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Sea Ice Conditions and Meteorological Observations at Saroma-ko Lagoon, Hokkaido, December 1997 - November 1998*,**

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Abstract : Long-term meteorological data have been collected at a permanently installed 5-m tower at a cape of Saroma-ko Lagoon to characterize the general meteorological and climatological features at the lagoon. A number of atmospheric boundary layer variables such as air temperature, wind azimuth and speed, and solar radiation obtained from the meteorological tower were reported during the period from December 1997 through November 1998. Freeze-up, breakup and duration of complete ice coverage of the lagoon have been also reported.

要旨 : サロマ湖は毎年冬期間結氷する。このサロマ湖のキムアネップ岬に設置された 5mの気象塔で通年の気象観測が行われている。このサロマ湖の 1977 年 12 月から 1988 年 11 月までの日平均気温、風速、日射量観測について報告する。また、1964 年から観測されている湖面の結氷状況について報告する。

Key words : Meteorological variables, sea ice, Saroma-ko Lagoon
キーワード: 気象要素, 海氷, サロマ湖

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I. Introduction

Saroma-ko Lagoon located on the Okhotsk Sea coast of Hokkaido is 149.2 km^2 in area, 19.5 m in maximum depth and 14.5 m in mean depth (Fig. 1). The lagoon has two inlets which are connected to the Sea of Okhotsk. About 90 % of the total inflow from the sea to the lagoon passes through the first inlet opened in 1927. The remainder passes through the second inlet which was built in December, 1978. The opening of the inlets might have caused changes in the water mass and current circulation of the lagoon, and in the exchange processes of the water between sea and lagoon waters. Also, freshwater input which is mainly supplied by two major rivers causes a reduction of salinity to less than 32 PSU. During winter most of the lagoon surface is covered with sea ice. The Saroma Research Center of Aquaculture in Sakaeura has been monitoring ice conditions at the lagoon for over thirty years. It is shown from year-to-year changes in the duration of complete ice coverage in the lagoon that the trend of variations appears to decrease for the past ten years (Fig. 2). The Saroma Research Center has been also operating a 5-m meteorological tower at the cape of Kimuaneppu (Fig. 1) in cooperation with the Sea Ice Research Laboratory of Hokkaido University to characterize the general meteorological and climatological features at the lagoon. In this report, time series of meteorological parameters during the period from December 1997 through November 1998 are shown. Time series data of meteorological variables were reported for the period from December 1991 through December 1992 by Shirasawa et al. (1993), for January 1993 through November 1995 by Shirasawa et al. (1995), for December 1995 through November 1996 by Shirasawa et al. (1996) and for November 1996 through November 1997 by Shirasawa et al. (1997).

II. Meteorological Data at Kimuaneppu

A location map of the meteorological tower at Kimuaneppu (44°06.08'N 143°56.12'E) is shown in Fig. 1. A thermometer, a pyrheliometer and a wind sensor were installed at the heights of 2.9, 4.2 and 5.0 m, respectively, of the 5-m tower set up at the cape of Kimuaneppu in 1989. Instantaneous values of those sensors were recorded at every 10 min and stored in a data acquisition system (Intelligent Data-Stocker DS-64K2 and LM-30K, Kona Sapporo Co.). The threshold value for the wind speed was 2 ms^{-1}. Time series of wind speed and azimuth, air temperature and solar radiation during the period from December 1997 through November 1998 at each month are shown in Fig. 3. Values for those graphs were obtained at a sampling interval of 10 min except for stick diagrams of wind vector on the uppermost frame in the figure, which were produced by data at a sampling interval of one

hour. Shown in Fig. 4 is a time series of wind rose at each month, indicating that the WNW wind along the Okhotsk Sea coast is predominant during the period from November through February. The duration of the complete ice coverage of the whole surface of Saroma-ko lagoon is shown in Fig. 2. In winters 1988/89, 1990/91, 1992/93 and 1996/97 the lagoon surface was not completely covered with sea ice.

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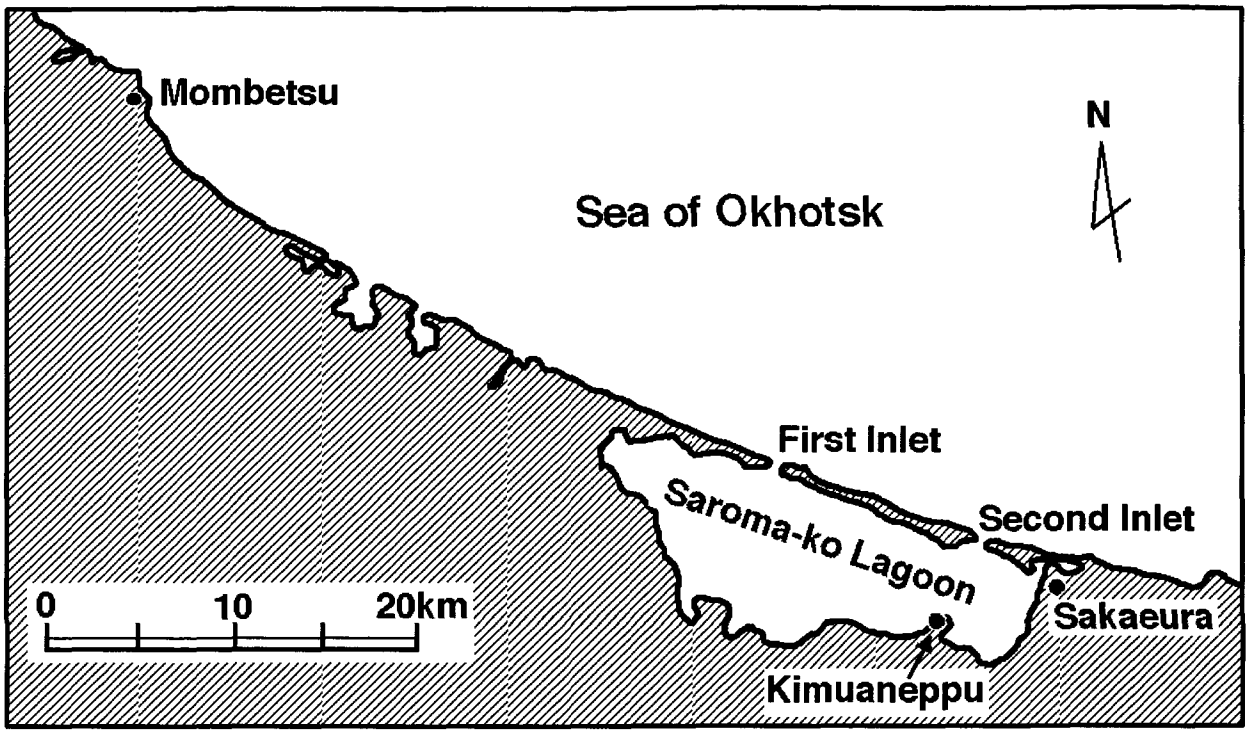


Fig. 1 A location map of Saroma-ko Lagoon.

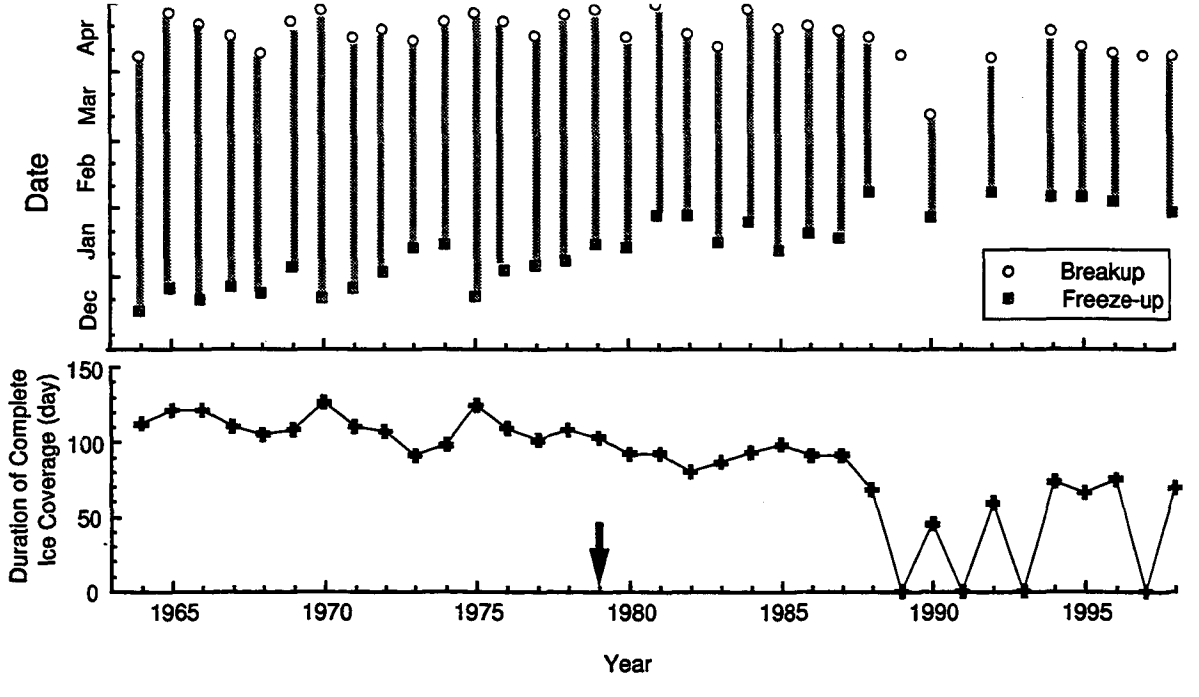


Fig. 2 Freeze-up, breakup and duration of complete ice coverage at Saroma-ko lagoon during the period from 1964 through 1998. The arrow indicates the date of the opening of the second inlet in December 1978.

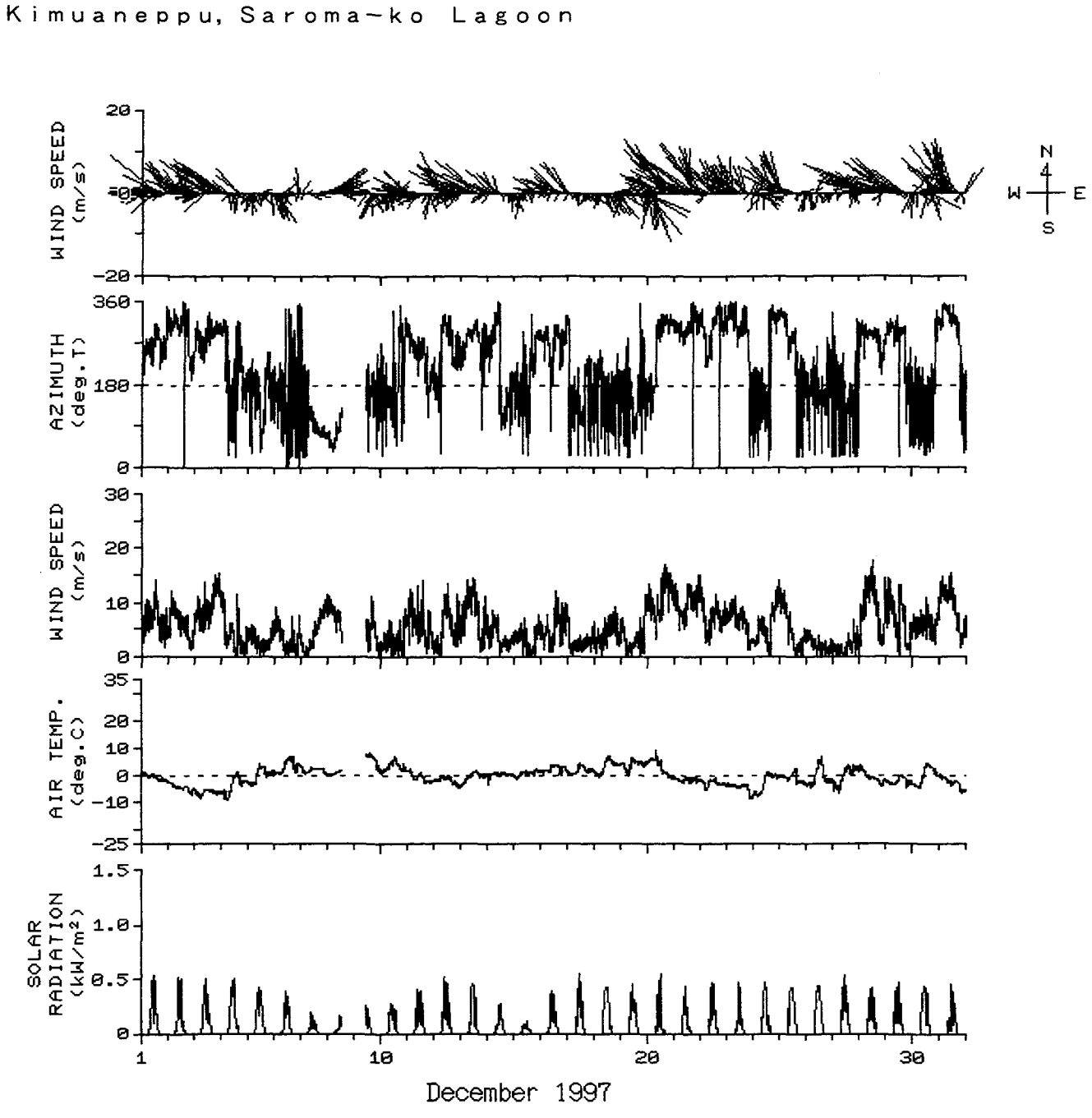
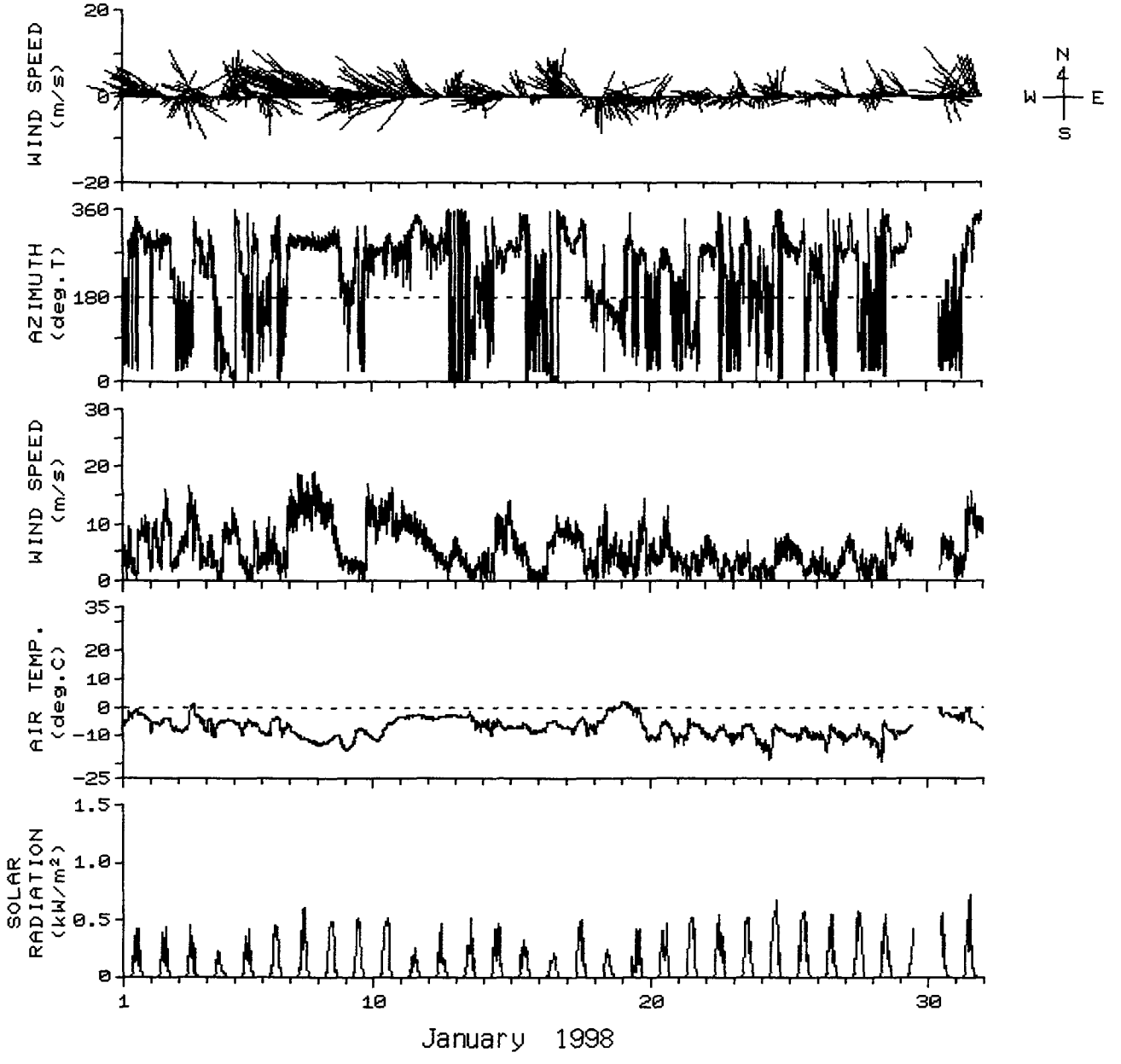
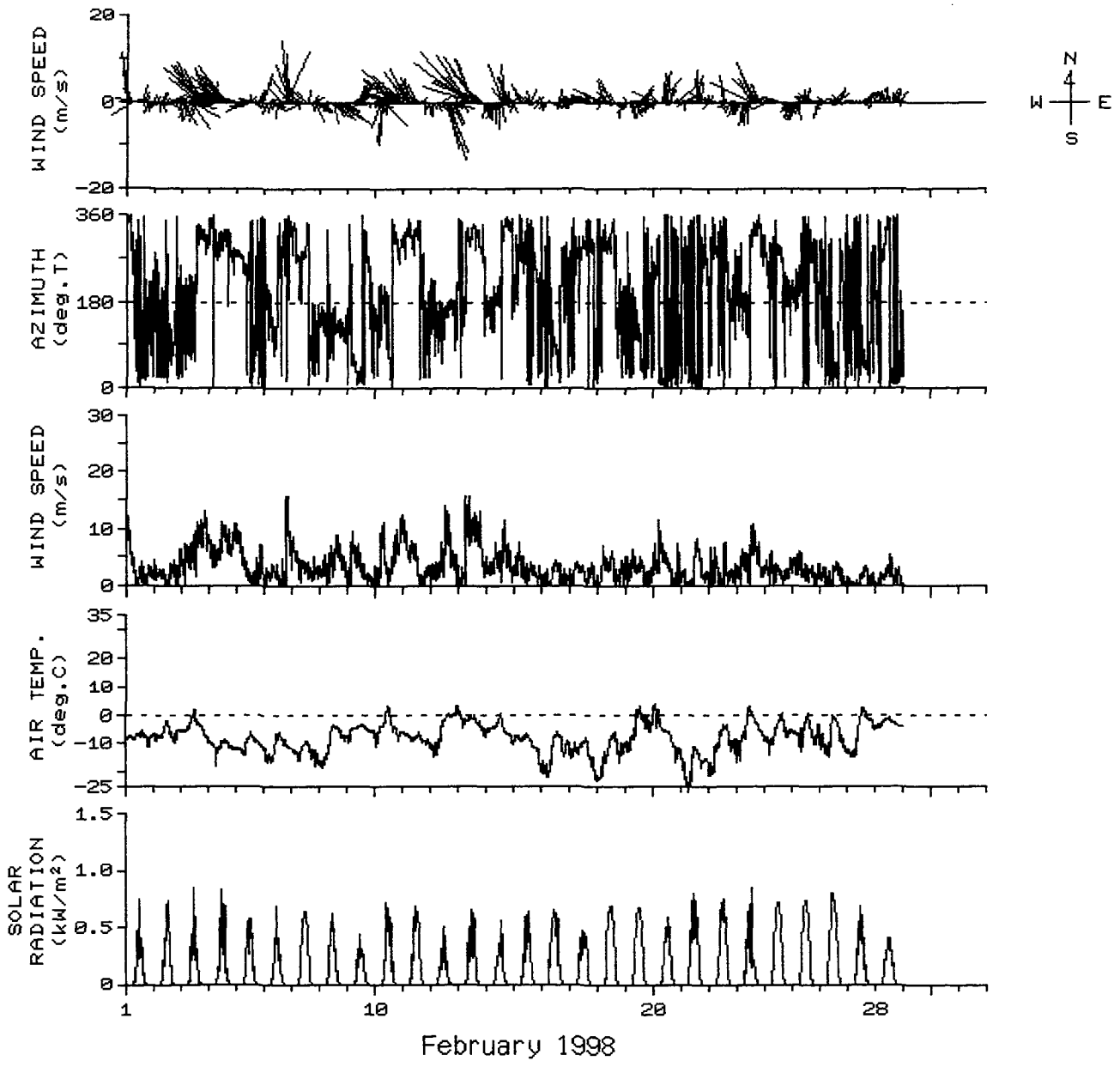


Fig. 3 Wind speed and azimuth, air temperature and solar radiation obtained during the period between December 1997 and November 1998 at Kimuaneppu.

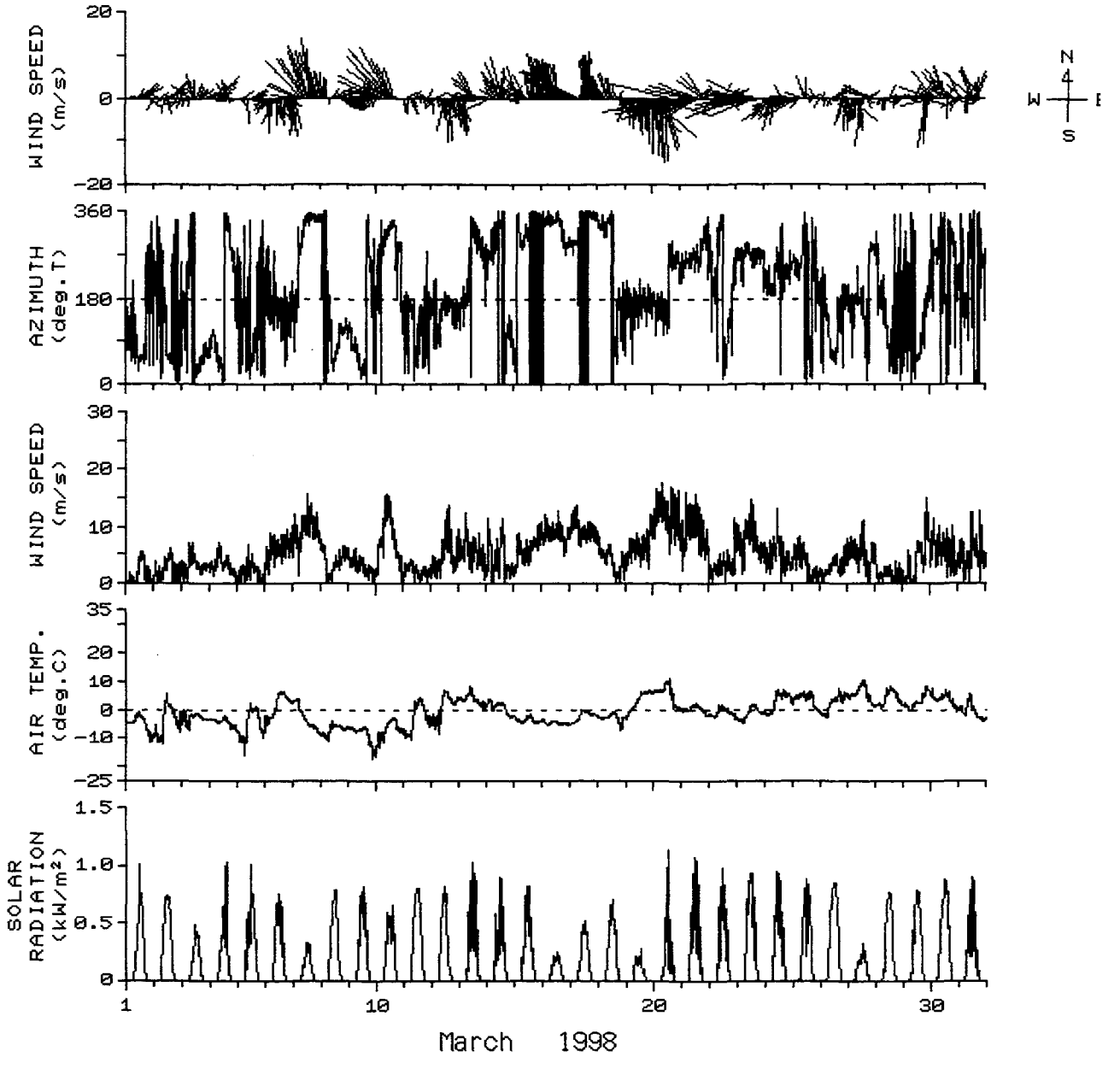
Kimuaneppu, Saroma-ko Lagoon



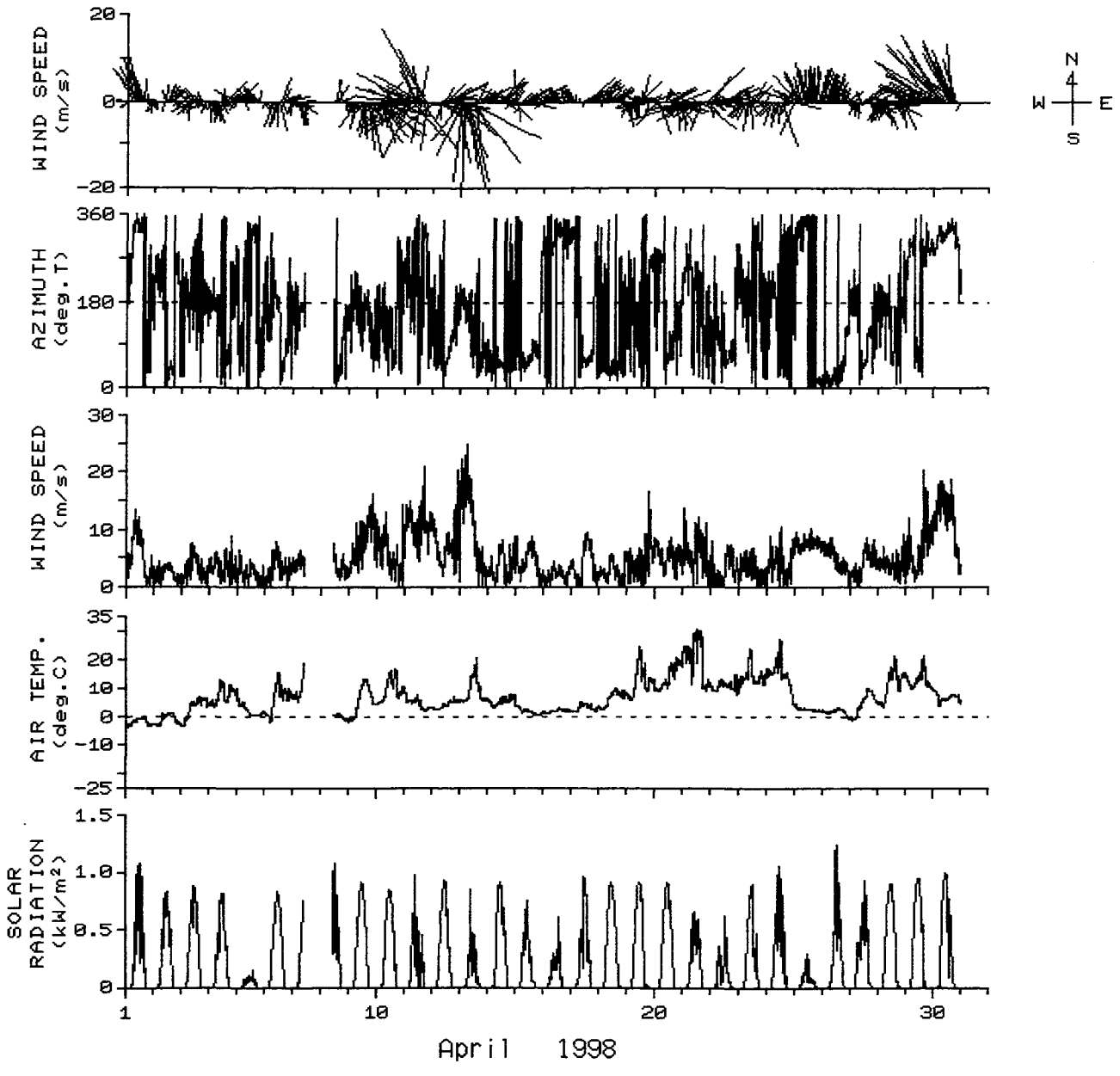
Kimuaneppu, Saroma-ko Lagoon



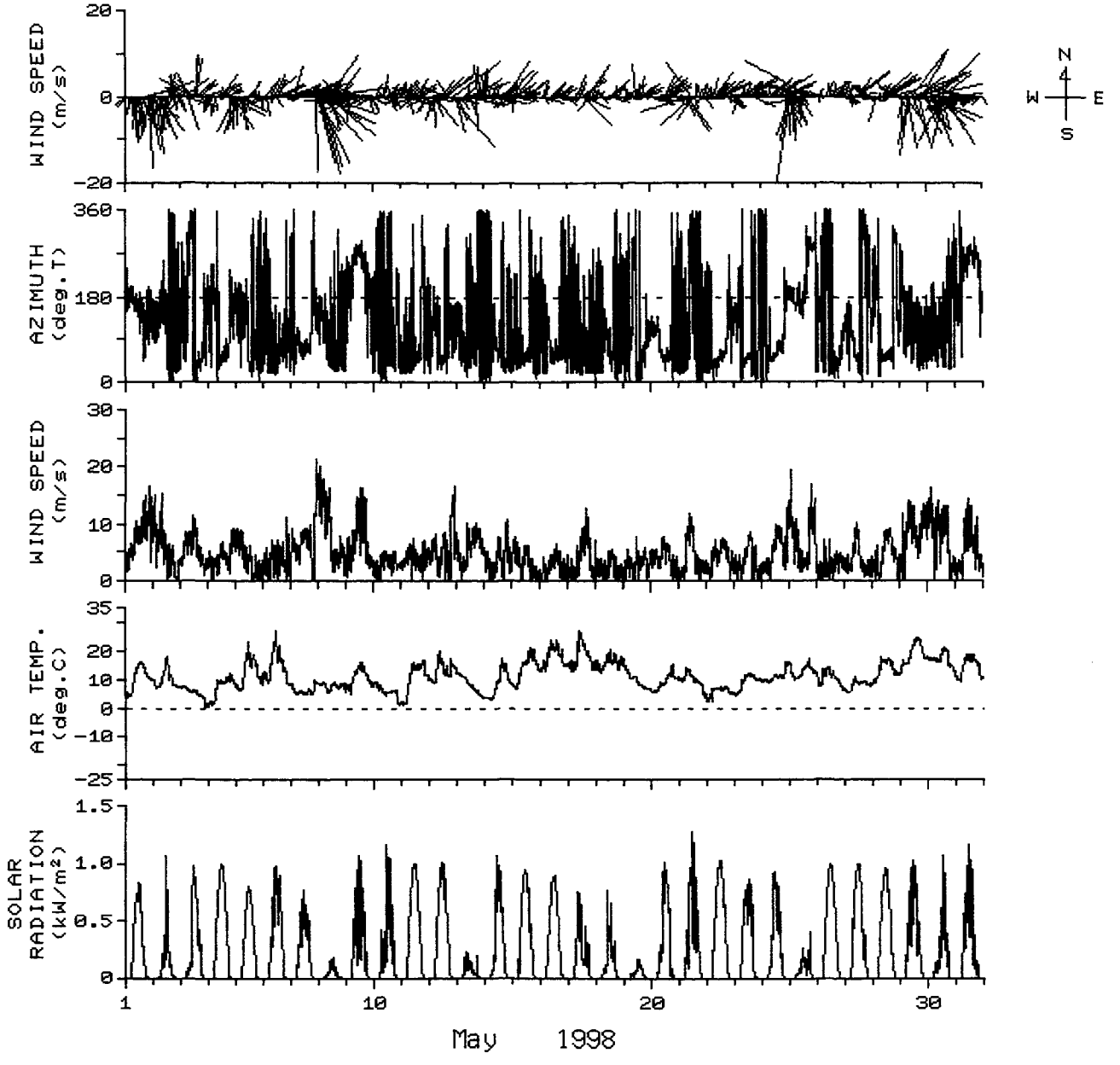
Kimuaneppu, Saroma-ko Lagoon



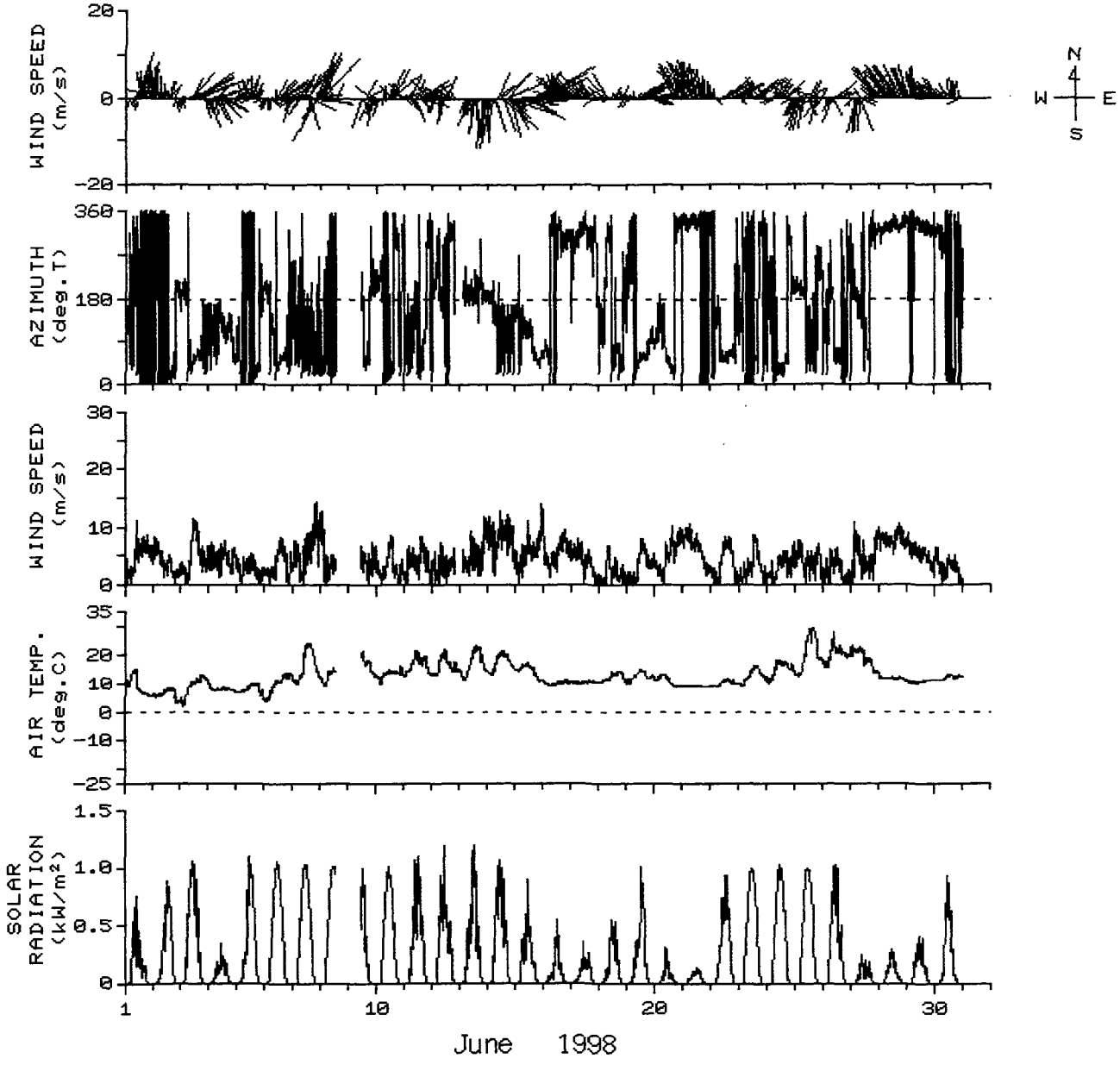
Kimuaneppu, Saroma-ko Lagoon



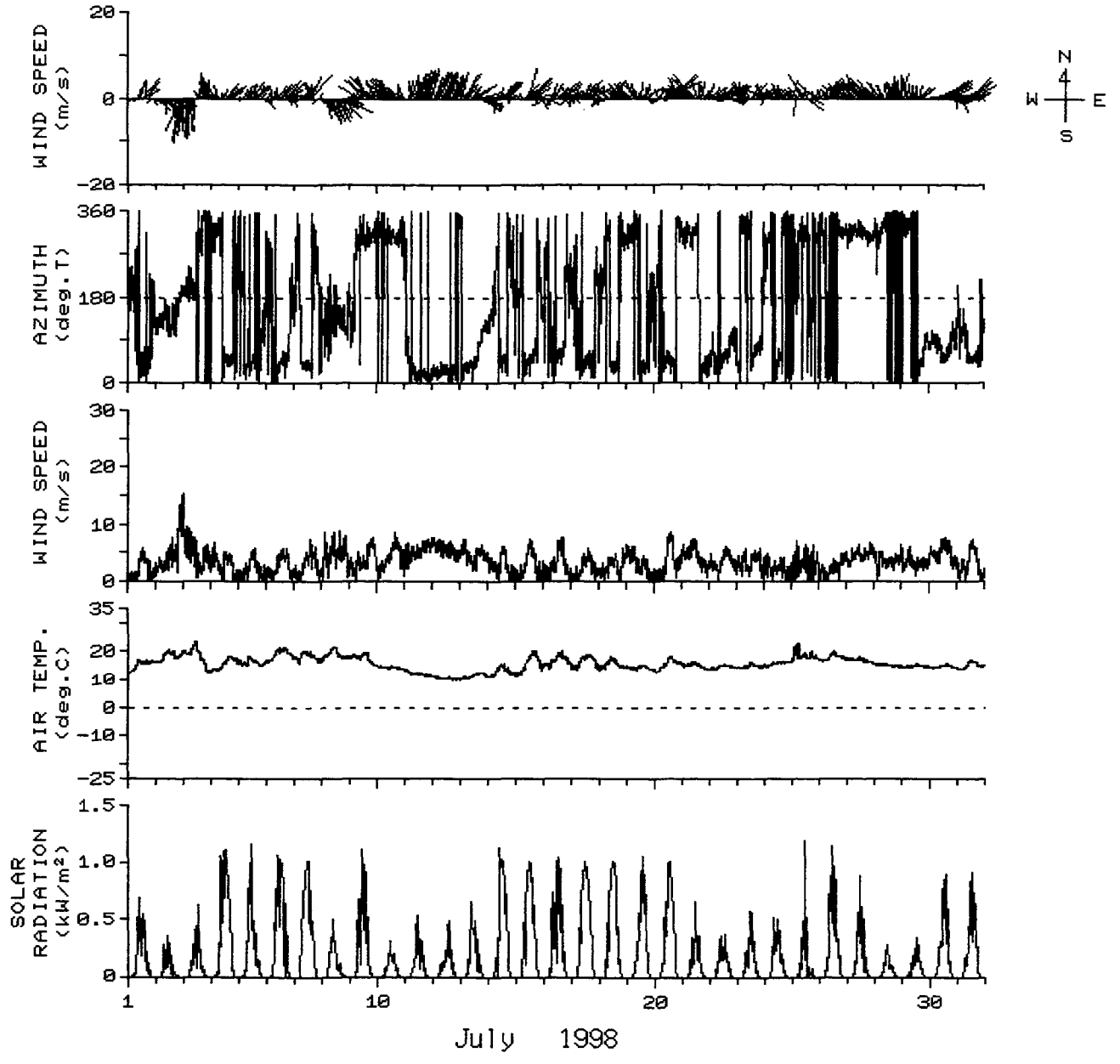
Kimuaneppu, Saroma-ko Lagoon



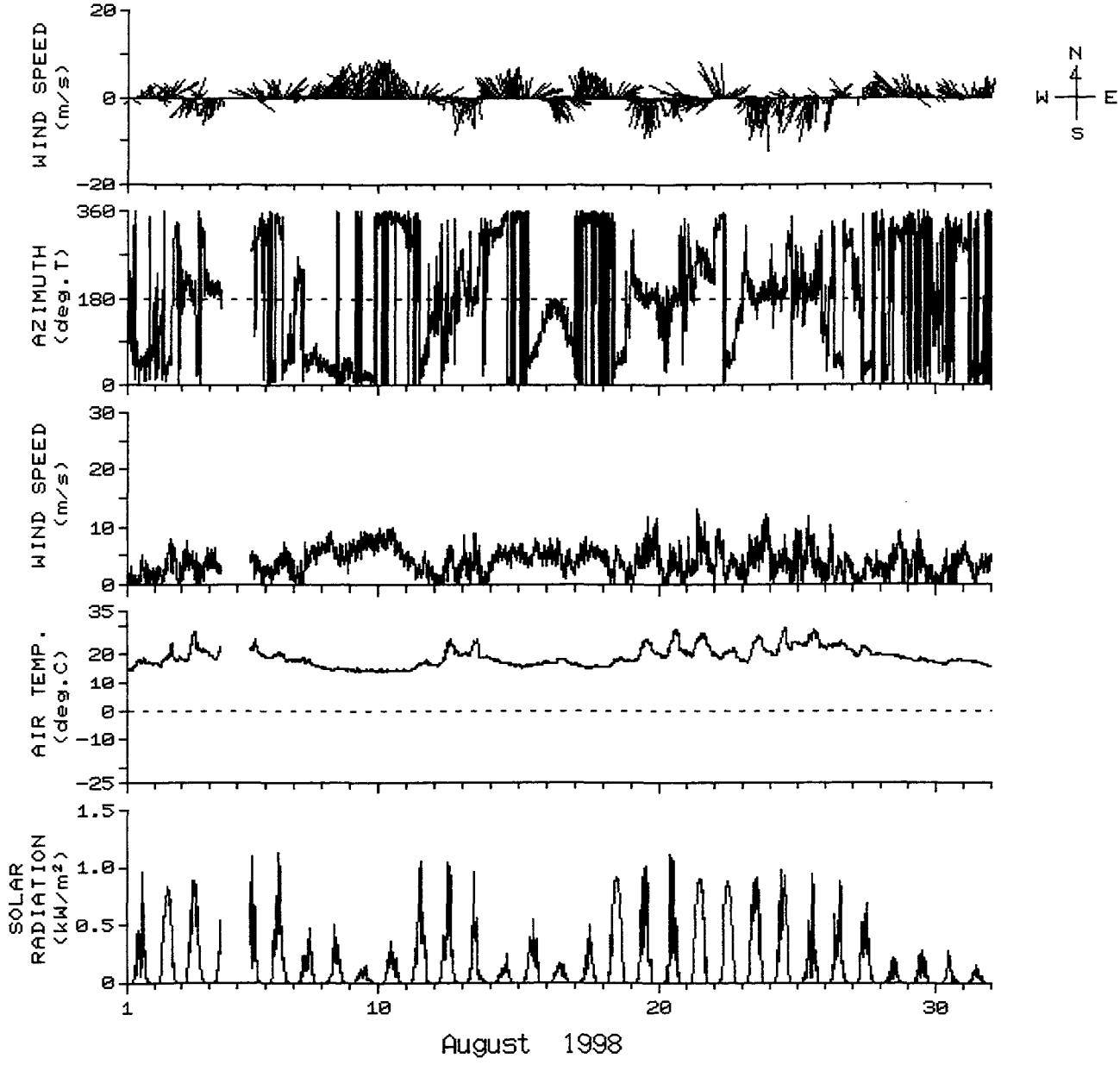
Kimuaneppu, Saroma-ko Lagoon



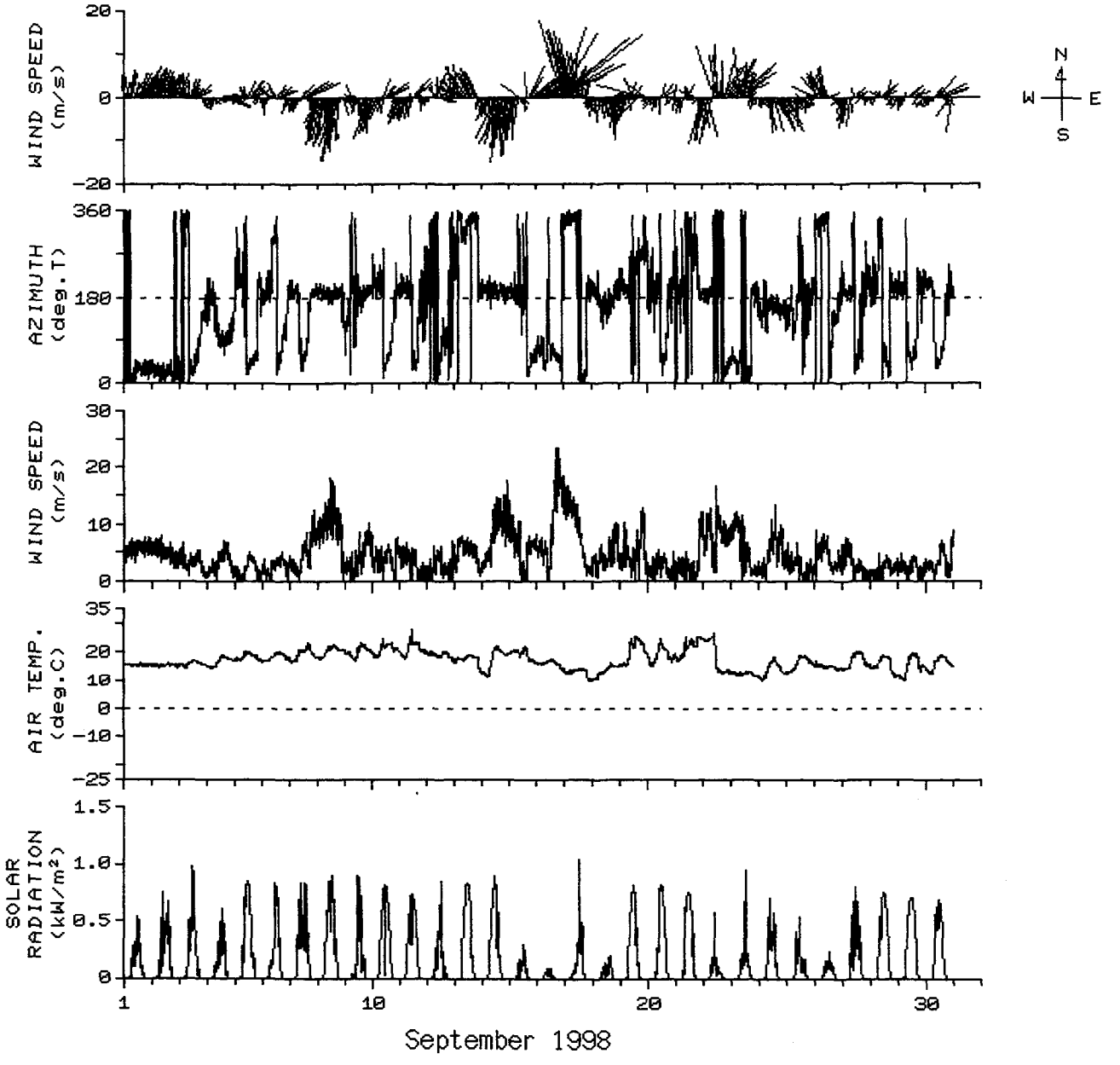
Kimuaneppu, Saroma-ko Lagoon



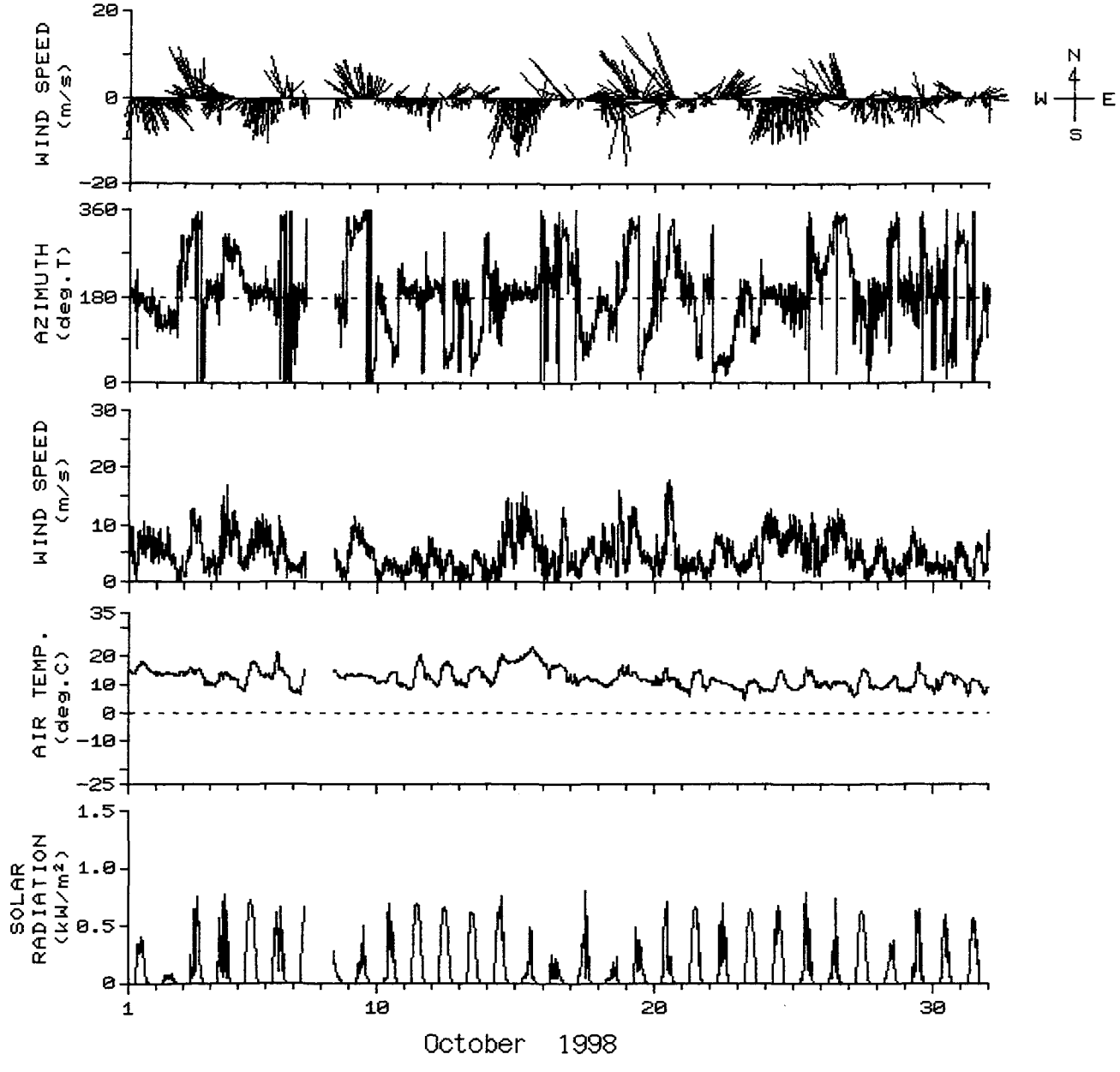
Kimuaneppu, Saroma-ko Lagoon



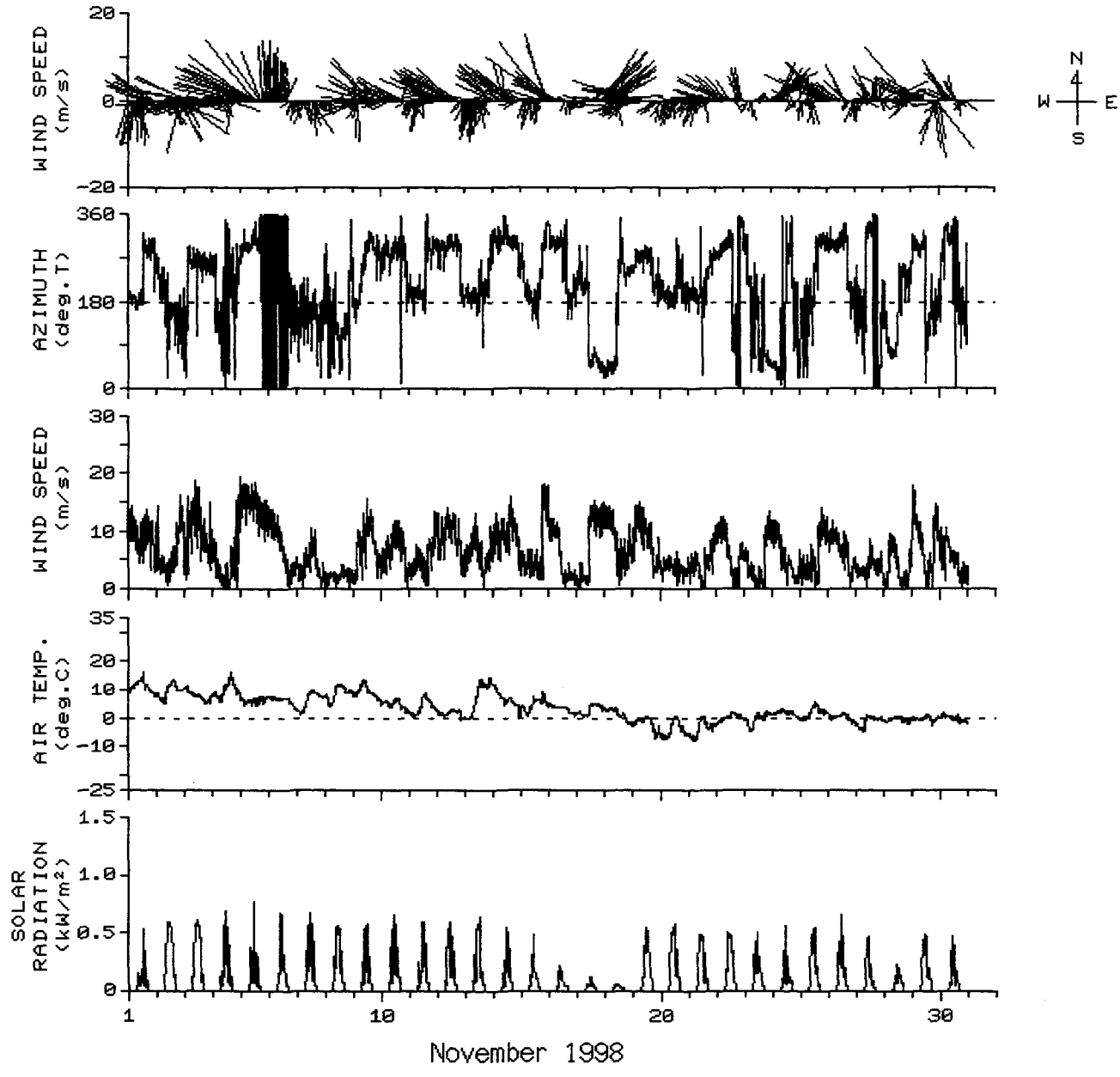
Kimuaneppu, Saroma-ko Lagoon



Kimuaneppu, Saroma-ko Lagoon



Kimuaneppu, Saroma-ko Lagoon



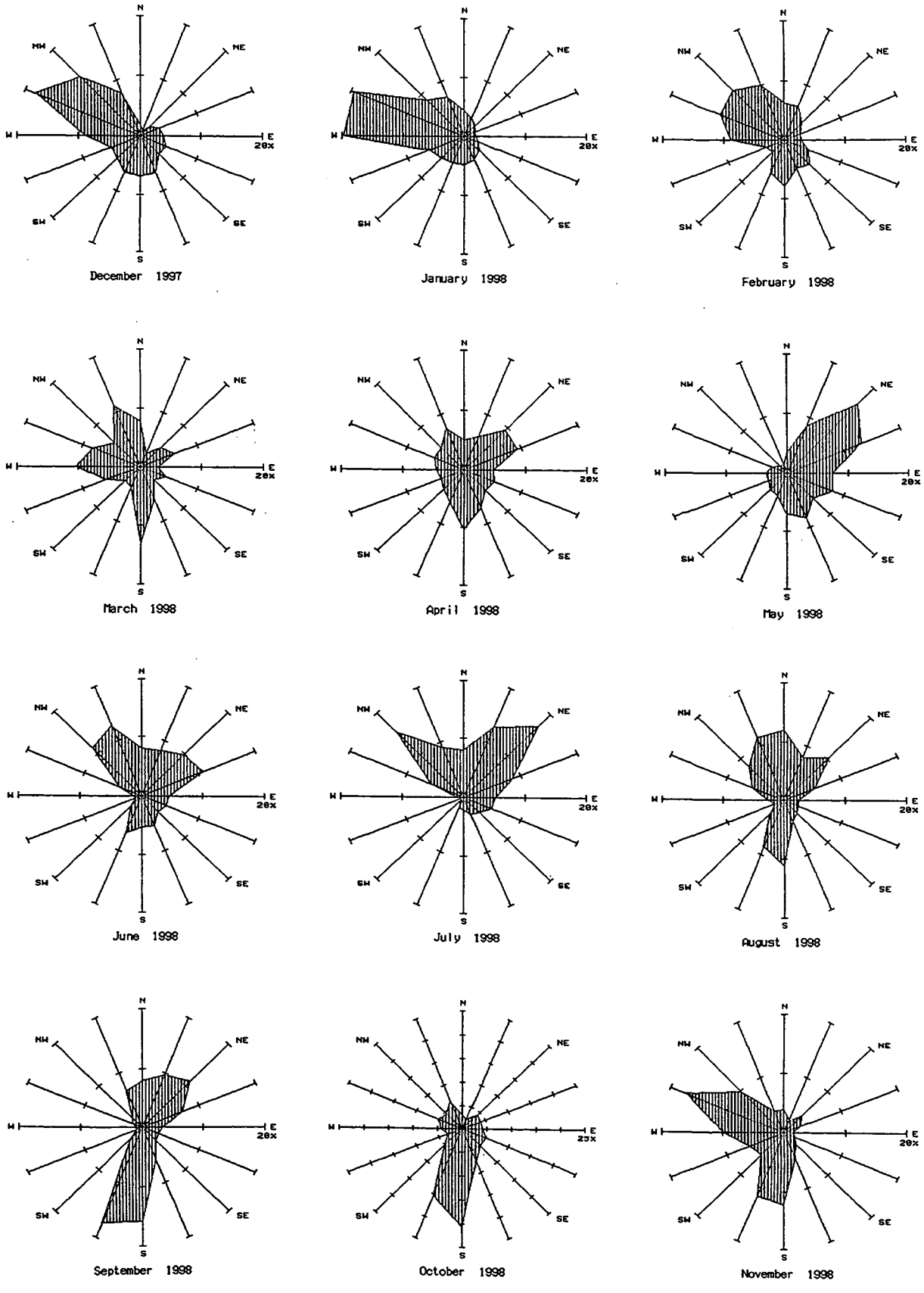


Fig. 4 Wind roses for each month during the period between December 1997 and November 1998 at Kimuaneppu.