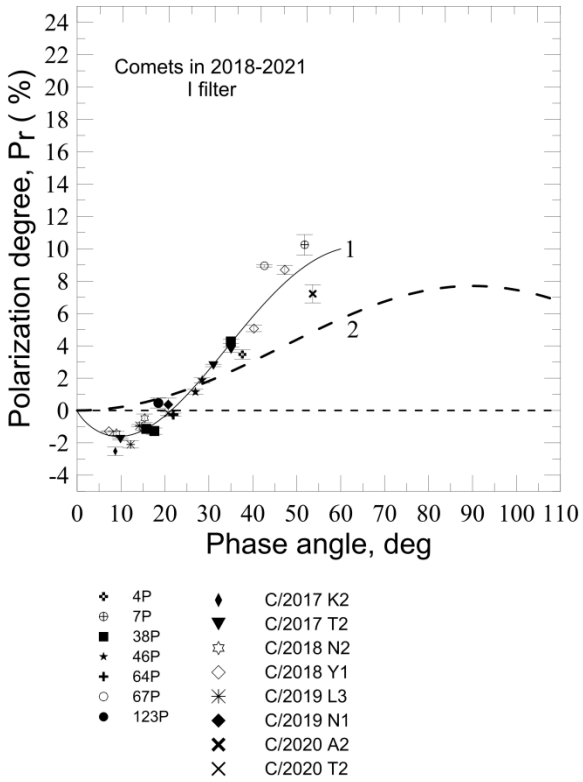


Fig 3. The same as Fig.1-2, but for I band.

Results: The data obtained have significantly supplemented the Database of Comet Polarimetry [1]. Most of the comets had a rather weak brightness of 13–16 magnitude and could be observed in a limited range of phase angles. Therefore, the results obtained can be used to analyze the synthetic phase dependences of the polarization of comets with different regions of origin and different evolution. In the range of observed phase angles, the phase dependence of polarization of the measured comets coincides with the synthetic phase dependence of dusty comets found earlier in [3]. Some comets, for example, 141P/Machholz, on the P vs α plane, occupy intermediate values between the PDP of dust comets and the PDP of molecular emissions. The reason for such deviations can be the gas contamination which strongly affects the polarization in the continuum.

References:

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