SAES User Manual

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1 Overview

Spectral Analysis for Earthquake Source (SAES) Parameters code is intended to perform a spectral analysis to calculate earthquake source parameters, i.e. corner frequencies, f_c, and long-period spectral amplitude, Ω_0 , which can be used to calcualte seismic moment, M_w, stress drop, $\Delta\sigma$, and source dimension, r in subsequent analysis. Through the input control file, the code allows the user to specify the following:

- desired source model (e.g., Brune's model, Boatwright model)
- choice of single spectrum fitting and/or spectral ratio fitting
- stations and events blacklisting or whitelisting
- signal-to-noise (SNR) threshold
- instrument response removal
- free-surface effect correction

Computation can be performed in parallel by setting **numworkers** larger than 1 in the control file.

2 Installation

```
$ cd $SAES_DIR
$ python setup.py install
```

3 Usage

```
from saes.saes_core import saes_core
saes_obj=saes_core('path/to/your/control.file')
```

4 Input

`catalog.dat`

It includes the list of events to be analyzed in ***Pyrocko*** format. Alternatatively, the users can provide event list in a 11-column table, as specified in `/input/events.dat`, and the code will conver it into `catalog.dat`

`cclist.dat`

In case of spectral ratio analysis, the cross-correlation file should be stored as in `/input/cclist.dat`.

`control.file`

This file contains parameters that control the computations. See the example in `/input/control.file` and comments therein.

`pre_filt.dat` [*OPTIONAL]*

This file is used to specify the bandpass corners for instrument response correction in the code.

`stations.xml`

This file should contain the station location and instrument response information in *FDSN XML* format. It is required for instrument response correction and for calculating epicentral and hypocentral distances.See the example in `/input/stations.xml`

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`tt_pyrocko.dat` and `tt.dat`

The files should contain the phase arrival picks in `snuffler` format `tt_pyrocko.dat` or in a 4-column table `tt.dat`. See examples in `/input/`.

5 Output

The code will create a folder that contains solution results (`.dat` file) as well as waveform fit figures (`.pdf` files) for each event. The examples in `/output` include solutions for two events: `201307112016` and `201307112058` (for single spectrum analysis).

6 Citation

To cite the software and manual, use:

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- Onwuemeka, J., G. Li (2020), *SAES Uset Manual.* URL:https://github.com/Johumel/SAES/blob/master/SAES_Manual.pdf