

Figure 2. Location of frontal boundaries north of Elephant Island from cross-shell CTD transects.

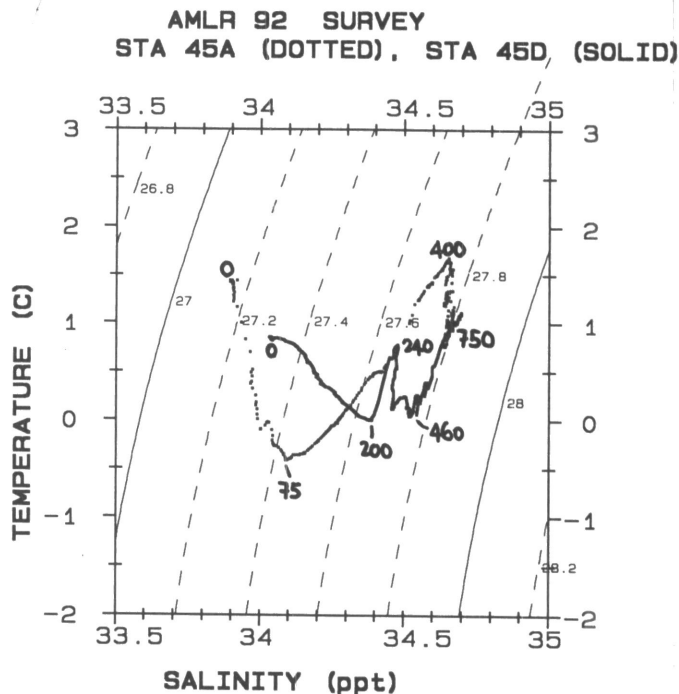


Figure 3. T/S relationship of water column at station 45 on 26 January and 3 March 1992. Depth of major T/S inversions are annotated on the curves.

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AMLR program: A comparison between the summer meteorological conditions at Seal Island and those over the adjacent waters of the Drake Passage

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Seal Island is the largest of a small group of islands located north of Elephant Island, the northernmost of the South Shetland Islands (see Rosenberg et al. for location map). It is the site

of an annual study of seals and penguins by the Antarctic Marine Living Resource (AMLR) program (Croll et al. this issue). The waters of the adjacent continental shelf and the Drake Passage are the primary study area of the AMLR program's fieldwork aboard the National Oceanic and Atmospheric Administration (NOAA) ship *Surveyor*. The University of Texas's program in physical oceanography is part of the AMLR multidisciplinary study of the distribution of krill (*Euphausia superba*). Our work has two major tasks: to study the hydrography of the upper water column as it relates to the observed distribution of the biological organisms (Helbling et al. in press; Amos and Lavender this issue) and to monitor the surface meteorological conditions that may affect the water structure (Amos this issue).

To accomplish the second task, continuous measurements of winds, air temperature, humidity, pressure, solar radiation parameters, sea temperature, salinity, beam transmission, and chlorophyll fluorescence are made while the ship is under way. This year a Coastal Climate automatic weather station was installed on Seal Island and operated from mid-December 1991 to mid-March 1992. Weather data were of interest for the seal and

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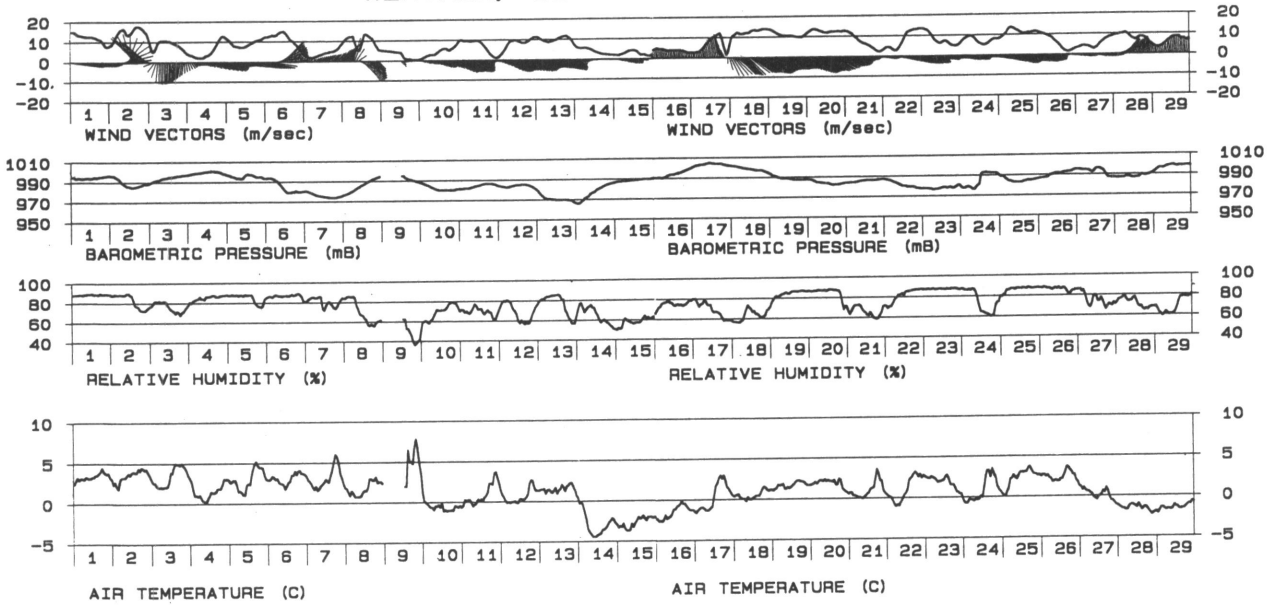


Figure 1. Time series weather data, Seal Island, February 1992. Top trace: wind speed and wind vectors (m.sec); north is up. Second trace: barometric pressure, reduced to sea level (mB). Third trace: relative humidity (percent). Bottom trace: air temperature (°C).

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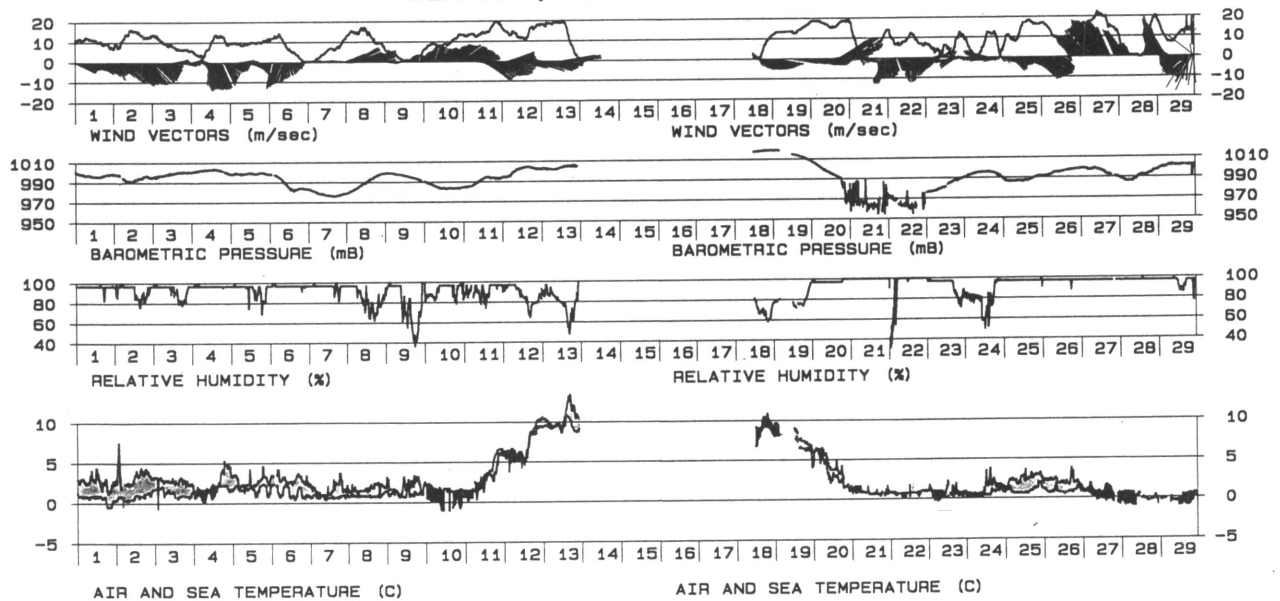


Figure 2. Time series weather data from AMLR underway equipment aboard *Surveyor*, February 1992. Traces as in figure 1, except bottom trace: air and sea temperature (°C); gray shading: air temperature greater than sea temperature; solid shading: sea temperature greater than air temperature. Gap in trace is when *Surveyor* was in port (Punta Arenas, Chile). Noise on pressure and humidity traces on 21 and 22 February is due to electronic interference.

penguin studies and also provided a comparison between a stationary "island" station and *Surveyor's* traveling "oceanic" station. The Seal Island Zeno weather station is located at an altitude of 120 meters at 60° 59.1' S 55° 23.1' W on an unobstructed hill above the encampment. The parameters measured were wind speed and direction, air temperature, humidity, and barometric pressure. In the Zeno, data are recorded internally at 10-

minute intervals using a microprocessor. The Seal Island crew downloaded data into a portable PC at approximately 2-week intervals.

Aboard *Surveyor*, a Coastal Climate Weatherpak shipboard weather system provides wind and air temperature data. The sensors are located 35 meters above sea level. Data from the ship's Global Positioning Satellite (GPS) navigation system and

Mean and extreme conditions on Seal Island and *Surveyor*

	Air temperature (°C)			Humidity (%)			Barometer (mb)			Winds (m.sec ⁻¹)		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
SEAL I (date)	9.1 2/09	-3.0 3/06	1.63	93 *	31 2/09	81.5	1016.1 3/03	973.6 2/07	991.9	19.6 2/02	0.0 *	3.1/060
SURVEYOR (date)	6.7 1/18	-4.0 2/10	2.21	100 **	68 2/10	94.4	1017.4 3/02	974.2 2/07	994.0	23.7	1.0	3.8/117

Note: Reading was obtained on several dates; **occurred on many dates. Mean wind directions are those to which the wind is blowing.

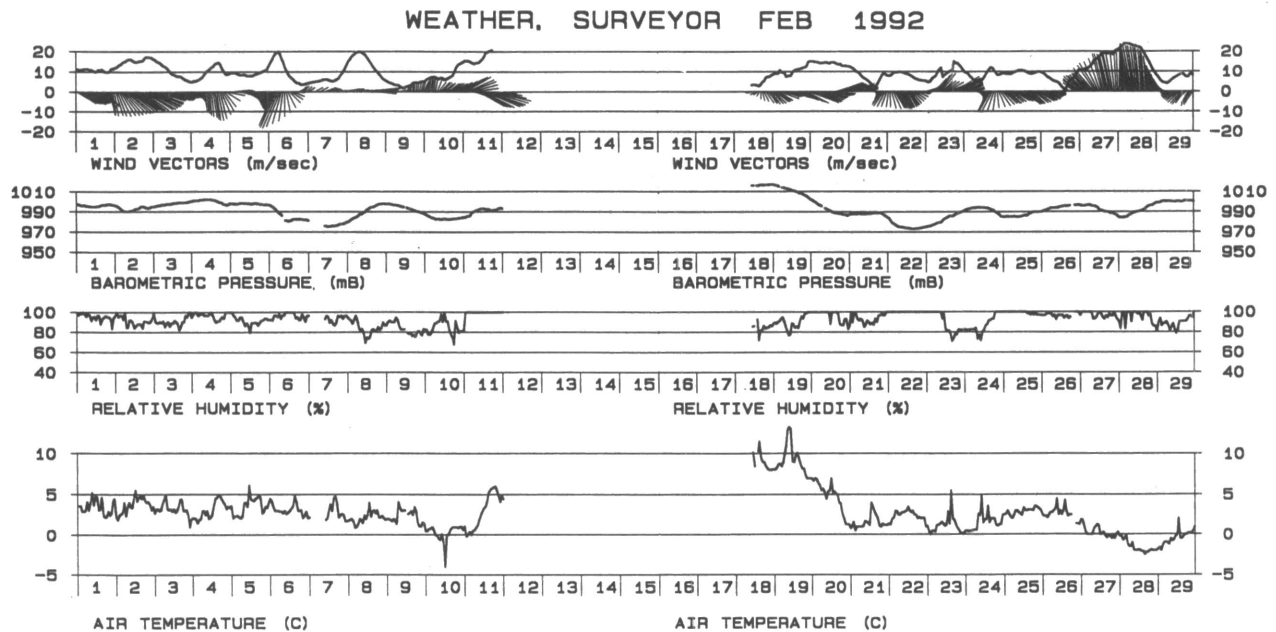


Figure 3. Time-series weather data from deck watch observations aboard *Surveyor*, February 1992. Traces as figure 1.

thermosalinograph are output to a shipwide local area network (LAN). Information is extracted from the LAN by a PC program developed by the author to integrate these data with data from several different environmental sensors for storage and real-time display and plotting. *Surveyor's* deck watch also manually records weather data on a standard deck log and daily weather observation sheet. Wind data are read from the Weatherpak display, but wet and dry bulb temperatures are obtained from a standard sling psychrometer and barometric pressure from the ship's aneroid barometer.

I compare here the February 1992 weather data from the Seal Island (figure 1) with those from the AMLR underway system (figure 2) and also with the data collected by *Surveyor's* deck watch (figure 3). These data have not yet been fully corrected. During February, *Surveyor* returned to Chile between legs 1 and 2, so comparable data were collected in the vicinity of Seal Island only from 1 through 10 February and 21 through 29 February. The most obvious similarity is in the atmospheric pressures which, when reduced to sea level for all three barometers (altitudes: Seal Island, 120 meters; AMLR, 10 meters; *Surveyor*, 10 meters), are identical within a millibar or so, with occasional phase lags of about an hour between the pressure measured on the ship and the pressure measured on Seal Island. Differences

can be seen in air temperature—with a much greater diurnal range on Seal Island than over the Drake Passage—lower humidity and wind speed, and directional variability. The table lists the mean and extreme conditions on Seal Island and *Surveyor* during the time the ship was near Elephant Island.

Surface humidity is important in remote satellite sensing, global climate (Liu et al. 1992), and ocean-atmosphere heat flux calculations (Hsu and Blanchard 1989). Over the southern ocean, few reliable humidity measurements have been made. One problem is the difficulty of measuring humidity in the near-freezing, near-saturation conditions encountered in antarctic seas. Our humidity sensor output on *Surveyor* frequently limited at 97.2 percent and stayed there for hours or even days. At first we believed that the sensor was malfunctioning, but comparisons between psychrometer readings that frequently showed both thermometers reading the same (i.e., 100 percent relative humidity) confirmed saturation (figures 2 and 3). Likewise, the humidity sensor atop the Seal Island hill appeared to limit at 93 percent (figure 1). These data will be used to explore ocean-atmosphere exchange processes, the effect of winds on the surface circulation, and the location of fronts that may bound krill populations. The Seal Island weather station was left in place, recording at 1-hour intervals. It will be recovered in December 1992.

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