

vgosDbCalc-0.4.6: User Guide

Sergei Bolotin, Karen Bayer, John Gipson, David Gordon, Daniel MacMillan

July 13, 2022

Contents

1	Introduction	2
1.1	Requirements	2
1.2	Changes from previous versions	2
1.2.1	Changes in version 0.4.6	2
1.2.2	Changes in version 0.4.5	2
1.2.3	Changes in version 0.4.4	2
1.2.4	Changes in version 0.4.3	3
1.2.5	Changes in version 0.4.2	3
1.2.6	Changes in version 0.4.1	3
1.2.7	Changes in version 0.4.0	3
1.2.8	Changes in version 0.3.4	3
1.2.9	Changes in version 0.3.3	3
1.2.10	Changes in version 0.3.2	3
1.2.11	Changes in version 0.3.1	3
1.2.12	Changes in version 0.3.0	3
1.2.13	Changes in version 0.2.0	4
2	Installation	5
3	Invoking vgosDbCalc	6
4	Configuring the software	8
4.1	Using system-wide settings	8
4.2	Setting paths to data	8
4.3	Setting user identities and affiliation	10
4.4	Setting options of the logger	10
5	Concluding remark	12

Chapter 1

Introduction

This document describes how to use the utility vgosDbCalc.

The utility performs calculating of theoretical values and their partials with respect to estimated parameters. It consists of two parts: the legacy software CALC (of the current version) and a replacement of the old database I/O library by the new one that deals with vgosDb format.

The utility vgosDbCalc is distributed in nusolve package that contains vSolve software and utilities vgosDb-Make, vgosDbCalc and vgosDbProcLogs. Each of the utilities has its own version number that can differ from distribution version, e.g., the first release of vgosDbCalc-0.1.0 appeared in nusolve-0.4.0 package.

The guide covers 0.4.6 version of the software. Since the vgosDbCalc is a simple utility we do not expect large modifications of the User Guide version from version.

1.1 Requirements

See *vSolve User Guide* for the requirements.

1.2 Changes from previous versions

This section was added in 0.5.0 version of the nusolve distribution (version 0.2.0 of the vgosDbCalc User Guide). It covers changes in the software and the user guide.

1.2.1 Changes in version 0.4.6

Nothing essential was changed.

1.2.2 Changes in version 0.4.5

Nothing essential was changed.

1.2.3 Changes in version 0.4.4

The command line arguments parser has switched to ARGV from GNU C Library.

A bug that prevents reading a database by session name if only one wrapper file exists (usually when vgosDbCalc is running) was found and fixed.

1.2.4 Changes in version 0.4.3

Instructions on installation of the software was moved to vSolve User Guide. Chapter 2 *Installation* was modified to reflect the changes.

1.2.5 Changes in version 0.4.2

Nothing essential was changed.

1.2.6 Changes in version 0.4.1

Nothing essential was changed.

1.2.7 Changes in version 0.4.0

New command line arguments were added, see the chapter 3 *Invoking vgosDbCalc* for details.

A dry mode has been implemented, the software reads input files, creates and fills all internal structures, but nothing is written.

Dealing with locale has been altered. Unfortunately, people do not read the manuals, as a result their locale set up conflicts with HOPS parsing of fringe files. Now, by default the locale is set to "C" after the utility is started. There are options to configure this feature in the wizard as well as a command line argument.

1.2.8 Changes in version 0.3.4

Nothing essential was changed.

1.2.9 Changes in version 0.3.3

This update contains bug fixes.

1.2.10 Changes in version 0.3.2

In this version behavior of vgosDbCalc has been modified: if the environment variable «\$DISPLAY» is not set, calls to pop up windows with error messages are suppressed. Also, during creation of the wrapper file name, the attribute «_i[Institution]» will be added. To suppress the last option, the short abbreviation of the affiliation should not be set (e.g., on the Fig. 4.3 put an empty string instead of «GSFC»).

A warning about permanently increase of the log file size was added to the section 4.4 *Setting options of the logger*.

A notion about locale configuration of the shell environment have been added to the chapter 3 *Invoking vgosDbCalc*.

1.2.11 Changes in version 0.3.1

The command line options -p and -W are added in this version, see the chapter 3 *Invoking vgosDbCalc*.

A section 4.1 *Using system-wide settings* is added.

The URL of software distribution has been updated in the chapter 5 *Concluding remark*.

1.2.12 Changes in version 0.3.0

Several bug fixes were made in vgosDbCalc. The version of the user guide was updated to be compatible with the version of the utility.

1.2.13 Changes in version 0.2.0

The utility is able to read an alternative version of master files. The use of the local master files is described in the section *4.2 Setting paths to data*.

The sections *1.1 Requirements* and *1.2 Changes from previous versions* were added to the chapter *1 Introductions*.

Chapter 2

Installation

The source codes of vgosDbCalc is distributed along with vSolve software. The latest stable version of the software one can find at <https://sourceforge.net/projects/nusolve> with a name like `nusolve-1.2.3.tar.gz`. Since the software is still in an active development phase, we recommend you use the latest version.

The utility is compiled during compilation of vSolve software. Please refer to vSolve User Guide how to configure, compile and install the software.

Chapter 3

Invoking vgosDbCalc

To invoke vgosDbCalc just type (specifying if necessary the full path to the executable) program name and a wrapper file of a VLBI session:

```
> vgosDbCalc <wrapper file>
```

The utility also accepts command line arguments. The arguments consist of two groups of options and a name of alternative configuration. The first group of options is related to Qt library and controls how the application will appear and behave. See Qt documentation about details, (e.g., <https://doc.qt.io/qt-5.14/qguiapplication.html>). The another group of options is used by itself. To get the list of these arguments, type

```
> vgosDbCalc --help
```

Here are command line arguments that are available at the time of writing:

General options:	
-l, --std-locale	Use the standard locale.
Configuration control:	
-a, --alt=STRING	Use an alternative configuration STRING.
Invocation of startup wizard:	
-w, --wizard	Force call of the startup wizard.
-W, --sys-wide-wizard	Run startup wizard for the system-wide settings.
Operation modes:	
-, --help	Give this help list.
-p, --print-setup	Print set up and exit.
-q, --dry-mode	Process in a "dry run" mode: files will not be created, instead names of the files will be printed.
--usage	Give a short usage message.
-V, --version	Print program version.

Most of these options are used either to override the current software configuration or for the debug purposes.

An alternative to providing the name of a wrapper file could be specifying a database name or a database name and version number. For example, running vgosDbCalc for a VLBI session EUROPE-136 which is stored in a database 15AUG03XA can be done using a master file name

```
> vgosDbCalc /home/slb/500/vgosDb/2015/15AUG03XA/15AUG03XA_V001_kall.wrp
```

or a database name can be provided to vgosDbCalc instead of the mater file name

```
> vgosDbCalc 15AUG03XA_V001
```

If a user wants to process a wrapper file with the last version, the version suffix can be omitted:

```
> vgosDbCalc 15AUG03XA
```

The command line argument «-l» preserve altering of the locale. If you want to use this option, please check locale setting of your shell environment. CALC software uses libC functions that are locale aware. Different languages have different rules for string comparison, representation of integer and real numbers and so on, so using locale other than standard "C", "POSIX" or "en" could cause incorrect work of the software. You can check your environment locale setting with command

```
> locale
```

Consult with your system administrator for details.

Chapter 4

Configuring the software

When `vgosDbCalc` is invoked the first time or new alternative configuration name has been provided, it calls a setup wizard. The wizard is a small application that asks a user few questions about the configuration.

If you want to change your current configuration, run `vgosDbCalc` with `-w` option:

```
> vgosDbCalc -w
```

If you want to set up (or change) the configuration of alternative setup, invoke `vgosDbCalc` with `-a AltCfg` option. For example, executing

```
> vgosDbCalc -w -a Test
```

will create an alternative set up under the name `Test`. To use this set up invoke `vgosDbCalc` as

```
> vgosDbCalc -a Test <wrapper file>
```

A name of an alternative setup should not contain `«/...»` sequence of chars.

4.1 Using system-wide settings

On a system with several users it is useful to set up common software settings, like path to observations, data files, and so on. To set up such settings, invoke the utility with `-W` option. Obviously, you have to have write access to the directory with system-wide settings. By default, the system-wide settings directory is derived from `${prefix}` variable of the `configure` script and is set to `${prefix}/etc/xdg`. It can be overwritten using `--sysconfdir` option of the `configure` script.

The system-wide settings take an effect if user settings do not exist (e.g., first run of the software), they do not change existing user's settings.

Combination of the option `-W` with the option `-a AltCfg` discards using the system-wide settings, the setup wizard will use the alternative setup instead.

Due to a problem in implementation of `QSettings` object, the system-wide settings option is available only if you have Qt library of version 4.8.0 or newer.

4.2 Setting paths to data

On the first after the introduction wizard's page, "Home directory", user can set up paths to the default directories. The directory set up is similar to configurations of `vgosDbMake` and `vgosDbProcLog` utilities.

The home directory of `vgosDbCalc` is a place where all non-absolute (i.e., a path that does not start with `"/` character) paths refer to.

vgosDbCalc Home Directory

Please, specify the software's home directory.

All paths that are not absolute will be counted from this directory. The software home directory have to be writable for a user and should be different from user's home directory.

vgosDbCalc home directory

Path to the software home directory:

Essential directories

Path to CALC a priori files:

Path to vgosDb files:

Path to Master files:

SOLVE a priori files

Site a priori file:

Source a priori file:

Ocean loading a priori file:

EOP a priori file:

Tilt a priori file:

Ocean pole tide loading a priori file:

General options

☒ Do not alternate locale set up

Figure 4.1: Setting up paths.

The path to CALC a priori files is in **Path to CALC a priori files** field. The it a priori files are available in the distribution. However, one file that contains ERP data (in the distribution it called **usno_finals.erp**) have to be updated time from time.

The path to VLBI observations in vgosDb format is specified by the field **Path to vgosDb files**. The data structure of vgosDb files would looks like

```
<VGOSDB_ROOT>/YYYY/YMMMDDBL/<data files>
```

Where **VGOSDB_ROOT** is a directory specified in the wizard, **YYYY** is a year and **YMMMDDBL** is a database name.

The software uses master files to figure out proper database name. The path to master files is a place where these files suppose to be. You can obtain the fresh copies of master files from

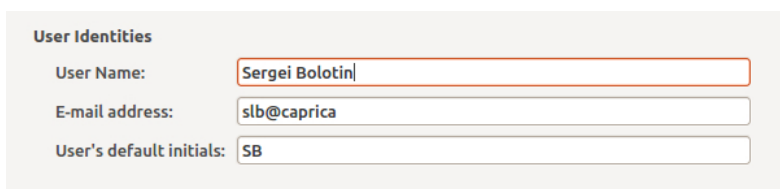
```
ftp://cddis.gsfc.nasa.gov/pub/vlbi/ivscontrol/
or
https://ivsc.gsfc.nasa.gov/program/master.html
```

Time from time the files need to be updated. In addition to the standard master files, a user can use its own "local" master file. The format of the local master file should be the same as the standard one, its name have to be in the form "masterYY-loc.txt", where "YY" – two digits of the year. This feature is designed for testing purposes or processing non-standard VLBI sessions. The software first checks for the local master files, if it found a record there it stops the search, so records in the canonical master files can be overwritten using the local master file.

The check box `Do not alternate locale set up` controls how the utility deals with locale set up. By default it is «off».

4.3 Setting user identities and affiliation

The second and third pages of the wizard, Fig. 4.2-4.3, set up user identities and affiliation.



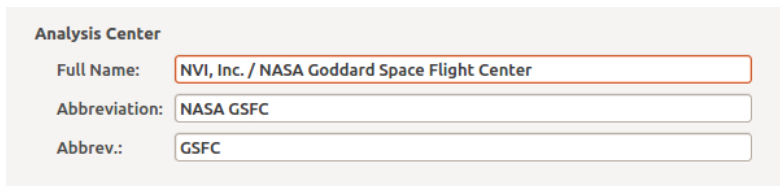
User Identities

User Name:

E-mail address:

User's default initials:

Figure 4.2: Setting up user ID.



Analysis Center

Full Name:

Abbreviation:

Abbrev.:

Figure 4.3: Setting up affiliation.

We strongly encourage users to provide, at least, a working e-mail address.

Information collected by these two pages are used only for composing the history part of `vgosDb` files and in `vgosDbCalc` log file.

The short form of the abbreviated affiliation («Abbrev.» on the Fig. 4.3) is used in wrapper file names as an attribute `_i<Institution>`. If the field is empty, the attribute will not be added to a name of a wrapper file.

4.4 Setting options of the logger

The last page of the start up wizard, Fig. 4.4, sets up properties of the logging subsystem. The field **Log file name** is a name of a file where the log messages will be saved if the checkbox **Save log to the file** is checked «on». The file will appear in `vgosDbCalc` home directory, Fig. 4.1. The **Log capacity** is an amount of log records that are kept in internal structure before send them to a file. The checkbox **Put time stamps** turns on adding time tags to the log messages.

The **Log level** determines how verbose the log output will be. The **Debug** level, as shown on the figure, could be useful for debugging purposes. For routine operations the **Info** level will be preferred.

Another log file will be created on a per session basis if the checkbox **Save log file for each session** is turned «on». The aux log file will be saved in **Path to logs for each session** directory and its name will be the same as the database name plus ".log" extension.

WARNING: If the logger is instructed to save data in the log file, the size of the file will grow up. The software does not check the size of the file (it does not know about your intentions), and eventually the file could take all free space on your computer! If you do not need the log output from previous runs, please, remove the file on a regular basis.

Logger

Change parameters of the logging subsystem.

Main log options

Log file name: ☒ Save log to the file

Log capacity: ☒ Put time stamps

Main log levels

☐ Error

☐ Warning

☐ Info

☒ Debug

Aux log options

Path to logs for each session: ☒ Save log file for each session

Figure 4.4: Setting up logger.

Chapter 5

Concluding remark

Currently, this document is in the developmental stage, its content could change time from time. Check for new versions at the ftp site:

`https://sourceforge.net/projects/nusolve`

If you have questions or suggestions that will improve the software or the User Guide, please e-mail us at:

`<mailto:sergei.bolotin@nasa.gov>`

Bibliography

- [1] S. Bolotin, J. Gipson, D. MacMillan: "Development of a New VLBI Data Analysis Software". In: International VLBI Service for Geodesy and Astrometry 2010 General Meeting Proceedings, edited by D. Behrend and K. Baver, NASA/CP-2010-215864, 197-201, 2010.
- [2] S. Bolotin, J. Gipson, D. Gordon, D. MacMillan: "Current Status of Development of New VLBI Data Analysis Software". In: Proceedings of the 20th Meeting of the European VLBI Group for Geodesy and Astrometry, edited by W. Alef, S. Bernhart, A. Nothnagel, Schriftenreihe des Instituts für Geodäsie und Geoinformation der Universität Bonn, Nr. 22, ISSN 1864-1113, 86-88, 2011.
- [3] S. Bolotin, K. Baver, J. Gipson, D. Gordon, D. MacMillan: "The First Release of ν Solve". In: International VLBI Service for Geodesy and Astrometry 2012 General Meeting Proceedings 'Launching the Next-Generation IVS Network', edited by D. Behrend and K. Baver, NASA/CP-2012-217504, 222-226, 2012.