GRAS SAF AND RADIO OCCULTATION DATA

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The GRAS SAF is part of EUMETSATs network of Satellite Application Facilities (SAFs) under the EUMETSAT Polar System (EPS). The objective of the GRAS SAF is to deliver operational radio occultation products from the GRAS instruments onboard the three MetOp satellites, of which the first was launched in 2006. The second MetOp satellite is scheduled for launch in 2012 and the third in 2016. Another objective of the GRAS SAF is to deliver the Radio Occultation Processing Package (ROPP) that contains modules for processing and assimilating radio occultation data. The Leading Entity of the GRAS SAF is the Danish Meteorological Institute (DMI) and this is also the physical location of the operational GRAS SAF Processing and Archiving Center. The other project partners are ECMWF (European Center for Medium-range Weather Forecasts, Reading, UK), IEEC (Institute dEstudis Espacials de Catalunya, Barcelona, Spain), and Met Office (Exeter, UK).

Radio occultation products are vertical profiles of meteorological variables like refractivity, temperature, humidity and pressure. The GRAS SAF currently receives level 1 radio occultation phase and bending angle data processed by EUMETSAT. These data are further processed to vertical profiles of refractivity (level 2a) using state-of-the art inversion algorithms. The level 1b and level 2a products are formatted as BUFR files and disseminated over the Global Telecommunication System network to NWP users worldwide within 1:41 hours (average value), 1:48 hours (90% of the profiles), and close to 100% of the profiles within the Near Real-time (NRT) timeliness of 3 hours from observation time.

Currently the data received from EUMETSAT are based on so-called phase-locked loop tracking. Preliminary open loop tracking (also known as raw sampling mode) data are now also available. Such data allows for improved bending angles and refractivity profiles that extend deeper into the lower parts of the troposphere in the tropics. In order to further process the data into vertical profiles of temperature, humidity, and pressure an approach based on a one-dimensional variational (1Dvar) retrieval algorithm is used. The 1Dvar approach needs as input error-covariance matrices for the observations and a background model. As background, profiles extracted from global ECMWF short-range forecasts fields are used.

An important feature of radio occultation data is that they are calibration free. Thus, radio occultation data are also well suited for climate investigations and monitoring, and the GRAS SAF will provide improved offline products and dedicated climate products to the research user community. We are investigating how to best exploit the GRAS data, both for construction of an accurate single-source climate database with known error characteristics of the data, and for provision of global climate monitoring. Climate data are provided in the form of global grids of bending angle, refractivity, temperature, humidity, and geopotential heights.