COMPARATIVE POLARIMETRY OF COMETS 103P/HARTLEY 2, 9P/TEMPEL 1, AND C/2009 P1 (GARRADD). N. N. Kiselev[1], V. K. Rosenbush[1], V. L. Afanasiev[2], D. A. Blinov[3], S. V. Kolesnikov[4], and S. V. Zaitsev[1]. [1]MAO NAN Ukraine, 27 Zabolotnoho str., 03680 Kyiv, Ukraine, kiselevnn@yandex.ru, [2]Special Astrophysical Observatory, RAS, Nizhnii Arkhyz, Karachai–Cherkessian Republic, 357147 Russia, afan@sao.ru, [3]Astronomical Institute of St.Petersburg University, Russia, dmitriy.blinov@gmail.com, [4] Observatory of Odessa National University, Shevchenko Park, 65014 Odessa, Ukraine, s_v-k@mail.ru.

Introduction: Similarity and diversity in the properties of cometary dust is one of the main problems in the physics of comets. Polarimetry is a very sensitive tool to probe the nature of cometary dust [1]. A way to study it is to compare the polarization phase angle dependence for different comets. For this purpose, we created Database of Comet Polarimetry [2] that is periodically updated. Here we present the results of polarimetry of recent comets 103P/Hartley 2 and 9P/Tempel 1 obtained during the EPOXI mission encounter (November 2011) and DEEP IMPACT mission (July 2005) respectively and comet C/2009 P1 (Garradd) during its approach to the Earth in 2011–2012.

Observations: The measurements of the linear polarization of comets Hartley 2, Tempel 1, and Garradd were carried out at the 2.6-m and 0.7-m telescopes of the Crimean Astrophisycal Observatory (Ukraine). The R wide-band filter (λ_0 = 640/80 nm) and the RW filter (550–750 nm) were used. The spectropolarimetric measurements of linear and circular polarization of comet Garradd in the range 350–900 nm were carried out with the SCORPIO-2 focal reducer at the 6-m BTA telescope of the Special Astrophysical Observatory (Russia). A description of instruments is given in [1,3].

Results: Phase angle dependences of linear polarization obtained for the presented comets are shown in Fig. 1. The results are compared with the polarization typical for most of the dusty comets (gray solid line) and with unusually high polarization for a very dusty comet C/1995 O1 (Hale–Bopp) (dashed line). The black solid line in the figure shows the polarization produced by the gas component of the coma (molecular emissions due to resonance fluorescence). The polarization of comet Garradd measured in larger areas of coma is in a good agreement with data for most comets, while the degree of polarization of comet Tempel 1 for comparable size of the coma (~11000 km) is much lower. High polarization in small areas of the comet Hartley 2 coma (~1000 km) is in a good agreement with the data [4] showing an increase in the degree of polarization with decreasing size of the observed coma. Clearly, for all the comets, dust scattering dominates the molecular radiation.

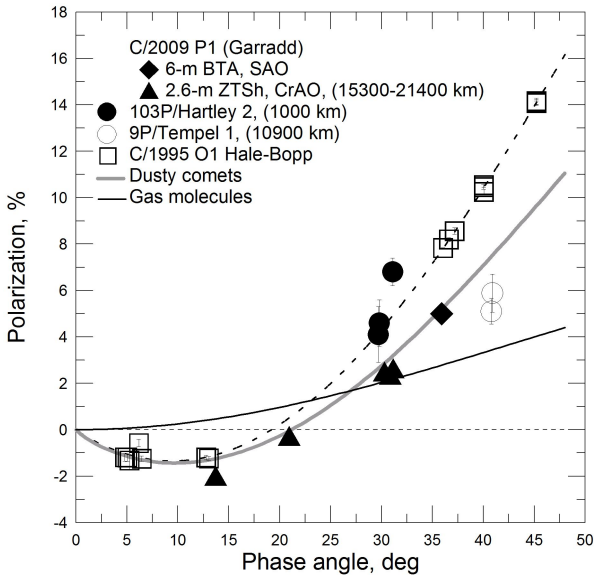

Fig. 1. Comparison of the polarization data for comets 103P/Hartley 2, 9P/Tempel 1, and C/2009 P1 (Garradd) with the phase-angle dependence of polarization for dusty comets (gray solid line) [5], comet Hale–Bopp (dashed line) [6], and the gas molecules (black solid line) [1].

These data as well as new measurements of comet Garradd will be discussed on the ideas presented in [7, 8] to show how the division of comets into two polarimetric classes depends on the distribution of gas and dust in the coma.

References:

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