

Overview and Status of the GRAS SAF Project

Abstract

Georg Bergeton Larsen, project manager
Frans Rubek, project scientist

Danish Meteorological Institute (DMI)
Lyngbyvej 100, DK-2100 Copenhagen

The EUMETSAT network of Satellite Application Facilities (SAFs) will, together with the EUMETSAT central facilities, constitute the future EUMETSAT Application Ground Segments (AGS) for the MSG and EPS/Metop satellites. SAFs are located in national meteorological offices or other approved institutes of EUMETSAT member states. The scope of the SAF activities will be to deliver products and/or software to derive these products, at the level of geophysical parameters, based primarily on the satellite data.

The Global Navigation Satellite System (GNSS) Receiver for Atmospheric Sounding (GRAS) Meteorology SAF (hereafter the GRAS SAF) will receive raw and preprocessed GPS radio occultation data from the GRAS instrument onboard the EPS/Metop satellite, process these into vertical profiles of refractivity, temperature, pressure, and humidity, vs. height, and distribute these products continuously to numerical weather prediction and climate monitoring users. The GRAS SAF products promise globally distributed high vertical resolution data on a 24 hour-basis, forming a considerable improvement on today's measurement methods when regarding coverage, vertical resolution, frequency, and cost.

A second objective of the GRAS SAF is to supply software for 4DVAR-assimilation of radio occultation data into numerical weather prediction models.

The basic principle in the GRAS SAF project is the radio occultation method, where a receiver onboard a low-flying satellite tracks GNSS signals as the transmitting satellite sets or rises behind the Earth (occultation). Due to refraction in the ionosphere and the neutral atmosphere the signal is delayed and its path bent, enabling calculation of the refractivity (and hereby temperature, pressure and humidity) at the point of closest approach. A typical occultation consists of a few minutes of data, yielding a vertical profile of atmospheric products 80 km high. The accuracy requirements of the products vary with height, with temperature RMS between 0.5 and 5 K, pressure RMS between 0.5 and 2 hPa, specific humidity RMS between 0.025 and 1 g/kg, and refractivity RMS between 0.1 and 2 %, and with a vertical resolution of 0.3 – 3 km.

The main users of the GRAS SAF products will be meteorologists doing data assimilation (Near-Real Time Products, delivered less than three hours after measurement) and users from the climate research and atmospheric science communities (improved Offline Products, delivered less than 30 days after measurement) needing comprehensive, globally distributed temperature, pressure, and humidity information.

The GRAS SAF will have close co-operation with especially the Climate Monitoring SAF and the NWP SAF. During the development phase use of data from ongoing satellite missions is expected.

The GRAS SAF has members at DMI (Denmark), IEEC (Spain), and Met Office (UK). The host institute is DMI.