ASPIN-ISON asteroid program: History, current state, and future prospects

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ASPIN - ISON asteroid program started in Sept. 2003 at Andrushivka observatory (Ukraine) [1]. For these purposes, a Zeiss-600 telescope with small CCD camera was used. In 2009, the telescope was upgraded by a full-format CCD camera and a lens corrector, increasing the FOV to 72'x72'. During the first 7 years, the observatory discovered more than 350 asteroids, inc. 2 NEAs. Unfortunately, at present time, when the rivalry of surveys is growing up, Andrushivka was forced to stop the observations in 2013, due to the bad astroclimate and, as a result, the low magnitude limit. In 2014, we are planning to install a new, wide-field ORI-50M (0.5-m f/2.3) telescope at a new site with good astroclimate conditions. After that, the survey program will resume. The next ISON observatory, which started its own survey, was ISON-NM (Mayhill, NM, USA). The survey work started in July 2010 and continues to this day. The first telescope of this observatory was Centurion-18, 0.45-m f/2.8 with full-frame CCD camera. In Sept. 2013, the telescope was replaced by our new telescope Santel-400AN (0.4-m f/3) with 105'x105' FOV. Both telescopes were controlled remotely from Moscow. At ISON-NM, more than 1,400 asteroids were discovered, including 4 NEOs and 2 comets: the well-known C/2010 X1 (Elenin)[2], P/2011 NO1 (Elenin)[3]. More than 450,000 observations of small bodies were obtained. Except survey work, ISON-NM carries out photometric observations of NEAs: it has obtained dozens of lightcurves, determining the rotation period for more than 20 NEAs, including extremely close and fast rotators, such as 2012 KP24, 2012 KT42, 2012 LZ1, and Duende (2012 DA14) [4]. Since April 2012, another observatory joined ASPIN – ISON-Kislovodsk (Kislovodsk, N. Caucasus, Russia). At the observatory, one (and first) of two Santel-400AN telescopes was installed with a full-frame CCD camera, providing a 105'x105' FOV. At present time, ISON-Kislovodsk is the second of all ASPIN observatories by the number of measurements and discoveries. Within 2 years, the observatory discovered about 100 asteroids, including 1 NEA and the famous comet C/2012 S1 (ISON)[5]. More than 80,000 measurements were obtained. In 2013, ISON started to use a very wide-field telescope VT-73e (0.19-m f/1.5) with FOV 7°x4.5° for chasing comets and bright NEAs. As first result, a new comet C/2013 V3 (Nevski) was discovered [6]. The next step of the ASPIN program was the installation of our largest wide-field telescope Santel-650A (0.65-m f/2) in Sept. 2013 at the ISON-Ussuriysk observatory. With a 50x50 mm CCD chip, the FOV of the telescope is 132'x132'. Test survey observations started in Dec. 2013. During the first two months, more than 10,000 measurements were obtained and 3 new asteroids discovered. All data obtained during the survey observations were processed by our CoLiTec[7] package, in near real-time mode. The main features of the processing pipeline are: tentative correction, astrometric and photometric reduction, detection of moving objects, identification of the detected objects with the MPC database, interactive filtration of the detected objects by the operator via GUI, sending all approved objects to the MPC or directly to the NEOCP, and preparing the sky coverage report. In addition to the survey's telescopes, ASPIN included photometric and, in the near future, follow-up sub-networks. For the photometric tasks, ISON used 0.4–2.6-m telescopes with small and moderate FOVs. Hundreds of lightcurves have been already obtained [8], rotation period has been derived for dozens of NEAs, and 6 binary systems have been discovered. Observations have been carried out in support of the study on the YORP effect. The follow-up sub-network will be using medium-aperture telescopes for the astrometric support of recently discovered NEAs and other unusual objects by the ISON network or objects posted at the NEOCP by other observatories. Four 0.4–0.5-m telescopes, are already installed in Kislovodsk (Russia), Blagoveschensk (Russia), Khureltogot (Mongolia), and Sinaloa (Mexico).

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