

An overview of the MTG-IRS Level-2 Products

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ABSTRACT

The Meteosat Third Generation (MTG) program is a cooperation between EUMETSAT and the European Space Agency (ESA). ESA develops and procures 4 satellites for the imaging applications (MTG-I) and 2 for the sounding applications (MTG-S), on behalf of EUMETSAT. Over the course of the next 20 years, the six satellites in the MTG satellite fleet will improve imaging and infrared sounding capabilities for meteorological and climate applications, benefiting both worldwide users and European national meteorological services. EUMETSAT develops and operates the ground segment used to control the satellites, acquires and processes the data, and delivers the products to users worldwide.

The hyperspectral Infrared Sounder IRS, deployed on MTG-S, is primarily designed to support numerical weather predictions at regional and global scales, including nowcasting. MTG-IRS will offer unparalleled data on atmospheric thermodynamic parameters with a high vertical resolution and horizontal sampling of 4 km at Nadir and temporal sampling of 30 minutes over Europe. It will provide 4-D hyper-spectral soundings of, inter alia, temperature, water vapour, ozone vertical profiles and trace gases to support atmospheric composition and air quality monitoring, within two spectral bands, 680-1210 and 1600-2250 cm⁻¹, with a spectral sampling of ~0.625 cm⁻¹ (as of today, subject to change). The IRS L2 products are not limited to vertical profiles, as they also will provide 1D geophysical parameters, such as, amongst others, surface temperature, 2-m temperature, cloud characterization and surface emissivity retrievals. Compared to sounding missions on Polar orbiters, temperature, humidity, and ozone profiles may be obtained significantly more often and spatially resolved. As a result, they can be employed as air-mass tracers to frequently extract 3D atmospheric motion vectors. Consequently, these constitute crucial inputs for numerical weather prediction models at the regional and global levels. It is foreseen to supplement the products at a later stage with the Atmospheric Motion Vectors derived from the temperature, moisture, and ozone vertical profiles.

This unprecedented system offers a significant advance in operational observation and will be a great asset to regional short-range weather forecasting and nowcasting, for the purpose of more accurately and quickly identifying areas of potential instability and associated weather phenomena like vertical motion, convection, precipitation, and severe storms. Identifying areas with potential atmospheric instabilities is hence critical to issue accurate warnings, as early as possible, to prepare population, economic actors, and civil protection. In this regard, the level 2 products will provide instability indices, aiming at ensuring continuity with other GII products, e.g. MSG and consistency with the MTG-FCI follow-up products. The list of the instability indices is completed with a few more indices collected in the literature and from initial interactions with forecasters.

We present here an overview of the L2 products datasets, illustrated with retrievals based on synthetic but realistic IRS cloudy-sky observations on June 24, 2021, when severe weather events occurred in southern Czech Republic.