

Kerner manual

Simon Stähler, Martin van Driel

April 2, 2014

This document is a very preliminary manual how to use the kerner program together with AxiSEM. It will be extended (hopefully).

1 Prerequisites

The *kerner* should be run under Linux in combination with a recent version of AxiSEM (Release version 1.0 is not enough!). To get the latest version of AxiSEM, use `git clone https://github.com/geodynamics/axisem.git`.

NetCDF is needed as well, preferably version 4.2. It can be downloaded and installed using the script shipped with AxiSEM.

The Makefile in axisem/SOLVER/UTILS is wrong. Replace it with the one in kerner/manual before compiling AxiSEM.

1.1 Run AxiSEM

The kerner needs two separate AxiSEM runs, one for the forward and one for the backward wavefield. One has to decide for a frequency first. This should especially depend on the disk space. A 50s run needs 5 GB in total, the space scales with the cube of the frequency. The background model of the mesh does not matter.

1.1.1 Forward field

Set these parameters, all others do not matter:

inparam_basic

SIMULATION_TYPE	moment
SEISMOGRAM_LENGTH	1800.
MESHNAME	IASP_50s
LAT_HETEROGENEITY	false
SAVE_SNAPSHOTS	false

inparam_advanced

SAMPLING_PERIOD	0.0
SOURCE_PERIOD	0.0
SOURCE_FUNCTION	errorf
USE_NETCDF	true
KERNEL_WAVEFIELDS	true
KERNEL_SPP	8
KERNEL_SOURCE	mask
KERNEL_IBEG	1
KERNEL_IEND	3

Set the requested depth in CMTSOLUTION (can be any value)

1.1.2 Backward field

Set these parameters, all others do not matter:

inparam_basic:

SIMULATION_TYPE	single
SEISMOGRAM_LENGTH	1800.
MESHNAME	IASP_50s
LAT_HETEROGENEITY	false
SAVE_SNAPSHOTS	false

inparam_advanced:

SAMPLING_PERIOD	0.0
SOURCE_PERIOD	0.0
SOURCE_FUNCTION	errorf
USE_NETCDF	true
KERNEL_WAVEFIELDS	true
KERNEL_SPP	8
KERNEL_SOURCE	mask
KERNEL_IBEG	1
KERNEL_IEND	3

inparam_source:

SOURCE_TYPE	vertforce
SOURCE_DEPTH	000.0
SOURCE_LAT	90.0
SOURCE_LON	0.0
SOURCE_AMPLITUDE	1E20

Only depth and source type matter.

1.2 Reorder fields in NetCDF file

After the runs have finished, run the script `kerner/manual/ordered.sh` in the AxiSEM Solver directory. You may have to adapt the directory names of the forward and backward runs. This script will occupy another several GB on your disk.

2 Run the kerner

The kerner settings are mainly set in `inparam_basic`. The variables `fwd_dir` and `bwd_dir` should point to the run directories of the AxiSEM runs. I always use symbolic links in the `wavefield` directory.

The kerner itself is run with:

```
mpirun -n $NTASKS ./kerner $PATH_TO_inparam_basic
```

It can be run from any directory, as long as the `$PATH_TO_inparam_basic` and the directories set within are correct. `$NTASKS` has to be at least 2, to have one master and one slave.

For just plotting wavefields, start the code without MPI.