CWAKE Validation

Plots made 2011/03/03 by Glenn Thompson.

A simple way to check consistency of AVO Reviewed catalog versus relocations with "CWAKE" using ttregions/avo.

Note that velocity models are currently truncated above 0 km because otherwise station elevations are ignored. Thus the models in CWAKE presently may differ from those used in Hypoellipse from -3km to 0km.

6 sample databases of high quality solutions were extracted from the AVO Reviewed catalog corresponding to Spurr, Redoubt, Augustine, Katmai-Trident, Martin-Mageik and Akutan.

They were relocated with:

relocate dbin dbout -useold

And here dbin and dbout are compared using the "catalog" class in MATLAB.

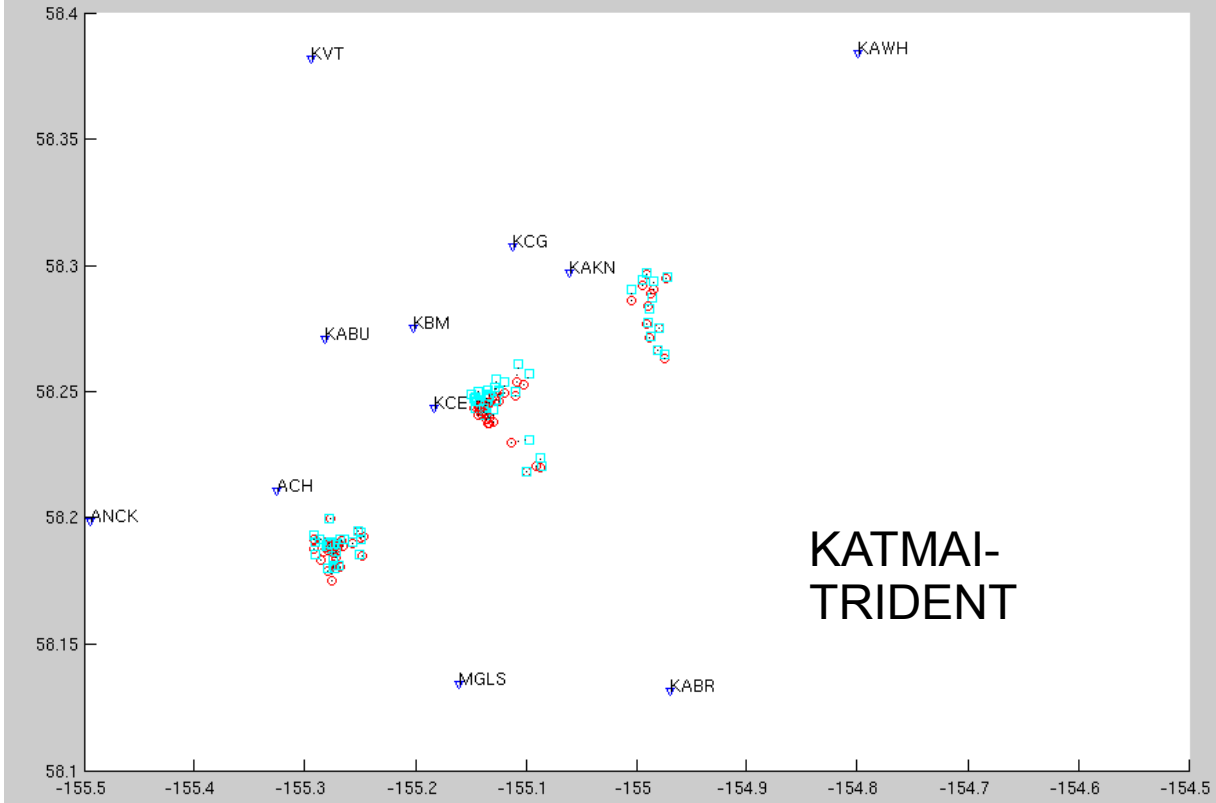
Local magnitudes were estimated with:

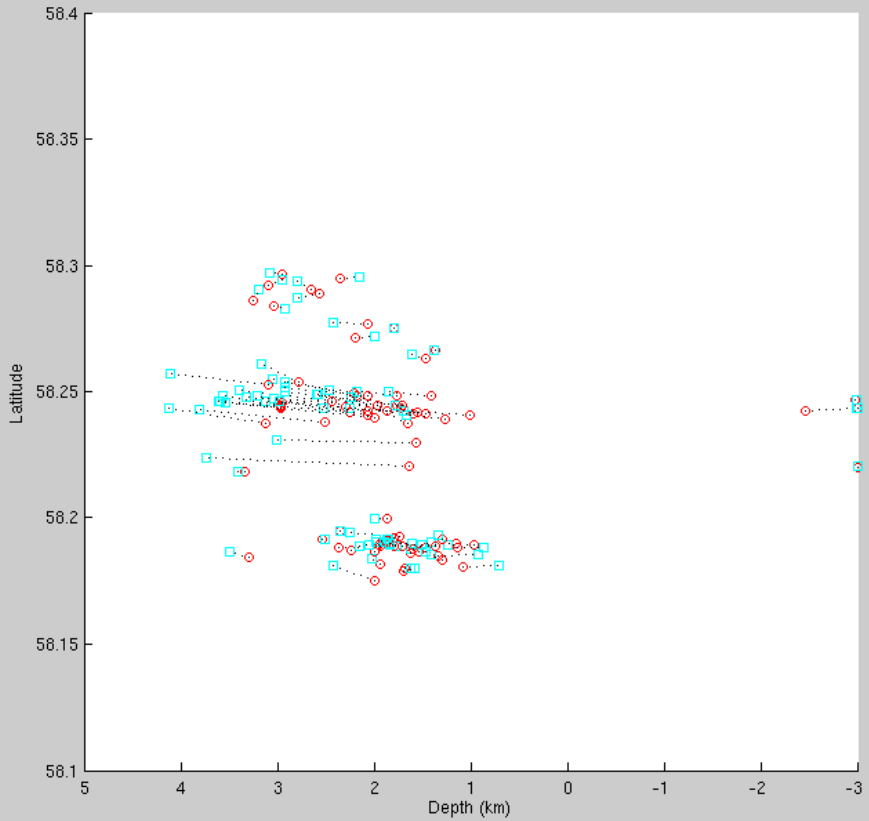
dbevproc -p dbevproc_avo dbin dbout

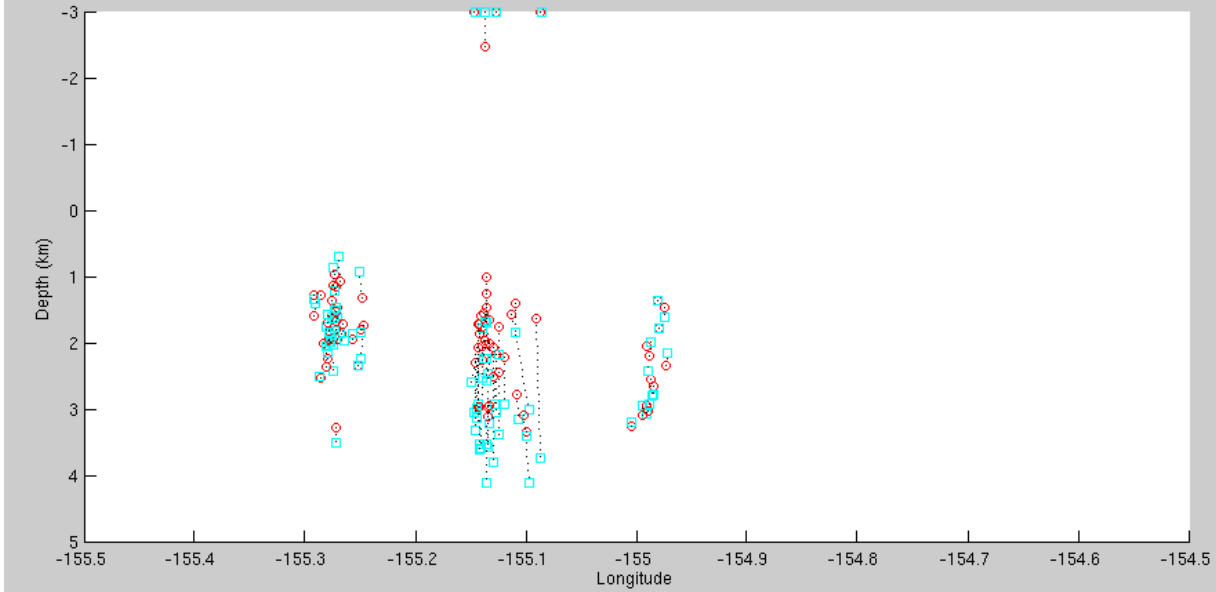
Unfortunately, magnitudes could only be batch computed for Katmai-Trident and Martin-Mageik (see posted error message to Antelope Users Group today to see why others did not work).

All work files are in /scratch/demo on coho.

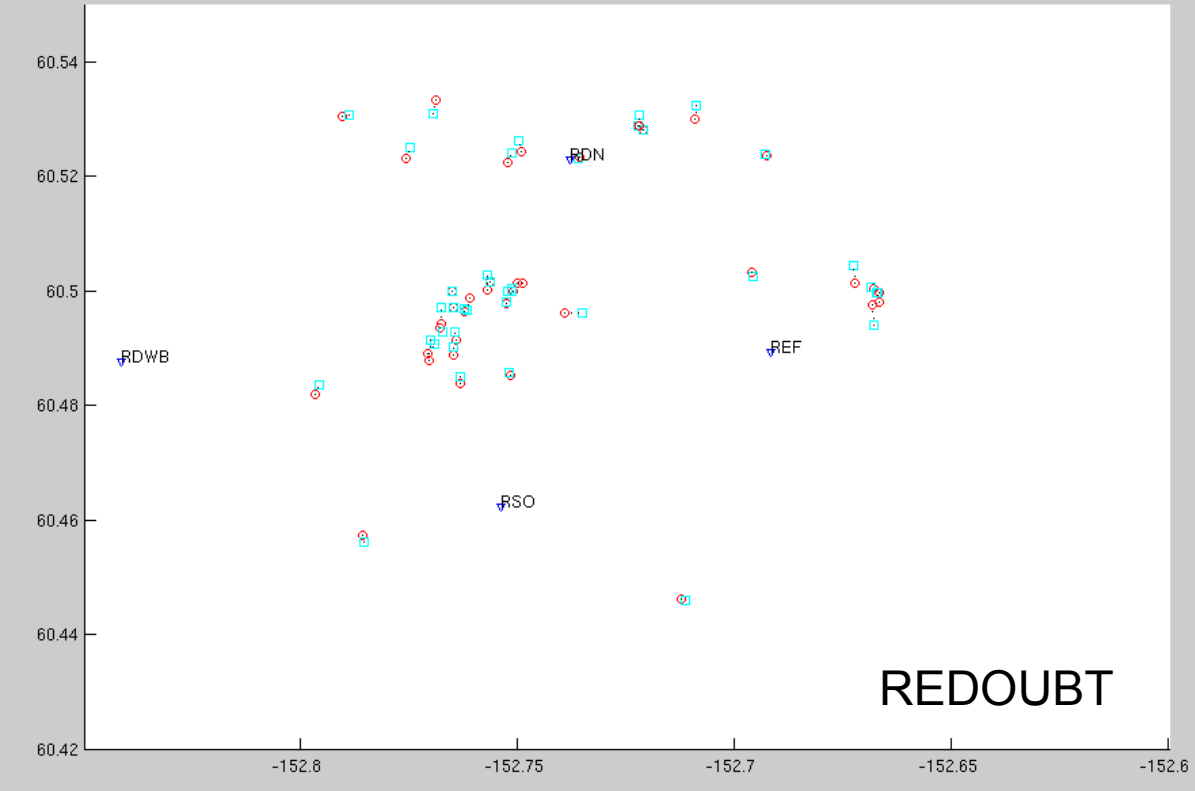
Changes in Hypocenters

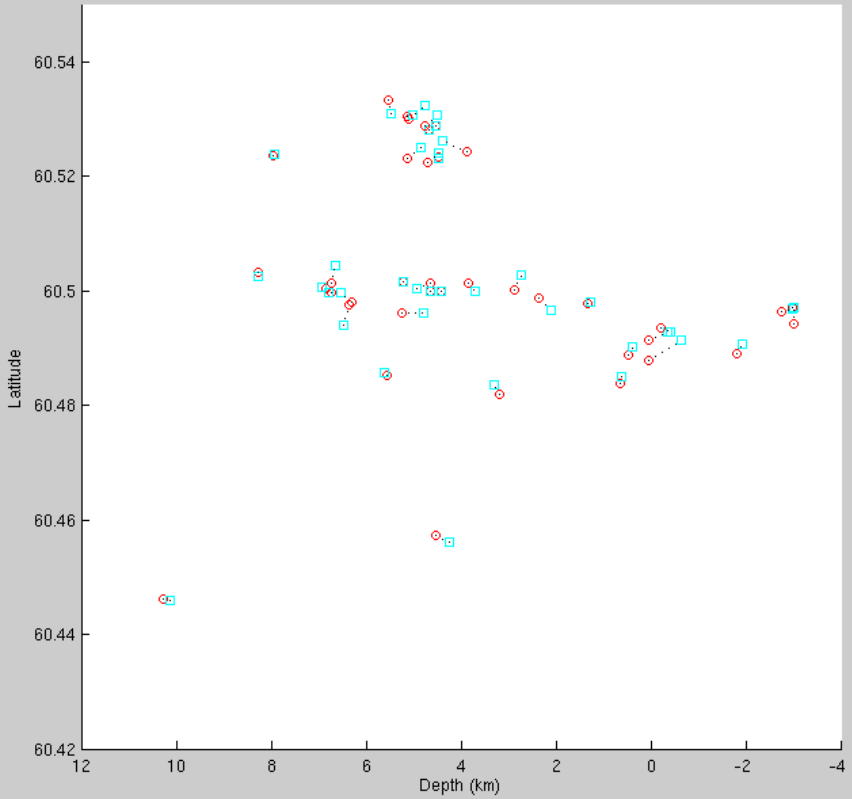


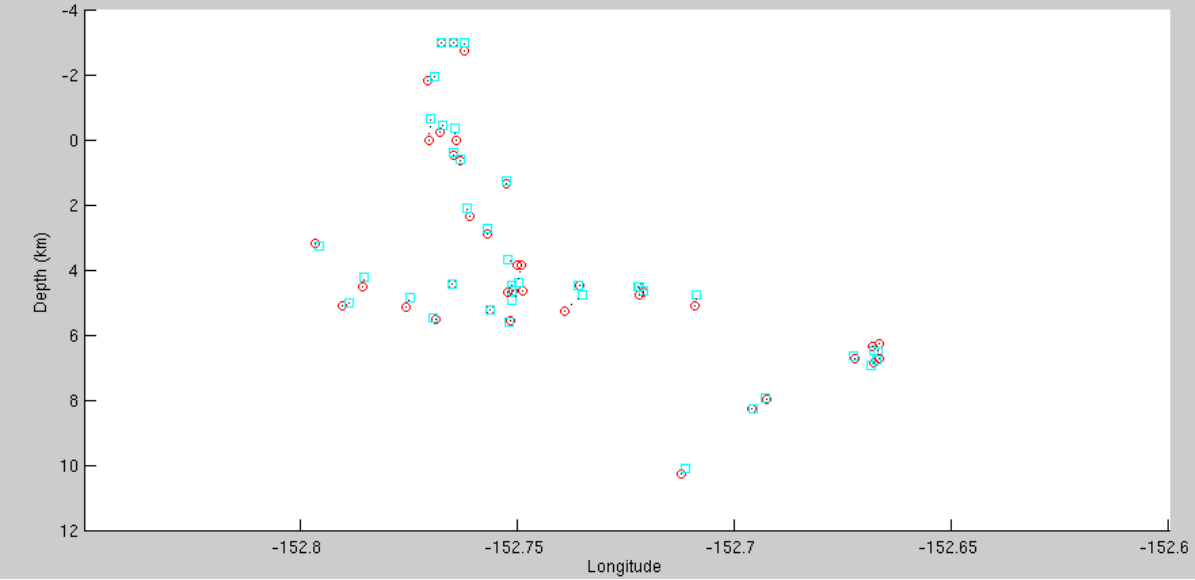




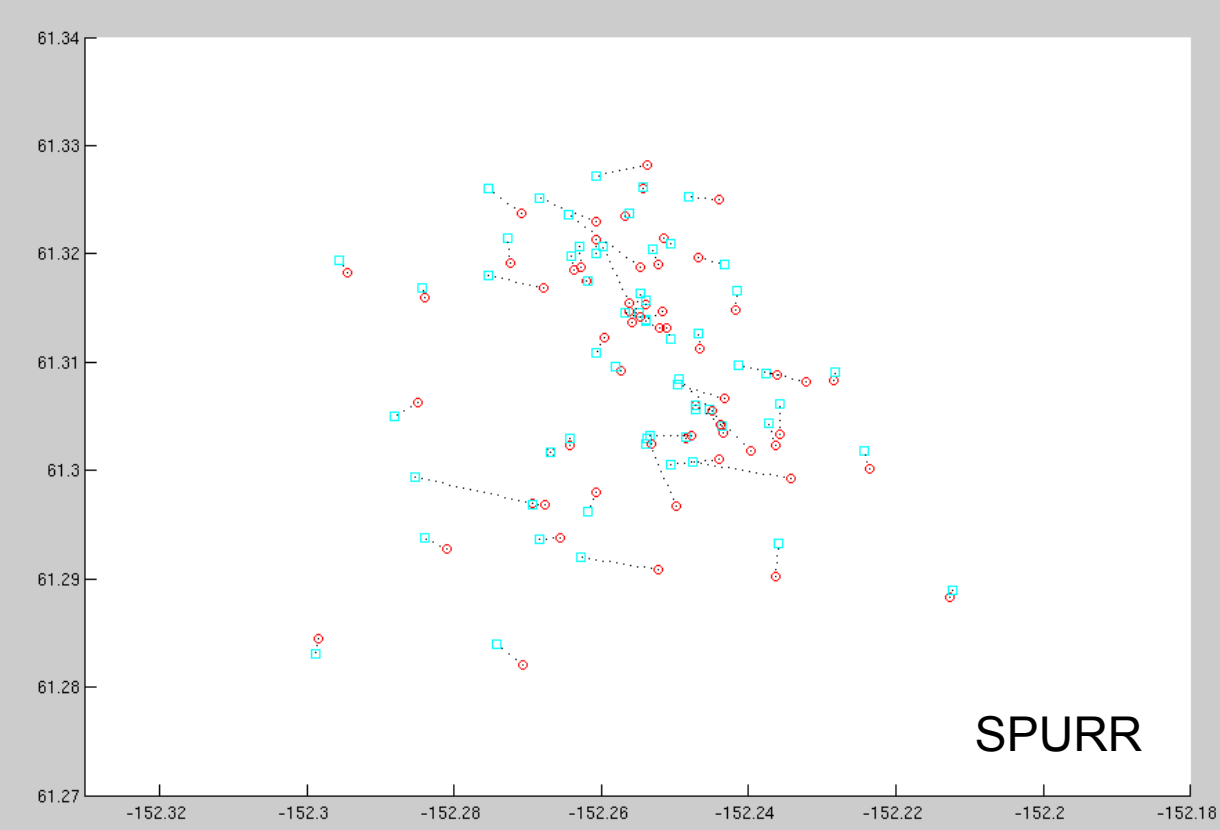
Average change in longitude was -0.00 km (std: 0.15 km)
Average change in latitude was 0.24 km (std: 0.26 km)
Average change in depth was 0.35 km (std: 0.53 km)
Average event moved from -155.1645, 58.2263, 1.78 km to -155.1646 58.2284 2.12 km
std in longitude changed from 5.89 km to 5.92 km
std in latitude changed from 3.89 km to 3.95 km
std in depth changed from 1.22 km to 1.42 km
source volume corresponding to 3d-std changed from 27.864 km^3 to 33.171 km^3

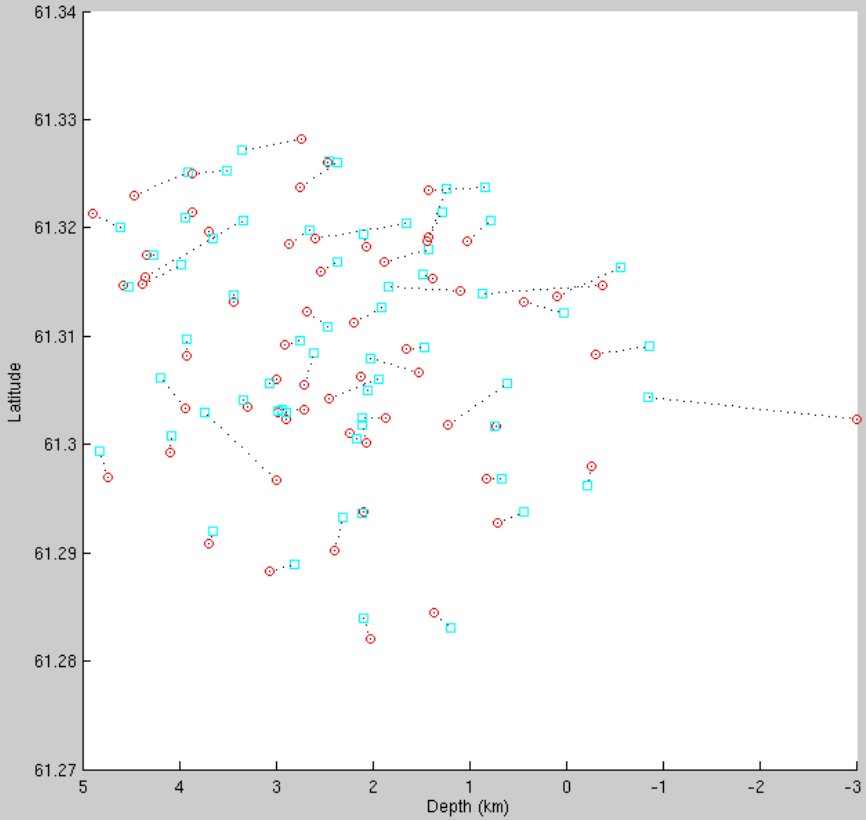


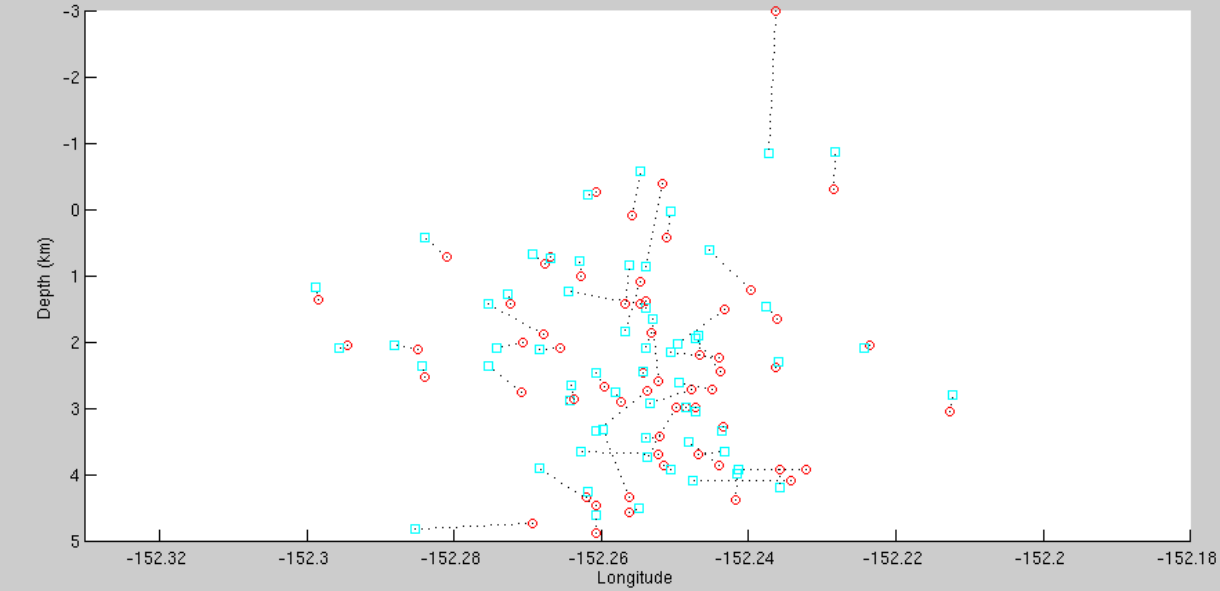




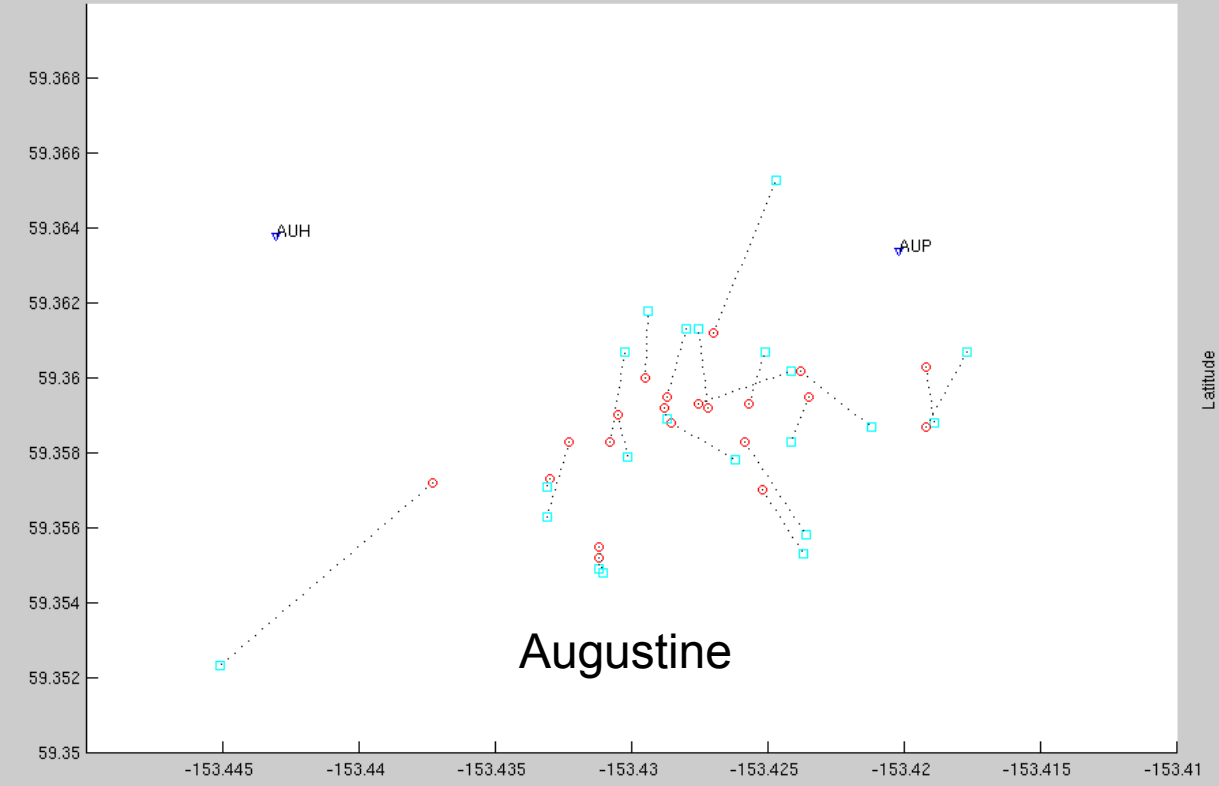
Average change in longitude was 0.00 km (std: 0.05 km)
Average change in latitude was 0.06 km (std: 0.17 km)
Average change in depth was -0.08 km (std: 0.21 km)
Average event moved from -152.7411, 60.5022, 3.73 km to -152.7410 60.5027 3.65 km
std in longitude changed from 2.01 km to 2.00 km
std in latitude changed from 2.14 km to 2.15 km
std in depth changed from 3.17 km to 3.22 km
source volume corresponding to 3d-std changed from 13.577 km^3 to 13.829 km^3

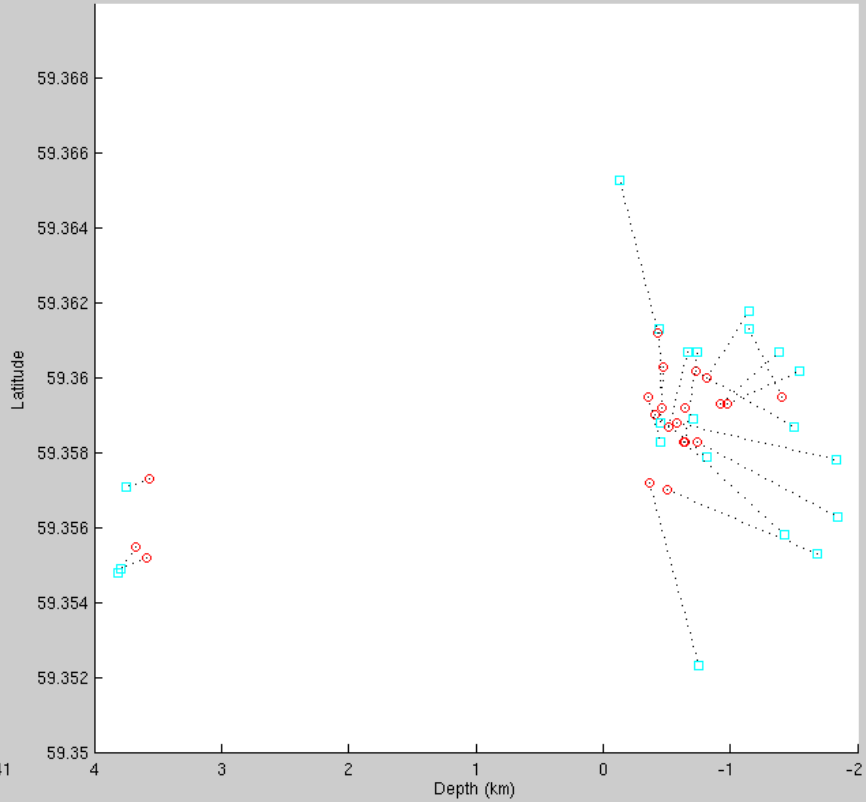


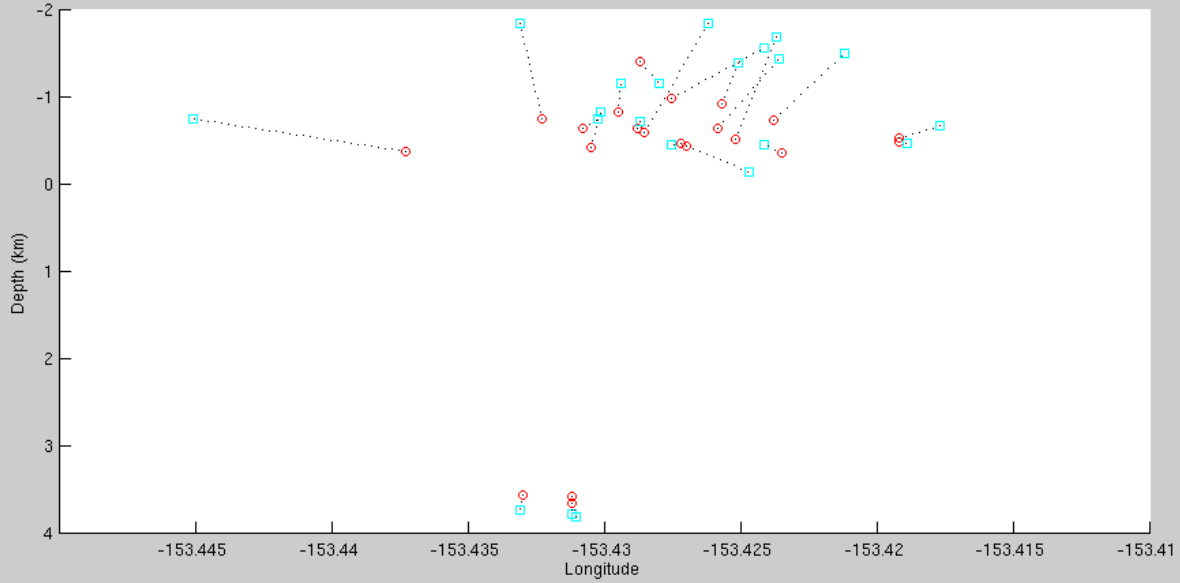




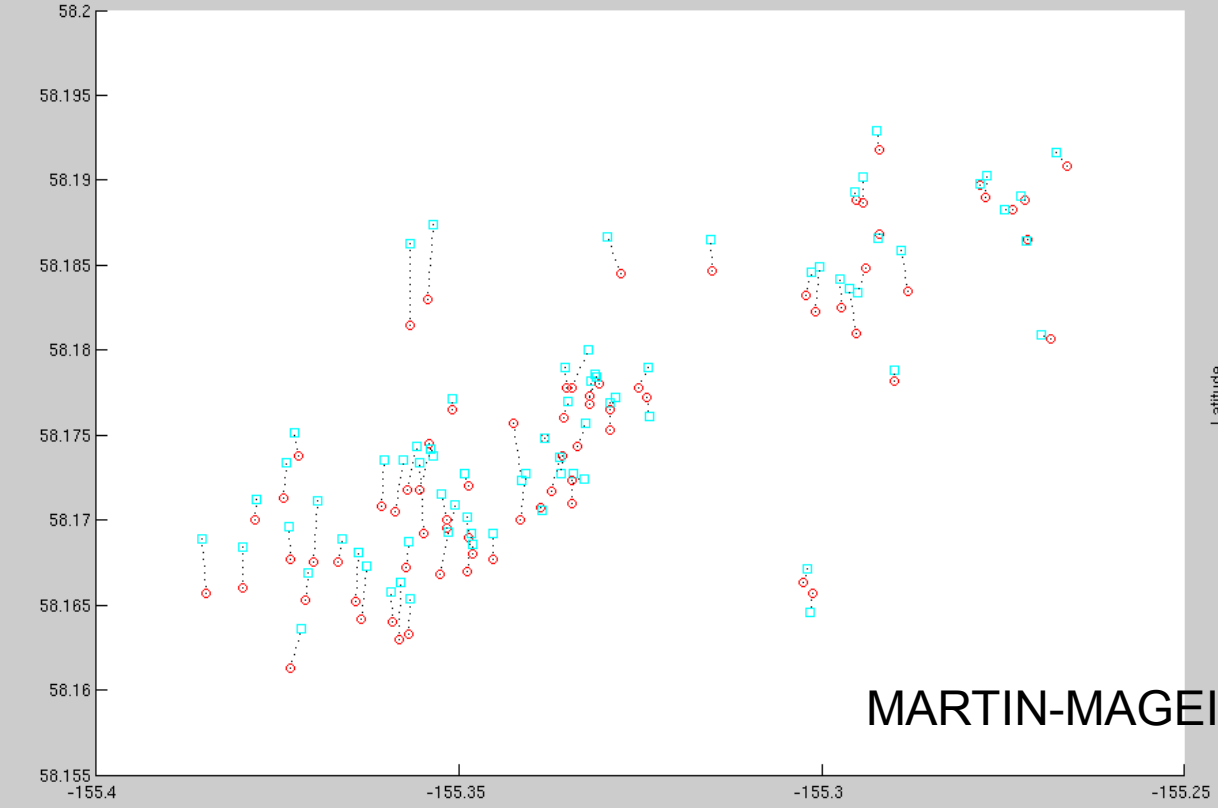
Average change in longitude was -0.13 km (std: 0.20 km)
Average change in latitude was 0.11 km (std: 0.18 km)
Average change in depth was -0.06 km (std: 0.47 km)
Average event moved from -152.2543, 61.3086, 2.35 km to -152.2568 61.3096 2.29 km
std in longitude changed from 0.85 km to 0.87 km
std in latitude changed from 1.21 km to 1.21 km
std in depth changed from 1.49 km to 1.39 km
source volume corresponding to 3d-std changed from 1.530 km^3 to 1.465 km^3

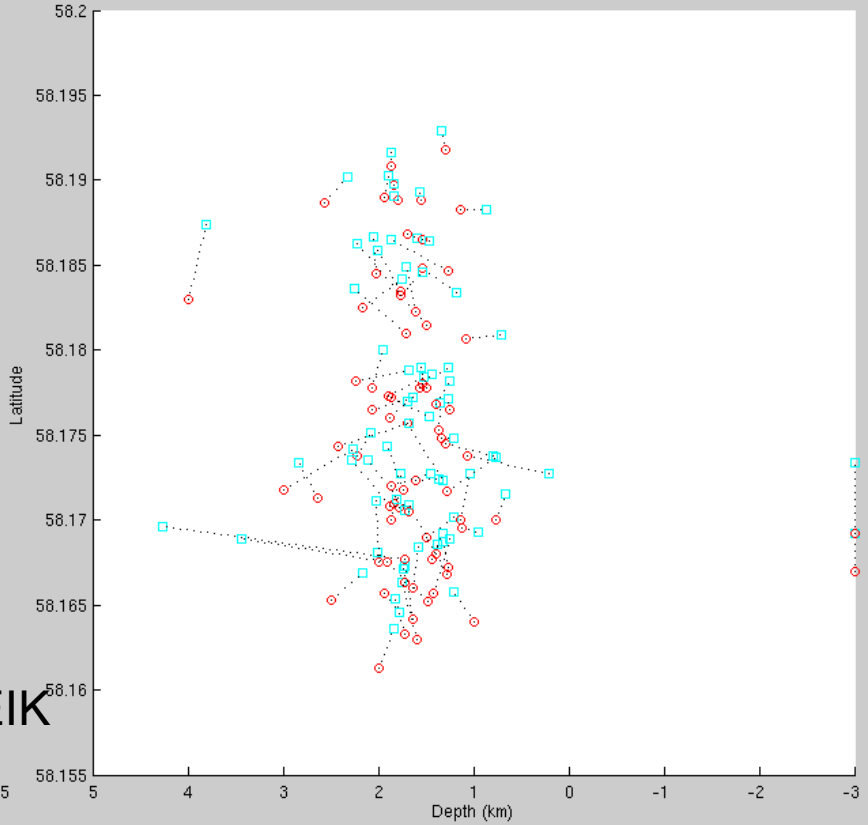




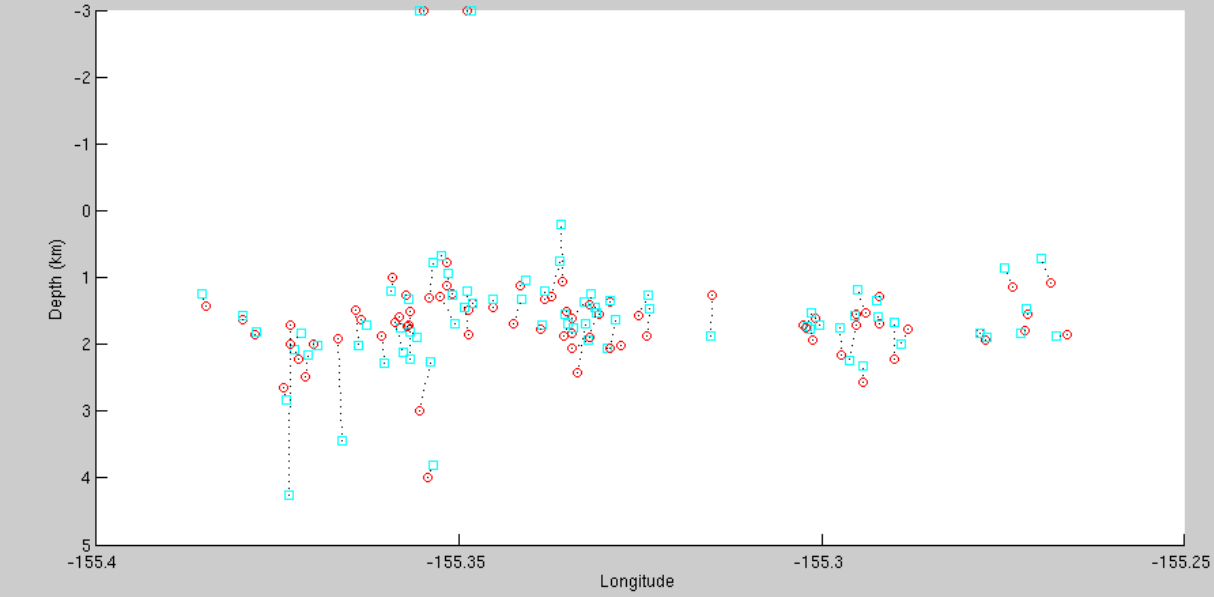


Average change in longitude was 0.02 km (std: 0.13 km)
Average change in latitude was -0.01 km (std: 0.23 km)
Average change in depth was -0.31 km (std: 0.48 km)
Average event moved from -153.4279, 59.3586, -0.04 km to -153.4275 59.3585 -0.35 km
std in longitude changed from 0.25 km to 0.33 km
std in latitude changed from 0.17 km to 0.33 km
std in depth changed from 1.54 km to 1.80 km
source volume corresponding to 3d-std changed from 0.064 km^3 to 0.200 km^3

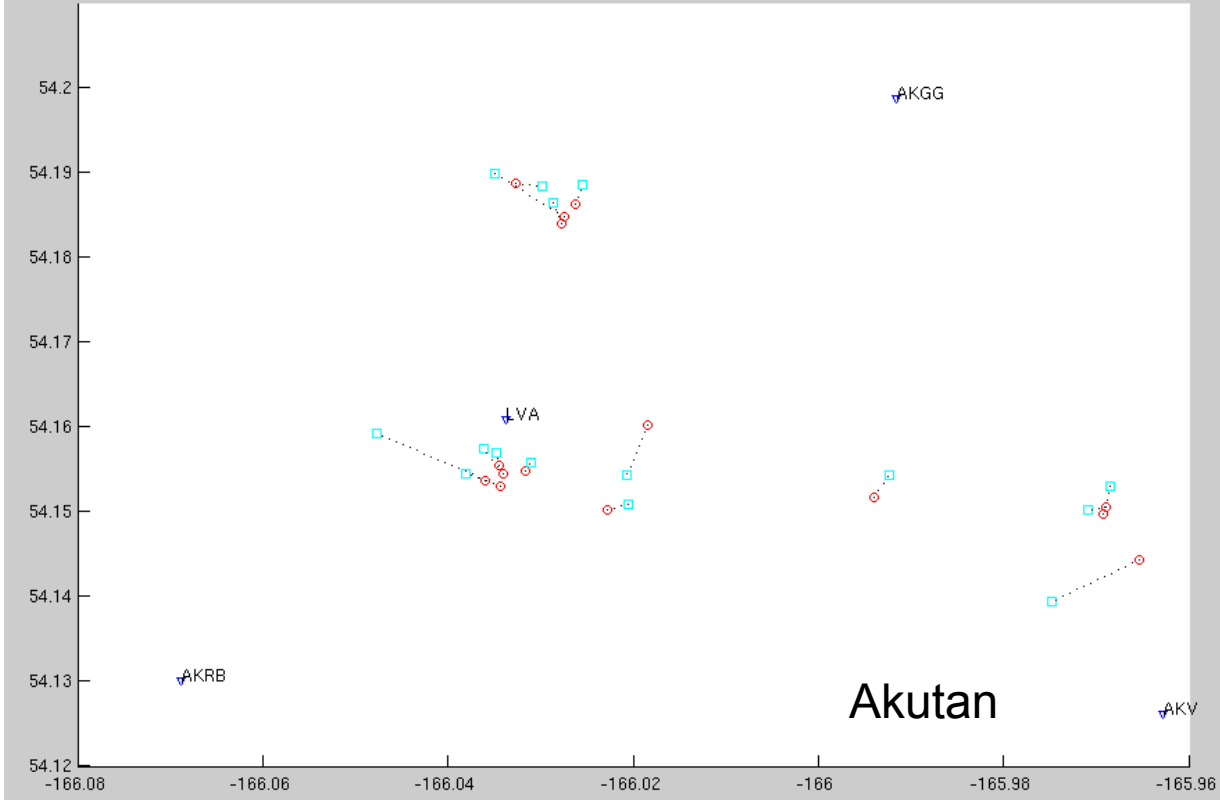


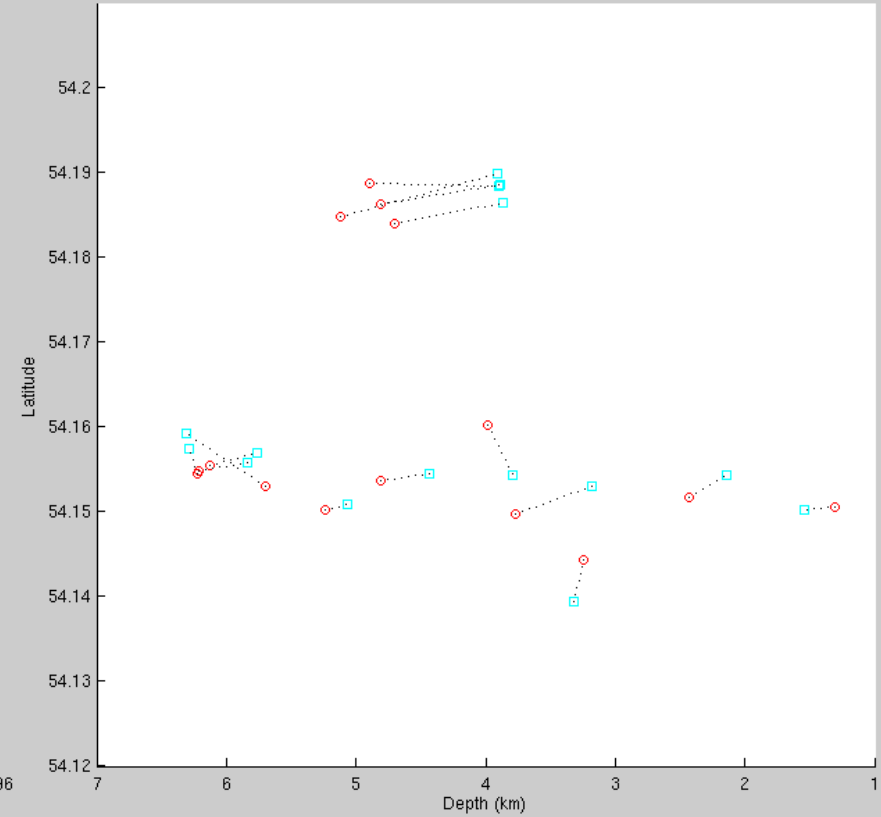


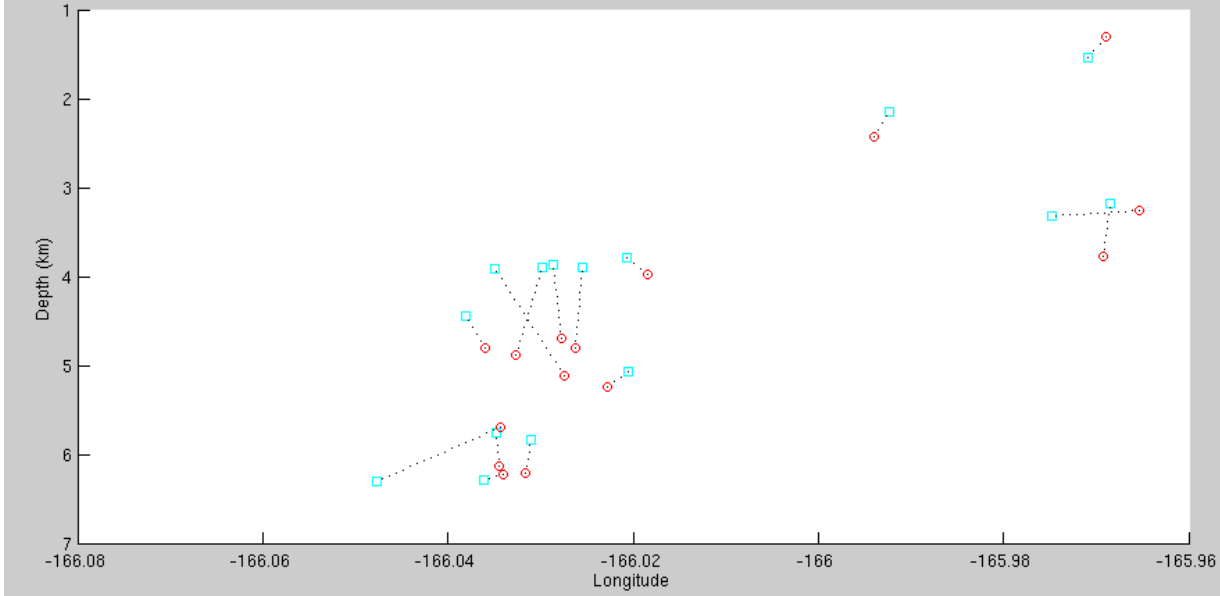
MARTIN-MAGEIK



Average change in longitude was 0.01 km (std: 0.05 km)
Average change in latitude was 0.16 km (std: 0.16 km)
Average change in depth was -0.03 km (std: 0.46 km)
Average event moved from -155.3330, 58.1751, 1.59 km to -155.3328 58.1765 1.56 km
std in longitude changed from 1.86 km to 1.84 km
std in latitude changed from 0.89 km to 0.86 km
std in depth changed from 0.91 km to 0.99 km
source volume corresponding to 3d-std changed from 1.504 km^3 to 1.575 km^3







Average change in longitude was -0.13 km (std: 0.30 km)
Average change in latitude was 0.13 km (std: 0.36 km)
Average change in depth was -0.36 km (std: 0.49 km)
Average event moved from -166.0149, 54.1615, 4.57 km to -166.0170 54.1626 4.22 km
std in longitude changed from 1.72 km to 1.73 km
std in latitude changed from 1.74 km to 1.85 km
std in depth changed from 1.42 km to 1.42 km
source volume corresponding to 3d-std changed from 4.234 km^3 to 4.550 km^3

Plots made using the “catalog” class (part of the volcseis_matlab repository)

```
if 0

%region = 'katmai';
region = [-155.5 -154.5 58.1 58.4 ];
cat1 = catalog(0, now, 0.0, region, 'KatmaiTrident', '');
cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'KatmaiTrident_relocate', '');
cat2.plotmap();
plotmapdiff(cat1, cat2);
clear

%region = 'redoubt';
region = [-152.85 -152.6 60.42 60.55 ];
cat1 = catalog(0, now, 0.0, region, 'Redoubt', '');
cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'Redoubt_relocate', '');
cat2.plotmap();
plotmapdiff(cat1, cat2);


%region = 'spurr';
region = [-152.33 -152.18 61.27 61.34 ];
cat1 = catalog(0, now, 0.0, region, 'Spurr', '');
%cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'Spurr_relocate', '');
%cat2.plotmap();
plotmapdiff(cat1, cat2);


%region = 'augustine';
region = [-153.45 -153.41 59.35 59.37 ];
cat1 = catalog(0, now, 0.0, region, 'Augustine', '');
%cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'Augustine_relocate', '');
%cat2.plotmap();
plotmapdiff(cat1, cat2);


%region = 'martin';
region = [-155.4 -155.25 58.155 58.2 ];
cat1 = catalog(0, now, 0.0, region, 'MartinMageik', '');
%cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'MartinMageik_relocate', '');
%cat2.plotmap();
plotmapdiff(cat1, cat2);

end

%region = 'akutan';
region = [-166.08 -165.96 54.12 54.21 ];
cat1 = catalog(0, now, 0.0, region, 'Akutan', '');
%cat1.plotmap();
cat2 = catalog(0, now, 0.0, region, 'Akutan_relocate', '');
%cat2.plotmap();
plotmapdiff(cat1, cat2);
```

Changes in Hypocenters: Summary

Region	Change east (km)	Change north (km)	Change depth (km)
Spurr	-0.1	0.1	-0.1
Redoubt	0.0	0.1	-0.1
Augustine	0.0	0.0	-0.3
Katmai-Trident	0.0	0.2	0.4
Martin-Mageik	0.0	0.2	0.0
Akutan	0.1	0.1	-0.4

Mean changes in location were < 0.5 km for all regions, and < 0.2 km for Spurr, Redoubt and Martin-Mageik

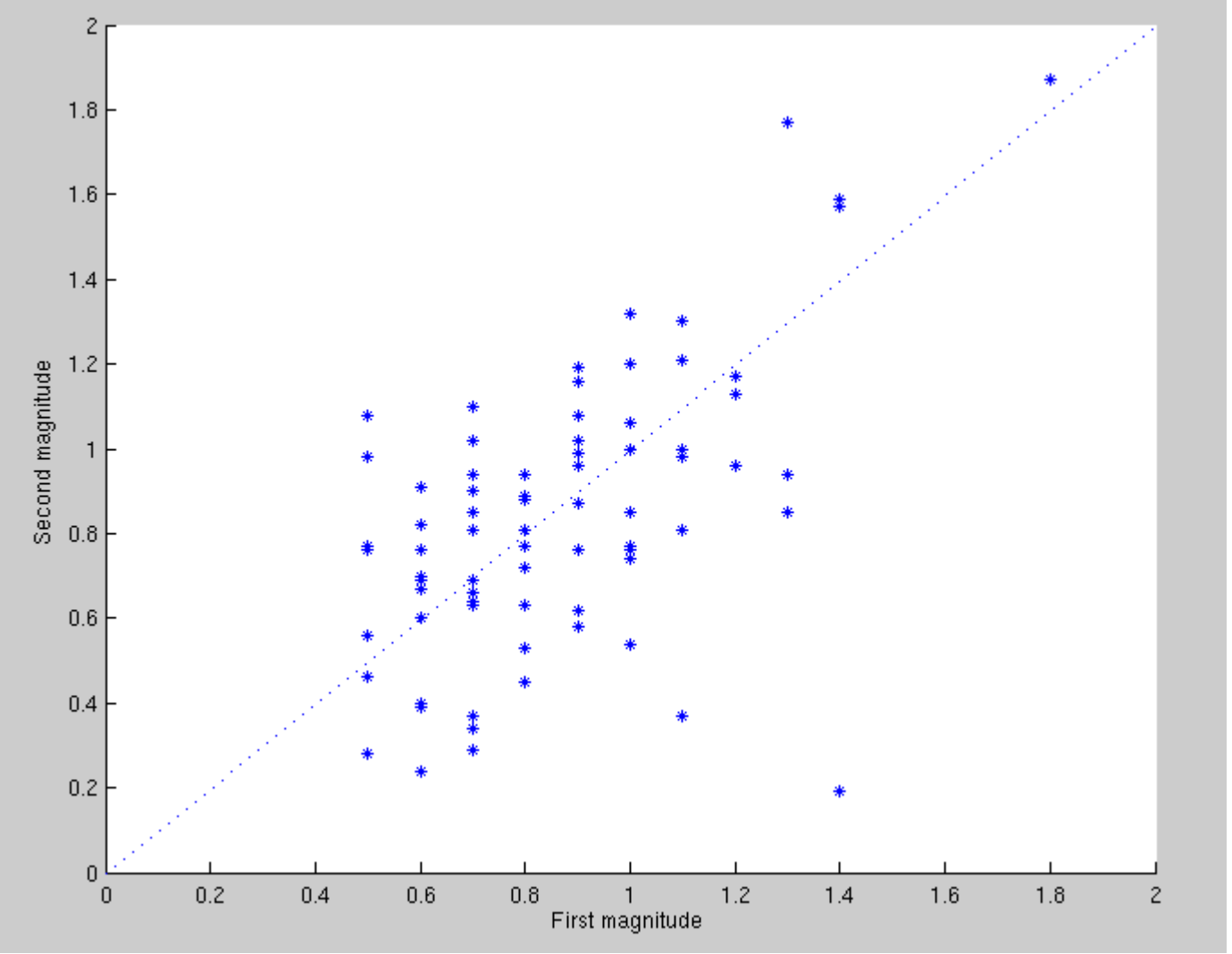
Code: (see cwake_comparison.m)

```
region = [-155.5 -154.5 58.1 58.4 ];
cat1 = catalog(0, now, 0.0, region, 'KatmaiTrident', '');
cat3 = catalog(0, now, 0.0, region, 'KatmaiTrident_dbevproc', '');
plotmagdiff(cat1, cat3);

region = [-155.4 -155.25 58.155 58.2 ];
cat1 = catalog(0, now, 0.0, region, 'MartinMageik', '');
cat3 = catalog(0, now, 0.0, region, 'MartinMageik_dbevproc', '');
plotmagdiff(cat1, cat3);
```

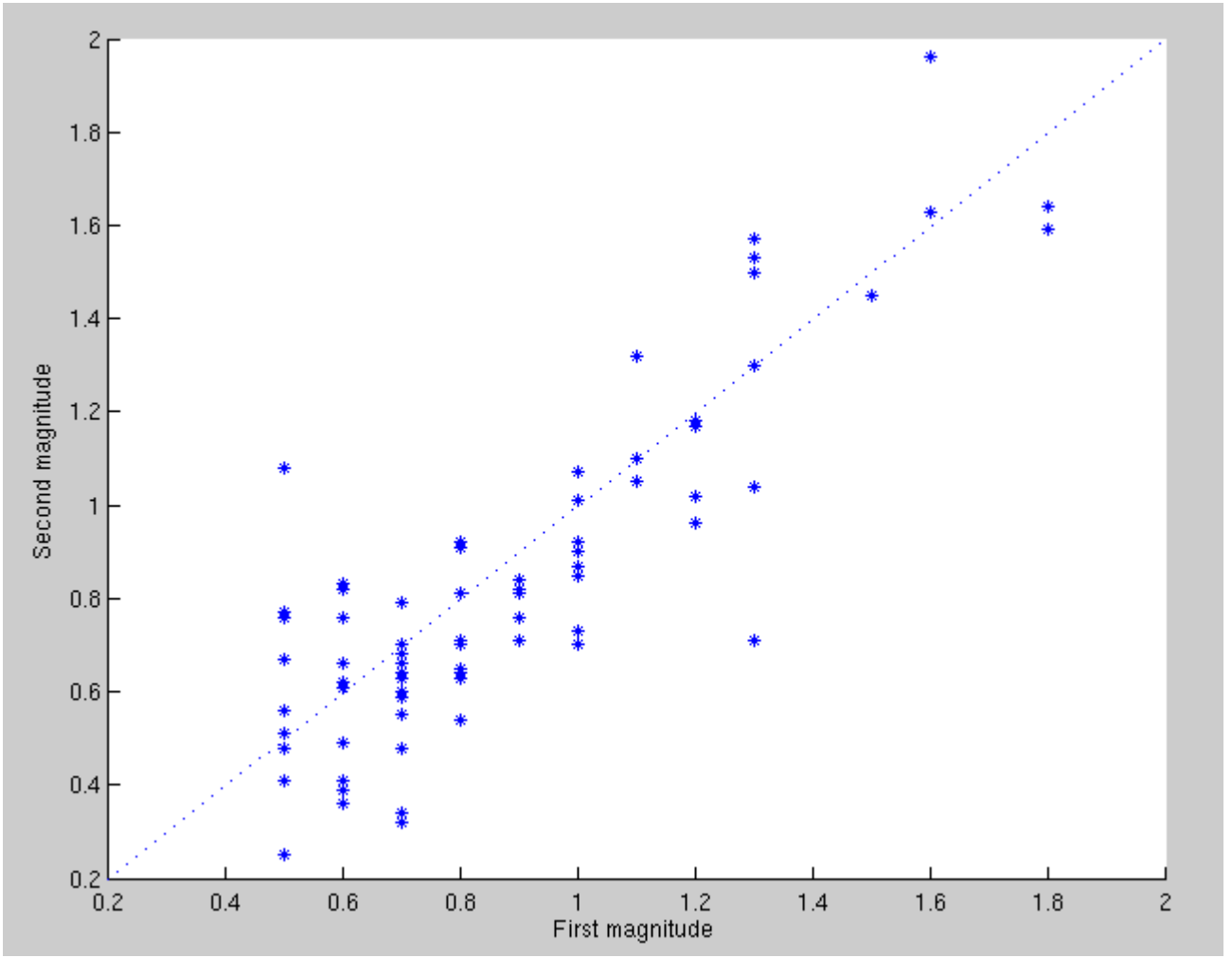
Changes in local magnitude

Katmai-Trident



Change: mean=-0.0, median=-0.0, std=0.3, max=0.6

Martin-Mageik



Change: mean=-0.0, median=-0.1, std=0.2, max=0.6

Local magnitude: Summary

- No change in mean magnitude in the two regions studied (Katmai-Trident and Martin-Mageik)
- About 68% of events showed a magnitude change of less than 0.25
- Biggest changes seen were 0.6: these events deserve further analysis. It is possible some of the waveforms used were noisy, or the calibration information is incorrect.