

## The ROMSAF GBGP Software Package

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- The vast majority of the work on the GBGP package was carried out by Dave Offiler
- This is the package currently used at the Met Office for the conversion of COST files to BUFR for dissemination on the GTS.
- It was heavily based on the Met Office's GWVBUFR package originally developed for E-GVAP, but now has the build system, testing, formal release procedures and user support.

- Ground Based GNSS Package (GBGP) is a software package available to download through the ROMSAF website [www.romsaf.org](http://www.romsaf.org)
- The main purpose of GBGP is to produce WMO-standard BUFR formatted files for dissemination to NWP users over the GTS locally or globally.
- It converts E-GVAP COST-format files to BUFR
- It also contains functions to convert from other data formats such as netCDF to the E-GVAP COST-format.
- Quality control checks can also be done through an SQL database.

- The current release is a prototype release
- Plan is to take it through the Delivery Readiness Inspection (DRI) process Q2 of 2018 to be formally released.
- The prototype can be obtained from the ROMSAF website, registration to login is required.



The screenshot shows the EUMETSAT ROM SAF website. The header includes the EUMETSAT logo, the text "ROM SAF RADIO OCCULTATION METEOROLOGY", and a satellite image. Navigation links are provided for "About", "Documentation", "Data & Software", "User Service", and "Resources". The "About" section lists links like Home, ROM SAF Project, News Archive, Contact, and Abbreviations. The "Documentation" section lists Publications, ROM SAF Reports, Visiting Scientist, and User Workshops. The "Data & Software" section lists Product Archive, Product Overview, Product Quality, Browse Occultations, NRT Monitoring, Climate Monitoring, and Software. The "User Service" section lists Helpdesk, Helpdesk History, RSS Feeds, Registration, and Login. The "Resources" section lists Links, Search, and Sitemap. The main content area features a table of software deliverables with columns for Level 1B, Level 2A, Level 2B, 2C, Level 3, Reprocessed data sets, Reanalysis, TPH, PBLH, Software, and Error covariance. The "GBGP" row is highlighted in green. Below the table, the "GBGP" section is titled "GRM-92: GBGP Software Deliverable". It describes the Ground-Based GNSS Package (GBGP) as a collection of software (provided as source code in Fortran-95), supporting build scripts, data files and documentation. Its principal purpose is to encode E-GVAP 'COST-format' files to WMO-standard BUFR format for dissemination to NWP users locally or globally via the GTS. The package also contains several pre-conversion tools to convert other formats, such as netCDF and CSV, to COST-format prior to BUFR encoding. Support for quality control against an SQL database of GNSS station meta-data is also included. Users wishing to obtain the GBGP code will need to first register via the registration page and agree to the terms and conditions of the software licence. There is no charge for the package. Registered users should login and access the GBGP package from the download page. As well as using the GBGP application tools, users may wish to integrate a subset of GBGP code into their own software applications, individually linking subroutines, modules or the GBGP object library, for instance to create their own\_format-to-COST pre-converter, or to use the provided GBGP COST-format API to analyse E-GVAP data in bulk. The STATUS is Development. The current product version is GBGP-1.0.0-prototype. The GBGP documents section lists links to GBGP Software Licence, GBGP Release Notes, GBGP Software Changes, GBGP User Guide, COST-format File Specification for GB-GNSS data, and BUFR Template Specification for GB-GNSS data. The footer includes links for previous page, go to top, and Print, along with EUMETSAT disclaimer, EUMETSAT logo, DMI logo, IECC logo, Met Office logo, and EUMETSAT ROM SAF logo.

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Level 1B	Level 2A	Level 2B, 2C	Level 3	Reprocessed data sets
Reanalysis	TPH	PBLH	Software	Error covariance
GRM-16 ROPP		GRM-92 GBGP		
GBGP		GBGP Download		

### GRM-92: GBGP Software Deliverable

The **Ground-Based GNSS Package (GBGP)** is a collection of software (provided as source code in Fortran-95), supporting build scripts, data files and documentation. Its principal purpose is to encode E-GVAP 'COST-format' files to WMO-standard BUFR format for dissemination to NWP users locally or globally via the GTS. The package also contains several pre-conversion tools to convert other formats, such as netCDF and CSV, to COST-format prior to BUFR encoding. Support for quality control against an SQL database of GNSS station meta-data is also included.

Users wishing to obtain the GBGP code will need to first register via the [registration page](#) and agree to the terms and conditions of the software licence. There is no charge for the package. Registered users should [login](#) and access the GBGP package from the [download page](#).

As well as using the GBGP application tools, users may wish to integrate a subset of GBGP code into their own software applications, individually linking subroutines, modules or the GBGP object library, for instance to create their own\_format-to-COST pre-converter, or to use the provided GBGP COST-format API to analyse E-GVAP data in bulk.

**STATUS:**  
**Development**

Current product version: GBGP-1.0.0-prototype

#### GBGP documents

Before downloading the package it is recommended that users refer to the GBGP Release Notes. The GBGP User Guide document provides further information on each of the software modules.

- [GBGP Software Licence](#)
- [GBGP Release Notes](#)
- [GBGP Software Changes](#)
- [GBGP User Guide](#)
- [COST-format File Specification for GB-GNSS data](#)
- [BUFR Template Specification for GB-GNSS data](#)

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# What's in the package?

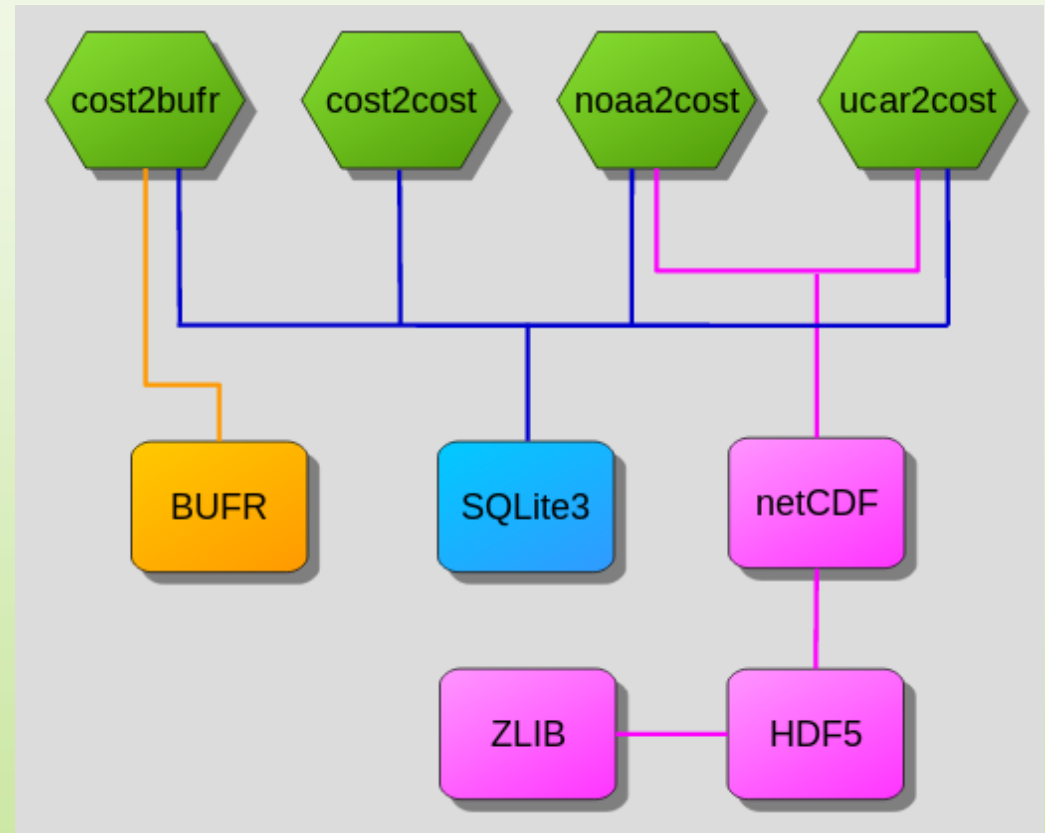
# GBGP

- GBGP has been designed to be highly modular, so independent components of it can be utilised in a users own code.
- Supplied in a single module (tarball)
- Software
- Build scripts
- Data files
- Documentation

# What's in the package?

# GBGP

- There are four core command line tools as part of GBGP
- There are dependencies that need to be installed to enable the use of these tools
- The build scripts for these 3<sup>rd</sup> party dependencies are included within GBGP but the actual packages can be downloaded from the ROMSAF page



- GBGP has been designed to be portable so that it can be compiled and run on a range of compilers and platforms
- The source code for GBGP is in Fortran-95
- It is recommended that the dependency packages are compiled using the same compiler as that planned for GBGP.
- Compilers it has been tested with include
  - ▶ Ifort(13,15,16)
  - ▶ Pgf15
  - ▶ Sunf95
  - ▶ Nagfor60
  - ▶ gfortran

- The core command line tool of the package.
- Converts E-GVAP COST-format files to WMO BUFR with abbreviated routing headers so they can be transmitted on the GTS as bulletins
- The inputted COST file is quality controlled to ensure the values are valid and in the correct range of expected values
- The optional use of the SQL database checks for duplicate station ids



- A command line tool that can be used in a number of ways
- A converter – Converts from any COST file version (V1, V2.x) to the current V2.2.
- A format checker – Check that the inputted COST file has the correct formatting for V2.2. For example it could pick up on incorrect column widths
- Quality Control – Performs some basic quality control on the data in the COST file (e.g. range checking). Station data not meeting QC is rejected and not written to the new file
- A filename checker – Can produce a filename based on the contents

- Command line tools for converting to E-GVAP COST format
- NOAA2COST can convert either NOAA netCDF files or NOAA CSV files to COST files
- UCAR2COST can convert UCAR netCDF files to COST files
- These can then be converted to BUFR via the COST2BUFR tool.
- The NOAA CSV and UCAR netCDF have limited meta data and so the COST file may have some values set to fill values or missing completely

- An SQL database is kept and updated which can be used by the tools for the quality control of the inputted data.
- A master copy of this SQL database is uploaded to the E-GVAP hub server several times a day.
- Useful for checking the metadata of the inputted file matches with what is expected.
  - ▶ Detects duplicate station ids
  - ▶ Changes in station heights or locations

- Consolidation of Met Office developed GWV and GWVBUFR portable (E-GVAP) software as a basis for GBGP; port relevant code; refactoring; re-brand as ROM SAF (apart from PES); develop autotools build system based on ROPP templates to replace bespoke scripts & static makefiles; basic portability testing. First demo package built end-March
- Demo GBGP adopted as a stand-alone dependency in Met Office internal GB-GNSS processing of E-GVAP data to BUFR and GTS dissemination in April in a live (pseudo-operational) environment
- ROM SAF website prepared to host GBGP alongside ROPP (Santi)
- Prototype status version (GBGP v1.0-proto) was released to users via the ROM SAF website on 8 August, including the usual User Documents set
- Minor items resulting from internal and external feedback included in a Beta version; Beta User and Project documents generated. External Beta testers identified
- Beta package uploaded to ROM SAF website 2 November; testers invited to start work (ongoing; reports due this week)
- Development of a completely new Test Folder system is in progress

- No plan deviations are foreseen Cf CDOP-3 Proposal
- No scientific developments are planned during CDOP-3
- Continuing maintenance, minor technical developments such as implementing additional BUFR codes for new processing centres or GNSS satellites; evolving or new data exchange file formats; potential for additional pre-converter tools to assist new 'native' formats generated by new geodetic processing centres to encourage provision of their data in COST-format and BUFR for GTS dissemination.
- Evolution of Test Folder suite to cover new tools, etc.
- No major releases (GBGP-2) are currently planned, but point releases (e.g GBGP-1.x) are included as needed by Users (including internal Met Office operations)
- Continuing User Support via ROM SAF Helpdesk, GBGP User Documentation, all to the same level as ROPP