SUPERPOSE- An Excel Visual Basic Program for Fracture Modeling Based on Stress Superposition Method

Sait Ozkaya

USER GUIDE FIGURE AND TABLES
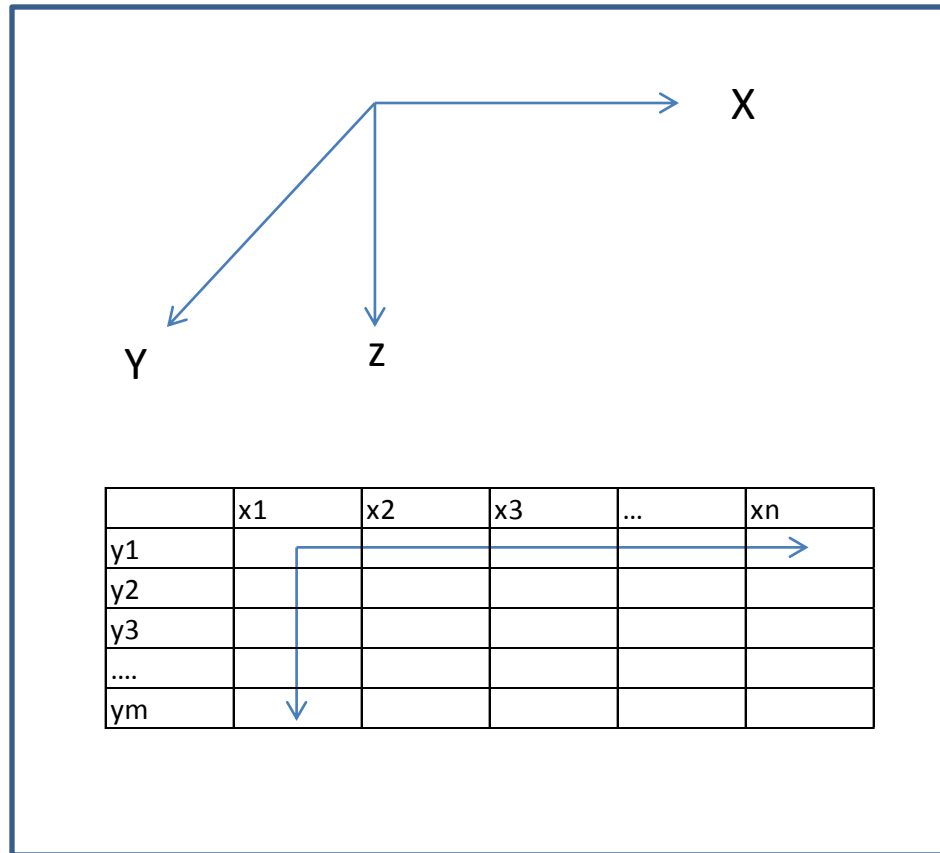
Figure U1. Grid axial convention and data sequence.

```
----------------------------------------------------------------------
----- Eclipse Data File Generated From GOCAD SGrid Export
----- Name of Exported SGrid: FIELD X_Frac_SGRD
----------------------------------------------------------------------


SPECGRID
   200 304 1 1 F /

GRIDUNIT
'FEET'  /

MAPUNITS
'FEET'  /

COORD
   1017060    9484908    8118.064    1017060    9484908    8123.78
   1017883    9484908    8078.894    1017883    9484908    8084.532
   1018705    9484908    8039.659    1018705    9484908    8045.215
   1019527    9484908    8000.383    1019527    9484908    8005.856
   1020349    9484908    7961.103    1020349    9484908    7966.495
   1021172    9484908    7921.799    1021172    9484908    7927.108
   1021994    9484908    7882.352    1021994    9484908    7887.58

.............................................
```

Table U1. Example GRDECL grid file in Eclipse format.

INPUT PARAMETERS			
imin	1	<--	Starting minimum grid in x direction (to trim left edge)
imax	486	<--	Last value of grid cell in y direction (to trim right edge)
jmin	1	<--	Starting minimum grid in y direction (top trip top edge)
jmax	519	<--	Last value of grid in y direction (to trim bottom edge
xdir	1	<--	x axis direction 1 right -1 left (if map axis is specified)
ydir	1	<--	y axis direction 1 down -1 up (if map axis is specified)
stepx	4	<--	decimate grid in x direction
stepy	4	<--	decimate grid in y direction
fname	G:\ECLIPSE_EXAMPLE_GRID.GRDECL		

Table U2. Input parameters to GRDECL routine. Place this in an Excel tab so that the input numbers are in cells B15 to B21.

	A	B	C	D	E	F
32		x	y	z	j	i
33		310000	2891000	2474.386	1	1
34		311002.5	2891000	2426.544	2	1
35		312005	2891000	2378.066	3	1
36		313007.5	2891000	2325.422	4	1
37		314010	2891000	2268.82	5	1
38		....				
39		....				

Table U3: imported structural grid data.

	K	L	M	N	O	P	Q	R
14	OUTPUT PARAMETERS							
15	nx orig	201		Original grid size in x direction output from red				
16	ny orig	305		original grid size in y direction out from red				
17	nxmax	51		Maximum number of cells in x direction				
18	nymax	77		Maximum number of cells in y direction				
19	min utme	310000	m	Minimum x coordinate East UTM				
20	max utme	360000	m	Maximum x coordinate East UTM				
21	min utmn	2815000	m	Minimum y coordinate North UTM				
22	max utmr	2891000	m	Maximum y coordinate East UTM				
23	min elev	1664	m	Minimum elevation (positive downdward)				
24	max elev	2847	m	Maximum elevation (positive downward)				

Table U4. Output parameters from GRDECL routine.

Important note: check if n1 (eg 546 in the example below) is nx or ny. The assumption as it is nx if not please swap (exchange 546 with 383 in the following example)

!					
! FILE NAME : FIELD1_STR					
! FORMATTED FILE CREATION DATE: JUL 14 2013					
! FORMATTED FILE CREATION TIME: 13:41					
!					
@FIELD1_METRIC HEADER		, GRID, 5			
15, 0.1000000E+31,		, 7, 1			
546, 283, 356100.0	, 391350.0	, 2855000.	, 2923125.		
36000.00 , 0.000000 , 0.000000					
@					
-2563.972	-2562.807	-2561.636	-2560.464	-2559.289	
-2558.116	-2556.946	-2555.782	-2554.625	-2553.478	
-2552.343	-2551.222	-2550.117	-2549.031	-2547.966	
-2546.923	-2545.907	-2544.917	-2543.957	-2543.028	
-2542.133	-2541.274	-2540.453	-2539.672	-2538.932	

Table U5. Zmap.dat file example.

INPUT PARAMETERS			
imin	160	<--	Starting minimum grid in x direction (to trim left edge)
imax	400	<--	Last value of grid cell in y direction (to trim right edge)
jmin	200	<--	Starting minimum grid in y direction (top trip top edge)
jmax	519	<--	Last value of grid in y direction (to trim bottom edge
stepx	4	<--	decimate grid in x direction
stepy	4	<--	decimate grid in y direction
dirop	1		1: y (downward) fist) 2 : x (left to right) first
Z+down	1		1: changes sign of elevation
fname	G:\EXAMPLE.DAT		

Table U6. ZMAPDAT routine file import parameters.

	B	C	D	E	F	G
32	x	y	z		i	J
33	358100	2923125	2583.682		17	1
34	358600	2923125	2580.978		21	1
35	359100	2923125	2577.859		25	1
36	359600	2923125	2574.265		29	1
37	360100	2923125	2570.146		33	1
38	....					

Table U7. Data imported into Excel by ZMAPDAT routine.

	K	L	M	N	O	P	Q	R
14	OUTPUT PARAMETERS							
15	nx orig	283		Original grid size in x direction output from red				
16	ny orig	546		Original grid size in y direction out from red				
17	nxmax	61		Maximum number of cells in x direction				
18	nymax	129		Maximum number of cells in y direction				
19	min utme	356100	m	Minimum x coordinate East UTM				
20	max utme	391350	m	Maximum x coordinate East UTM				
21	min utmn	2855000	m	Minimum y coordinate North UTM				
22	max utmr	2923125	m	Maximum y coordinate East UTM				
23	min elev	1706.866	m	Mimimum elevation (positive downdward				
24	max elev	2597.139	m	Maximum elevation (positive downward)				

Table U8. Output parameters from ZMAPDAT routine.

	A	B	C	D	E	F	G	H
6	nxmax	61		Original grid size in x direction output from red				
7	nymax	129		original grid size in y direction out from red				
8	nxin	61		Maximum number of x cells limit for this run				
9	nyin	129		Maximum number of y cells limit for this run				
10	xmin	350000	UTM	UTME of origin				
11	ymin	2850000	UTM	UTMN of origin				
12	zmin	1700	m	Depth to origin				
13	zmax	2597	n	Max depth				
14	nxpts	11		Number of cells in x direction				
15	nypts	11		Number of cells in ydirection				
16	E	16864	Mpa	Young modulus				
17	thick	30	m	Layer thickness				
18	Sv	30		Vertical effective stress				
19	Sxx	120	Mpa	Regional horizontal maximum effective stress				
20	Syy	10	MPa	Regional horizontal minimum effective stress				
21	alfax	20	deg	shmax angle from x (counter clockwise positive)				
22	phi	53	deg	Internal frictionangle				
23	UCS	86	MPa	Unconfined compressive strength				
24	m Hoek	20		Coefficient of Hoek-Brown failure envelope				
25	lendex	100		Length multiplier for tensile fractures				
26	lendshr	25		Length multiplier for shear fractures				
27	cizlimex	10		Plot every nth tensile fracture. n=cizlimex				
28	cizlimsh	5		Plot every nth shear fracture. n=cizlimsh				
29	failop	2		Failure option: 1 Hoek-Brown else Coulomb				

Table U9. Input parameters for the main program.

	B	C	D	E	F
32	x	y	z	I	J
33	358179.1	3036034	2547.848	1	1
34	358416.8	3035957	2544.914	2	1
35	358654.6	3035880	2541.927	3	1
36	358892.3	3035802	2538.881	4	1
37	359130.1	3035725	2535.781	5	1
38	………………				

Table U10. Input data for main routine. Position in Excel tab. E F are not part of the input but indicate only the sequence of input grid data. Output from GRDECL or ZMAPDAT routines may be copied and pasted directly.