



PRODUCT DATA SHEET

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Earth Rotation Parameter Data (ERP file)

Summary

Geoscience Australia's (GA) Ginan Analysis Centre Software (ACS) calculates the rotation parameters of the Earth in the process of producing precise GNSS satellite orbit and clock data. These products are produced using GNSS receiver measurements from GA's continuously operating reference station (CORS) network covering Australia, New Zealand and the South Pacific and a network of international stations.

These Earth rotation parameters (ERP) are available from GA in the IGS ERP file format [1].

Data in the ERP file can be used to determine the precise rotation of the Earth about its axis and includes Polar Motion coordinates, the length of day offset, rates of motion of the coordinates, and the variances on all these parameters [1]. These can be used to understand the precession of the Earth's rotational axis.

Access

Geoscience Australia offers Earth orientation parameters in the ERP file format [1].

Users can freely access these files at <https://data.gnss.ga.gov.au/docs/home/index.html> with documentation on how to obtain them at

<https://geoscienceaustralia.github.io/ginan/resources/GinanProductsStreamsAccess20220422.pdf>

Methods include sftp and AWS s3.

Technical details

Geoscience Australia ERP Earth Rotation Parameters Products	
Versions	Rapid and Ultra-Rapid
Products Released	One Rapid Product daily Four Ultra-Rapid Products daily
Release Times	Rapid: 1700 UTC Ultra-Rapid: 0300, 0900, 1500, 2100 UTC
Constellations Used	GPS (in future Galileo, GLONASS, BeiDou, QZSS)
Data Source	RINEX format Phase and Pseudorange observations from a globally distributed network of GNSS receivers sourced from Geoscience Australia's (GA) CORS stations and others from the International GNSS Service (IGS) network [4].

	Input Earth orientation data from the International Earth Rotation and Reference Systems service's (IERS) daily final values [5].
Filenames	<p>The ERP products follow the IGS Long Product Filename convention, detailed in this document:</p> <p>http://acc.igs.org/repro3/Long_Product_Filenames_v1.0.pdf</p> <p>An example of a filename is given below:</p> <p><u>GAG0EXPULT_20232050000_01D_01M_ERP.ERP</u></p> <p>Use the table below for a break-down of this filename:</p>

GAG0EXPULT_20232050000_01D_01M_ERP.ERP		
Code	Meaning	Value
GAG	Analysis Centre	Geoscience Australia Ginan
0	Version Number	Version 0
EXP	Campaign Type	Experimental (OPS: Operational)
ULT	Solution Type	Ultra-Rapid (RAP: Rapid, FIN: Final)
20222050000	Datetime of Initial Epoch YYYYDOYHHmm	Year: 2023, Day-of-year: 205, Time: 0000 UTC
01D	Length from Initial Epoch in File D-Day, H-Hour, M-Minute, S-Second	1 Day (24 hours)
01M	Epoch Length – Amount of Time between each record	1 Minute
ERP	File / Product Type	Earth Orientation Parameter/s
.ERP	File Extension	ERP file

File Specification History

The ERP file format of the International GNSS Service (IGS) was officially adopted in July 1994, starting in GPS week 0756 [2]. This format for recording Earth Rotation Parameters was agreed on by the various Analysis Centres (ACs) of the IGS and the International Earth Rotation and Reference Systems Service (IERS). An update to the format, version 2, was announced and adopted in July 1998 to increase the resolution of the data values by an order of magnitude – this is the current version of the format [1].

The format specifies that the following fields are mandatory [1]:

- MJD: modified Julian day to 0.01 day precision
- Xpole: X coordinate of the pole with respect to the International Terrestrial Reference Frame (ITRF)
- Ypole: Y coordinate of the pole with respect to the ITRF [3]
- UT1-UTC: Time offset with respect to UTC assuming a uniform mean rotation rate [3]
- LOD: Length Of Day excess compared to nominal value – 86400 s [4]
- Xsig: standard deviation of Xpole value
- Ysig: standard deviation of Ypole value
- UTsig: standard deviation of UT1 – UTC
- LODsig: standard deviation of LOD
- Nr: number of receivers in the solution
- Nf: number of receivers with fixed coordinates
- Nt: number of satellites (transmitters) in the solution

Optional parameters include the rate of motion of the X, Y coordinates (Xrt, Yrt) and their standard deviation (Xrtsig, Yrtsig), as well as the correlation between X,Y and UT1 (XYCorr, XUTCOR, YUTCOR).

The IGS creates a combined ERP product, using results from the contributing ACs. The GNSS satellite and ground receiver clock solutions from the ACs are collected and combined by the Analysis Centre Coordinator (ACC) to generate the official IGS ERP product [5].

Quality Assurance

On a daily basis GA assesses the quality of the precise orbit and clock data by comparison with other independent sources. For further details on quality monitoring please contact GA at clientservices@ga.gov.au.

Terms of Use

GA provides Earth rotation parameter data in ERP format free of charge but on an “as is” and “with all faults” basis without any warranty whatsoever. GA does not warrant that the precise orbit and clock data shall meet any requirements or expectations or be fit for any intended purposes.

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GA does not guarantee the accuracy, relevance, timeliness, or completeness of any information or data available through the Service or on linked external websites.

References

- [1] Kouba J., Mireault Y., New IGS ERP Format (version 2), 10 July 1998, International GNSS Service (IGS) Email, IGSMail-1949, Accessed [2022-08-10] <https://cddis.nasa.gov/archive/reports/formats/erp.format>
- [2] Kouba J., New ERP Format, 7 July 1994, International GNSS Service, Email, IGSMail-0662, Accessed [2022-08-10] https://cddis.nasa.gov/archive/reports/formats/igs_erp1.format
- [3] The Earth Orientation and The Earth Orientation Parameters, Paris Observatory IERS Center <https://hpiers.obspm.fr/eop-pc/earthor/EOP.html>
- [4] The Earth's Orientation <https://hpiers.obspm.fr/eop-pc/earthor/orientation.html>
- [5] International GNSS Service, GNSS Rapid Combined Earth Rotation Parameter (ERP) Product, Greenbelt, MD, USA: NASA Crustal Dynamics Data Information System (CDDIS), Accessed [2022-08-09] at doi: 10.5067/GNSS/gnss_igsrerp_001