

Kerner manual

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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 1.1 is not enough!). To get the latest version of AxiSEM, use `git clone https://github.com/geodynamics/axisem.git`.

1.1 NetCDF

NetCDF is needed as well, preferably version 4.2. It can be downloaded and installed using the script shipped with AxiSEM. The NetCDF libraries in Ubuntu 14.04 are enough

1.2 Compiler

Gfortran >4.6

1.3 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.

1.3.1 Forward field

Set these parameters, all others do not matter:
inparam_basic

<code>SIMULATION_TYPE</code>	<code>moment</code>
<code>SEISMOGRAM_LENGTH</code>	<code>1800.</code>
<code>MESHNAME</code>	<code>IASP_50s</code>
<code>LAT_HETEROGENEITY</code>	<code>false</code>

SAVE_SNAPSHOTS	false
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inparam_advanced

SAMPLING_PERIOD	0.0
SOURCE_PERIOD	0.0
SOURCE_FUNCTION	errorf
USE_NETCDF	true
KERNEL_WAVEFIELDS	true
KERNEL_DUMPTYPE	displ_only
KERNEL_SPP	8
KERNEL_SOURCE	igno
KERNEL_COLAT_MIN	00.
KERNEL_COLAT_MAX	180.
KERNEL_RMIN	0000.
KERNEL_RMAX	6372.

Set the requested depth in CMTSOLUTION

1.3.2 Backward field

Set these parameters, all others do not matter:

inparam_basic:

SIMULATION_TYPE	force
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_DUMPTYPE	displ_only
KERNEL_SPP	8

KERNEL_SOURCE	igno
KERNEL_COLAT_MIN	00.
KERNEL_COLAT_MAX	180.
KERNEL_RMIN	0000.
KERNEL_RMAX	6372.

1.4 Reorder fields in NetCDF file

After the runs have finished, run the script `field_transform.csh` in the run directories. 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, change the setting `WHAT_TO_DO` in `inparam_basic` and start the code without MPI.