First-time comet observations at the National Observatory of Turkey

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Introduction: We performed first-time scientific comet observations from Tübitak National Observatory (TUG), Turkey using two telescopes of that facility. In order to test the capabilities of the instruments, we performed a long comet-monitoring campaign from October 2013 to January 2014. We observed many comets, including but not limited to C/2012 S1 ISON, 154P Brewington, and C/2013 R1 Lovejoy. All comets were monitored for several nights with the Bessel R, V, and B filters from the 1-m (T100) and 1.5-m (RTT150) telescopes. Additionally, we acquired the first spectroscopic observations of a comet from TUG, using the TUG Faint Object Spectrograph (TFOSC with grism between 3230-9120 Å) mounted on RTT150.

With these observations, we could assess the quality of the TUG instruments for cometary science, and identified a few limitations. We propose some technical improvements for future comet observations. These will open new observational opportunities for Turkish astronomers and a participation in international campaigns on cometary science.

Observations and simulations: Apart from testing the instruments, our observations were also driven by the scientific questions regarding comet ISON around its perihelion passage. We intended to follow the formation and evolution of dust coma structures, and use well-tested models to simulate and understand this activity (Vincent et al. 2010, 2013, Lin et al. 2012). Additionally, we wanted to acquire spectra and derive the composition of the tail before and after perihelion. Unfortunately, the comet was not very active before perihelion and completely disintegrated at the end of November 2013. Nonetheless, we had acquired many images in the previous weeks, and we used the remaining nights to monitor other comets, mainly C/2013 R1 Lovejoy.

Since the observatory is not equipped with the comet gas filters, we concentrated on dust structures and monitored comet ISON during October 2013 in Bessel R, B, and V filters. The cometary activity structures are investigated and simulations of dust tail are performed. On December 2013, we performed the first comet spectroscopy, targeting comet 154P and, additionally, observed comet C/2013 R1 in the Bessell R, B, and V filters.

Results: Some additional gas filters for comet observations would be very useful for further observations. Fortunately, the budget for them is approved for 2014, and they are in the selection process. This will significantly improve future comet observations at TUG.

T100: Imaging of fast-moving bright comets (like ISON) can be achieved by using short exposure times on the remotely operable T100 telescope, but non-sidereal tracking has to be improved for the observation of fast-moving small bodies of the solar system. Studies on the improvement of T100's tracking have already started at TUG.

RTT150: Non-sidereal tracking is excellent and allowed us to take spectra of comet 154P.

For future, we have established collaboration with the Rosetta mission and will monitor comet 67P/Churyumov-Gerasimenko starting from spring 2015. We are also ready for Gaia follow-up observations of solar-system objects with RTT150 (max. 5 nights/yr), T100 (max. 80 h/yr), and T60 (10–15 % of the total observing time).

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