

Figure 3a: Locatable Akutan seismic events in space and time for September and October.

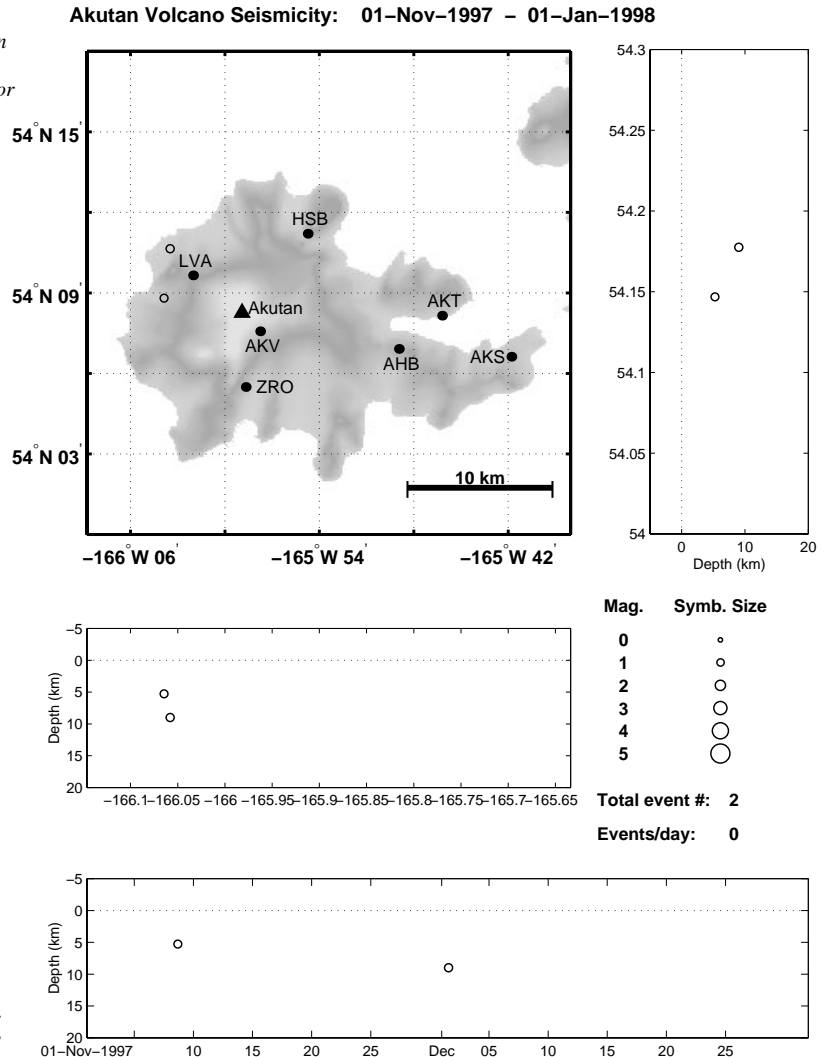


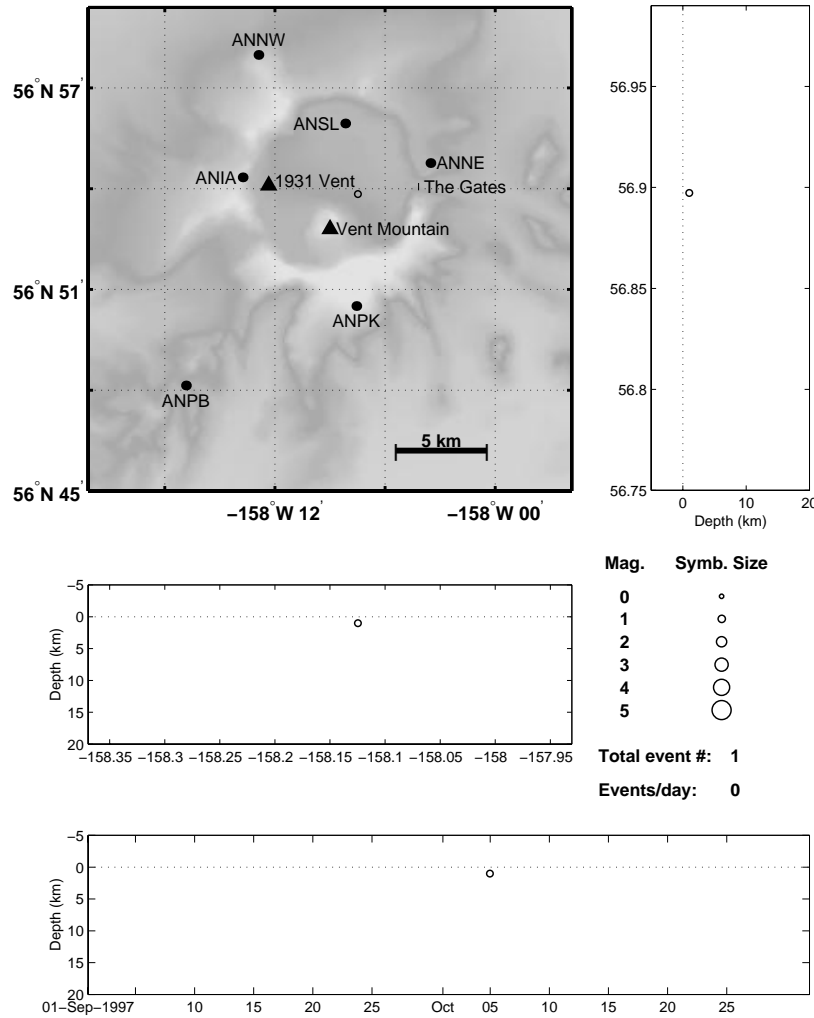
Figure 3b: Locatable Akutan seismic events in space and time for November and December.

Akutan:

During September and October, only two earthquakes were located in the vicinity of Akutan (figs. 3A, 14A and 15A). The larger of the two events had a magnitude of 1.0. Both of these events were located just east of the summit at a depth of about 4 km. The number of events located in the vicinity of Akutan during this two-month interval is a third that of the July and August time period.

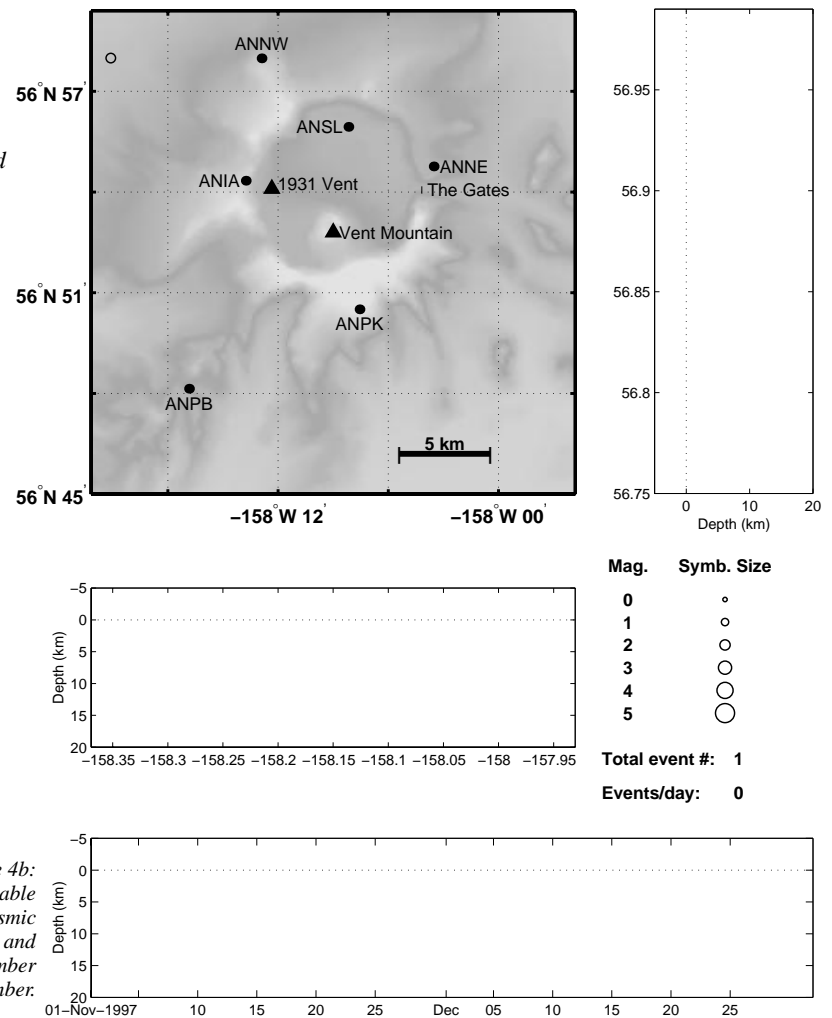
As was the case during September and October, only two earthquakes were located in the Akutan region during November and December (figs. 3B, 16B and 17B). These two events, the largest of which had a magnitude of 1.3, were located near the western coast of Akutan Island about 5 - 7 km northwest of the summit. Seismicity in this region has been a fairly persistent feature since the deployment of the seismic stations into their current configuration during the summer of 1996.

Aniakchak Volcano Seismicity: 01-Sep-1997 – 01-Nov-1997



*Figure 4a:
Locatable
Aniakchak
seismic events
in space and
time for
September and
October.*

Aniakchak Volcano Seismicity: 01-Nov-1997 – 01-Jan-1998



*Figure 4b:
Locatable
Aniakchak seismic
events in space and
time for November
and December.*

Aniakchak: One event was located in the Aniakchak region during September and October (figs. 4A, 14A and 15A). This event had a magnitude of 0.8 and was located beneath the caldera at a distance of 2.5 km northwest of Vent Mountain and a depth of 1 km. Note that this is the first Aniakchak event to locate within the map area shown in Figure 2. A second earthquake was located within the map area during November and December (figs. 4B, 16B and 17B). This event was located about 12 km northwest of the 1931 vent and had a magnitude of 1.8. Note that this event does not appear on the two cross-sections or the time-depth plot because its hypocentral depth (28 km) exceeds the maximum plotted depth of 20 km.

Augustine Volcano Seismicity: 01-Sep-1997 - 01-Nov-1997

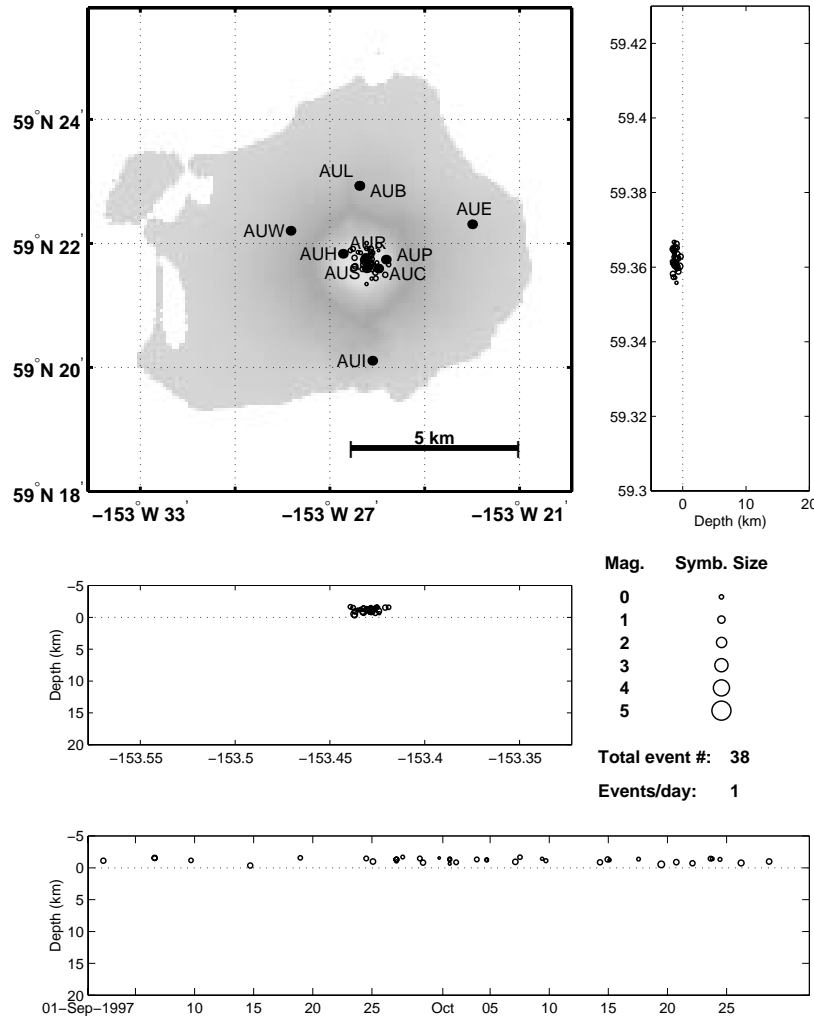


Figure 5a: Locatable Augustine seismic events in space and time for September and October.

Augustine Volcano Seismicity: 01-Nov-1997 - 01-Jan-1998

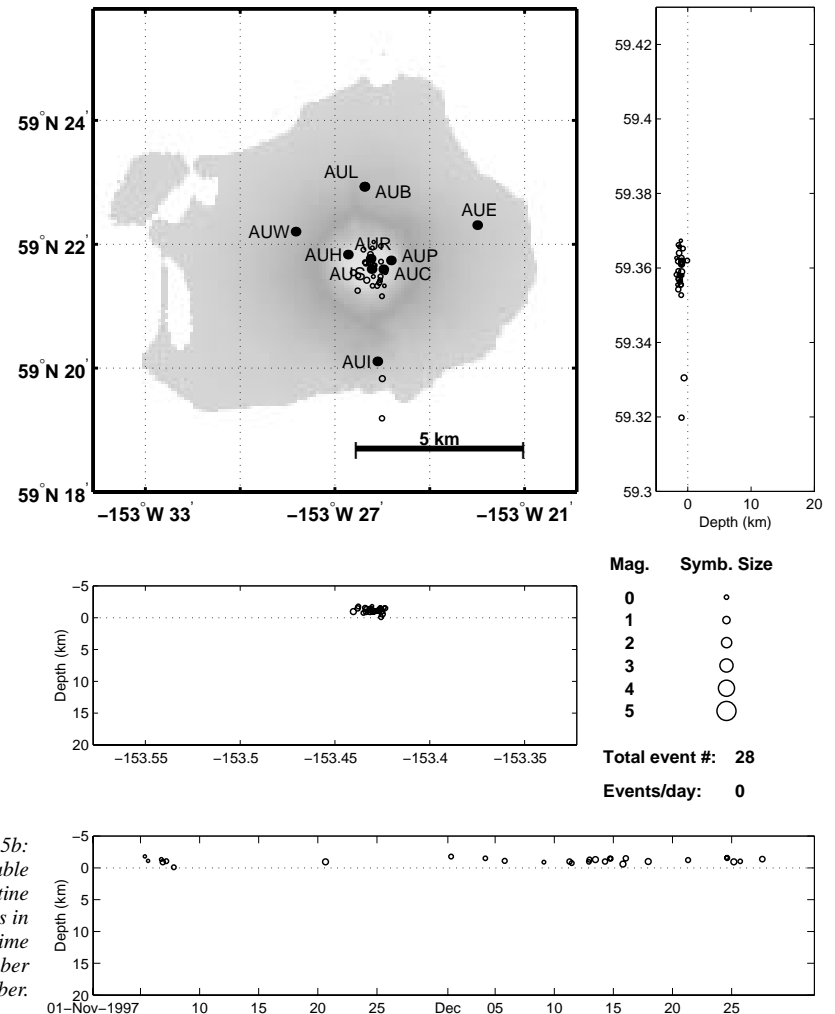


Figure 5b: Locatable Augustine seismic events in space and time for November and December.

Augustine: A total of 38 earthquakes were located at Augustine during September and October (figs. 5A, 14A and 15A). The largest such event had a magnitude of 0.8. The epicenters are tightly clustered around the summit (see cross-sections in Figure 5A) with all the events occurring within about 1 km of it. All of these events had shallow hypocentral depths (i.e. hypocenters above sea-level) and thus were located within the volcanic pile. The number of events located during this two-month interval is greater than that of the previous two-month interval (38 vs. 25) as well as the number predicted from the 3-year mean seismicity rate (~14 located events). To a large extent, this difference in the number of located events may be due to an increase in the number of near summit seismic stations available for routine earthquake location during this time period. Station AUR, which had been out for quite some time, was repaired on August 27, 1997 (Guy Tytgat personal comm.). Then on September 25, station AUC was finally wired into the data acquisition system, thus increasing the number of summit stations from three (prior to the repair of AUR) to a total of five. The apparent increase in seismicity on the time-depth plot in figure 5 corresponds quite well with the addition of AUC to the acquisition system. Also, there appears to be a somewhat tighter spatial clustering of epicenters than has generally been the case. This is probably also the result of having

more seismic stations near the summit available for routine data processing. Since the 3-year mean seismicity rate was based upon only three summit stations, it may no longer be valid for the current station configuration at Augustine. Further monitoring will indicate if this is indeed the case.

A total of 28 earthquakes, the largest of which had a magnitude of 0.5, were located in the vicinity of Augustine during November and December (figs. 5B, 16B and 17B). Of the 28 located events, 26 events were located at shallow depth near the summit of Augustine (i.e. within the volcanic pile). The remaining two events appear to have been related to the formation and/or movement of shore-ice during a period of cold weather in December. These events were located near the southern shore of Augustine Island about 4-5 km south of the summit (fig. 5B). The number of located events in the Augustine region during this two-month interval is lower than that of September and October. This value is still, however, about twice the number predicted from the 3-year mean seismicity rate. As noted above this discrepancy is likely the result of the increased number of useable summit stations for routine earthquake location.

Dutton:
No earthquakes were located or, for that matter, detected in the vicinity of Dutton during September and October (fig. 15A). It was also very quiet with respect to the Helicorder earthquake counts during this time period (fig. 14A). The lack of seismicity at Dutton is not out of the ordinary. Very few events have been located in this region since AVO has had earthquake location capability (July 1996) at Dutton. The apparent low level of seismicity at Dutton is further borne out by the eight years of accumulated Helicorder event counts for Dutton.

One event was located in the Dutton region during November and December (figs. 6B, 16B and 17B). This earthquake had a magnitude of 1.6 and was located about 6 km southeast of the summit at a depth of 1.8 km. This is the first earthquake located in the vicinity of Dutton since July 1997, and only the third such event in 1997. The background level of seismicity is such that the presence of any located events during a two-month period is of significance.

Iliamna:
During September and October, a total of seven earthquakes, the largest of which had a magnitude of 1.7, were located in the Iliamna region (figs. 7A, 14A and 15A). Four of these events were located within about 1 km of the summit. Three of these events were located southeast of the summit while a fourth one was located east-northeast of the summit. The final three earthquakes were located 6-7 km south of the summit, which is a bit further southwest than has usually been the case. The number of events located at Iliamna during this two-month interval is considerably lower than the 29 events that were located there during the previous two-months. Since the stations of the Iliamna seismic subnet appear to have been functioning properly during this two-month period, this rather dramatic decrease in seismicity appears to be genuine. The seismicity rate for September and October is also less than third the value of the estimated 22-month mean seismicity rate.

The apparent lull in seismicity at Iliamna did not continue into November and December. During this two-month interval, a total of 22 earthquakes were located in the vicinity of Iliamna (figs. 7B, 16B and 17B). The largest such event had a magnitude of 1.6 and was located about 1 km east-northeast of the summit of Iliamna. This event and 19 others formed a rough northeast-southwest trending zone of seismicity

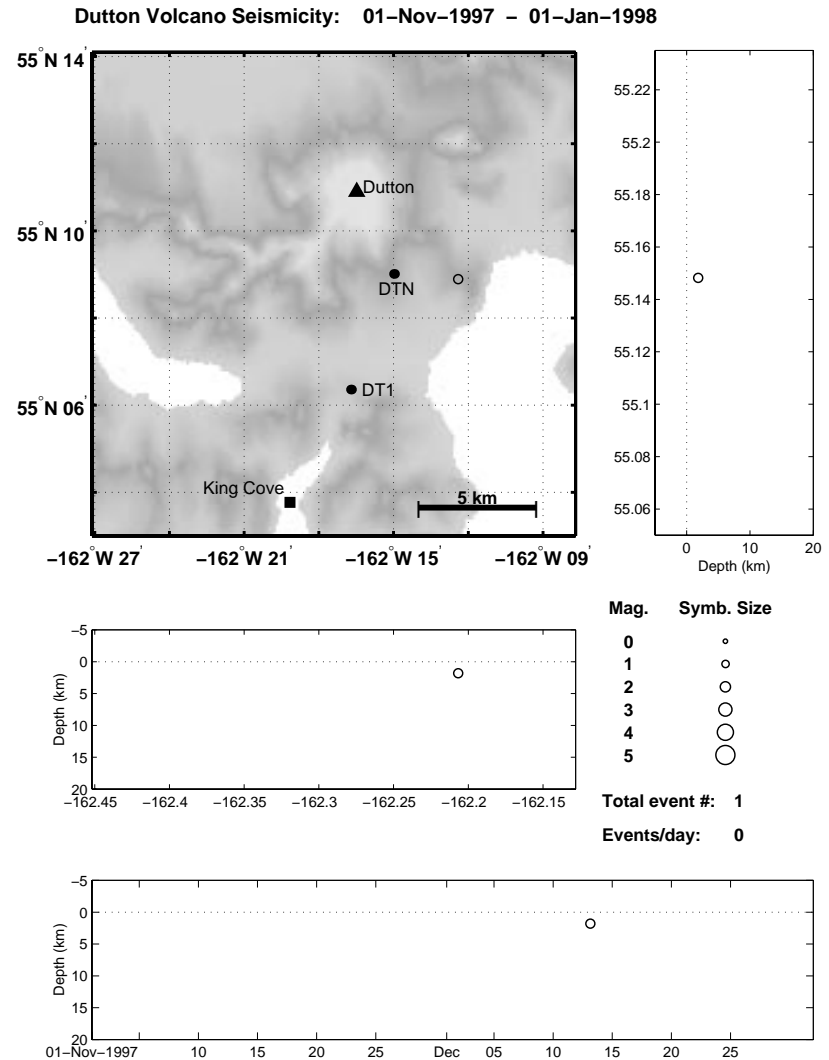


Figure 6b: Locatable Dutton seismic events in space and time for November and December.

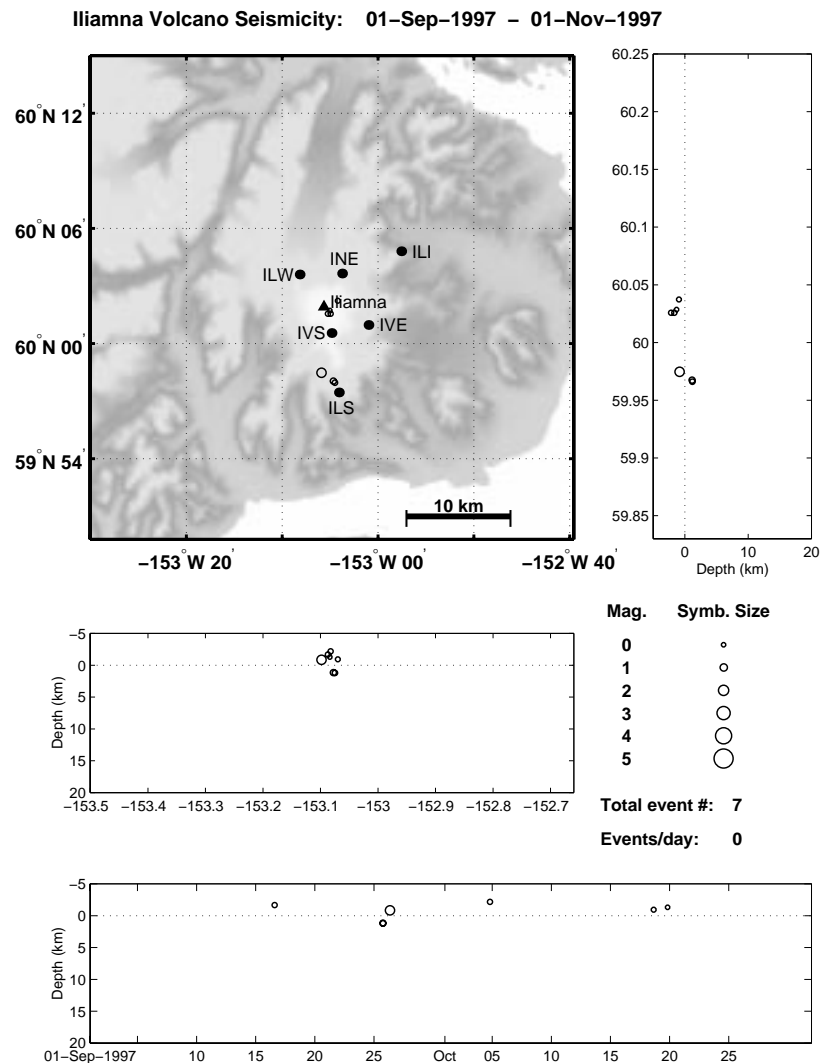


Figure 7a:
Locatable
Iliamna seismic
events in space
and time for
September and
October.

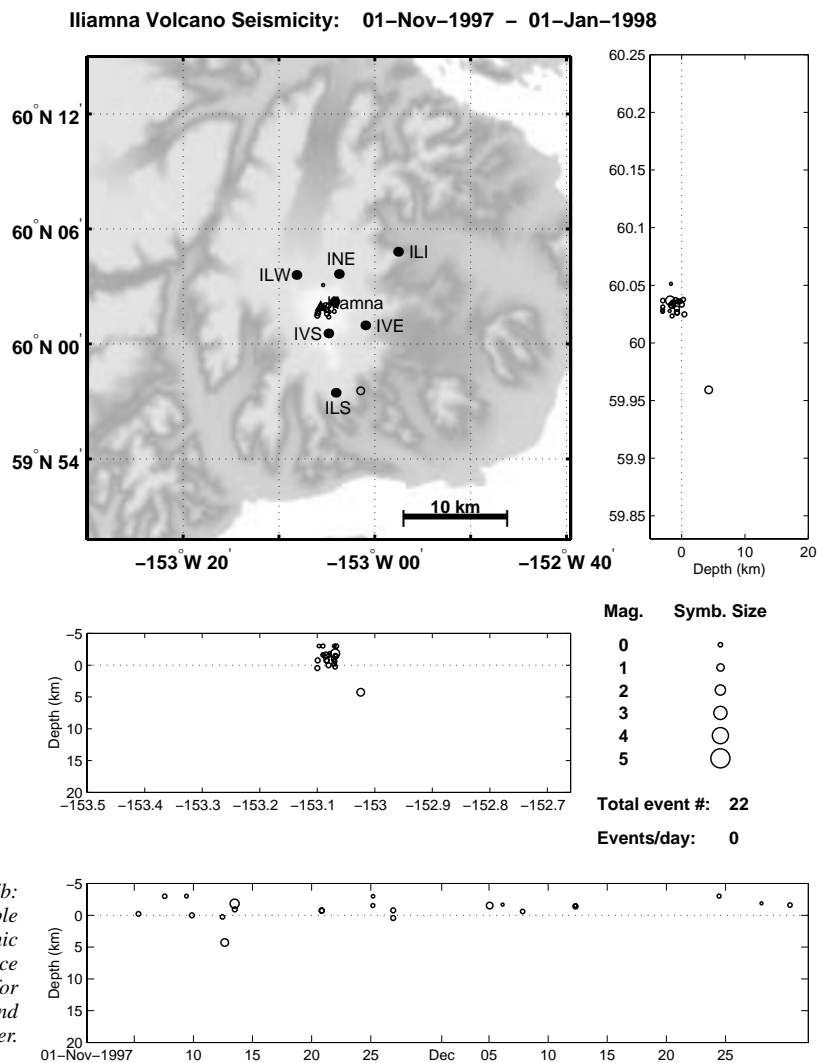
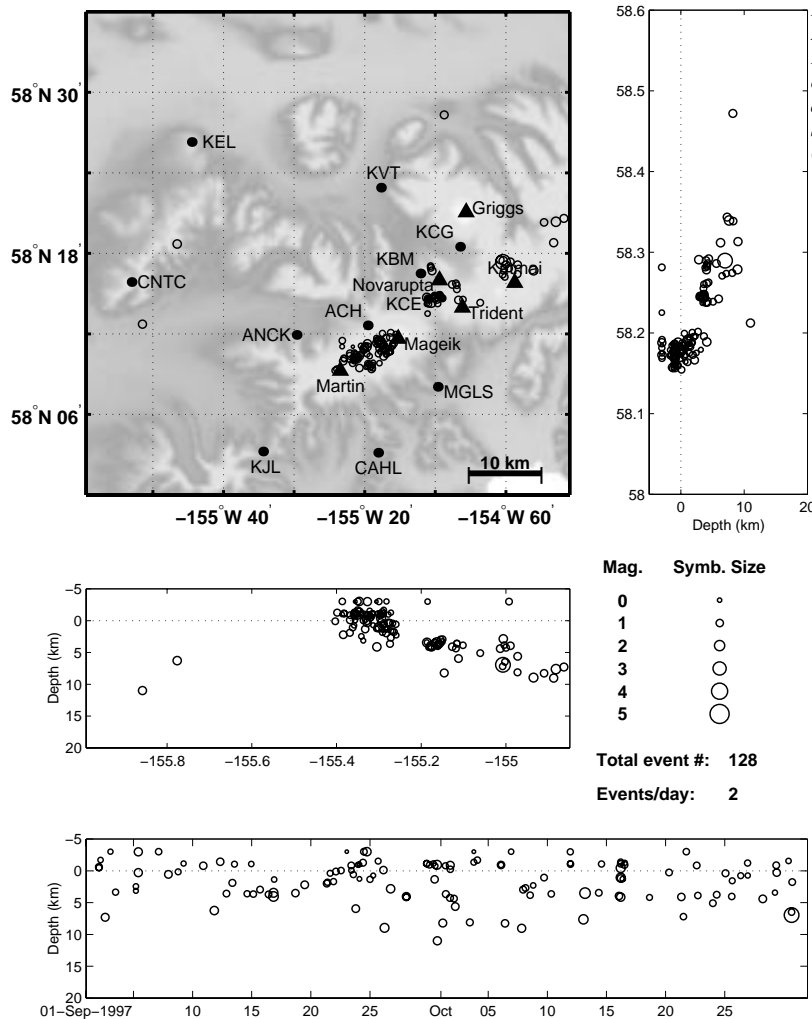


Figure 7b:
Locatable
Iliamna seismic
events in space
and time for
November and
December.

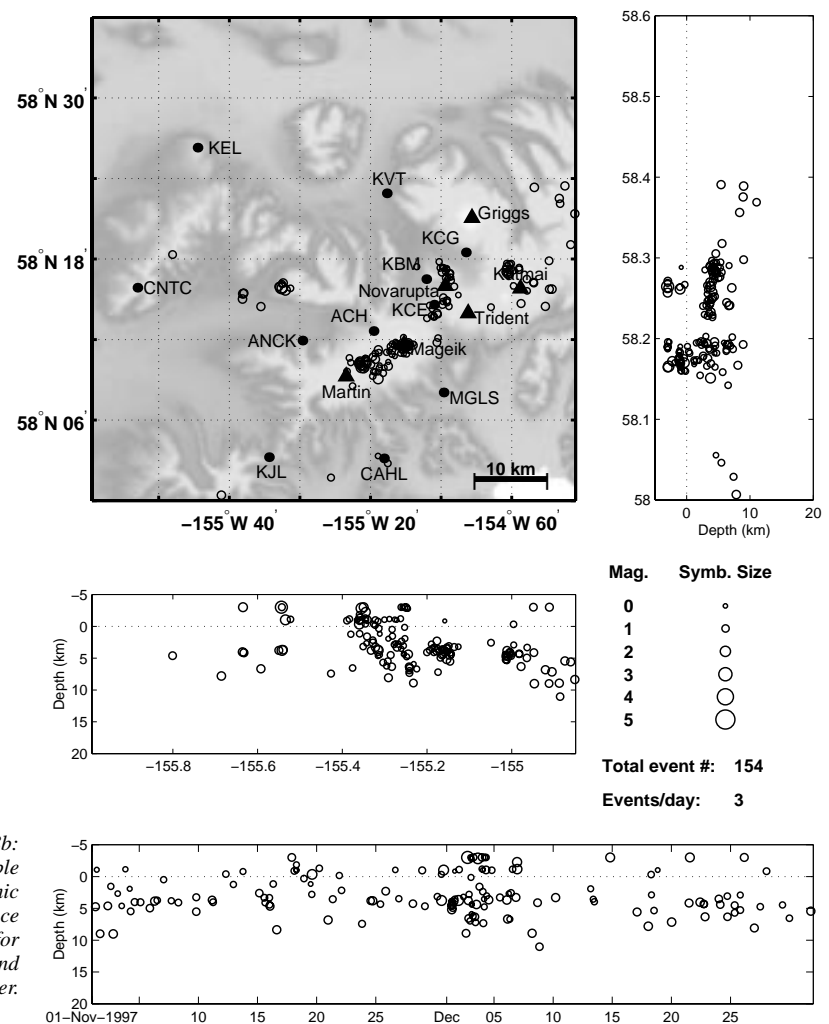
approximately 3 km in length and located slightly east of the summit. Two of the events located do not fall along this trend. One of these events was located about 9 km south-southeast of the summit. This earthquake was located a bit farther southeast than has generally been observed and as such may be part of the distinct southeastern cluster of events first observed in March and April. The other event was located about 2 km north of the summit. This event as well as 7 others, which were part of the linear zone of activity, were designated as being b-type events because of their relatively low frequency content. Because all of these b-type earthquakes were located at very shallow depths, they may be glacial events rather than representing actual seismic activity at Iliamna. The number of earthquakes located during this two-month period is much greater than that of the previous two-month interval (i.e. 22 vs. 7) but it is, however, in line with the number predicted based upon the estimated mean rate of seismicity at Iliamna.

Katmai Volcano Seismicity: 01-Sep-1997 - 01-Nov-1997



*Figure 8a:
Locatable
Katmai seismic
events in space
and time for
September and
October.*

Katmai Volcano Seismicity: 01-Nov-1997 - 01-Jan-1998



*Figure 8b:
Locatable
Katmai seismic
events in space
and time for
November and
December.*

Katmai: A total of 128 earthquakes were located in the Katmai/Valley of Ten Thousand Smokes region during September and October (figs. 8A, 14A and 15A). The largest earthquake located during this two-month interval had a magnitude of 3.5 and was located about 3 km northwest of Katmai Caldera at a depth of 7.0 km. As usual, most of the seismicity occurred under the Mounts Martin and Mageik region or clustered in the vicinity of Novarupta, Trident, Katmai Caldera and the area 10-15 km east of Griggs. Three earthquakes were located well off the volcanic axis. These events are likely regional tectonic earthquakes unrelated to volcanic activity in the region. The number of located events during September and October is much greater than that of the previous two-month interval, which is to be expected since much of the Katmai seismic network was out during July.

During November and December, 154 earthquakes were located in the Katmai region (figs. 8B, 14B and 15B). The largest event had a magnitude of 2.6. This event was located off the main volcanic axis about 15 km northwest of Martin. A total of 15 events or about 10% of the total, were located off the main volcanic axis. An

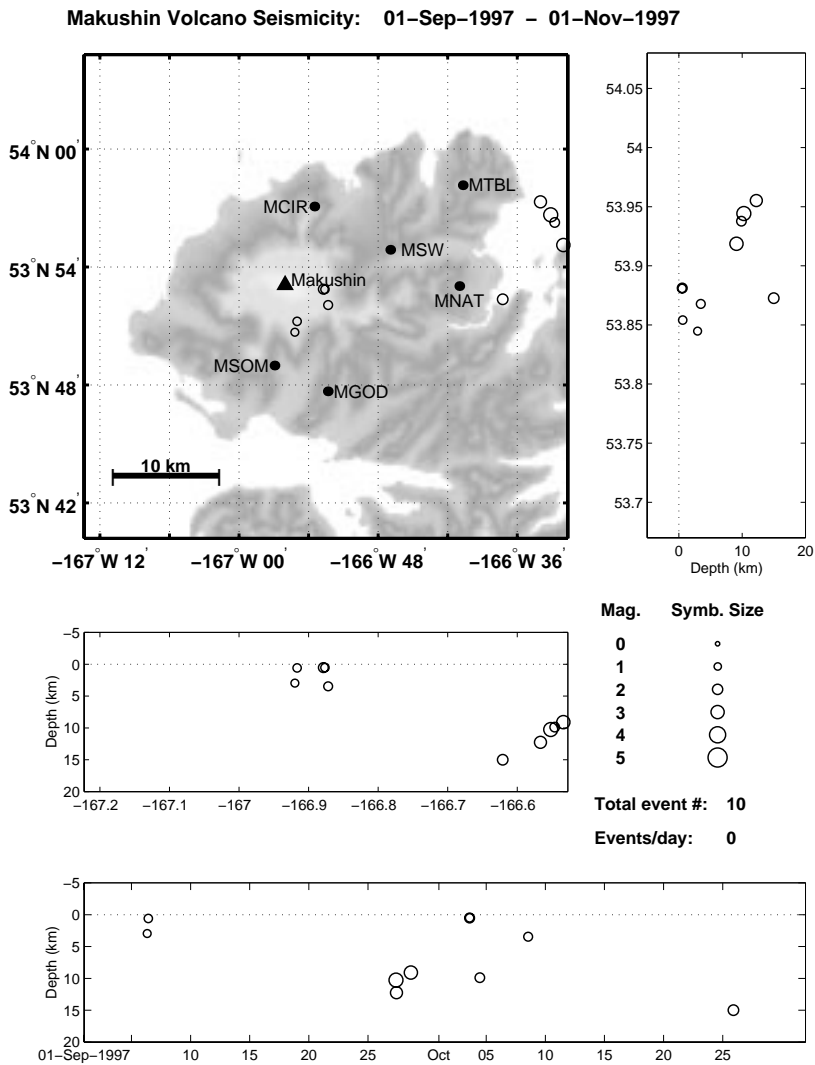


Figure 9a:
Locatable
Makushin seismic
events in space
and time for
September and
October.

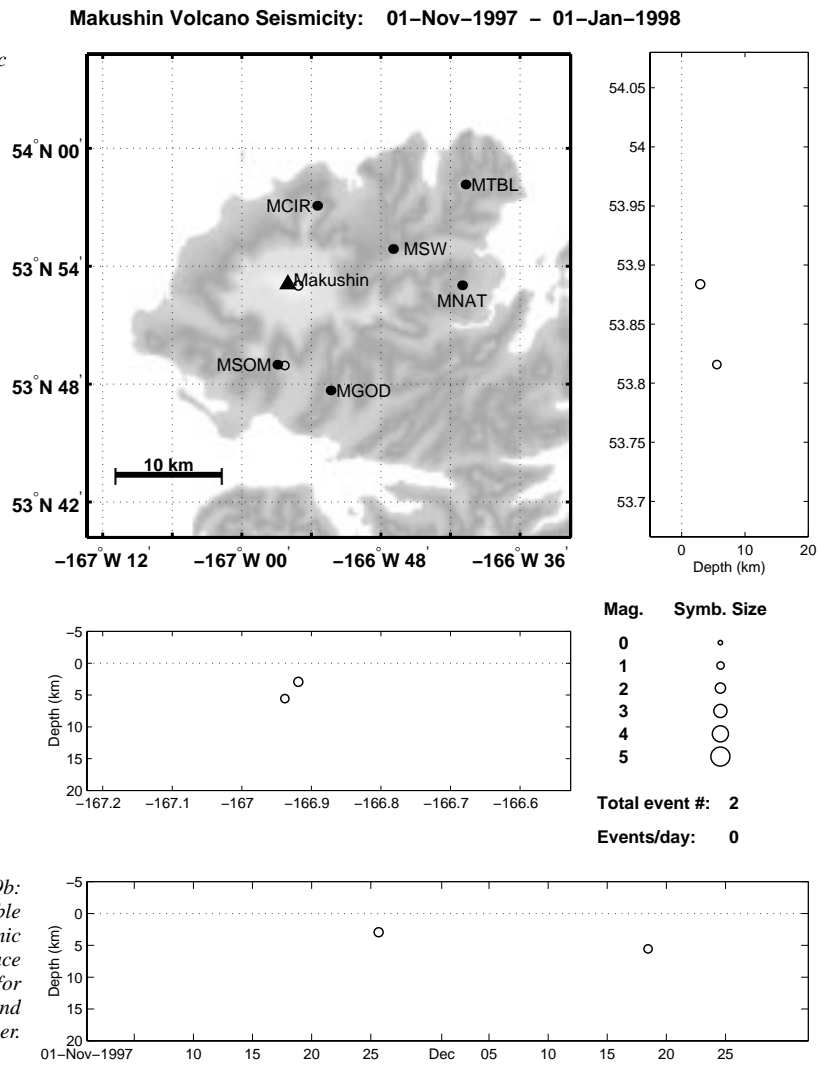


Figure 9b:
Locatable
Makushin seismic
events in space
and time for
November and
December.

additional event was located more or less along the axis but it was located about 27 km southwest of Martin which quite some distance from where seismicity is generally observed in the area. The 15 off-axis events and perhaps the above event may represent regional tectonic seismicity unrelated to volcanic activity in the area.

Makushin: During September and October a total of 10 earthquakes, the largest of which had a magnitude of 3.3, were located in the general vicinity of Makushin (figs. 9A, 14A and 15A). Four of these, including the magnitude 3.3 event, were located beneath Unalaska Bay about 2-6 km southeast of Eider Point. Another event was located near the mouth of Nateekin Bay about 6 km west of the town of Unalaska. The remaining five events were located much closer to Makushin. Three events were located 3-4 km east of the summit while the other two events located 4-5 km south of the summit. All five of these events were located at depths of less than 5 km. During the previous two-month period, seismicity was also observed in the regions southeast of the summit and offshore near Eider Point. The number of events located within the

map region during this two-month period is somewhat lower than that for the previous two-month interval (i.e. 10 vs. 15 located events). This value, however, is greater than the six located events predicted from the six-month mean seismicity rate.

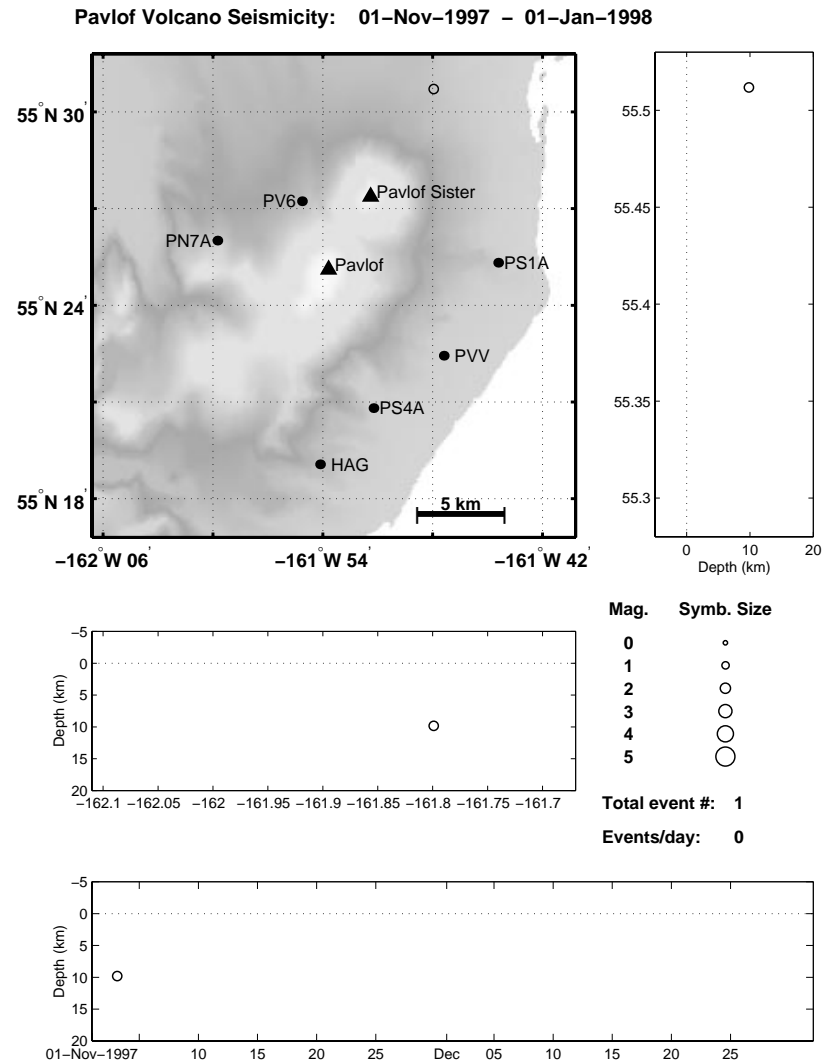
Only two earthquakes were located in the vicinity of Makushin during November and December (figs. 9B, 14B and 15B). The largest of these events had a magnitude of 1.6 and was located about 1 km south-southeast of the summit at a depth of about 3 km. The other event was located about 8 km south of the summit (~3 km east-south-east of Pakushin Cone). The number of events located during this two-month interval is less than that of the previous two-month period as well as the number expected based upon the six-month mean rate of seismicity.

Pavlof:
No earthquakes were located in the Pavlof region during the months of September and October. No local events triggered the event detection system or were sufficiently large to appear on the plot of Helicorder event counts (figs. 14A and 15A).

One earthquake was located in the general vicinity of Pavlof during November and December (figs. 10B, 14B and 15B). This event had a magnitude of 1.7 and was located about 7 km north-northeast of Pavlof Sister at a depth of about 10 km. This is the first event that was located in this region since January 1997 and the ninth such event this year. Since the stations of the Pavlof seismic network and their telemetry were functioning properly throughout this time, the rate of seismicity in this region is thus fairly low.

Redoubt:
Nine earthquakes were located in the vicinity of Redoubt during September and October. The largest of these events had a magnitude of 1.1 (figs. 11A, 14A and 15A). Of the nine located earthquakes, the four more distant ones are probably regional tectonic events, unrelated to volcanic activity at Redoubt. Five events, the largest of which had a magnitude of 0.5, occurred within a 10 km radius of the summit. Two of these five "proximal" events were located about 4 km northwest of the summit. Another two events were about 3 km east-southeast of the summit, while the final proximal event was located about 4 km south-southeast of the summit. The number of earthquakes located in the Redoubt region during September and October is lower than that of the previous two-month interval. This is the case for both the general vicinity of Redoubt (i.e., the area plotted in Figure 11A) as well as the area within 10 km of the summit. During July and August, twice as many earthquakes were located within 10 km of the summit. The observed rate of seismicity within the 10 km radius during September and October is also much lower than the 17 located events predicted from the 3-year mean seismicity rate.

Figure 10b: Locatable Pavlof seismic events in space and time for September and October.



Redoubt Volcano Seismicity: 01-Sep-1997 - 01-Nov-1997

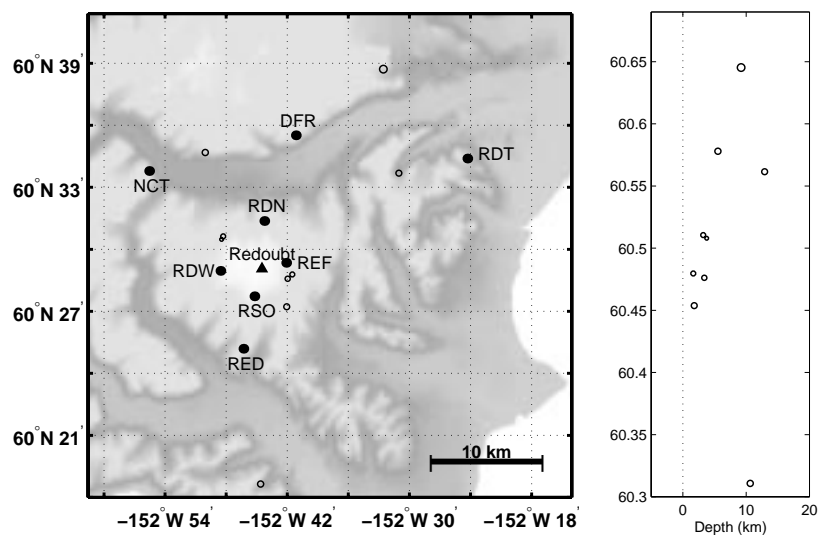


Figure 11a: Locatable Redoubt seismic events in space and time for September and October.

Redoubt Volcano Seismicity: 01-Nov-1997 - 01-Jan-1998

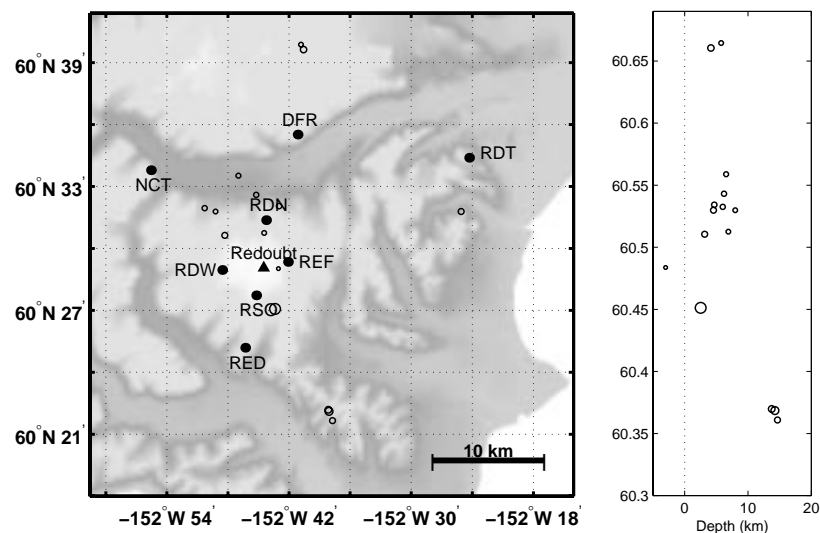
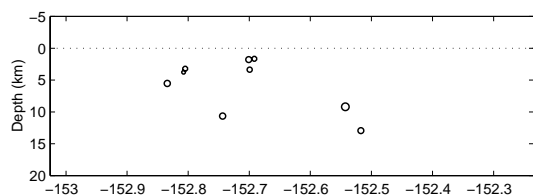
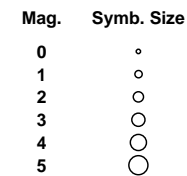
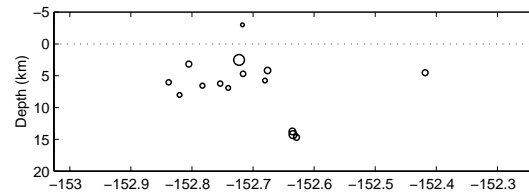


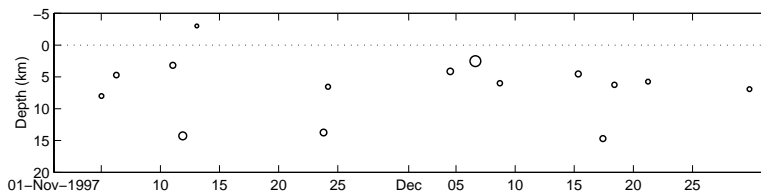
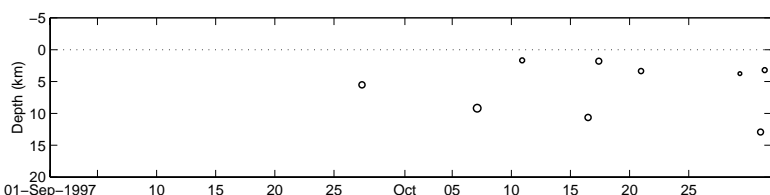
Figure 11b: Locatable Redoubt seismic events in space and time for November and December.



Total event #: 9
Events/day: 0



Total event #: 15
Events/day: 0



A total of 15 earthquakes, the largest of which had a magnitude of 2.2, were located in the vicinity of Redoubt during November and December (figs. 11B, 14B and 15B). Of the 15 located events, a total of nine, including the magnitude 2.2 event, were located within 10 km of the summit of Redoubt. The magnitude 2.2 earthquake was located about 4 km south-southeast of the summit. A small (ML -0.2) event was located about 1 km east of the summit. Four of the remaining seven proximal events were located 3-9 km north of the summit while the final three such events were located about 5-8 km northwest of the summit. Six earthquakes were located about 15-20 km from Redoubt Volcano. Because of their relatively large distance from Redoubt, these events probably represent regional tectonic activity unrelated to volcanic activity. The number of events located within 10 km of the summit is nearly twice that of the previous two-month interval (i.e. 9 vs. 5 located events). This value is, however, much lower than that predicted from the 3-year mean seismicity rate.

Shishaldin Volcano Seismicity: 01-Sep-1997 - 01-Nov-1997

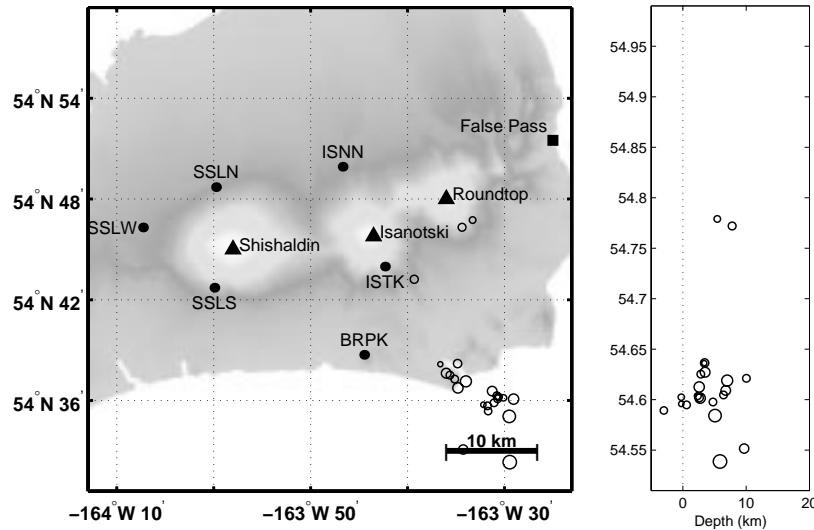


Figure 12a:
Locatable
Shishaldin
seismic events
in space and
time for
September
and October.

Shishaldin Volcano Seismicity: 01-Nov-1997 - 01-Jan-1998

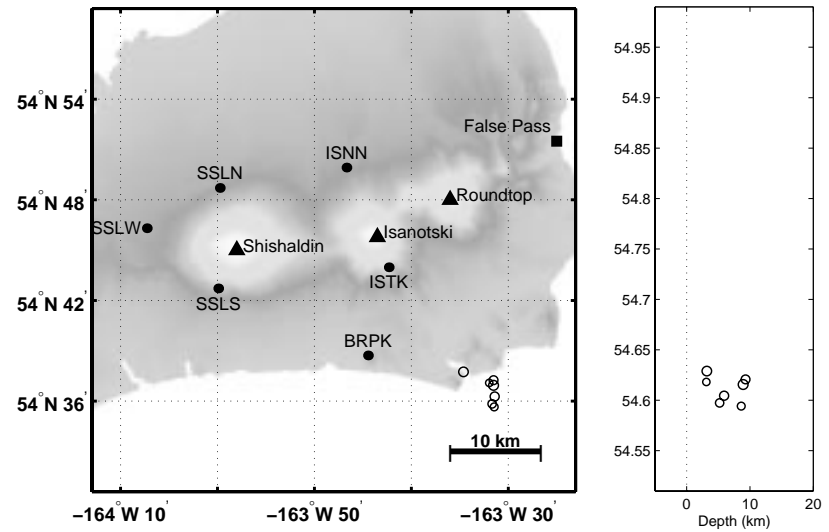
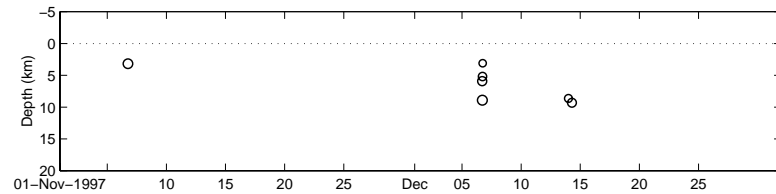
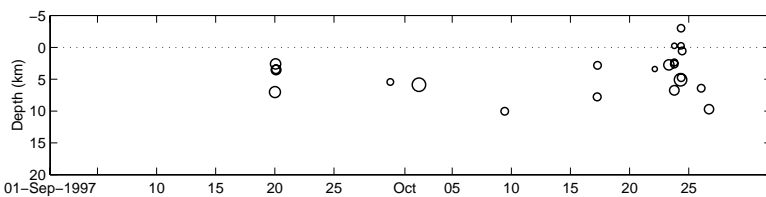
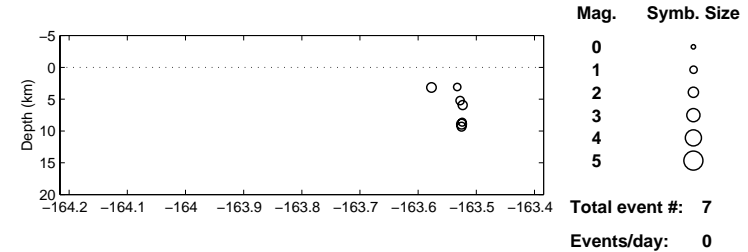
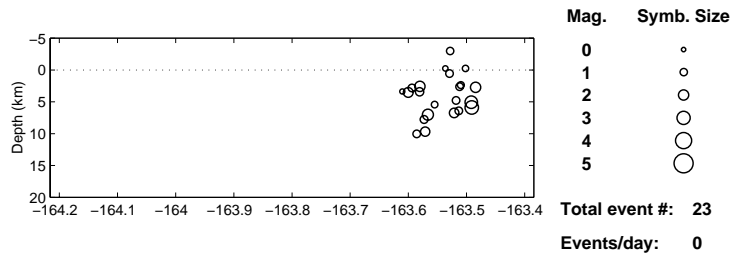


Figure 12b:
Locatable
Shishaldin
seismic events in
space and time
for November
and December.



Shishaldin:

During September and October, a total of 23 earthquakes were located in the general region of Shishaldin (figs. 12A, 14A and 15A). The largest event such event had a magnitude of 3.1 and was located off shore of Unimak Island about 11 km from Cape Lazaref. This earthquake along with 19 others formed a northwest-southeast trending zone of seismicity extending from about 3 km northwest of Cape Lazaref to nearly 11 km southeast of Cape Lazaref. Prior to September, the Shishaldin network was in operation for only about three-weeks. However, during that three-week period another event was also located in this zone of seismicity. Since these events occurred on the periphery of the seismic network, their locations, particularly with respect to hypocentral depth, are not extremely well constrained. Three earthquakes were located during September and October which do not appear to be a part of the "Cape Lazaref Seismic Zone." Two of these earthquakes, the largest of which had a magnitude of 1.2, were located about 3 km south-southeast of Roundtop. The third earthquake was located about 7 km southeast of Isanotski and had a magnitude of 1.3. This event does not appear on the two cross-sections or the time-depth plot because this event had a hypocentral depth of about 35 km, which exceeds the maximum plotted depth of 20 km.

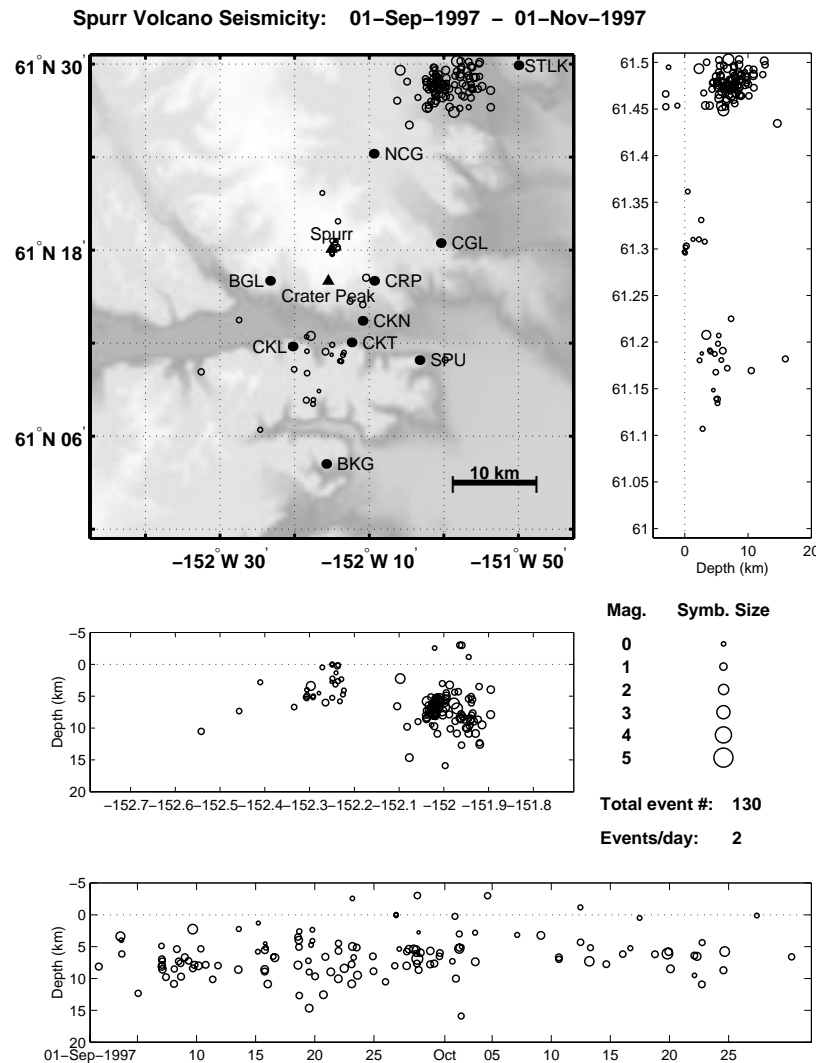


Figure 13a: Locatable Spurr seismic events in space and time for September and October. The intense seismicity well northeast of the volcano is thought to be tectonic, rather than magmatic, in origin.

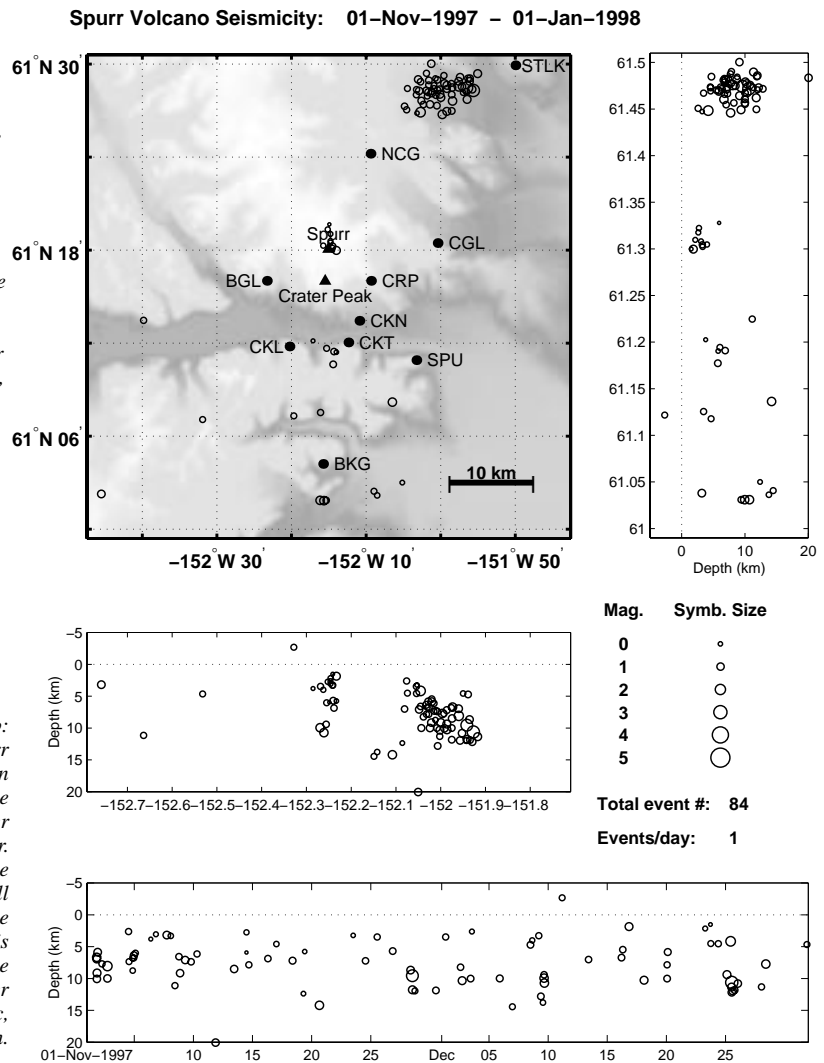


Figure 13b: Locatable Spurr seismic events in space and time for November and December. The intense seismicity well northeast of the volcano is thought to be tectonic, rather than magmatic, in origin.

A total of seven earthquakes, the largest of which had a magnitude of 1.9, were located in the Shishaldin area during November and December (figs. 12B, 14B and 15B). These events appear to be part of continued activity in the Cape Lazaref Seismic Zone. One event was located about 2 km north-northeast of Cape Lazaref. The remaining six events were located 4-5 km east to east-southeast of Cape Lazaref. The number of events located in the vicinity of Shishaldin during November and December was considerably lower than that of the previous two-month interval. Additional data will need to be collected before much can be said regarding what sort of background rate of seismicity characterizes the Shishaldin region.

S^{purrr}: During September and October, 130 earthquakes, the largest of which had a magnitude of 2.2, were located in the general vicinity of Spurr (figs. 13A, 14a and 15A). A total of 98 of these events were located in the Strandline Lake region. As usual, discussion will be restricted to the non-Strandline Lake events of which there were 32. The largest non-Strandline Lake event had a magnitude of 1.5 and was located about 7 km south-southwest of Crater Peak. This event

as well as the majority of the non-Strandline Lake events was located south of the Chakachatna River. Such seismicity has been a persistent feature of the pattern of seismicity in the Spurr region and is probably just a fairly active zone of regional tectonic seismicity unrelated to volcanic activity. A total of 12 earthquakes were located within 10 km of the summit of Spurr. The largest of these events had a magnitude of 0.9 and was located about 5 km southeast of the summit. Two events were located a bit further south and east; these events were located about 7-8 km south-southeast of the summit. Two events

were located about 4 and 7 km north of the summit. The remaining seven of these events were all located beneath the summit. The number of earthquakes which were located within a 10 km radius of the summit was a bit greater than that for July and August (i.e. 12 vs. 9 located events). However, the number of located events within the 10 km radius was still lower than the 19 such events predicted from the 3-year mean seismicity rate.

extending from the summit northward. The number of located events within the 10 km radius of Spurr is slightly lower than that of the previous two-month interval and nearly half the value predicted based upon the 3-year mean seismicity rate.

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A total of 84 earthquakes were located in the general vicinity of Spurr during November and December (figs. 13B, 14B and 15B). The largest earthquake located during this time period had a magnitude of 2.7 and occurred in the Strandline Lake region. Only 27 of these events were not located within the Strandline Lake area. Of the 27 non-Strandline Lake events a total of 10 were located with 10 km of the summit of Spurr. The largest such event had a magnitude of 1.2 and was located about 1 km east of the summit. This event was the southern most earthquake in a ~3 km long north-south trending cluster of seismicity

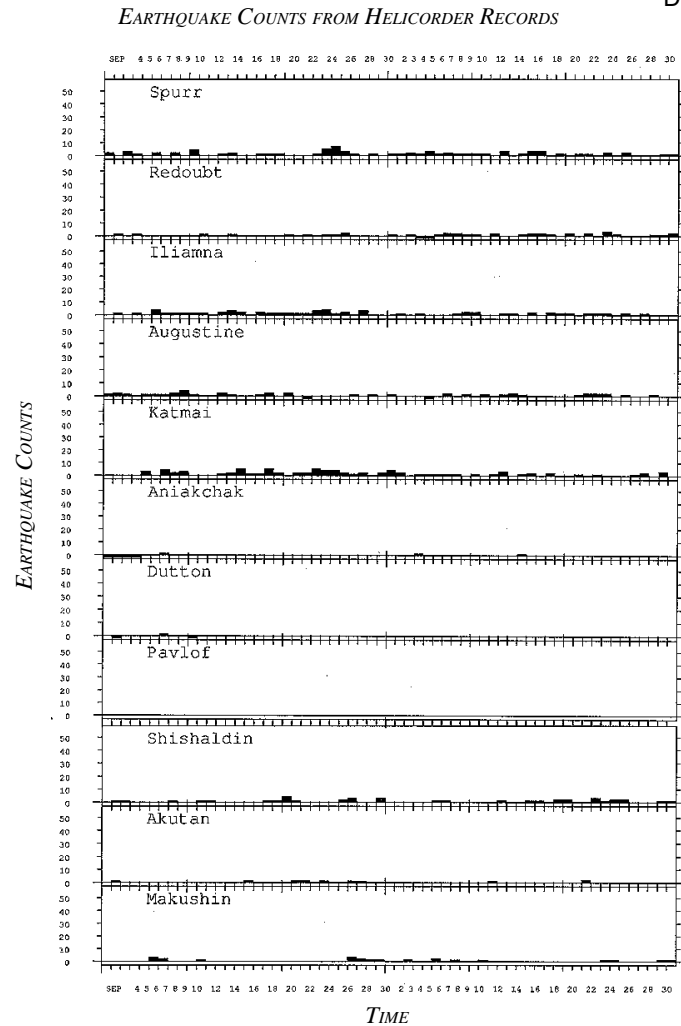


Figure 14a: Histogram of seismic events counted from helicorder records during September through October.

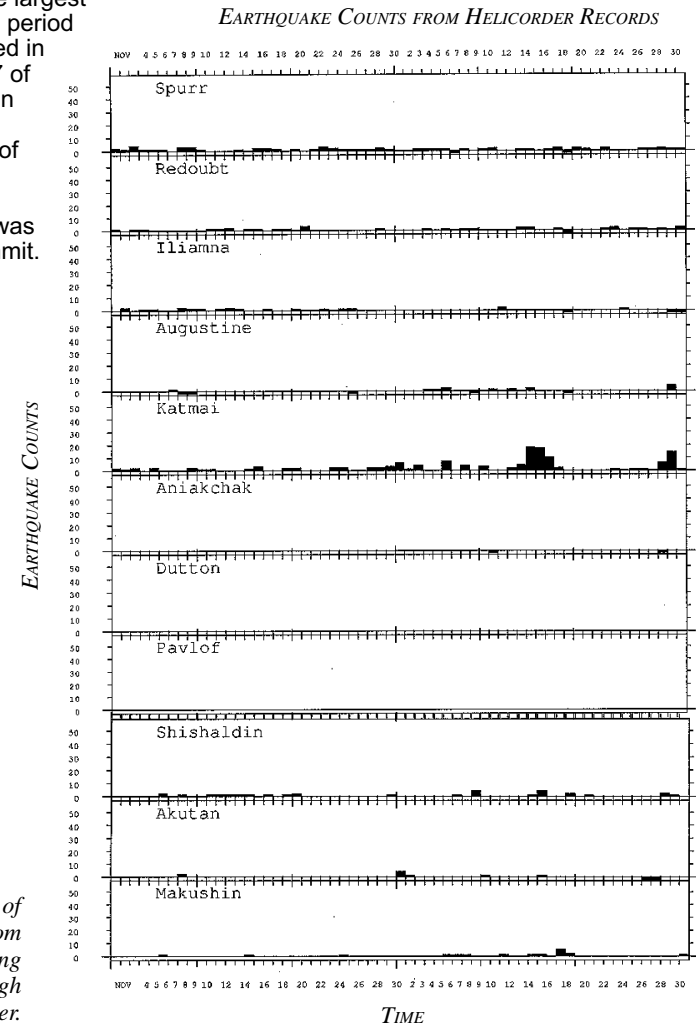


Figure 14b: Histogram of seismic events counted from Helicorder records during November through December.