PO-AK 83

, 4280

INTERIM REPORT

ALASKA OUTER CONTINENTAL SHELF METEOROLOGY

Contract NA83-ABC-00166
Research Unit 519
Reporting Period April 1983 - December 1983

by

Thomas L. Kozo
Research Scientist

VANTUNA Research Group

A. TASK OBJECTIVES

1. Prepare a model analysis of nearshore winds for both winter and summer conditions showing orographic and thermal contrast effects on the areas off the Yukon Delta.
2. Estimate extreme wave and icing conditions in the St. George and Navarin Basins.
3. Prepare a synopsis of relevant meteorological events which presaged or accompanied significant ice movements as established by satellite data.
4. Provide meteorological support to an ecosystem study at Peard Bay.
5. Analyze data from buoys drifting on ice floes and relate their motion to synoptic pressure fields.
6. Begin a study of the effect of headlands on coastal wind fields.

B. FIELD ACTIVITIES AND MEETINGS

1. See Appendix A which covers the summer Peard Bay Field Program. (item A4, above).
2. Participated in the Chukchi Sea Studies Coordination Meeting in Seattle, 12-14 June 1983.
3. Participated in the Chukchi Sea OCSEAP meeting at Alyeska Resort in early November 1983.

C. STATUS OF WORK IN PROGRESS

The task objectives are covered according to the numbering system in A (above].

1 & 6. The Yukon Delta region is an area where physical data is generally sparse. However, there are meteorological data bases within 200 km allowing for extrapolation of conditions. The summer 1980 OCSEAP wind study at Harrison Bay (shape is inverse of a delta) and the summer of 1982 Beaufort Lagoon Study (LGL) have already yielded evidence on the thermal effects of coastlines with convex or concave curvature. These data are being applied to the Yukon Delta region. In general, convex coastal curvature will concentrate both incomming ocean wave energy and thermally generated wind energy. At present, open water buoy drift data in the near shelf region. From the summer of 1983 (U.S. Coast Guard project) is being analyzed in the Barter Island area for headland and for orographic effects. The distance that orographic effects project seaward (in some cases 100 km) in the winter and late spring are being analyzed from buoy drift data covering February through July 1982 (NSF grant). In addition Flow Research Buoy drift data from the Norton Sound area itself will be examined.

2. Estimates of extreme wave heights and icing conditions have been made for the St. George and Navarin Basins. The icing and wave height report, along with a narrative (for the Navarin Basin) were sent to Laurie Jarvela in late November for use in an OCSEAP report. Maximum significant wave heights

of 13 m and 16 m in the month of February were calculated for the Navarin and St. George Basins respectively from historical wind data. Superstructure icing was seen to exist from October through April under 28 knot winds (onset of gale , force) and otherwise ❑ean environmental conditons for the Navarin Basin. The dangerous months for accumulation in the Navarin are December through April. St. George Basin showed superstructure icing from December through April under mean environmental conditions pulsed with 28 knot winds. Dangerous accumulation under these same conditions occurred only in February for St. George Basin. Increasing the windspeed and using extreme environmental conditions extended the icing possibility season and dangerous accumulation spans for both Basins.

3 & 5. At present a 4-year relevant meteorological data base (from atmospheric pressure networks) exists for the Alaskan Chukchi and Beaufort coastal areas capable of reproducing geostrophic winds. For time periods prior to 1979, an analysis of twice daily National Weather Service (NWS) surface pressure charts is possible. These charts have been recorded and put on microfilm at the National Climatic Center (dating back at least 20 years). Dr. Bill Stringer (University of Alaska) has presently given me a list of significant ice “breakout” events in the Bering Strait area dating back to 1974. These events will be matched to NWS pressure charts and initial analysis of some 1982 data looks promising. In addition, Dr. Stringer is

searching for Chukchi and Beaufort ice edge events that are consecutive and capable of quantitative analysis when matched with my own on NWS data. Analysis of position data from buoys on nearshore drifting ice floes has begun using a satellite transmitting unit deployed by this investigator in the Beaufort Sea under a NSF contract (with NOS helicopter aid). The coincident driving geostrophic winds are being calculated at this time. The R.U. 519 Final Report for 1980 has ice edge and floe movement depicted for 27 July through 7 August 1979. The buoy data from Flow Research has not yet been related to meteorological events.

4. Meteorological support for the Peard Bay study and the nearshore region of the Chukchi coast was provided from late July to 10 October 1983. The time period of data accumulation was double the original proposed time period. This data was reduced and analyzed in time for the 1 November 1983 Chukchi Sea Meeting at Alyeska Resort. At this meeting S.A.I. and EG & G representatives were given copies of the meteorology data. Also, conferences with the summer 1983 principal investigators showed an apparent correlation of wind direction, with both nearshore current direction and temperature and salinity changes within Peard Bay.

In addition, analysis of 1982 Chukchi Sea data was done under this 1983 contract as requested by Mauri Pelto and Jody Hilton.

D. REFEREEED PUBLICATIONS RELATED TO OCSEAP WORK

1. Evidence for sea breezes on the Alaskan Beaufort Sea Coast, Geophys. Res. Letters 6, 849-852, 1979.
2. Mountain Barrier Baroclinity Effects on Surface Winds Along the Alaskan Arctic Coast, Geophys. Res. Letters 7, 377-380, 1980.
3. An observational study of sea breezes along the Alaskan Beaufort Sea Coast: Part I, J. Appl. Meteor., 12(7), 891-905, 1982.
4. A mathematical model of sea breezes along the Alaskan Beaufort Sea Coast: Part II, J. Appl. Meteor., 12(7), 906-924, 1982.
5. Initial model results for arctic mixed layer circulation under a refreezing lead, J. Geoph. Res., 88, 2926-2934, 1983.
6. Mesoscale wind phenomena along the Alaskan Beaufort Sea Coast. The Alaskan Beaufort: Ecosystem and Environment, E. Reimnitz, P. Barnes, and D. Norton, Eds., Academic Press, San Francisco, in press, 1984.

E. RELATED CONTRACT WORK OTHER THAN R.U. 519

1. NSF--Mountain Barrier Baroclinity, 1 May 1981 to 1 May 1982.
2. LGL--Yukon Delta physical environment, 1983.
3. Us. Coast Guard--Geostrophic wind calculation for buoy drift, Beaufort, summer 1983.

F. ESTIMATE OF FUNDS EXPENDED

1. As of 30 November 1983, expenditures are $81,500.40.
2. Additional costs due to extra work, mainly incurred by long field season were $9,344.69.

APPENDIX A

CHUKCHI SEA FIELD TRIP REPORTS

Sumner of 1983

R.U. 519

by

Thomas L. Kozo and Mike Owen

Occidental College
VANTUNA Research Group
1600 Campus Road
Los Angeles, CA 90041

FIELD TRIP REPORT
21 July - 3 August 1983

by Mike Owen

The field group was composed of Thomas Kozo and Mike Owen. The group objectives were:

1) Deploy one self-contained mechanical weather station, (MWS, manufactured by Meteorology Research, Inc.) at the Wainwright DEW site;

2) Deploy one MWS and one satellite transmitting weather station (STWS, manufactured by Polar Research Lab) at the Peard Bay abandoned DEW landing strip;

3) Service and recalibrate a STWS already located at Franklin Bluffs ;

4) Service and recalibrate a STWS already located at Icy Cape;

5) Service and recalibrate a STWS located at Utukok River;

6) Collect weather data recorded by Wainwright DEW personnel;

7) Calibrate pressure equipment at the Barrow National Weather Service (NWS) office.

8) Install solar radiation sensor near the Naval Arctic Research Lab (NARL) site at Pt. Barrow.

Below is a chronological summary of the operations accomplishing these objectives:

21 July Arrived at Prudhoe Bay. NOAA truck was used to drive to Franklin Bluffs to check operation of the STWS and measure the size of the lithium battery for future replacement.

22 July Departed Prudhoe Bay for Barrow via Cape Smythe Air. Unable to use NOAA helicopter because of space limitations. Pilot: LaBonte, Mechanic: Accurso. Once at NARL, Pt. Barrow equipment was checked and unpacked for deployment.

23 July Our portable barometric pressure sensors were calibrated against the Barrow (NWS) mercury barometer. Unable to deploy Wainwright and Peard Bay weather stations due to unavailability of NOAA helicopter. Helicopter utilized in the transportation of equipment and personnel to the camp on Franklin Spit adjacent to Peard Bay.

24 July NOAA helicopter used to deploy one MWS at Wainwright DEW site. NOAA helicopter unavailable for further work due to other commitments.

25 July NOAA helicopter unavailable due to pilot change over and marginal weather conditions. Pilot: Vandenberg, Mechanic: Accurso.

26 July NOAA helicopter used to deploy MWS and STWS at Peard Bay abandoned DEW line site air field. Pyroheliograph (radiation sensor) installed at Pt. Barrow (NARL) site.

27 July Depart NARL via NOAA helicopter to retrieve, STWS from Utukok River and Icy Cape areas. Stations repaired, serviced and recalibrated at Cape Lisburne AFB.

28 July Depart Cape Lisburne AFB via NOAA helicopter to re-deploy STWS at Icy Cape and Utukok River locations. MWS operation checked at Wainwright DEW site during helicopter refueling. Return to NARL.

29 July Thomas Kozo departed Pt. Barrow via Cape Smythe Air for Prudhoe Bay. Once at Prudhoe Bay he used a NOAA truck for transportation to Franklin Bluffs to replace the lithium battery in the STWS.

30 July Thomas Kozo departed Prudhoe Bay for Los Angeles. Mike Owen packed equipment for storage at NARL, Pt. Barrow.

1 August NOAA helicopter unavailable due to weather and logistical restrictions.

2 August Mike Owen used the NOAA helicopter to service previously deployed MWS at" Peard Bay and Wainwright locations. Meteorological data collected from Wainwright DEW site for the time period 24 July to 8 August 1983. Weather was poor and objectives were accomplished mainly due to the skill of NOAA pilot and crew, Vandenberg and Accurso.

3 August Mike Owen departed Pt. Barrow for Los Angeles.

All objectives accomplished. We would like to thank the people stationed at NARL, Pt. Barrow and Cape Lisburne AFB. Their help was much appreciated.

FIELD TRIP REPORT
31 August - 4 September 1983

by Thomas L. Kozo

The field party consisted of Thomas L. Kozo alone. The objective of the trip was to check the status of the already field deployed meteorological instruments in the Peard Bay area. The field experimental period was extended into the month of September.

Chronological Summary:

Helicopter pilot: Davis, Mechanic: Dehart

31 August	Departed Los Angeles for Alaska
1 September	Arrived 3 pm in Barrow. It was too late to fly with an 8:30 pm sunset.
2 September	Installed new data tapes in the MWS at Peard Bay and Wainwright. Used NOAA helicopter as transportation for this work. Collected pyroheliograph readout from station at NARL.
3 September	Departed Barrow for Anchorage
4 September	Departed Anchorage for Los Angeles.

FIELD TRIP REPORT
27 September - 2 October 1983

By Mike Owens

The field group was composed of Thomas Kozo and Mike Owen. The group objectives were:

1) Retrieve one Mechanical Weather Station (MWS) from the Wainwright DEW site;

2) Retrieve one MWS and one STWS from the Peard Bay site near the air strip;

3) Collect barometric pressure data from the Barrow NWS station.

Below is a chronological summary of the operations accomplishing these objectives:

27 Sept. Arrived at Anchorage. Rental car used for transportation while in the Anchorage area. Our equipment had been inadvertently shipped from NARL (Pt. Barrow) to Anchorage and stored at Elmendorf AFB (in NOAA facilities) earlier this month. We therefore had to pack and ready this equipment for re-shipment to Pt. Barrow. The NOS truck was used for transportation of equipment between Elmendorf AFB and Anchorage Air Terminal. Equipment and supplies for the task were supplied by Lt. Joe Talbot of NOS. Equipment was repackaged and shipped to NARL, Pt. Barrow via commercial air carrier.

29 Sept. After determining that the equipment reached Barrow Alaska, Thomas Kozo and Mike Owen departed for Pt. Barrow (NARL). Once there, they checked and readied equipment now stored at NARL .

30 Sept. Cape Smythe Air Twin Otter used for transportation. Retrieved one MWS and also collected meteorological data for dates 9/2/83-9/30/83 from Wainwright DEW site. Retrieved one MWS and one STWS from Peard Bay DEW site air strip.

1 Oct. Collected barometric pressure data for dates 7/15/83-10/1/83 from Barrow NWS Station. Packed equipment and data for shipment.

2 Oct. Shipped equipment to Los Angeles. Thomas Kozo and Mike Owen departed Pt. Barrow.

Field trip objectives were accomplished. All equipment and data were retrieved in good condition. We would like to thank Lt. Joe Talbott and his staff for assistance while in Anchorage. Their foresight in having all the supplies needed for rapid reshipment of our equipment to Pt. Barrow was much appreciated.