Report for scientific visit at Armagh Observatory (UK) under support of COST action

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During the visit, together with Dr. Stefano Bagnulo and his graduate student Aaron Stinson, we analyzed the observations of two comets (74P/Smirnova-Chemykh and 152P/Helin-Lawrence) obtained in 2012 with the ESO/VLT telescope, equipped with FORS as focal plane instrument. The goals of the observations were the characterization of the nucleus by polarimetric and photometric observations at different phase angles, and spectroscopic observations in one epoch only. The observations were programmed when the comets were at an heliocentric distance greater than 3AU, i.e. without coma, in order to observe the bare nuclei. Instead the two comets were pretty active and the coma was hiding the nuclei. However the observations were even more interesting because we could characterize and measure the evolution of the solid component of the coma with a series of observations obtained with one of the world top instruments.

At first we obtained the polarimetric and photometric maps for comet 152P in function of the heliocentric distance and the phase angle. Since the comet was close to the its perihelion, the heliocentric distance did not change too much during the observations and, consequently, the variation in dust production was small as well. So, all the changes in the polarimetric & color maps were mainly due to the change in the phase angle and not to the production of dust. We could also measure the evolution of the coma that was slowly expanding, indicating that in the grain size distribution the large grains were dominating. The low Signal to Noise Ratio (SNR) of the polarimetric maps did not allow us to confirm this conclusion.

One very interesting result were obtained from the color map derived from the observations of 152P at almost opposition (phase = 2.86 deg, on 23/5/2012). On the coma photometric center the color was different from the color of the coma. Is this the signature of the nucleus, that had a strong opposition effect in the color? We are still investigating on this phenomena that, to our knowledge, has never been observed before. Also for this effect, the low SNR of the polarimetric maps did not allow us to see if the nucleus had a signature in polarimetry.

An oral presentation (Aaron Stinson, Stefano Bagnulo, Hermann Boehnhardt, Gian Paolo Tozzi, Sonia Fornasier, and Karri Muinonen, Broadband FORS/VLT polarimetry of comet nuclei: 9P/Tempel 1, 19P/Borrelly, 67P/Churyumov-Gerasimenko, 74P/Smirnova-Chernykh, and 152P/Helin-Lawrence) was given by Aaron at the Asteroid, Comets and Meteors meeting held in Helsinki where he gave the preliminary results about those two comets (and other ones). Two papers will be submitted soon.

To conclude the visit at Armagh observatory has been very successful and the contribution of COST Action has been very welcome

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