Global Study of Cloud properties using Sentinel Satellite Data

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Abstract:

The main objective of the project is to consolidate and further develop cloud parameter retrieval algorithms (SACURA for MERIS, AATSR, SCIAMACHY) to determine climate-relevant cloud parameters such as cloud top height, cloud optical thickness, cloud effective radius of water droplets and ice crystals, cloud albedo, ice content, liquid water content, and cloud cover. The development is done under the umbrella of a Universal Cloud Retrieval Algorithm (UCRA), which can be applied to the appropriate Sentinel missions as well as to a synergetic combination of them. The algorithm shall be tested, applied and validated especially for the use with Sentinel-2 und 3. UCRA will enable the creation of consistent cross-platform long-term datasets of cloud properties relevant for climate studies (20-30 year, from ATSR onward). To this end, the following steps have been carried out: 1) Extension of the SACURA algorithm by a module capable to retrieve parameters also for optically thin (semi-transparent) clouds; 2) Establishment and implementation of techniques to retrieve vertical profiles of cloud droplet sizes using multispectral measurements; 3) Improvement of the algorithms to retrieve cloud parameters in ice clouds; 4) Development of a method to retrieve cloud parameters for clouds "contaminated" by aerosols. An application to data of Sentinel-5P and Sentinel-4 is planned as soon as the data are available.

Potential for application:

The developed methods shall serve for the generation of long-term datasets of climate relevant cloud parameters for previous missions (ATSR, MERIS, AATSR-2) and future satellite sensors (S2, S3, etc.) and should be applicable to sensors of the next generation of

GLOS

Duration: 01.07.2012 – 31.03.2016

EO Data Source: Sentinel-2, Sentinel-3

Support Program: Sentinel Satellite Utilization Preparation

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Publications

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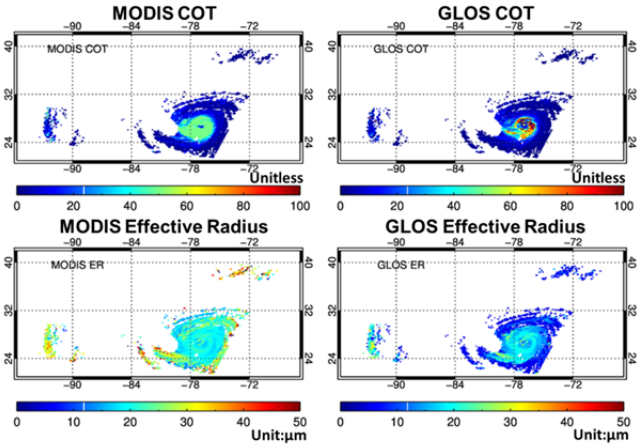
weather monitoring satellites such as METOP second and third generation.

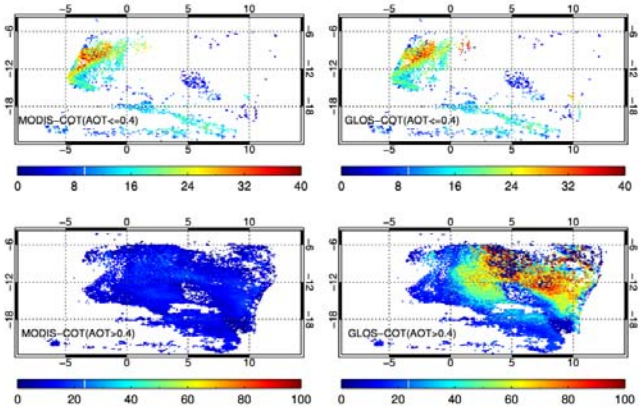
The analysis of these datasets will deliver results for the improved understanding of the role of clouds in the climate system and in the hydrological cycle. Furthermore, they are foreseen to improve the accuracy of trace gas retrievals as well as the reliability of numerical weather predictions. Additionally, the developed algorithms (or relevant parts of them) are intended to be implemented in operational processing schemes and deliver near-real time retrievals that will be stored as data products and shall be made publicly available.

Further results:

The so far derived parameters can be made available by the authors. The licensing of the data is not conclusively decided but will be based on a creative commons license (or similar).



Determination of the Cloud Optical Thickness (COT) and effective radius of ice clouds using a weighting function method compared to an established product (MOD06) (© IUP, Uni-Bremen)



Comparison of the COT between MODIS standard product and a different weighting function method, able to retrieve cloud properties in presence of aerosol particles, described by their Optical Thickness (AOT) (© IUP, Uni-Bremen)