

# Moment Tensor Code

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AUG Meeting

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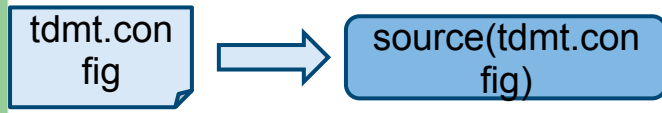
# Plan

Rewrite of Doug Dreger's Time-Domain Moment Tensor INVerse Code using Antelope's Python Interface:

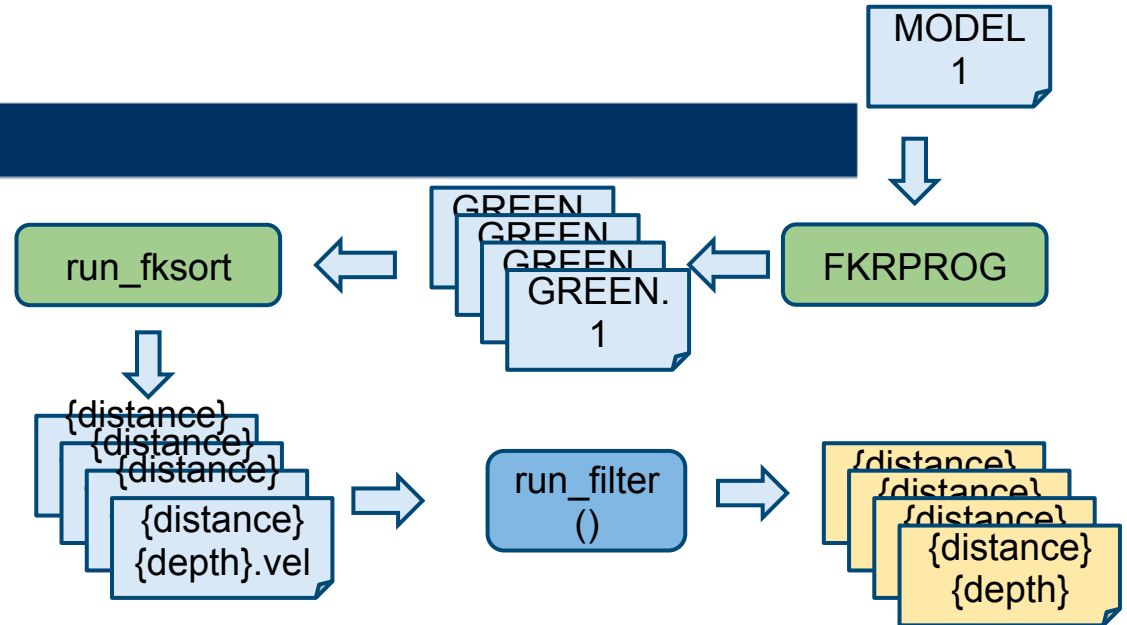
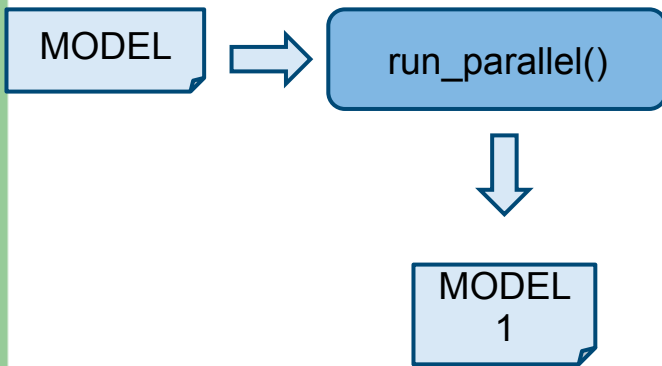
- Remove initial configuration step
- Remove intermediate data formats
- Remove 3rd party code dependencies
- New Datascope schemas for MT results
- Consolidate configuration into “ .pf ” file(s)

# Original Code

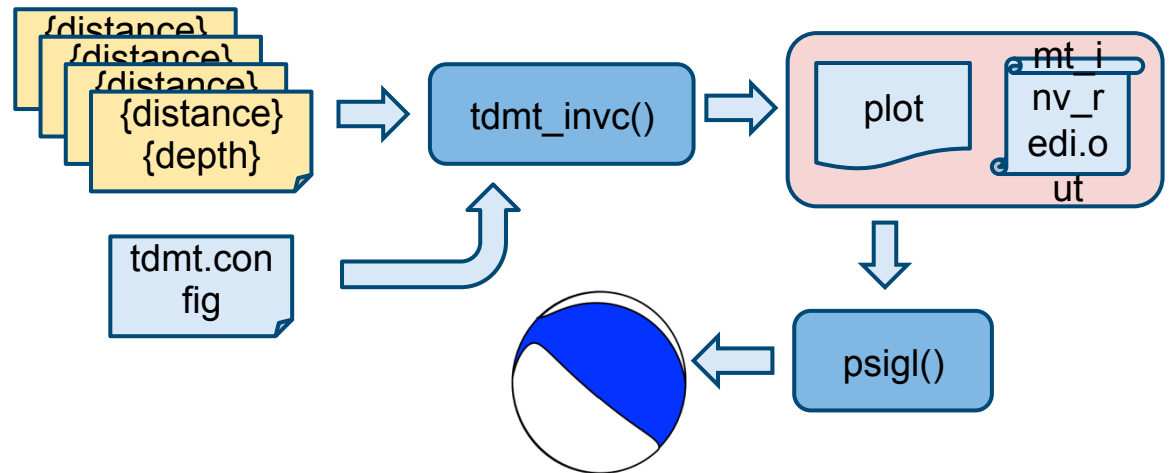
## Configure Environment



## Get the Green functions



## Run Moment Tensor Inversion

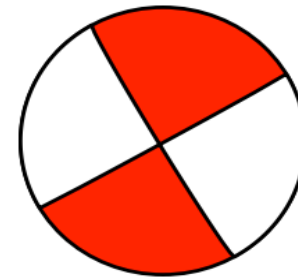
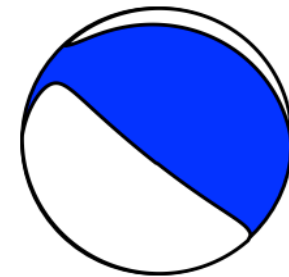
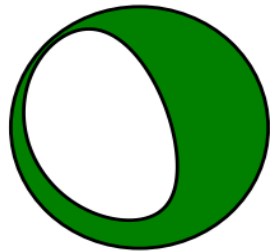


## So far...

- Get origins and stations from Datascope tables.
- Filtering and rotation from E-N-Z into R-T-Z.
- Building of Data Matrix.
- Get pre-calculated Green's.
- Construct Green's Matrix.
- Calculate MT using both datasets.
- Invert the MT and from the eigenvalues/vectors calculate the MT solution.
- Update Datascope with results.

# Additional packages required

- ObsPy - Open source Python toolbox for seismology



# Datascope Extensions

Relation `moment_tensor_greensfuncs`

Fields ( `vmodel delta depth azimuth dip dir dfile lddate` )

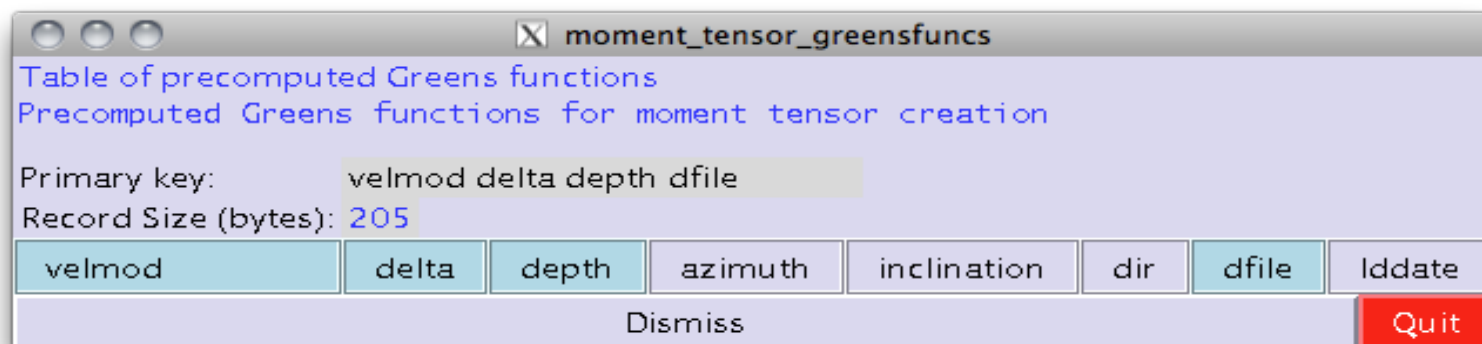
Primary ( `vmodel delta depth dfile` )

Description ( "Table of precomputed Greens functions" )

Detail {

Precomputed Greens functions for moment tensor creation

};



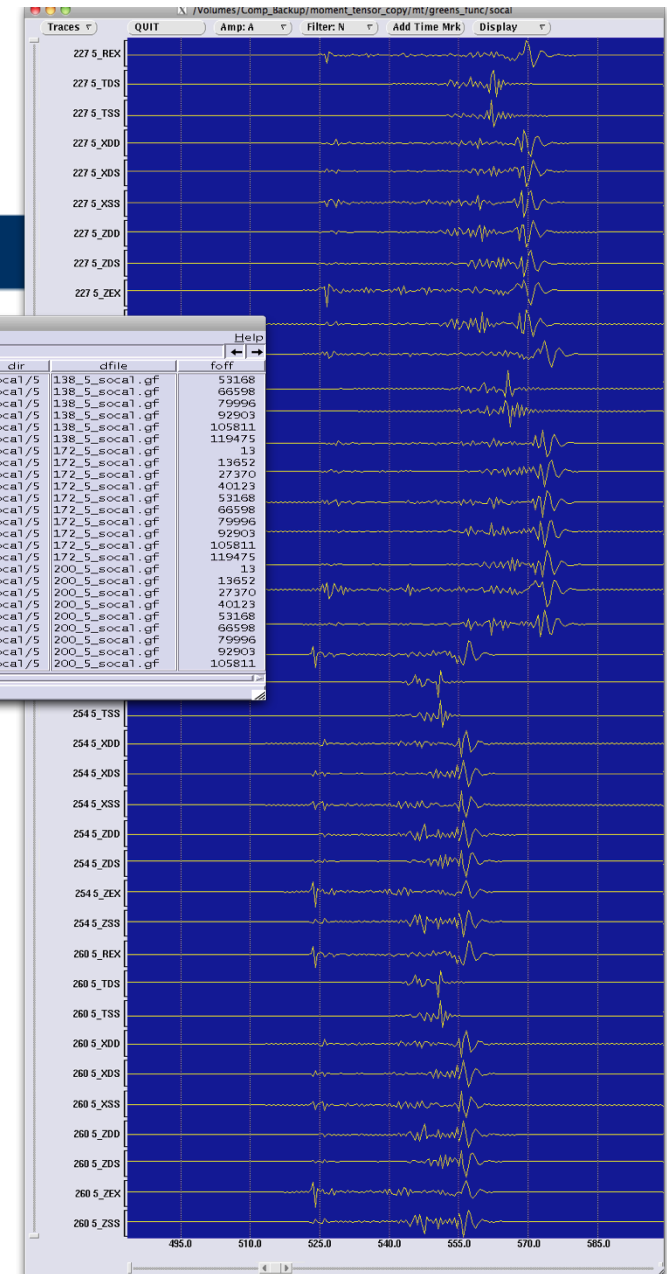
# Green's Functions

social wfdisc

sta	chan	time	endtime	nsamp	samprate	calib	instype	seqtype	datatype	dir	dfile	fcoeff	
138	5_XDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	53168
138	5_XSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	66598
138	5_ZDD	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	79996
138	5_ZDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	92903
138	5_ZEX	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	105811
138	5_ZSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	138_5_socal.gf	119475
172	5_REX	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	13
172	5_TDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	13652
172	5_TSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	27370
172	5_XDD	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	40123
172	5_XDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	53168
172	5_XSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	66598
172	5_ZDD	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	79996
172	5_ZDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	92903
172	5_ZEX	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	105811
172	5_ZSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	172_5_socal.gf	119475
200	5_REX	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	13
200	5_TDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	13652
200	5_TSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	27370
200	5_XDD	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	40123
200	5_XDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	53168
200	5_XSS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	66598
200	5_ZDD	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	79996
200	5_ZDS	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	92903
200	5_ZEX	1/01/1970 (001)	0 00:01.000000	1/01/1970 (001)	1 08:17.000000	2048	2.00000000	1	V	as	socal/5	200_5_socal.gf	105811

Dismiss

Green's Functions are built dynamically upon request if not already present in archive. Newly constructed functions are stored on a database referenced by a wfdisc table.



# Datascope Extensions

Relation moment\_tensor\_images

Fields ( sta orid dir dfile lddate )

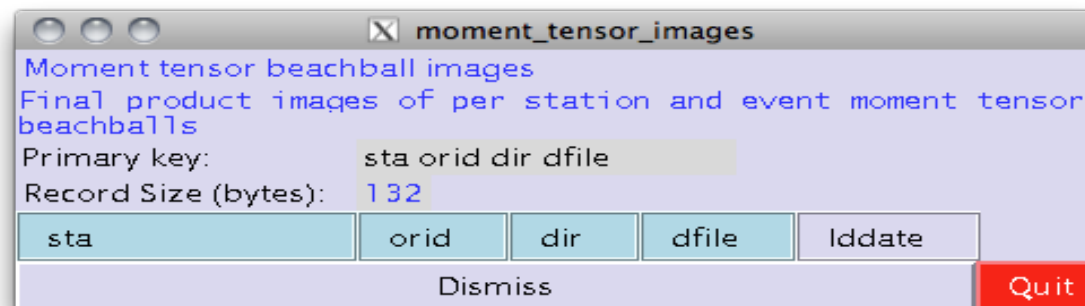
Primary ( sta orid dir dfile )

Description ( "Moment tensor beachball images" )

Detail {

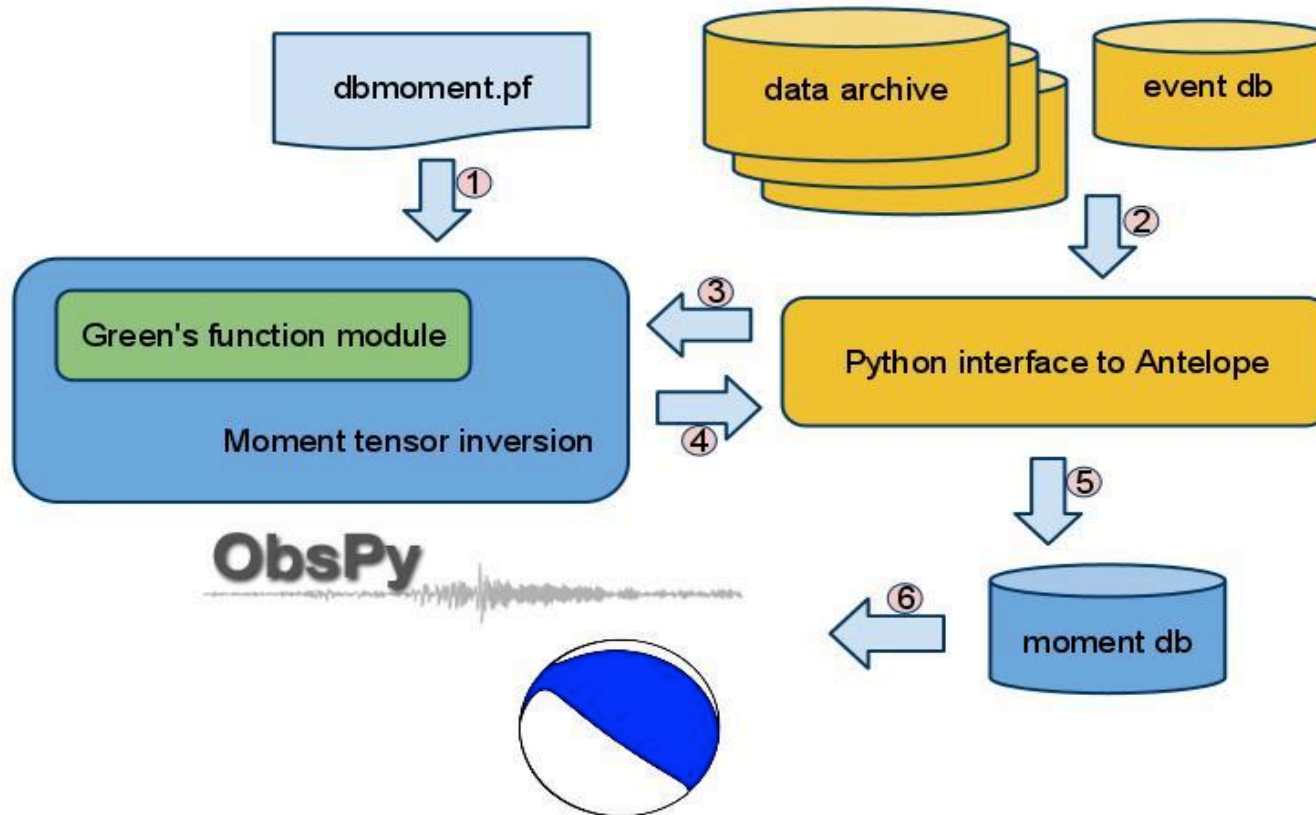
Final product images of per station and event  
moment tensor beachballs

};

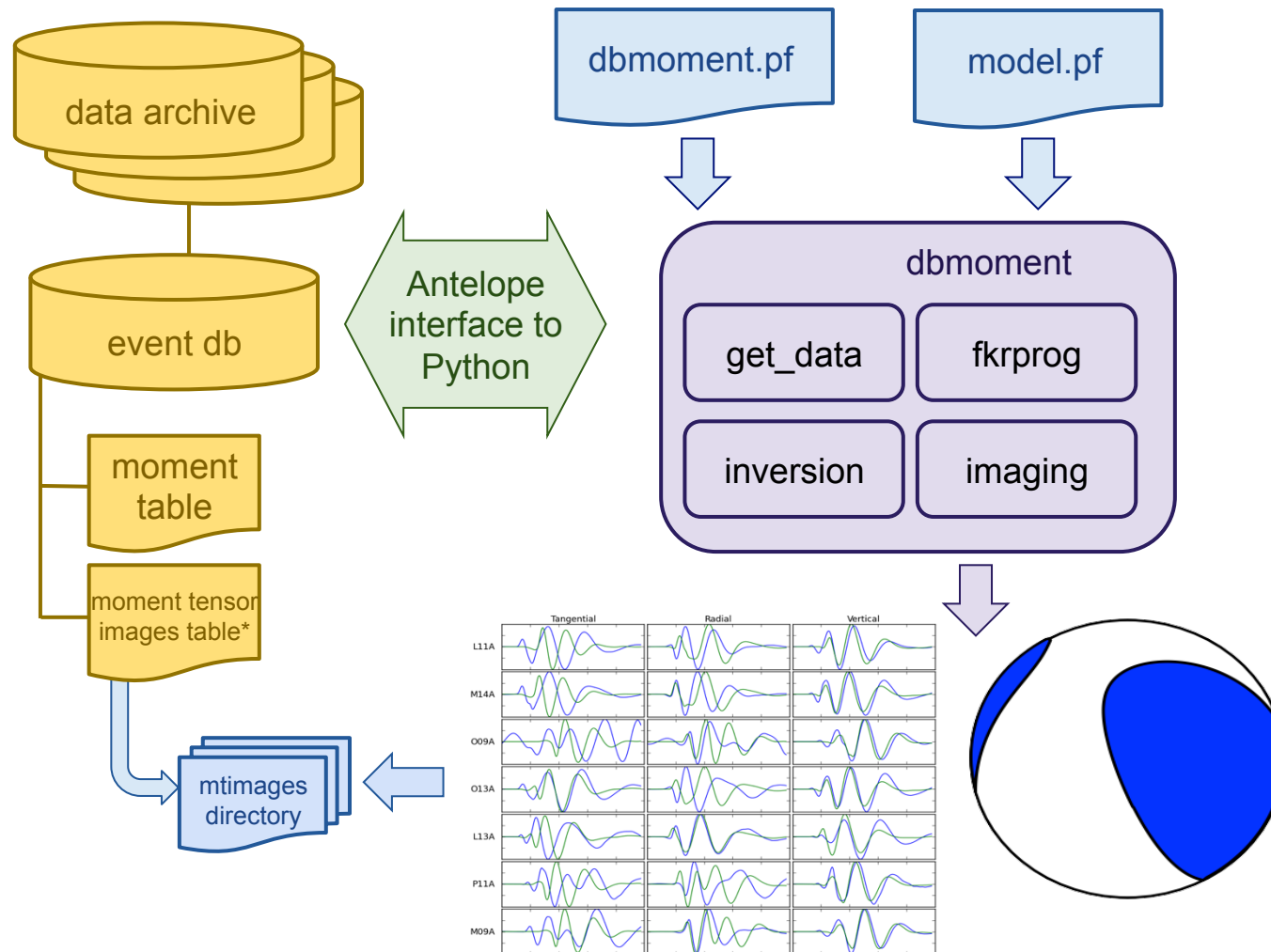




# Overview



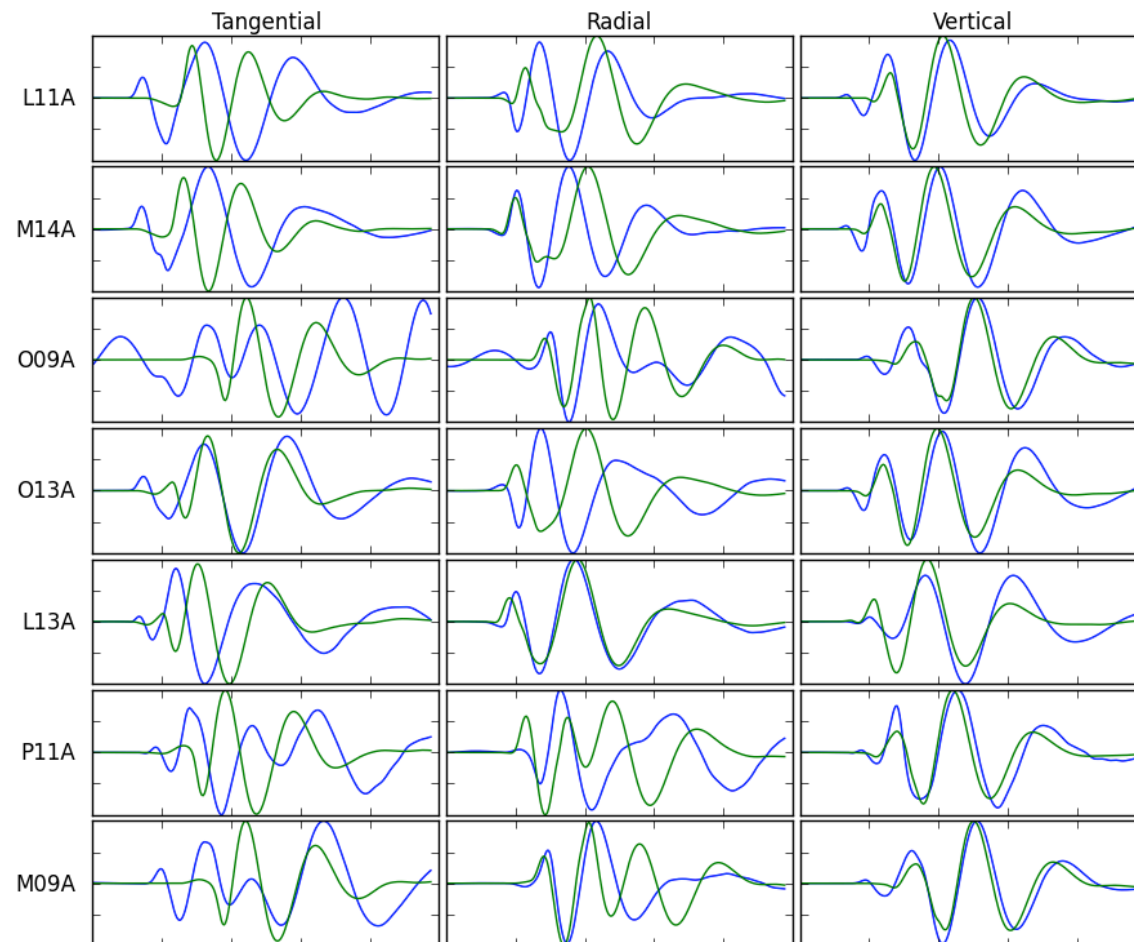
# Modularity



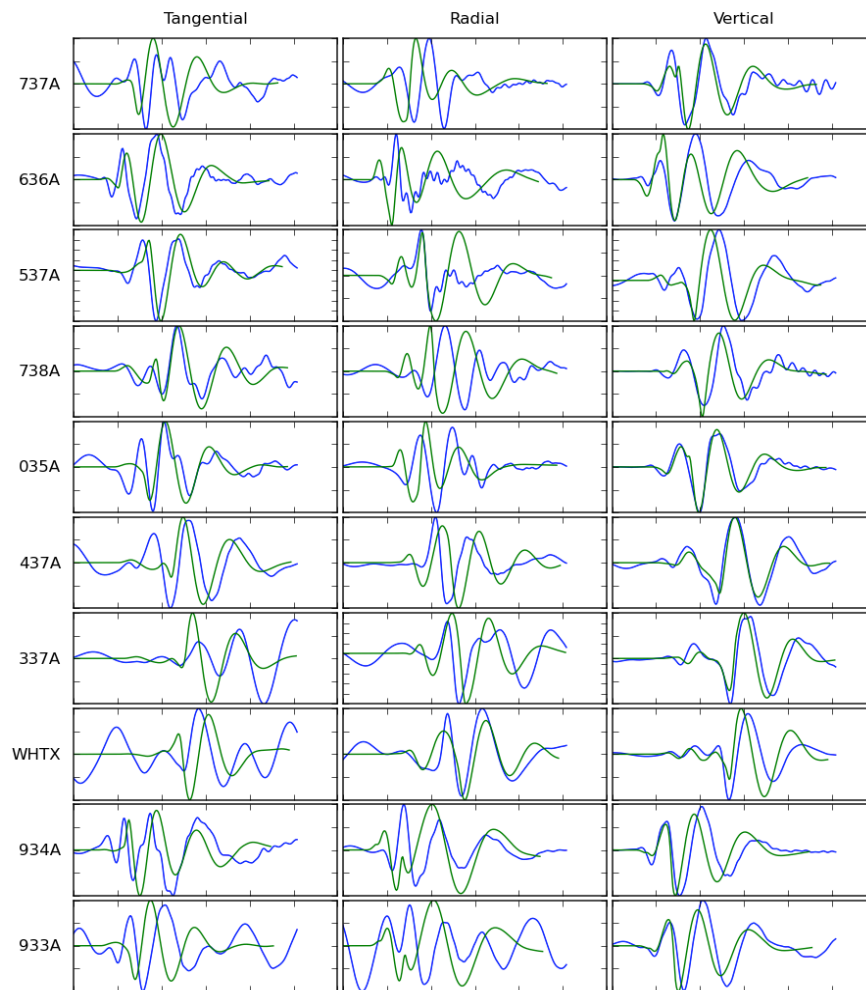
# Missing

- Frequency-Wavenumber integration program is not stable and requires some debugging .
- Expand code to decimate higher sampled data.
- Compare solutions against Dreger's solutions.

# Example 1



# Example 2



orid = 3830971  
 time = 10/20/2011 12:24:40  
 Strike 1 = 78  
 Rake 1 = -72  
 Dip 1 = 72  
 Strike 2 = 211  
 Rake 2 = -137  
 Dip 2 = 24  
 Mo = 1.340E+23  
 Mw = 4.718  
 % DC = 28.644  
 % CLVD = 71.356  
 % ISO = 0.000  
 VR = 3.624E-09  
 VAR = 3.624E-09

