METEOR: Space-based meteor observation project

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METEOR is two-year meteor observation project onboard the International Space Station (ISS) [1], conducting photometric observation for the first year and spectroscopic observation for the second year. ISS provides us an ideal platform for continuous meteor observation without weather disturbances. The flux data collected allow better comparison of physical and chemical data among major meteor showers and their parent bodies. After two launch failures in October 2014 and June 2015, the METEOR instrument was delivered to the ISS in March 26, 2016. Once the METEOR camera was installed in front of the window facing toward the Earth in the Window Observation Research Facility rack in the US Nation-al Laboratory module, the nominal operation started on July 7, 2016. Since planned photometric and spectroscopic observation was not complete in the nominal two-year period due to variable constraints, such as the Moon condition, the beta angle of the ISS, and hardware failures, the extra observation was conducted for another half year. All the observation was complete on March 5, 2019 and the METEOR instrument was de-installed on March 31, 2019.

METEOR consists of a high sensitive, high definition TV (HDTV) color camera equipped with a wide-angle, extremely bright lens (F0.95, f=10.5mm, diagonal FOV=57.8 deg) [2]. Observation is done in visible wavelength, as the METEOR camera has an IR cut filer, allowing visible light only, up to 700 nm. A transmitted blazed diffraction grating (300 grooves/mm) is used for spectroscopic observation. It is manually in-stalled by ISS crew in front of the lens. Target atomic emission lines are Fe I (370 nm), Ca I (393 nm), Mg I (518 nm), Na I (589 nm), which are key elements of dominant silicate minerals, such as olivine, pyroxene and plagioclase in meteorites and interplanetary dust. A software to detect meteors in the recorded video data and extract the portion including meteors was developed with deep learning algorithms, in collaboration with the Software Technology and Artificial Intelligence Research Laboratory of Chiba Institute of Technology. Initial results were presented [2, 3] and further data analyses are currently underway. Some of the captured meteor images are available at the METEOR project website: http://www.perc.it-chiba.ac.jp/project/meteor/.

References:

[1] Arai T. et al. (2014) LPSC 45th, abstract #1610
[2] Arai T. et al. (2017) LPSC 48th, abstract #3034
[3] Arai T. et al. (2018) LPSC 49th, abstract #2525.