SOURCE PARAMETER INVERSION PROGRAM CAPJOINT

USER'S GUIDE

By

Weiwen Chen and Zhe Jia

University of Science and Technology of China

vincentc@mail.ustc.edu.cn, jiazhe@mail.ustc.edu.cn

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Code available from server at:
http://home.ustc.edu.cn/~vincentc/CAPjoint

Requirement

In order to run the code CAPjoint, you need to have the following software installed and added to the system path.
1. Seismic Analysis Code (SAC)
   http://www.iris.edu/dms/nodes/dmc/software/
2. Tau-P
   http://www.seis.sc.edu/taup/
3. CRUST2.0
   http://igppweb.ucsd.edu/~gabi/crust2.html
4. Frequency-Wavenumber synthetic seismogram (FK)
   http://www.eas.slu.edu/People/LZhu/downloads/fk3.1.tar
5. Numerical Recipes (NR)
   http://www.nr.com/
6. Generic Mapping Tools (GMT)
   http://gmt.soest.hawaii.edu/projects/gmt
7. PSSAC2
   https://geodynamics.org/svn/cig/seismo/3D/ADJOINT_TOMO/measure_adj/UTIL
/pssac2/
8. Ghostscript and Gsview
   http://www.cs.wisc.edu/~ghost/

Installation

1. Make sure the Numerical Recipes (NR) is installed, the default path for the NR is ~/bin/NR, change the path in cap_main/subhir/Makefile if necessary.
2. Compile the CAPjoint code by do the Makefile.
3. Compile the tel3 code in the folder tel3/
4. Be aware that the default output path for the executable file is in ~/bin/, please add it to the system path if necessary.

Run the code

1. If you do not have structure model, be sure that CRUST2.0 is installed to generate velocity model automatically. Please check vmodel_tel and vmodel_loc for the detailed format of model file.
2. Specify the input parameters in LeadCAP.cmd, see detailed information in the script annotations.
3. For IRIS WILBER format seed files, extract the SAC files by "sh LeadDATA.cmd

*.seed". Otherwise you should de-instrument and rotate the SAC files to the great arc by yourself, then cut the window length and multiply 100 to fit the measurement of the forward modeling codes.

4. Run "sh LeadCAP.cmd"

```
[cww@localhost CAPjoint]$ ls
2014-03-10_MW6.8_N_California.seed  cmds            LeadData.cmd
cap_plt_3.pl                         LeadCAP.cmd
[cww@localhost CAPjoint]$ sh LeadData.cmd 2014-03-10_MW6.8_N_C
alifornia.seed
```

```
[cww@localhost CAPjoint]$ sh LeadCAP.cmd
```

Joint Inversion Implement

```
# Now specify weighting parameters:
# teleseimic Vs. Local; teleseismic P Vs. SH; switch of P/SH
# P/SH switch: P only:-1 ; SH only: 1 ; P & SH: 0 (default)
  w_TEL_LOC=50;          w_P_SH=1;              s_P_SH=0;
```

1. Modify the weighting parameters in the LeadCAP.cmd

2. The total error amount of each datasets: local and teleseismic, as well as the average error will be printed on the screen after the inversion is done (see fig below). Pick a proper weighting number to fit your requirement. For beginner users, we recommend choosing the weighting parameters to balance the average error of each dataset, which means make them as equal as possible.
3. For example, in this case, to balance the local and teleseismic datasets, we advise that use 1/4 for tel/loc weighting parameter, which is 0.25
4. Weighting parameter for teleseismic P and SH waves is also provided. Usage is similar as described above

```
              total         tel         loc         P           SH
rms:          82.679        60.225      22.454      22.425      37.8
  n:          25            10          15          5           5
rms_average:  3.307160      6.022500    1.496933    4.485000    7.560000


        rms_loc      n_tel
scalar: ------- *    ----- = 0.248557
        rms_tel      n_loc

        rms_SH       n_P
scalar: ------- *    ----- = 1.685619
        rms_P        n_SH
```