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VIE_INIT

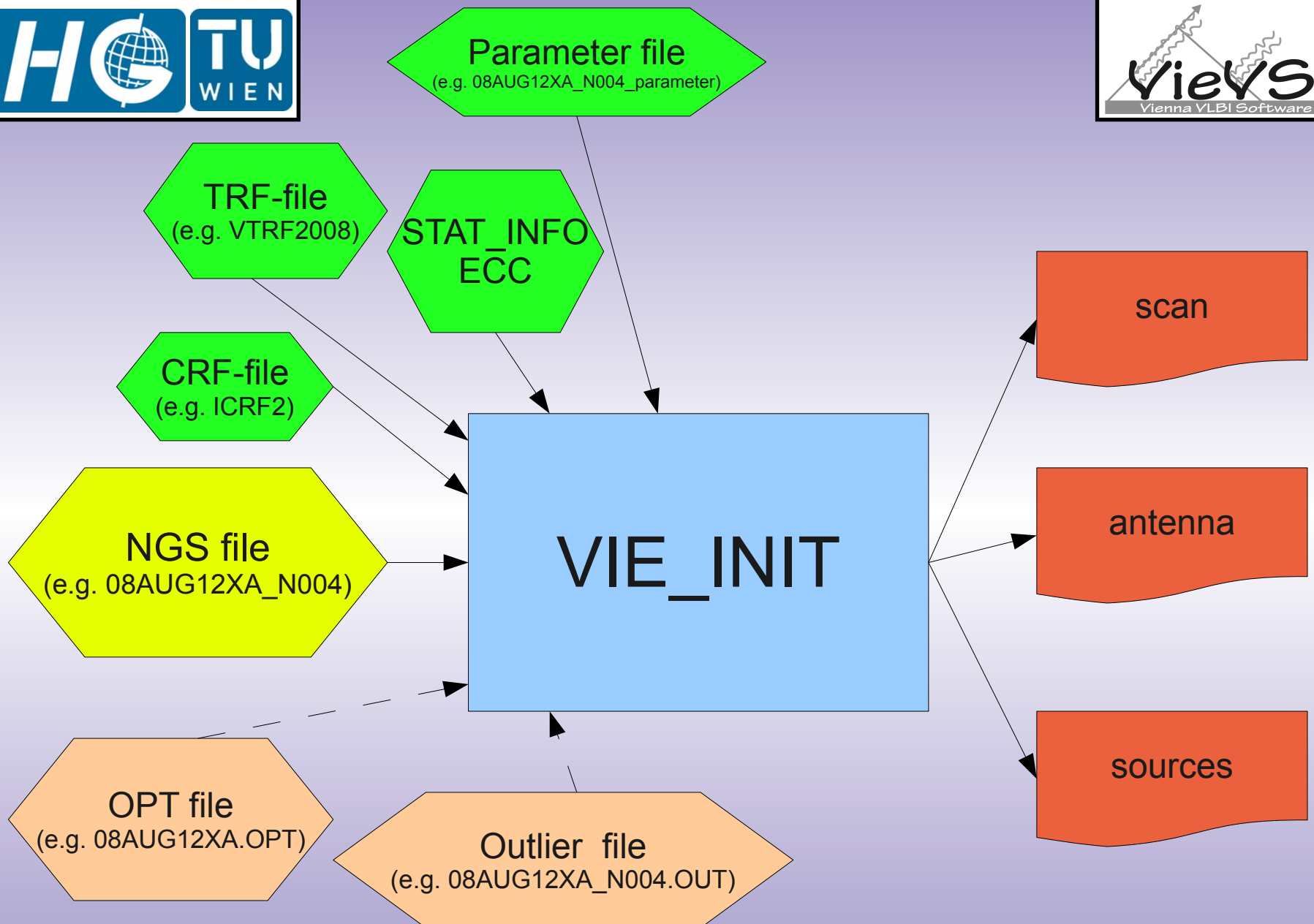
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VieVS User Workshop
14 – 16 September, 2011
Vienna



What does VIE_INIT do?

-  Reads observations from the NGS file
-  Reads station coordinates and velocities from the TRF file
-  Read source coordinates from CRF file
-  Possible to:
 -  Remove outliers (specified in an outlier file)
 -  Exclude stations, sources, baselines (specified in OPT-file)
 -  Introduce an elevation cut-off angle



The parameter file

- Contains the options for VIE_INIT (and the other parts of VieVS)
- Created by VIE_SETUP
- The parameter file used in VIE_INIT is stored in the **DATA/LEVEL0** directory

The NGS file

- An NGS file (version >3 or 4) contain:
 - Observed delay (and delay rate). Ambiguities already resolved
 - Ionospheric delay (and rate)
 - Additional measurements, e.g. temperature, pressure, cable wrap, quality code



The NGS file



DATA IN NGS FORMAT FROM DATABASE 09AUG22XK_V003

Observed delays and rates in card #2, modified errors in card #9

TSUKUB32 -3957408.75200 3310229.36700 3737494.78900 AZEL .00000

WETTZELL 4075539.88300 931735.26100 4801629.37100 AZEL .00000

\$END

0955+476 9 58 19.671641 47 25 7.842440

1128+385 11 30 53.282613 38 15 18.546970

\$END

.8212990000000D+04 GR PH

\$END

TSUKUB32 WETTZELL 0955+476 2009 08 22 07 58 6.0000000000 101

-7231560.78088789 .02291 -1338669.4166866930 .07389 0 I 102

.00054 .00000 .00000 .00000 -2.778901538421864 0. 103

.00 .0 .00 .0 .00 .0 .00 .0 104

-.00010 .00146 .00000 .00000 .00000 .00000 105

28.390 14.600 999.751 951.200 86.511 97.900 0 0 106

-.1289037990 .09754 .0165501479 .01593 0 108

-7231560.78088789 .07573 -1338669.4166866930 .37717 0 I 109

TSUKUB32 WETTZELL 1128+385 2009 08 22 07 59 42.0000000000 201

1087121.30123478 .00796 -1583101.4780455410 .01725 0 I 202

.00127 .00000 .00000 .00000 .165474166106772 0. 203

.00 .0 .00 .0 .00 .0 .00 .0 204










-.00068 .00029 .00000 .00000 .00000 .00000 205







28.345 14.600 999.800 951.200 86.489 97.900 0 0 206

.0427781143 .10365 -.0570984871 .01060 0 208

1087121.30123478 .07262 -1583101.4780455410 .37026 0 I 209

TRF files

-  .mat files in the TRF directory:
 -  ITRF2005, VTRF2005, ITRF2008, and VTRF2008
 -  Contain station coordinates and velocities
 -  If a station is not found in the TRF file, the coordinates from the NGS header is used. The velocities are then zero!
-  .txt files in TRF directory:
 -  User defined TRF in ascii format
-  The STAT_INFO.mat file (TRF directory):
 -  Information about the antenna (mount, axis offset etc.)
-  The ECC.mat file (TRF directory) contains eccentricities

-  .mat files in the CRF directory:
 -  ICRF_Ext2 and ICRF2
 -  Contain source coordinates
 -  If a source is not found in the CRF file, the coordinates from the NGS header is used
-  .txt files in CRF directory:
 -  User defined CRF in ascii format

OPT file

- ▣ Contains information of clock breaks (not used in VIE_INIT), stations to be excluded, sources to be excluded etc.
- ▣ See separate presentation

Outlier file

- ❑ Contains list of outliers for the session
- ❑ Created in VIE_LSM
- ❑ Outliers are removed in VIE_INIT. To detect and remove outliers you need to run VieVS twice:
 - ❑ In the first run outliers are detected in VIE_LSM and saved it in a file
 - ❑ In the second run this file run is used in VIE_INIT for removing the outliers

mod_qu
[-] [□] [X]

TRF

ITRF2005 VTRF2005

ITRF2008 VTRF2008

Other:

CRF

ICRF Ext 2 ICRF2

Other:

Ephemerides

JPL 405

JPL 421

EOP

c04 05 predefined EOP

c04 08

include a priori nutation offsets dX, dY

include high frequency

ocean tides interpf (Conventions)

Libration

xp,yp (10 terms)

UT1 (11 terms)

Station corrections

solid Earth tides

tidal ocean loading FES2004.mat

tidal atmosphere loading s12_cm_noib_leonid.mat

non-tidal atmosphere loading

pole tide

linear (IERS 20...

cubic (IERS 2010)

thermal antenna deformation

Pressure and temperature

always GPT External (.trp) file

use met data from NGS fi (GPT only as backup)

A priori troposphere gradients

no model APG (Böhm) DAO (MacMillan)

Mapping function

VM1 GMF

Quality code limit

0

Ionosphere

from NGS external file

Precession/Nutation Model

IAU 2000A IAU 2006/200...

Interpolation

linear lagrange

Tidal UT variations (Defraigne & Smi...

Cut-off Elevation angle

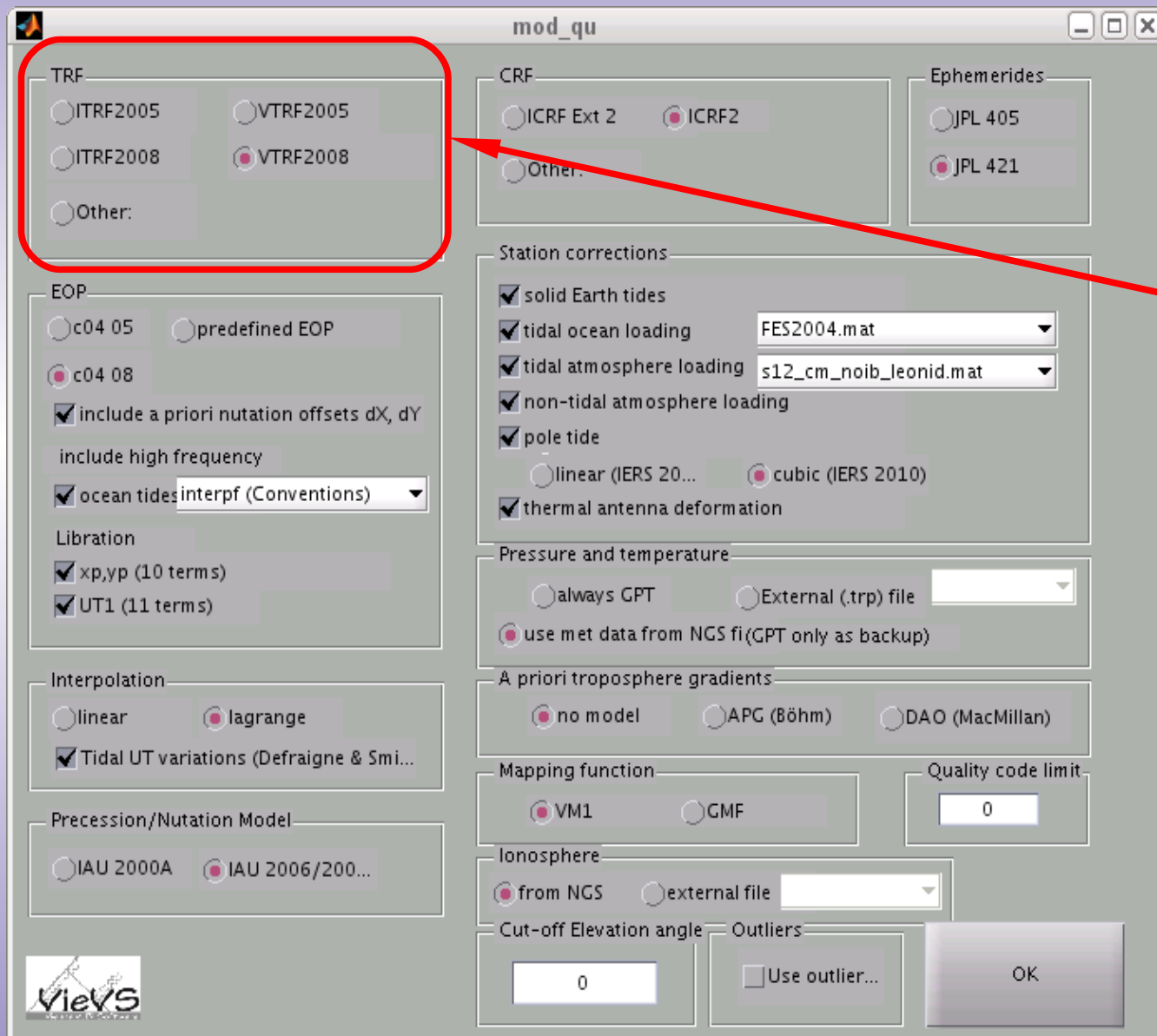
0

Outliers

Use outlier...

OK

VIE_INIT options



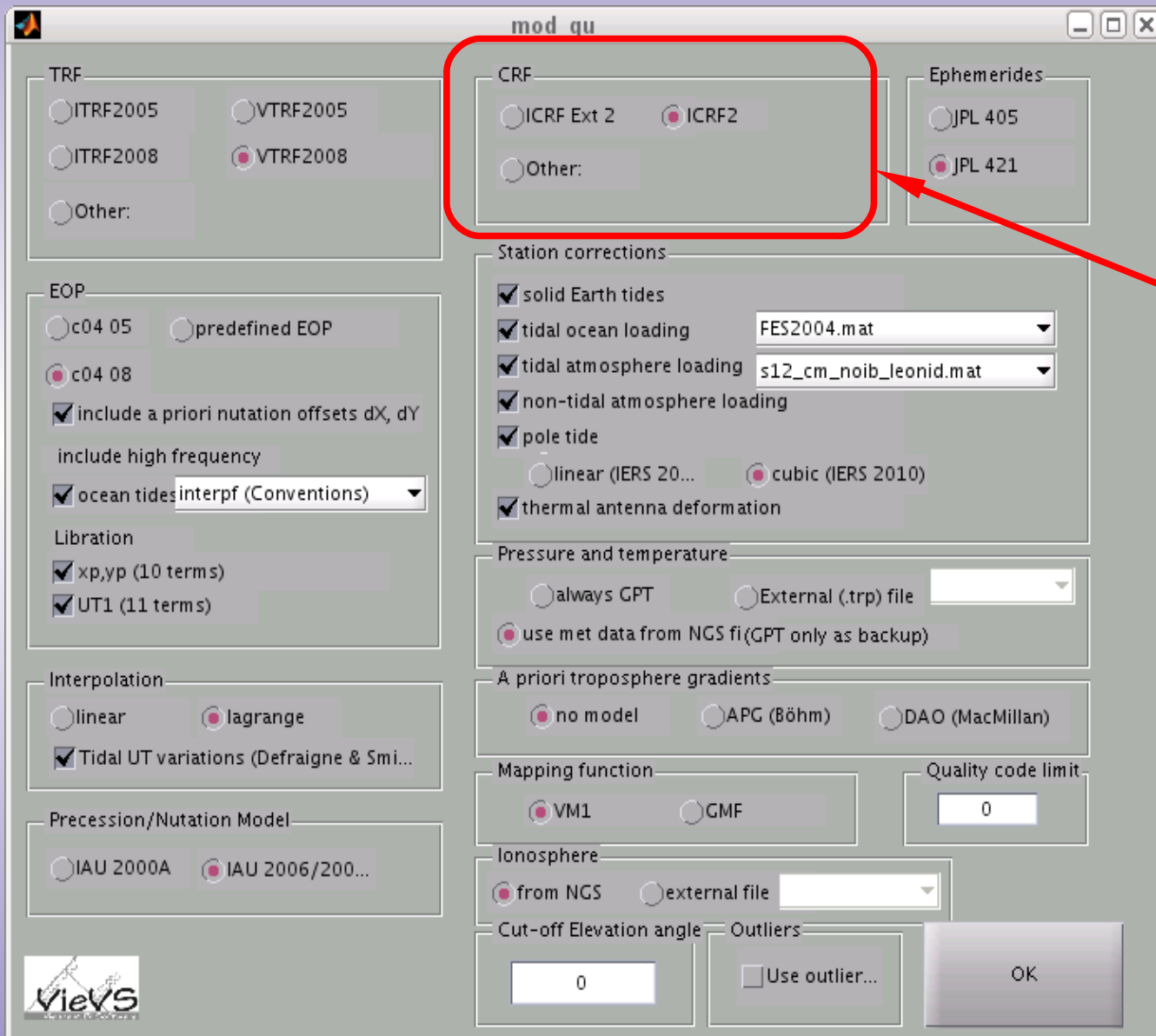
The screenshot shows the 'mod_qu' window with the following sections:

- TRF:**
 - ITRF2005
 - VTRF2005
 - ITRF2008
 - VTRF2008
 - Other:
- CRF:**
 - ICRF Ext 2
 - ICRF2
 - Other..
- Ephemerides:**
 - JPL 405
 - JPL 421
- Station corrections:**
 - solid Earth tides
 - tidal ocean loading (FES2004.mat)
 - tidal atmosphere loading (s12_cm_noib_leonid.mat)
 - non-tidal atmosphere loading
 - pole tide
 - linear (IERS 20...)
 - cubic (IERS 2010)
 - thermal antenna deformation
- Pressure and temperature:**
 - always GPT
 - External (.trp) file
 - use met data from NGS fi (GPT only as backup)
- A priori troposphere gradients:**
 - no model
 - APG (Böhm)
 - DAO (MacMillan)
- Mapping function:**
 - VM1
 - GMF
- Quality code limit:** 0
- Ionosphere:**
 - from NGS
 - external file
- Cut-off Elevation angle:** 0
- Outliers:** Use outlier...

Select what TRF file to use:

ITRF2005
ITRF2008
VTRF2005
VTRF2008

Other: User defined TRF file (ascii file in TRF directory)



The screenshot shows the 'mod qu' window with the following settings:

- TRF:** ITRF2005, VTRF2005, ITRF2008, VTRF2008, Other:
- CRF:** ICRF Ext 2, ICRF2, Other:
- Ephemerides:** JPL 405, JPL 421
- Station corrections:**
 - solid Earth tides
 - tidal ocean loading (FES2004.mat)
 - tidal atmosphere loading (s12_cm_noib_leonid.mat)
 - non-tidal atmosphere loading
 - pole tide
 - linear (IERS 20...)
 - cubic (IERS 2010)
 - thermal antenna deformation
- Pressure and temperature:**
 - always GPT
 - External (.trp) file
 - use met data from NGS fi (GPT only as backup)
- A priori troposphere gradients:**
 - no model
 - APG (Böhm)
 - DAO (MacMillan)
- Mapping function:** VM1, GMF
- Quality code limit:** 0
- Ionosphere:** from NGS, external file
- Cut-off Elevation angle:** 0
- Outliers:** Use outlier...

Select what CRF file to use:

ICRF Ext 2
ICRF2

Other: User defined CRF file (ascii file in CRF directory)

mod_qu

TRF

ITRF2005 VTRF2005
 ITRF2008 VTRF2008
 Other:

EOP

c04 05 predefined EOP
 c04 08
 include a priori nutation offsets dX, dY
include high frequency
 ocean tides

Libration

xp,yp (10 terms)
 UT1 (11 terms)

Interpolation

linear lagrange
 Tidal UT variations (Defraigne & Smi...)

Precession/Nutation Model

IAU 2000A IAU 2006/200...

CRF

ICRF Ext 2 ICRF2
 Other:

Ephemerides

JPL 405
 JPL 421

Station corrections

solid Earth tides
 tidal ocean loading
 tidal atmosphere loading
 non-tidal atmosphere loading
 pole tide
 linear (IERS 20... cubic (IERS 2016)
 thermal antenna deformation

Pressure and temperature

always GPT External (.trp) file
 use met data from NGS fi (GPT only as backup)

A priori troposphere gradients

no model APG (Böhm) DAO (MacMillan)

Mapping function

VM1 GMF

Quality code limit

Ionosphere

from NGS external file

Cut-off Elevation angle

Outliers

Use outlier...

OK

Met data from NGS file (GPT as backup), or always GPT

VIE_INIT options

mod_qu

TRF

ITRF2005 VTRF2005
 ITRF2008 VTRF2008
 Other:

EOP

c04 05 predefined EOP
 c04 08
 include a priori nutation offsets dX, dY
include high frequency
 ocean tides
Libration
 xp,yp (10 terms)
 UT1 (11 terms)

Interpolation

linear lagrange
 Tidal UT variations (Defraigne & Smi...)

Precession/Nutation Model

IAU 2000A IAU 2006/200...

CRF

ICRF Ext 2 ICRF2
 Other:

Ephemerides

JPL 405
 JPL 421

Station corrections

solid Earth tides
 tidal ocean loading
 tidal atmosphere loading
 non-tidal atmosphere loading
 pole tide
 linear (IERS 20... cubic (IERS 2010)
 thermal antenna deformation

Pressure and temperature

always GPT External (.trp) file
 use met data from NGS fi (GPT only as backup)

A priori troposphere gradients

no model APG (Böhm) DAO (MacMillan)

Mapping function

VM1 GMF

Quality code limit

Ionosphere

from NGS external file

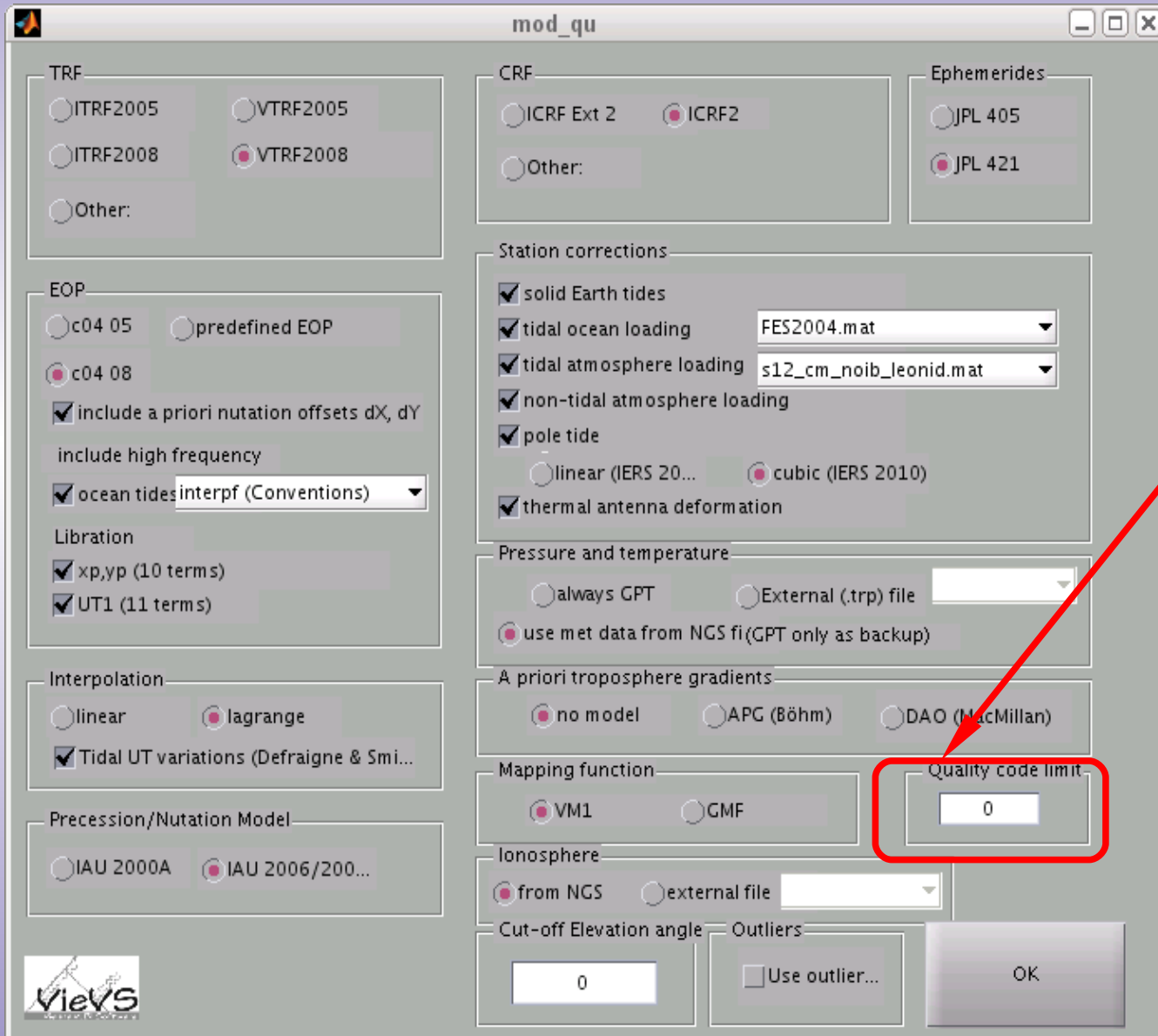
Cut-on Elevation angle

Outliers

Use outlier...

Ionospheric delays from NGS file or external file

VIE_INIT options



The screenshot shows the 'mod_qu' window with the following sections and options:

- TRF:** ITRF2005, VTRF2005, ITRF2008, VTRF2008, Other:
- CRF:** ICRF Ext 2, ICRF2, Other:
- Ephemerides:** JPL 405, JPL 421
- Station corrections:**
 - solid Earth tides
 - tidal ocean loading (FES2004.mat)
 - tidal atmosphere loading (s12_cm_noib_leonid.mat)
 - non-tidal atmosphere loading
 - pole tide
 - linear (IERS 20...)
 - cubic (IERS 2010)
 - thermal antenna deformation
- Pressure and temperature:**
 - always GPT
 - External (.trp) file
 - use met data from NGS fi (GPT only as backup)
- A priori troposphere gradients:**
 - no model
 - APG (Böhm)
 - DAO (MacMillan)
- Mapping function:**
 - VM1
 - GMF
- Quality code limit:** (highlighted with a red box)
- lonosphere:**
 - from NGS
 - external file
- Cut-off Elevation angle:**
- Outliers:** Use outlier...

Quality code limit

Only observations with a quality code less or equal to this limit are used

Higher quality code → worse quality of observation

Quality code 0: good quality

Quality code >0: bad quality

Normally use quality code limit 0

mod_qu

TRF

ITRF2005 VTRF2005
 ITRF2008 VTRF2008
 Other:

EOP

c04 05 predefined EOP
 c04 08
 include a priori nutation offsets dX, dY
include high frequency
 ocean tides

Libration

xp,yp (10 terms)
 UT1 (11 terms)

Interpolation

linear lagrange
 Tidal UT variations (Defraigne & Smi...)

Precession/Nutation Model

IAU 2000A IAU 2006/200...

CRF

ICRF Ext 2 ICRF2
 Other:

Ephemerides

JPL 405
 JPL 421

Station corrections

solid Earth tides
 tidal ocean loading
 tidal atmosphere loading
 non-tidal atmosphere loading
 pole tide
 linear (IERS 20... cubic (IERS 2010)
 thermal antenna deformation

Pressure and temperature

always GPT External (.trp) file
 use met data from NGS fi (GPT only as backup)

A priori troposphere gradients

no model APG (Böhm) BAO (MacMillan)

Mapping function

VM1 GMP

Quality code limit

Ionosphere

from NGS external file

Cut-off Elevation angle

Outliers

Use outlier...

OK

Cut-off elevation angle limit (degrees)

Only observations above this elevation angle is used

mod_qu

TRF

ITRF2005 VTRF2005
 ITRF2008 VTRF2008
 Other:

EOP

c04 05 predefined EOP
 c04 08
 include a priori nutation offsets dX, dY
include high frequency
 ocean tides
Libration
 xp,yp (10 terms)
 UT1 (11 terms)

Interpolation

linear lagrange
 Tidal UT variations (Defraigne & Smi...)

Precession/Nutation Model

IAU 2000A IAU 2006/200...

CRF

ICRF Ext 2 ICRF2
 Other:

Ephemerides

JPL 405
 JPL 421

Station corrections

solid Earth tides
 tidal ocean loading
 tidal atmosphere loading
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 pole tide
 linear (IERS 20... cubic (IERS 2010)
 thermal antenna deformation

Pressure and temperature

always GPT External (.trp) file
 use met data from NGS fi (GPT only as backup)

A priori troposphere gradients

no model APG (Böhm) DAO (MacMillan)

Mapping function

VM1 GMF

Quality code limit

Ionosphere

from NGS external file

Cut-off Elevation angle

Outliers

Use outlier...

If checked, observations specified as outliers in the outlier file are removed

```
Command Window
File Edit Debug Desktop Window Help
../DATA/LEVEL0//11JAN18XA_N004
-----
|                               Welcome to VIE_INIT!!!!                               |
-----

ans =
..
ans =
..
bas_exc1 =
..

Start reading 2011/11JAN18XA_N004
[antenna,sources,scan]=read_ngs(ngsfile,trffile,infofile,crffile,ini_opt)
No TRF coordinates for station HOBART12

No TRF coordinates for station TIGOC0NC

Warning: Asterisk(s) found in NGS file!!! Value(s) treated as zero!
> In read\_ngs at 277
  In vie\_init at 156
  In vie\_batchld at 43
  In views at 67
Done reading the file!
A total of 11 stations, 57 sources and 834 scans were found
The following stations were found:
ONSALA60
TSUKUB32
BADARY
NYALES20
WETTZELL
HARTRA0
HOBART26
HOBART12
TIGOC0NC
WESTFORD
ZELENCHK
VIE_INIT finished!!! You can now continue with VIE_MOD
Thank you for using vievs!
fx >>
```

```
Command Window
File Edit Debug Desktop Window Help
../DATA/LEVEL0//11JAN18XA_N004
-----
|                               Welcome to VIE_INIT!!!!                               |
-----

ans =
..
ans =
..
bas_exc1 =
..

Start reading 2011/11JAN18XA_N004
[antenna,sources,scan]=read_ngs(ngsfile,crffile,infofile,crffile,ini_opt)
No TRF coordinates for station HOBART12
No TRF coordinates for station TIGOC0NC
Warning: Asterisk(s) found in NGS file!!! Value(s) treated as zero!
> In read_ngs at 277
  In vie_init at 156
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Done reading the file!
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ONSALA60
TSUKUB32
BADARY
NYALES20
WETTZELL
HARTRA0
HOBART26
HOBART12
TIGOC0NC
WESTFORD
ZELENCHK
VIE_INIT finished!!! You can now continue with VIE_MOD
Thank you for using views!
fx >>
```

These stations
have no TRF
coordinates

```
Command Window
File Edit Debug Desktop Window Help
../DATA/LEVEL0//11JAN18XA_N004
-----
|                               Welcome to VIE_INIT!!!!                               |
-----

ans =
..
ans =
..
bas_exc1 =
..

Start reading 2011/11JAN18XA_N004
[antenna,sources,scan]=read_ngs(ngsfile,trffile,infofile,crffile,ini_opt)
No TRF coordinates for station HOBART12

No TRF coordinates for station TIGOC0NC

Warning: Asterisk(s) found in NGS file!!! Value(s) treated as zero!
> In read_ngs at 277
  In vie_init at 156
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The following stations were found:
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BADARY
NYALES20
WETTZELL
HARTRA0
HOBART26
HOBART12
TIGOC0NC
WESTFORD
ZELENCHK
VIE_INIT finished!!! You can now continue with VIE_MOD
Thank you for using vievs!
fx >>
```

Number of stations, sources, and scans

```
Command Window
File Edit Debug Desktop Window Help
../DATA/LEVEL0//11JAN18XA_N004
-----
|                               Welcome to VIE_INIT!!!!                               |
-----

ans =
..
ans =
..
bas_exc1 =
..

Start reading 2011/11JAN18XA_N004
[antenna,sources,scan]=read_ngs(ngsfile,trffile,infofile,crffile,ini_opt)
No TRF coordinates for station HOBART12

No TRF coordinates for station TIGOC0NC

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> In read_ngs at 277
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BADARY
NYALES20
WETTZELL
HARTRA0
HOBART26
HOBART12
TIGOC0NC
WESTFORD
ZELENCHK
VIE_INIT finished!!! You can now continue with VIE_MOD
Thank you for using vievs!
fx >>
```

Names of the stations

Output form VIE_INIT

- ❑ Matlab structure arrays: **scan**, **antenna** and **sources**.
- ❑ Saved in **DATA/LEVEL0/** (file names: *NGSFILENAME_structure.mat*, e.g. **10AUG02XA_N004_antenna.mat**).
- ❑ For detailed description, see **DOC/structures.xls** and **DOC/VieVS_variables.pdf**



The scan structure array

- Contains the scans
 - Observed delays (and sigmas), corrected for ionosphere and cable wrap (*scan.obs.obs*)
 - All observations in the NGS file with quality code below or equal to the limit, above minimum elevation angle, not in list of outliers, stations not excluded etc.
 - Also contains additional measurements, like pressure and temperature
 - More quantities added in VIE_MOD



The antenna structure array

- Contains information for all stations which is participating in at least one scan in the scan structure array
- Station positions and velocities
- Additional information, e.g. antenna mount, eccentricities, axis offset

The sources structure array

-  Information about the sources. Contains all sources observed in at least one scan in the scan structure array
-  Contains the source positions

Things that can be good to know

-  If station/source n is not in the TRF/CRF, the field:
antenna(n).in_trf/sources(n).in_crf
will be zero (otherwise one)
-  If the pressure and the temperature for station n are missing in the NGS file, this will be calculated from GPT (Global Pressure and Temperature model).
The fields *antenna(n).gptpres* and *antenna(n).gpttemp* will then be one

Now we continue with VIE_MOD