

Software for

Local station correlation: large N-arrays and DAS

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Software for simulation and analysis of the cross-correlation of seismic records at short distances and analysis of surface wave dispersion.

The material is presented with three components with separate .zip files

- (1) Construction of Correlation and Array displays
– CCGD-Array.zip
- (2) Surface Wave analysis using large N-array correlations
– Narray-codes.zip
- (3) Surface Wave analysis using DAS correlations (includes data)
– DAS-codes.zip

Construction of Correlation and Array displays

Brian L.N. Kennett

.zip folder: CCGD-Array.zip

CCGD: local correlations for seismometers and DAS

For a given spacing between stations, frequency and slowness this routine produces a suite of displays of local properties over a 750m x 500m zone using 150x100 arrays.

The displays are on two Pages:

Page 1 - (a) Geometric spreading effects from a source to the two stations. (b) The ratio of the difference between the distance from the source to the two stations and the inter-station path length. (c) Phase contributions, (d) Total effect for two seismometers, (e) Orientation effects for DAS cable with orientation along the inter-station path, (f) Net effect for two DAS sensors.

Page 2 - (a) relative phase between propagation from the source and the inter-station path, (b) net effect including geometrical spreading.

To run

`ccgd.x`

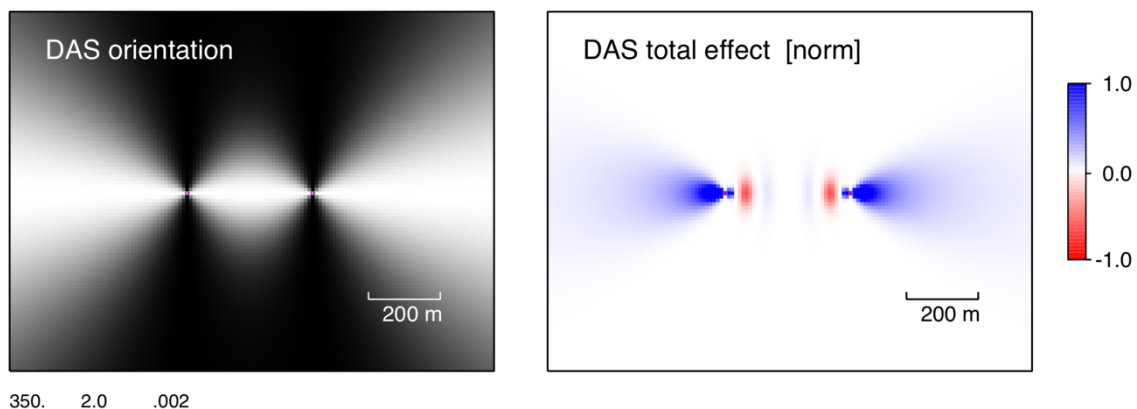
Input requested – spacing [m], frequency [Hz], slowness [s/m]

spacing, freq, slowness:

350 2.0 0.002

Output to `ccgd.out` – array information

and to `ccgd.ps` – Postscript file (suitable for editing)



Snapshot of part of Postscript display for Page 1 with mnemonic for parameters at bottom corner.

The Programs are written in Fortran 77 and a Postscript library is provided.

Array response for correlation:

The Array response routines are designed to be useful for a domain 10 km x 10 km.

For an Array identified by a 4-character string, e.g. af34

Need to create a list of coordinates `af34.ne.dat` of northings and eastings relative to a convenient origin (example below)

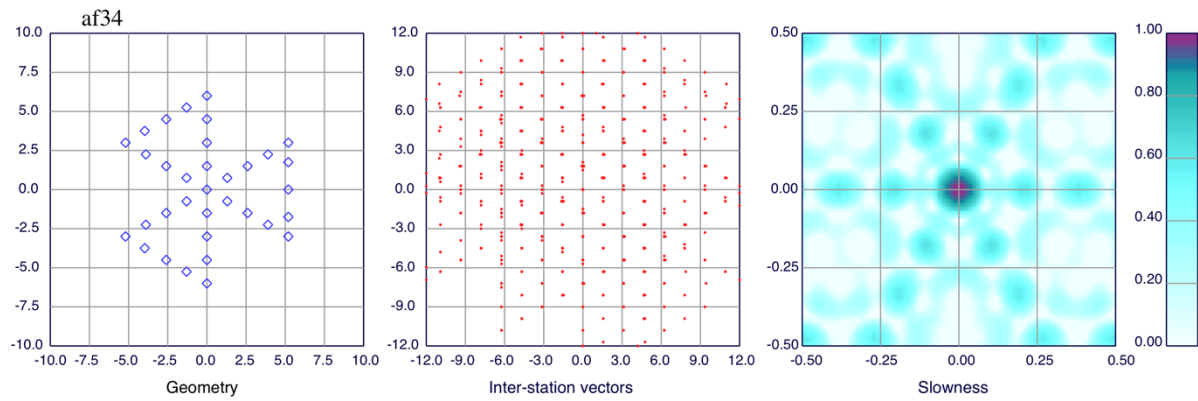
0.00000	0.00000
0.00000	1.50000
0.00000	3.00000
0.00000	4.50000
0.00000	6.00000
1.29904	0.75000
2.59808	1.50000
3.89711	2.25000
5.19615	3.00000
1.29904	-0.75000
2.59808	-1.50000
3.89711	-2.25000
5.19615	-3.00000
-0.00000	-1.50000
-0.00000	-3.00000
-0.00000	-4.50000
-0.00000	-6.00000
-1.29904	-0.75000
-2.59808	-1.50000
-3.89711	-2.25000
-5.19615	-3.00000
-1.29904	0.75000
-2.59808	1.50000
-3.89711	2.25000
-5.19615	3.00000
-3.96711	3.75000
-2.59808	4.50000
-1.29904	5.25000
5.19615	1.75000
5.19615	0.00000
5.19615	-1.75000
-3.96711	-3.75000
-2.59808	-4.50000
-1.29904	-5.25000

The array response in slowness space, using this geometry with the addition of inter-station vectors is produced by the simple script

```
arre.run af34
```

where the argument must be the array identifier.

This script calls the routines `int-dist.x`, `int-vect.x`, `arre3-disp.x` to produce the postscript display `af34-3.ps`



The array-bar (arr-bar.ps) shown at the right is provided as a separate file.

The 25 colours used for the array display are specified in the file
col.pa1

Compilation:

The routines have been used with the Gfortran compiler on an iMac.
A makefile is provided.

Surface Wave analysis using large N-array correlations

Chengin Jiang

.zip folder: Narray-codes.zip

contents of the .zip folder

1. noise.py:

The snapshot of the noise.py version used for processing the Lake George data. For full documentation and updates of the codes, please visit the github repository <https://github.com/mdenolle/NoisePy>

2. make_multi_component.py:

a stand-alone script for particle motion filter based on the 9-component correlation tensor

3. compute_dispersion_onesource.py:

a stand-alone script for integral transformation to measure phase dispersion based on array seismology

Surface Wave analysis using DAS correlations

Krystyna Smolinski

.zip folder: DAS-codes.zip

contents of the .zip folder

1. CC_to_dispersion.ipynb:

Jupyter notebook to create dispersion curves from cross-correlated DAS data

2. fk_separation.py:

Perform f-k-domain separation of a cross-correlation record section.

3. slant_stack_new_PWS.py:

Perform slant-stack (MASW) dispersion curve analysis

Intended to operate on the output from FK-filtered record section

4. cross_correlations_numpy_paper:

Folder with the cross-correlations extracted for the Bern data