SEISMOLOGICAL SERIES

of the

DOMINION OBSERVATORY

1961 - 2

EARTHQUAKES OF THE CANADIAN ARCTIC 1956 - 1959

W. E. T. Smith

OTTAWA, CANADA

Department of Mines and Technical Surveys

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INTRODUCTION

The general program of the Seismological Service, to catalogue all Canadian earthquakes, was outlined in a paper by Milne and Smith (1960-2) of this series. For expediency, Canada was divided into four separate regions with definite boundaries. Of these, only one — the Arctic region — is material here. It comprises all Canada north of the 60th parallel. The paper cited above was the first of a series to be issued annually dealing with all the regions. As such, it included the earthquakes in the Arctic region during 1960. However, since only one epicentral position was known, no map was shown. The present work lists similar data for the years 1956-1959 inclusive, and has a map showing all known epicentres including that of 1960. A catalogue of earthquakes occurring in this region prior to 1956 is in process of preparation. Pending its completion, serial numbers have not been assigned to subsequent shocks.

Many of the epicentre coordinates in this list are quoted from data distributed by the United States Coast and Geodetic Survey and are acknowledged by the letters USCGS. In most of these cases the magnitudes were determined at Ottawa. This is indicated by the letters Ott. All other data are based on the records of Canadian seismograph stations — especially Resolute.

Resolute was the only station in the Canadian Arctic from 1956-1959. Data prior to November 7, 1957 were obtained from short-period vertical Sprengnether records and subsequently from short-period vertical Willmore records. The change in instrumentation increased peak sensitivity at the station by a factor of fifteen. This increase is mainly responsible for the increased frequency of local shocks.

The seismograph records were interpreted using travel-time curves of the main phases (P_n, P_1, S_n, S_1) computed for various depths within the earth's crust and plotted on a single sheet. These were based on the seismic velocities and crustal model for the Canadian Shield as determined by Hodgson (1953).*

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* Hodgson, J.H., 1953. A seismic survey in the Canadian Shield. I - Refraction studies based on rockbursts at Kirkland Lake, Ont.; II - Refraction studies based on timed blasts: Dom. Obs., Pub. Ottawa, v. 16, nos. 5 and 6, 109-181.

From these curves, focal depths have been estimated on the basis of $P_n - P_1$ and $S_n - S_1$ intervals within a certain range of epicentral distance. However, it should be understood that this procedure is regarded as experimental. Because of the high sensitivity of the Resolute seismograph many small events are recorded. As there is no way at present of distinguishing truly seismic events from others, such as cracking ice, all are included pending further research. Because of a number of additions and corrections, the material herein supersedes the lists which appeared in various issues of the Seismological Bulletin.

Nineteen of the 184 events listed are plotted on the accompanying map. The epicentre classes referred to in the legend are as follows:

(A) denotes an accurate determination from abundant data;
(B) denotes a fairly reliable estimate based on considerable data;
and (C) denotes a less certain result sometimes based on scanty information. Class (C) epicentres have been so indicated both in the list and on the map. The remainder are classes (A) and (B), and have not been separated.

EARTHQUAKES OF THE CANADIAN ARCTIC 1956 - 1959

(Universal time is used throughout)

(M = magnitude)

1956

January 7	16:41:04. M = 6.5 (Ott.). Epicentre (USCGS) 65 1/2°N, 133 1/2°W. Yukon Territory.
February 10	06:20:38. M = 2.9. Origin 139 km from Resolute, NWT.
May 17	11:26:00. M = 4.7 (?). Origin 1000 km (?) from Resolute, NWT.
June 3	05:19:23. M = 5.0 (?). (Ott.). Epicentre (USCGS).79 1/2°N, 118 1/2°W. Arctic ocean.
August 1	01:48:20. M = 5.8 (Ott.). Epicentre (USCGS) 66°N, 133 1/2°W. Yukon Territory.
September 20	00:18:31. M = 3.1 (?). Origin 475 km (?) from Resolute, NWT.
October 3	18:34:25. M = 2.5. Origin 90 km from Resolute, NWT.
October 16	04:57:42. M = 2.6. Origin 303 km from Resolute, NWT.
October 17	08:34:05. M = 4.1 (?). Origin 810 km (?) from Resolute, NWT.
November 3	05:26:02. M = 5.7 (Ott.). Epicentre (USCGS) 61°N, 139°W. Southern Yukon Territory.
November 4	21:40:55. M = 5.4 (Ott.). Epicentre (USCGS) 61°N, 139°W. Yukon Territory.

1957

January 30	12:08:27. M = 5.8 (Ott.). Epicentre (USCGS) 65°N, 134°W. Yukon Territory.
April 9	22:53:39. M = 3.3. Origin 108 km from Resolute, NWT.
April 10	06:57:17. M = 3.0. Origin 108 km from Resolute, NWT.
July 7	23:51:27. M = 3.4. Origin 442 km from Resolute, NWT.
October 14	00:49:09. M = 3.1. Origin 385 km from Resolute, NWT.
October 25	19:10:05. M = 3.3. Origin 328 km from Resolute, NWT.
November 12	03:57:56. M = 1.2. Origin 46 km from Resolute, NWT.
December 9	22:07:43. M = 6.7 (Ott.). Epicentre (USCGS) 65 1/2°N, 133°W. Yukon Territory.
December 10	08:15:58. M = 5.7. Epicentre 65 1/2°N, 133°W. Yukon Territory. Identified as an aftershock of the previous earthquake by the similarity of seismic traces recorded at the Canadian stations.
December 24	04:30:02. M = 1.5. Origin 53 km from Resolute, NWT.
December 25	04:14:11. M = 1.8. Origin 49 km from Resolute, NWT.
December 25	05:31:03. M = 1.9. Origin 49 km from Resolute, NWT.
December 29	23:58:31. M = 1.6. Origin 78 km from Resolute, NWT.

1958

January 2 13:48:24. M = 1.3. Origin 49 km from Resolute, NWT.
January 3 09:13:35. M = 1.7. Origin 49 km from Resolute, NWT.
January 4 03:13:05. M = 2.9. Origin 245 km from Resolute, NWT, at a depth of about 10 km.
January 7 08:06:37. M = 2.2. Origin 92 km from Resolute, NWT.
January 7 15:34:30. M = 1.8. Origin 220 km from Resolute, NWT.
January 9 20:00:31. M = 3.4. Origin 444 km from Resolute, NWT., at a depth of about 17 km.
January 9 21:03:26. M = 4.6. Epicentre, 65 1/2°N, 80°W, (C). Foxe Basin, NWT. Foreshock of the earthquake below.
January 9 21:14:38. M = 5.0. Epicentre, 65 1/2°N, 80°W, (C). Foxe Basin, NWT.
January 15 00:33:52. M = 1.5. Origin 51 km from Resolute, NWT.
January 15 22:57:17. M = 2.9. Origin 305 km from Resolute, NWT.
February 4 09:51:47. M = 3.9. Origin 800 km from Resolute, NWT.
February 6 11:24:18. M = 3.7. Origin 750 km from Resolute, NWT.
February 6 12:29:59. M = 3.8. Origin 750 km from Resolute, NWT.
February 7 07:31:50. M = 4.4. Origin 1200 km from Resolute, NWT.
February 18 19:36:09. M = 2.2. Origin 86 km from Resolute, NWT.
February 19 20:04:03. M = 3.1. Origin 315 km from Resolute, NWT., at a depth of about 17 km.
February 24 08:24:40. M = 3.5. Origin 405 km from Resolute, NWT., at a depth of about 4 km.
February 24 11:26:17. M = 3.0. Origin 410 km from Resolute, NWT., at a depth of about 7 km.
February 27 16:33:31. M = 3.0. Origin 400 km from Resolute, NWT., at a depth of about 14 km.
February 28 03:55:18. M = 4.3. Origin 1060 km from Resolute, NWT.
February 28 19:17:44. M = 2.7. Origin 420 km from Resolute, NWT., at a depth of about 4 km.
March 1 12:29:15. M = 4.5. Origin 1730 km from Resolute, NWT.,
March 3 02:13:49. M = 0.9. Origin 33 km from Resolute, NWT.
March 4 03:36:19. M = 1.9. Origin 107 km from Resolute, NWT.
March 4 18:52:40. M = 2.8. Origin 392 km from Resolute, NWT., at a depth of about 14 km.
March 4 21:52:48. M = 2.6. Origin 386 km from Resolute, NWT., at a depth of about 6 km.
March 6 09:26:54. M = 2.2. Origin 287 km from Resolute, NWT.
March 7 07:02:40. M = 2.8. Origin 412 km from Resolute, NWT., at a depth of about 4 km.
March 13 19:40:48. M = 1.0. Origin 61 km from Resolute, NWT.
March 23 04:40:21. M = 2.8. Origin 265 km from Resolute, NWT., apparently near the surface of the earth.
March 26 04:30:00. M = 3.7. Origin 660 km from Resolute, NWT.
March 26 21:35:27. M = 2.4. Origin 180 km from Resolute, NWT.
March 27 07:35:18. M = 2.6. Origin 340 km from Resolute, NWT., at a depth of about 10 km.
March 28 19:13:31. M = 2.1. Origin 235 km from Resolute, NWT.
March 31 08:55:48. M = 2.3. Origin 66 km from Resolute, NWT.

April 5 10:00:06. M = 2.4. Origin 25 km from Resolute, NWT.
April 12 18:42:21. M = 1.0. Origin 62 km from Resolute, NWT.
April 24 07:22:49. M = 2.5. Origin 283 km from Resolute, NWT.
May 15 01:47:39. M = 2.3. Origin 295 km from Resolute, NWT.
May 17 23:55:34. M = 2.6. Origin 188 km from Resolute, NWT.
May 22 12:31:11. M = 1.8. Origin 57 km from Resolute, NWT.
May 30 14:10:13. M = 5.3. Origin 970 km from Resolute, NWT.
May 31 11:43:42. M = 4.0. Origin 750 km from Resolute, NWT.
June 6 15:30:56. M = 2.4. Origin 107 km from Resolute, NWT.
June 9 23:45:17. M = 1.8. Origin 164 km from Resolute, NWT.
June 25 12:40:42. M = 1.4. Origin 99 km from Resolute, NWT.
June 30 14:02:08. M = 4.7. (Ott.). Epicentre (USCGS) 73°N, 69 1/2°W. Baffin Bay.
July 4 04:19:29. M = 2.9. Origin 400 km from Resolute, NWT., at a depth of about 18 km.
July 10 06:15:51. M = 8. (USCGS). Epicentre (USCGS) 58.6°N, 137.1°W. Southeastern Alaska. Six killed and moderate property damage. Extensive fissuring and avalanche activity. Portions of Khantaak Island submerged in Yakutat Bay. Waves estimated at more than 100 feet in Lituya Bay. This earthquake is centred outside the region with which this report is concerned. Although not reported felt in Canada, it must certainly have affected portions of the Canadian Arctic and western Canada. Several smaller shocks originated at the same place during the month following the main shock. These have not been included here.
July 15 02:38:04 M = 2.7. Origin 300 km from Resolute, NWT., at a depth of about 10 km.
July 26 03:08:31. M = 2.0. Origin 87 km from Resolute, NWT.
July 28 03:11:46. M = 2.0. Origin 88 km from Resolute, NWT.
August 7 02:20:50. M = 3.8. Origin 430 km from Resolute, NWT., at a depth of about 12 km.
August 10 02:14:20. M = 1.8. Origin 61 km from Resolute, NWT.
August 29 12:57:16. M = 2.8. Origin 420 km from Resolute, NWT., apparently near the surface of the earth.
September 4 14:28:02. M = 0.6. Origin 12 km from Resolute, NWT.
September 22 20:08:07. M = 2.0. Origin 156 km from Resolute, NWT.
September 24 15:34:40. M = 2.0. Origin 135 km from Resolute, NWT.
October 7 00:11:23. M = 2.2. Origin 230 km from Resolute, NWT., at a depth of about 22 km.
October 9 09:30:13. M = 1.8. Origin 116 km from Resolute, NWT.
October 9 09:35:50. M = 1.4. Origin 115 km from Resolute, NWT.
October 10 07:50:29. M = 2.0. Origin 116 km from Resolute, NWT.
October 11 00:41:35. M = 5.7. (Ott.). Epicentre (USCGS) 65 1/2°N, 132 1/2°W. Yukon Territory.
October 20 23:37:54. M = 1.9. Origin 152 km from Resolute, NWT.
October 21 05:14:21. M = 2.2. Origin 115 km from Resolute, NWT.
October 21 06:52:23. M = 1.9. Origin 115 km from Resolute, NWT.
October 26 06:11:39. M = 2.3. Origin 160 km from Resolute, NWT. at a depth of about 25 km.
October 26 15:24:13. M = 5.6. (Ott.) Epicentre (USCGS) 65 1/2°N, 133°W. Yukon Territory.

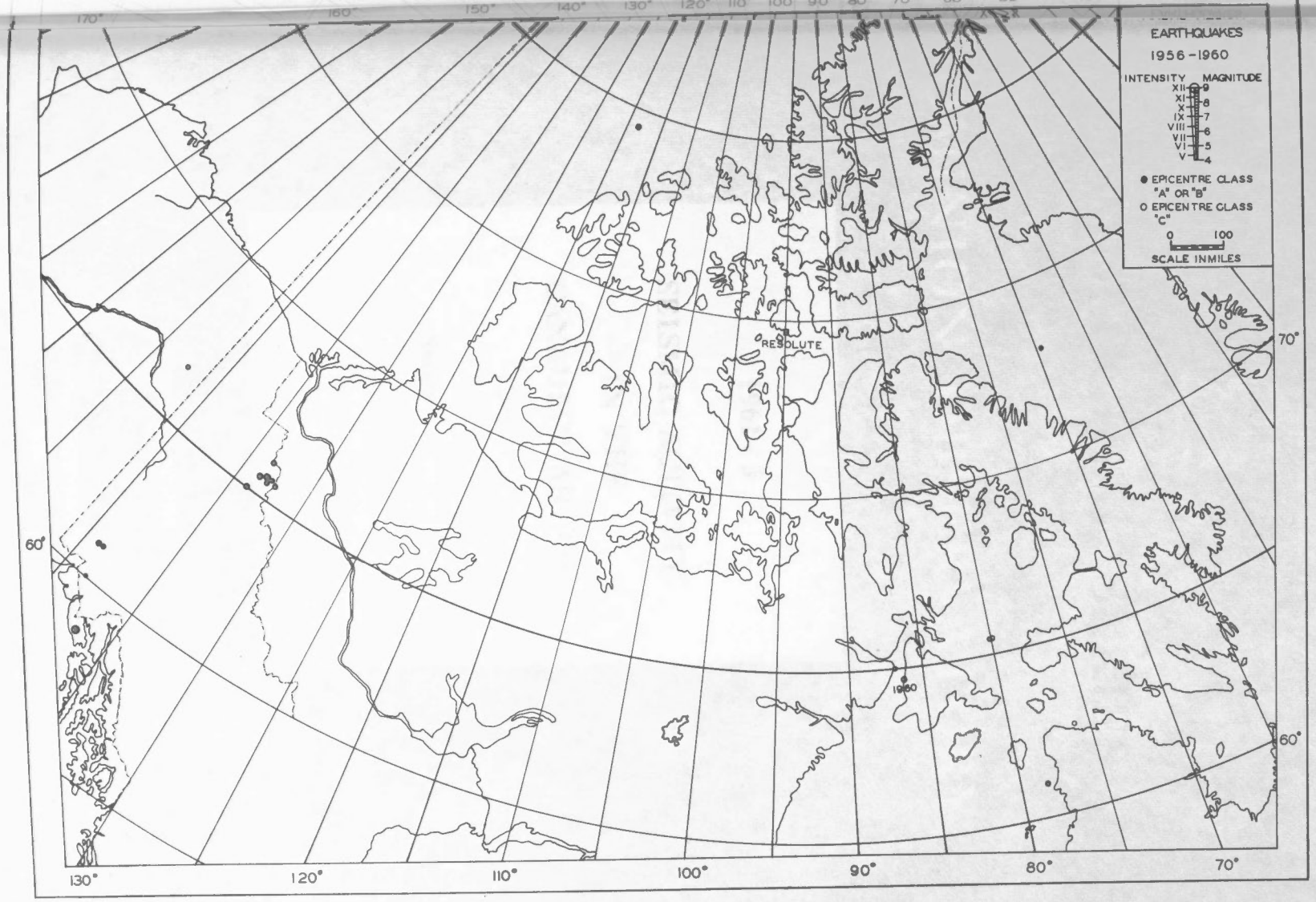
October 28 04:48:16. M = 3.5. Origin 420 km from Resolute, NWT.
October 30 23:42:10. M = 1.9. Origin 164 km from Resolute, NWT.
October 31 03:27:04. M = 4.0. Origin 570 km from Resolute, NWT., at a depth of about 19 km.
October 31 12:27:54. M = 2.3. Origin 148 km from Resolute, NWT.
November 2 03:20:56. M = 4.7. Origin 1610 km from Resolute, NWT.
November 2 06:29:43. M = 1.9. Origin 101 km from Resolute, NWT.
November 14 04:21:07. M = 0.7. Origin 25 km from Resolute, NWT.
November 17 19:43:19. M = 0.6. Origin 80 km from Resolute, NWT.
December 1 19:22:14. M = 1.2. Origin 62 km from Resolute, NWT.
December 3 00:17:18. M = 2.1. Origin 158 km from Resolute, NWT.
December 13 01:35:15. M = 2.3. Origin 220 km from Resolute, NWT., at a depth of about 31 km.
December 13 09:54:07. M = 1.7. Origin 175 km from Resolute, NWT., at a depth of about 20 km.
December 14 10:22:05. M = 1.5. Origin 102 km from Resolute, NWT.
December 14 23:15:26. M = 5.1. Origin 1780 km from Resolute, NWT.
December 28 09:31:13. M = 1.4. Origin 115 km from Resolute, NWT.
December 28 22:21:30. M = 1.1. Origin 86.1 km from Resolute, NWT.
December 30 10:06:51. M = 1.1. Origin 66 km from Resolute, NWT.

1959

January 3 12:43:24. M = 2.5. Origin 232 km from Resolute, NWT., at a depth of about 19 km.
January 16 07:48:02. M = 1.5. Origin 63 km from Resolute, NWT.
January 28 23:14:57. M = 5.0. Epicentre 62.5°N, 76.0°W, (C). In Hudson Strait.
January 30 05:17:32. M = 5.9. (Ott.). Epicentre (USCGS) 61.0°N, 78.5°W. In Hudson Bay.
February 2 03:08:46. M = 2.2. Origin 112 km from Resolute, NWT.
February 2 04:40:17. M = 2.7. Origin 115 km from Resolute, NWT.
February 4 19:07:04. M = 1.0. Origin 25 km from Resolute, NWT.
February 21 13:57:50. M = 1.9. Origin 82 km from Resolute, NWT.
March 2 23:21:01. M = 2.1. Origin 116 km from Resolute, NWT.
March 3 10:08:36. M = 4.1. Origin 640 km from Resolute, NWT.
March 5 20:03:35. M = 1.2. Origin 49 km from Resolute, NWT.
March 5 20:20:57. M = 2.3. Origin 117 km from Resolute, NWT.
March 5 22:39:05. M = 2.4. Origin 110 km from Resolute, NWT.
March 6 21:09:53. M = 1.9. Origin 41 km from Resolute, NWT.
March 13 16:45:44. M = 2.3. Origin 113 km from Resolute, NWT.
March 17 17:33:26. M = 2.2. Origin 185 km from Resolute, NWT., at a depth of about 20 km.
March 18 02:08:47. M = 2.2. Origin 127 km from Resolute, NWT.
March 22 08:15:19. M = 2.8. Origin 254 km from Resolute, NWT., at a depth of about 21 km.
March 23 22:12:47. M = 3.6. Origin 500 km from Resolute, NWT., apparently near the earth's surface.
March 26 21:50:09. M = 2.3. Origin 148 km from Resolute, NWT.
April 8 19:18:22. M = 1.6. Origin 215 km from Resolute, NWT., at a depth of about 22 km.

April 19	06:43:29. M = 5.0. (Ott.). Origin (USCGS) in Yukon Territory. Epicentre (Ott.) 66.5°N, 142.5°W. Class (C). Inside Alaska on the Arctic circle.
April 19	07:29:18. M = 2.9. Origin 425 km from Resolute, NWT., apparently near the earth's surface.
April 21	08:43:48. M = 2.0. Origin 53 km from Resolute, NWT.
April 26	07:26:15. M = 2.9. Origin 460 km from Resolute, NWT., at a depth of about 15 km.
May 3	09:30:14. M = 2.8. Origin 45 km from Resolute, NWT., apparently near the earth's surface.
May 12	00:08:22. M = 1.2. Origin 41 km from Resolute, NWT.
May 13	16:56:43. M = 3.0. Origin 119 km from Resolute, NWT.
May 15	06:24:19. M = 2.1. Origin 127 km from Resolute, NWT.
May 22	00:46:20. M = 1.4. Origin 62 km from Resolute, NWT.
May 23	22:17:55. M = 1.8. Origin 164 km from Resolute, NWT.
May 27	19:28:39. M = 2.0. Origin 44 km from Resolute, NWT.
May 28	05:42:55. M = 2.7. Origin 450 km from Resolute, NWT.
May 30	02:44:07. M = 1.8. Origin 183 km from Resolute, NWT., at a depth of about 18 km.
June 22	05:00:47. M = 2.8. Origin 500 km from Resolute, NWT.
June 22	05:17:58. M = 1.3. Origin 115 km from Resolute, NWT.
June 22	06:55:51. M = 2.8. Origin 119 km from Resolute, NWT.
June 22	10:08:58. M = 2.7. Origin 450 km from Resolute, NWT.
June 24	19:11:04. M = 3.0. Origin 430 km from Resolute, NWT.
June 27	10:53:27. M = 3.4. Origin 395 km from Resolute, NWT., at a depth of about 26 km.
June 30	03:27:54. M = 1.1. Origin 29 km from Resolute, NWT.
July 2	19:42:45. M = 2.8. Origin 270 km from Resolute, NWT., at a depth of about 19 km.
July 2	19:48:00. M = 2.8. Origin 270 km from Resolute, NWT., at a depth of about 19 km.
July 2	23:07:57. M = 2.5. Origin 270 km from Resolute, NWT., at a depth of about 19 km.
July 9	19:55:15. M = 2.4. Origin 307 km from Resolute, NWT.,
July 19	11:11:00. M = 2.0. Origin 27 km from Resolute, NWT.
August 15	21:11:43. M = 1.9. Origin 37 km from Resolute, NWT.
September 9	09:55:57. M = 1.8. Origin 62 km from Resolute, NWT.
September 13	03:25:58. M = 2.5. Origin 189 km from Resolute, NWT.
September 16	19:55:49. M = 0.8. Origin 12 km from Resolute, NWT.
September 16	20:24:40. M = 1.0. Origin 12 km from Resolute, NWT.
September 30	15:52:47. M = 1.9. Origin 189 km from Resolute, NWT.
October 1	05:41:39. M = 2.9. Origin 116 km from Resolute, NWT.
October 1	11:00:51. M = 2.4. Origin 115 km from Resolute, NWT.
October 2	05:55:40. M = 2.7. Origin 115 km from Resolute, NWT.
October 2	06:57:34. M = 2.7. Origin 115 km from Resolute, NWT.
October 7	03:02:21. M = 2.7. Origin 115 km from Resolute, NWT.
October 7	03:49:10. M = 2.1. Origin 115 km from Resolute, NWT.
October 17	05:11:49. M = 2.4. Origin 115 km from Resolute, NWT.
October 17	20:27:35. M = 5.6. (Ott.). Epicentre (USCGS) 60°N, 138 1/2°W. Yukon-British Columbia border.
October 20	23:29:20. M = 3.4. Origin 258 km from Resolute, NWT., at a depth of about 26 km.

October 21	07:46:17. M = 5.3. Epicentre, 65°N, 87°W, (C). Near Southampton Island, NWT.
October 25	02:07:42. M = 2.9. Origin 430 km from Resolute, NWT.
October 31	19:20:24. M = 3.1. Origin 270 km from Resolute, NWT.
November 16	11:48:57. M = 3.6. Origin 197 km from Resolute, NWT.
December 15	07:10:28. M = 2.1. Origin 222 km from Resolute, NWT., at a depth of about 35 km.
December 17	12:47:00. M = 1.3. Origin 58 km from Resolute, NWT.
December 17	19:13:25. M = 2.1. Origin 228 km from Resolute, NWT., at a depth of about 34 km.
December 17	21:36:19. M = 2.1. Origin 246 km from Resolute, NWT., at a depth of about 27 km.
December 18	15:37:25. M = 2.6. Origin 60 km from Resolute, NWT.
December 21	00:06:59. M = 2.2. Origin 164 km from Resolute, NWT., at a depth of about 17 km.
December 21	01:26:52. M = 1.9. Origin 172 km from Resolute, NWT.
December 23	01:26:44. M = 4.6. Origin 750 km from Resolute, NWT.
December 26	09:56:02. M = 1.8. Origin 44 km from Resolute, NWT.
December 29	09:17:28. M = 4.0. Origin 730 km from Resolute, NWT. at a depth of about 9 km.


EARTHQUAKES
1956 - 1960
INTENSITY
MAGNITUDE
XII
XI
X
IX
VIII
VII
VI
V
9
8
7
6
5
4
● EPICENTRE CLASS "A" OR "B"
o EPICENTRE CLASS "C"
0
100
SCALE IN MILES
RESOLUTE
1960
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
60°
130°
120°
110°
100°
90°
80°
70°
60°