Beyond the Mouse – A Short Course in Programming
Part 5: Matlab & Antelope

Using Matlab to access and manipulate AVO and AEIC seismic data

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Why should I care?

Antelope is one of the (but not the only!) ways of dealing with seismic data

AVO, AEIC, and IRIS/PASSCAL all use Antelope

Antelope has a rich set of libraries for manipulating seismic data via programming languages – c, FORTRAN, tcl/tk, perl, Matlab, and shell scripting

What is Antelope?

A suite of software for acquiring, archiving, databasing, and using seismic data

Two components:

Real time (Orb) system

Offline (archival) system

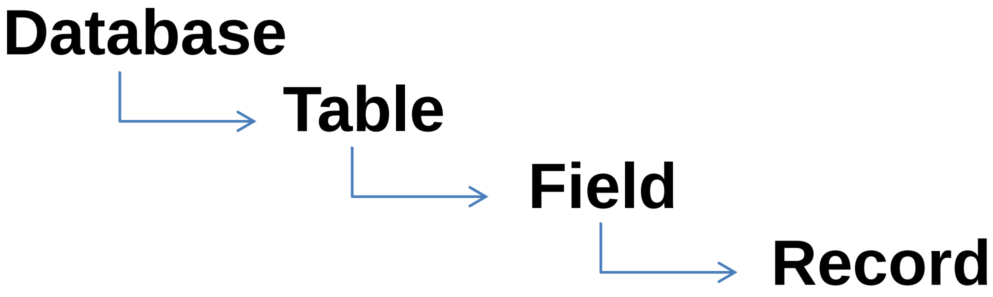
Entire short-courses have been taught on just the basics!

Antelope uses the Datascope relational database system

What is a (Datascope) database?

A way of organizing a collection of information into easily accessible format.

Structure:



Database

Table

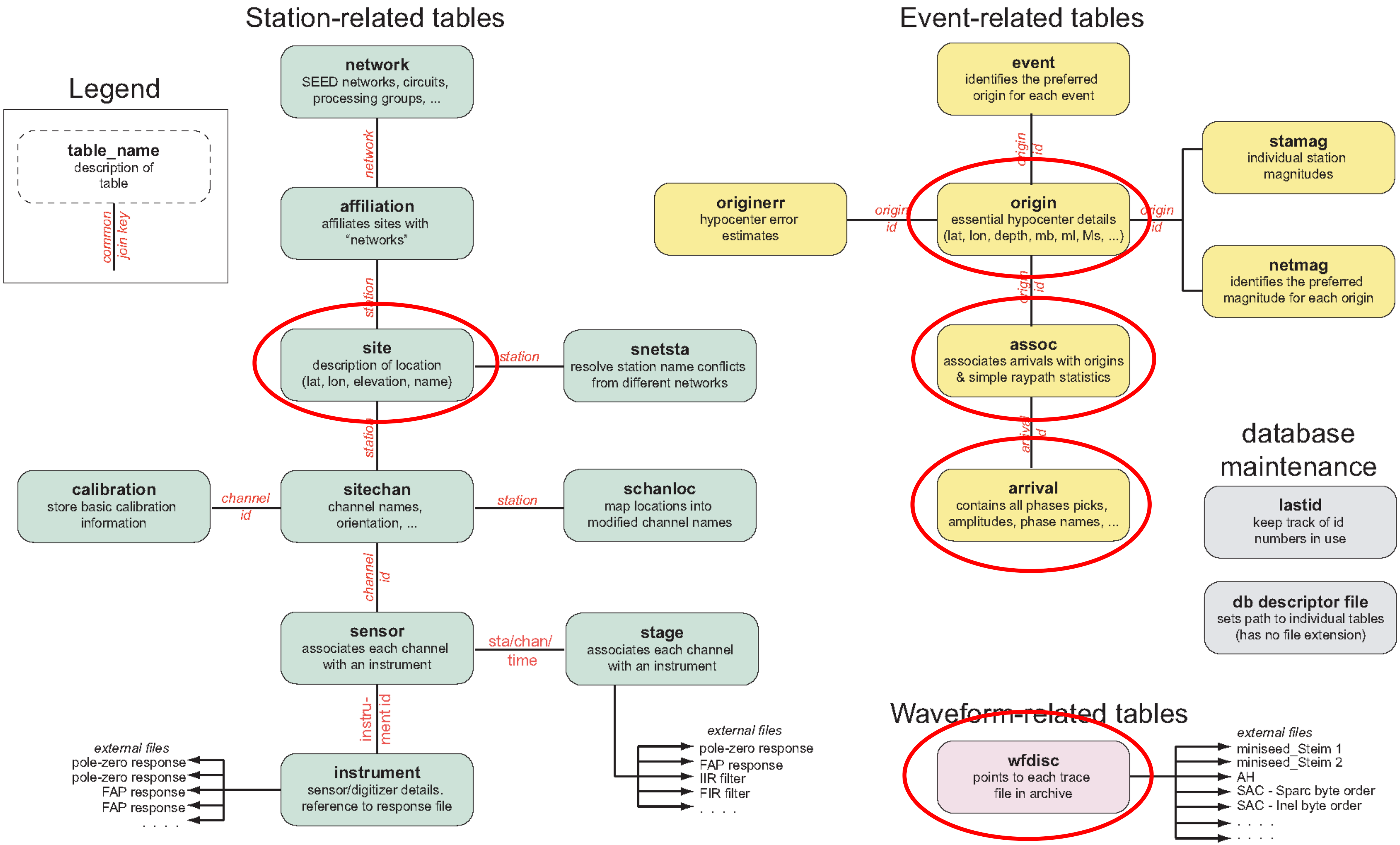
Field

Record

Tables can be joined together to combine and subset data using ***join keys***

Individual tables and fields are defined by a database ***schema*** (for Antelope seismic data, schema is css3.0)

Minimum css3.0 database



Legend

table_name
description of table

Station-related tables

network
SEED networks, circuits, processing groups, ...

affiliation
affiliates sites with "networks"

site
description of location (lat, lon, elevation, name)

snetsta
resolve station name conflicts from different networks

calibration
store basic calibration information

sitechan
channel names, orientation, ...

schanloc
map locations into modified channel names

sensor
associates each channel with an instrument

stage
associates each channel with an instrument

instrument
sensor/digitizer details. reference to response file

Event-related tables

event
identifies the preferred origin for each event

originerr
hypocenter error estimates

origin
essential hypocenter details (lat, lon, depth, mb, ml, Ms, ...)

stamag
individual station magnitudes

netmag
identifies the preferred magnitude for each origin

assoc
associates arrivals with origins & simple raypath statistics

arrival
contains all phases picks, amplitudes, phase names, ...

database maintenance

lastid
keep track of id numbers in use

db descriptor file
sets path to individual tables (has no file extension)

Waveform-related tables

wfdisc
points to each trace file in archive

What is a (Datascope) database?

Important idea:

Databases do ***not*** have to have all of the tables shown.

Datascope allows you to combine two databases containing different tables together into one larger database through a database **descriptor** file.

```
mgardine@sockeye> more my_database
#
schema css3.0
dbpath /home/mgardine/{station_db}:/home/mgardine/{origin_db}
```

Results is a new database, called *my_database,* which contains the tables in *station_db* and *origin_db*

What to do with a database?

Locations of important databases (all on the Sun network):

AEIC/AVO Stations:

/iwrun/op/params/Stations/{master_stations}

AEIC Origins:

/Seis/catalogs/aeic/Total/{Total}

AVO Origins:

/Seis/Kiska4/picks/Total/{Total}

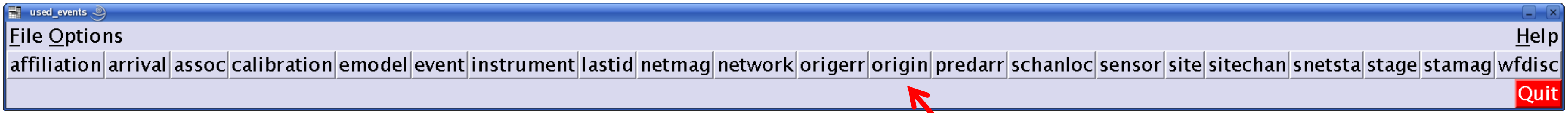
AEIC/AVO Waveforms:

/iwrun/op/db/archive/* (day files)

What to do with a database?

Antelope provides a graphical front-end for viewing and simple editing of databases : ***dbe***

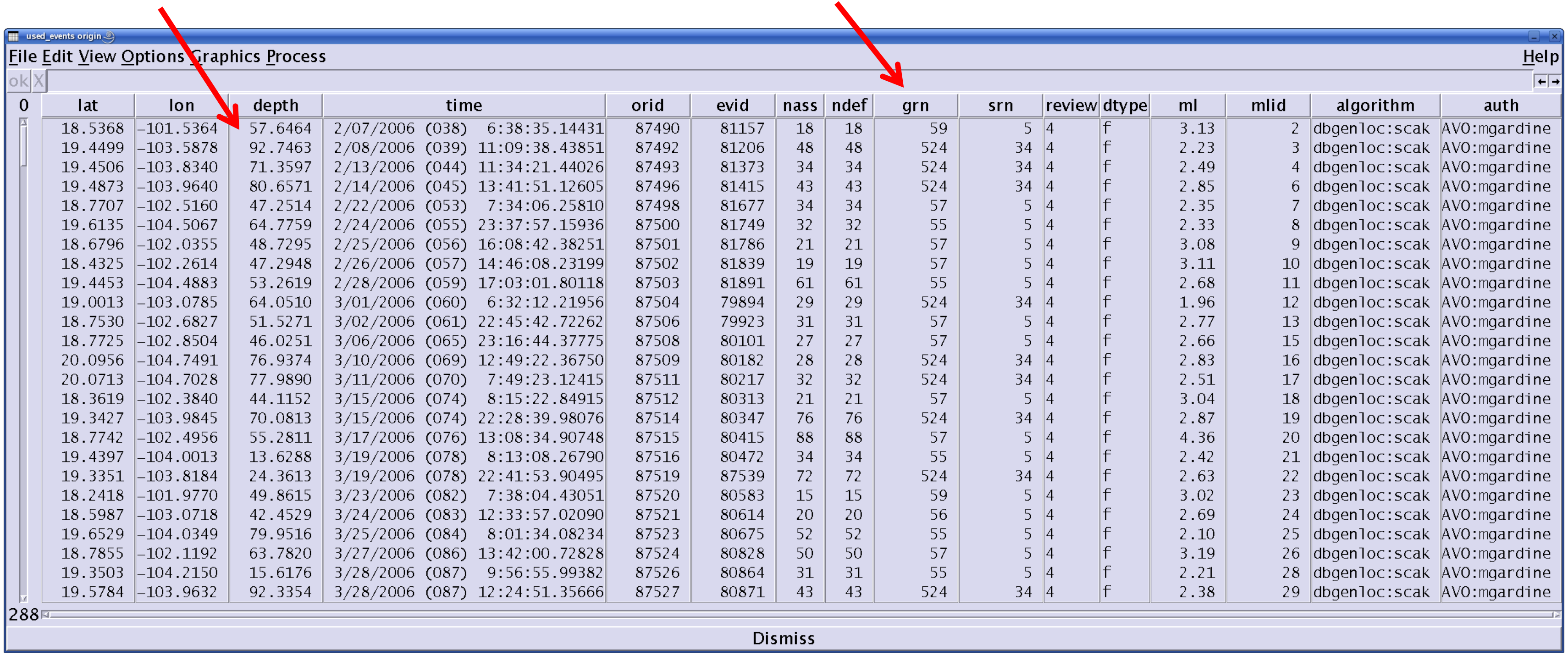
```
mgardine@sockeye> dbe my_database
```



Each record in the table

Each field in the table

Each table in the database



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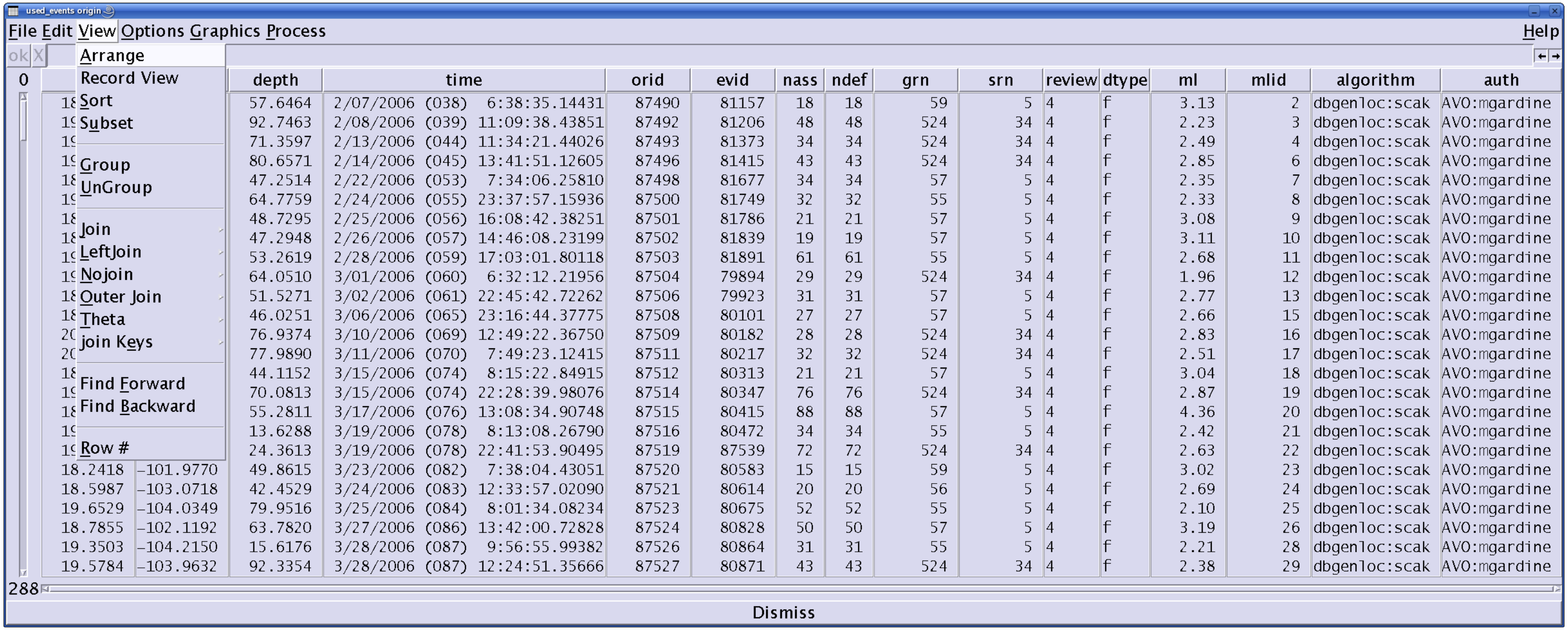
19.4499	-103.5878	92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19.4506	-103.8340	71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19.4873	-103.9640	80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18.7707	-102.5160	47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19.6135	-104.5067	64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18.6796	-102.0355	48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18.4325	-102.2614	47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
19.4453	-104.4883	53.2619	2/28/2006 (059) 17:03:01.80118	87503	81891	61	61	55	5	4	f	2.68	11	dbgenloc:scak	AVO:mgardine
19.0013	-103.0785	64.0510	3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
18.7530	-102.6827	51.5271	3/02/2006 (061) 22:45:42.72262	87506	79923	31	31	57	5	4	f	2.77	13	dbgenloc:scak	AVO:mgardine
18.7725	-102.8504	46.0251	3/06/2006 (065) 23:16:44.37775	87508	80101	27	27	57	5	4	f	2.66	15	dbgenloc:scak	AVO:mgardine
20.0956	-104.7491	76.9374	3/10/2006 (069) 12:49:22.36750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
20.0713	-104.7028	77.9890	3/11/2006 (070) 7:49:23.12415	87511	80217	32	32	524	34	4	f	2.51	17	dbgenloc:scak	AVO:mgardine
18.3619	-102.3840	44.1152	3/15/2006 (074) 8:15:22.84915	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
19.3427	-103.9845	70.0813	3/15/2006 (074) 22:28:39.98076	87514	80347	76	76	524	34	4	f	2.87	19	dbgenloc:scak	AVO:mgardine
18.7742	-102.4956	55.2811	3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
19.4397	-104.0013	13.6288	3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19.3351	-103.8184	24.3613	3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770	49.8615	3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718	42.4529	3/24/2006 (083) 12:33:57.02090	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349	79.9516	3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192	63.7820	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150	15.6176	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632	92.3354	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

What to do with a database?

View > Arrange to see all possible fields of a table/view



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19		92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19		71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19		80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18		47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19		64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18		48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18		47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
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20		76.9374	3/10/2006 (069) 12:49:22.36750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
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19		13.6288	3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19		24.3613	3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
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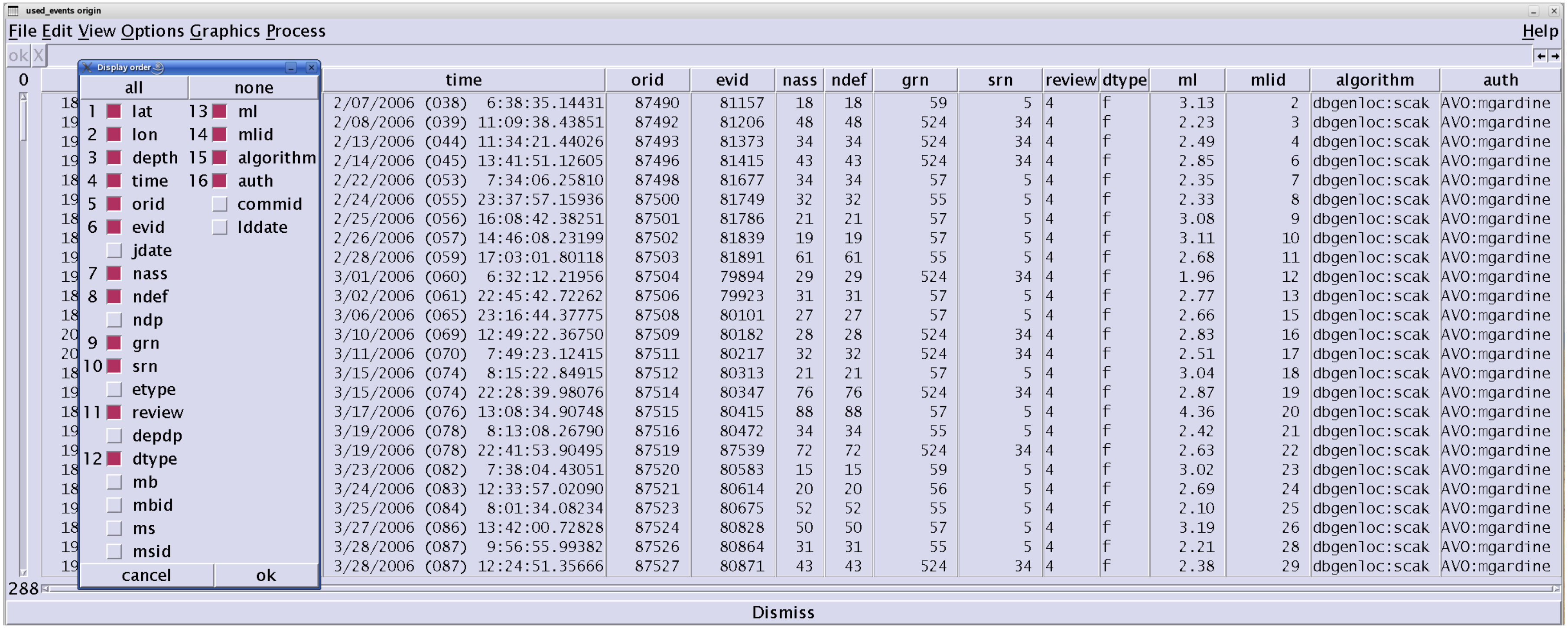

Display order

all none

1 ☑ lat
2 ☑ lon
3 ☑ depth
4 ☑ time
5 ☑ orid
6 ☑ evid
□ jdate
7 ☑ nass
8 ☑ ndef
□ ndp
9 ☑ grn
10 ☑ srn
□ etype
11 ☑ review
□ depdp
12 ☑ dtype
□ mb
□ mbid
□ ms
□ msid

13 ☑ ml
14 ☑ mlid
15 ☑ algorithm
16 ☑ auth
□ commid
□ lddate

cancel ok

	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
18	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
19	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
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19	3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

What to do with a database?

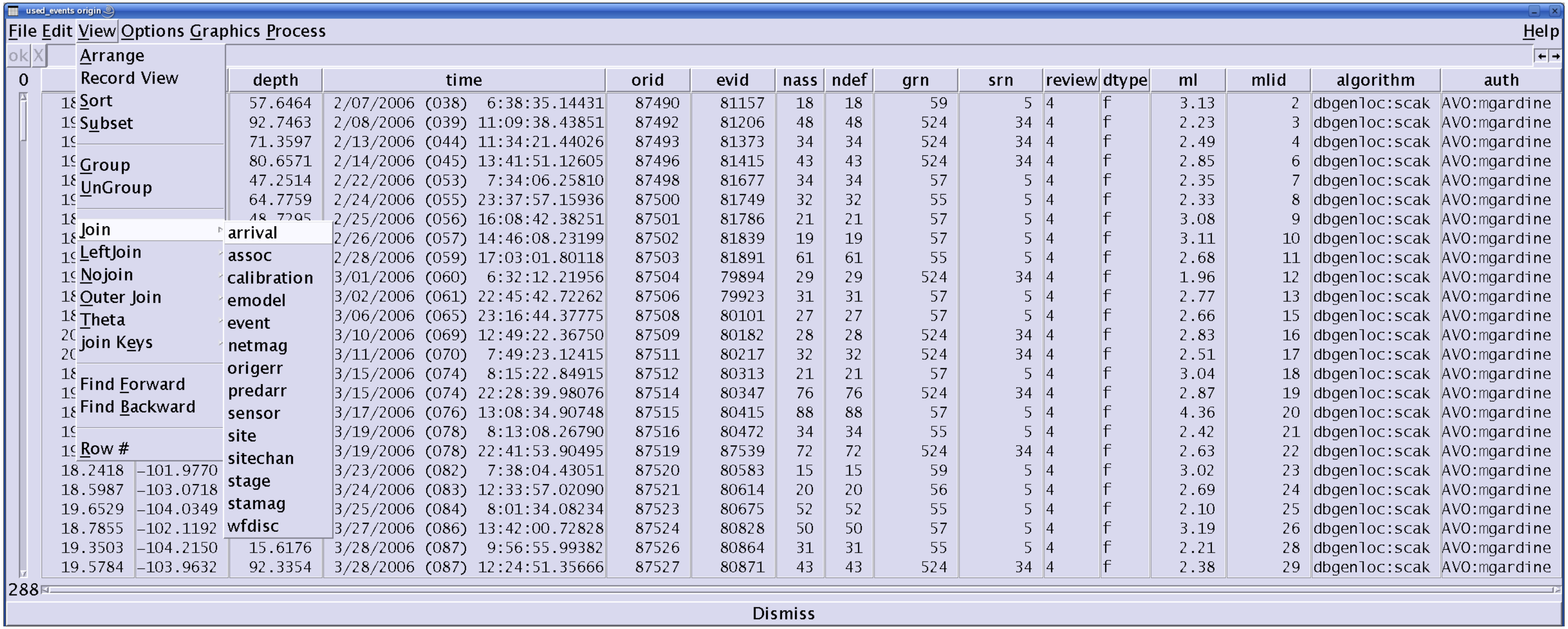
In practice, I find that two database operations are used more than any others:

Join: Merges two tables together using a field common to both (example: *orid*, *arrid*). Result is called a "***view***"

Subset: Filters the values in a table (or view) based on user-specified conditions

What to do with a database?

View > Join to join the current view with another table



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		92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
		71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
		80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
		47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
		64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
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			3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
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			3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
			3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
			3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770		3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718		3/24/2006 (083) 12:33:57.02090	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349		3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192		3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150	15.6176	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632	92.3354	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

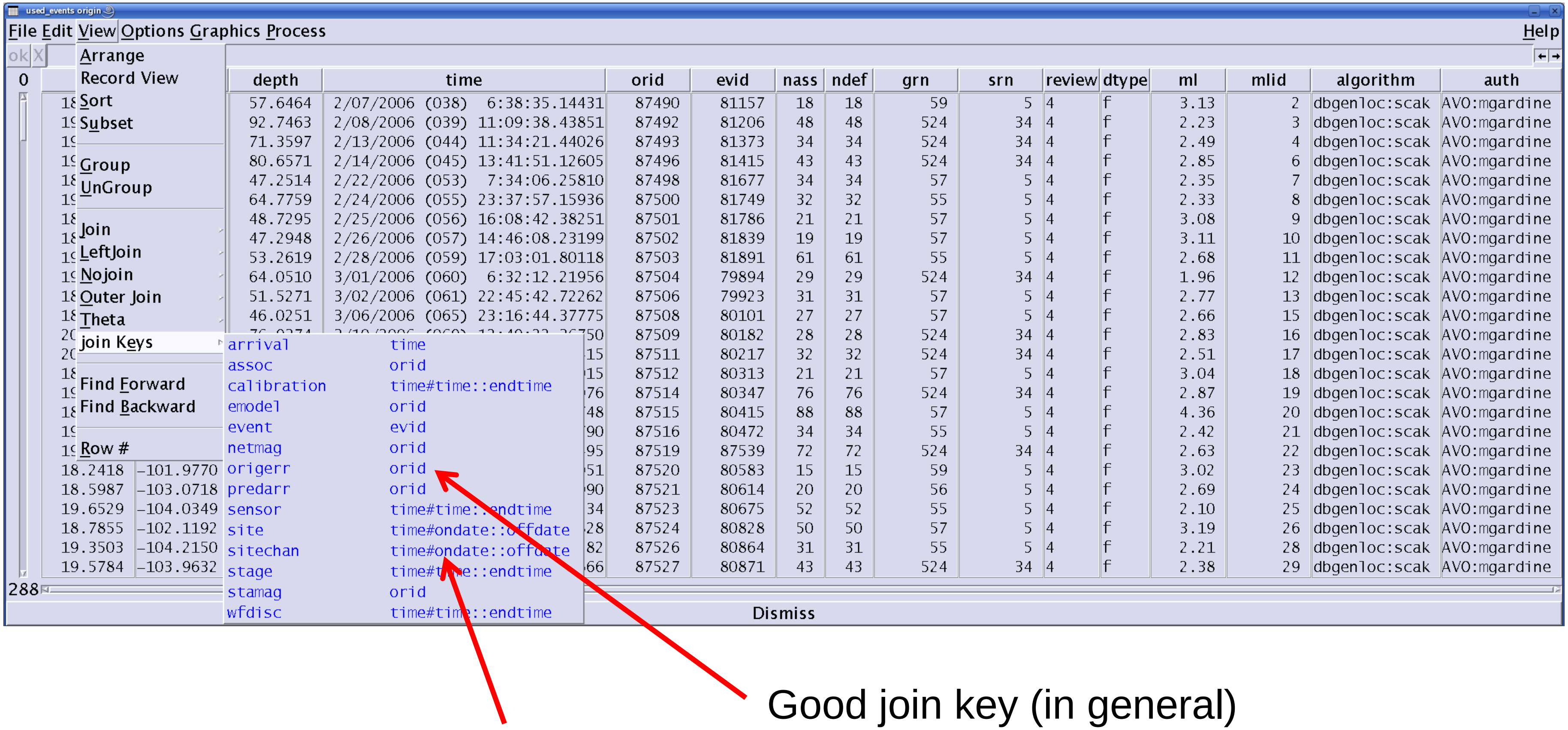
IMPORTANT NOTE:
Not all tables can be (correctly) joined together directly. Order matters!

Example: You want all of the arrivals for a given origin. Try opening the origin table and joining it with the arrival table. Is the result what you expected?

Solution: You must join the tables through an intermediary table called Assoc

What to do with a database?

View > join Keys to see what field the current view will use to join with the other tables



0		depth	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
18		57.6464	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
19		92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19		71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19		80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18		47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19		64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18		48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18		47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
19		53.2619	2/28/2006 (059) 17:03:01.80118	87503	81891	61	61	55	5	4	f	2.68	11	dbgenloc:scak	AVO:mgardine
19		64.0510	3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
18		51.5271	3/02/2006 (061) 22:45:42.72262	87506	79923	31	31	57	5	4	f	2.77	13	dbgenloc:scak	AVO:mgardine
18		46.0251	3/06/2006 (065) 23:16:44.37775	87508	80101	27	27	57	5	4	f	2.66	15	dbgenloc:scak	AVO:mgardine
20		76.0274	3/10/2006 (069) 12:40:22.26750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
20			15	87511	80217	32	32	524	34	4	f	2.51	17	dbgenloc:scak	AVO:mgardine
18			15	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
19			76	87514	80347	76	76	524	34	4	f	2.87	19	dbgenloc:scak	AVO:mgardine
18			48	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
19			90	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19			95	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770		51	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718		90	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349		34	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192		28	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150		82	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632		66	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

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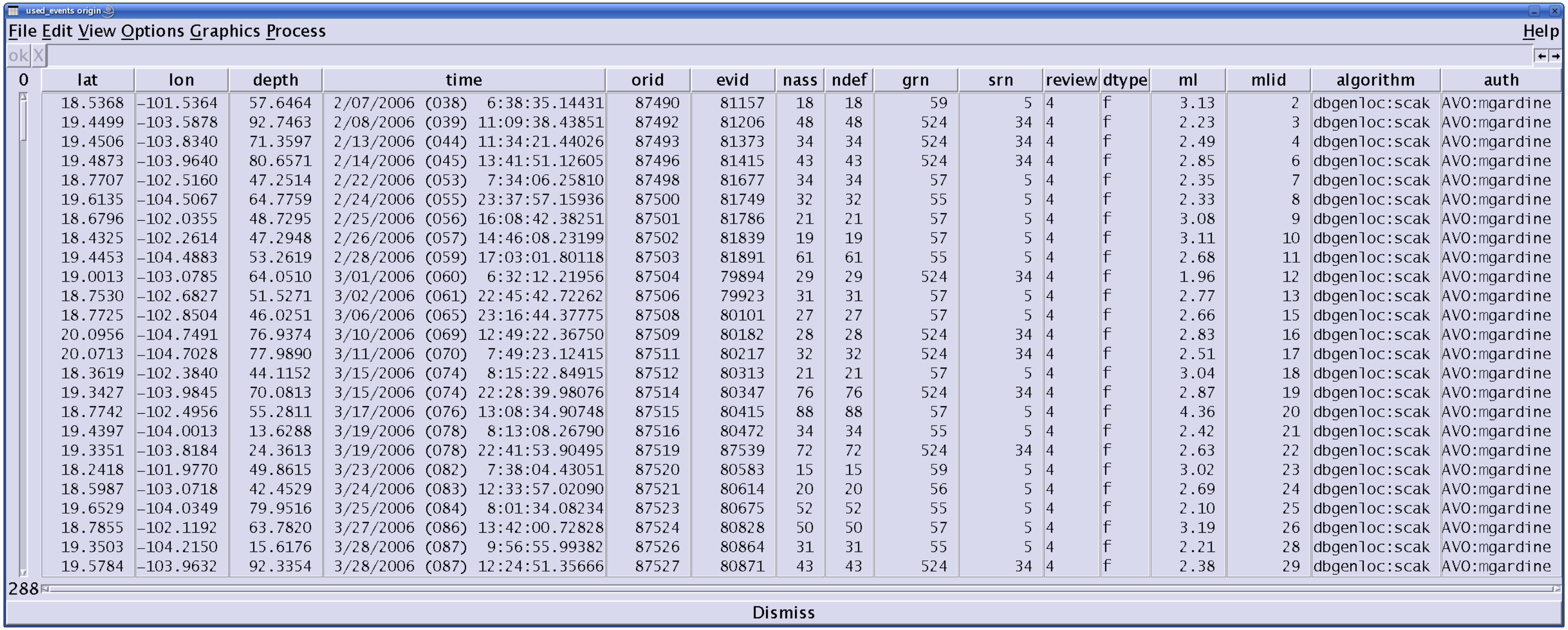
arrival	time
assoc	orid
calibration	time#time::endtime
emodel	orid
event	evid
netmag	orid
origerr	orid
predarr	orid
sensor	time#time::endtime
site	time#ondate::offdate
sitechan	time#ondate::offdate
stage	time#time::endtime
stamag	orid
wfdisc	time#time::endtime

Good join key (in general)

Bad join key

What to do with a database?

Subset: Filters the values in a table (or view) based on user-specified conditions

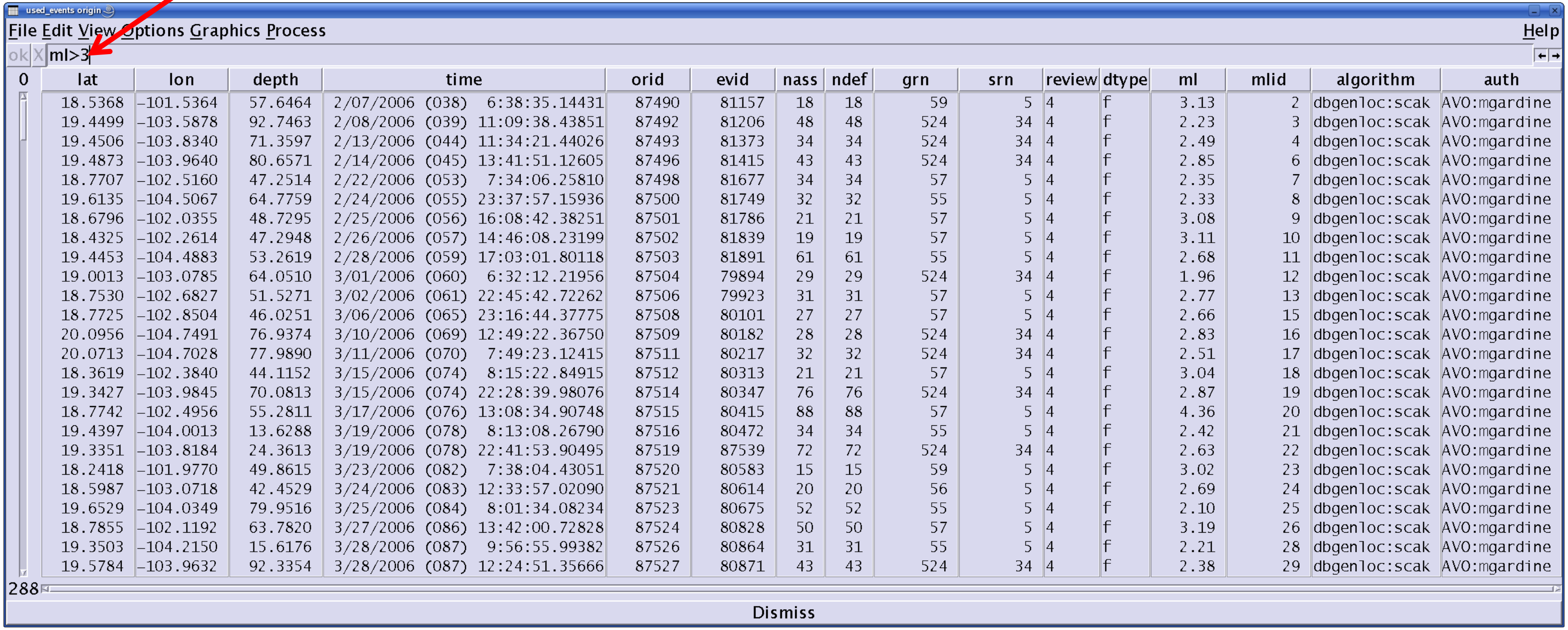


lat	lon	depth	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
18.5368	-101.5364	57.6464	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
19.4499	-103.5878	92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19.4506	-103.8340	71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19.4873	-103.9640	80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18.7707	-102.5160	47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19.6135	-104.5067	64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18.6796	-102.0355	48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18.4325	-102.2614	47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
19.4453	-104.4883	53.2619	2/28/2006 (059) 17:03:01.80118	87503	81891	61	61	55	5	4	f	2.68	11	dbgenloc:scak	AVO:mgardine
19.0013	-103.0785	64.0510	3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
18.7530	-102.6827	51.5271	3/02/2006 (061) 22:45:42.72262	87506	79923	31	31	57	5	4	f	2.77	13	dbgenloc:scak	AVO:mgardine
18.7725	-102.8504	46.0251	3/06/2006 (065) 23:16:44.37775	87508	80101	27	27	57	5	4	f	2.66	15	dbgenloc:scak	AVO:mgardine
20.0956	-104.7491	76.9374	3/10/2006 (069) 12:49:22.36750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
20.0713	-104.7028	77.9890	3/11/2006 (070) 7:49:23.12415	87511	80217	32	32	524	34	4	f	2.51	17	dbgenloc:scak	AVO:mgardine
18.3619	-102.3840	44.1152	3/15/2006 (074) 8:15:22.84915	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
19.3427	-103.9845	70.0813	3/15/2006 (074) 22:28:39.98076	87514	80347	76	76	524	34	4	f	2.87	19	dbgenloc:scak	AVO:mgardine
18.7742	-102.4956	55.2811	3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
19.4397	-104.0013	13.6288	3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19.3351	-103.8184	24.3613	3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770	49.8615	3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718	42.4529	3/24/2006 (083) 12:33:57.02090	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349	79.9516	3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192	63.7820	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150	15.6176	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632	92.3354	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

What to do with a database?

Subset: Filters the values in a table (or view) based on user-specified conditions

Say we want all origins with $M_L > 3$


Entry window

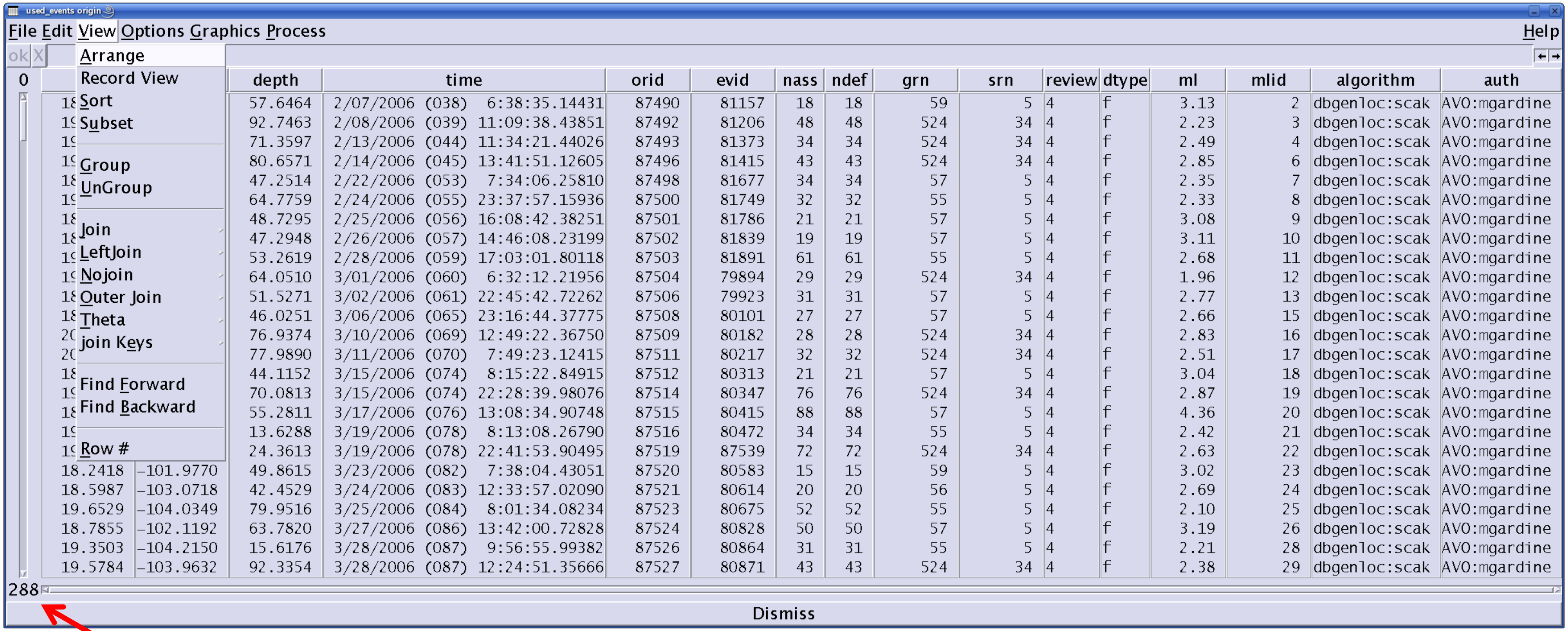
lat	lon	depth	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
18.5368	-101.5364	57.6464	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
19.4499	-103.5878	92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19.4506	-103.8340	71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19.4873	-103.9640	80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18.7707	-102.5160	47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19.6135	-104.5067	64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18.6796	-102.0355	48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18.4325	-102.2614	47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
19.4453	-104.4883	53.2619	2/28/2006 (059) 17:03:01.80118	87503	81891	61	61	55	5	4	f	2.68	11	dbgenloc:scak	AVO:mgardine
19.0013	-103.0785	64.0510	3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
18.7530	-102.6827	51.5271	3/02/2006 (061) 22:45:42.72262	87506	79923	31	31	57	5	4	f	2.77	13	dbgenloc:scak	AVO:mgardine
18.7725	-102.8504	46.0251	3/06/2006 (065) 23:16:44.37775	87508	80101	27	27	57	5	4	f	2.66	15	dbgenloc:scak	AVO:mgardine
20.0956	-104.7491	76.9374	3/10/2006 (069) 12:49:22.36750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
20.0713	-104.7028	77.9890	3/11/2006 (070) 7:49:23.12415	87511	80217	32	32	524	34	4	f	2.51	17	dbgenloc:scak	AVO:mgardine
18.3619	-102.3840	44.1152	3/15/2006 (074) 8:15:22.84915	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
19.3427	-103.9845	70.0813	3/15/2006 (074) 22:28:39.98076	87514	80347	76	76	524	34	4	f	2.87	19	dbgenloc:scak	AVO:mgardine
18.7742	-102.4956	55.2811	3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
19.4397	-104.0013	13.6288	3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19.3351	-103.8184	24.3613	3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770	49.8615	3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718	42.4529	3/24/2006 (083) 12:33:57.02090	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349	79.9516	3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192	63.7820	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150	15.6176	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632	92.3354	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

What to do with a database?

Subset: Filters the values in a table (or view) based on user-specified conditions

Say we want all origins with $M_L > 3$

View > Subset to apply the expression in the entry window



		depth	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
18		57.6464	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
19		92.7463	2/08/2006 (039) 11:09:38.43851	87492	81206	48	48	524	34	4	f	2.23	3	dbgenloc:scak	AVO:mgardine
19		71.3597	2/13/2006 (044) 11:34:21.44026	87493	81373	34	34	524	34	4	f	2.49	4	dbgenloc:scak	AVO:mgardine
19		80.6571	2/14/2006 (045) 13:41:51.12605	87496	81415	43	43	524	34	4	f	2.85	6	dbgenloc:scak	AVO:mgardine
18		47.2514	2/22/2006 (053) 7:34:06.25810	87498	81677	34	34	57	5	4	f	2.35	7	dbgenloc:scak	AVO:mgardine
19		64.7759	2/24/2006 (055) 23:37:57.15936	87500	81749	32	32	55	5	4	f	2.33	8	dbgenloc:scak	AVO:mgardine
18		48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
18		47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
19		53.2619	2/28/2006 (059) 17:03:01.80118	87503	81891	61	61	55	5	4	f	2.68	11	dbgenloc:scak	AVO:mgardine
19		64.0510	3/01/2006 (060) 6:32:12.21956	87504	79894	29	29	524	34	4	f	1.96	12	dbgenloc:scak	AVO:mgardine
18		51.5271	3/02/2006 (061) 22:45:42.72262	87506	79923	31	31	57	5	4	f	2.77	13	dbgenloc:scak	AVO:mgardine
18		46.0251	3/06/2006 (065) 23:16:44.37775	87508	80101	27	27	57	5	4	f	2.66	15	dbgenloc:scak	AVO:mgardine
20		76.9374	3/10/2006 (069) 12:49:22.36750	87509	80182	28	28	524	34	4	f	2.83	16	dbgenloc:scak	AVO:mgardine
20		77.9890	3/11/2006 (070) 7:49:23.12415	87511	80217	32	32	524	34	4	f	2.51	17	dbgenloc:scak	AVO:mgardine
18		44.1152	3/15/2006 (074) 8:15:22.84915	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
19		70.0813	3/15/2006 (074) 22:28:39.98076	87514	80347	76	76	524	34	4	f	2.87	19	dbgenloc:scak	AVO:mgardine
18		55.2811	3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
19		13.6288	3/19/2006 (078) 8:13:08.26790	87516	80472	34	34	55	5	4	f	2.42	21	dbgenloc:scak	AVO:mgardine
19		24.3613	3/19/2006 (078) 22:41:53.90495	87519	87539	72	72	524	34	4	f	2.63	22	dbgenloc:scak	AVO:mgardine
18.2418	-101.9770	49.8615	3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
18.5987	-103.0718	42.4529	3/24/2006 (083) 12:33:57.02090	87521	80614	20	20	56	5	4	f	2.69	24	dbgenloc:scak	AVO:mgardine
19.6529	-104.0349	79.9516	3/25/2006 (084) 8:01:34.08234	87523	80675	52	52	55	5	4	f	2.10	25	dbgenloc:scak	AVO:mgardine
18.7855	-102.1192	63.7820	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
19.3503	-104.2150	15.6176	3/28/2006 (087) 9:56:55.99382	87526	80864	31	31	55	5	4	f	2.21	28	dbgenloc:scak	AVO:mgardine
19.5784	-103.9632	92.3354	3/28/2006 (087) 12:24:51.35666	87527	80871	43	43	524	34	4	f	2.38	29	dbgenloc:scak	AVO:mgardine

288

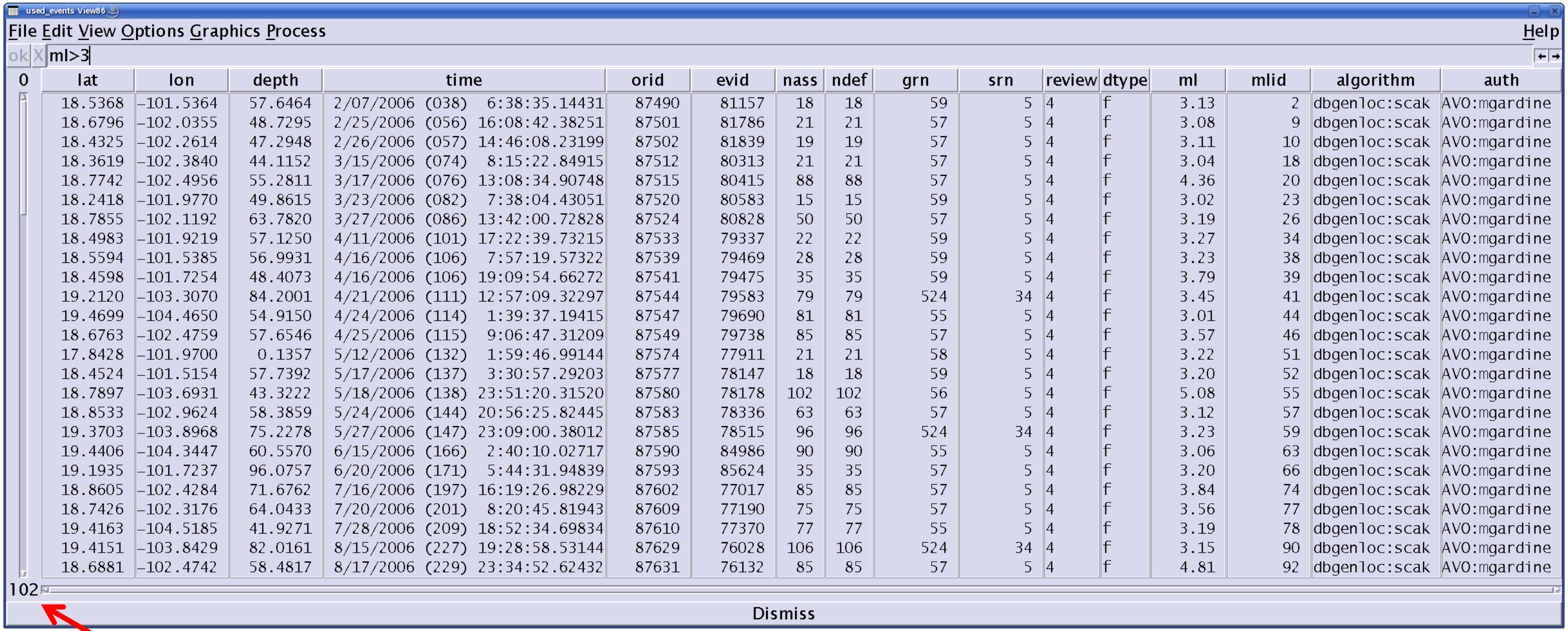
Note the total number of records in the current view

What to do with a database?

Subset: Filters the values in a table (or view) based on user-specified conditions

Say we want all origins with $M_L > 3$

View > Subset to apply the expression in the entry window



ml>3

0	lat	lon	depth	time	orid	evid	nass	ndef	grn	srn	review	dtype	ml	mlid	algorithm	auth
	18.5368	-101.5364	57.6464	2/07/2006 (038) 6:38:35.14431	87490	81157	18	18	59	5	4	f	3.13	2	dbgenloc:scak	AVO:mgardine
	18.6796	-102.0355	48.7295	2/25/2006 (056) 16:08:42.38251	87501	81786	21	21	57	5	4	f	3.08	9	dbgenloc:scak	AVO:mgardine
	18.4325	-102.2614	47.2948	2/26/2006 (057) 14:46:08.23199	87502	81839	19	19	57	5	4	f	3.11	10	dbgenloc:scak	AVO:mgardine
	18.3619	-102.3840	44.1152	3/15/2006 (074) 8:15:22.84915	87512	80313	21	21	57	5	4	f	3.04	18	dbgenloc:scak	AVO:mgardine
	18.7742	-102.4956	55.2811	3/17/2006 (076) 13:08:34.90748	87515	80415	88	88	57	5	4	f	4.36	20	dbgenloc:scak	AVO:mgardine
	18.2418	-101.9770	49.8615	3/23/2006 (082) 7:38:04.43051	87520	80583	15	15	59	5	4	f	3.02	23	dbgenloc:scak	AVO:mgardine
	18.7855	-102.1192	63.7820	3/27/2006 (086) 13:42:00.72828	87524	80828	50	50	57	5	4	f	3.19	26	dbgenloc:scak	AVO:mgardine
	18.4983	-101.9219	57.1250	4/11/2006 (101) 17:22:39.73215	87533	79337	22	22	59	5	4	f	3.27	34	dbgenloc:scak	AVO:mgardine
	18.5594	-101.5385	56.9931	4/16/2006 (106) 7:57:19.57322	87539	79469	28	28	59	5	4	f	3.23	38	dbgenloc:scak	AVO:mgardine
	18.4598	-101.7254	48.4073	4/16/2006 (106) 19:09:54.66272	87541	79475	35	35	59	5	4	f	3.79	39	dbgenloc:scak	AVO:mgardine
	19.2120	-103.3070	84.2001	4/21/2006 (111) 12:57:09.32297	87544	79583	79	79	524	34	4	f	3.45	41	dbgenloc:scak	AVO:mgardine
	19.4699	-104.4650	54.9150	4/24/2006 (114) 1:39:37.19415	87547	79690	81	81	55	5	4	f	3.01	44	dbgenloc:scak	AVO:mgardine
	18.6763	-102.4759	57.6546	4/25/2006 (115) 9:06:47.31209	87549	79738	85	85	57	5	4	f	3.57	46	dbgenloc:scak	AVO:mgardine
	17.8428	-101.9700	0.1357	5/12/2006 (132) 1:59:46.99144	87574	77911	21	21	58	5	4	f	3.22	51	dbgenloc:scak	AVO:mgardine
	18.4524	-101.5154	57.7392	5/17/2006 (137) 3:30:57.29203	87577	78147	18	18	59	5	4	f	3.20	52	dbgenloc:scak	AVO:mgardine
	18.7897	-103.6931	43.3222	5/18/2006 (138) 23:51:20.31520	87580	78178	102	102	56	5	4	f	5.08	55	dbgenloc:scak	AVO:mgardine
	18.8533	-102.9624	58.3859	5/24/2006 (144) 20:56:25.82445	87583	78336	63	63	57	5	4	f	3.12	57	dbgenloc:scak	AVO:mgardine
	19.3703	-103.8968	75.2278	5/27/2006 (147) 23:09:00.38012	87585	78515	96	96	524	34	4	f	3.23	59	dbgenloc:scak	AVO:mgardine
	19.4406	-104.3447	60.5570	6/15/2006 (166) 2:40:10.02717	87590	84986	90	90	55	5	4	f	3.06	63	dbgenloc:scak	AVO:mgardine
	19.1935	-101.7237	96.0757	6/20/2006 (171) 5:44:31.94839	87593	85624	35	35	57	5	4	f	3.20	66	dbgenloc:scak	AVO:mgardine
	18.8605	-102.4284	71.6762	7/16/2006 (197) 16:19:26.98229	87602	77017	85	85	57	5	4	f	3.84	74	dbgenloc:scak	AVO:mgardine
	18.7426	-102.3176	64.0433	7/20/2006 (201) 8:20:45.81943	87609	77190	75	75	57	5	4	f	3.56	77	dbgenloc:scak	AVO:mgardine
	19.4163	-104.5185	41.9271	7/28/2006 (209) 18:52:34.69834	87610	77370	77	77	55	5	4	f	3.19	78	dbgenloc:scak	AVO:mgardine
	19.4151	-103.8429	82.0161	8/15/2006 (227) 19:28:58.53144	87629	76028	106	106	524	34	4	f	3.15	90	dbgenloc:scak	AVO:mgardine
	18.6881	-102.4742	58.4817	8/17/2006 (229) 23:34:52.62432	87631	76132	85	85	57	5	4	f	4.81	92	dbgenloc:scak	AVO:mgardine
102																

Note the total number of records in the current view

What to do with a database?

The expressions allowed in the entry window are fairly high-level:

Logical expressions:

```
ml > 3
depth < 30
sta == ‘RSO’
lat > 60 && lat < 61 && lon > -156 && lon < -155
```

Pattern matching:

```
chan =~ /.*Z/
phase =~ /P|S/
```

Calculator:

```
distance(orig.lat, orig.lon, site.lat, site.lon) < (10/111.1)
```

See the Datascope: A tutorial pdf for more examples of expressions that you can use for subsetting

Antelope and Matlab

Rather than using a graphical interface like ***dbe***, the Matlab interface (actually, almost all of the Datascope libraries) use a structure called a ***database pointer***

Each pointer has four fields, with each field being filled in with an integer:

Database #
Table #
Field #
Record #

These numbers tell Antelope what database and view you are operating on, and where to find it. It's all a bit abstract, but in many ways most of the things you will do with these database pointers are very analogous to things that we've already done with ***dbe*** .

Since the easiest way to learn a program is to use it, the final portion of this presentation will cover two examples doing some basic analyses of catalog data using Matlab.

Where possible, I will also show the duality between doing things in Matlab and with ***dbe***.

Example 1: AVO data

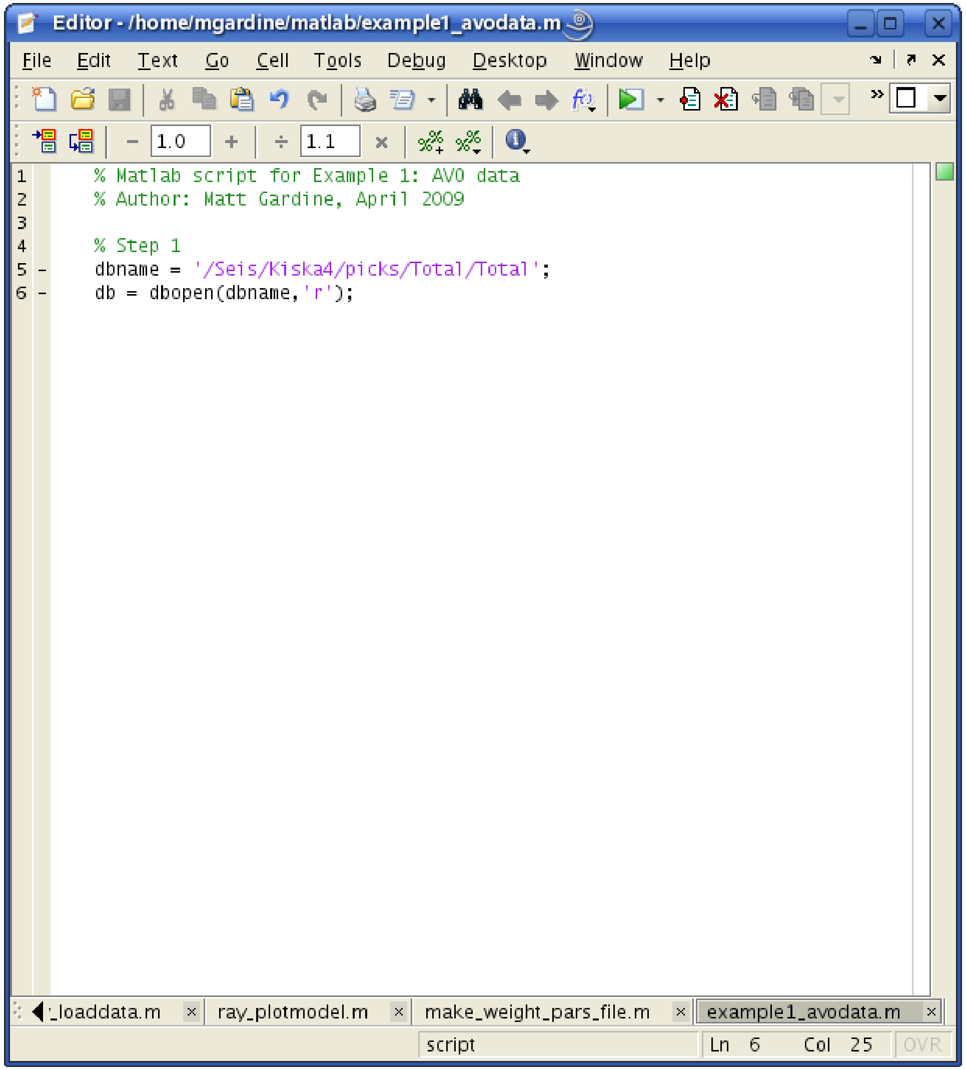
For this problem, I want to create a plot showing the cumulative number of earthquakes located at Redoubt over the last 10 years.

What steps will we need to do in order to accomplish this task?

1. Locate the AVO catalog
2. Find what database tables would be relevant to the task
3. Decide what constitutes an earthquake “at” Redoubt
4. Subset the data to only include what we want
5. Extract the data – what fields will we need?
6. Plot the data

Step 1: Locate the AVO Catalog

Found at /Seis/Kiska4/picks/Total/{Total} on the Sun network



```
% Matlab script for Example 1: AVO data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/Kiska4/picks/Total/Total';
db = dbopen(dbname,'r');
```

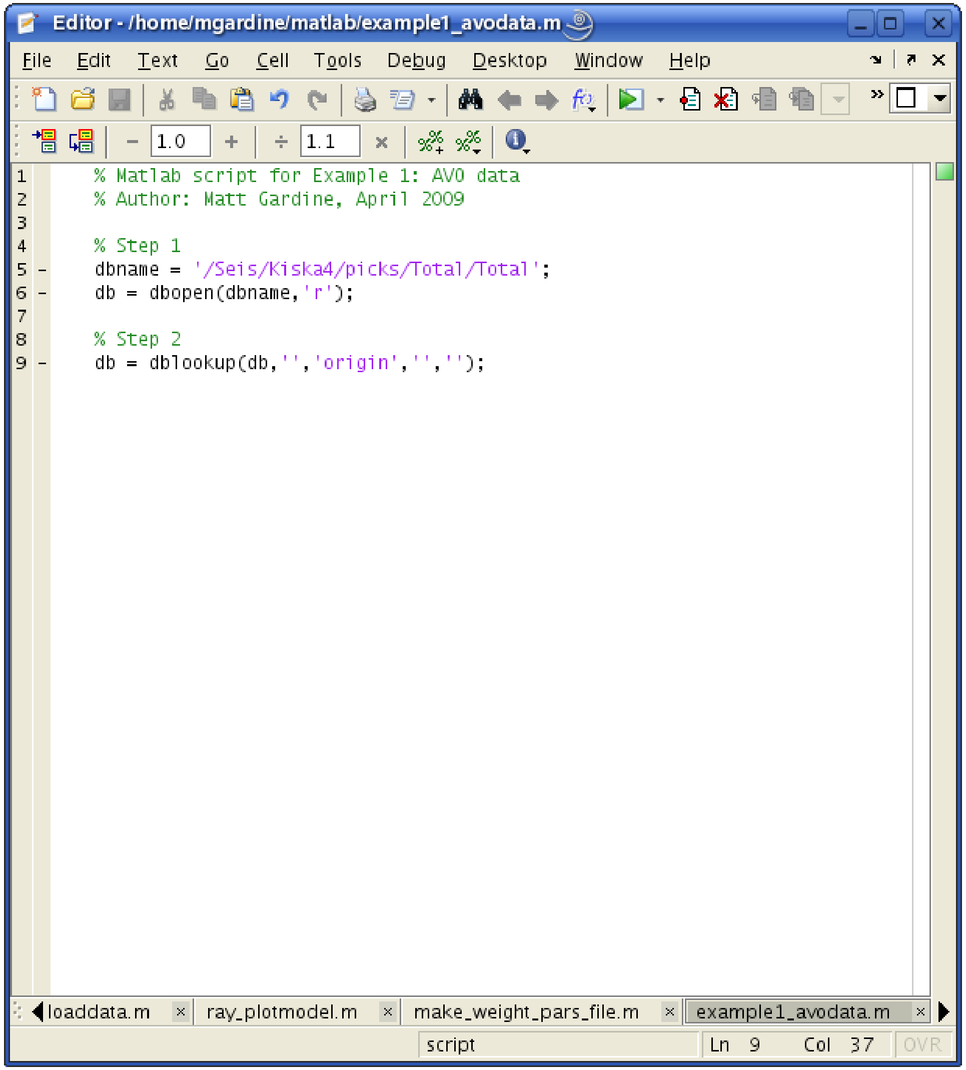
The variable db is now a database pointer, with an entry in the *database* field, and NULL (-511) in the others.

This is equivalent to opening a database through dbe:

```
mgardine@sockeye> dbe
/Seis/Kiska4/picks/Total/Total
```

Step 2: Find what database tables would be relevant to the task

We want the earthquake origins themselves, with no interest in arrivals, stations, or waveforms. Therefore, the *origin* table is the only table of interest.



```
% Matlab script for Example 1: AVO data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/Kiska4/picks/Total/Total';
db = dbopen(dbname,'r');

% Step 2
db = dblookup(db,'','origin','','');
```

The *dblookup* command is the way for a user to fill in the pointer values.

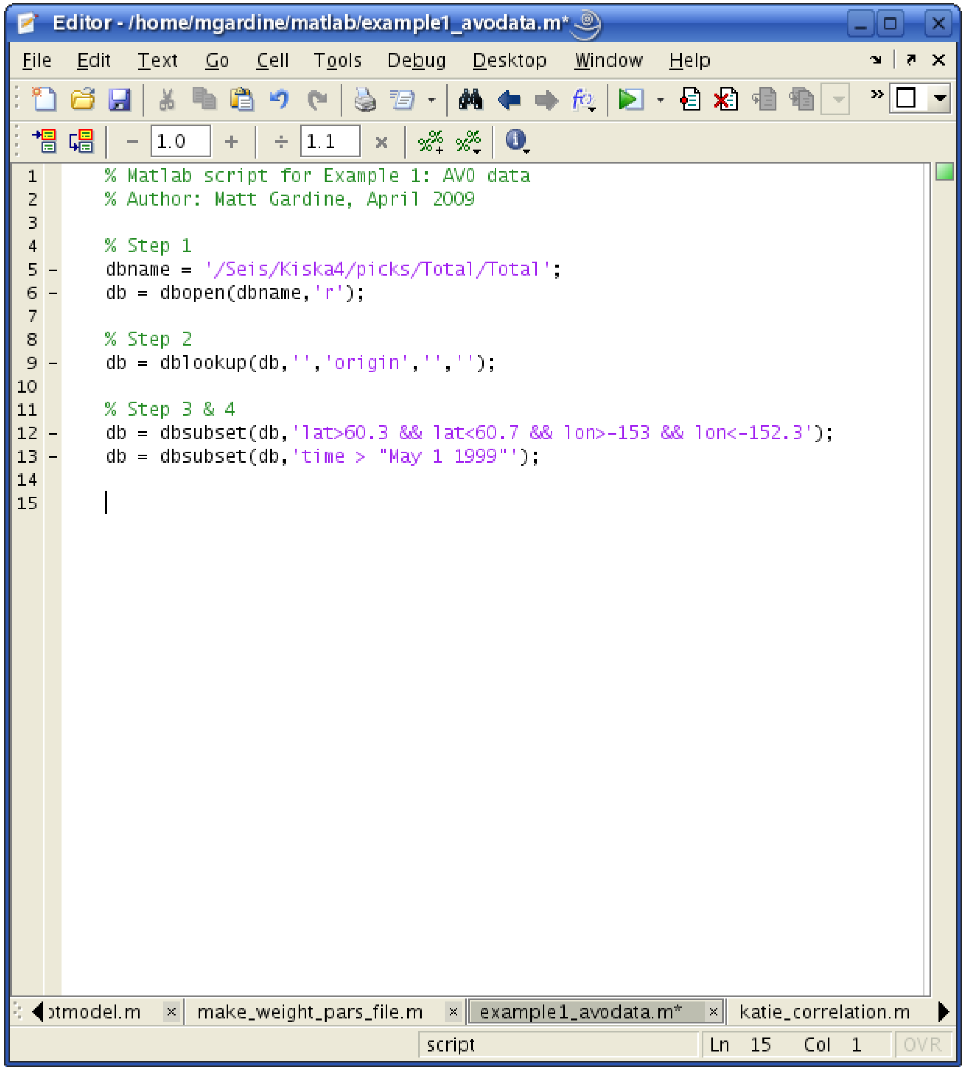
In this case, we want our pointer to point towards the origin table.

The variable db is now a database pointer, with an entry in the *database* and table fields, and NULL (-511) in the others.

This is equivalent to clicking on the origin table dbe.

Step 3:Decide what constitutes an earthquake “at” Redoubt
Step 4: Subset the data to only include what we want

There are two straightforward choices – creating a latitude/longitude bounding box, or use a radial distance from some point


Editor - /home/mgardine/matlab/example1_avodata.m*
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
otmodel.m
make_weight_pars_file.m
example1_avodata.m*
katie_correlation.m
script
Ln 15
Col 1
OVR

```
% Matlab script for Example 1: AVO data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/Kiska4/picks/Total/Total';
db = dbopen(dbname,'r');

% Step 2
db = dblookup(db,'','origin','','');

% Step 3 & 4
db = dbsubset(db,'lat>60.3 && lat<60.7 && lon>-153 && lon<-152.3');
db = dbsubset(db,'time > "May 1 1999"');

```

The *dbsubset* command is the way for a user to subset a view.

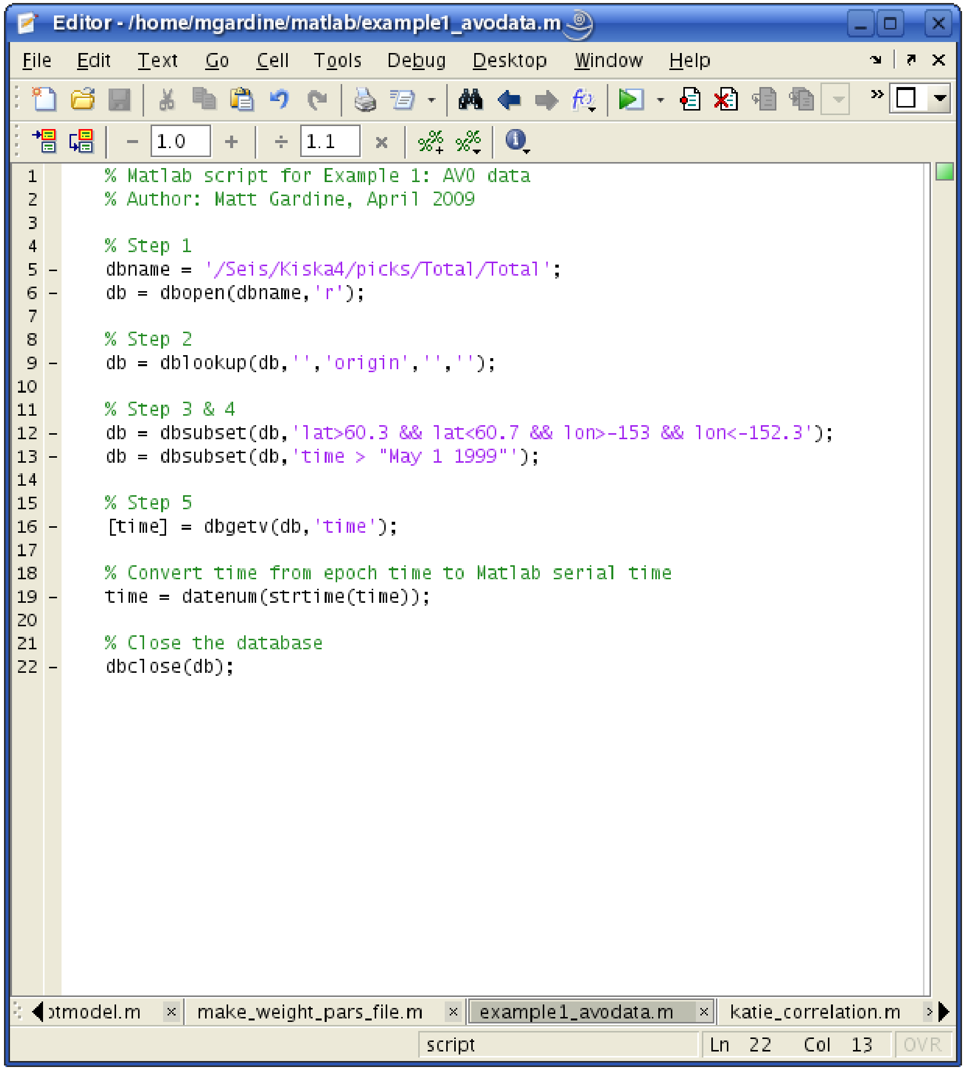
In this case, we want our view to only contain origins from 60.3-60.7 N and 152.3-153 W (roughly corresponds to bounds on AVO’s seismicity plot for Redoubt). Next, we subset to only include origins from the last 10 years.

The variable db is now a database pointer, with an entry in the *database* and a new value in the *table* field, and NULL (-511) in the others.

This is equivalent to typing in “*lat>60.3&&lat<60.7&&lon>-153&&lon<-152.3 && time> “May 1 1999”*” in the entry window and clicking **View > Subset**

Step 5: Extract the data

Since we want to plot cumulative number of earthquakes verses time, we really only need the *time* field.


Editor - /home/mgardine/matlab/example1_avodata.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
otmodel.m
make_weight_pars_file.m
example1_avodata.m
katie_correlation.m
script
Ln 22 Col 13
OVR

```
% Matlab script for Example 1: AVO data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/Kiska4/picks/Total/Total';
db = dbopen(dbname,'r');

% Step 2
db = dblookup(db,'','origin','','');

% Step 3 & 4
db = dbsubset(db,'lat>60.3 && lat<60.7 && lon>-153 && lon<-152.3');
db = dbsubset(db,'time > "May 1 1999"');

% Step 5
[time] = dbgetv(db,'time');

% Convert time from epoch time to Matlab serial time
time = datenum(strtime(time));

% Close the database
dbclose(db);
```

The *dbgetv* command is the way for a user to extract records from a view into Matlab variables.

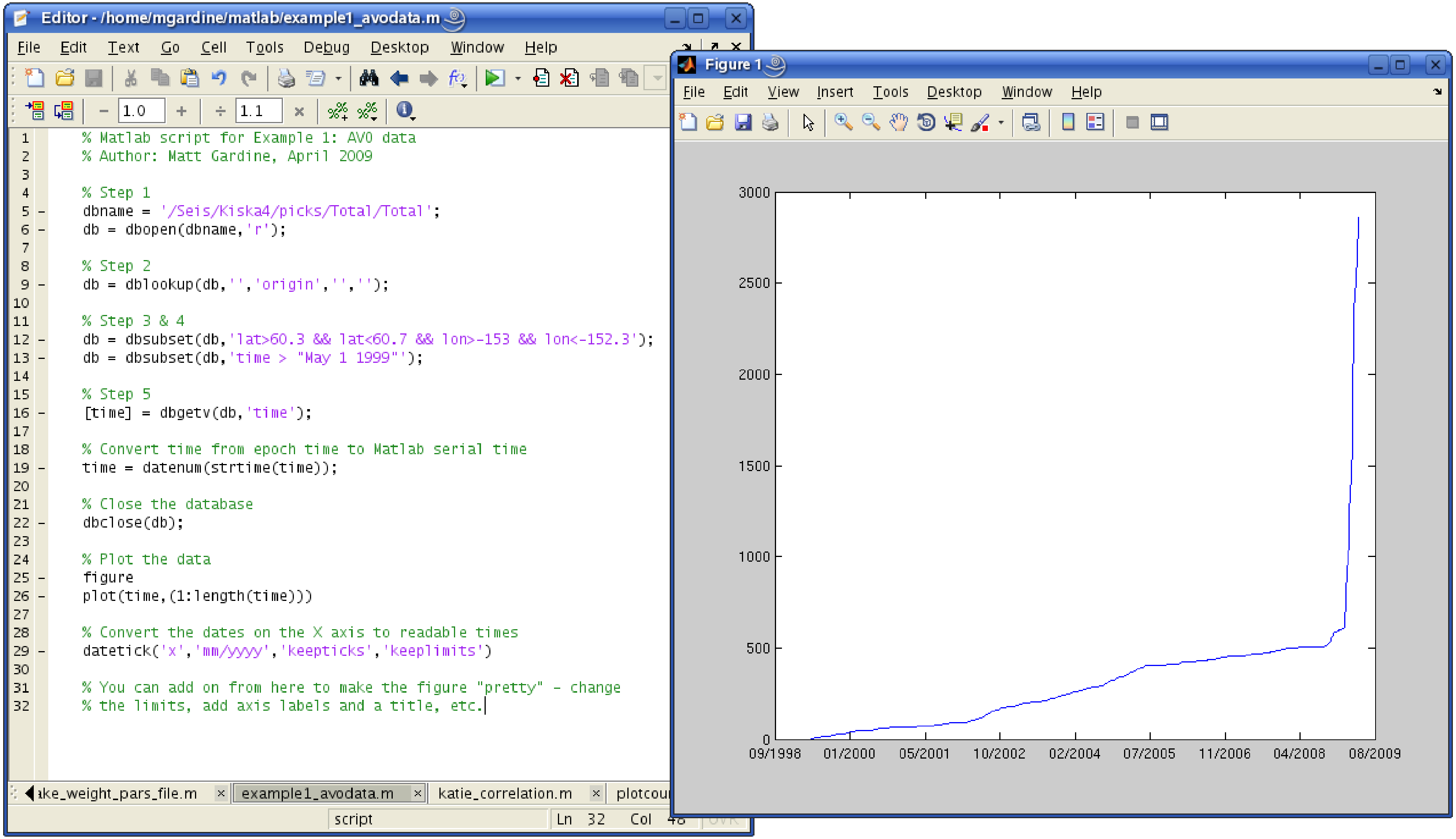
In this case, we want to extract all of the records from the *time* field in our view.

For any field that uses times, Antelope automatically extracts the values in **epoch** time. The easiest way to convert this to a more Matlab-friendly format is through the **strtime** command.

This is equivalent to clicking **View > Arrange**, unchecking everything except the *time* field, then clicking on **File > Save > Text separated by tabs**, and then importing the text file into Matlab. Quite a pain!

Step 6: Plot the data

We can plot the data by using a simple **plot** command with the time on the x-axis and the cumulative number of events on the y-axis. Changing the format of the axis from serial date format to a string format is done with **datetick**.



```
% Matlab script for Example 1: AVO data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/Kiska4/picks/Total/Total';
db = dbopen(dbname,'r');

% Step 2
db = dblookup(db,'','origin','','');

% Step 3 & 4
db = dbsubset(db,'lat>60.3 && lat<60.7 && lon>-153 && lon<-152.3');
db = dbsubset(db,'time > "May 1 1999"');

% Step 5
[time] = dbgetv(db,'time');

% Convert time from epoch time to Matlab serial time
time = datenum(strtime(time));

% Close the database
dbclose(db);

% Plot the data
figure
plot(time,(1:length(time)))

% Convert the dates on the X axis to readable times
datetick('x','mm/yyyy','keepticks','keeplimits')

% You can add on from here to make the figure "pretty" - change
% the limits, add axis labels and a title, etc.
```

Example 2: AEIC data

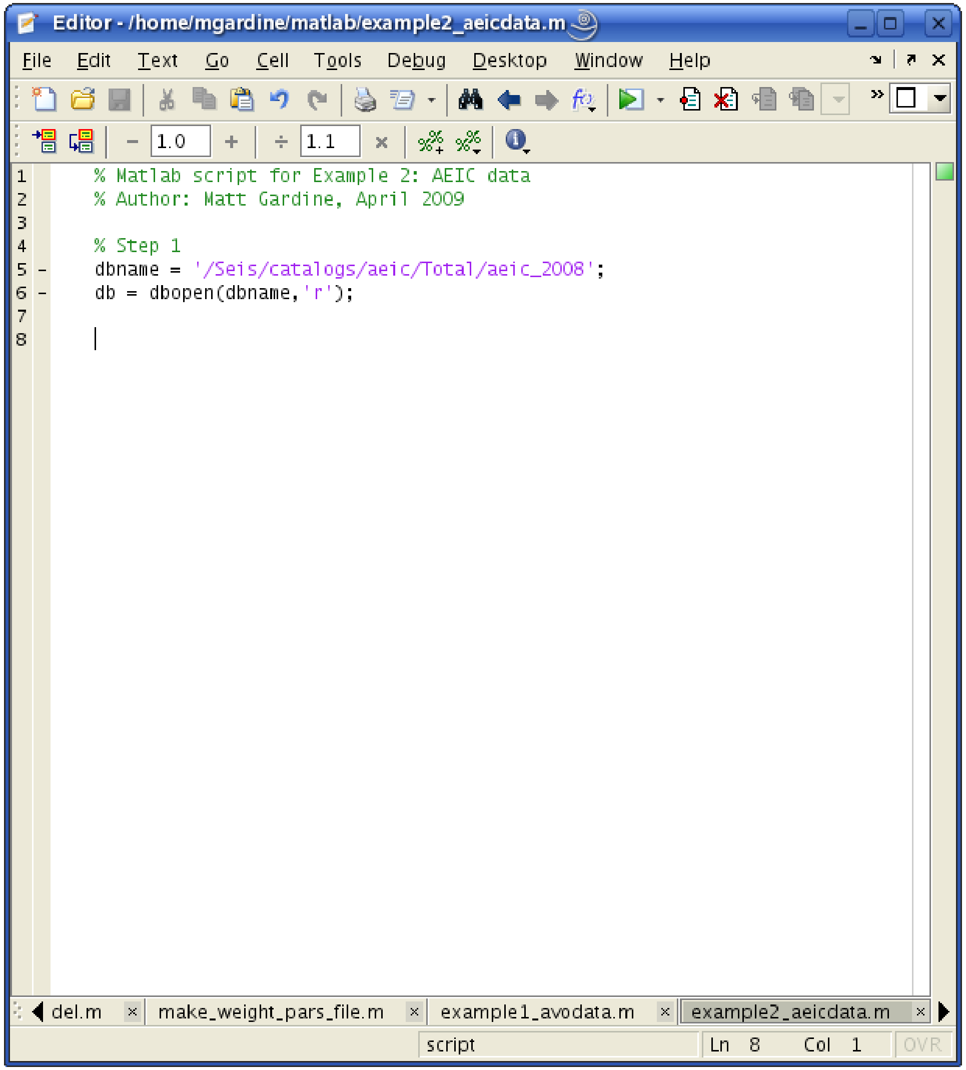
Now let's do a slightly more complicated example using AEIC data. Say we want to know how many P-arrivals from M_L>3 earthquakes in 2008 were seen at station COLA, and at what back-azimuth those arrivals came from.

What steps will we need to do in order to accomplish this task?

1. Locate the 2008 AEIC earthquake catalog
2. Find what database tables would be relevant to the task
3. Join the tables that we need together
4. Subset the catalog to only include information that we want
5. Extract the data
6. Plot the data

Step 1: Locate the 2008 AEIC earthquake catalog

Found at /Seis/catalogs/aeic/Total/{aeic_2008} on the Sun network


Editor - /home/mgardine/matlab/example2_aeicdata.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
del.m
make_weight_pars_file.m
example1_avodata.m
example2_aeicdata.m
script
Ln 8 Col 1
OVR

```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');
```

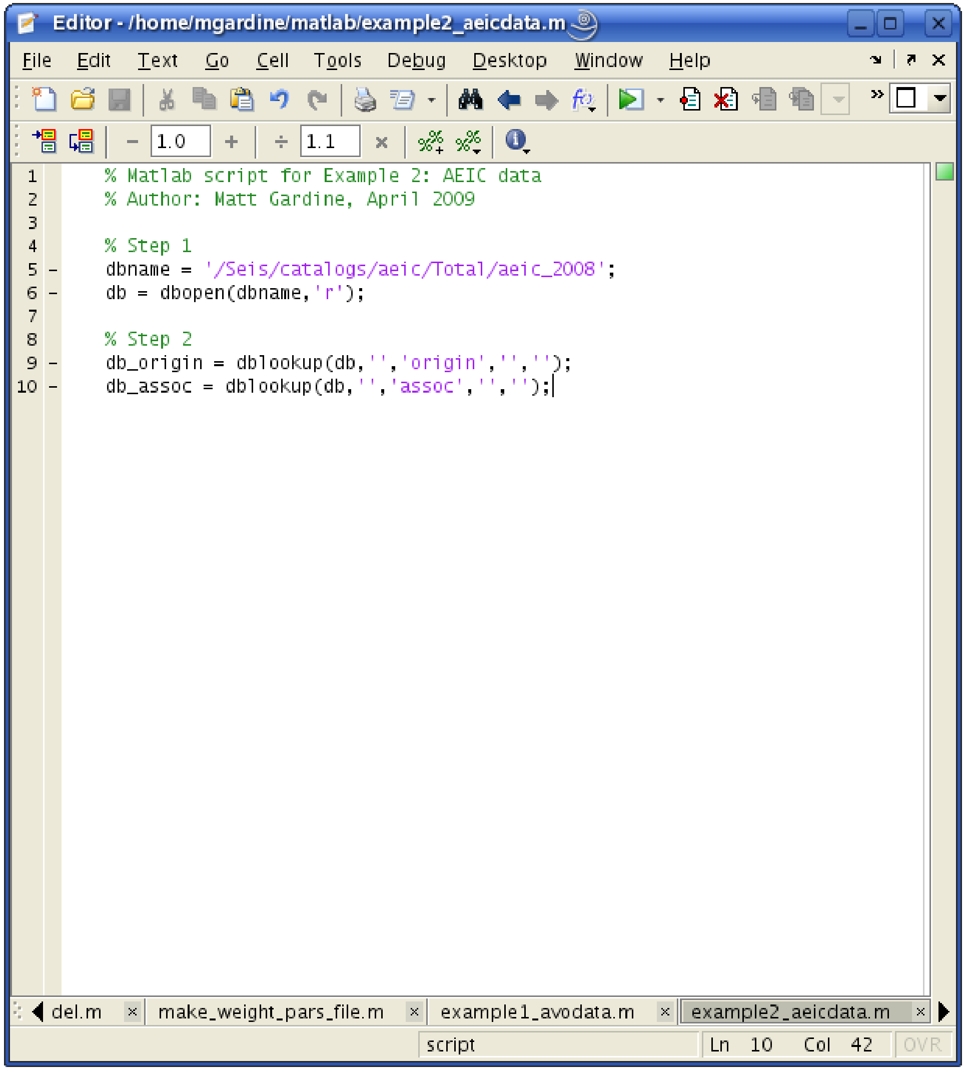
The variable db is now a database pointer, with an entry in the *database* field, and NULL (-511) in the others.

This is equivalent to opening a database through dbe:

```
mgardine@sockeye> dbe
/Seis/catalogs/aeic/Total/aeic_2008
```

Step 2: Find what database tables would be relevant to the task

We want the information about the earthquake origins (magnitude > 3), and information about the arrivals (back-azimuth of P-arrivals on COLA). The origin information is stored in the *origin* table, and the back-azimuths are stored in the *assoc* table.


Editor - /home/mgardine/matlab/example2_aeicdata.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
del.m
make_weight_pars_file.m
example1_avodata.m
example2_aeicdata.m
script
Ln 10
Col 42
OVR

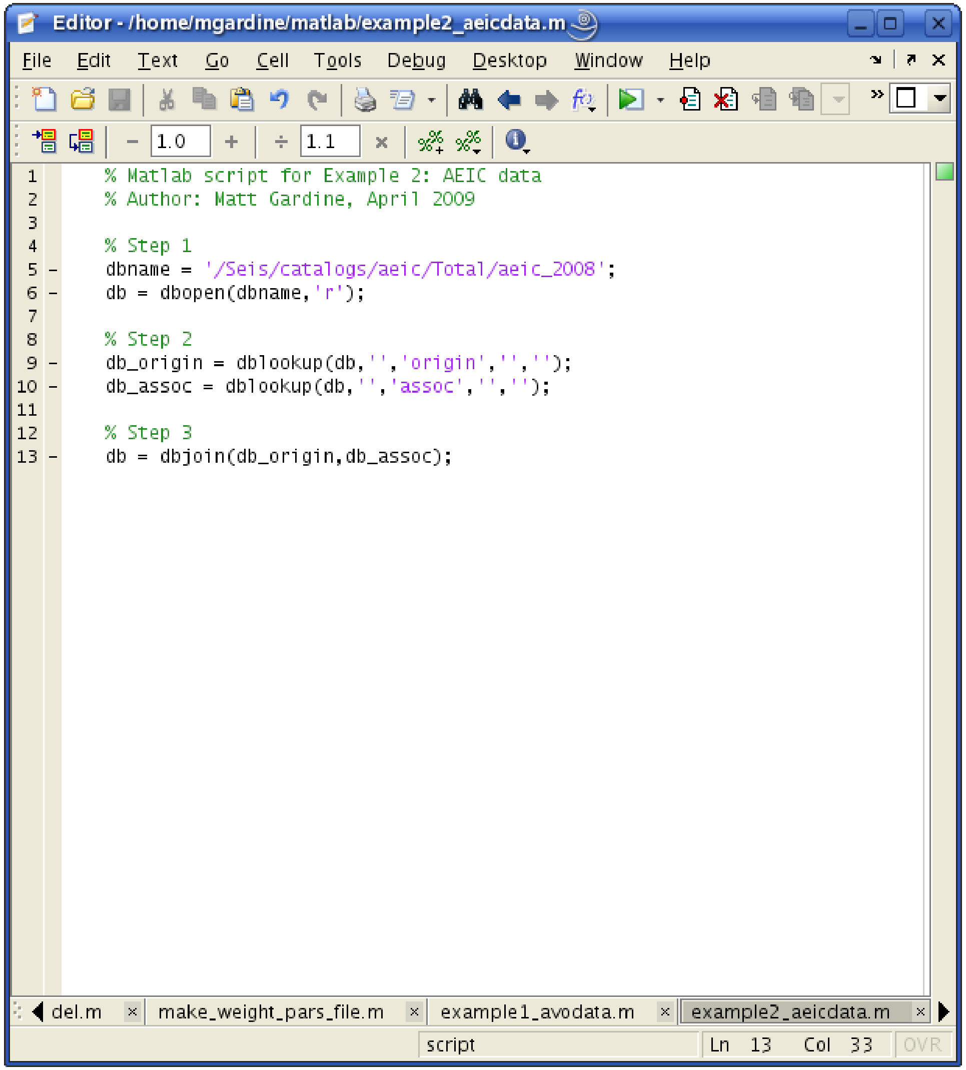
```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');

% Step 2
db_origin = dblookup(db,'','origin','','');
db_assoc = dblookup(db,'','assoc','','');
```

We will need to use *dblookup* twice, in order to get the pointer values for both the *origin* and *assoc* tables.

The variable db_origin is now a database pointer, with an entry in the *database* and *table* fields pointing to the origin table, and NULL (-511) in the others.

The variable db_assoc is now another database pointer, with an entry in the *database* and *table* fields pointing to the assoc table, and NULL (-511) in the others.

Step 3: Join the tables that we need together



Editor - /home/mgardine/matlab/example2_aeicdata.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
del.m
make_weight_pars_file.m
example1_avodata.m
example2_aeicdata.m
script
Ln 13 Col 33
OVR

```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');

% Step 2
db_origin = dblookup(db,'','origin','','');
db_assoc = dblookup(db,'','assoc','','');

% Step 3
db = dbjoin(db_origin,db_assoc);
```

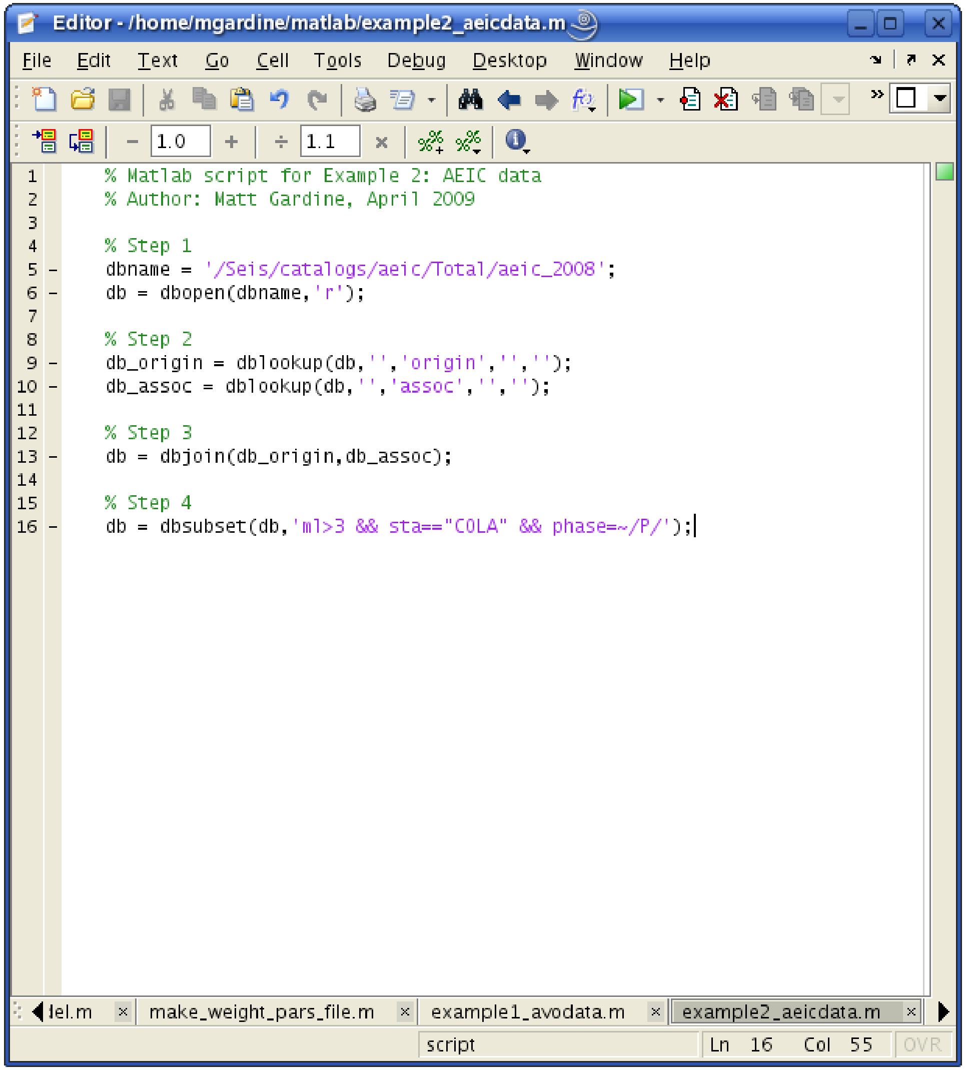
The *dbjoin* command takes two database pointers and performs a join into a new view with a new database pointer.

The variable db is now a database pointer, with an entry in the *database* and a new value in the *table* field, and NULL (-511) in the others.

This is equivalent to opening the *origin* table in dbe, and then clicking on **View > Join > Assoc**

Step 4: Subset the catalog to only include the information that we want

We will need three distinct subsets: magnitudes > 3, only show P arrivals, and only show arrivals at station COLA.



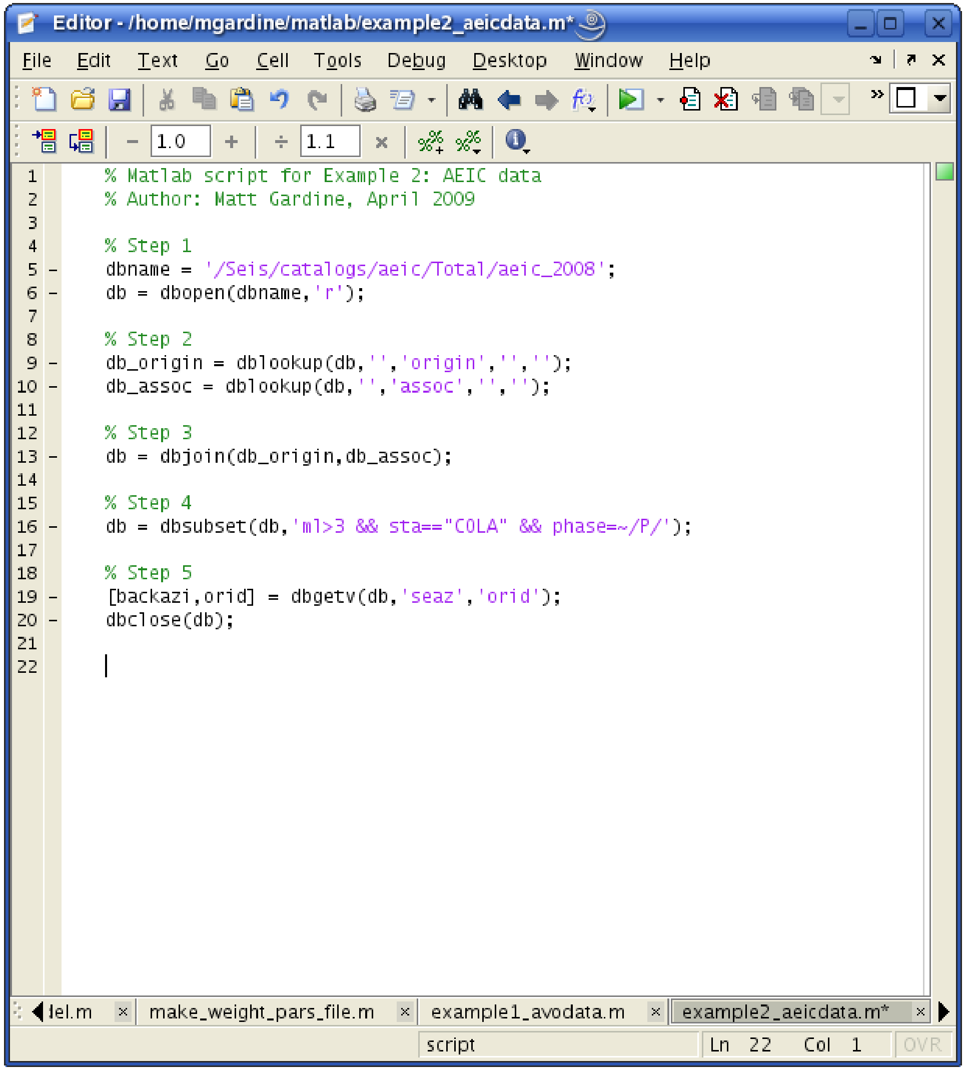
```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');

% Step 2
db_origin = dblookup(db,'','origin','','');
db_assoc = dblookup(db,'','assoc','','');

% Step 3
db = dbjoin(db_origin,db_assoc);

% Step 4
db = dbsubset(db,'ml>3 && sta=="COLA" && phase=~/P/');
```

This time will we combine all three subsets into one expression and then subset the view with the *dbsubset* command.

The variable db is now a database pointer, with an entry in the *database* and a new value in the *table* field, and NULL (-511) in the others.

This is equivalent to typing in “*ml>3 && sta==“COLA” && phase=~/P/*” in the entry window and clicking **View > Subset**

Step 5: Extract the data



```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');

% Step 2
db_origin = dblookup(db,'','origin','','');
db_assoc = dblookup(db,'','assoc','','');

% Step 3
db = dbjoin(db_origin,db_assoc);

% Step 4
db = dbsubset(db,'ml>3 && sta=="COLA" && phase=~/P/');

% Step 5
[backazi,orid] = dbgetv(db,'seaz','orid');
dbclose(db);
```

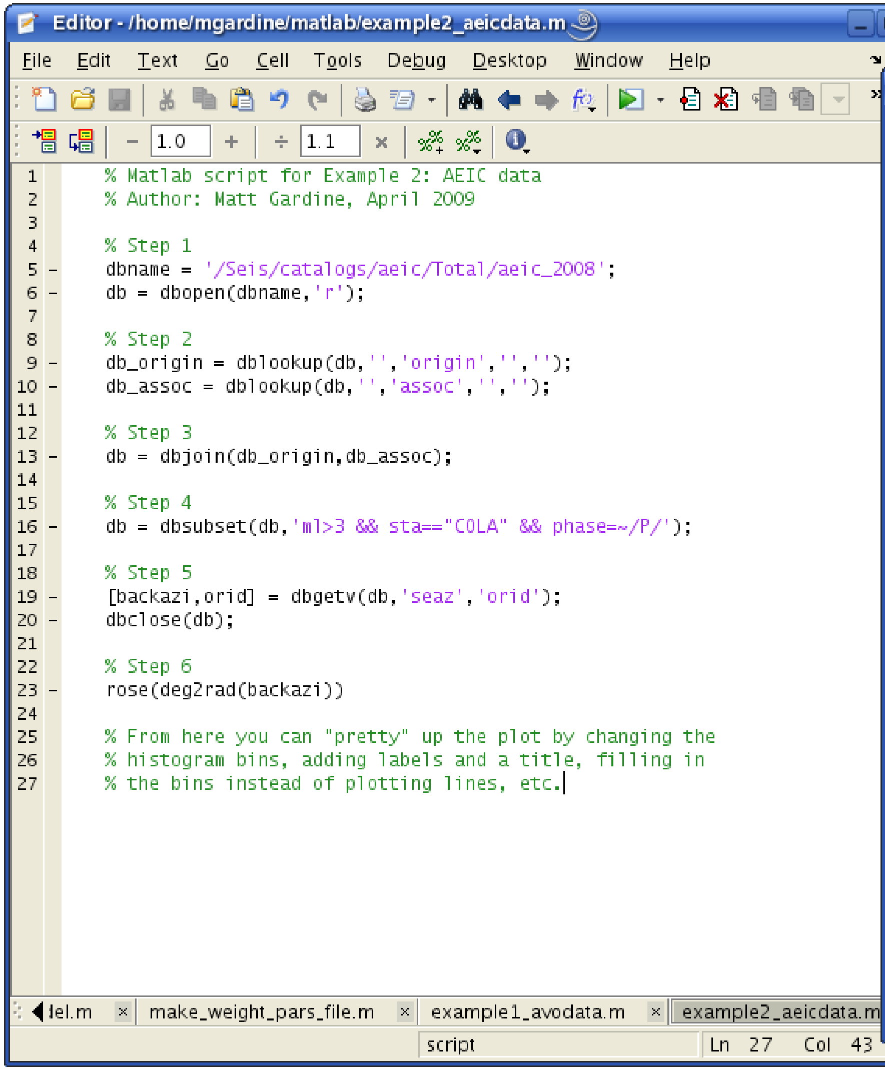
Here we will extract two fields from our database: the seaz (station-to-event azimuth, aka back-azimuth), and the orid (origin id numbers).

dbgetv supports extracting as many fields as you want (as long as they are present in the view, of course) into Matlab variables.

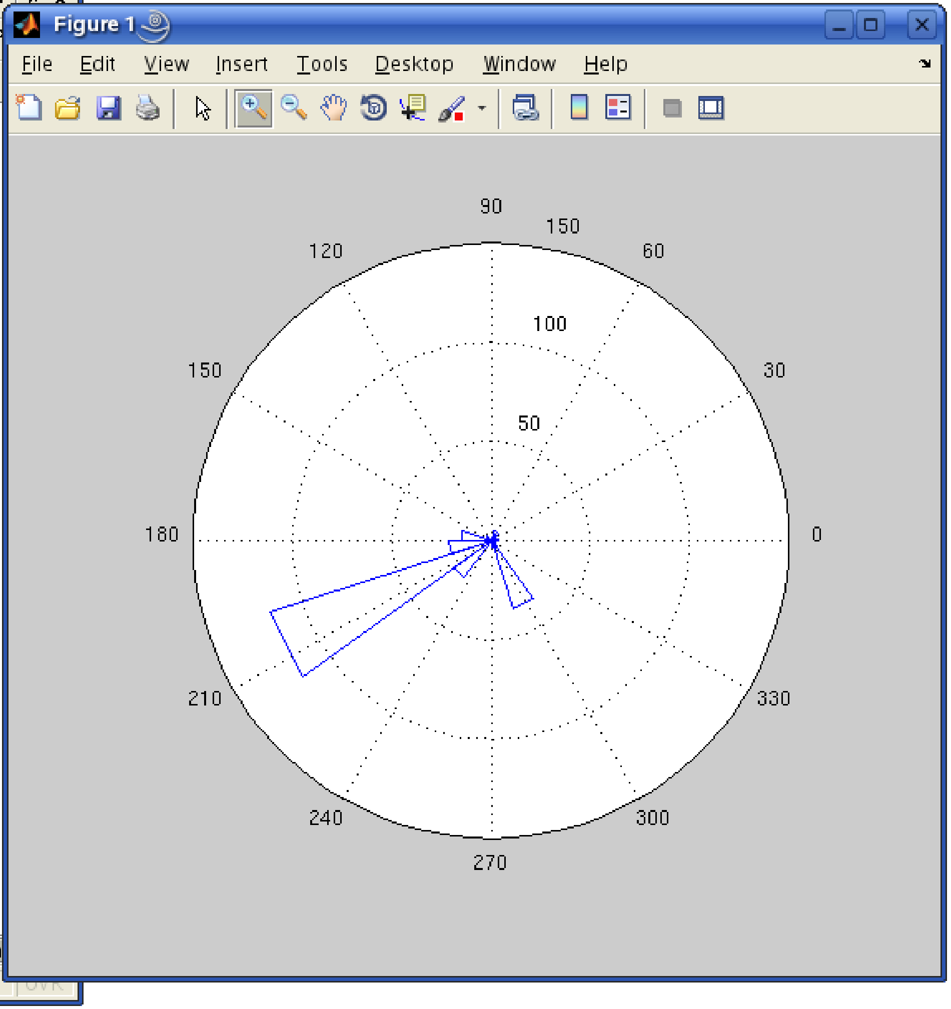
This is equivalent to clicking **View > Arrange**, unchecking everything except the *seaz* and *orid* fields, then clicking on **File > Save > Text separated by tabs**, and then importing the text file into Matlab.

Step 6: Plot the data

We can plot the data by using the **hist** command, but since we are dealing with angular values, a better way would be by using the **rose** command, which plots a rose diagram (a histogram in polar coordinates).


Editor - /home/mgardine/matlab/example2_aeicdata.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
lel.m
make_weight_pars_file.m
example1_avodata.m
example2_aeicdata.m
script
Ln 27 Col 43

```
% Matlab script for Example 2: AEIC data
% Author: Matt Gardine, April 2009

% Step 1
dbname = '/Seis/catalogs/aeic/Total/aeic_2008';
db = dbopen(dbname,'r');

% Step 2
db_origin = dblookup(db,'','origin','','');
db_assoc = dblookup(db,'','assoc','','');

% Step 3
db = dbjoin(db_origin,db_assoc);

% Step 4
db = dbsubset(db,'ml>3 && sta=="COLA" && phase=~/P/');

% Step 5
[backazi,orid] = dbgetv(db,'seaz','orid');
dbclose(db);

% Step 6
rose(deg2rad(backazi))

% From here you can "pretty" up the plot by changing the
% histogram bins, adding labels and a title, filling in
% the bins instead of plotting lines, etc.
```



Other Matlab/Antelope Tools

A few additional tools (not developed by BRTT) exist for additional manipulation of Antelope data with Matlab

Waveform – A Matlab object which allows for the importation and manipulation of waveform (time series) data into Matlab.

Download: http://www.mathworks.com/matlabcentral/fileexchange/23809
Help:
http://www.giseis.alaska.edu/input/celso/matlabweb/waveform_suit/waveform.html

Correlation - A Matlab object built on top of Waveform which allows for the efficient calculation and plotting of cross-correlation values between waveforms.

Download: http://www.giseis.alaska.edu/Seis/EQ/tools/matlab
Help: Same link

Other Helpful Links

Datascope: A Tutorial

http://www.brtt.com/docs/datascope.pdf

Antelope Toolbox for Matlab User’s Manual and Tutorial:

http://crs.inogs.it/antelope/doc/matlab/Antelope_Toolbox_for_Matlab.pdf