1 Prerequisites

The following libraries are necessary for using of GIEM2G:

- MPI subsystem GIEM2G needs at least TWO processes to work!
- FFTW3 (http://www.fftw.org/download.html) It *must* be built with MPI and OpenMP support i.e. with (`--enable-mpi --enable-openmp`)
- OpenBlas (https://github.com/xianyi/OpenBLAS) (recommended) or other modern implementation of BLAS/LAPACK

2 Installation

2.1 For Linux

It is highly recommended to create a section in `make.inc` for your platform by

```
ifeq ($(PLATFORM), MY_PLATFORM)
FC=
FC_Link=

FOPTS=
Ar=

LIB_FFTW= <PATH_TO_FFTW>/lib -lfftw3_omp -lfftw3_mpi  -lfftw3
LIB_BLAS= <PATH_TO_BLAS>/lib -lopenblas_omp
FFTW_INC=  <PATH_TO_FFTW>/include

INSTALL_PATH=
endif
```

- Set your favorite *MPI* Fortran compiler to `FC, FC_Link`.
- Set optimization and linking options to `FOPTS`. For gfortran you can use the ones from the GNU section of `make.inc`
- *Note!* your compiler with your options must support preprocessing
- Set `xiar` to `AR` in case of using Intel compilers and `ar` in other cases
- The `<PATH_TO_FFTW>`, `<PATH_TO_BLAS>` are paths to FFTW3 and BLAS libraries correspondingly
- Set path for installed binary into `INSTALL_PATH`

To build GIEM2G run `make  PLATFORM=MY_PLATFORM`. Unfortunately, the parallel make is not supported for GIME2G

2.2 For Windows

I have never try to do this.

3 Using

- Example of input format (json-based): `test/commemi3d2.json`
- The background conductivity for $z < 0$ is always 0
- The origin of coordinate system in lateral direction is placed in the corner of anomaly
- The field "Conductivity" contains path to the plain-text file with conductivity distribution.
- *Note* The order of data of this file is like $\sigma(N_z, N_x, N_y)$ *Fortran* order. That means that in first conductivity is changed along Z direction, than along X and than along Y.
- The field "zborders" contains coordinates of the cell borders in vertical direction. This way, length of this array is $N_z + 1$
- The values of "xshift" and "yshift" fields in the "Recievers" means shift of the origin of the set of recivers from the center of the cell (1,1) of the anomaly. For any element of the "Recievers" array GIEM2G compute 6 components of electrical and magnetic fields in the $N_x N_y$ sites with following coordinates $(\frac{dx}{2} + xshift + dx \cdot I, \frac{dy}{2} + yshift + dy \cdot J, depth), I = 0 \dots N_x, J = 0 \dots N_y$. Thus `"xshift": 0e0,"yshift": 0e0, "depth": 0` mean that electrical and magnetic fields will be computed above the centers of the anomaly cells at $z = 0$ i.e. at the ground-air border.
- Command to run: `mpirun -n <NP> path-to-GIEM2G <input>.json`
- Nx, Ny and `<NP>` must be even and $2Ny$ must be divisible by `<NP>` without reminder