STANDARD RUPTURE FORMAT

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04/24/2006

Introduction

The general fault surface is represented by a distribution of point sources. In principle, there is no inherent restriction on the geometry of the fault surface or on the spacing and distribution of the point sources used to describe that surface. Each point source description contains all the necessary information to compute the contribution of that point to the total response of the fault rupture. However, it is recognized that most current methods used to develop or model fault ruptures are based on descriptions that employ planar rectangular segments. To facilitate the exchange (and retention) of fault representations in this format, the description presented below allows for the (optional) inclusion of information that specifies the planar segments used to define the fault surface.

Aki & Richards convention for strike, dip and rake are used for all the source descriptions. Slip is specified in three orthogonal directions, two within the subfault surface, and the third in the direction of the outward normal to that surface. This allows for the possibility of time dependent rake and/or fault opening. Figure 1 illustrates the coordinate system conventions used in this description.

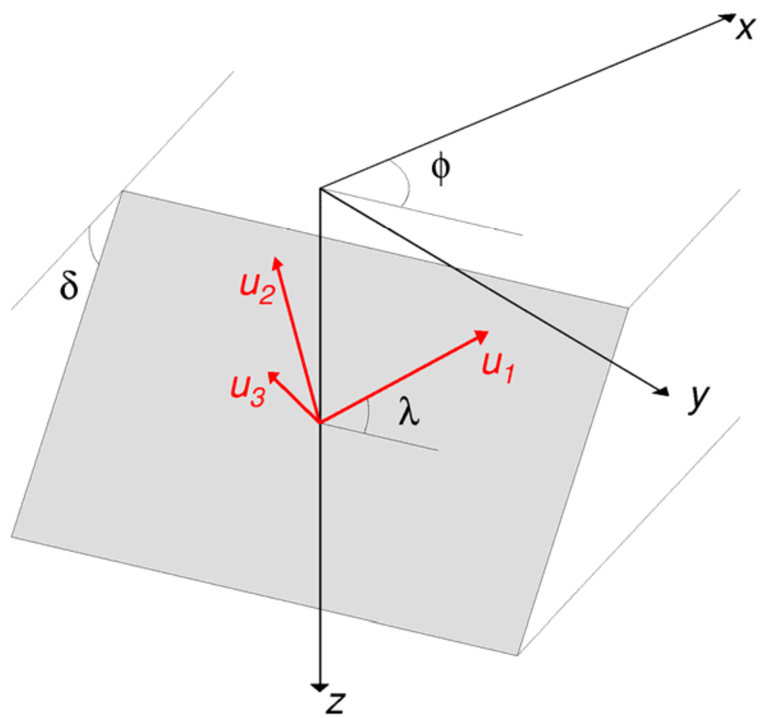

Figure1: Coordinate system conventions for an individual subfault surface. The system (x,y,z) is the global system (e.g., x = north, y = east, z = down). The system (u_1,u_2,u_3) is the local system in which the slip is specified. The axes u_1 and u_2 are tangent to the surface and u_3 is the outward normal to the surface. The strike (ϕ), and dip (δ) are the same as Aki & Richards. Strictly speaking, the rake (λ) defines the orientation of the u_1 axis (with u_2 at λ+90^o).

For a pure shear dislocation with constant rake, all slip will be in the u_1 direction, thus requiring convolution of only a single STF. Time variable rake needs two orthogonal components (u_1 and u_2) each with a unique STF, thus requiring convolution of two STFs. In this case λ can be specified such that u_1 and u_2 bracket the average rake direction.

Format Specification

The file type as described below is in ASCII format to allow for easy exchange and editing capabilities. The general file format is as follows:

VERSION
HEADER BLOCK (optional)
DATA BLOCK

where

VERSION	= version identifier (e.g., 1.0)
HEADER BLOCK	= general fault description (used for general description of the fault surfaces)
DATA BLOCK	= general point source information covering fault surface

HEADER BLOCK

The optional HEADER BLOCK consists of a series of lines describing the general features of the fault surfaces. Given below is a description for planar segments representing the fault. Additional descriptive formats can be developed and added as needed.

For the planar segment format, the first line is:

PLANE NSEG

where

PLANE	= flag specifying that following lines describe planar fault
NSEG	= number of segments in fault description

For each segment, the following two lines are needed:

ELON	ELAT	NSTK	NDIP	LEN	WID
STK	DIP	DTOP	SHYP	DHYP	

where (for this segment)

ELON	= top center longitude
ELAT	= top center latitude
NSTK	= # of subfaults along strike
NDIP	= # of subfaults down-dip
LEN	= fault length
WID	= fault width
STK	= fault strike
DIP	= fault dip
DTOP	= depth to top of fault
SHYP	= along strike location (from top center) of hypocenter
DHYP	= down-dip location (from top edge) of hypocenter

The above description is repeated for each additional segment.

DATA BLOCK

Following the optional header lines described above are the required DATA BLOCK lines. The first line in the DATA BLOCK is:

POINTS NP

where

POINTS = flag specifying that following lines describe point sources
NP = number of point source to follow

The remaining lines in the DATA BLOCK contain information about each of the point sources. For each point source, the format is:

```
LON    LAT    DEP   STK    DIP   AREA  TINIT  DT
RAKE   SLIP1  NT1   SLIP2  NT2   SLIP3 NT3
Sv1[1]
Sv1[2]
Sv1[3]
  . . .
Sv1[NT1]
Sv2[1]
Sv2[2]
Sv2[3]
  . . .
Sv2[NT2]
Sv3[1]
Sv3[2]
Sv3[3]
  . . .
Sv3[NT3]
```

where

LON = longitude of point source
LAT = latitude of point source
DEP = depth (km) of point source
STK = strike
DIP = dip
AREA = area of "point" source (cm*cm)
TINIT = initiation time (when rupture reaches subfault center)
DT = time step in slip velocity function
RAKE = direction of u_1 axis (rake direction)
SLIP1 = total slip (cm) in u_1 direction
NT1 = number of time points in slip velocity function for u_1 direction
SLIP2 = total slip (cm) in u_2 direction
NT2 = number of time points in slip velocity function for u_2 direction

SLIP3 = total slip (cm) in u_3 (surface normal) direction
NT3 = number of time points in slip velocity function for u_3 direction
Sv1[1],…,Sv1[NT1] = Slip velocity at each time step for u_1 direction
Sv2[1],…,Sv2[NT2] = Slip velocity at each time step for u_2 direction
Sv3[1],…,Sv3[NT3] = Slip velocity at each time step for u_3 direction

Although the general format given here allows for slip in all three directions (u_1,u_2,u_3), most cases will have only one (u_1) or two (u_1, u_2) non-zero slip components. In these situations, the remaining slip components, as well as the number of time points for the slip velocity, are specified as “0”.