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Deformation Integrity Monitoring for GNSS-Positioning Services including a Scalable Hazard Monitoring by the Karlsruhe Approach (MONIKA)

- Software Handling -

Speaker:
Dipl.Ing. Peter Spohn

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1. Preparations
2. New project
3. Baseline processing
4. Epoch definition
5. 3D-Adjustment
6. Plate rotation
7. Deformation analysis
8. Automatications

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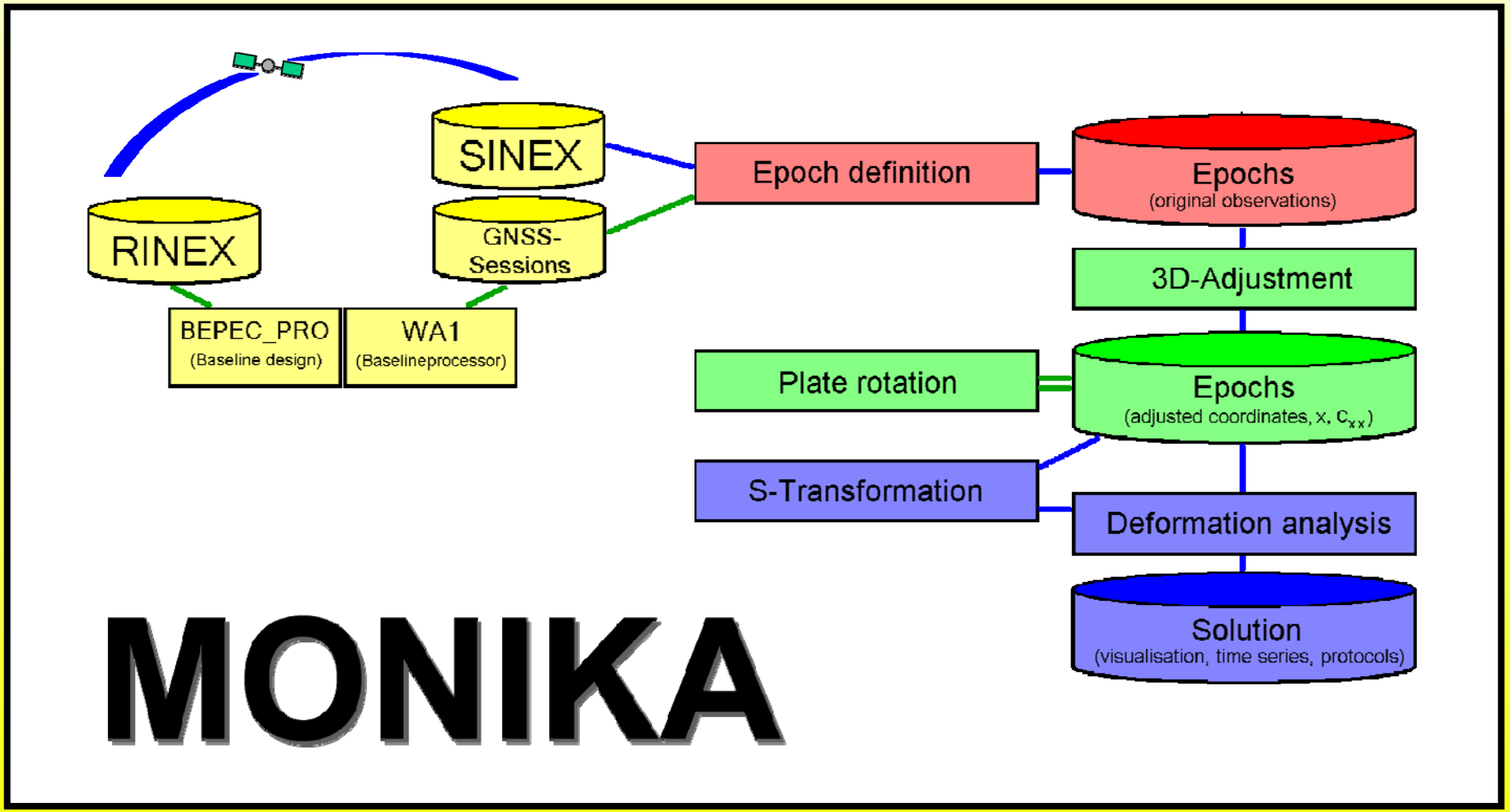
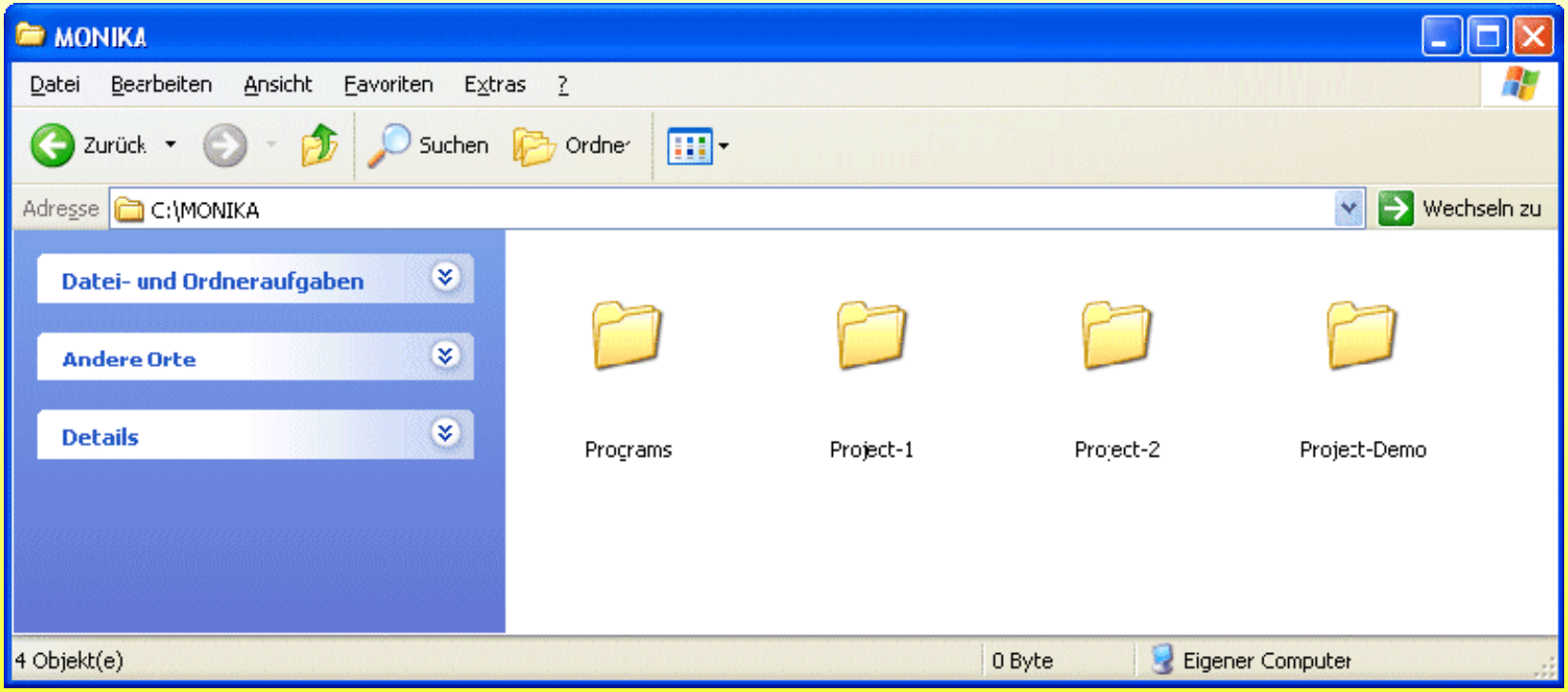
Overview



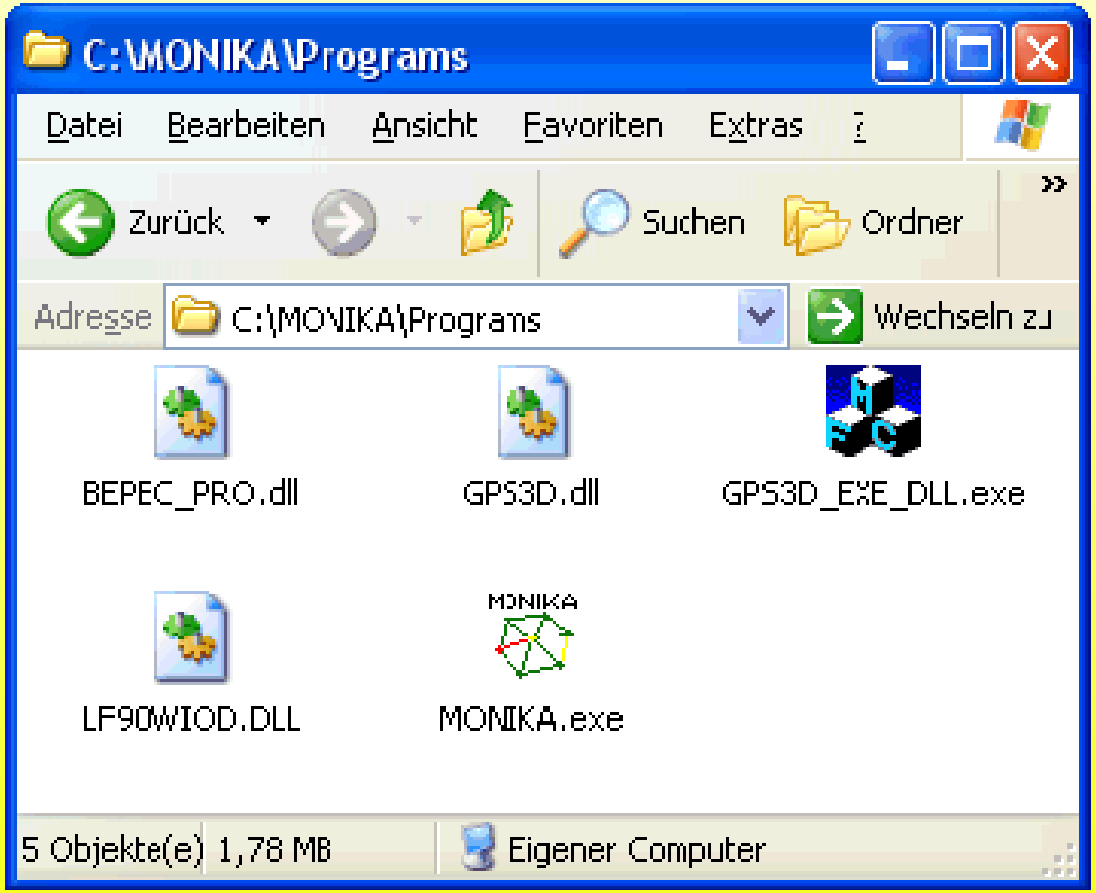
1. Preparations



- Project and folder-based file handling

MONIKA-Files

- MONIKA.exe
- BEPEC_PRO.dll
- GPS3D.dll
- GPS_EXE_DLL.exe
- LF90WIOD.dll



MONIKA-Files

- MONIKA.exe
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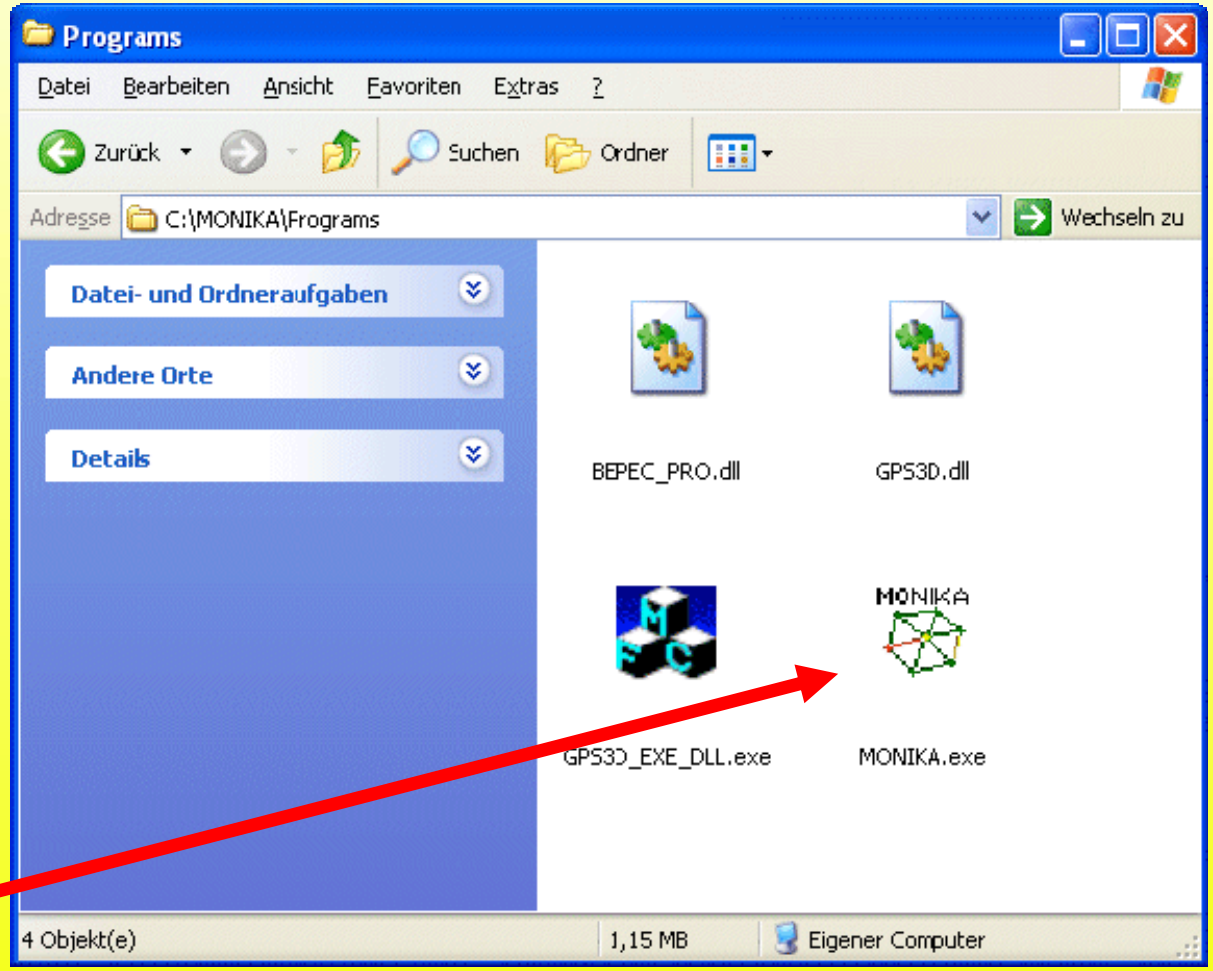
- GPS3D.dll
- GPS_EXE_DLL.exe

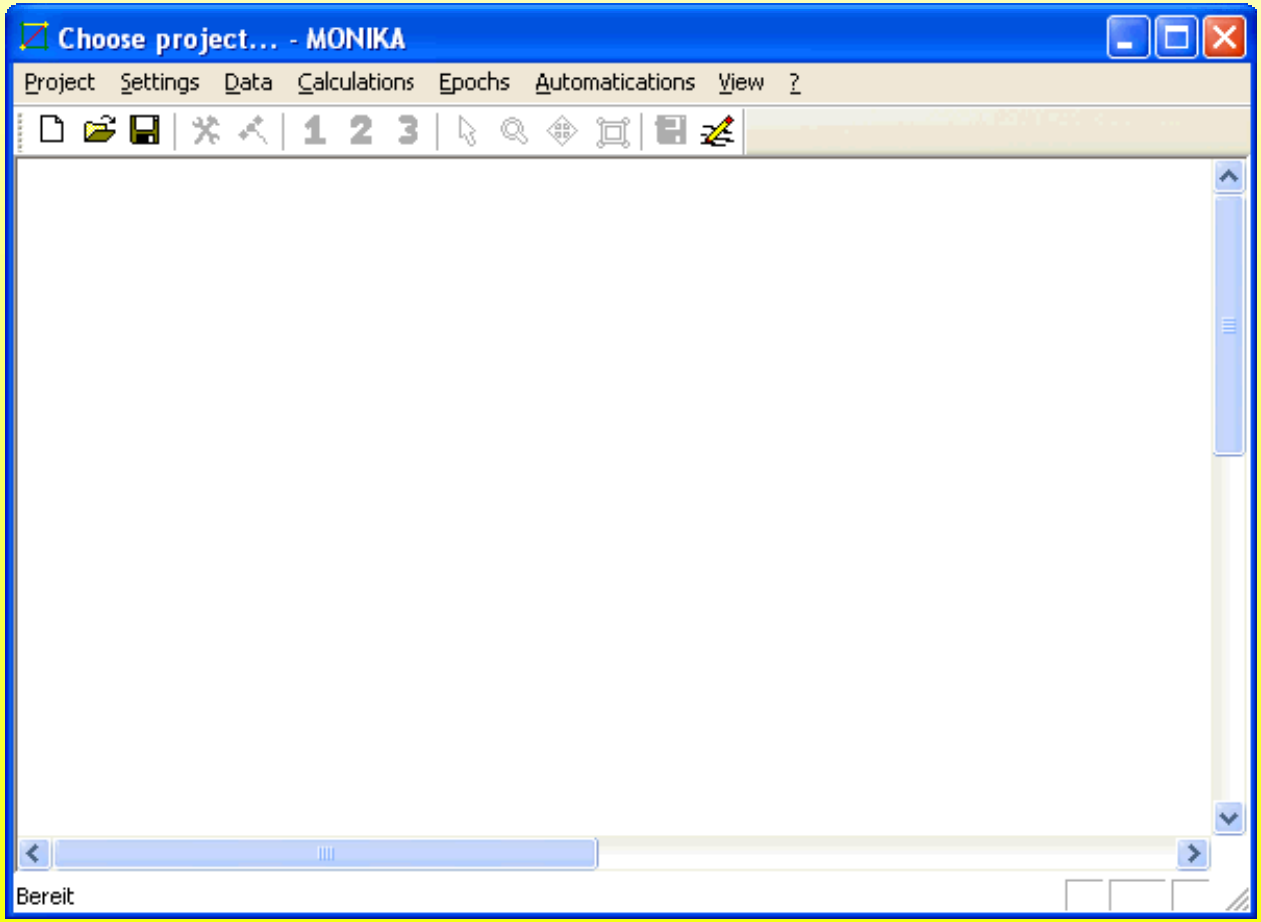


start MONIKA

2. New project

2.1 Program window

- menu bar
- shortcut bar
- status bar



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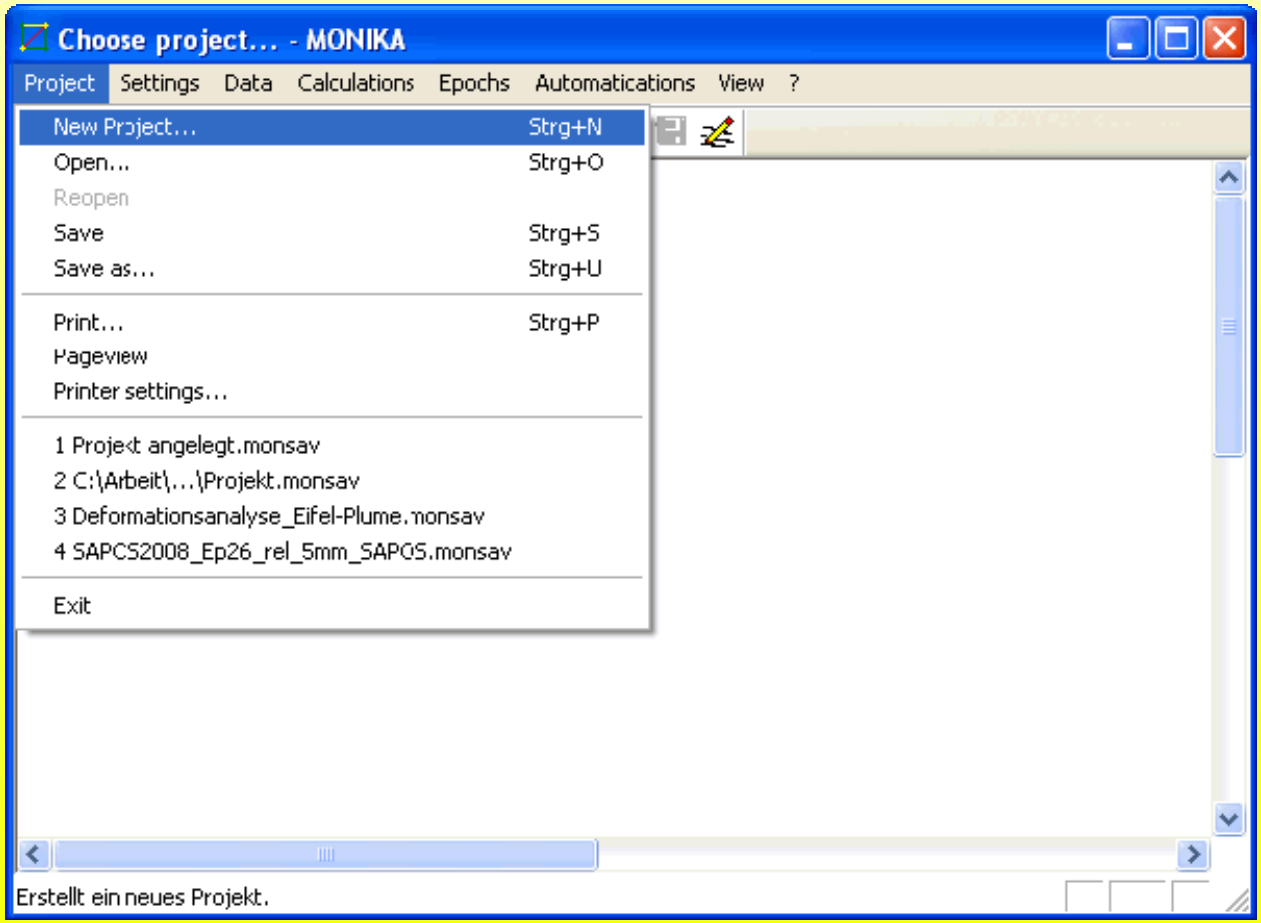
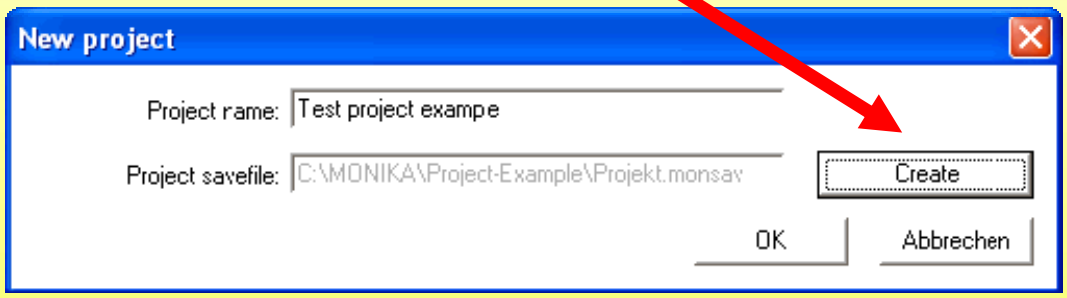
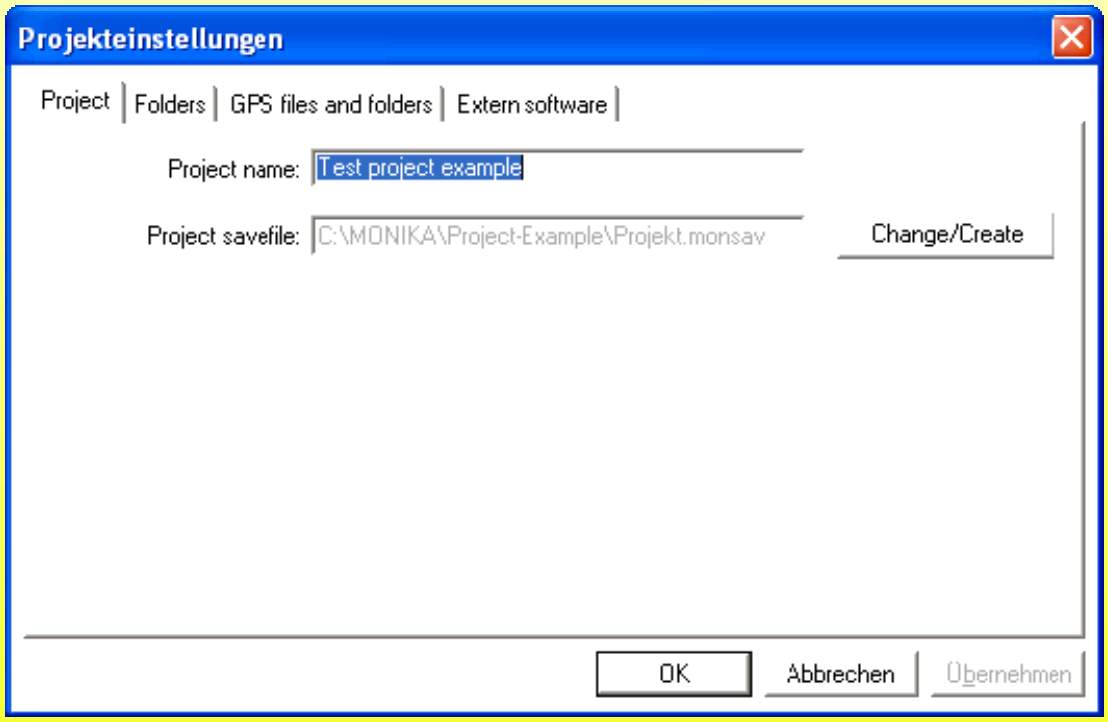
creating a new project



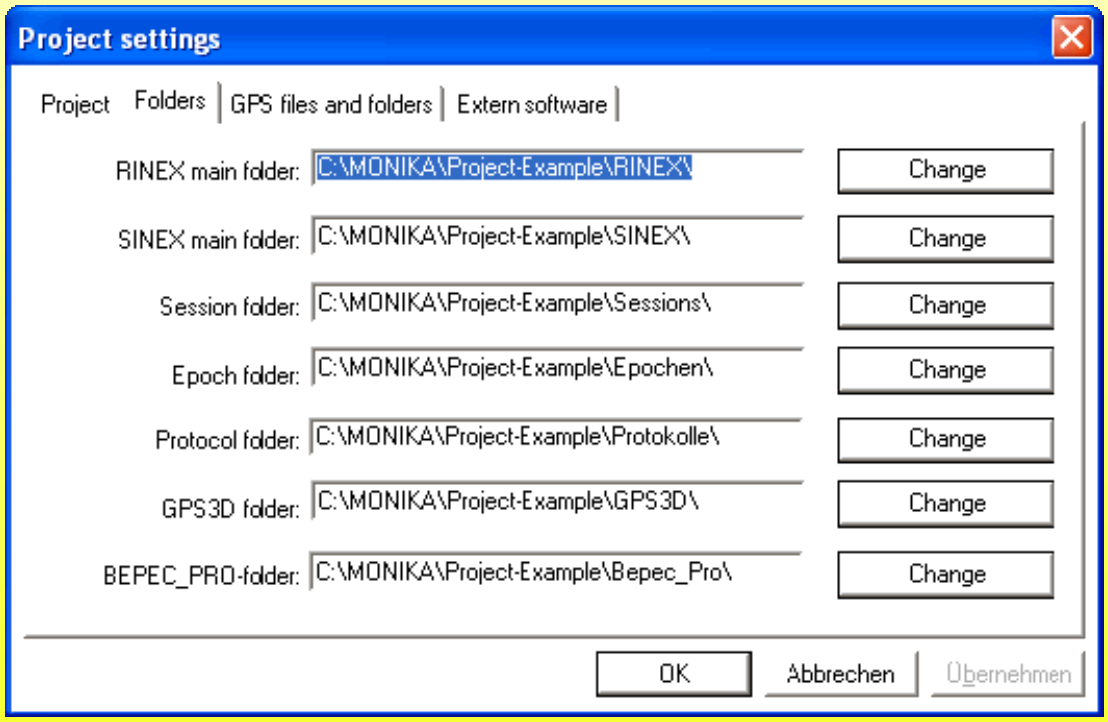
creating a new save file



Project settings - Project page



Project settings - Folders page



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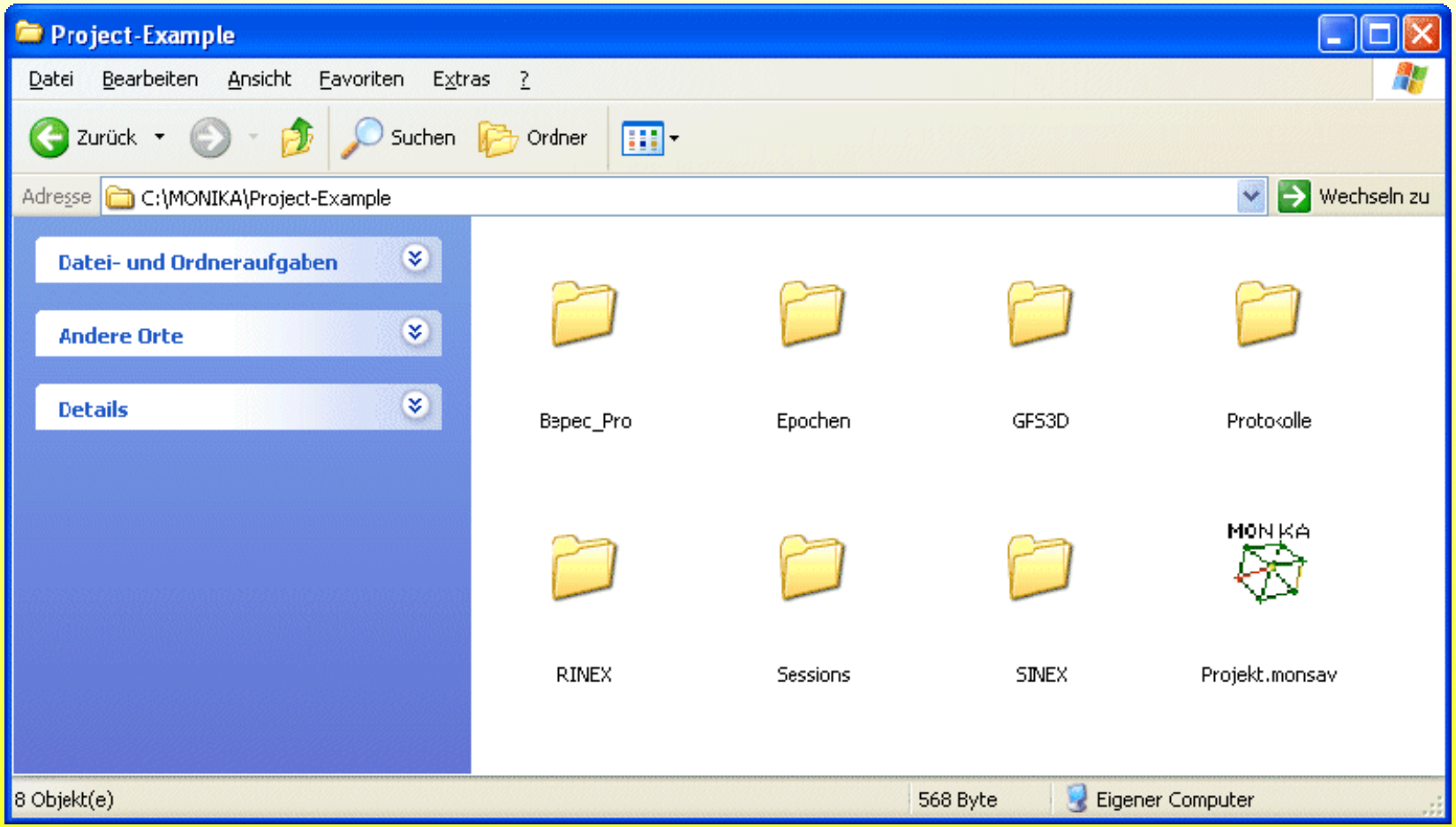
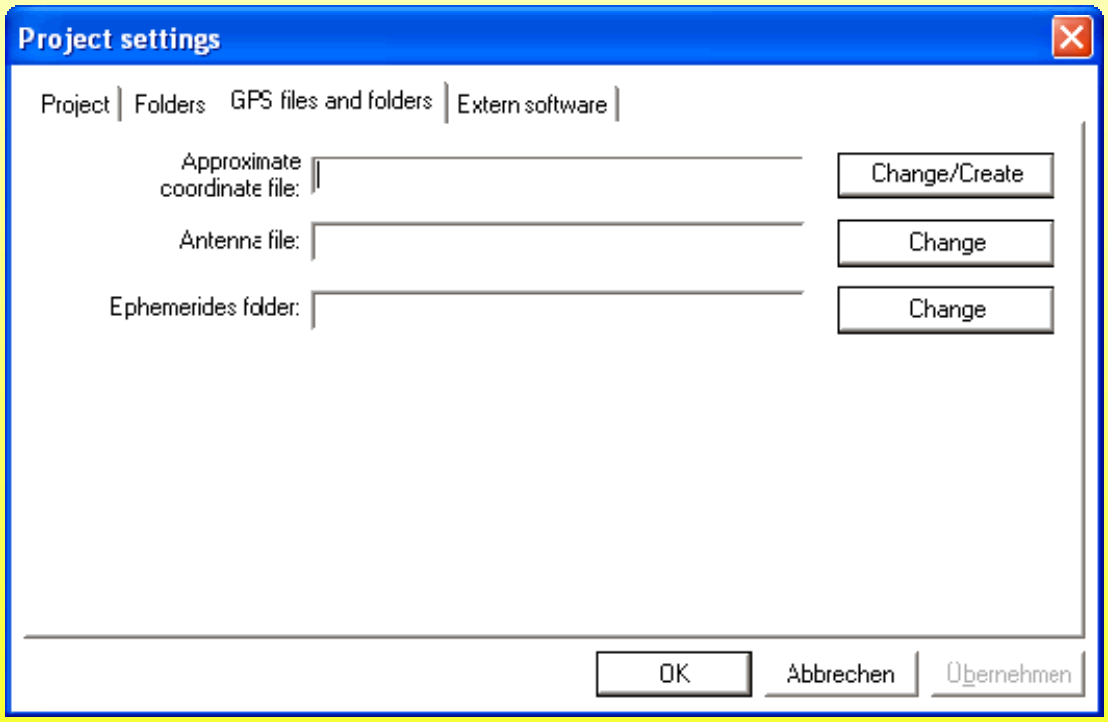


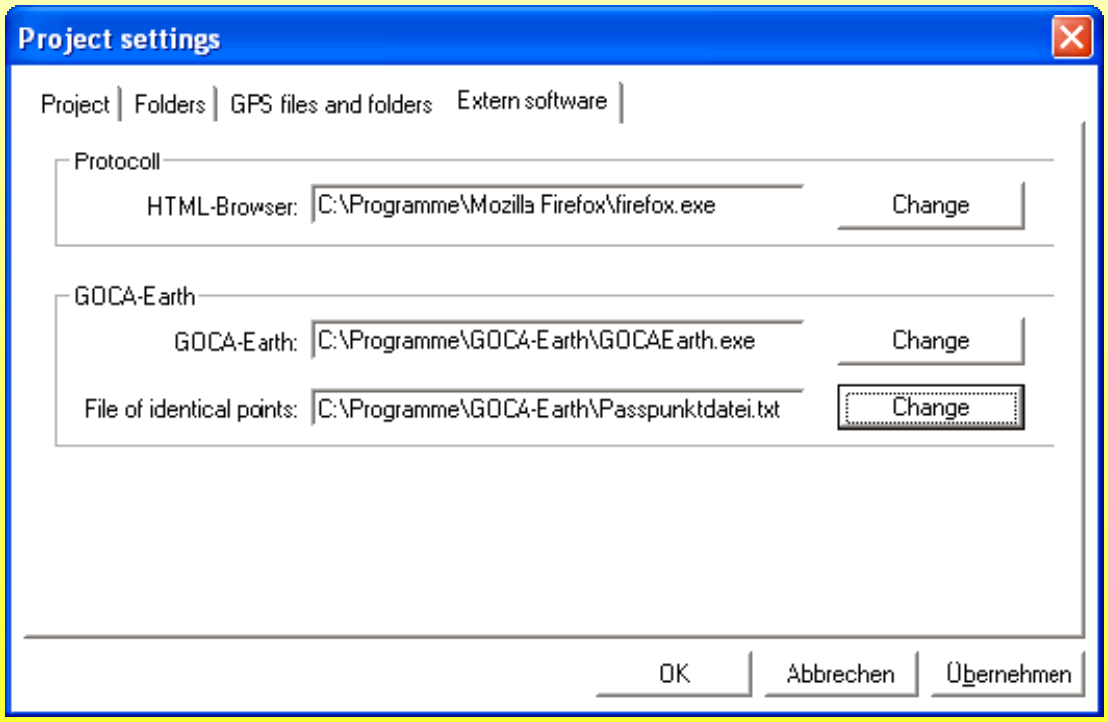
folder-based file handling

Project settings - GPS page



files which are needed for the baseline processing

Project settings - extern software page



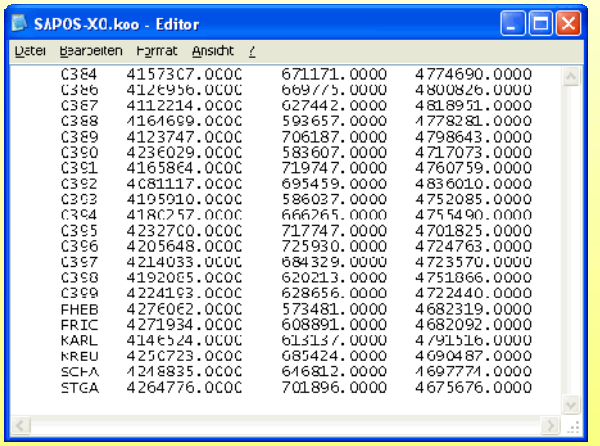
eg. internet browser for protocol viewing

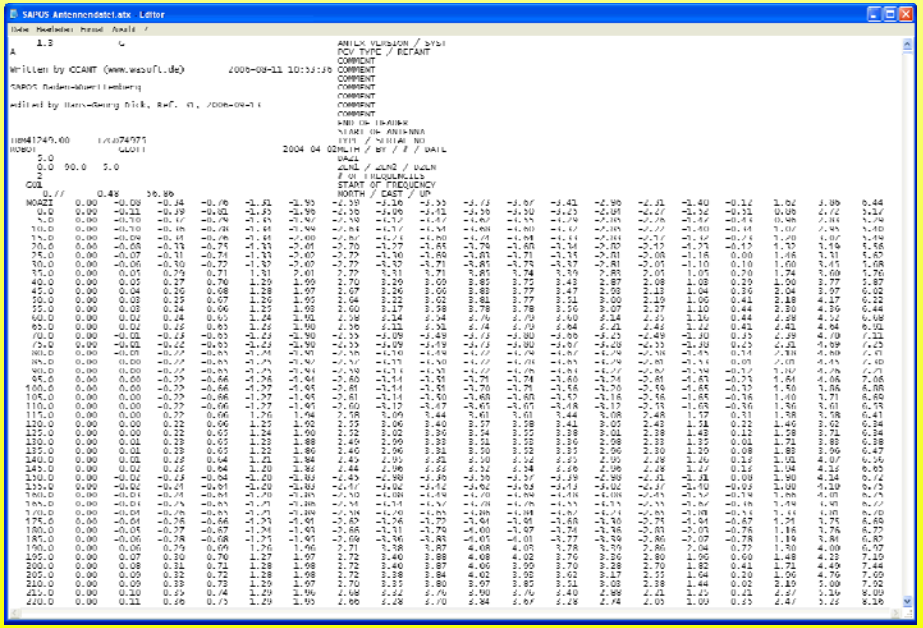
3. Baseline processing

3.1 Preparatory work

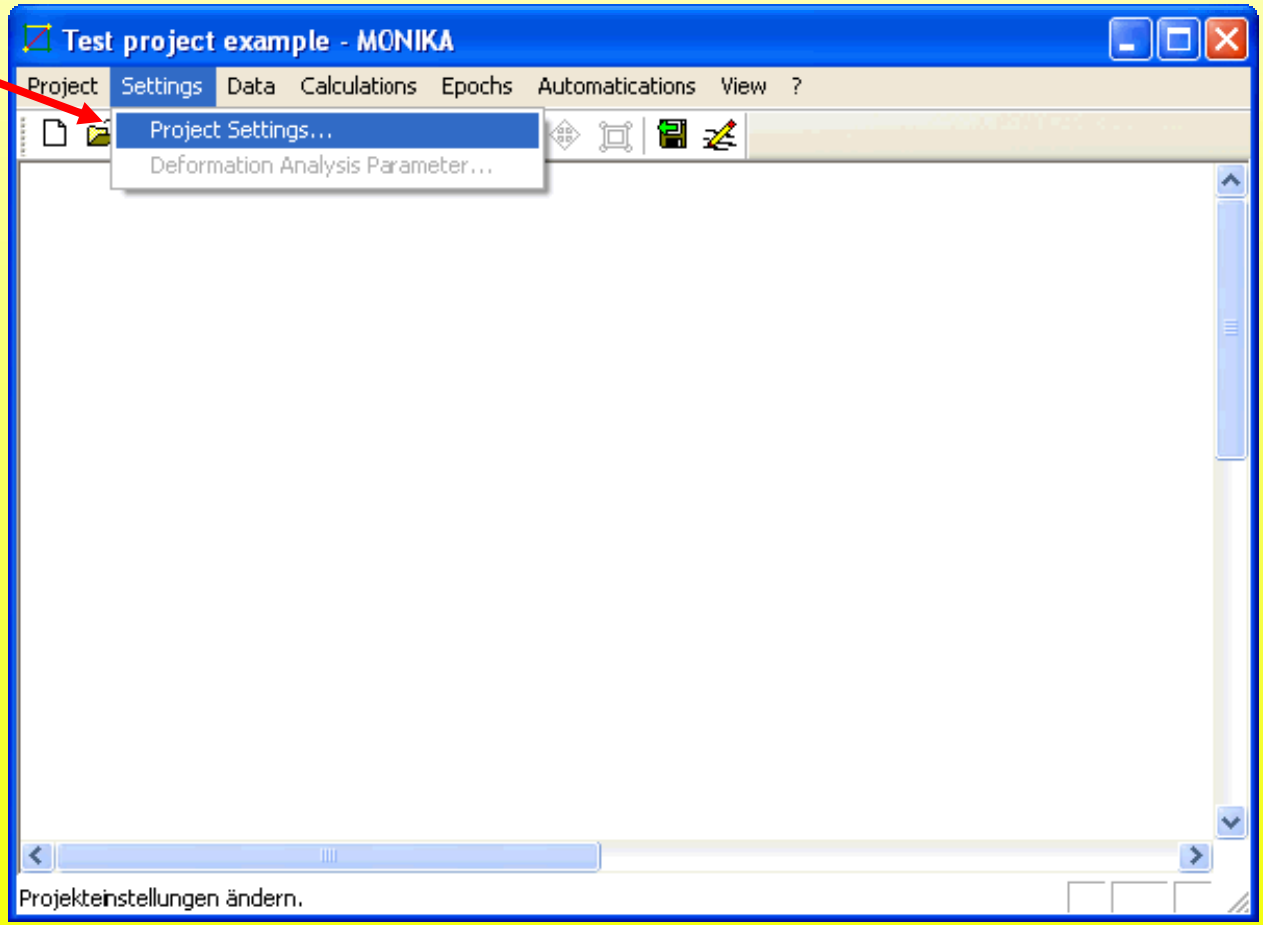
Files needed:

- Aproximate coordinates (for net design)
- Antenna calibration file
- RINEX files
- Ephemerides data (optional)



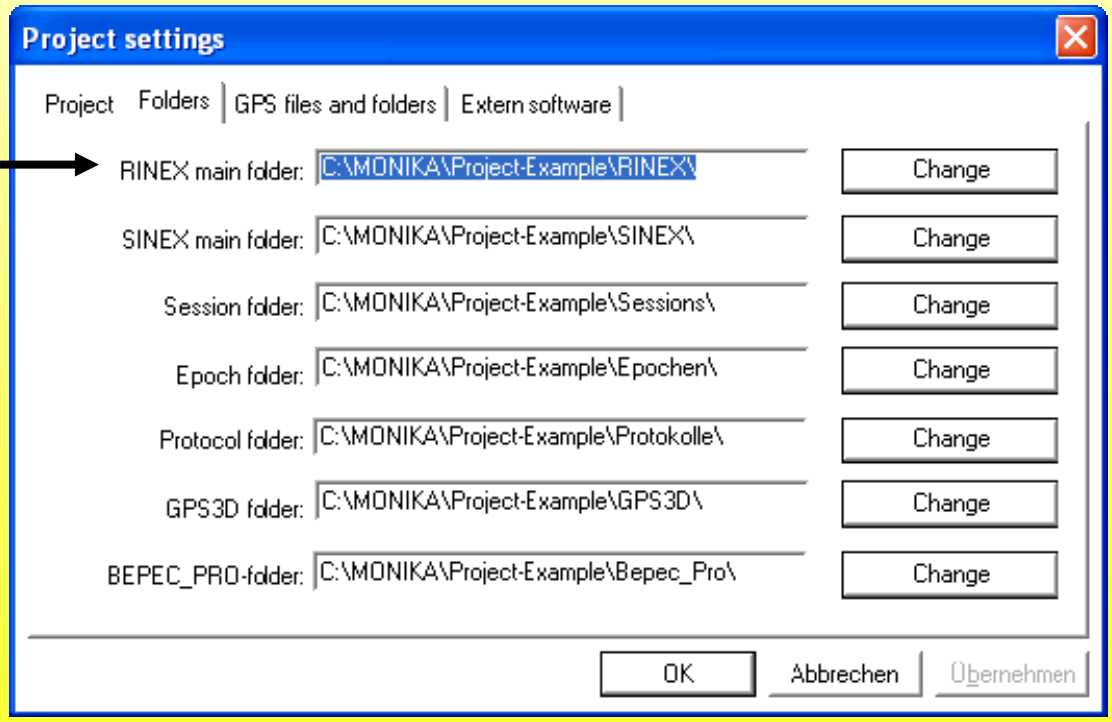


project settings

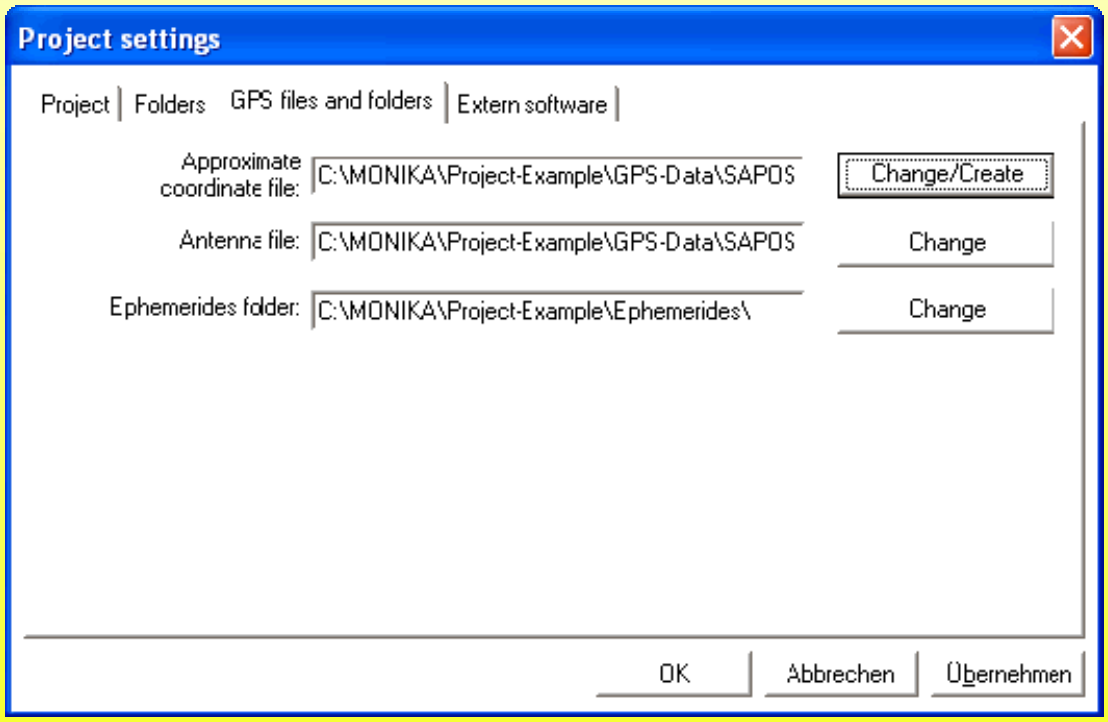


Project settings - Folders page

main folder for RINEX files



Project settings - GPS page



files which are needed for the baseline processing

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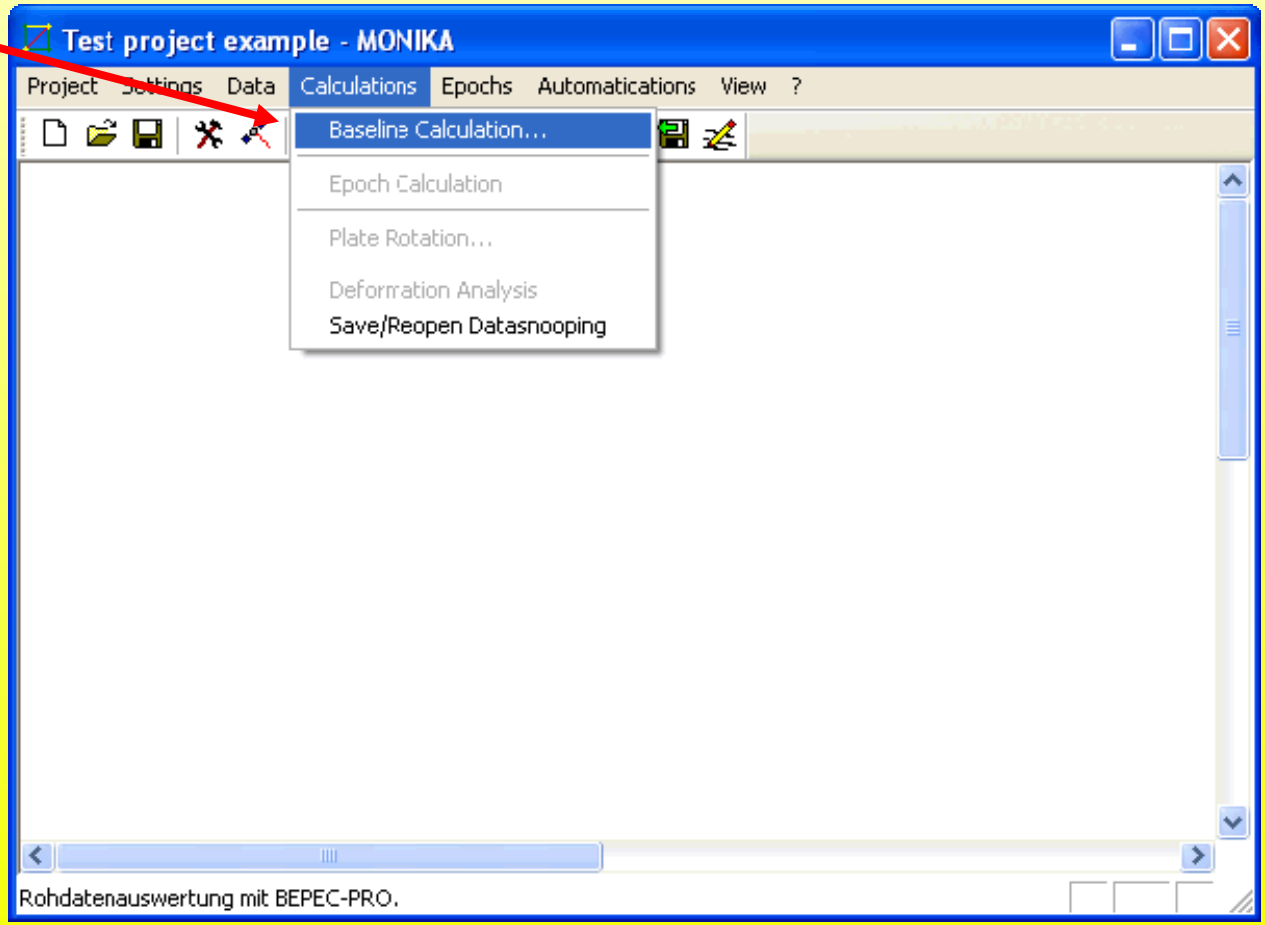
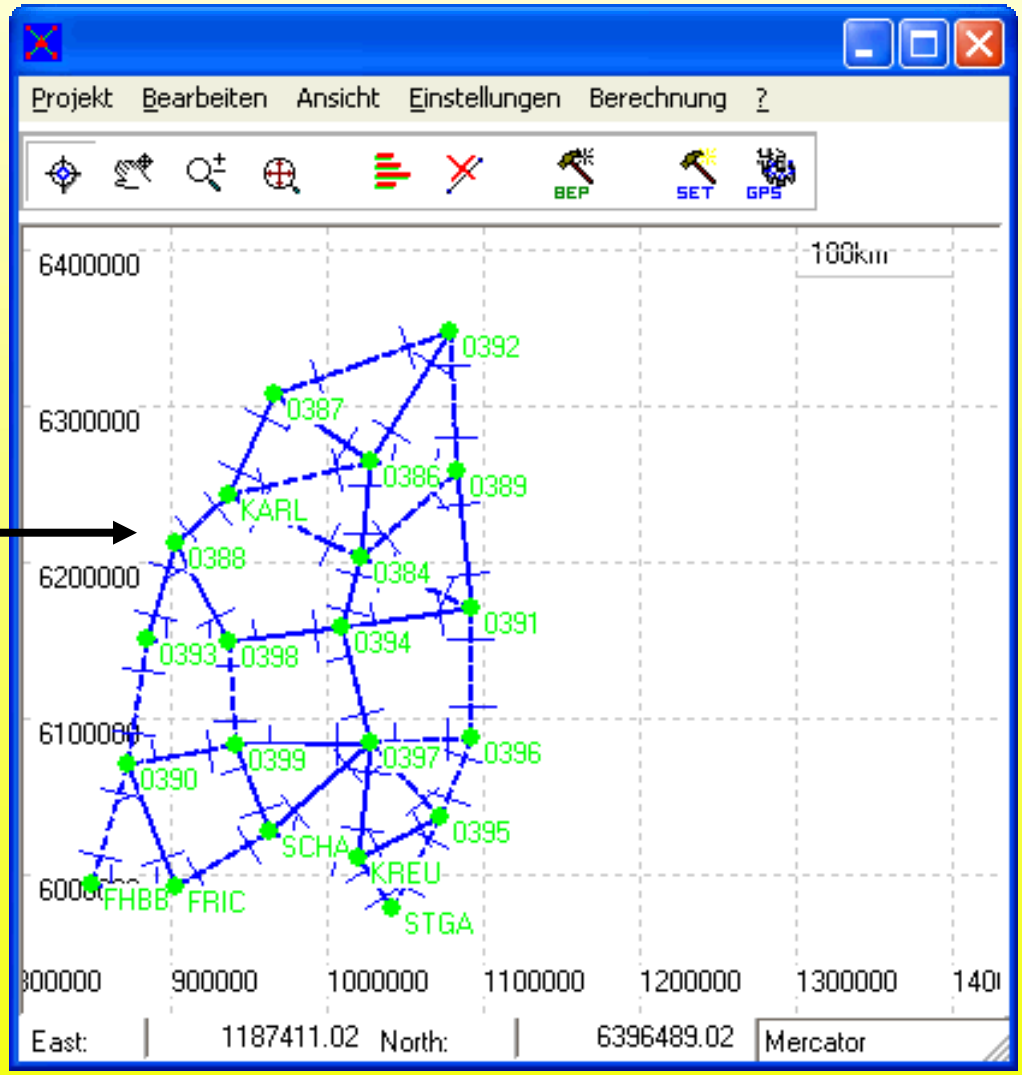
baseline processing



BEPEC_PRO DLL

Automatic baseline creation

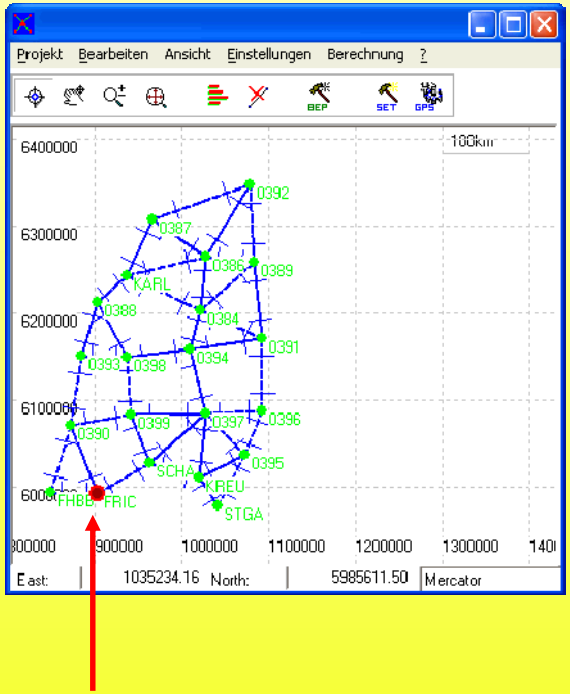
(only german interface available)

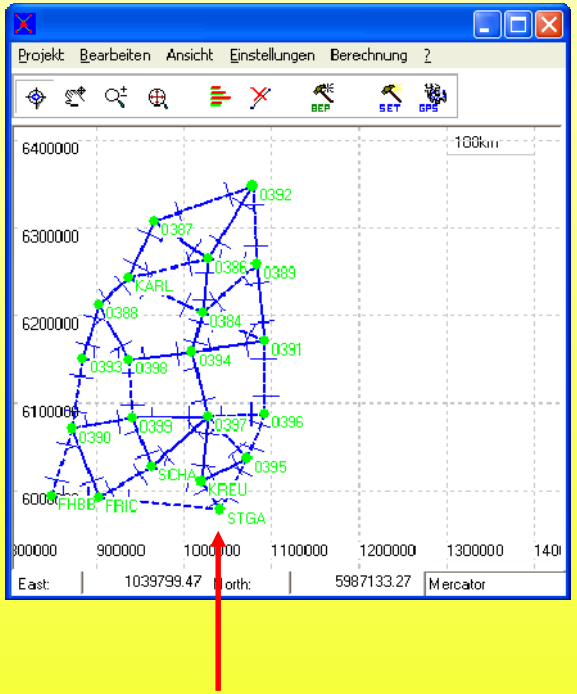


BEPEC_PRO DLL

create baseline

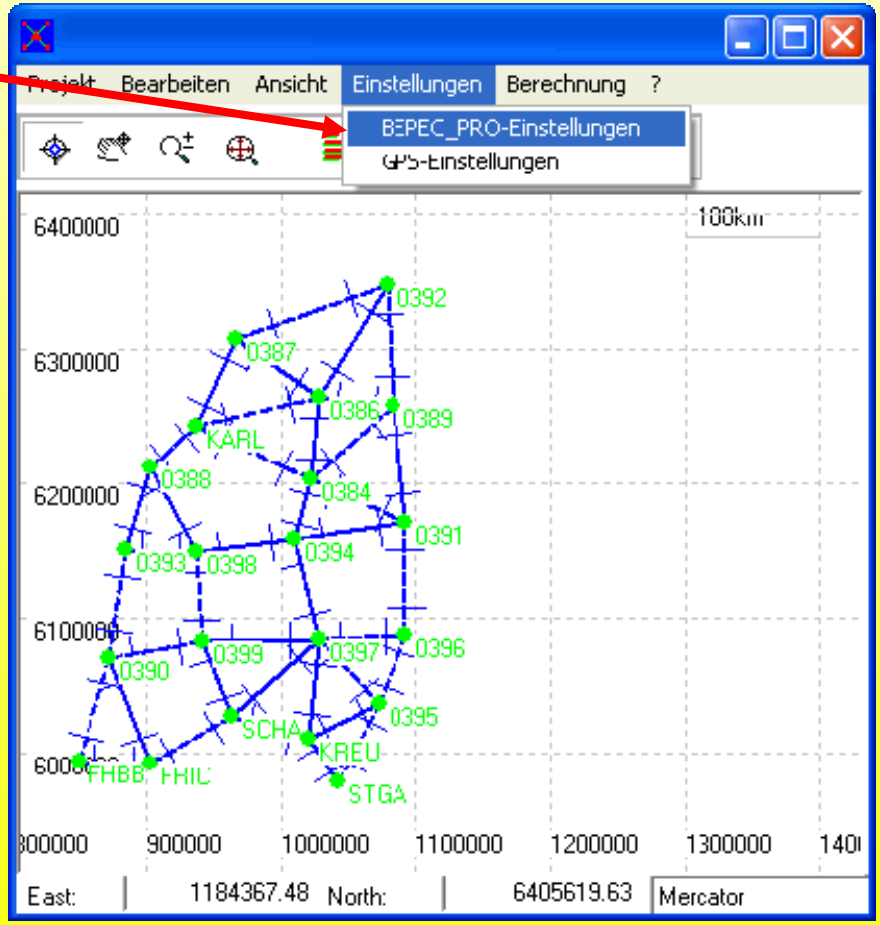
(left click on points)





delete baseline: Mark baseline with left click and then delete it with right click.

BEPEC_PRO settings



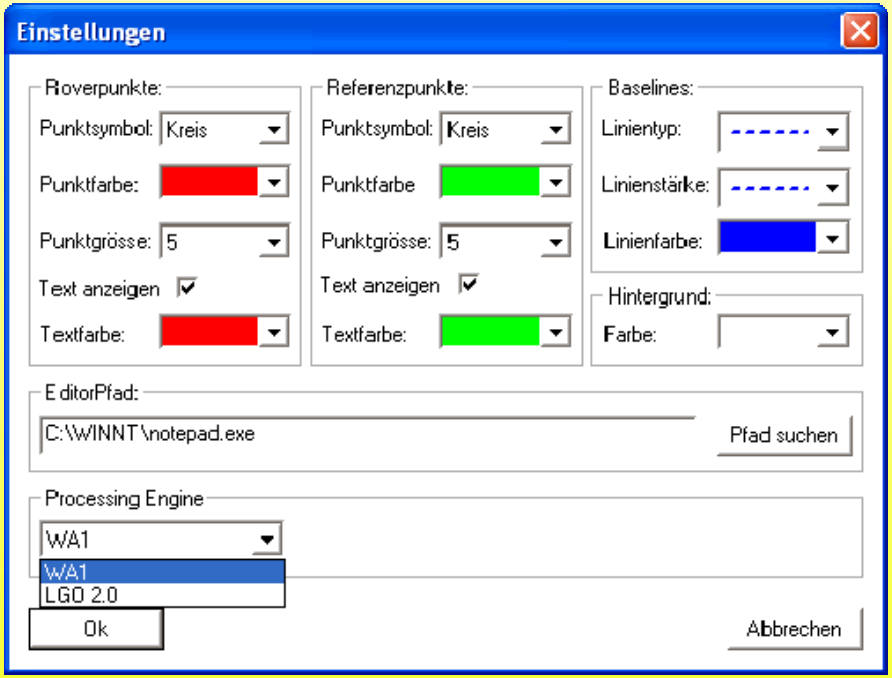
BEPEC_PRO DLL

View settings

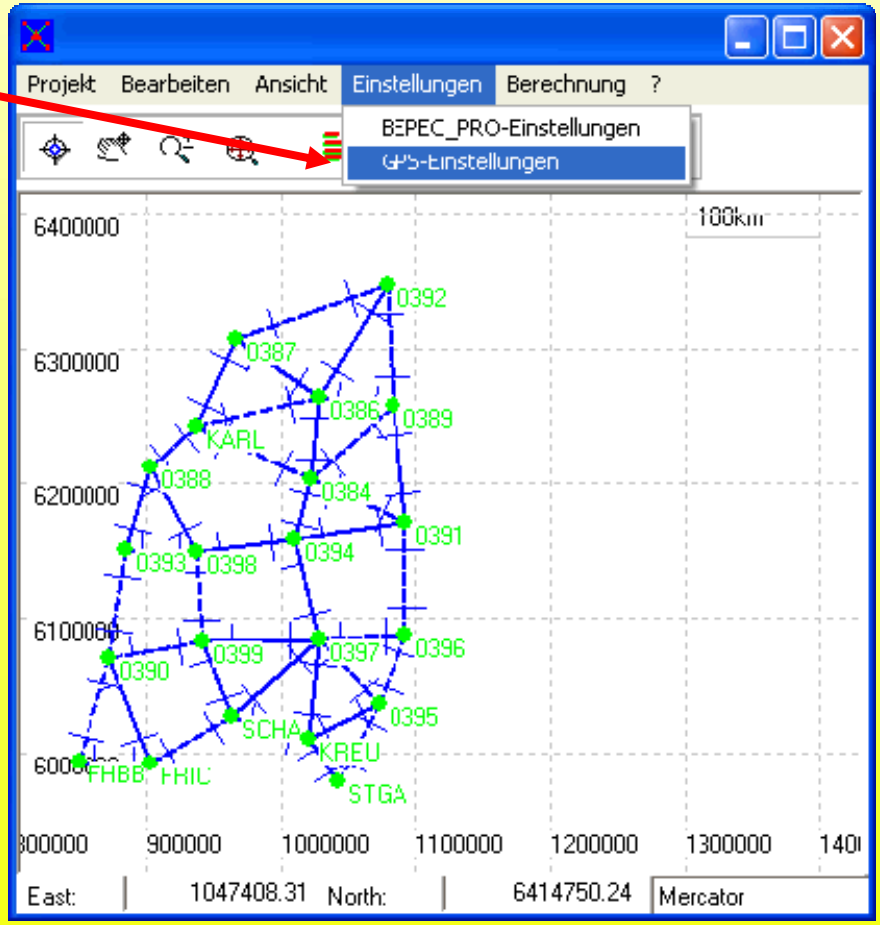
Editor setting

Processing engine

(WA1, LGO 2.0)



GPS settings



BEPEC_PRO DLL

used satellites

solution type (best)

raw data intervall (all data)

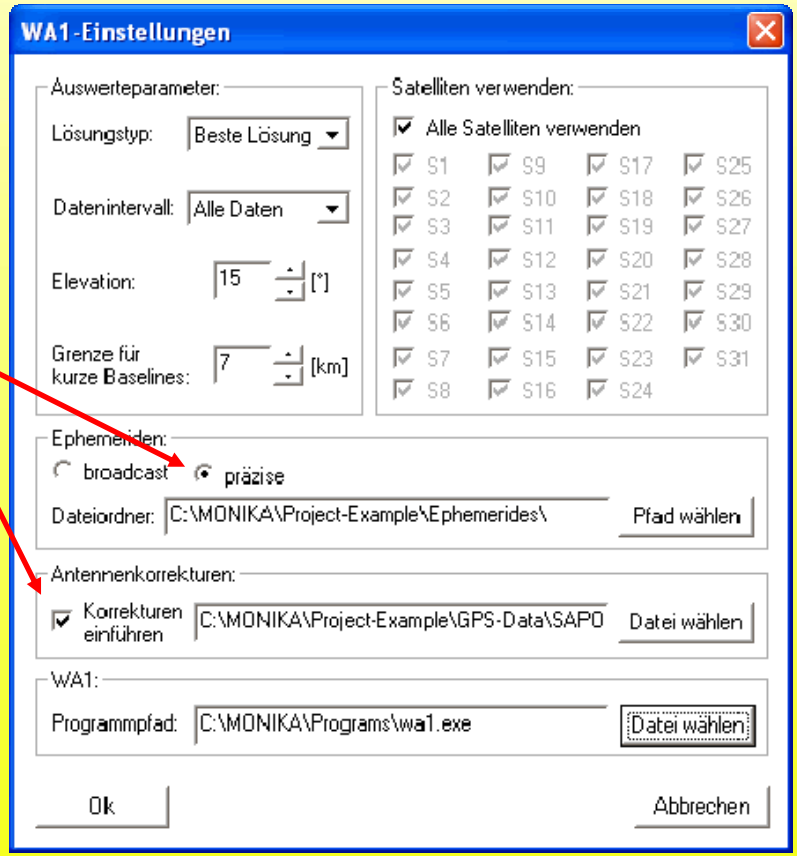
activate !

Ephemerides

Antenna corrections

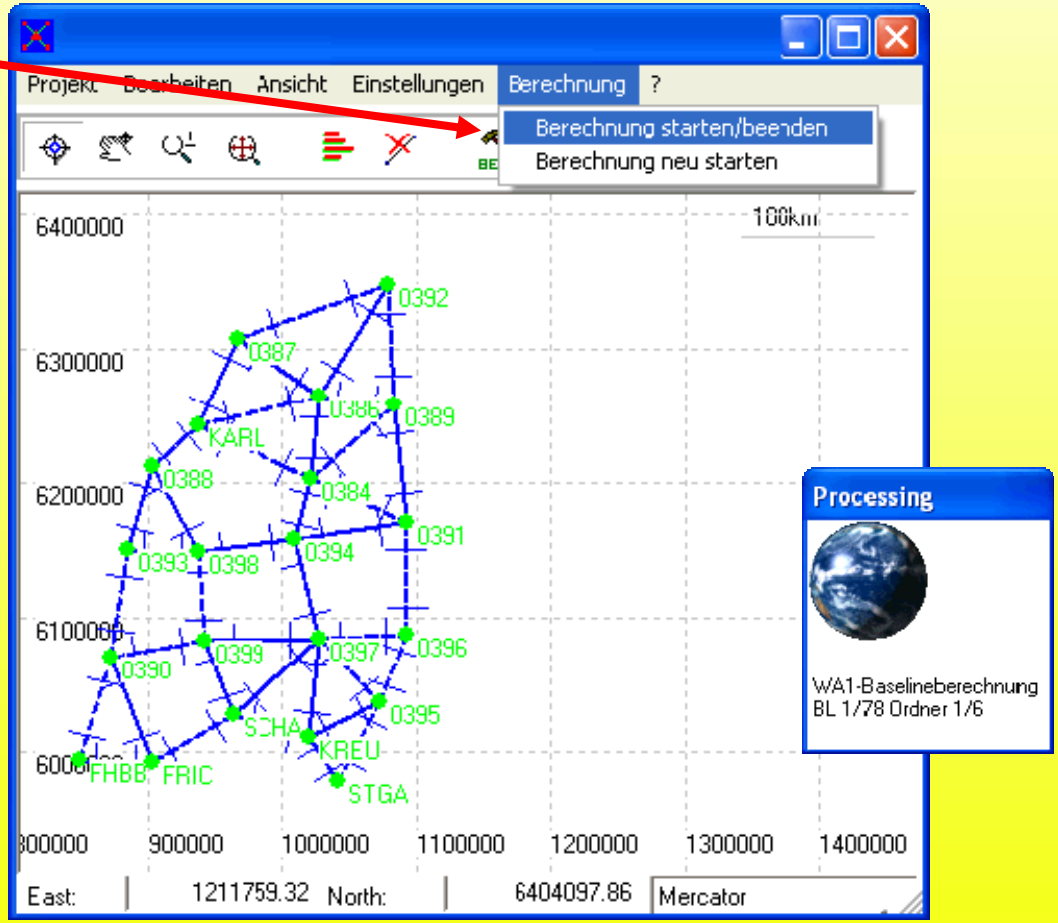
Processing engine

(executeable file)



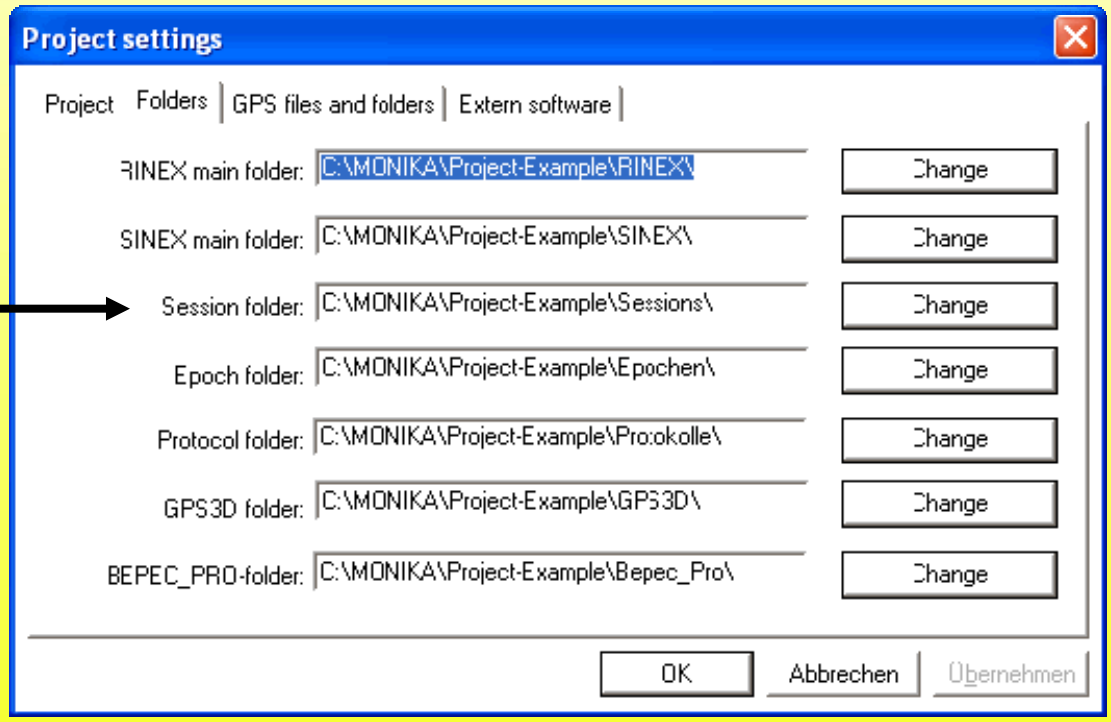
BEPEC_PRO DLL

start processing



Project settings - Folders page

baseline processing solutions are saved here



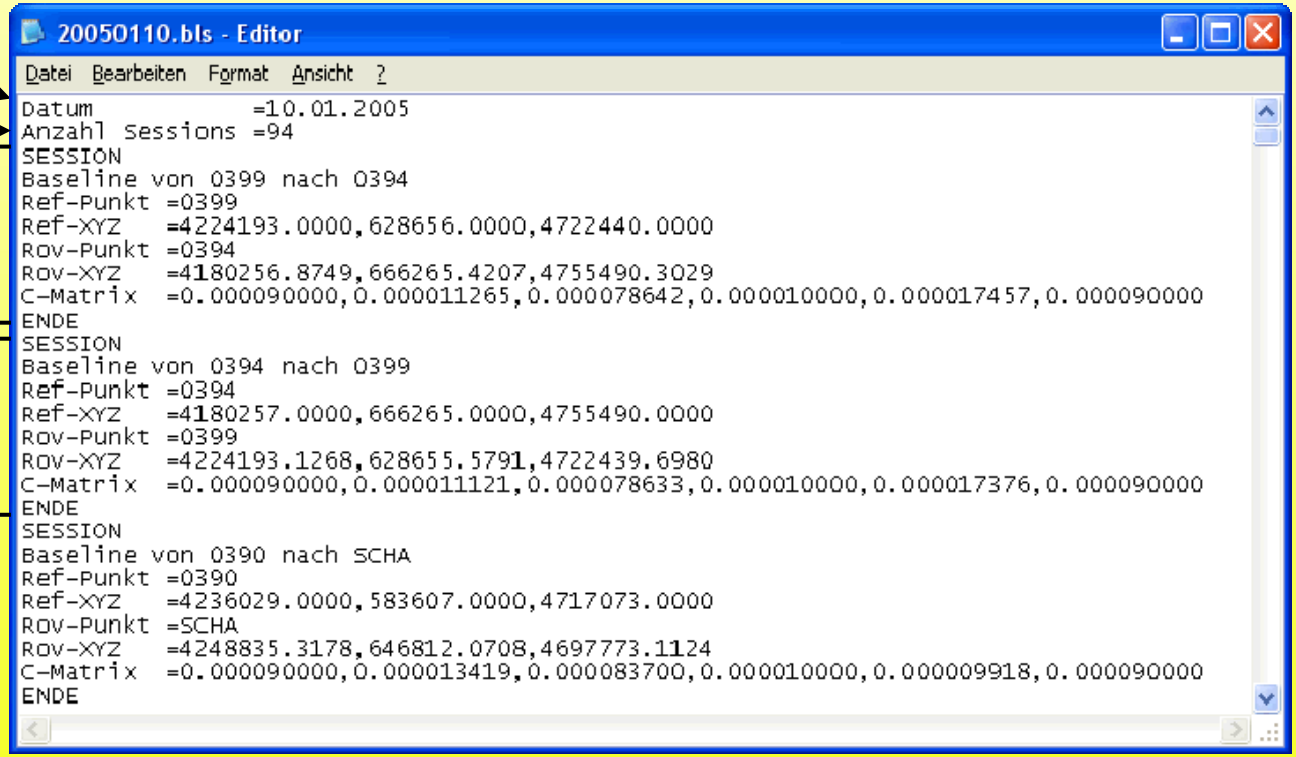
3.4 BLS-Format

Date

Number of Sessions

1. Baseline

2. Baseline



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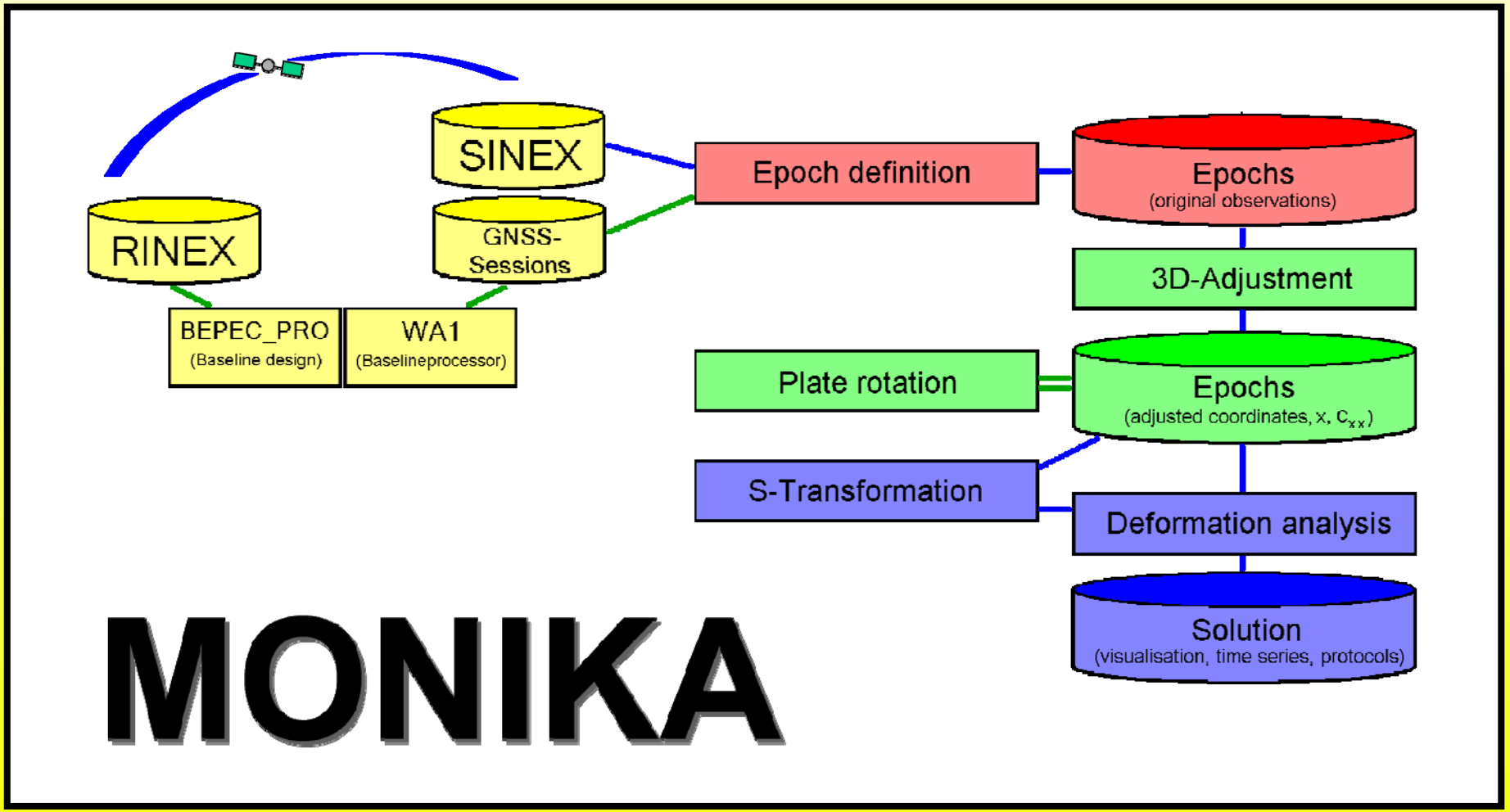
Overview

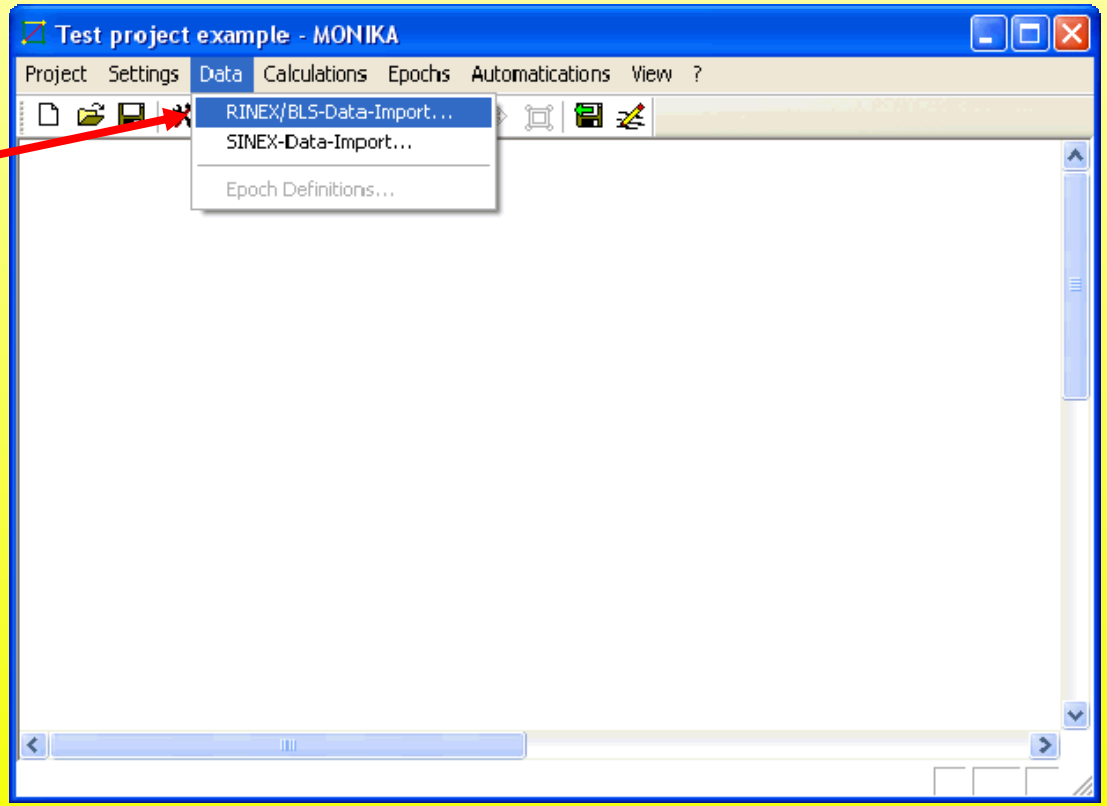


4. Epoch definition

4.1 BLS-Data-Import

Dayly sessions files

RINEX/BLS-Import



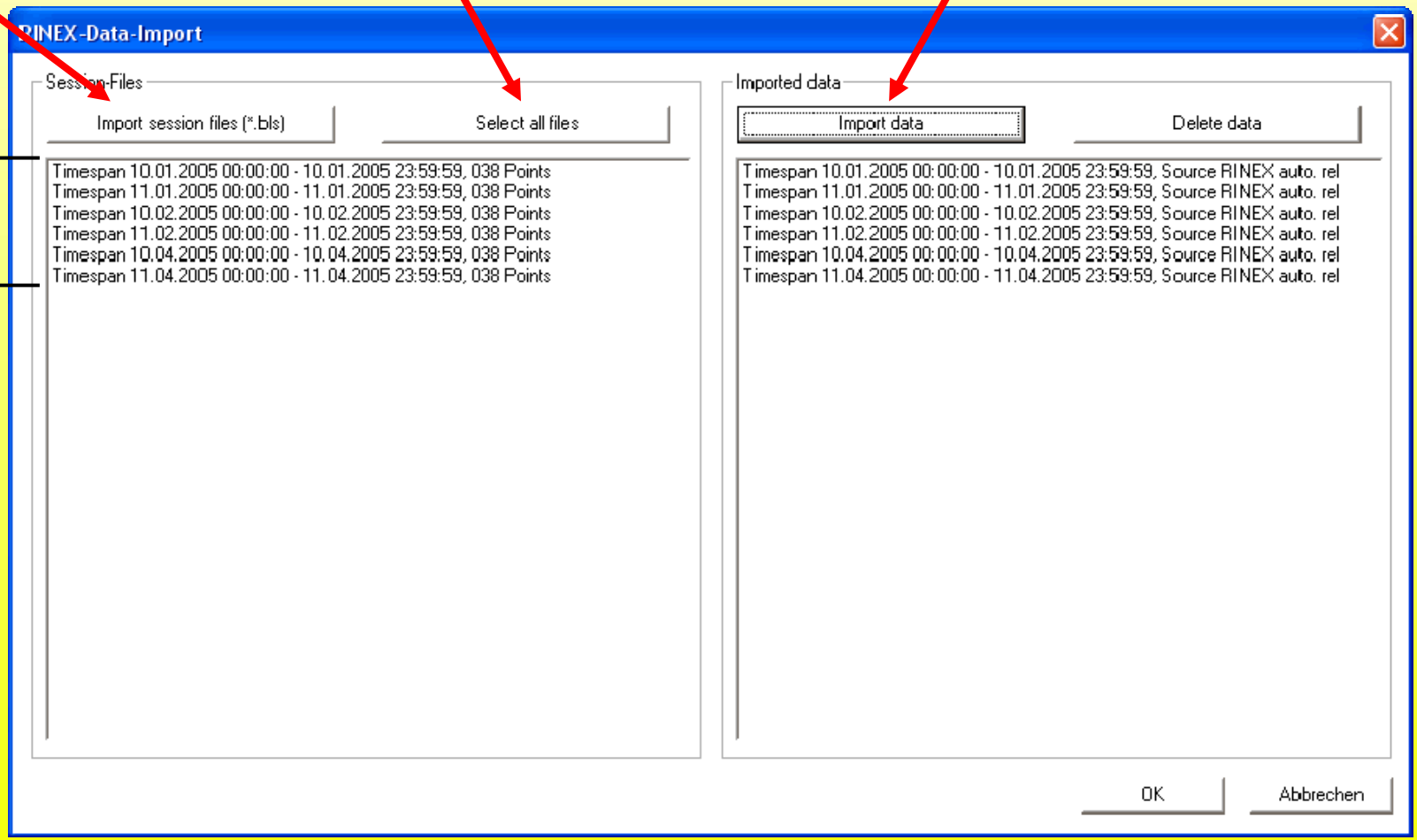
BLS-Data-Import dialog

1.open files (*.bls)

2.select files

3.import files

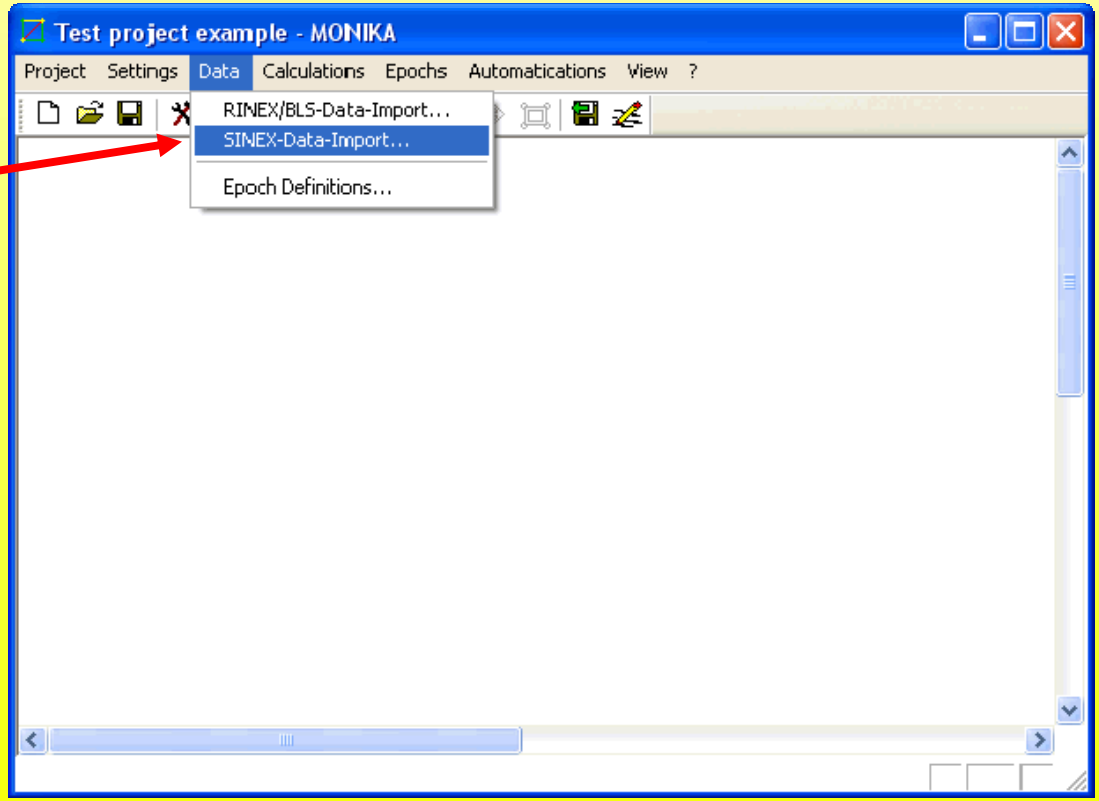
data



4.2 SINEX-Data-Import

(SINEX Format V2.1, Estimate solution or Normal Equation - Format)

SINEX-Import



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SINEX-Data-Import dialog

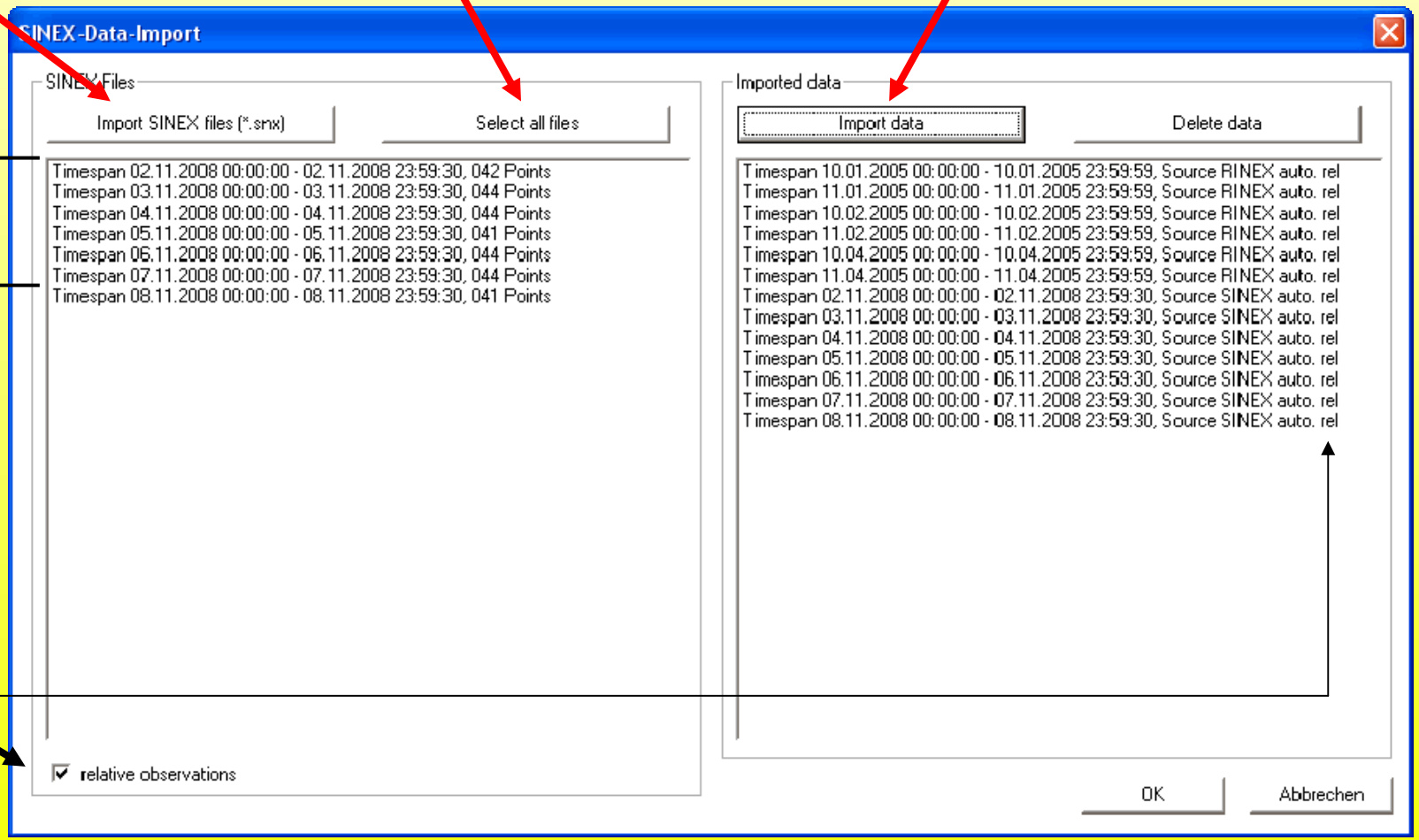
1.open files (*.snx)

2.select files

3.import files

data

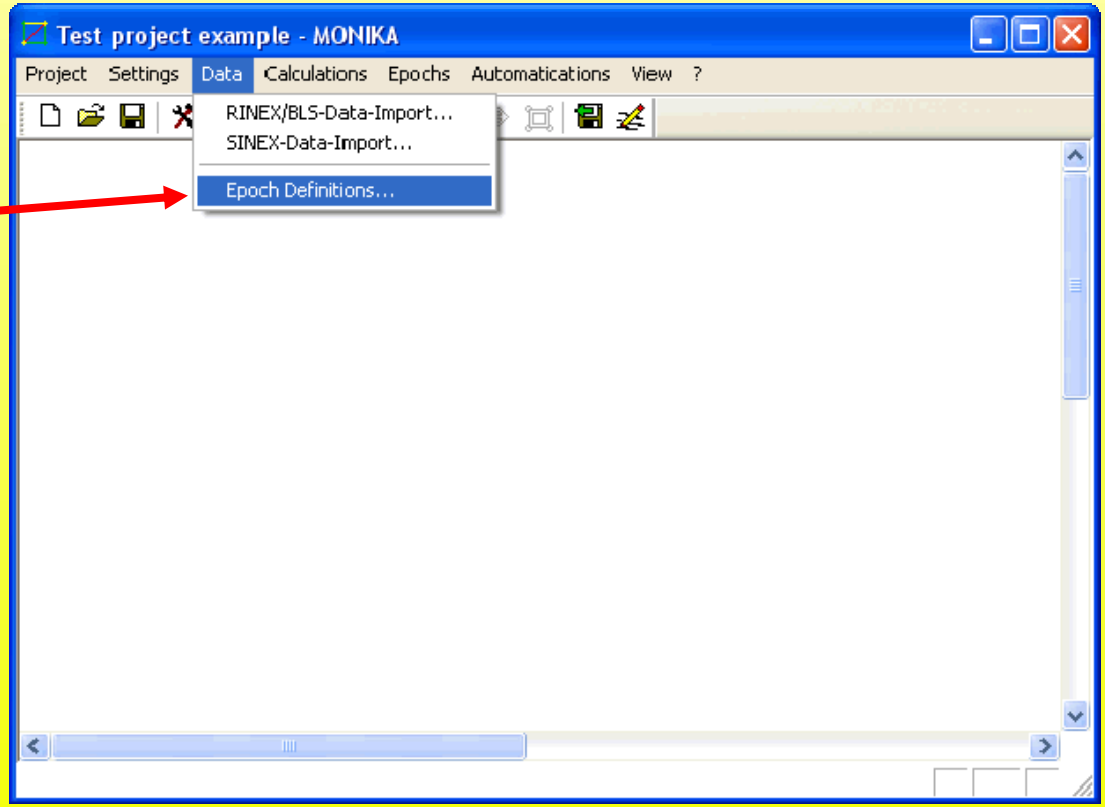
absolute or relative data ?



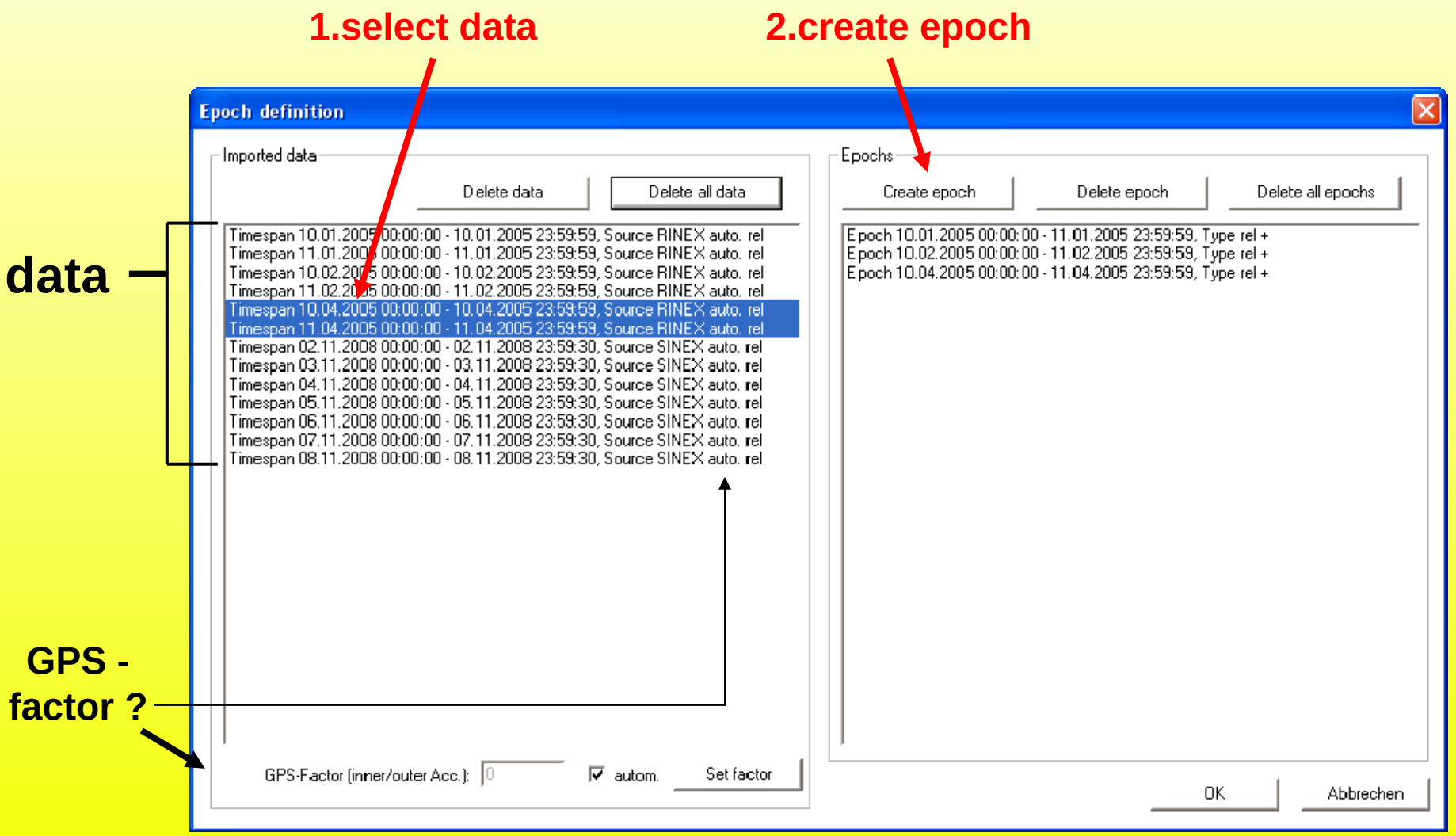
4.3 Epoch definition

(only available, if data already have been imported)

epoch definition



Epoch definition dialog



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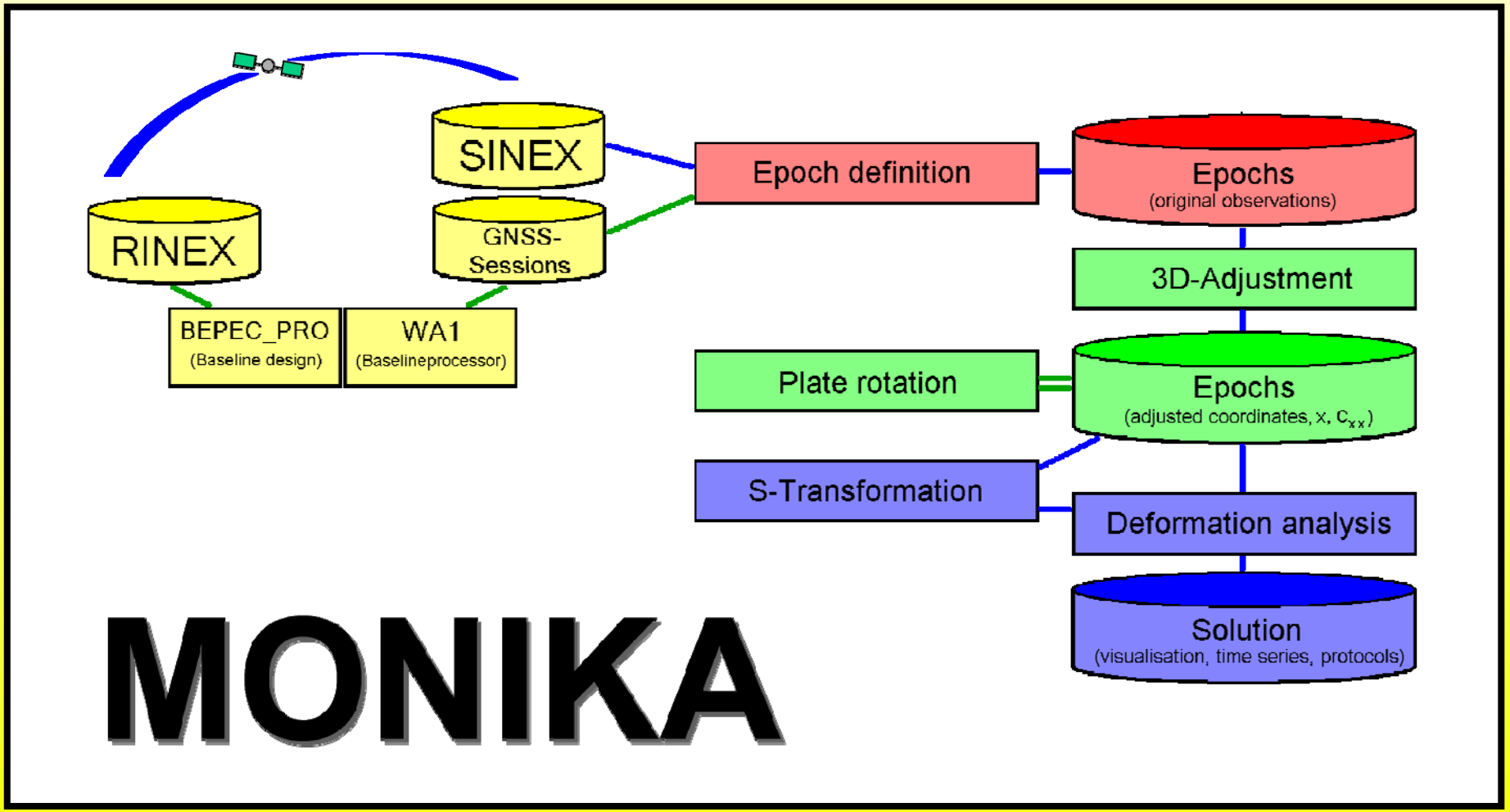
Overview



5. 3D-Adjustment

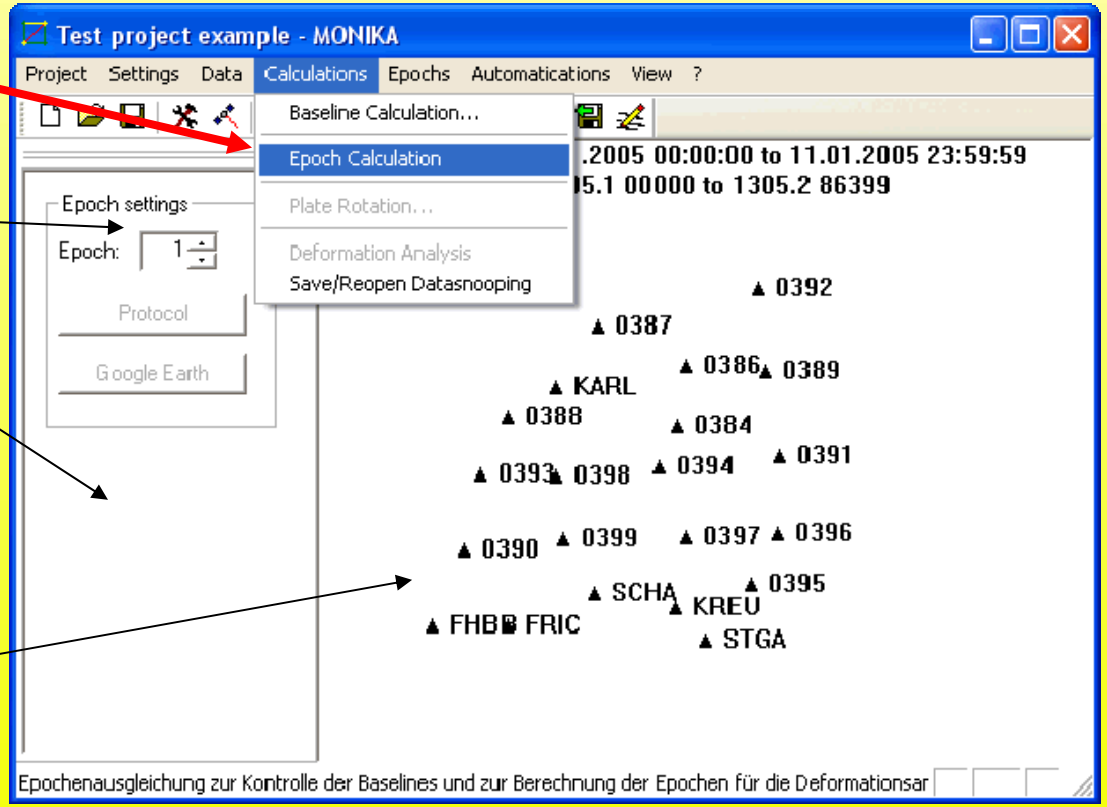
(with GPS3D.dll)

start 3D-Epoch-Adjustment

actual epoch

navigation bar

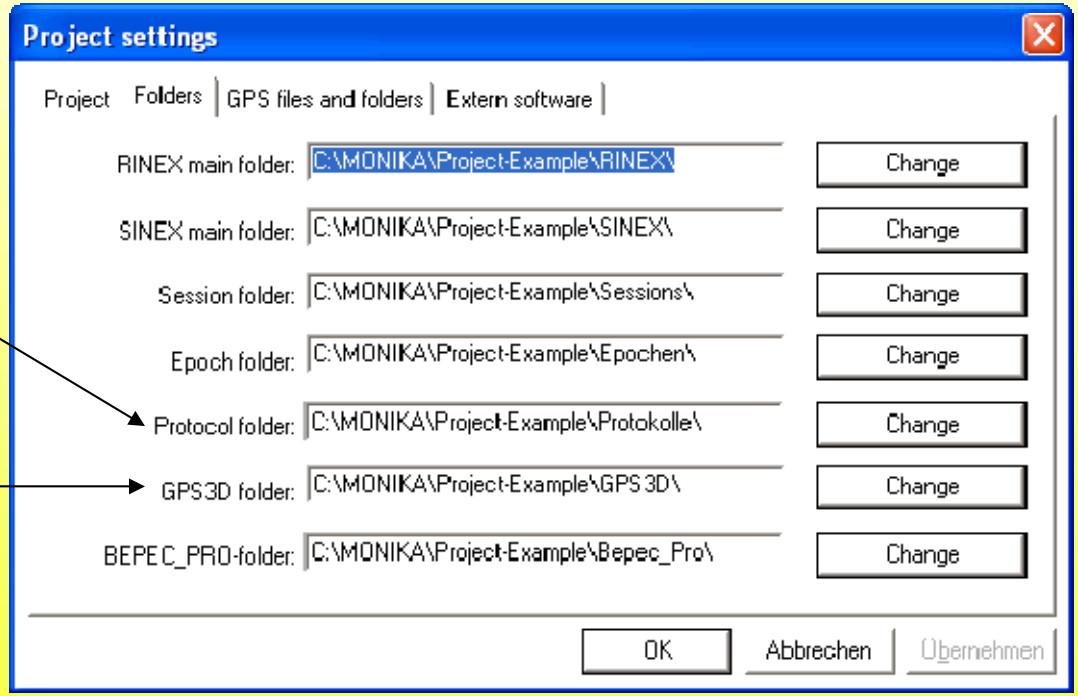
when epochs are defined, they are displayed in the main window



Solutions

GPS3D-HTLM-Protocol

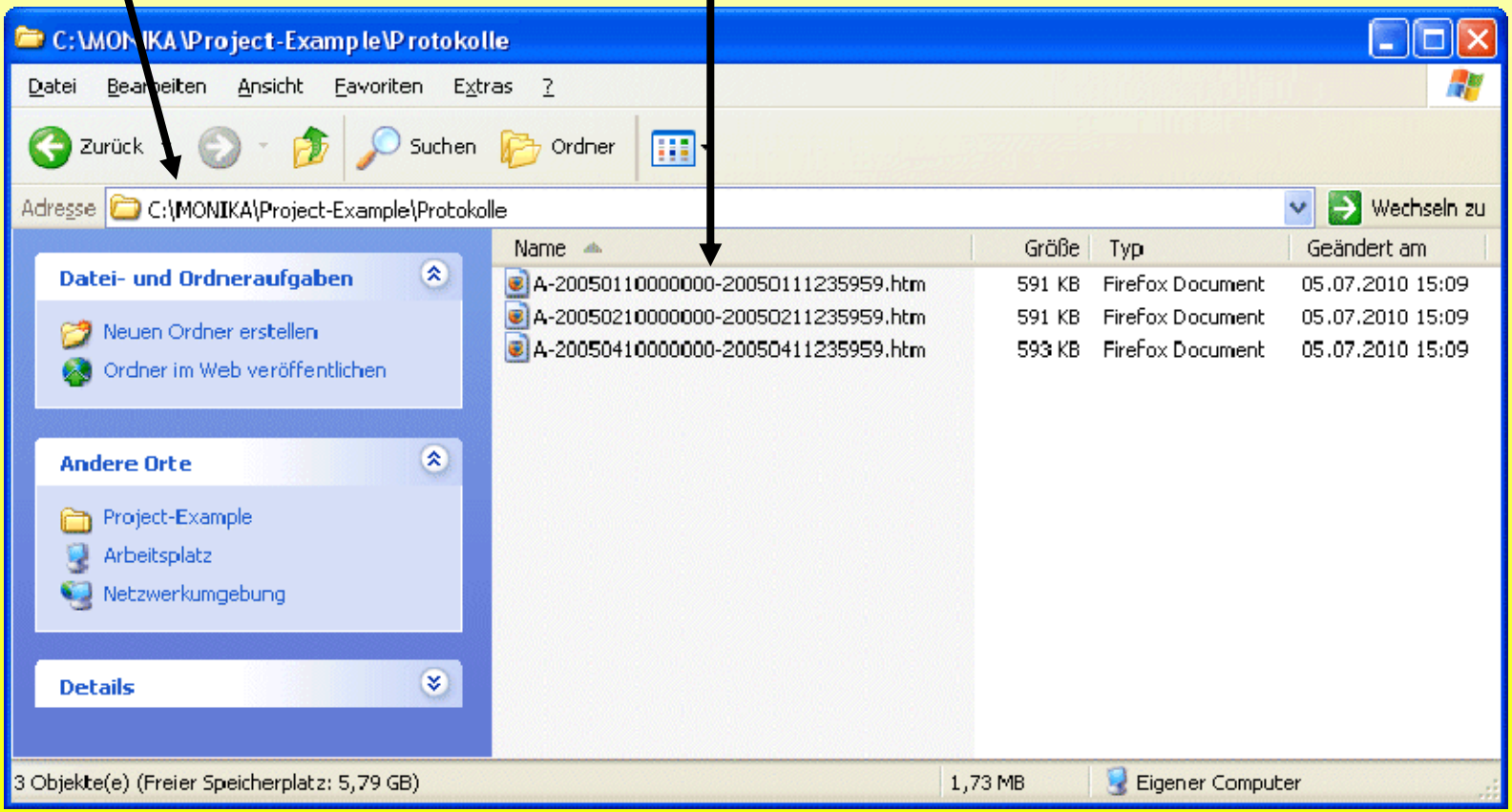
temporary files
(can be deleted)



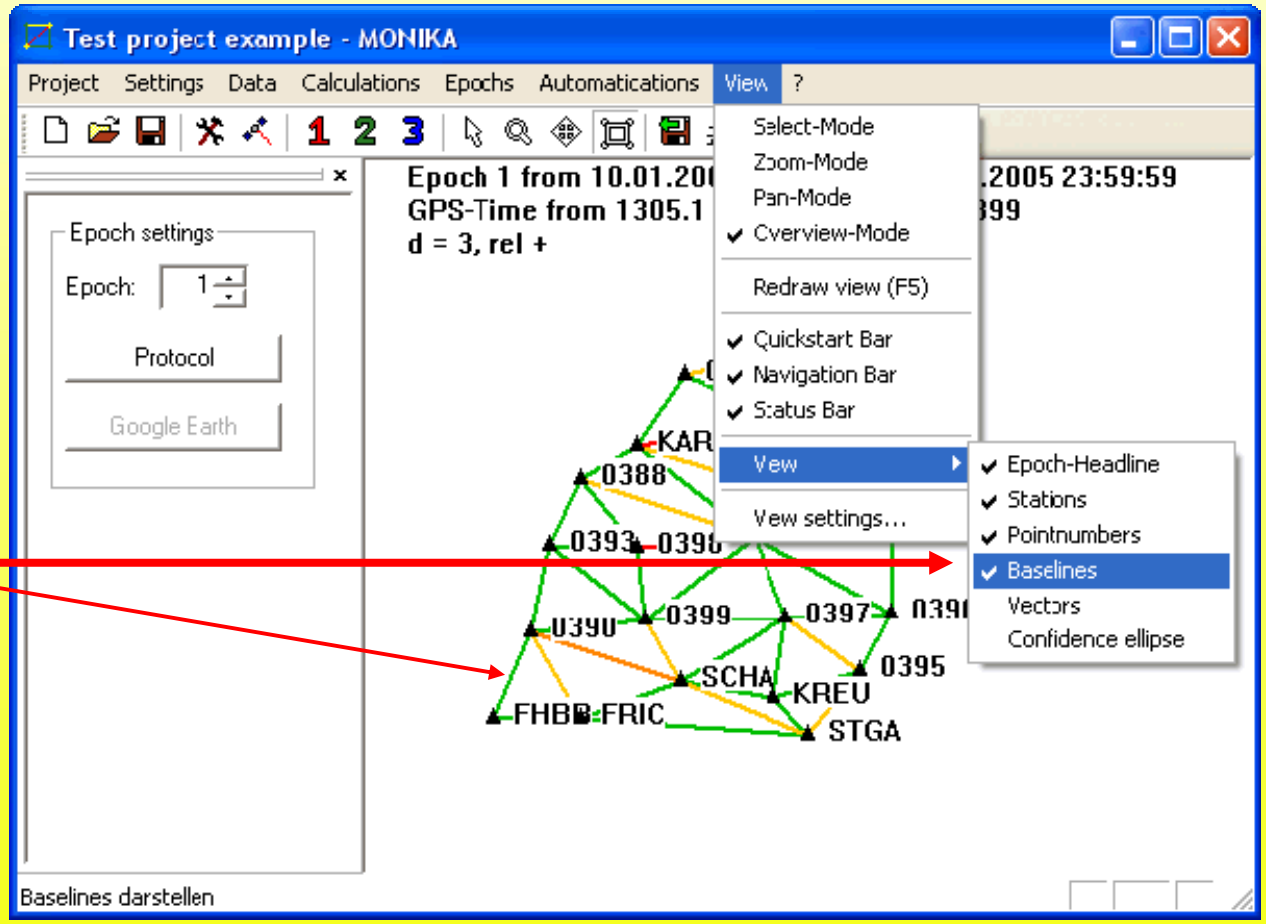
HTML-Protocols

Protocol-Folder

GPS3D-HTLM-Protocols



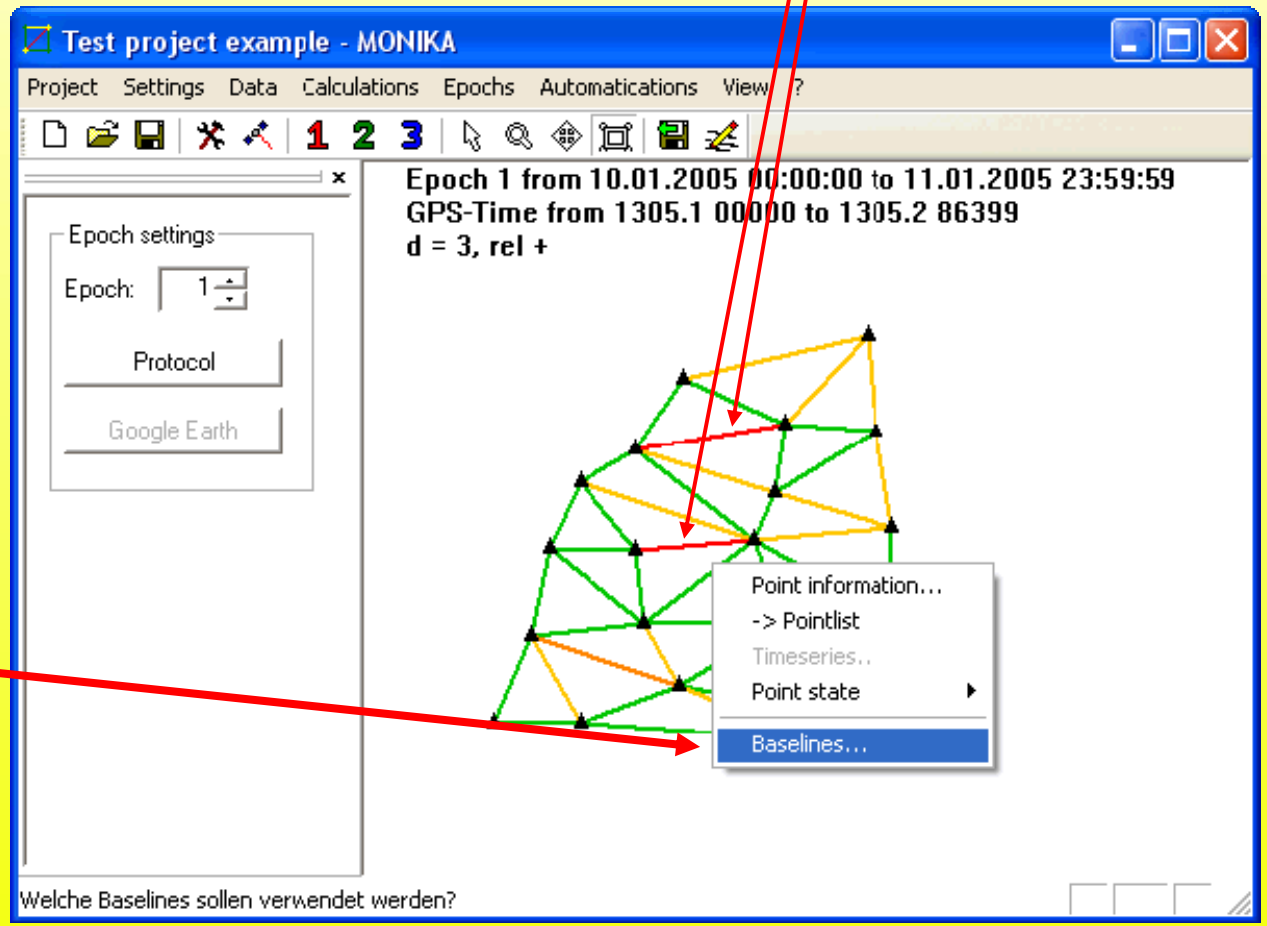
Display settings



show baselines

Analyse 3D-Adjustment

critical baselines

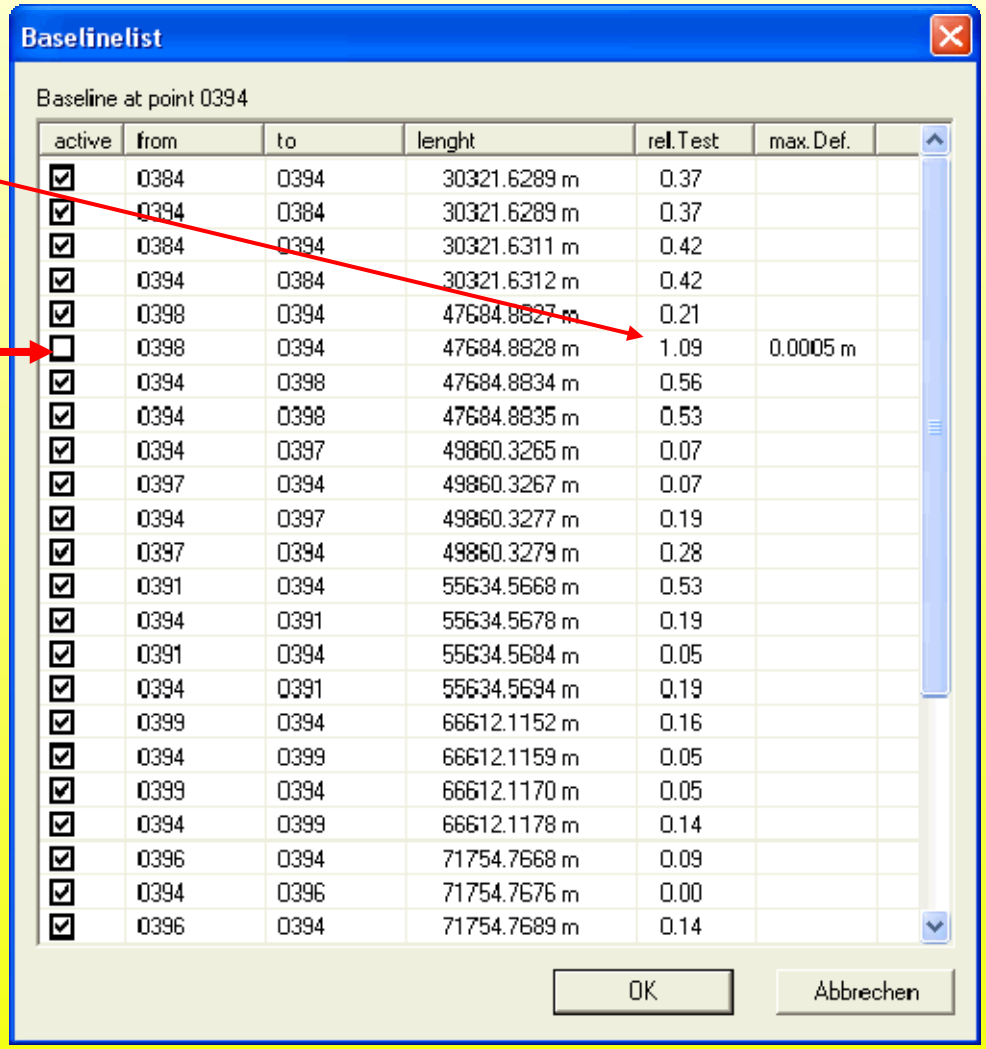


show baselines at point (right click)

Analyse 3D-Adjustment

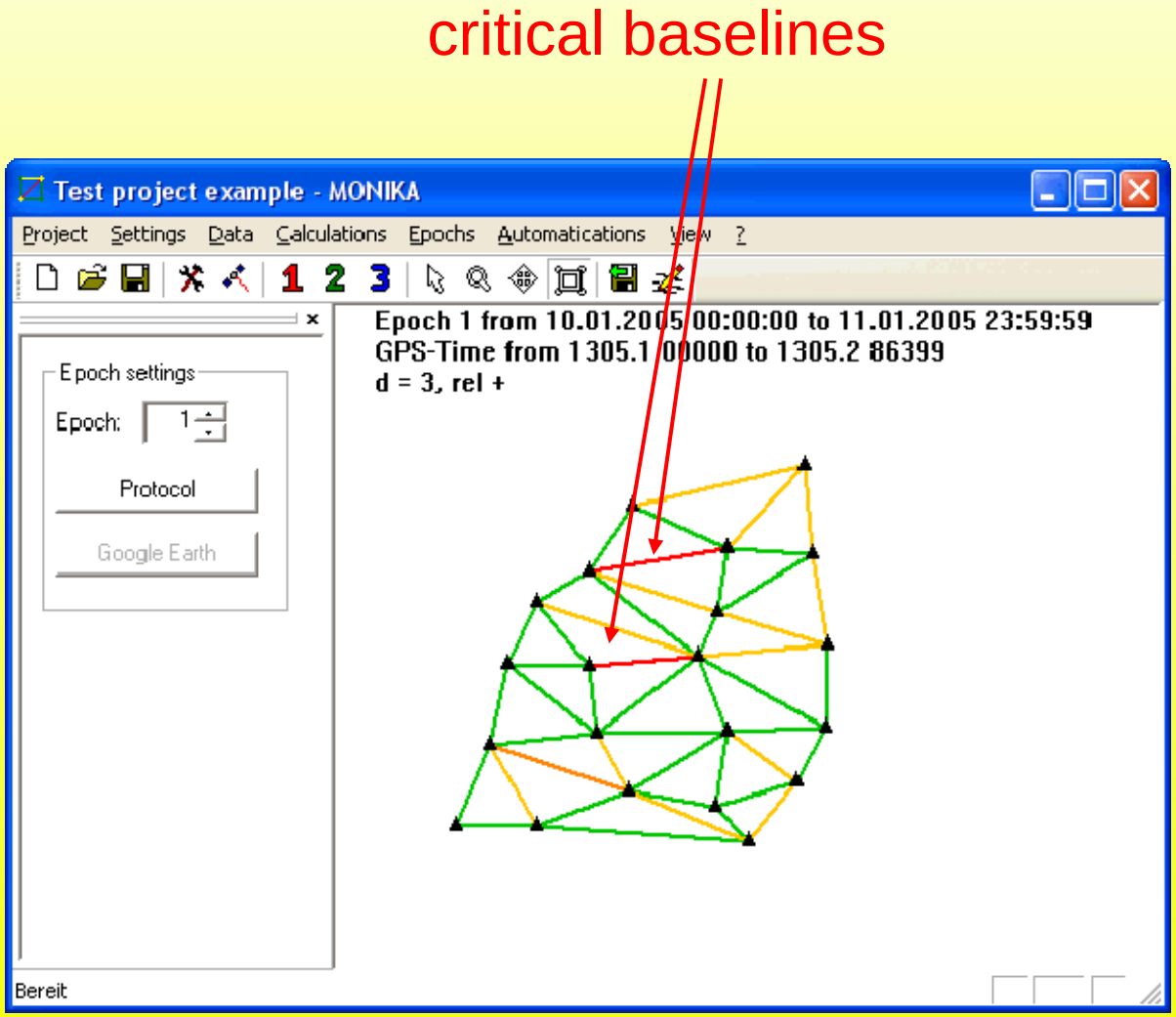
critical baseline

deactivate baseline



Analyse 3D-Adjustment

1. seach for critical baselines in all epochs
2. deaktivate the most critical baselines
3. calculate the 3D-Adjustment again

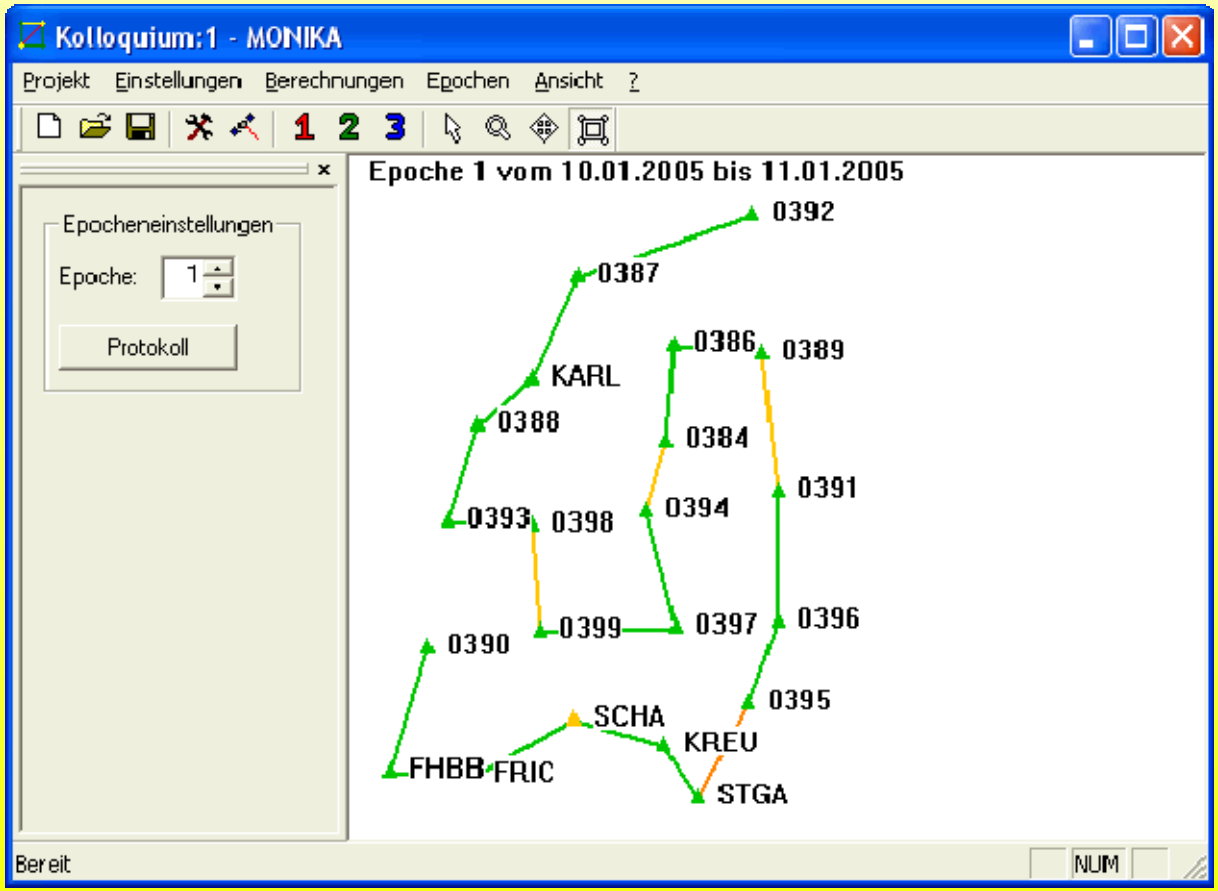


Baseline correlation

because of the the identical RINEX data, the baselines are correlated with each other.

solution:

➡ line of baselines



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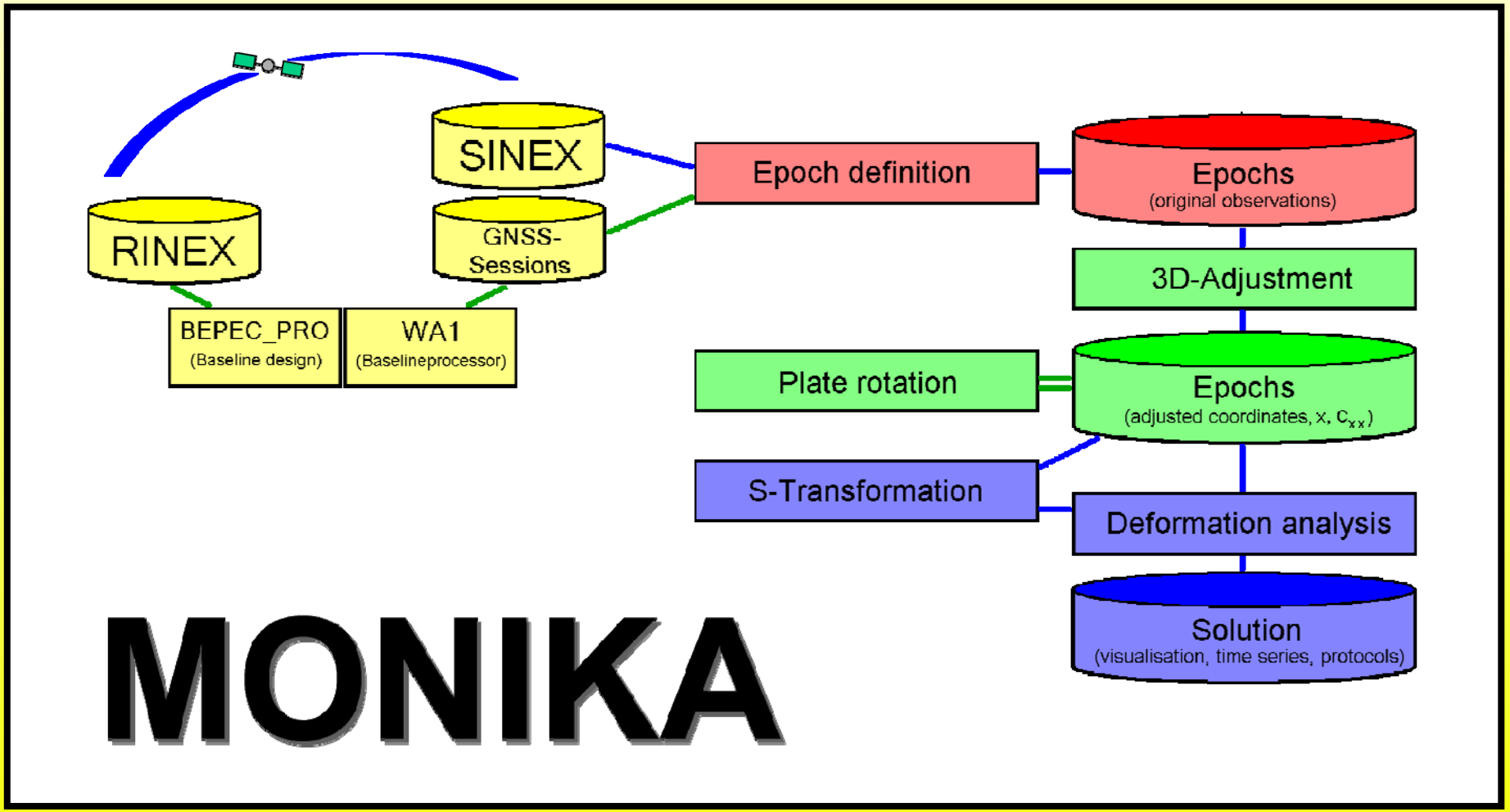
Overview



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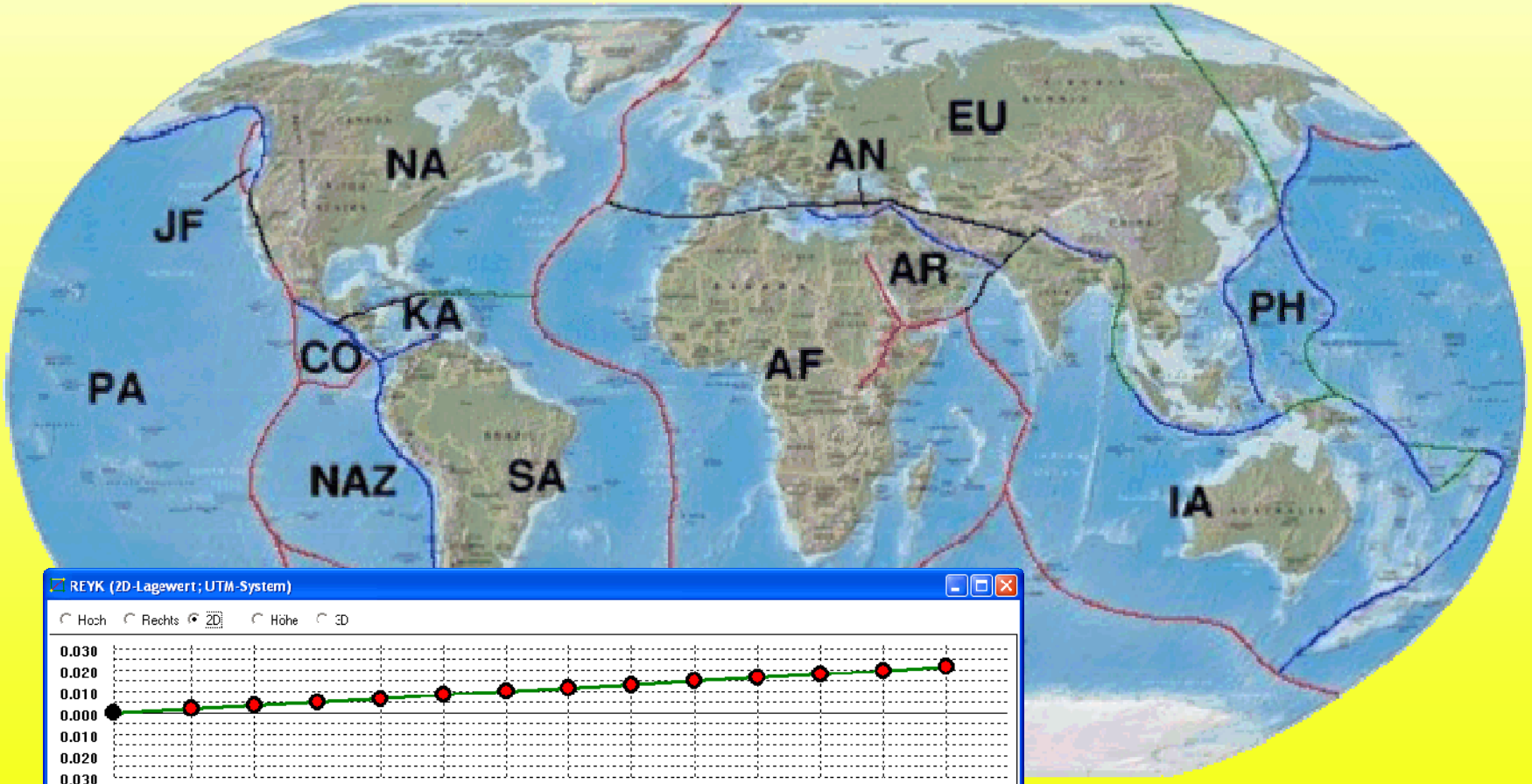
6. Plate rotation

necessary when large GNSS-networks or a long timespan is calculated



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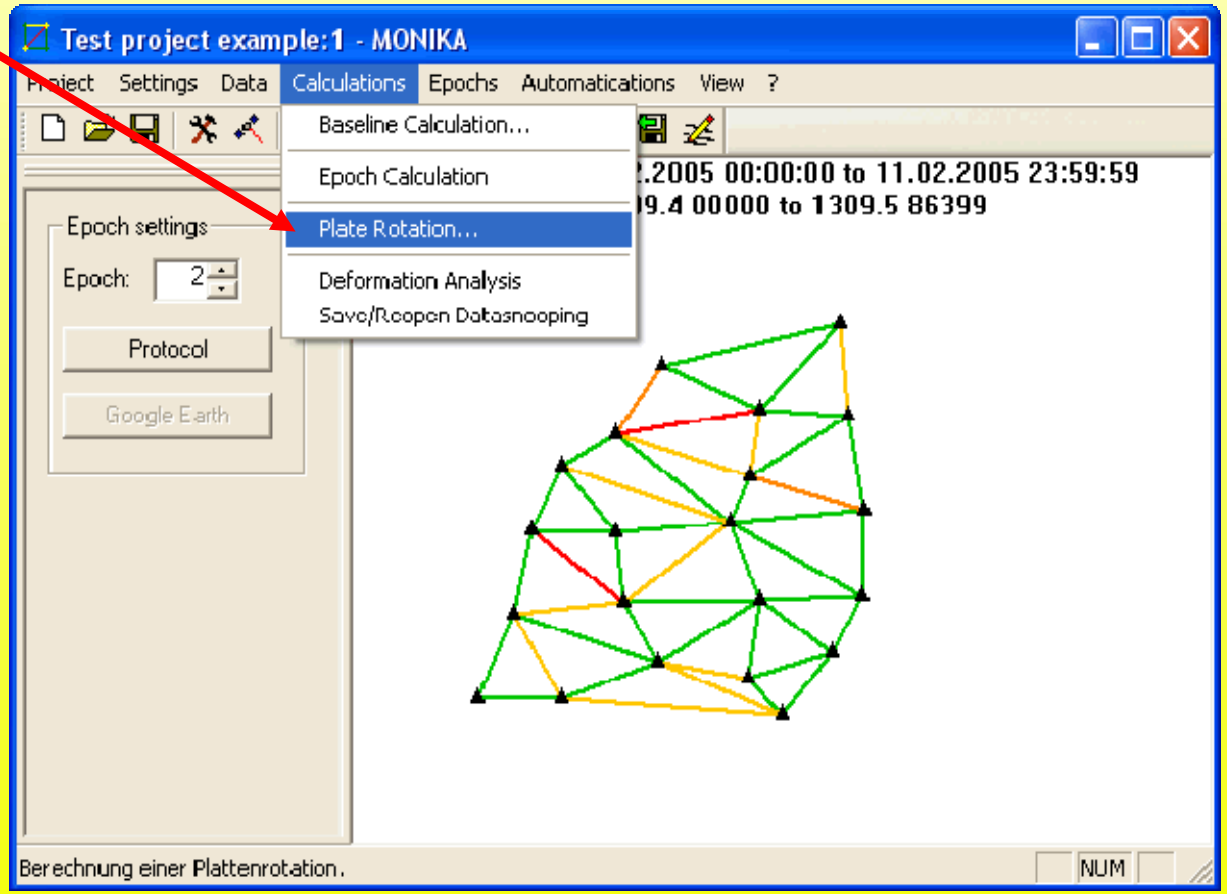
initialise plate rotation calculation



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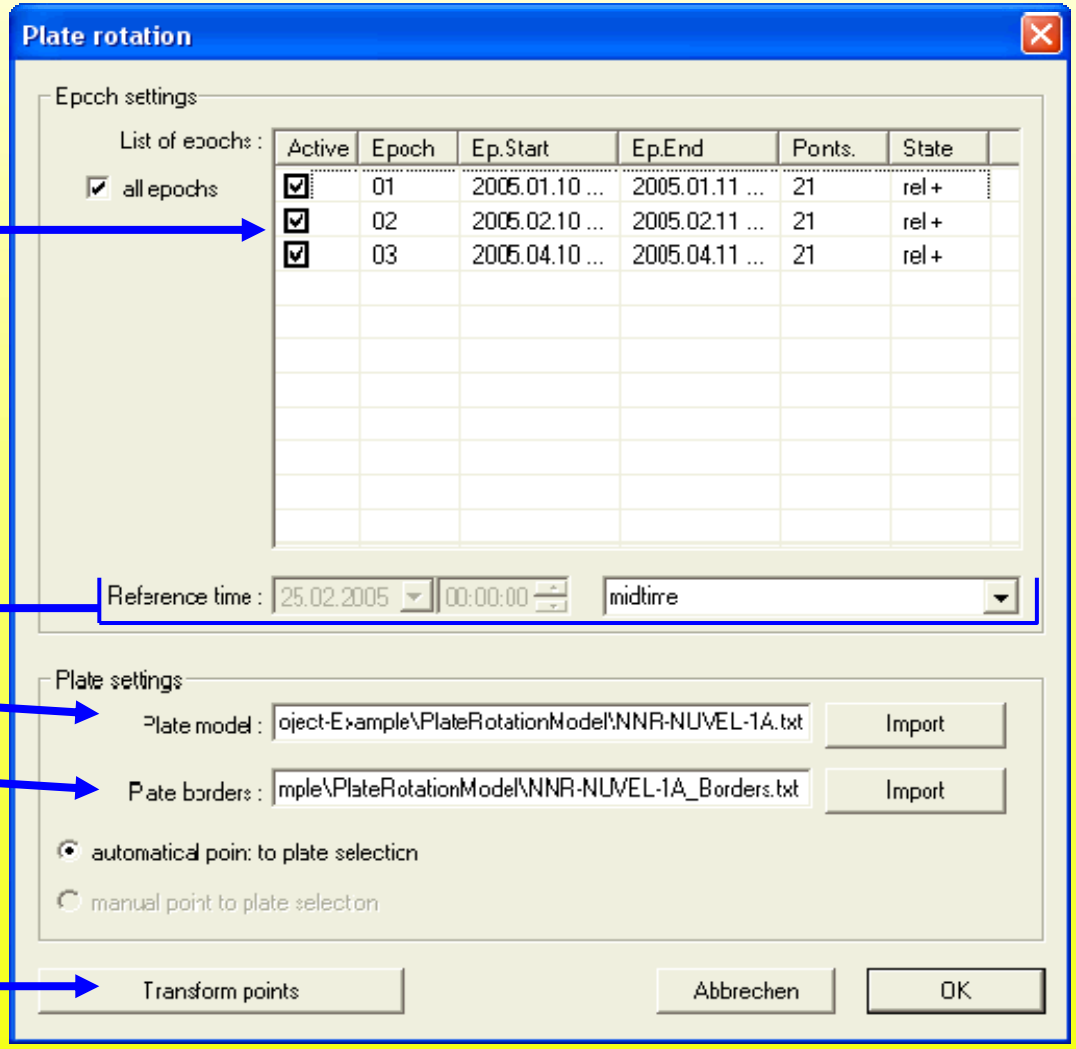
epochs

reference time

plate model

plate borders

calculate transformation



6. Plate rotation

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border file

plate model file

NNR-NUVEL-1A_Borders.txt - Editor

Datei Bearbeiten Format Ansicht ?

```
: AFRC  African
359.30 -54.80
359.70 -54.50
   .80 -54.90
  3.00 -53.60
  4.00 -54.20
  5.00 -54.80
  7.60 -53.60
  8.30 -54.00
 11.50 -52.20
 12.70 -52.80
 13.90 -51.80
 15.10 -52.20
 15.90 -51.70
 18.50 -52.70
 20.00 -52.80
 22.50 -53.00
 25.50 -53.80
 26.20 -52.50
 27.80 -52.80
 29.50 -50.20
 30.50 -49.80
 32.50 -47.00
 34.80 -47.20
```

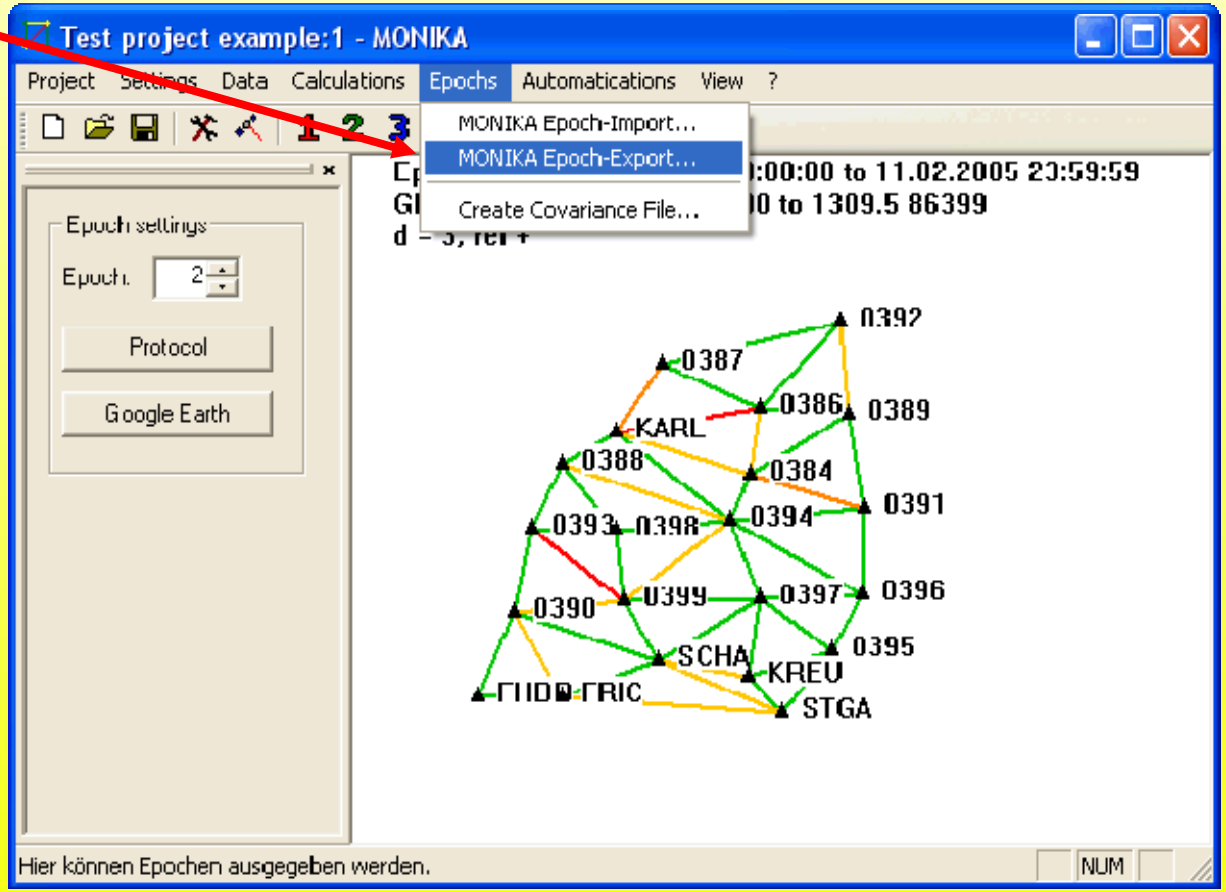
NNR-NUVEL-1A.txt - Editor

Datei Bearbeiten Format Ansicht ?

```
;Plate PHI       LAM    OMEGA       omega(x)   omega(y)   omega(z) Plate
;
;      [deg]     [deg] [deg/Ma] -   [rad/Ma]   [rad/Ma]   [rad/Ma] - Name
;
;-------------------------------------------------------------------------------
NNR-NUVEL-1A
AFRC   50.569  -73.978 0.2909      0.000891 -0.003099  0.003922 Africa
ANTA   62.986  244.264 0.2383     -0.000821 -0.001701  0.003706 Antarctica
ARAB   45.233   -4.464 0.5455      0.006685 -0.000521  0.006760 Arabia
AUST   33.852   33.175 0.6461      0.007839  0.005124  0.006282 Australia
CARB   25.014  266.989 0.2143     -0.000178 -0.003385  0.001581 Caribbea
COCO   24.487  244.242 1.5103     -0.010425 -0.021605  0.010925 Cocos
EURA   50.631  247.725 0.2337     -0.000981 -0.002395  0.003153 Eurasia
INDI   45.505    0.345 0.5453      0.006670  0.000040  0.006790 India
NOAM   -2.438  -85.895 0.2069      0.000258 -0.003599 -0.000153 N.America
NAZC   47.804  259.870 0.7432     -0.001532 -0.008577  0.009609 Nazca
PCFC -63.045  107.325 0.6408     -0.001510  0.004840 -0.009970 Pacific
SOAM -25.325  235.570 0.1164     -0.001038 -0.001515 -0.000870 S.America
JUFU -30.054   58.870 0.6658      0.005200  0.008610 -0.005820 Juan de Fuca
PHIL -38.011  -35.360 0.8997      0.010090 -0.007160 -0.009670 Philippine
;RIVR  20.428  253.128 1.9781     -0.009390 -0.030960  0.012050 Rivera
SCOT -25.273  261.234 0.1705     -0.000410 -0.002660 -0.001270 Scotia
```

6.1 Epoch-Export

export epochs



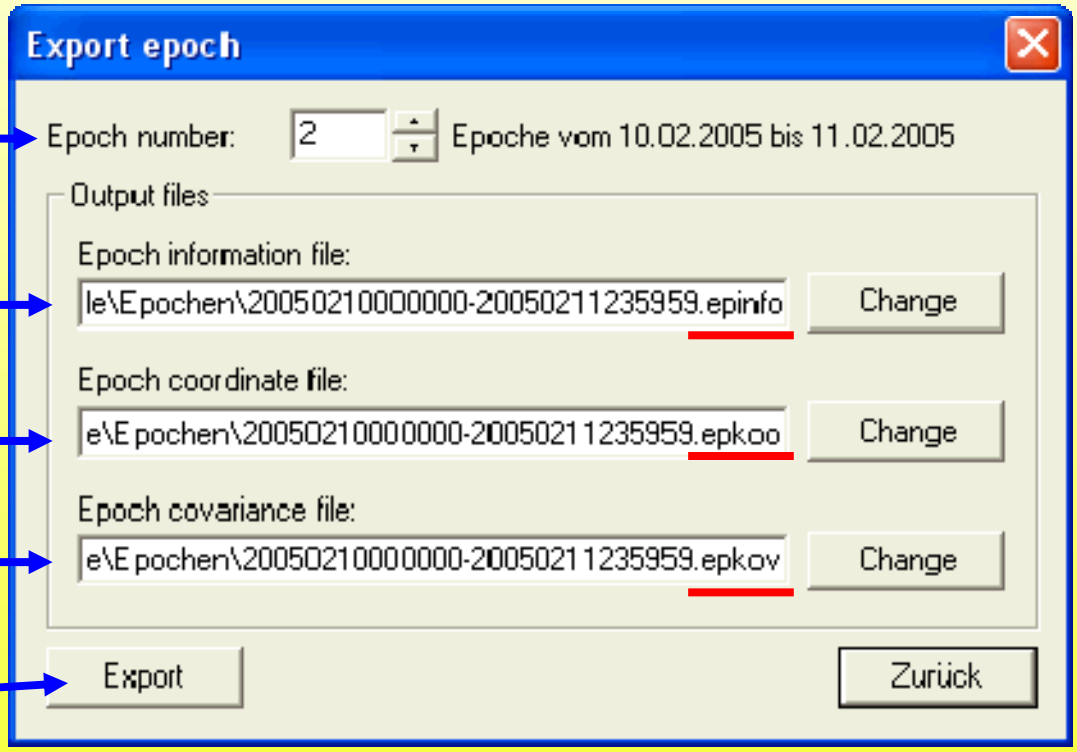
epoch number

information file

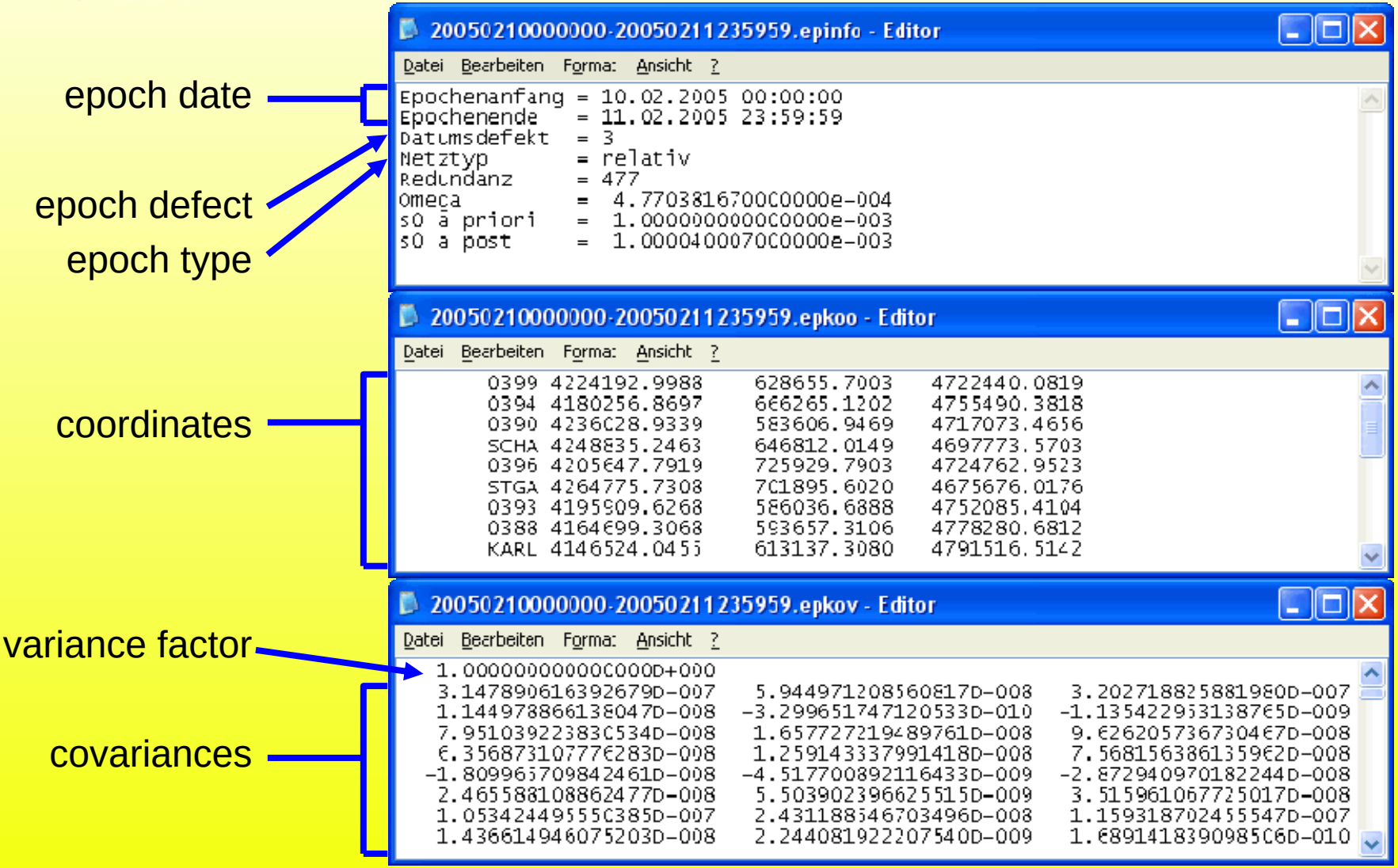
coordinate file

covariance file

export epoch

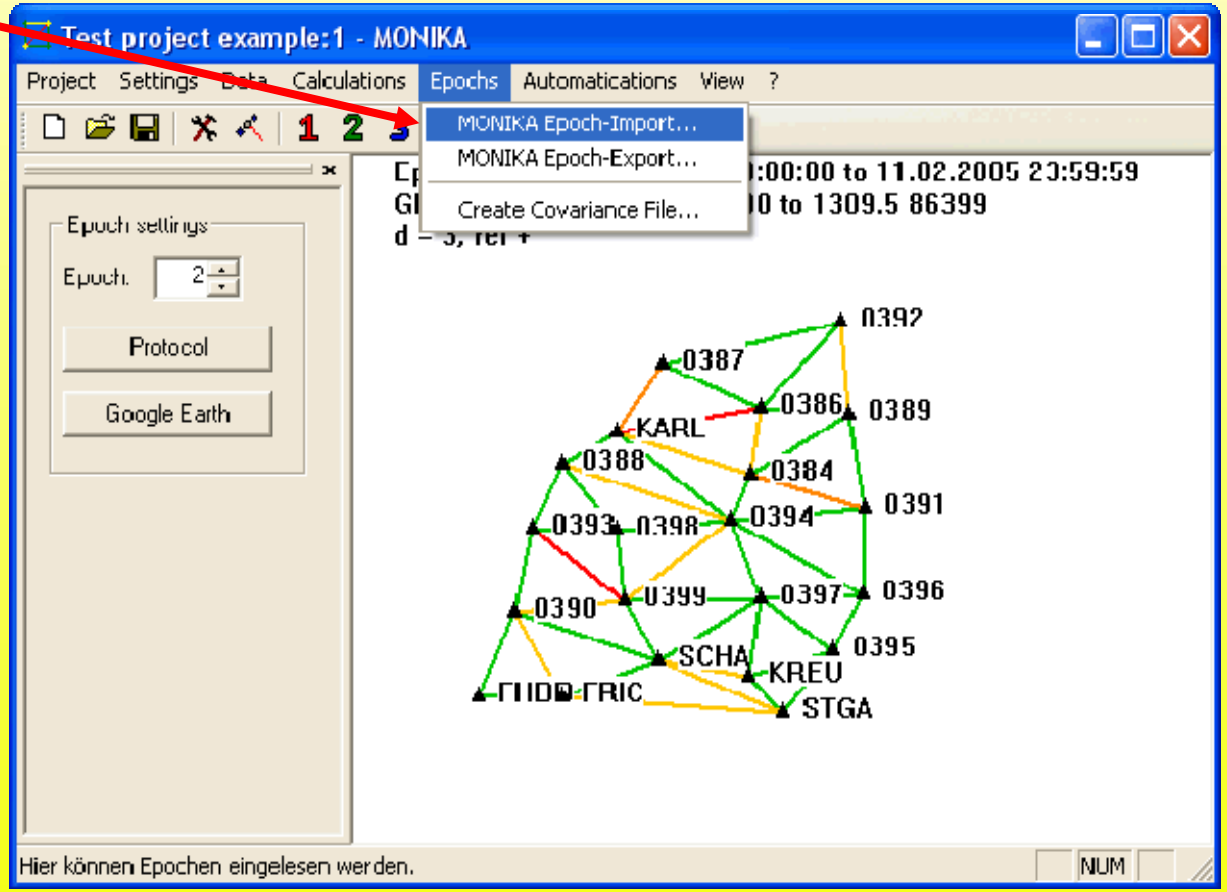


6.2 Epoch-Format



6.3 Epoch-Import

import epochs



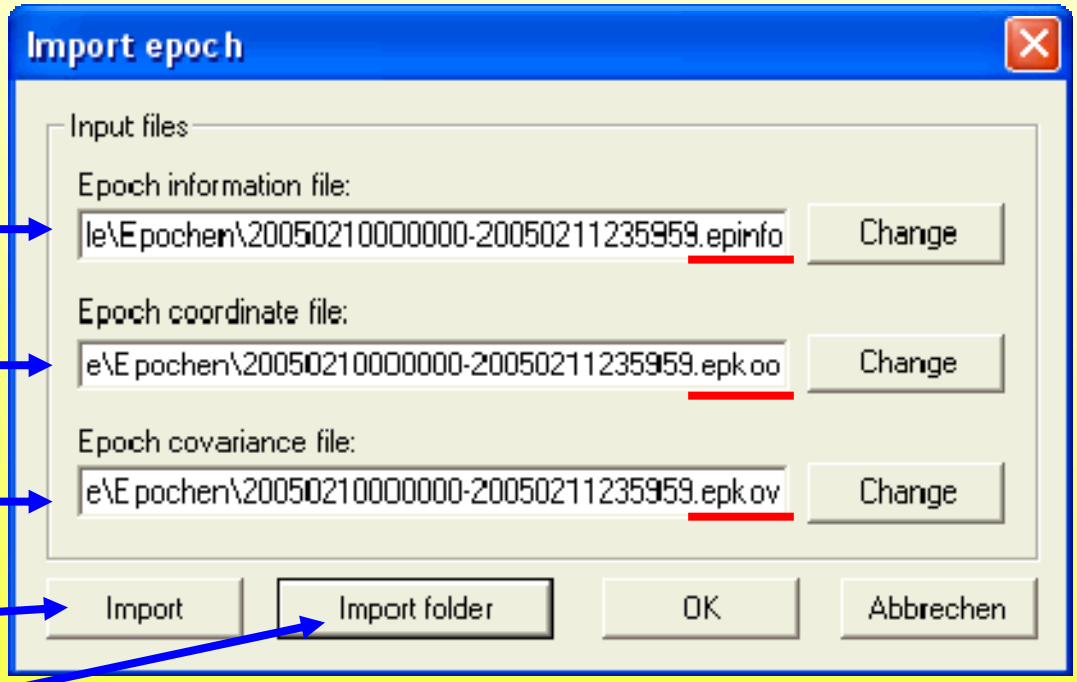
information file

coordinate file

covariance file

import epoch

import complete folder



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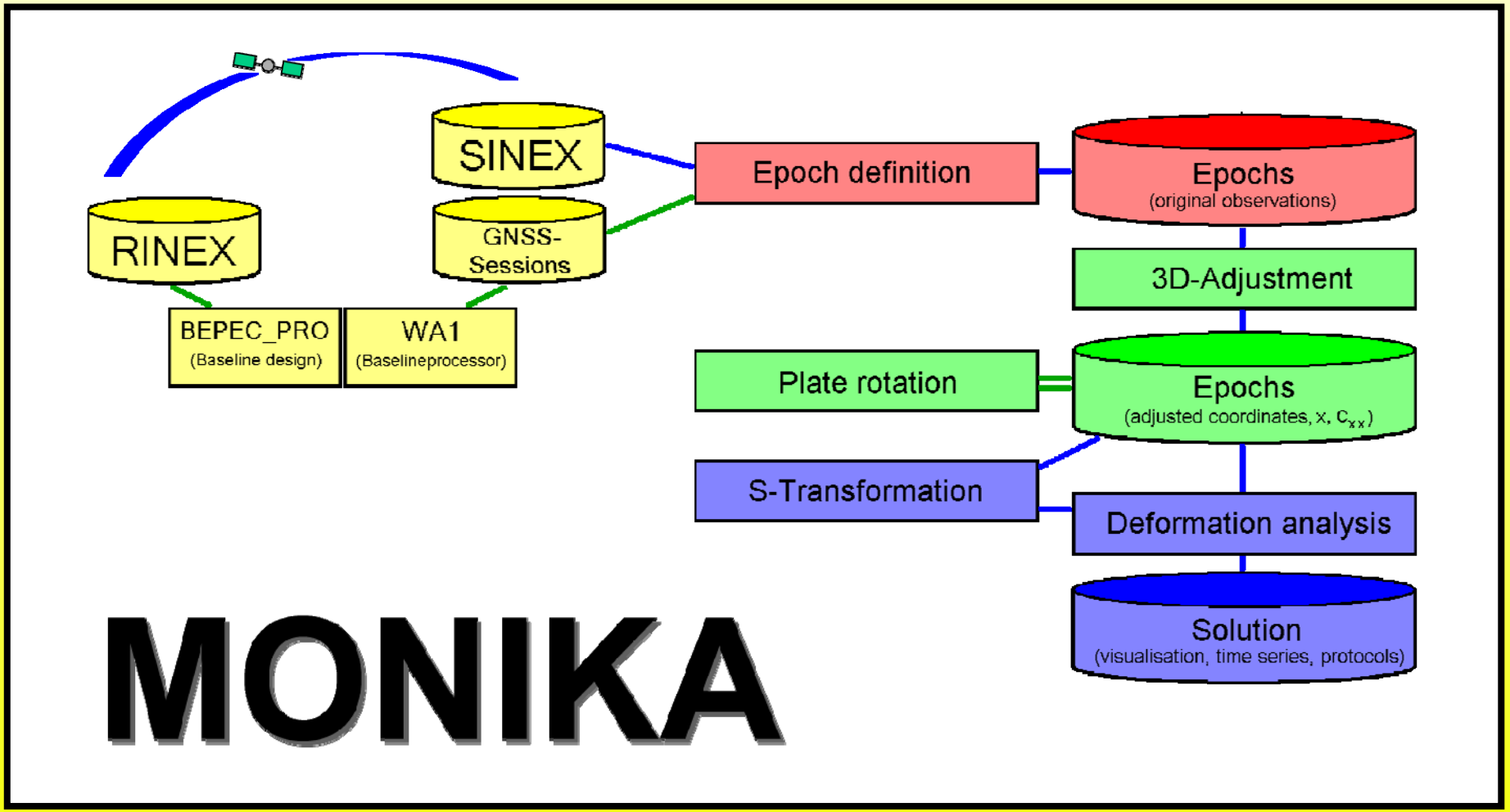
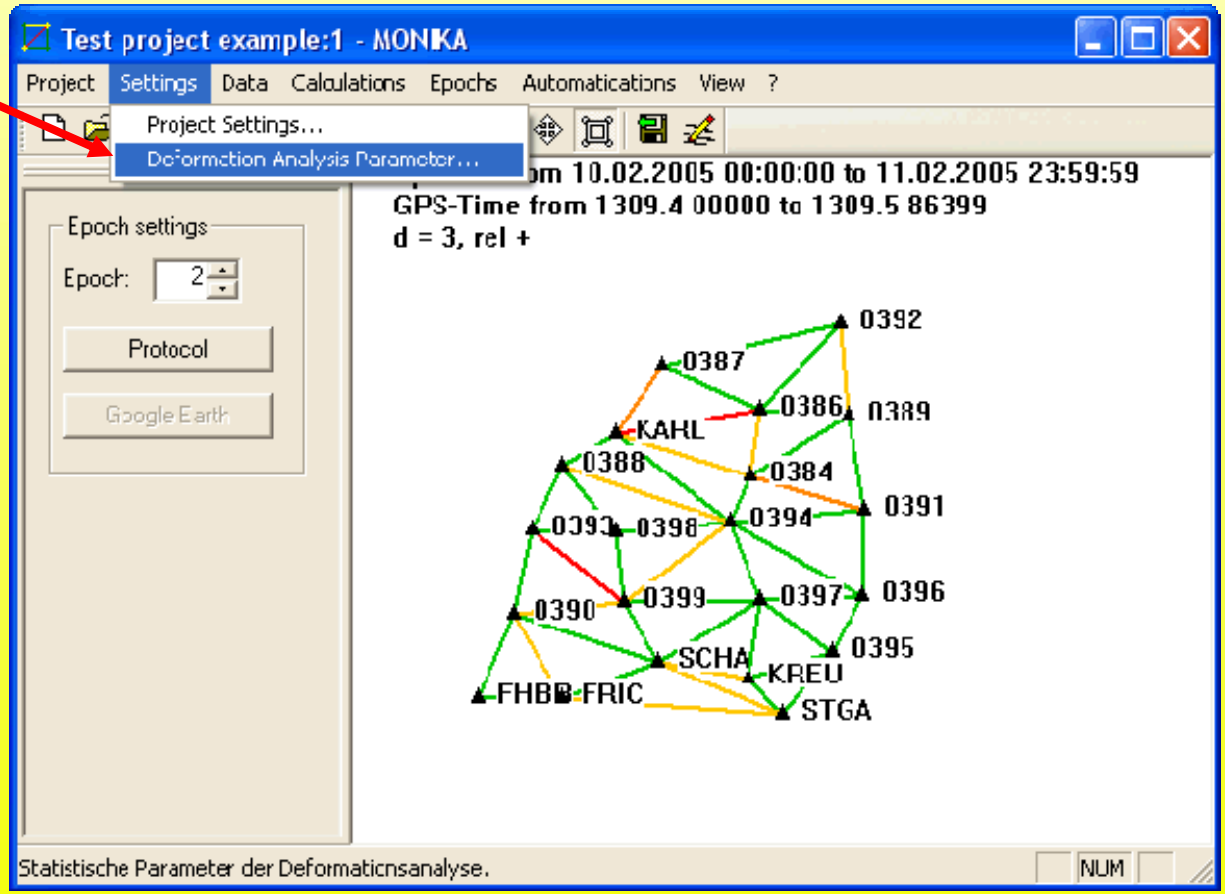
Overview



7. Deformation analysis

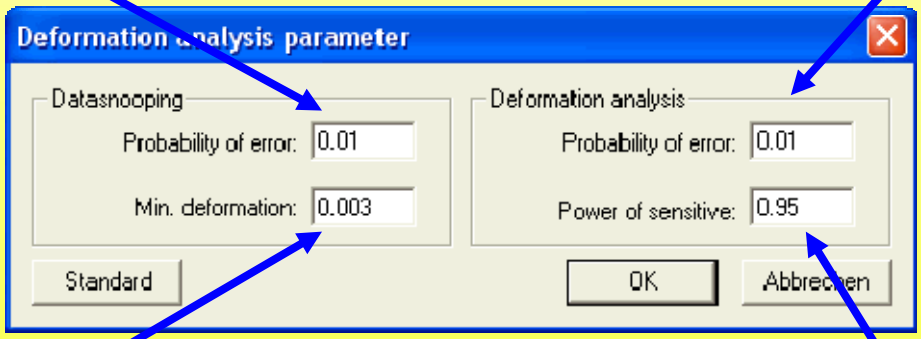
deformation analysis parameter settings



7.1 Parameters

probability of error during the datasnooping

probability of error during the final deformation analysis

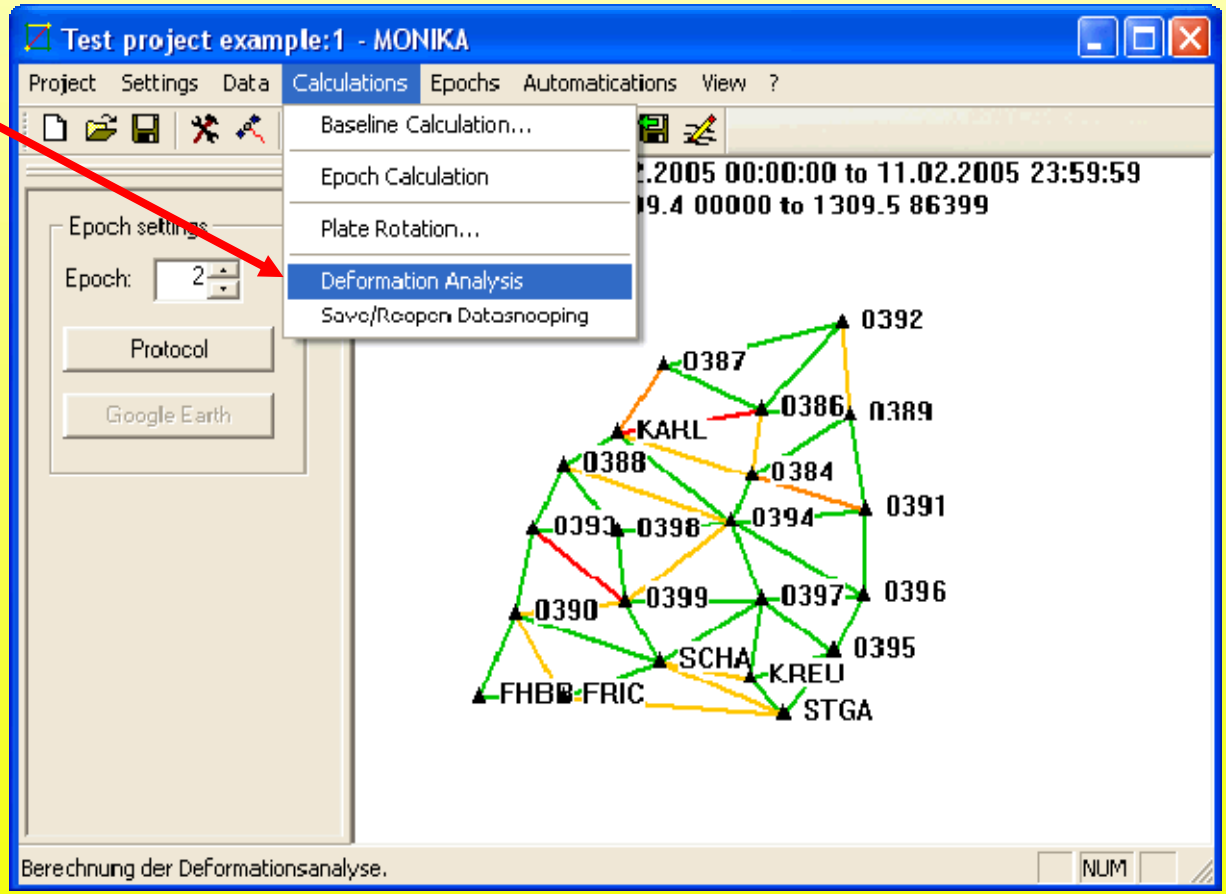


minimal deformation for an deformated reference point

power of the sensitivity analysation

7.2 Deformation analysis

starting the deformation analysis



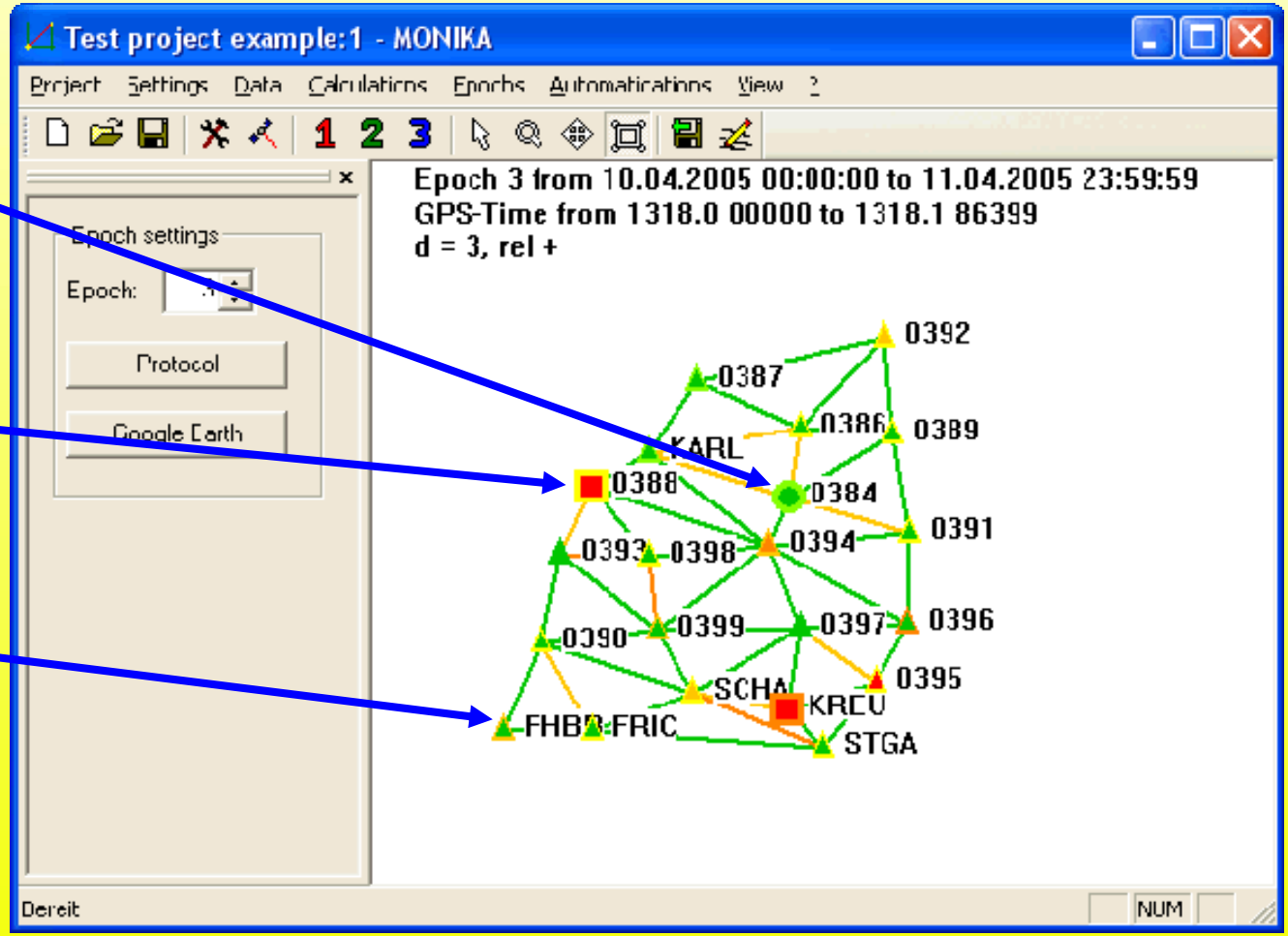
7.3 View solutions

symbols:

object point
(circle)

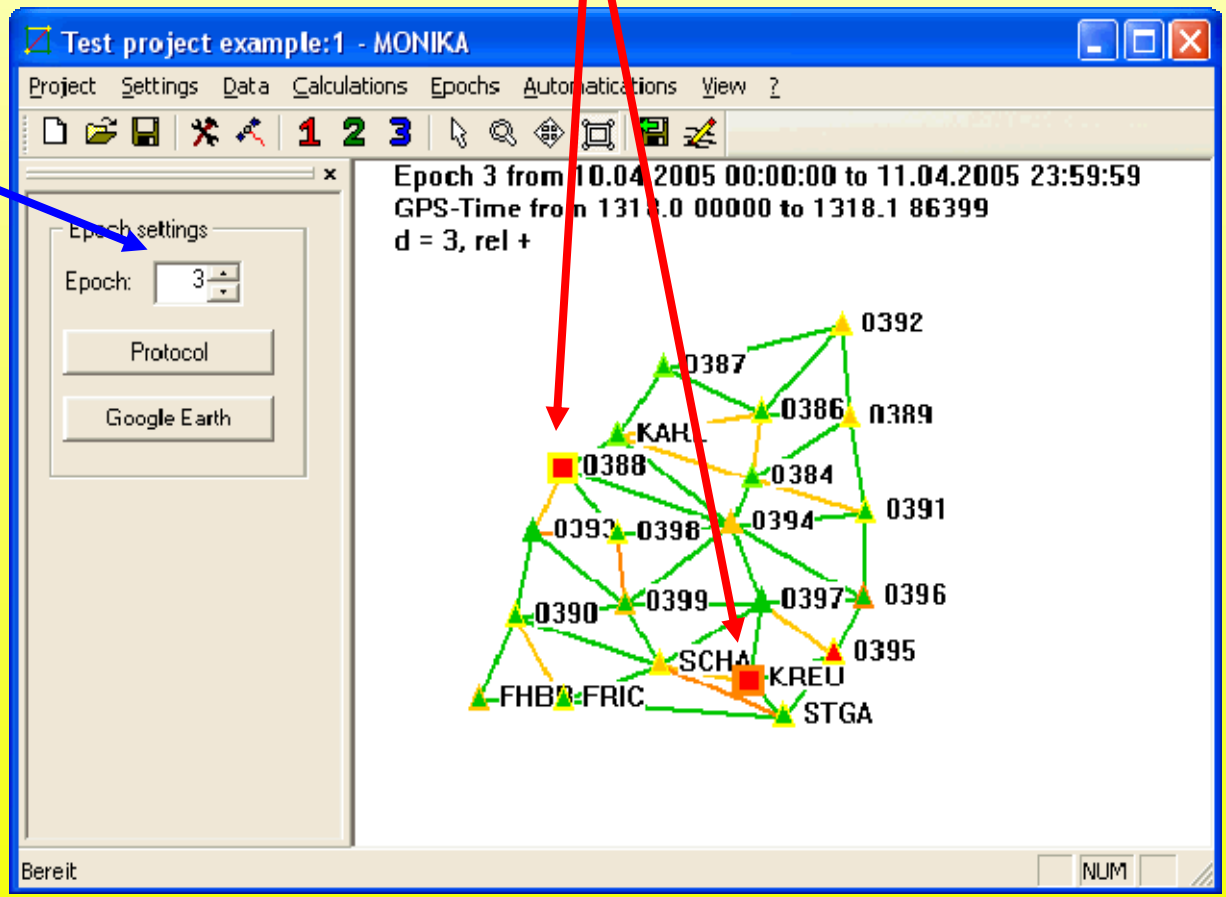
deformated
reference point
(square)

reference point
(triangle)

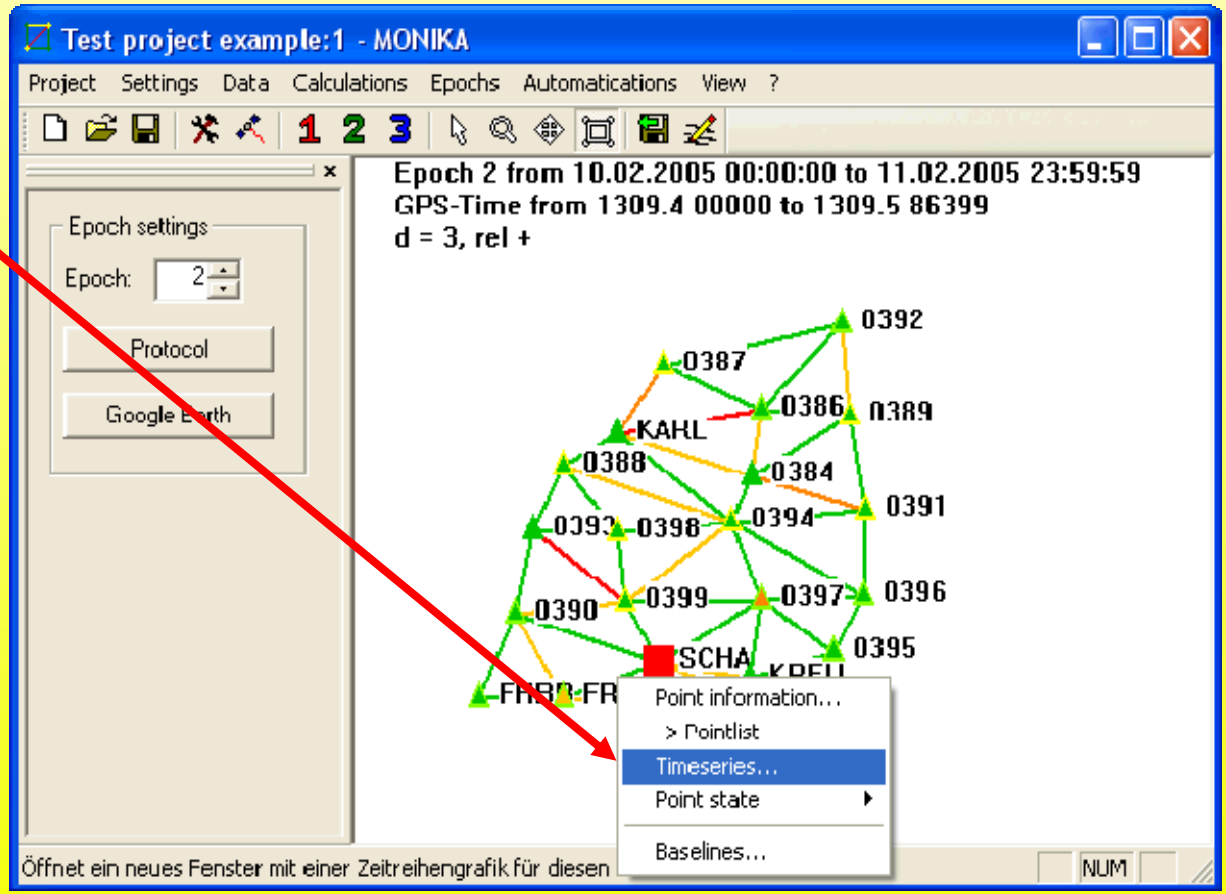


search for deformated reference points

switch through
all epochs



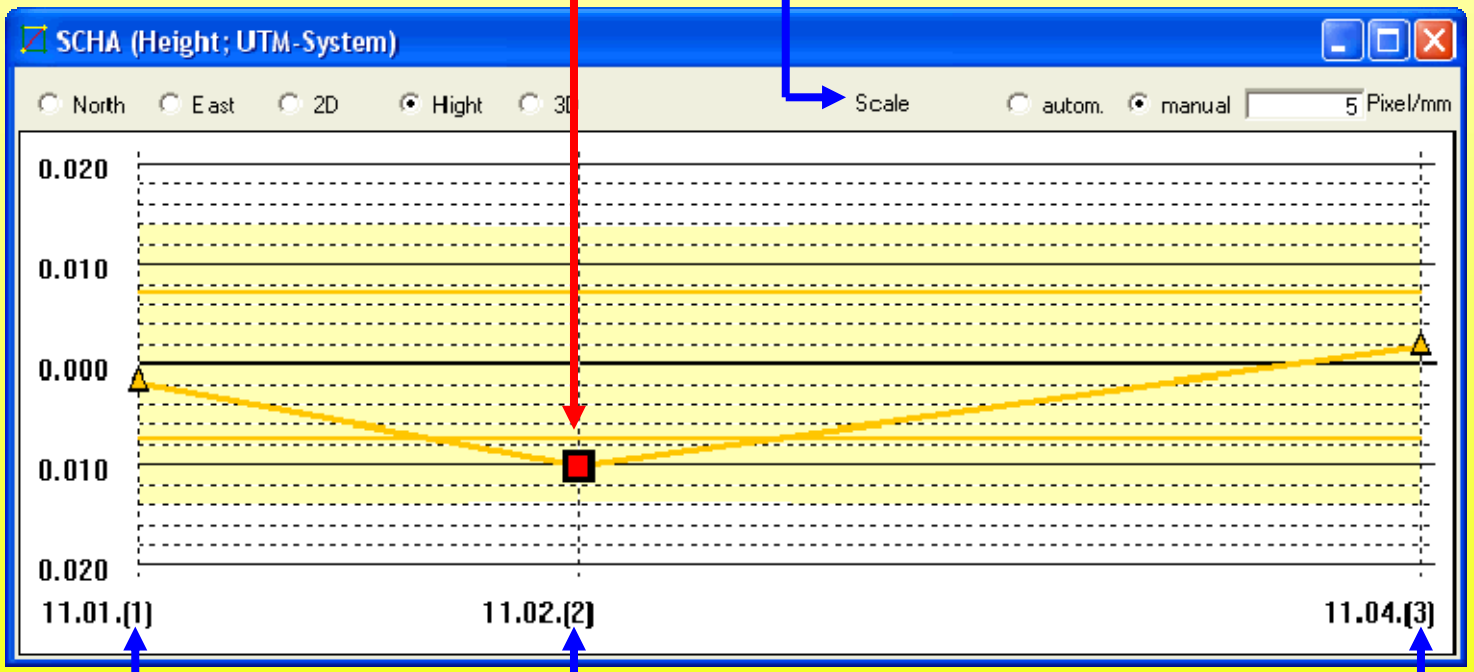
open time
series diagramm
at point
(right click)



deformated reference point (2. epoch)

reference system

set scale

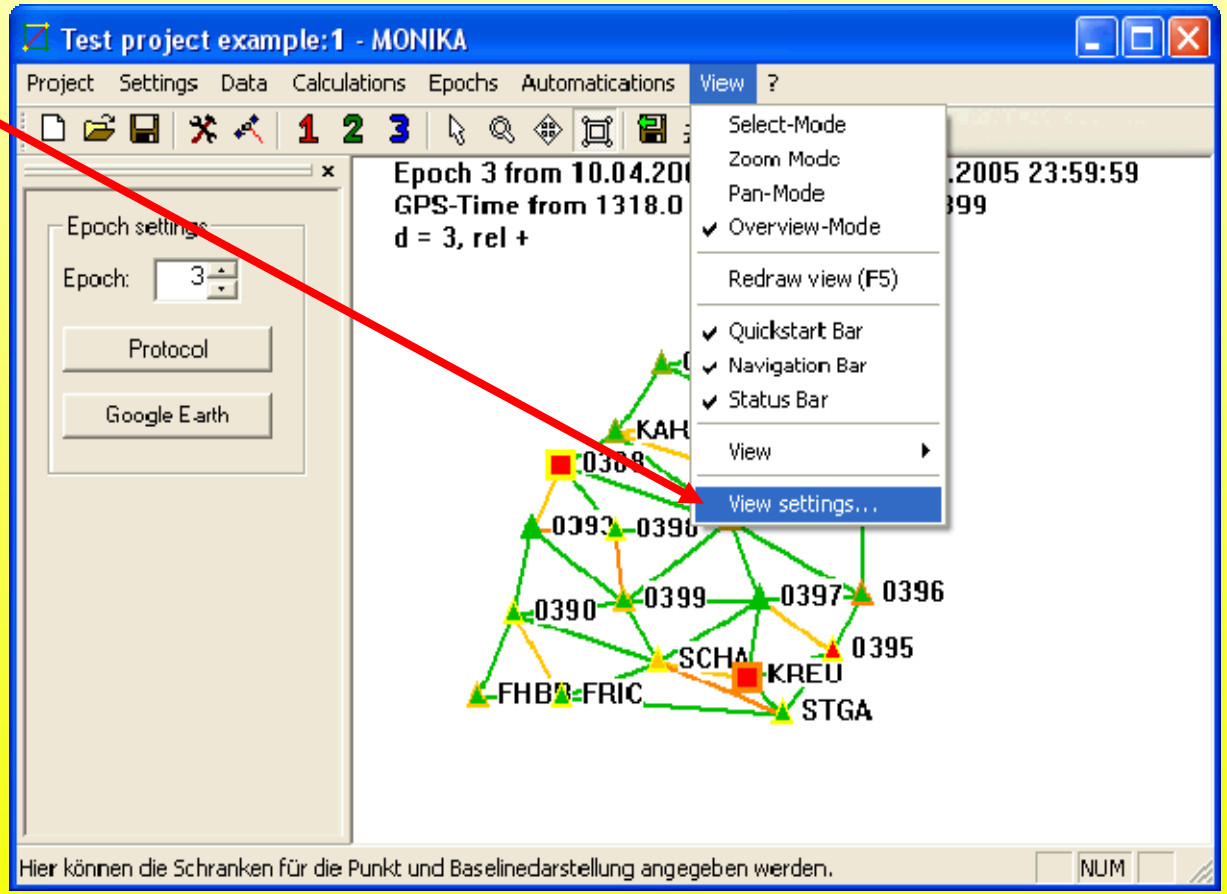


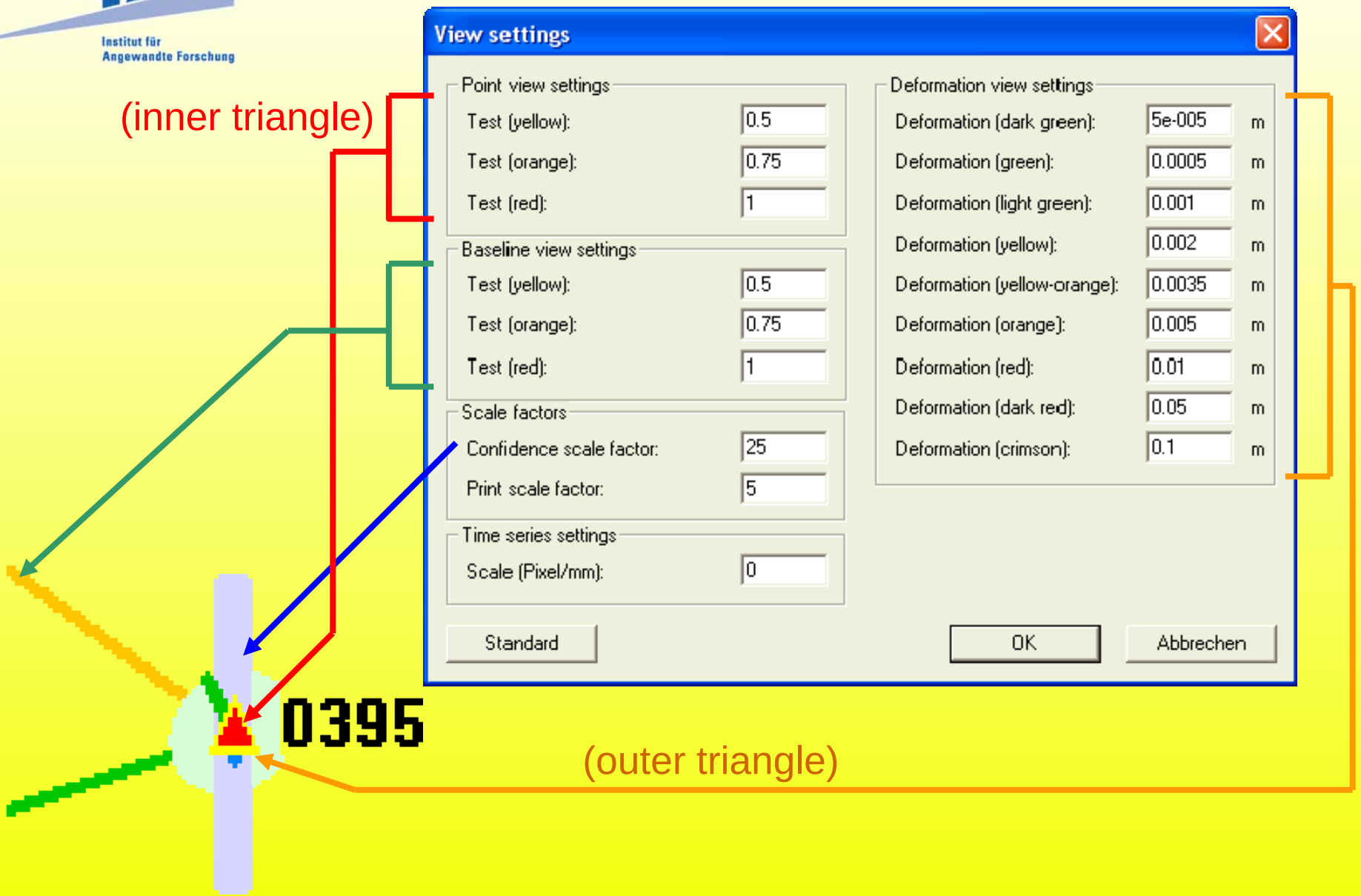
scale

epochs

7.4 View settings

open the view settings





7.4 View Settings

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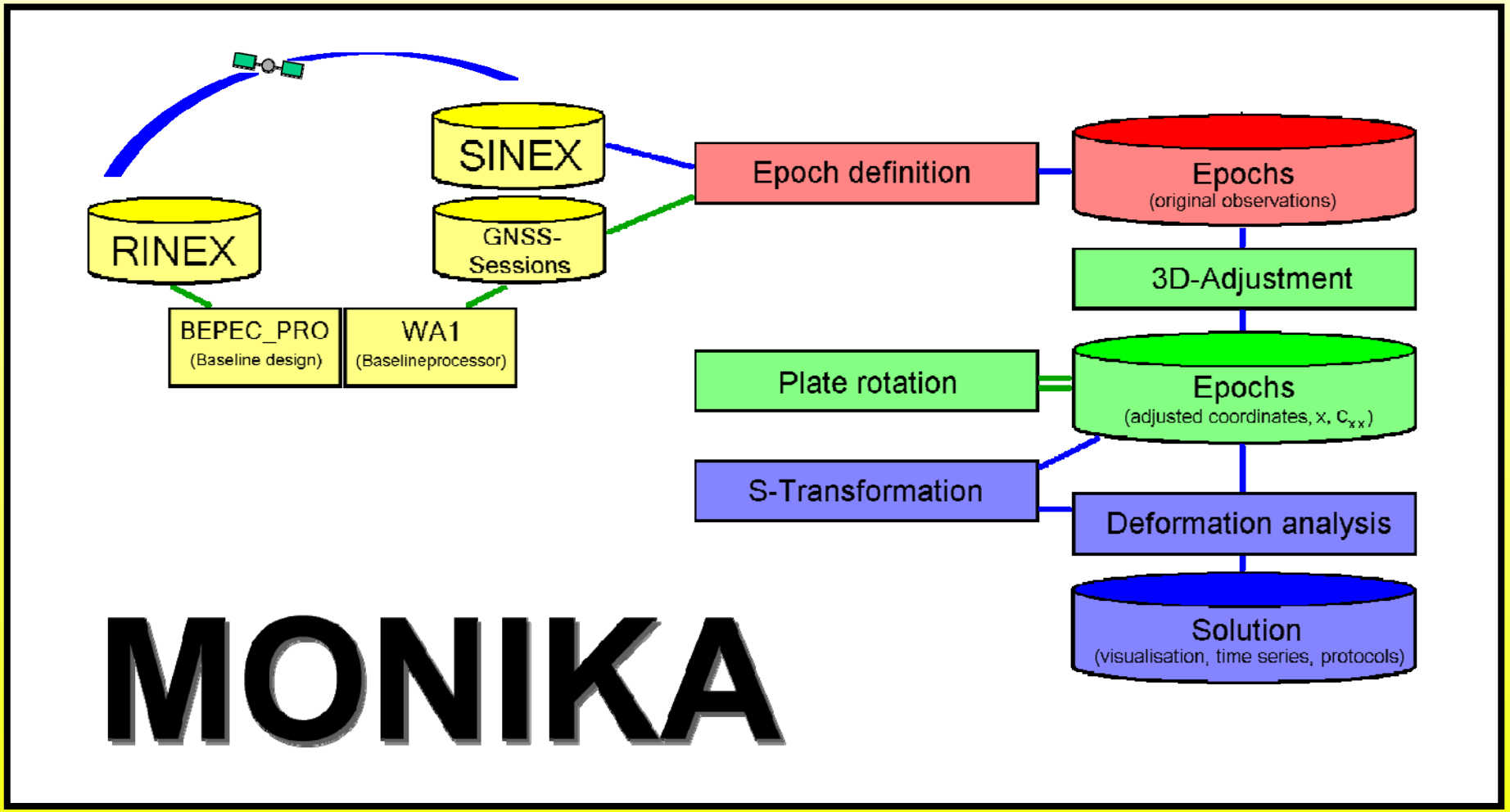
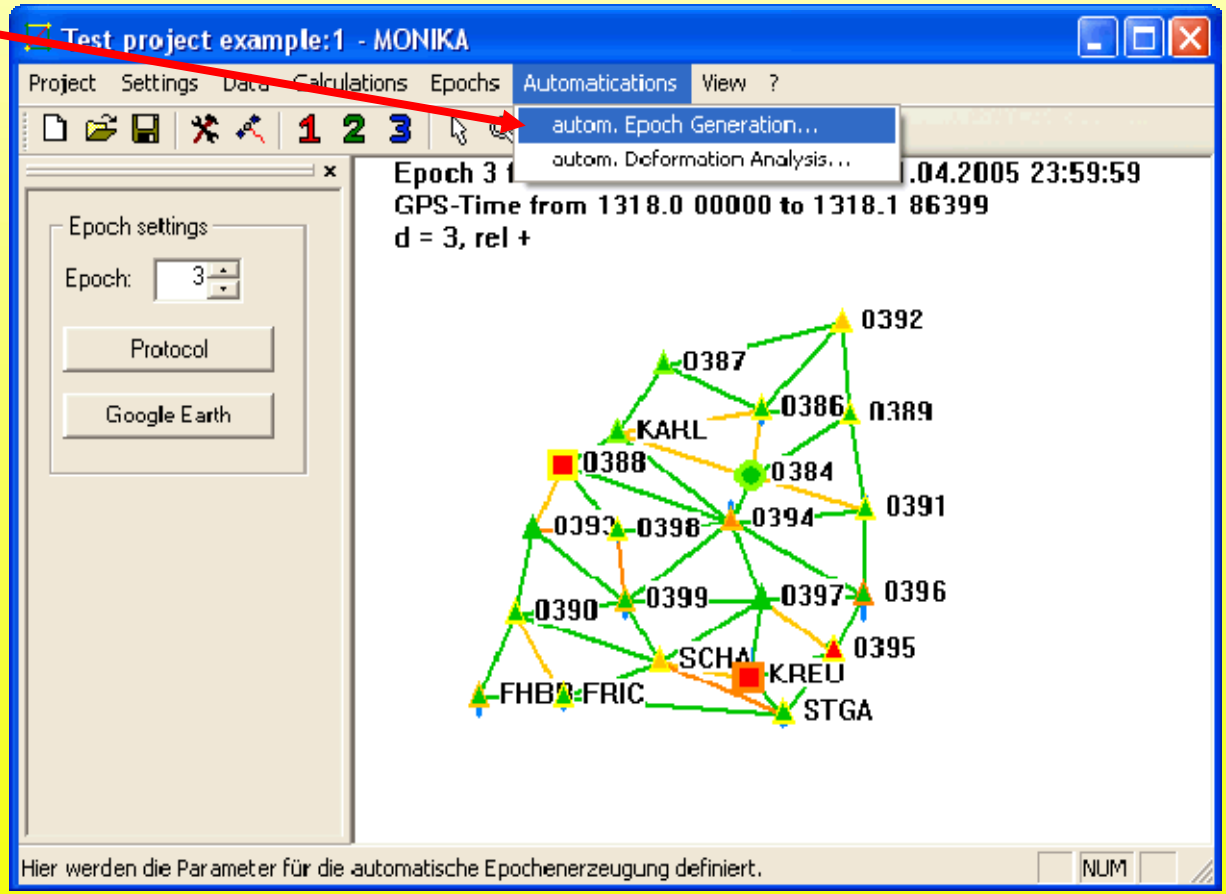
Overview



8. Automatications

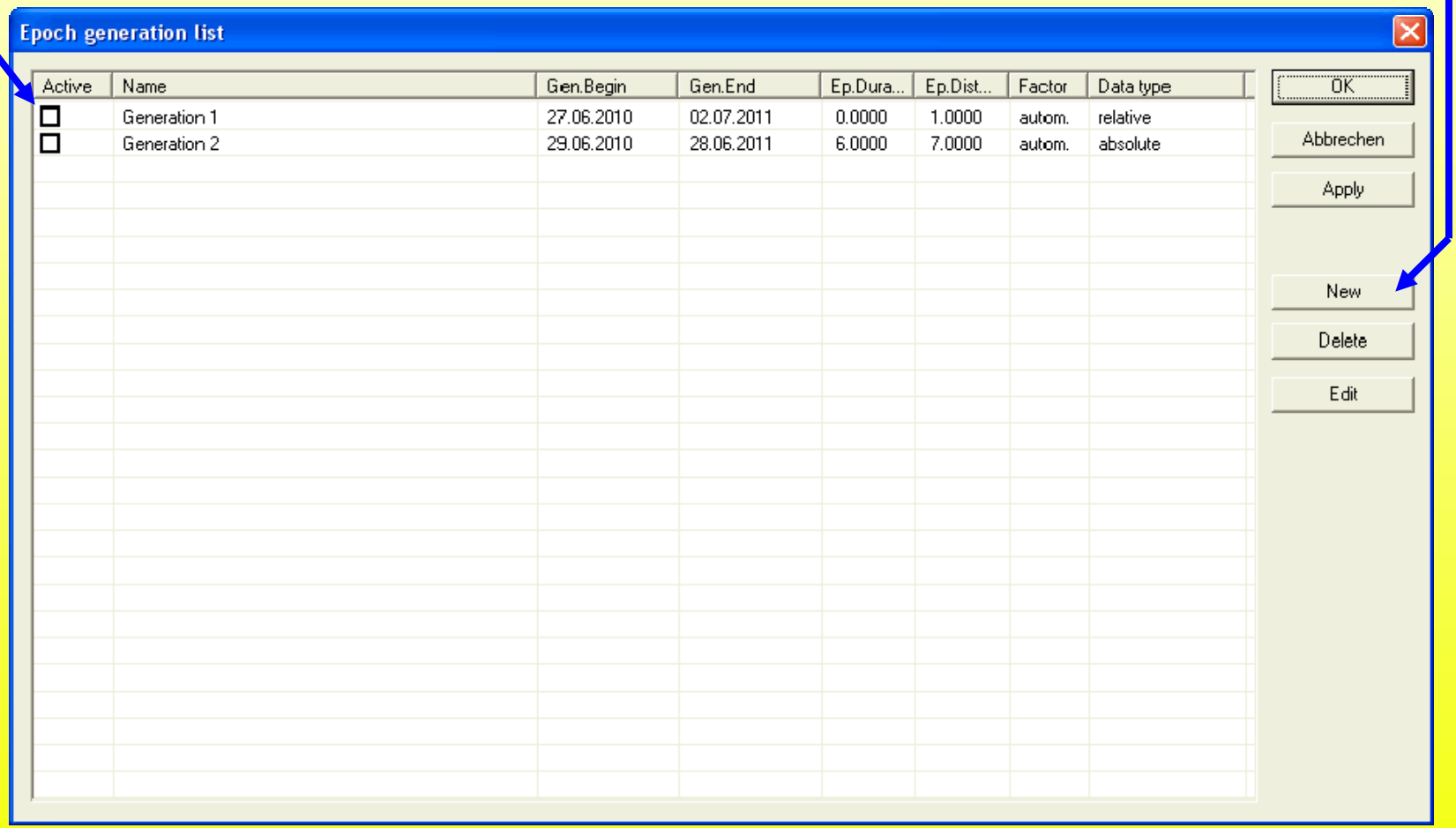
automatic epoch generation



8.1 Epoch generation

activation

new generation



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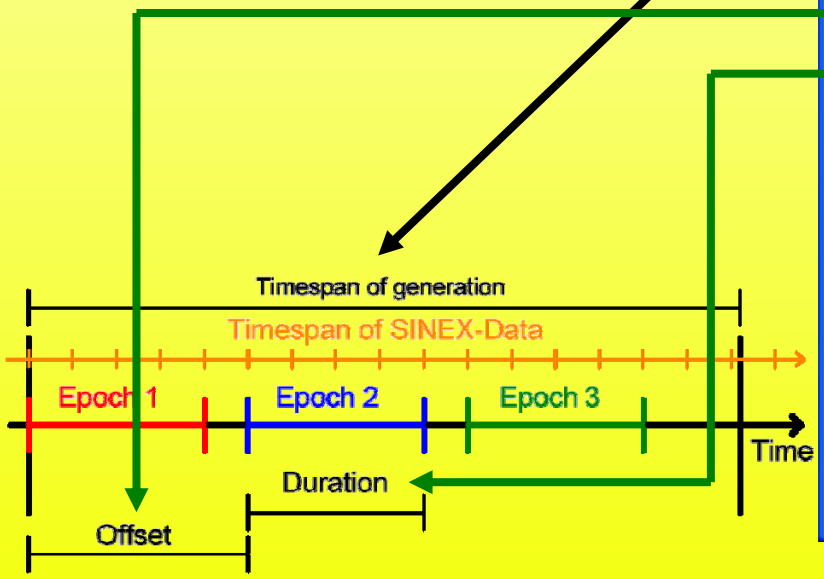
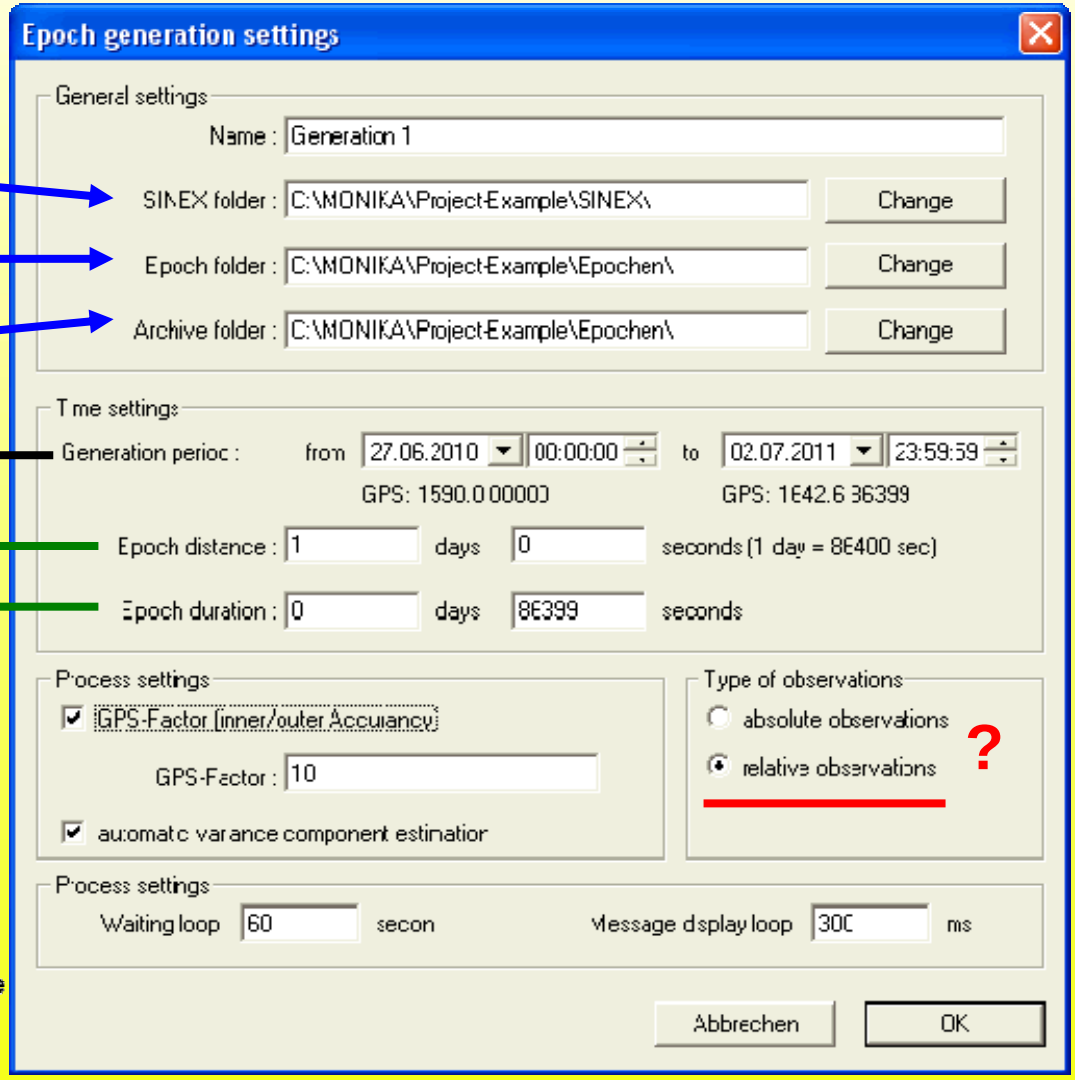
Imput folder

Output folder

Archive folder

(for old files)





8.1 Epoch Generation

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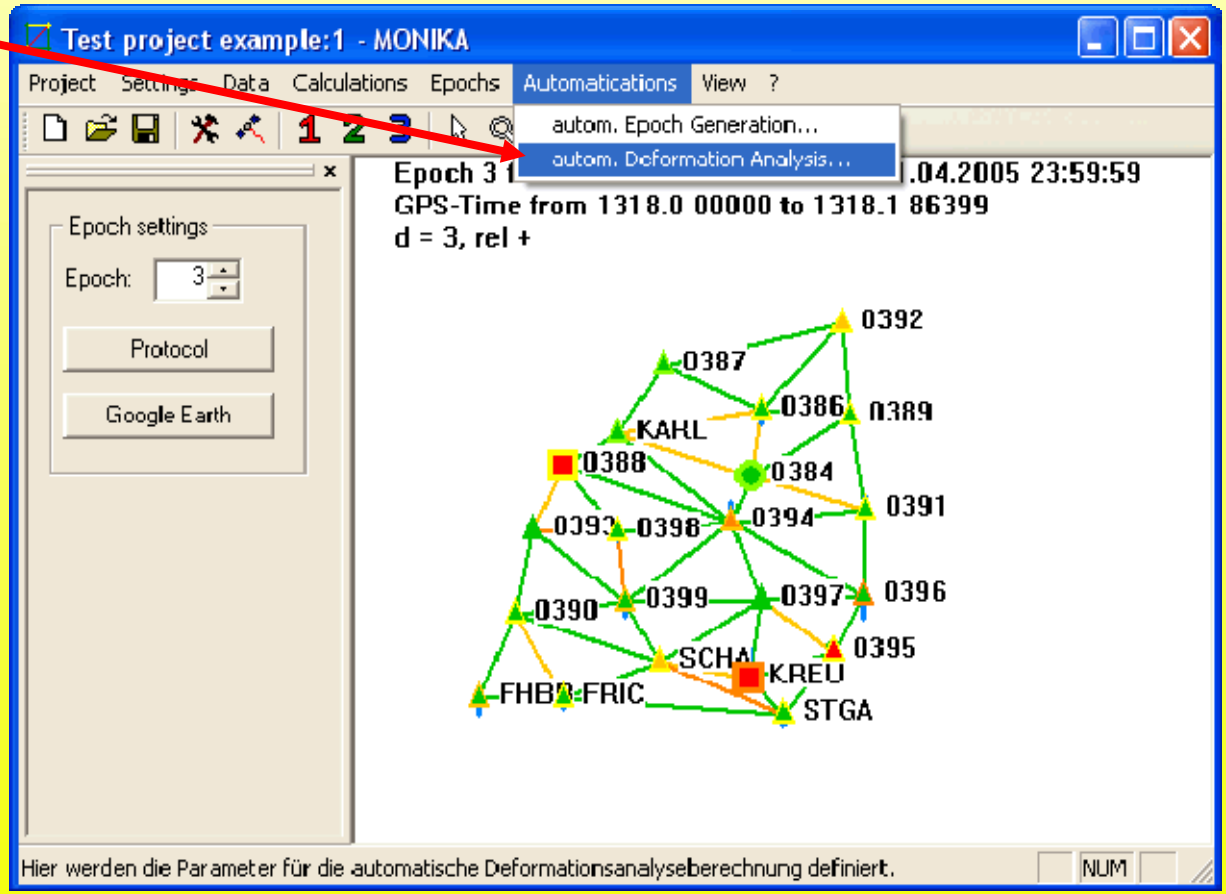
automatic deformation analysis generation



8.2 Deformation Analysis generation

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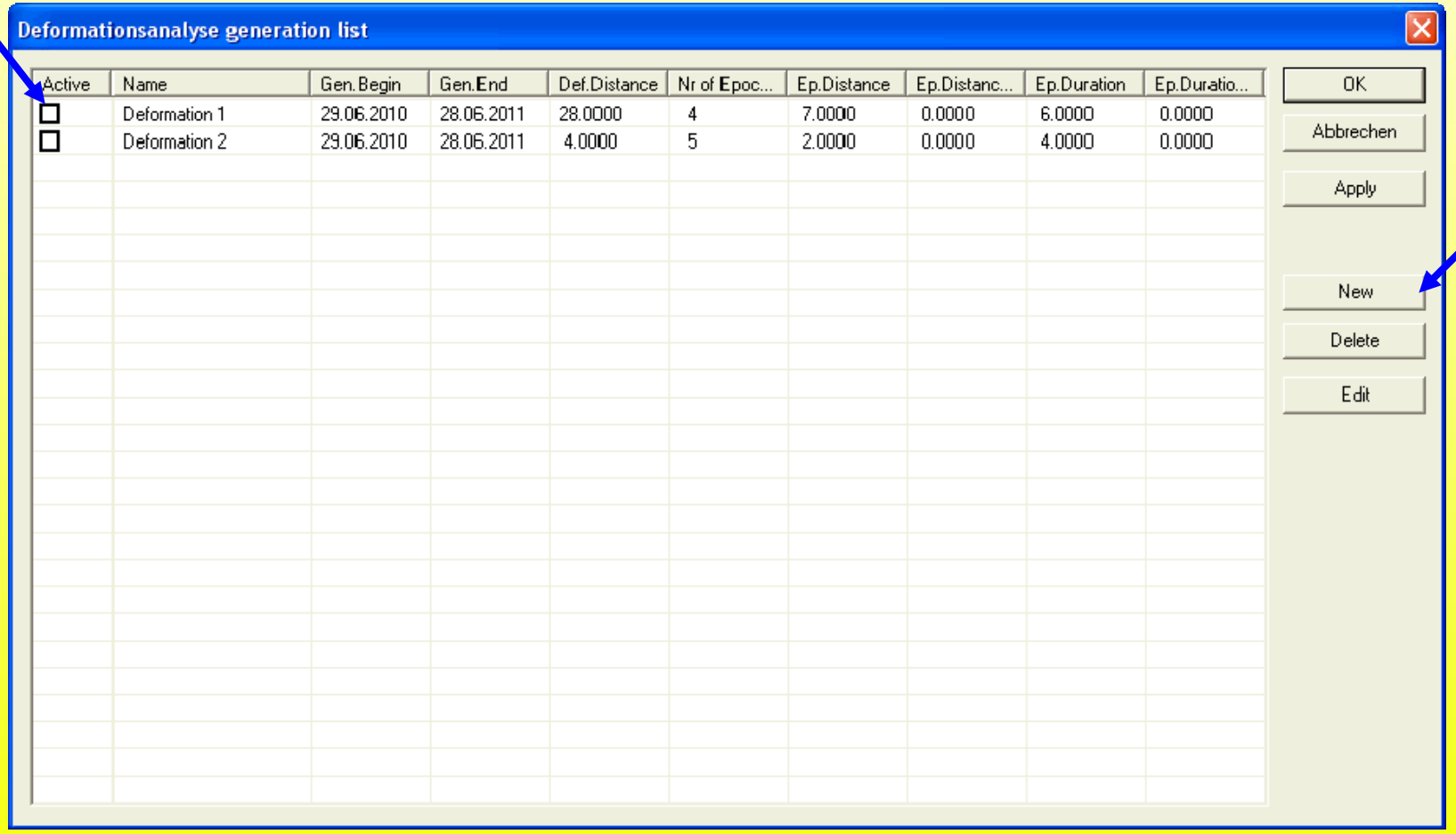
8.1 Deformation analysis generation

activation

new generation



8.2 Deformation Analysis generation

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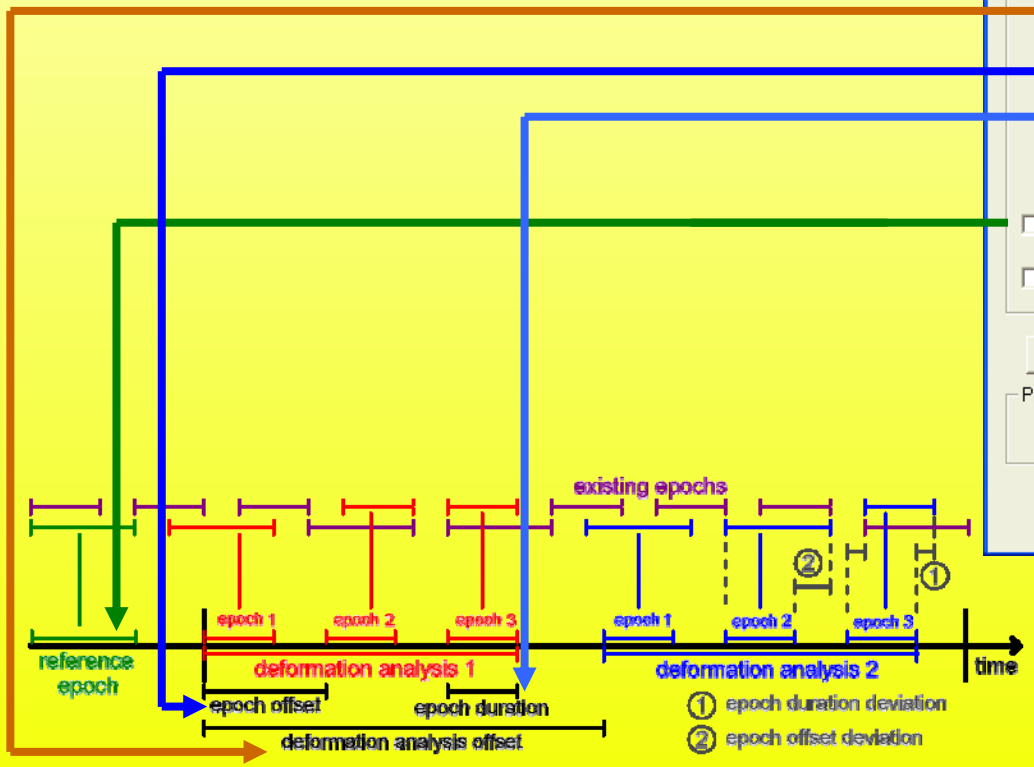
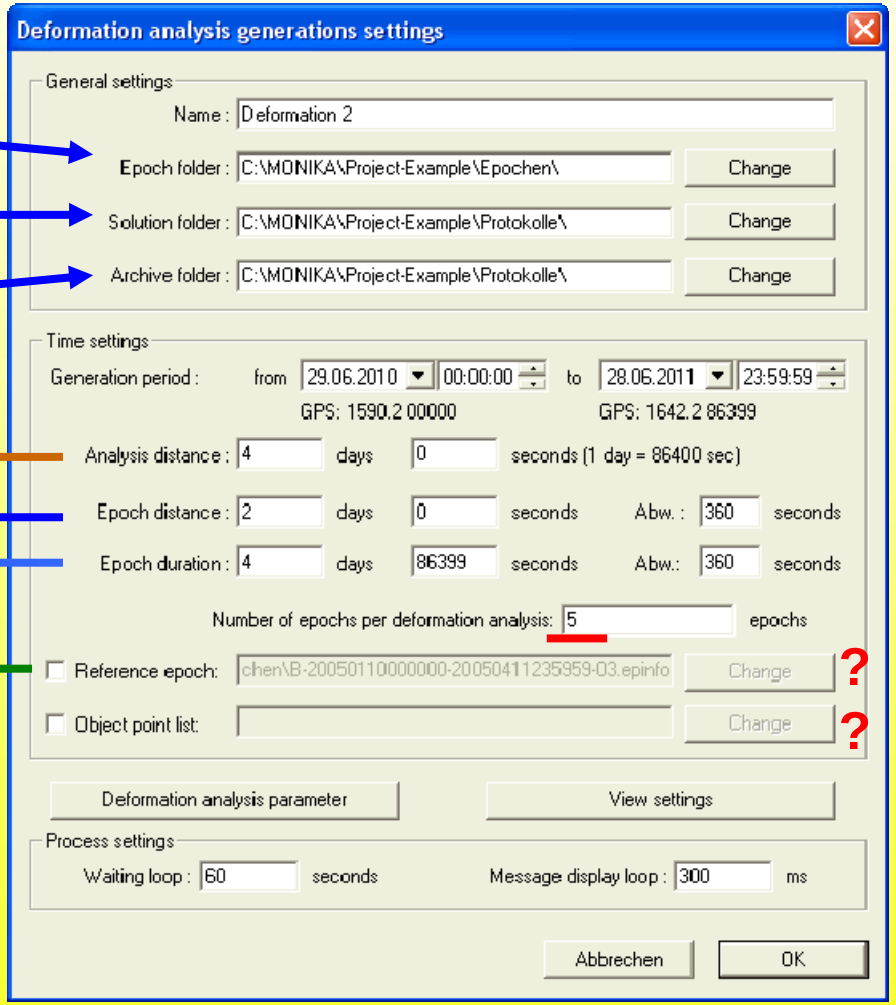
Imput folder

Output folder

Archive folder

(for old files)





8.2 Deformation Analysis generation

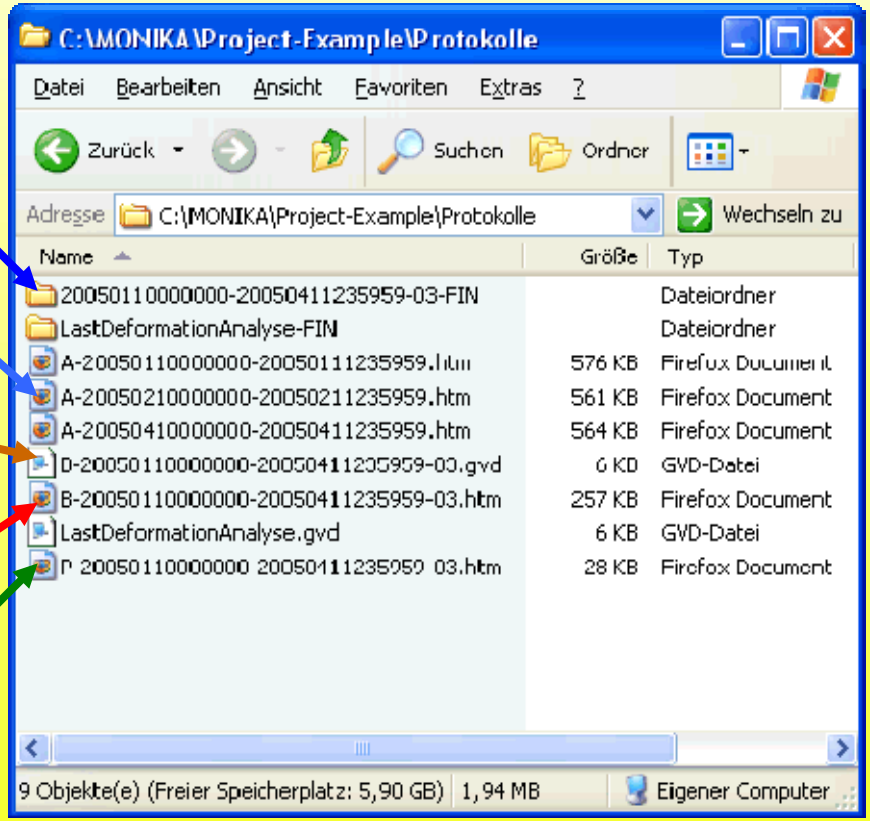
FIN-Files for GOCA

HTML-GPS3D-Protocol

GVD-File for GOCA-Earth
(identical points + deformations)

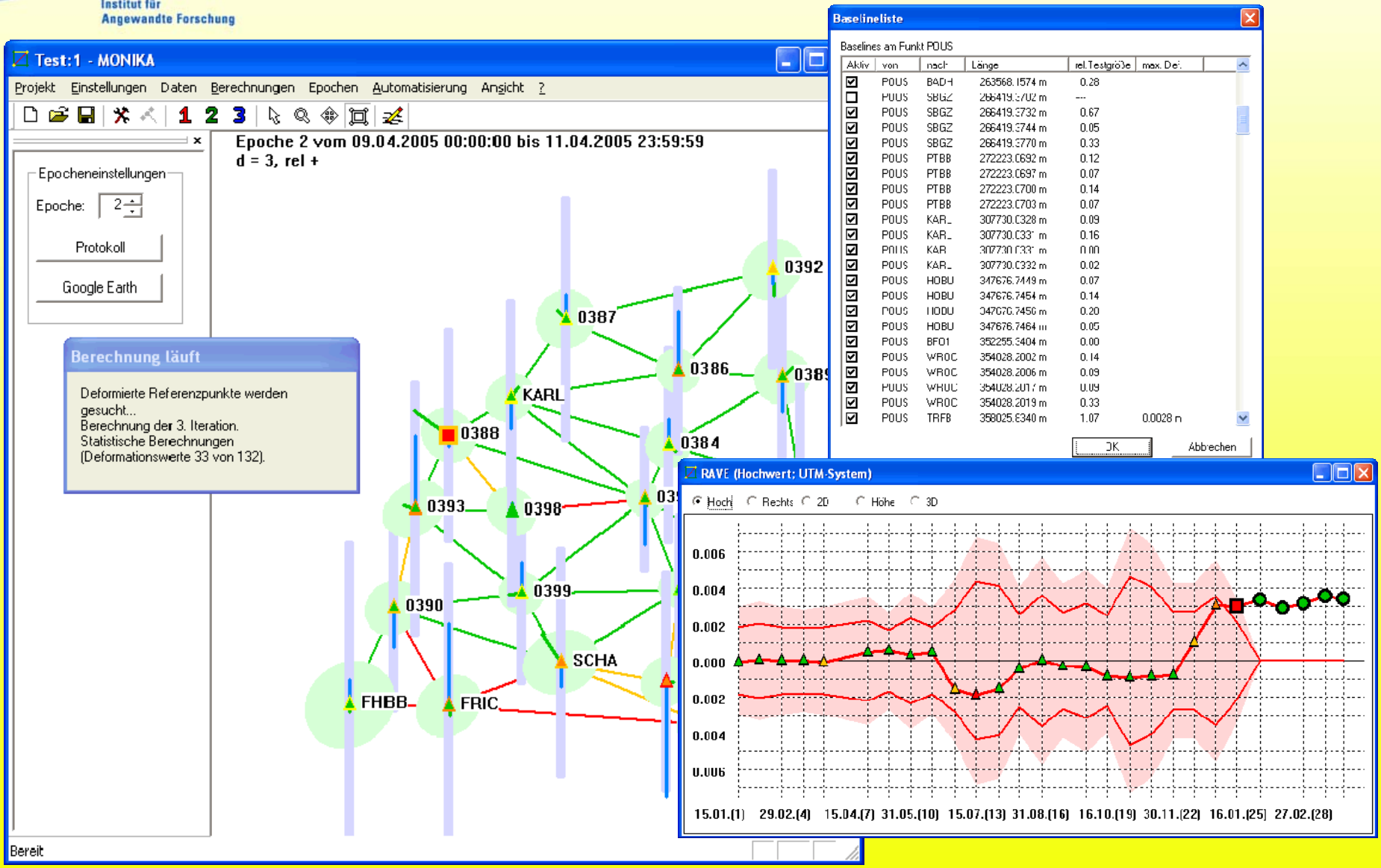
HTML-Deformation-Protocol

HTML-Plate-Rotation-Protocol



8.3 Deformation Analysis Files

MONIKA


Test:1 - MONIKA
Projekt Einstellungen Daten Berechnungen Epochen Automatisierung Ansicht ?
Epoche 2 vom 09.04.2005 00:00:00 bis 11.04.2005 23:59:59
d = 3, rel +
Epocheneinstellungen
Epoche: 2
Protokoll
Google Earth
Berechnung läuft
Deformierte Referenzpunkte werden gesucht...
Berechnung der 3. Iteration.
Statistische Berechnungen
(Deformationswerte 33 von 132).
0392
0387
0386
KARL
0388
0384
0393
0398
0399
0390
SCHA
FHBB
FRIC
Bereit
Baselineliste
Baselines am Punkt POUS
Aktiv von nach Länge rel.Testgröße max. Def.
POUS BADH 263568.1574 m 0.28
POUS SBGZ 266419.3732 m 0.67
POUS SBGZ 266419.3744 m 0.05
POUS SBGZ 266419.3770 m 0.33
POUS PTBB 272223.0692 m 0.12
POUS PTBB 272223.0697 m 0.07
POUS PTBB 272223.0700 m 0.14
POUS PTBB 272223.0703 m 0.07
POUS KAR_ 307730.0328 m 0.09
POUS KAR_ 307730.0332 m 0.02
POUS HOBU 347676.7449 m 0.07
POUS HOBU 347676.7454 m 0.14
POUS HOBU 347676.7464 m 0.05
POUS BFO1 352255.3404 m 0.00
POUS WROC 354028.2002 m 0.14
POUS WROC 354028.2006 m 0.09
POUS WROC 354028.2019 m 0.33
POUS TRFB 358025.8340 m 1.07 0.0028 m
OK
Abbrechen
RAVE (Hochwert; UTM-System)
Hoch Rechts 2D Höhe 3D
0.006
0.004
0.002
0.000
0.002
0.004
0.006
15.01.(1) 29.02.(4) 15.04.(7) 31.05.(10) 15.07.(13) 31.08.(16) 16.10.(19) 30.11.(22) 16.01.(25) 27.02.(28)

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Thank you for your attention !

Any questions?

End