UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
345 Middlefield Road, M/S 77
Menlo Park, California 94025

EASTERN GULF OF ALASKA SEISMICITY: QUARTERLY REPORT TO THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION FOR APRIL 1, 1980 THROUGH JUNE 30, 1980

By

John C. Lahr and Christopher D. Stephens

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Open-file Report

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Quarterly Report
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Research Unit 210

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA

John C. Lahr
Christopher D. Stephens

U.S. Geological Survey
Mail Stop 77
345 Middlefield Road
Menlo Park, CA 94025

I. ABSTRACT OF HIGHLIGHTS

New procedures have been developed to streamline earthquake data processing and since October 1979 we have been completing preliminary processing within twelve weeks of real time. A catalog of earthquakes for October-December 1979 is now in review and January-March 1980 will be completed after Canadian data has been incorporated.

II. TASK OBJECTIVES

1) Tabulate the locations and magnitudes of all significant earthquakes in the NEGOA region.
2) Prepare focal mechanism solutions to aid in interpreting the tectonic processes active in the region.
3) Identify both offshore and onshore faults that are capable of generating earthquakes.
4) Assess the nature of the strong ground shaking associated with large earthquakes in the NEGOA.
5) Evaluate the observed seismicity in close cooperation with OCSEAP Research Units 16 and 251 towards development of an earthquake prediction capability in the NEGOA.
6) Compile and evaluate frequency versus magnitude relationships for seismic activity within and adjacent to the study areas.

II. FIELD AND LABORATORY ACTIVITIES

A. Field Activities

This year's station maintenance program began June 14 when John Rogers began work in Anchorage. He was joined by Jack Pelton later in June and will be aided later by Greg Condrotte and John Lahr. This spring's snow, ice and wind conditions have taken their usual toll of station masts and antenna, and repair is now under way for the stations near Cordova. In addition to repair and routine maintenance on the telemetered seismic network (Fig. 1), one additional station is planned for Juneau. This station will utilize a currently unused frequency band on the NOAA Alaska Tsunami Warning Network phone line to Sitka, thus avoiding additional telemetry costs.

This summer's program also includes extensive effort in strong motion instrumentation. Figure 2 shows the strong motion stations in the Gulf of Alaska region. We have an agreement with the USGS Seismic Engineering Branch to fund the maintenance of 12 of the Alaskan strong motion instruments, as 12 new instruments were purchased and installed in Alaska with OCSEAP funds during FY 75. John Rogers will service 8 of the 12, those that are within our telemetered seismic network. Funds have been transferred to the Seismic Engineering Branch for servicing of the remaining four, one on Middleton Island, one in Kodiak, and two on the Kenai Peninsula. The six existing strong motion instruments located at remote sites, including two recently transferred from Shell Oil Company to the USGS, will be maintained and checked for possible triggers. Five more remote instruments will be installed this summer.

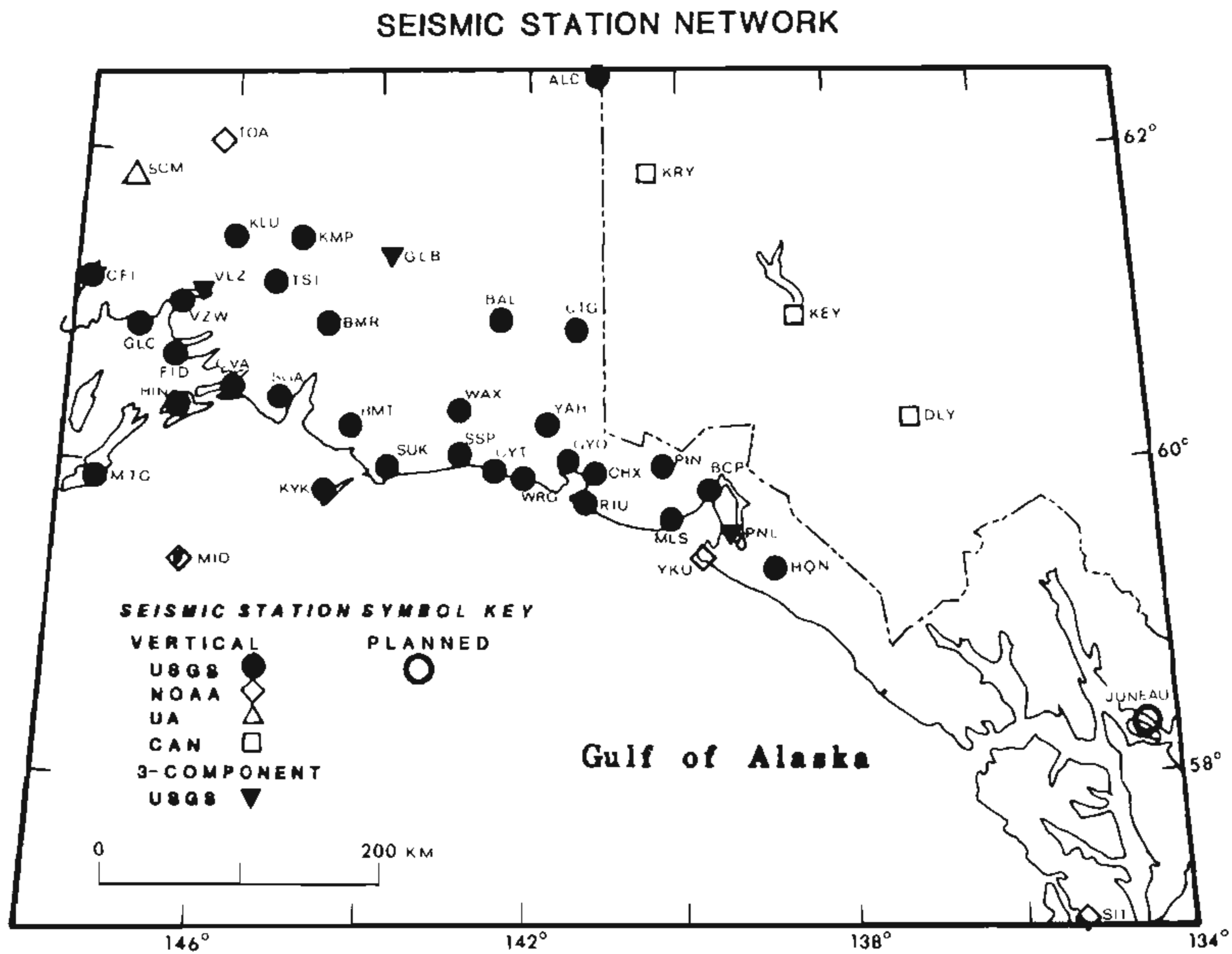


Fig. 1. Eastern Gulf of Alaska seismic stations funded in part by OCSEAP, (solid circles and triangles), station to be installed at Juneau, (open circle) and other regional stations operated by NOAA, the University of Alaska (UA), and the Canadian Department of Energy, Mines and Resources (CAN).

STRONG MOTION STATIONS

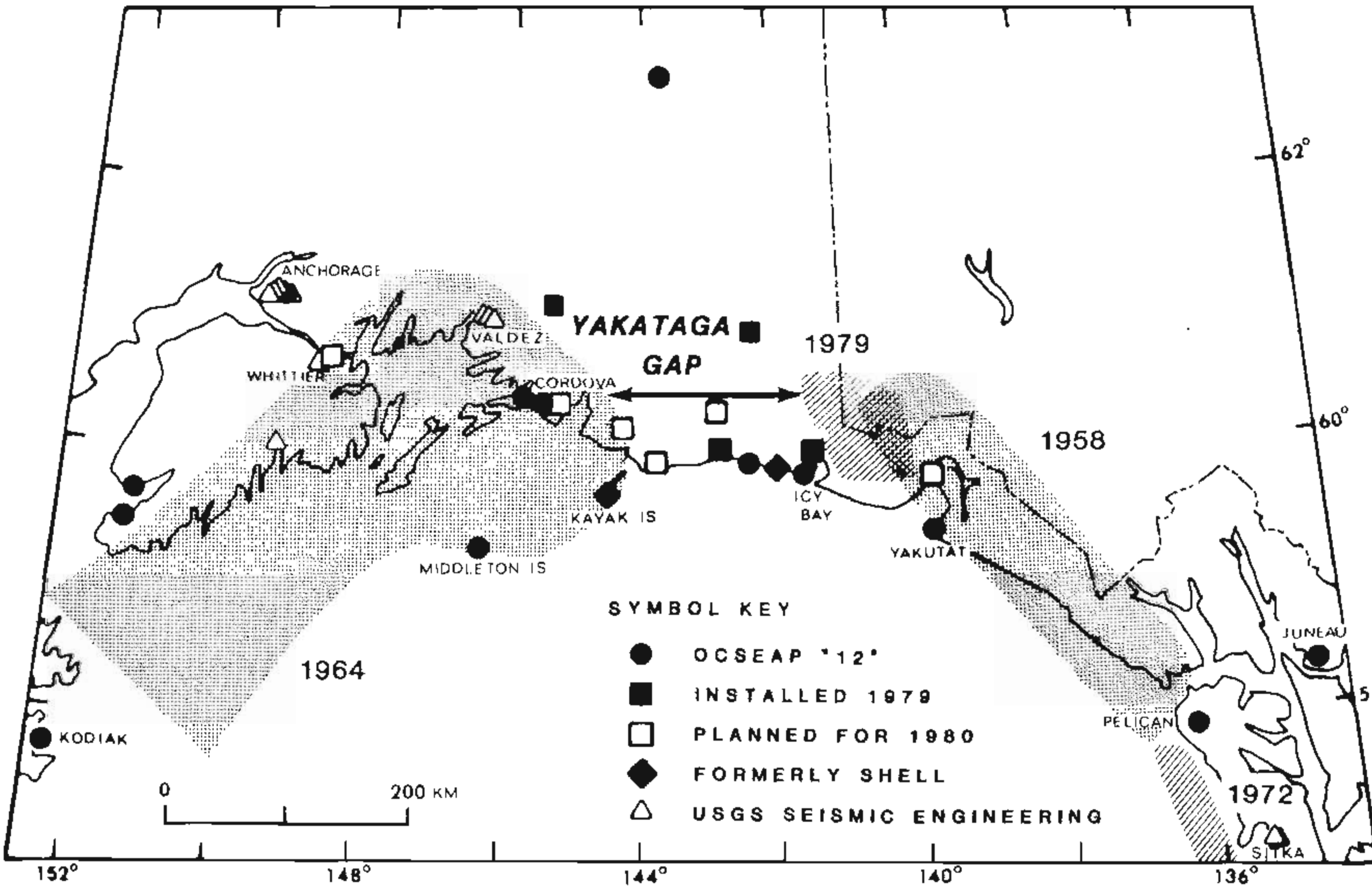


Fig. 2. Strong motion stations operated along the Gulf of Alaska. All but the USGS Seismic Engineering Branch stations (triangles) are maintained with OCSEAP funds. Approximate extent of aftershock zones of large earthquakes along the Gulf of Alaska since 1901 (after Sykes, 1971, and Stephens and others, 1980) are shaded.

A telemetering strong motion instrument, Kinemetrics Model SMA1A, will be installed at Whittier. This will give us an opportunity to gain some experience with this style instrument. If it works well, we may install the SMA1A at a remote telemetered site and use the input switching capability of the amplifier-voltage-controlled-oscillator (A1VCO) to automatically switch to the SMA1A when the high sensitivity geophone is saturated.

B. Scientific and Field Party

Robert Cancilla, USGS, PSA
Greg Condrotte, USGS, Physical Science Tech (PST)
Kent Fogleman, USGS, Geophysicist
Jane Freiberg, USGS, PSA
Suzanne Helton, USGS, Physical Science Aid
John Lahr, USGS, Geophysicist, Project Chief
Jan Melnick, USGS, PSA
Jack Pelton, USGS, Geophysicist
John Rogers, USGS, Electronics Engineer
Christopher Stephens, USGS, Geophysicist
Roy Tam, USGS, Mathematics Aid
Brenda Romes, USGS, PSA
William Wong, USGS, Electronics Engineer

C. Laboratory Activities

Since last April's Annual Report, an extensive report on the aftershocks of the St. Elias, Alaska earthquake of 1979 was written and submitted to the Bulletin of the Seismological Society of America (Stephens and others, 1980b). The paper by Lahr and Plafker (1980) on the regional tectonic framework of southern Alaska has been revised and accepted for publication by Geology.

John Lahr attended the Ewing Symposium on Earthquake Prediction at New Paltz, New York during May and presented a paper on seismicity patterns prior to the 1979 St. Elias earthquake (Lahr and Stephens, 1980).

D. Sample Localities

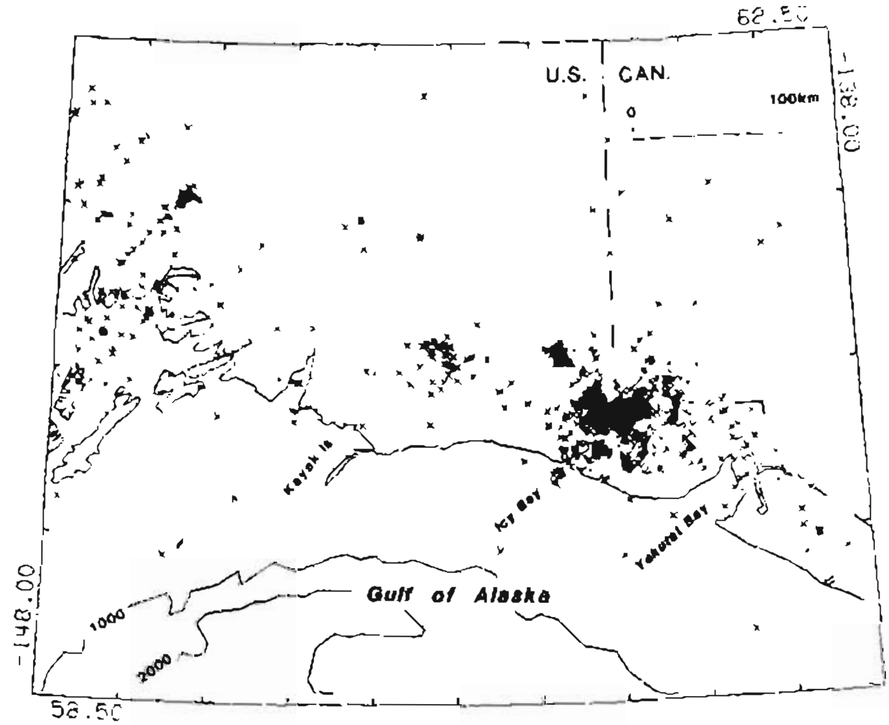
A map of seismic stations operated by the U.S. Geological Survey in the Eastern Gulf of Alaska from July through September 1979 is shown in Figure 1. Data from this network is routinely supplemented by readings from four regional Canadian stations.

E. Data Collection and Analysis

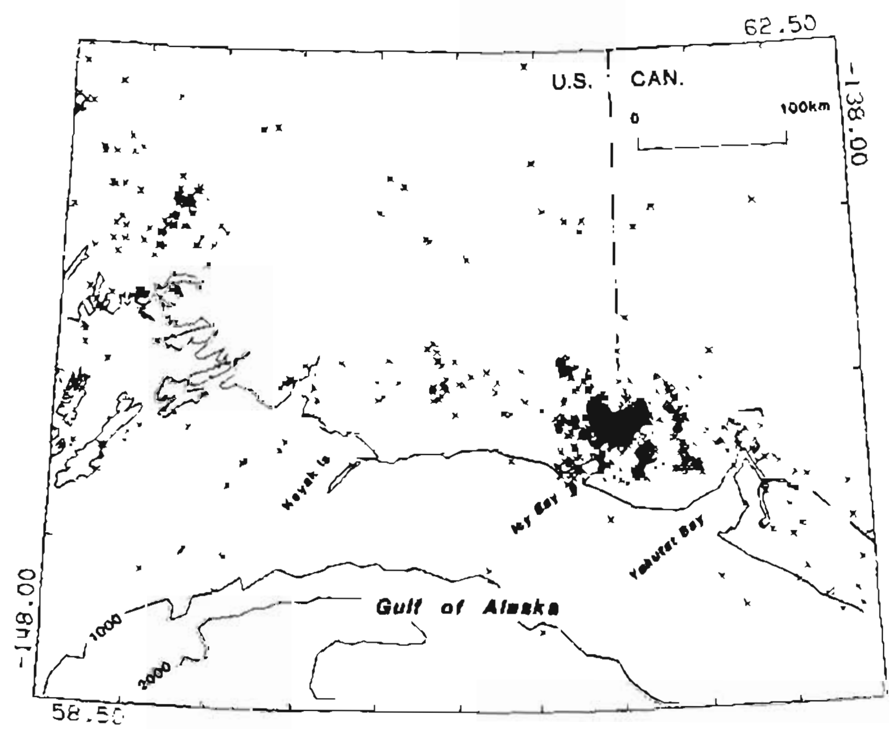
The processing of data for October-December 1979 has been completed in catalog form (Stephens and others, 1980a) and preliminary locations are complete for January-March 1980.

IV. and V. RESULTS AND PRELIMINARY INTERPRETATION

The locations for 1097 earthquakes that occurred during October-December 1979 and 971 earthquakes that occurred during January-March 1980 are shown in Figure 3. The two largest earthquakes that occurred during



SOUTHEASTERN ALASKA EARTHQUAKES, 1 OCT - 31 DEC 1979



SOUTHEASTERN ALASKA EARTHQUAKES, 1 JAN - 31 MAR 1980

Fig. 3. Seismicity in the Eastern Gulf of Alaska region during October 1979 through March 1980.

these six months were of magnitude 4, and 28 events had magnitudes of 3 and larger. During both quarters, aftershocks of the 1979 St. Elias earthquake predominate. The aftershocks continue to occur in spatial clusters, rather than being uniformly distributed over the inferred fault plane.

Other notable centers of activity are located north of Valdez and northeast of Kayak Island. A concentration of activity northeast of Kayak Island has been noted since the network was installed in 1974 and is of particular interest now, due to its location within the remaining Yakataga seismic gap (Figure 2). The gap is defined by the portion of the plate boundary that has not broken since at least 1900, in contrast to the adjoining regions. This gap is an important region for continued strong motion monitoring because of the relatively high probability of obtaining acceleration data close to a large earthquake. Records have never been obtained within 75 km of a magnitude 8 event or within 40 km of a magnitude 7 event. (Page and others, 1975). If such an event were to occur it would be important to have local telemetered stations to determine the exact configuration of the rupture surface as well as strong motion instruments at a range of distances and site conditions. Results of strong motion studies in this region are applicable to other areas of petroleum development.

VI. PROBLEMS ENCOUNTERED AND RECOMMENDATIONS

The amplifier-voltage-controlled-oscillator problems have been greatly reduced with the introduction over the past two years of the A1VCO (Rogers and others, 1980). The problem of radio telemetry failures continue to be of concern. At receive sites that have AC power we have begun introducing base station receivers made by General Electric. These radios have proved quite reliable and superior to the Motorola handi-talkie radios used elsewhere. We have also contacted a company that has agreed to design a low power radio pair to replace the handi-talkies. Prototypes are due to be delivered for checkout this summer.

VIII. REFERENCES AND PUBLICATIONS

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