

A new Earth system science resource: A globally gridded GEO-Ring radiance product and its application

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Sustained observation and data provision capabilities are crucial for monitoring weather and climate. EUMETSAT, NOAA, and JMA are collaborating on developing a GEO-Ring radiance data record which is a significantly improved baseline compared to the heritage ISCCP and GridSat data sets used for decades. The aim is to provide to users the best possible and longest (1978 - today) GEO-Ring radiance climatology for all available spectral channels with 30 min temporal sampling around Earth. The result of this effort will be a 40+ year record that can be used for global and regional applications (solar energy, precipitation and drought, global and regional reanalyses, weather prediction with machine learning, extreme weather analysis, etc.) and will also contribute to the generation of GCOS Essential Climate Variables (ECV).

The new data record will contain many rescued satellite data adding additional value to this radiance record. This is 10 years of data from SMS-1/2 and GOES 1-7 data enable 30min sampling for the early years over the Americas. Later GOES satellites had differing scanning strategy delivering only a full disc scan every 3 hours, for those satellites the existing partial scans are stitched together to enable the 30 min sampling throughout the record. In addition, there is also a possibility of filling up the data gap over the Indian Ocean prior to 1998 due to a recently started collaboration with India Meteorological Department who is the custodian of data from INSAT, the Indian geostationary satellites.

Consistent quality control and recalibration have been applied to all geostationary measurements that contain a significant number of radiometric anomalies. Automated algorithms have been developed to detect and flag the anomalies and to include the information in the data files so that users are able to exclude them from their applications. This strongly enhances the usability of images, e.g., in eclipse situations where only small parts of an image are affected but the whole image was so far discarded from downstream processing into ECVs. Recalibration using reference measurements has considerably reduced radiometric biases of these measurements up to 3 K for the early satellites and significantly improved the temporal stability of the time series.

The workflow generates a Fundamental Climate Data Records of individual satellite series operated at the same orbit position. From this gridded data records will be created per orbit position with a nominal resolution of 30 min and 5 km. The individual satellite series will also be combined into a quasi-global gridded product that should simplify the usage of it. Several post-processing such as limb correction needed for storm tracking and precipitation will either be incorporated into the data or provided by tooling. A test data was released to the community during the first half of 2026 covering 2019 - 2024 (<https://vuser.eumetsat.int/resources/user-guides/geo-ring-test-data>) to gather feedback on its usage and a feedback workshop is planned on 23-25 June 2026. The data processing and distribution will be done using state-of-the-art cloud computing technology at EUMETSAT and NOAA.