Program: hazgridXNGA2.f
Language: fortran95 (gfortran)
Purpose: Compute probabilistic seismic hazard at various sites from a grid of sources
Current Technical Contact: Stephen Harmsen, harmsen@usgs.gov
Date of last Modification: January 10, 2007

To run: hazgridXNGA2.exe input.file > log.file
Sample Input File: Comments are given in blue. These blue comments are not read by the program. The data on the left side are what the program needs.
Here is an example input file:

```
0               !use grid-of-sites option (1 implies list of stations)
0 22. 0.1     !minlat, maxlat,dlat  Site grid in Thailand&Indonesia
94. 105. 0.1          !minlong, maxlong, dlong (in degrees)
760. 1        !Vs in upper 30 m, 760 m/s here; depth to Vs2500 (km)
1 5 1 1        !depth to top-of-rupture. Here, fix at 5 km
1 0 0         !proportion of Strike-slip, reverse, normal-faulting, resp.
5. 1000.      !delta-R and Rmax (km) for source-to-site calculations
-17. 22. 0.20       !source region, sampled at 0.2 d increment in lat
88. 117. 0.20       !source region, sampled at 0.2 d increment in long.
1.0 5.0 7.0 0.1 3.0         !default bvalue=1. Mag range 5 to 7, by 0.1
1 0 0                       !use grid of avalue(rates) but default b, Mmax
d1.a                        !name of binary agrid file, output of agrid pgm
1. 0          !cyr, incr=0. If incr=1, convert cumulative to incremental
4             ! How many spectral periods in analysis?
0.2 0. 0.     !first period, here 0.2 sec SA. Next line: Output file name.
SEasiagrid.5hz
19            !number of ground motions, then list of sampled g.m.
.005 .0075 .0113 .0169 .0253 .0380 .0570 .0854 .128 .192 .288 .432
.649 .973 1.46 2.19 3.28 4.92 7.38
2       !number of attenuation models to consider for this period
6 0.5 1000. 0.25 0        !Code 6 is Frankel et al. model. Weigh 0.5
10 0.5 1000 0.5 0         !Code 10 is Campbell&Bozorgnia, highQ
0.3 0. 0.     ! next period: 0.3 sec SA
SEasiagrid.3hz
20            !how many ground motions and list of g.m.
.0025 .00375 .00563 .00844 .0127 .0190 .0285 .0427 .0641 .0961
.144 .216 .324 .487 .730 1.09 1.64 2.46 3.69 5.54
2
6 0.5 1000. 0.25 0        !Frankel et al.
10 0.5 1000 0.5 0         !Campbell&Bozorgnia, hybrid
```

0.0 0. 0. !3rd period: PGA=0.0 sec SA
SEasiagrid.pga
20
.001 .00375 .00563 .00844 .0127 .0190 .0285 .0427 .0641 .0961
.144 .216 .324 .487 .730 1.09 1.64 2.46 3.69 5.54
2
6 0.5 1000. 0.25 0 !Frankel et al.
10 0.5 1000 0.5 0 !Campbell&Bozorgnia, hybrid
1.0 0. 0. !4th spectral period: 1.0 sec SA
SEasiagrid.1hz
20
.0025 .00375 .00563 .00844 .0127 .0190 .0285 .0427 .0641 .0961
.144 .216 .324 .487 .730 1.09 1.64 2.46 3.69 5.54
2
6 0.5 1000. 0.25 0 !Frankel et al.
10 0.5 1000 0.5 0 !Campbell&Bozorgnia, hybrid

Notes: If you want to perform analysis for a list of sites instead of a grid of stations, the first line should begin with 1, then list the station coordinates and their names. Example:

2
13.65 100.7 Bangkok1
13.75 100.6 Bangkok2
…
In this example, PSHA analysis will be done for two sites in and around Bangkok.

There are many options the code is able to work with. You can use up to seven attenuation models per spectral period. The index or code for each of these is contained in the comments early in the source code.

You can consider up to seven spectral periods per run. Different attenuation models work with different sets of periods. If you select common periods, such as 0.2 and 1.0 s, all of the models will work. If you select uncommon periods, such as 5.0 seconds, many models won't work. Newer models, such as NGA (Next Generation of Attenuation Models) often have more periods to choose from.

Here is a current list of attenuation models available in hazgridXnga2:

Some are for fixed site conditions and some for
Vs-30 dependent site conditions. CEUS fixed site is HR or FR; WUS FR or soil.

INDEX Whose Model?

1 Spudich ea, 2000. Model form is based on BJF93. Has siteamp from BJF97.
2 toro ceus BC rock (this is a high-Q model)
-2 toro ceus hard rock
3 Sadigh et al (rock-site coeffs.& eqn) firm rock
-3 Sadigh et al (soils-site coeffs.&eqn) in prep aug06 (don't use)
4 AB06 BC Atkinson and B00re 2006
-4 AB06 hardrock. There is a siteamp that is added to hardrock median;
however, it is 0 (in logspace) for vs30=760.
5 AB94 ceus for BC rock site condition
-5 AB94 HRceus
6 Frankel ea BC rock, ceus
-6 FEA HardRock ceus
7 Somerville ceus. BCrock. Note: Somerville is used
for the finite-fault portion of gridded hazard. Used with Charleston
-7 Somerville ceus. hardrock.
8 Abrahamson-Silva 1997. rock. july 25 2006
9 Campbell and Bozorgnia 2003. rock. july 25 2006
-9 Campbell and Bozorgnia 2003. D soil. future 2006
10 Campbell CEUS BC or firmrock 2003. july 25 2006
-10 Campbell CEUS A or hardrock 2003. aug 2006
11 BJF 1997. All Vs30 allowed, like NGA relations. Mech dependent
12 AB intraslab seismicity Puget Sound region BC-rock condition
-12 AB intraslab seismicity Puget Sound region D-soil condition
13 Geomatrix slab seismicity rock, 1997 srl. july 25 2006
-13 Geomatrix slab seismicity soil, 1997 srl. july 25 2006
14 Motazetti and Atkinson ready for 4 Pds, Has siteamp from BJF97.
15 not currently used.
18 AB 2003 intraslab seismicity world data BC-rock condition
-18 AB 2003 intraslab seismicity world data region D-soil condition
19 Tabakoli and Pezeshk 2005 added nov 14 2006.
21 boore-atkinson nga updated to the 10-27-2006 version, nov 2 2006. SH.
22 campbell-bozorgnia nga updated to the 11-2006 vers, nov 14 2006.
the CB update includes peak displacement, a novelty. Sigma for
random horizontal component is the default now.
23 chiou-youngs nga vers 6-2006.
24 abrahamson-silva partially set up mar 06 (this relation will probably change).
25 idriss pga oct 2005.
26 Kanno et al. BSSA 2006. This model has large aleatory sigma for
all spectral periods, about 50% larger than NGA relations above.