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## TROPOMI UV radiation product and recent applications

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Solar ultraviolet (UV) radiation has a broad range of effects concerning life on Earth. Because of its high photon energy, UV radiation influences human health, terrestrial and aquatic ecosystems, air quality, and materials in various ways. The Sentinel 5 Precursor (S5P) mission on a sun-synchronous orbit with an ascending node equatorial crossing at 13:30, which in conjunction with a wide swath of 2600 km provides near-global daily coverage. S5P's TROPOMI instrument measures radiation backscattered from the Earth-atmosphere system and provides observations of atmospheric composition with the best spatial resolution presently. Among other things, TROPOMI measurements are used for calculating the UV radiation reaching the Earth's surface over the sunlit part of the globe.

This UV-radiation product is processed at the Finnish Meteorological Institute Copernicus Collaborative Ground segment. The product was released via FinHUB in summer 2020. The TROPOMI L2 UV product contains 36 UV parameters in total, including irradiances at four different wavelengths and dose rates for erythemal and vitamin D synthesis action spectra. All parameters are calculated for overpass time, for solar noon time, and for theoretical clear-sky conditions with no clouds or aerosols. Daily doses and accumulated irradiances are also calculated by integrating over the sunlit part of the day. In addition to UV parameters, quality flags related to the UV product and processing are generated. Validation with ground based instruments have shown that the agreement is very good, typically within 10%.

The S5P is the first Copernicus mission dedicated to atmospheric observations, and it will be complemented by Sentinel 4 with geostationary orbit and Sentinel 5 on Sun-synchronous morning orbit with planned launches in the coming years. It is expected that surface UV-radiation products from these instruments will continue the present time series.

The TROPOMI surface UV radiation product responds to the increasing need for information regarding the tropospheric chemistry and biologically active wavelengths of the solar spectrum reaching the surface. In this presentation we introduce the TROPOMI UV radiation product and

future developments, discuss about the quality of the product and demonstrate the usefulness of the satellite UV-data by showing recent applications including among others the exceptionally high UV-radiation conditions in mid latitudes due to persistent Antarctic ozone hole in December 2020 and modeling of seasonal cycle of COVID-19. By combining the TROPOMI UV data with observations of trace gases from the same instrument, there is also a potential for new kind of applications, where satellite data can be used in novel ways to study photochemical processes in the troposphere.