README for Source Spectra Project

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This file outline the contents of the folder Source\_Spectra\_Project. This project was executed from the Spring 2017 to Spring 2018.

**Folders and Files:**

Background\_Material

* Contains final poster presented at the SSA conference in Denver in April 2017
* Papers relevant to the project

Phase\_Data

* All the phase pick data for events in the Oklahoma Kansas induced seismicity zone from 2013 to 2017.
* Gathering the picks was done using the python package libcomcat but can be done by other methods. The pick files are then matched with the event and station list to make sure picks exist for each. See the script get\_eventlist.py in the Test\_Code folder for an example of using libcomcat.
* Visit the libcomcat github for additional details on how to download picks files.

data

* All the sac files output from setup\_source\_site\_files.py and the input to the source site inversion fortran code. The sac files are duplicated, one version of each in the main folder and then another copy in subfolders separated by events. This is just for ease of access from different codes. The current files in there are part of an example subset.

source\_site\_inversion\_original

* Original files for the source site inversion fortran code. Duplicates are in the main folder, this folder is just used as reference for the original code.

Master\_event\_list\_2009\_2017.csv

* Csv file that lists all the events in the Oklahoma Kansas induced seismicity zone from 2009 to 2017. Each line is in the same format needed for input into the setup\_source\_site\_files.py (event\_list.csv is that input file). If you want to output sac files for additional events just copy those lines into the event\_list.csv file.

Master\_station\_list.csv

* Csv file that lists all possible stations that recorded events in the Oklahoma Kansas induced seismicity zone from 2009 to 2017. Each line is in the same format needed for input into the setup\_source\_site\_files.py (station\_list.csv is that input file). If you want to output sac files for additional stations just copy those lines into the station\_list.csv file.

Setup\_source\_site\_files.py

* This is the main file for creating sac and text files that are input into the inversion code. The input for this script is the setup\_parameters.csv, station\_list.csv, and event\_list.csv
* See Guide\_to\_source\_site\_setup\_py.txt for details of what goes into the input files.
* The output of this script is the sac files in the folder ‘data’, fortran\_sac\_files.txt (has a list of the sac files and the pick starts and windows), and fortran\_stations.txt (formatted info about the stations). These are all needed as input for the fortran code which starts with quartetsac6

**Workflow:**

1. Create a list of events and stations you want to calculate the inversion on in the csv file formats laid out in (you can grab additional events or stations from the Master csvs and just copy in the lines):
   1. Event\_list.csv
   2. Stations\_list.csv
2. Edit the setup\_parameters.csv script as needed. Details of the meaning of all the parameters are in the Guide\_to\_source\_site\_setup\_py.txt. The current default values are a good start.
3. Run the python script setup\_source\_site\_files.py
   1. This will read in the above three CSV files and call to IRIS using the obspy package.
   2. The sac files will be downloaded in bulk for the given station and event pairs.
   3. The record responses are removed, detrend, taper, and filtered.
   4. The sac files are currently output as Velocity, this can be changed on Line 88 of the script where it says “output=’VEL’”
   5. The edited sac files are output into a specified folder (‘data’ folder) with the format needed to run the fortran inversion.
   6. This script also creates the files ‘fortran\_sac\_files.txt’ and ‘fortran\_stations.txt’. These are formatted to be the input into the fortran script quartetsac6. Please note that that fortran code is currently hard coded to have the input files be called ‘k2autoed\_2014.cfg’ (the equivalent of fortran\_stations.txt) and ‘20131113173000NAMESv.DAT’ (the equivalent of fortran\_sac\_files.txt). Thus to run the script you should either change the names of the two txt files or change the file names in the fortran code. Leave 20131113173000NAMESa.DAT’ empty as all the files are velocity.
   7. Alternatively, if you already have a set of sac files or want to use a shell script to download files that will work but then the file names will have to be modified to work in fortran.
4. Run the fortran scripts for the source site inversion in the following order.
   1. Start with quartetsac6. The quartetsac6shell script currently has an example of input parameters, this is a good start but they may need to be adjusted.
   2. Constraint
   3. Runspars1
   4. Viewsol3
   5. Standev or standev2
   6. Viewsol3

Below is a map of the stations and events in the current subset and a histogram of the event magnitudes.



