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16. Abstract
A mosaic of south-central Alaska composed of 19 ERTS-1 images, when compared with the seismicity pattern of the area, reveals that the larger earthquakes tend to fall on lineaments which are easily recognizable on the imagery. In most cases, these lineaments have not been mapped as faults. One particular lineament, which was the scene of three earthquakes of magnitude 4 or greater during 1972, passes very close to Anchorage.

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SEISMICALLY ACTIVE STRUCTURAL LINEAMENTS IN SOUTH-CENTRAL ALASKA AS SEEN ON ERTS-1 IMAGERY

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The factor which controls the pattern of seismicity in south-central Alaska is the manner in which the north Pacific lithospheric plate underthrusts the continent. The 1964 earthquake was evidently the result of a very low-angle thrust which intersected the surface (if, indeed, it did) in the vicinity of the Aleutian trench and dipped gently to the northwest under the Kenai Peninsula (e.g., Plafker, 1972). Various studies since that time, however (e.g., Page and Lahr, 1972; Davies and Berg, 1973; VanWormer et al., 1974), show that the actual zone of subduction (the Benioff zone) lies well to the west of the Aleutian trench, along the base of the Alaska Range and the west shore of Cook Inlet. Most earthquakes in south-central Alaska are thought to be either directly or indirectly a result of this underthrusting.

The accompanying mosaic was constructed from 19 ERTS-1 images* produced on four consecutive passes of the satellite on November 2,3,4 and 5, 1972. It shows south-central Alaska with Anchorage at the head of Cook Inlet near the right center, the Kenai Peninsula at lower right center, and the Alaska Range curving across the scene from the upper right to the lower left. The Denali fault is conspicuous as it cuts through the Alaska Range from upper right to upper left center. This major right-lateral fault is thought to be (at least over part of its length) the surface along which differential motion between oceanic plate and continent is occurring. The Denali fault is roughly paralleled by the Lake Clark fault (which is somewhat less conspicuous) to the south. The solid circles on the overlay represent epicenters of earthquakes which occurred in this area during 1972. These are events, however, which had a magnitude of 4 or greater, and many

*Image ID nos. 1102-20452,20455,20458,20461; 1103-20495,20504,20511,20520,20533; 1104-20563,20565,20572,20574,20581; 1105-21015,21021,21024,21030,21035.

smaller events (about 1500) which were located are not shown. The numbers relate the epicenters to the parameters of their respective earthquakes which are given in the Appendix.

Most of the earthquakes are seen to occur in the vicinity of Cook Inlet, but it should be noted that these are largely deep-seated events related to, or lying in, the subduction zone, and they probably do not bear a direct relationship to lineaments which can be seen at the surface. A few earthquakes appear to be associated with the Denali fault, particularly in the vicinity of Mt. McKinley (which is casting the long shadow in the upper left quadrant), and there is an obvious clustering of earthquakes along the Lake Clark fault.

Of primary interest, however, are those lineaments which are not geologically mapped as faults, but which could probably be so classified on the basis of ongoing seismicity. Particularly noteworthy are the set of sub-parallel lineaments trending off the Denali fault to the southwest, and the peculiar graben-like structure of the mountains around Anchorage. The 1964 epicenter was very near earthquakes 34 and 50 on the lineament at the right margin, although it is not clear whether or not this lineament could have played a role in that earthquake. Note the extremely sharp escarpment of the Kenai Mountains which passes very close to Anchorage and the association of at least three earthquakes with this apparent fault.

It is clear that ERTS imagery, in the next few years, will prove to be a most important tool in assessing earthquake hazards in areas where existing seismic and geologic data are minimal. This is an especially important matter in Alaska, which will be experiencing an unprecedented rate of growth and expansion now that resource development is so vital an issue to the nation.

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APPENDIX

The following table lists, by number, all the epicenters which are plotted. All data in the table were produced by the University of Alaska seismology program, except those accompanied by an asterisk (*), for which the National Oceanographic and Atmospheric Administration (NOAA) was the source.

Date (1972)	Latitude (N)	Longitude (W)	Magnitude
1. Jan 2	59.3	153.6	4.4
2. Jan 9	59.5	156.6	4.0
3. Jan 19	59.4	156.9	4.3
4. Jan 24 *	59.6	151.4	4.0
5. Feb 5 *	60.3	153.8	4.6
6. Feb 13 *	59.9	154.2	4.9
7. Feb 16	59.5	152.9	4.3
8. Feb 25	61.3	149.4	4.0
9. Feb 27	59.2	151.6	4.4
10. Feb 29	63.2	150.5	4.0
11. Mar 1 *	59.6	152.8	4.6
12. Mar 7	60.0	155.3	4.0
13. Mar 12 *	64.1	148.4	4.2
14. Mar 12	61.6	147.7	4.0
15. Mar 14	60.8	152.3	4.0
16. Mar 21	60.1	150.3	4.0
17. Mar 23	59.7	153.2	4.3
18. Mar 25	59.8	155.6	4.0
19. Mar 25	59.3	155.3	4.1
20. Mar 28 *	59.8	153.4	4.3
21. Mar 29 *	59.9	153.1	5.1
22. Apr 2 *	59.9	153.6	4.9
23. Apr 5	61.4	151.9	4.0
24. Apr 7 *	60.1	152.8	5.1
25. Apr 9	64.0	150.9	4.5
26. Apr 9	61.6	151.0	4.1
27. Apr 11 *	62.0	150.4	4.2
28. Apr 15	60.8	153.6	4.1
29. Apr 16	63.4	147.6	4.6
30. Apr 16	63.5	147.6	4.1
31. Apr 19	58.7	155.6	4.1
32. Apr 20 *	60.2	152.1	4.7
33. Apr 20 *	59.9	153.6	4.5
34. Apr 25	61.1	147.1	4.0
35. Apr 25 *	62.0	147.8	4.6
36. Apr 28 *	63.6	149.9	4.7
37. May 7	61.1	152.1	4.1
38. May 8	59.6	155.7	4.1
39. May 8	58.8	153.0	4.1
40. May 14	62.4	151.1	4.0
41. May 14	61.8	150.3	4.1
42. May 19	59.6	152.9	4.1

Date (1972)	Latitude (N)	Longitude (W)	Magnitude
43. May 20	59.6	152.9	5.2
44. Jun 1	59.6	155.1	4.0
45. Jun 10	59.1	155.6	4.1
46. Jun 14	61.0	152.5	5.2
47. Jun 16	59.3	152.3	4.2
48. Jun 18	62.6	152.7	4.7
49. Jun 20	59.5	152.7	5.1
50. Jun 22	61.4	147.5	4.6
51. Aug 6	60.0	149.2	4.0
52. Aug 9	58.7	154.5	4.1
53. Aug 12	61.4	149.8	4.0
54. Aug 17	59.4	152.6	4.2
55. Aug 19	59.1	153.3	4.2
56. Aug 22	59.8	152.2	4.1
57. Aug 23	58.4	153.2	5.5
58. Sep 3 *	59.7	149.1	4.7
59. Sep 11 *	59.6	148.9	5.1
60. Oct 1	62.7	149.1	5.2
61. Oct 1	59.8	153.3	4.7
62. Oct 20	60.0	152.4	4.2
63. Oct 21	63.2	151.1	5.4
64. Nov 19	60.9	153.1	4.6
65. Nov 21	62.2	149.7	4.1
66. Nov 22	59.6	152.4	4.1
67. Nov 25	58.6	152.2	4.3
68. Nov 28	59.7	153.5	5.1
69. Dec 3	59.8	154.7	4.0
70. Dec 3	58.6	155.2	4.4
71. Dec 4	59.8	154.8	4.2
72. Dec 15	60.3	151.2	5.0
73. Dec 18	60.8	153.1	5.6
74. Dec 29	61.6	151.3	4.5


148°
62°
154°
60°
Anchorage
N
5
1972 Earthquake
Epicenter M ≥ 4.0
Strike – Slip
Fault
Thrust Fault
Possible Fault
Volcano
GEOPHYSICAL INSTITUTE
University of Alaska
0
50
100 KM