

# Stress Inversion user guide



This application evaluates stress axis orientation ( $\sigma_1$ ,  $\sigma_2$ ,  $\sigma_3$  axis orientation as well as P and T axes orientation) and relative stress magnitude (R value) by inverting earthquake focal mechanisms. Stress state can be defined for a point (0D case), profile or time change (1D case), map (2D). The framework of calculating the deviatoric stress tensor together with its uncertainties using bootstrap resampling method is also provided along with a variety of plots.

See also [MSATSI documentation](#).



REFERENCES [Document Repository](#)

CATEGORY Visualizations

KEYWORDS Source mechanism, Moment tensor, Stress inversion

CITATION Please acknowledge use of this application in your work: IS-EPOS. (2018). *Stress inversion* [Web application]. Retrieved from <https://tc.s.ah-epos.eu/>

## Step by Step

After selecting a catalog in the User's workspace, click on 'ACTIONS', then 'USE IN APPLICATION' and then 'Stress Inversion' as highlighted in Figure 1.

An alternative approach to perform stress inversion, by computing and adding in the workspace the parameters one by one is appended at the end of the chapter.

For a comprehensive scientific description of the process and the parameters definition and constraints please visit <http://www.induced.pl/msatsi>

### Song Tranh catalog

#### File

SONG\_TRANH\_catalog.mat

#### Summary

Number of events:

5708

Time

2013 Aug 24

#### Data

Name	Description	
ID		
Time	Event occurrence time	
Lat	Latitude [deg]	
Long	Longitude [deg]	

#### ACTIONS

USE IN APPLICATION...	Catalog Export
USE IN VISUALIZATION...	Catalog Filter
SHOW FILE INFORMATION	Completeness Magnitude Estimation
DOWNLOAD	FOCI application
COPY	GMPParameters Tool
CREATE LINK	Inter-event Time Distribution Analysis
MOVE	Localization
RENAME	Magnitude Conversion
DELETE	Signal download tool
	Source size distribution functions/Stationary Hazard
	Spectral Analysis
	Stress Inversion
	Time Series Builder
	Time dependent hazard in mining front surroundings
	Time dependent hazard in selected area

Figure 1. Selection of the application from the data uploaded in the workspace

The following screen now appears (Figure 2) and the following fields, corresponding to parameter values and options, are requested to be fulfilled by the user:

Number of valid mechanisms: 114.

Analysis type:

Bootstrap resamplings:

Confidence level:

PT plots: ☐

Advanced options: ☐

Plot type:

Confidence intervals:

R plot: ☒

Stereonet: ☒

Advanced options: ☒

Projection:

S1: ☒

S2: ☒

S3: ☒

Stress axis labels: ☒

Title:

X label:

Y label:

Z label:

Status CREATED

Figure 2. Selection of input parameters and files for the application

**Using Seismic Catalog:** The seismic catalog has been already selected in the previous step, however, the User may select another dataset from the workspace for stress inversion.

**The number of valid mechanisms:** This is an informative field showing the number of available focal mechanisms, such that the User knows about the sample size that is going to be analyzed.

**Analysis Type:** Three options are currently available in the EPISODES Platform: 0D, 1D and 2D, and can be selected after clicking on the small arrow at the tab. If 1D or 2D options are selected, the user is requested to enter the parameter(s) and window(s) of X, or X and Y dimensions, respectively (Figure 3)

Analysis type:

Grid X dimension:  window:

Grid Y dimension:  window:

Figure 3. Additional input parameters for the application

**Bootstrap Resamplings:** Positive integer values are valid in this field, defining the number of Bootstrap Resamplings to be performed.

**Confidence Level:** A number between 0 and 100 is requested, defining the percentage of confidence interval of the results.

**PT Plots:** on/off (Switches the plotting of P and T axes).

**Advanced Options:** A number of advanced options are available after clicking on the small box (Figure 4). See at the MSATSI manual for details (<http://www.induced.pl/msatsi>)

Advanced options:	<input checked="" type="checkbox"/>
Damping:	<input checked="" type="checkbox"/>
Damping coeff:	<input type="text" value="0"/>
Fraction valid fault planes:	<input type="text" value="0.5"/>
Minimum events node:	<input type="text" value="20"/>

Figure 4. Additional input parameters for the application

**Plot Type:** The User may select one of the available options (accordingly to the *Analysis Type*) after clicking on the small arrow.

**Confidence Intervals:** The User may select one of the available options after clicking on the small arrow.

**Rplot:** on/off, plot can be activated/ deactivated by ticking or not the box, respectively.

**Stereonet:** on/off, off, plot can be activated/ deactivated by ticking or not the box, respectively.

**Advanced Options:** A number of advanced options are available after clicking on the small box (Figure 5). See at the MSATSI manual for details (<http://www.induced.pl/msatsi>)

Advanced options:	<input checked="" type="checkbox"/>
Projection:	<input type="text" value="Wulff"/>
S1:	<input checked="" type="checkbox"/>
S2:	<input checked="" type="checkbox"/>
S3:	<input checked="" type="checkbox"/>
Title:	<input type="text"/>
X label:	<input type="text"/>
Y label:	<input type="text"/>
Z label:	<input type="text"/>

Figure 5. Additional input parameters for the application

After choosing all the aforementioned parameters the User may click on 'RUN' button to proceed to the calculation process. The results are soon to be available and saved by the system (Figure 6). Those results include schemes, as well as tables with results with option to perform simple plots with those results. These results are shown in the red frame of Figure 7.

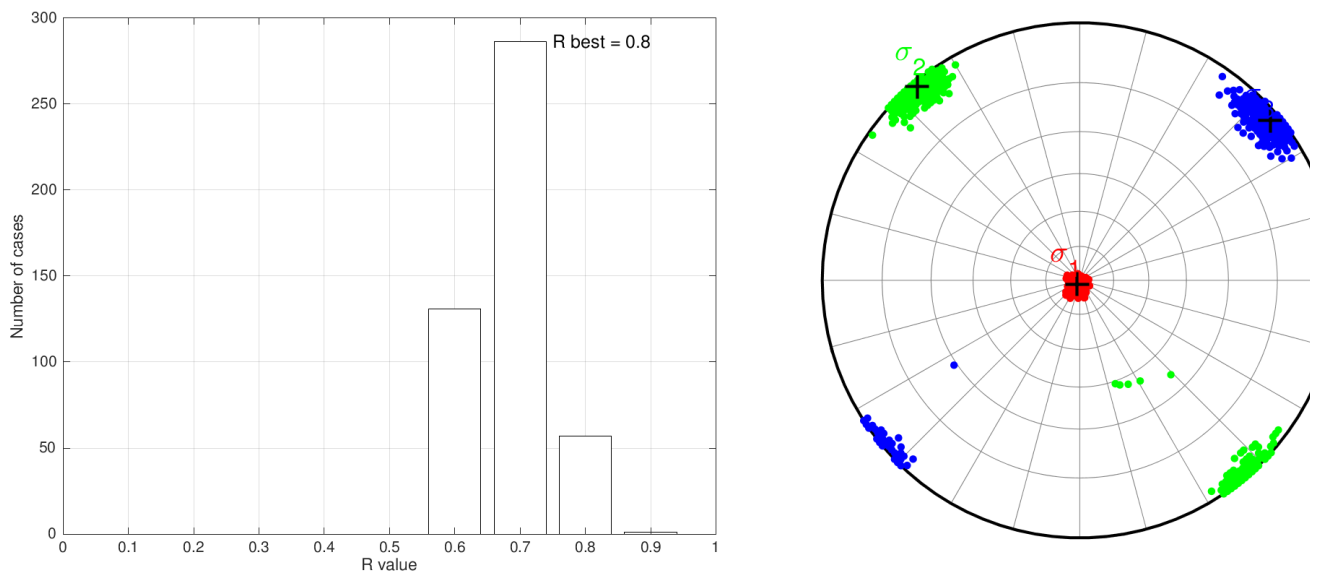


Figure 6. Example of some of the output graphs produced by the application

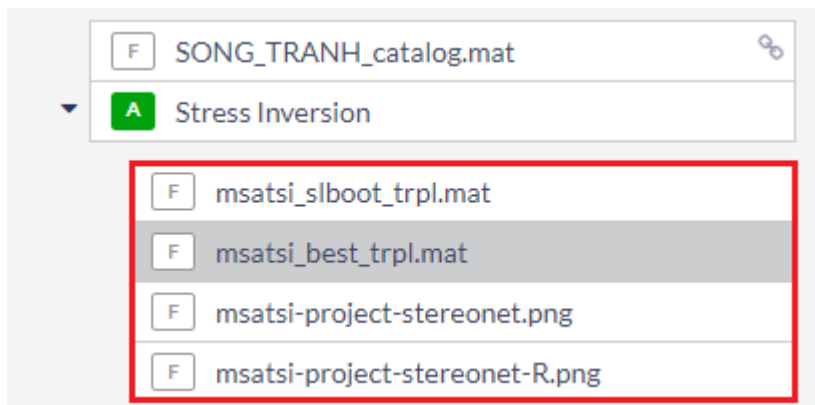


Figure 7. Outputs of the application

[Back to top](#)

Go to  **EPISODES**  
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