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Data Files from "The Importance of the Dynamic Source Effects on Strong Ground Motion during the 1999 Chi-Chi, Taiwan, Earthquake: Brief Interpretation of the Damage Distribution on Buildings"

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Introduction

We studied the effects of the dynamic rupture process on ground motion of the 1999 Chi-Chi (Taiwan) earthquake. For this purpose, the causative fault of the earthquake was divided in two vertical cross sections. These sections were chosen to represent the epicentral area (southern model) and the northern part (northern model) of the fault. Each section was modeled independently by using a 2D discrete element model (DEM). In order to study the effects of the faulting when the rupture does not break the surface, the southern model was used forcing the rupture process to stop 3 km before reach the surface.

The output of the program for these three models is stored in ASCII format. The data consist of the distribution of the slip and slip velocity along the fault and the displacements and velocities along the free surface. These data were used to plot all the figures in our article in this issue. The observed records used for comparison were provided by the Seismology Center, Central Weather Bureau (CWB), Taipei, Taiwan, distributed on CD-ROM in December 1999.

The archived data files are given on the attached CD-ROM, under the directory of \DalguerLA. In addition to a readme.txt file (this short note) and Figure1.pdf, there are three sets of six compressed ASCII data files with filename in the form: (1) velsurf.xxx: velocity distribution on the free surface; (2) dissurf.xxx: displacement distribution on the free surface; (3) sliphang.xxx: slip along the fault on the hanging-wall side; (4) slipfoot.xxx: slip along the fault on the footwall side; (5) slvehang.xxx: slip velocity along the fault on the hanging-wall side; and (6) slvefoot.xxx: slip velocity along the fault on the footwall side. "xxx" is "nor" for the Northern model, "xxx" is "sou" for the Southern model, and "xxx" is "so1" for the model that does not break the free surface.

Explanation of the Data Files

The data in the files are in columns separated by a comma. The first column is the time (200 samples per sec). The other columns correspond to displacement (m) or velocity (m/sec), depending on the file, of each point on the fault or free surface.

The slip and slip velocity are recorded in columns (after the time column) starting from the deepest part of the fault and spaced every 0.25 km (161 columns plus the time column), except the files of the northern zone in which the columns are distributed every 0.5 km (81 columns plus the time column), so the last column corresponds to the intersection with the free-surface (see Figure1.pdf on the attached CD-ROM)

Displacements and velocities on the free surface are recorded in columns (after the time column) starting from point 1 on the hanging wall, 23.4 km from the trace of the fault (see Figure1.pdf on the attached CD-ROM). Each point has two columns corresponding to the X and Y components, respectively (X, perpendicular to the fault; Y, parallel to the fault). The points are spaced every 0.9 km from 1 to 27 corresponding to the hanging wall and from 28 to 54 corresponding to the footwall (108 columns plus the time column). Therefore, if we want to calculate the vertical and horizontal components for each point, we need to do the corresponding transformation of coordinates, as follows:

$$\text{Horizontal} = X \sin(\text{dip}) - Y \cos(\text{dip}),$$
$$\text{Vertical} = X \cos(dip) + Y \sin(\text{dip}),$$

where *dip* is the dip angle of the fault assumed 33° and 41 min.

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