

GBGP

The EUMETSAT
Network of
Satellite
Application
Facilities



ROM SAF

Radio Occultation Meteorology

ROM SAF CDOP-2

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Danish Meteorological Institute (DMI)
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ROM SAF

The Radio Occultation Meteorology Satellite Application Facility (ROM SAF) is a decentralised processing centre under EUMETSAT which is responsible for operational processing of GRAS radio occultation data from the Metop satellites and radio occultation (RO) data from other missions. The ROM SAF delivers bending angle, refractivity, temperature, pressure, and humidity profiles in near-real time and off-line for NWP and climate users. The off-line profiles are further processed into climate products consisting of gridded monthly zonal means of bending angle, refractivity, temperature, humidity, and geopotential heights together with error descriptions.

The ROM SAF also maintains the Radio Occultation Processing Package (ROPP) which contains software modules that will aid users wishing to process, quality-control and assimilate radio occultation data from any radio occultation mission into NWP and other models, and the Ground-Based GNSS Package (GBGP) which provides format conversion with quality-checking for processed ground-based GNSS data prior to dissemination to, and use by, NWP centres.

The ROM SAF Leading Entity is the Danish Meteorological Institute (DMI), with Cooperating Entities: i) European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading, United Kingdom, ii) Institut D'Estudis Espacials de Catalunya (IEEC) in Barcelona, Spain, and iii) Met Office in Exeter, United Kingdom. To get access to our products or to read more about the ROM SAF please go to: <http://www.romsaf.org>

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Executive Summary

This document summarizes the significant differences between the first formal release of the Ground-Based GNSS Package (GBGP) Version 1.0 and the previous (prototype) release, Version 1.0-proto.

1. Introduction

1.1 Purpose of the document

This document summarizes the significant differences between the first formal release of the Ground-Based GNSS Package (GBGP) Version 1.0 and the previous (prototype) release, Version 1.0-proto.

For guidance on downloading and installing the GBGP software, and the available documentation, please refer to the GBGP Release Notes [RD.1]. All comments on the GBGP software should, in the first instance, be reported via the ROM SAF Helpdesk at <http://www.romsaf.org>.

1.2 Reference documents

The following documents provide supplementary or background information, and could be helpful in conjunction with this document:

- [RD.1] GBGP-1 (v1.0) Release Notes
Ref: SAF/ROM/METO/SRN/GBGP/001 – Version 1.0
- [RD.2] GBGP User Guide
Ref: SAF/ROM/METO/UG/GBGP/001
- [RD.3] 'COST-format' file specification for ground-based GNSS delay and water vapour data
Ref: E-GVAP/METO/FMT/COST/001
- [RD.4] WMO FM94 (BUFR) specification for ground-based GNSS delay and water vapour data
Ref: E-GVAP/METO/FMT/BUFR/001
- [RD.5] NetCDF (Unidata) website
URL: <http://www.unidata.ucar.edu/software/netcdf/>
- [RD.6] NOAA/Earth Systems Research Laboratory GPSNet website
URL: <http://gpsmet.noaa.gov/>
- [RD.7] UCAR/COSMIC Programme Office SuomiNet/CONUS website
<http://www.suominet.ucar.edu/>

1.3 Acronyms and abbreviations

API	Application Programming Interface
BUFR	Binary Universal Form for the Representation of data (also: FM94) (WMO)
CDOP-2	Second Continuous Development and Operations Phase (EUMETSAT)
CSV	Comma-Separated Value
DMI	Danish Meteorological Institute; ROM SAF Leading Entity
ECMWF	The European Centre for Medium-range Weather Forecasts

EUMETSAT	EUropean organisation for the exploitation of METeorological SATellites
GB-GNSS	Ground-Based GNSS
GBGP	Ground-Based GNSS Package
GCC	GNU Compiler Collection (not to be confused with gcc , the GCC C-compiler)
GNU	GNU's Not Unix
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTS	Global Telecommunications System (WMO)
HDF5	Hierarchical Data Format version 5
IWV	Integrated Water Vapour
Met Office	Meteorological Office of the United Kingdom
MetDB	Meteorological DataBase (Met Office)
netCDF	Network Common Data Format
NRT	Near Real Time
OS	Operating System
POSIX	Portable Operating System Interface
RHEL	Red Hat Enterprise Linux
RO	Radio Occultation (also: GPS-RO, GNSS-RO)
ROM SAF	Radio Occultation Meteorology SAF (formerly GRAS SAF)
ROPP	Radio Occultation Processing Package
SAF	Satellite Application Facility (EUMETSAT)
UCAR	University Center for Atmospheric Research (Boulder, CO, USA)
WMO	World Meteorological Organisation
ZHD	Zenith Hydrostatic Delay
ZTD	Zenith Total Delay
ZWD	Zenith Wet Delay

1.4 Definitions

GB-GNSS data products under the the E-GVAP project and other data suppliers (such as NOAA and UCAR) of NRT or offline products:

Data levels:

- Level 0:* Raw phase tracking and ancillary data, and other GNSS data before clock correction and reconstruction;
- Level 1a:* Reconstructed full resolution excess phase, SNR, amplitude, orbit information
- Level 1b:* Zenith total delay, timestamped and annotated with GNSS station location, metadata and quality information;
- Level 2:* Zenith wet delay, integrated water vapour, ancillary meteorological data
- Level 3:* Gridded Level 1 and 2 offline products in the form of, e.g., hourly time series, daily or longer means, metadata, and quality information.

Product types:

- NRT product: data product delivered less than 1.5 hours after measurement;
- Offline product: data product delivered greater than 1 day after measurement;
- Reprocessed product: data product processed consistently over a long dataset.

File format Types:

- COST-format:* Text-based format defined by E-GVAP and used for general exchange of GB-GNSS Level 1/2 data. This format is defined in [RD.3];
- BUFR:* WMO binary format for dissemination of NRT observational data on the GTS. For GB-GNSS details, see [RD.4];
- netCDF:* Unidata binary format for general data storage and exchange. [RD.5]. For GB-GNSS data and documentation on this format, see [RD.6] and [RD.7];
- CVS:* A simple text-line-based flat-format. For GB-GNSS data and documentation on this format, see [RD.6].

Note that the ROM SAF does not itself process or provide any GB-GNSS data products; it only maintains the GBGP software to assist in disseminating and using this data type.

2. List of changes

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