

et34-x-v74-*

**Program System
for
Earth and Ocean Tide Analysis and Prediction**

Release Notes

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0. Modified installation and update procedure

From this release on, more than one complete Eterna systems are offered. As a consequence, the installation and update procedures necessary had to be adjusted. Therefore, the user has to get familiar with the new structure of the “Download section” on the Eterna webpage, which is presented in the following:

Downloads

- [1. System Architecture Overview](#)
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- [2. Import to read prior to installation: Release Notes et34-x-v74](#)
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- [3. Complete set of System Manuals for Windows und LINUX et34-docu-v74](#)
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- [4a. System et34-x-v74-winsil](#)
- [4b. System et34-x-v74-wingnu](#)
- [4c. System et34-x-v74-lnxgnu](#)
-
- [5. simfit-v74-Configuration-Files only for system 4a](#)
-
- [6. The DUT1, Polar Motion and LOD file ETPOLUT1-NEW.dat](#)
- [6a. The DUT1, Polar Motion and LOD file ETPOLUT1-WAS.DAT](#)
-
- [7. Time difference catalogue ETDDT.dat](#)
-
- [8. BIM 150 containing: Ducarme,B., Schueller,K. : Canonical wave grouping as the key to optimal tidal analysis \(34 downloads\)](#)

First of all, the user should download and unpack the complete set of manuals of item 3. on his computer. Then, the relevant installation guide(s) has (have) to be selected. From there, the user might proceed with the rules presented in the installation guide(s) to be applied like cook book recipes for installing /updating his Eterna system(s). It has to be emphasized that the manuals “Theory” and “Users Guide” apply to all Eterna systems while the installation guides are specific to each system.

After having successfully installed Eterna, the user should move the Eterna manuals into the foreseen docu- directories as described in the installation guides.

1. System enhancements

1.1 New structure of the Eterna program system

From this release on, 3 different program systems of Eterna will be offered depending on 2 different operating system platforms, i.e. WINDOW 10 and LINUX , Fedora release 29 on x86_64 architecture. Concerning the Fortran compilers, Silverfrost FTN 95 and GNU Fortran 95 are available for WINDOWS 10 while for LINUX , GNU Fortran 95 is the choice. Consequently, there will be different 3 Eterna systems which can individually be downloaded from the ETERNA web page as indicated in section 0.

From a Fortran viewpoint, the syntaxes are chosen so that only those source codes constructs are used which are supported by both compilers. Hence, the codes do only differ in graphics functionalities and file specification rules. For optimum maintenance , the graphic routines in the non-graphic systems are yet present and serve as placeholders and consisting of dummy codes.

As LINUX file specifications are case sensitive, from now on, all three systems do uniformly use lower case letters for file names.

For these reasons, the Eterna system variants are mostly equivalent and should numerically provide the same results. However, due to differences in the operation systems and compiler architectures, slight deviations in the magnitudes of rounding errors, especially with ill-conditioned normal equation matrices, might occur.

1.1.1 Eterna system *winsil based on Windows 10 and Silverfrost FTN 95 compiler

This Eterna system corresponds to the existing one known as ET34-X-V74. From now on, it is denoted as **et34-x-v74-winsil**. Here “win” stands for MS-Windows 10 operating system and “sil” for the application of the “Silverfrost FTN95 compiler” including the SIMDEM/SIMFIT graphic package. **If the user wants graphics to be generated, this system variant is the only one which will provide it.**

1.1.2 Eterna system *wingnu based on Windows 10 and GNU Fortran95 compiler

This Eterna system corresponds to the existing one known as ET34-Xng-V74-gnu. From now on, it is denoted as **et34-x-v74-wingnu**. Here “win” stands for MS-Windows 10 operating system and “gnu” for the application of the GNU Fortran95 compiler”. No graphic support is provided in this system variant besides printer plots.

Although the user can switch off the graphics in the *winsil system, it is strongly recommended to use this system variant if no professional graphics are needed or desired.

1.1.3 Eterna system *lnxgnu based on Linux and GNU Fortran95 compiler

This Eterna system is new and denoted as **et34-x-v74-lnxgnu**. Here “lnx” stands for LINUX operating system and “gnu” for the application of the GNU Fortran95 compiler”. It is a LINUX specific adjustment of **et34-x-v74-wingnu** described in the previous section.

1.2 New rules for the analysis of ocean tides

Tide gauge data can also be analysed by Eterna using tidal component **TIDALCOMPO = 9** , i.e. static ocean tides, as theoretical reference model. However, the phase conventions of the oceanographers are not met in previous releases. To facilitate Eterna for these analyses, we changed the sign of the tidal phase parameter “kappa” so that from this release on, **lags will be positive for this component**. Likewise the table headers are consistently updated from “leads” into “lags”. Furthermore, for this component, all phase parameters “kappa” will now refer to Greenwich meridian, longitude $\lambda = 0^\circ$. Also, there have phases corrections of 180° to be taken into account depending on the geocentric latitudes and potential orders of the observation stations and the defined references (Greenwich or equator) (see manuals Theory and Users Guide).

1.3 Enlargement of the hourly sampling interval

For applications dealing with long periodic data, the hourly sampling interval is sometimes inconvenient in the sense of representing some sort of “sampling overkill”. Of course, one could resample the data as part of the data pre-processing procedure prior to analysis. Alternatively, a straightforward method is offered where one could choose larger sampling intervals as integral multiples of 24h and the program will automatically manage it. However, it is the user’s responsibility to take care of the aliasing problem by providing suitable aliasing filters. These filters will work on the observations prior to resampling.

Detailed information will be presented in the users guide at **parameter CHANGETOHI**.

1.4 Changed reference phases for non-linear harmonics

In previous releases, the analysed phases of the non-linear harmonics were defined as absolute local phases referring to the 1st observation of the records.

Since each non-linear tide possesses a decomposition with respect to the 11 astronomical elements, analysed phases now refer (similar to the TGP-constituents) to their astronomical arguments (longitude =0) which is presented in Table A05 in the analysis result file *.prn.

For sake of consistency , we have also changed the first phase column of Table A05 from TGP-potential phases to TGP astronomical arguments while the local tidal component phases remained unchanged.

1.5 DUT1, pole tide , LOD processing

There are records to be analysed which do begin earlier than the 1st entry in etpolut1*.*. This situation is dealt with in the following way:

- The user is notified about this situation by the program.
- There will be no DUT1, pole tide , LOD processing prior to the 1st entry in etpolut1*.*.
- DUT1 will be taken care of for data after the 1st entry in etpolut1*.*.
- Pole and LOD tide processing will basically not be possible for such (mixed) records.

1.6 Application of V1-constituents : parameter V1POTTREAT

This parameter was introduced to offer the possibility of performing analyses in comparison to the former Standard Eterna. There all V1-constituents were treated as V3-constituents, nobody knew why. With the introduction of the actual V1 with theoretical amplitude factors = 1, the V1->V3 substitution needs no longer to be done. Therefore, with this release, we only allow V1-> V3 for the WZ Earth model of Standard Eterna. For the DDW-Earth models V1 is always set by the program.

1.7 Length of the autocovariance function

Compared to previous releases, the choice of the maximum lag τ_{max} of the autocovariance is

- the number of observations N or
- the total time span N_{tts} between the first and last observation in the record including the gaps.

In comparison to the normal equations, energies and cross energies of the signals involved are calculated over the total time span N_{tts} , because they are dependant on absolute time. However, the associated number of sample products are always N and not N_{tts} .

As shown before ,the autocovariance function only depends on time differences. Hence, despite of gaps, a consistent estimate can be evaluated by just leaving out function contributions comprising gap ranges. Therefore, since gaps do not deliver any contributions to the autocovariance function, N will be the appropriate selection instead of N_{tts} .

From this release on , the program works this way. This will probably lead to slight difference compared to former analyses with respect to the quantities involved: Spectra, frequency dependent RMSEs, parameter errors and confidence intervals etc.

2. Source code revisions

Several source code optimizations have been performed.

3. Tables and directory updates

All tables have been updated as demanded by program enhancements and maintenance. Therefore , it is compulsory to always use the newest version, represented by the delivered commdat-v74 directory instead of keeping former ones.

3.1 Table A05 of the tidal component development in *.prn

See 1.4

4. Documentation file updates

All documentation files have been revised and updated .

Due to different operating system and compiler platforms, 3 different installation guides are offered, while the theory and users guide document parts remain the same for all platforms.

The manuals are referred to as :

- For all Eterna systems independent of the operation systems and compilers :
 - Theory : Manual-01-ET34-X-V74-theory.pdf
 - Users Guide : Manual-02- ET34-X-V74-usersguide.pdf

- Dependent on a specific Eterna system are the Installation Guides:
 - Manual-03-ET34-X-V74-winsil-installationguide.pdf
 - Manual-03-ET34-X-V74-wingnu-installationguide.pdf
 - Manual-03-ET34-X-V74-lnxgnu-installationguide.pdf

- Release notes

It is highly recommended to study the complete documentation prior to installation.

5. Contents of the distribution kits for the Eterna systems

All release files can be downloaded from

<http://ggp.bkg.bund.de/eterna/>

5.1 Documentation manuals et34-docu-v74.7z

This zip file contains all Eterna documentation as pdf-files. It should be downloaded prior to installation because it contains valuable information how to set up the Eterna system under consideration.

5.2 Eterna systems et34-x-V74-*.7z

The installation procedure is explained in detail in the Installation Guides.

5.2.1 Eterna system et34-x-v74-winsil.7z (with SIMDEM/SIMFIT graphics)

- commdat-v74
- et34-ana-v74-winsil

5.2.2 Eterna system et34-x-V74-wingnu.7z (no graphics)

- commdat-v74
- et34-ana-v74-wingnu

5.2.3 Eterna system et34-x-v74-lnxgnu.7z (no graphics)

- commdat-v74
- et34-ana-v74-lnxgnu

6. Acknowledgements

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Hartmut Wziontek is responsible for the Linux specific code and documentation adjustments. His work led to providing a LINUX version of this program which is an important contribution for enabling a broader scientific community to use the Eterna program.