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Meteorological and Oceanographic Observations at Marine Towers on the Okhotsk Sea Coast of Hokkaido, January – December 2000*,**

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Abstract: Measurements of wind speed and direction, humidity, air and water temperature, solar radiation, salinity and chlorophyl a were carried out through all the year round at marine towers on the Okhotsk Sea coast of Mombetsu, Hokkaido. Shown in this report are time series of those meteorological and oceanographic variables and also daily sea-ice distributions and ice concentrations observed by the sea-ice radar.

要旨: 北海道オホーツク海沿岸域のほぼ中央に位置する紋別に設置されたタワーにて風速・風向、湿度、気温、日射、水温、塩分、クロロフィルa量の連続観測を行った。また、流氷レーダーにて結氷期の沿岸域の流氷分布、密接度の観測を行った。ここでは、これらの時系列観測データを報告する。

Key words: Meteorological and Oceanographic Variables, Air-Sea-Ice Observation System (ASIOS), Okhotsk Tower, Sea-Ice Radar, Okhotsk Sea Coast of Hokkaido

キーワード: 気象・海洋要素、大気—海洋—海氷観測システム、オホーツク・タワー、流氷レーダー、北海道オホーツク海沿岸

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** 北海道大学低温科学研究所 流氷研究施設 研究報告 第160号

I. Introduction

The Air-Sea-Ice Observation System (ASIOS) of Hokkaido University was established near Mombetsu Harbor, Hokkaido in 1986, in order to measure the atmospheric boundary layer over sea ice in the near shore region covered with unstable pack ice (e.g., Aota et al., 1988; Shirasawa and Aota, 1991). After some years' operation the tower of the ASIOS was removed to be reconstructed on a breakwater at the west end of the Mombetsu Harbor (Fig. 1), and it has been operated since April 1997. Another marine tower, so called the Okhotsk Tower was constructed at the east end of the Mombetsu Harbor in February 1996 (Fig. 1). It has been mainly used for oceanographic observations and as an under-ice aquarium. Measurements of meteorological and oceanographic variables have been carried out through all the year round by the ASIOS and Okhotsk Tower on the Okhotsk Sea coast since April 1997. Time series of those variables during the period from January through December 2000 are reported in this data report. The time series data for the periods from April 1997 to November 1998 and from December 1998 to December 1999 were reported by Shirasawa et al. (1998) and Shirasawa et al. (1999), respectively.

II. Observation

The ASIOS tower stands on a breakwater at the west end of Mombetsu Harbor, where is located free to sea breeze (Fig. 1). Meteorological sensors were installed on a mast on the observation capsule of 3m in diameter and of 2.7m in height with a dome, and at the height of about 15m from the sea level. The Okhotsk Tower located at the east end of Mombetsu Harbor (Fig. 1) has been used mainly for oceanographic observations. Sea-ice distributions and ice concentrations on the Okhotsk Sea coast near Mombetsu within about 50 km from the coast have been observed daily by the sea-ice radar network of Hokkaido University. Time series of wind speed and direction, humidity, air temperature and solar radiation obtained from the ASIOS tower during the period from January to December 2000 are shown in Fig. 2. The water temperature, salinity and chlorophyl a values obtained from the Okhotsk Tower and daily ice concentrations observed by the sea-ice radar are also shown in Fig. 2. The air temperature was below 0°C from the beginning of January and beyond -15°C on 26 January. The water temperature reached the freezing point on 20 January, while sea ice appeared within the radar coverage at the Mombetsu station. The air and water temperatures started increasing at late March, while sea ice disappeared from the radar coverage and the salinity decreased. The chlorophyl a

values were at about 2-5 mgm^{-3} in January and then decreased to 2-3 mgm^{-3} from late January through early April. The values then increased to about 5 mgm^{-3} at late April, while the air and water temperatures increased and the salinity decreased. Thereafter, the chlorophyl a values appeared to vary cyclically. Wind roses are shown monthly in Fig. 3. The westerly winds were predominant from the fall through the spring.

References

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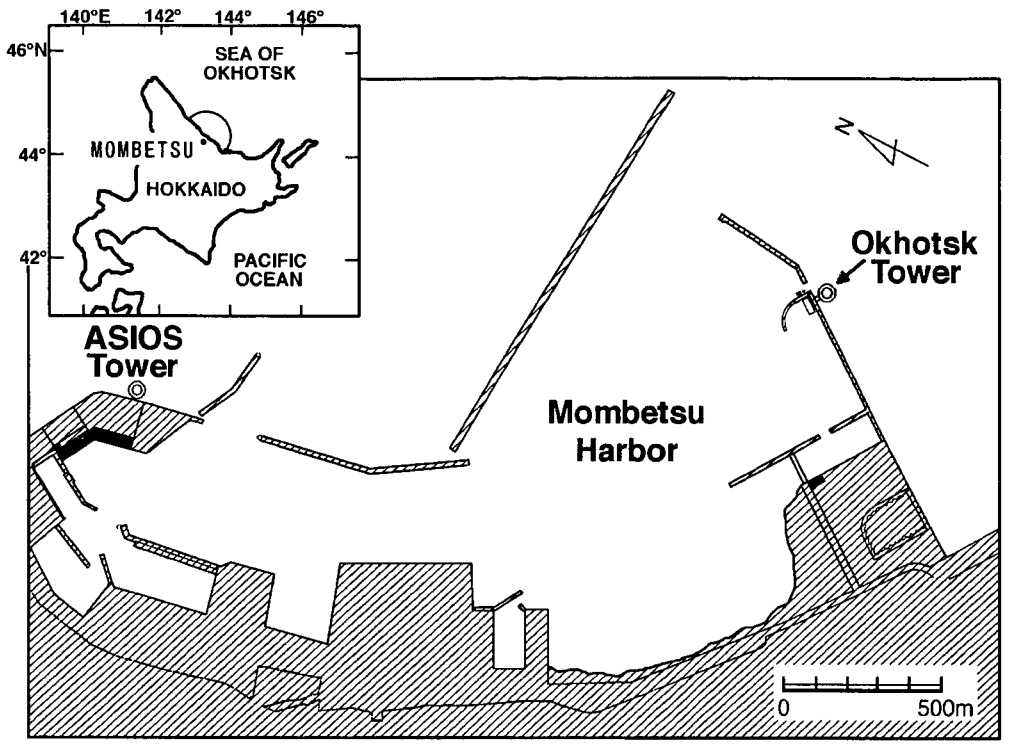


Fig. 1 The sites of the Air-Sea-Ice Observation System (ASIOS) tower and the Okhotsk Tower, Mombetsu, Hokkaido. The sea-ice radar coverage at the Mombetsu station is shown as a half circle on the map.

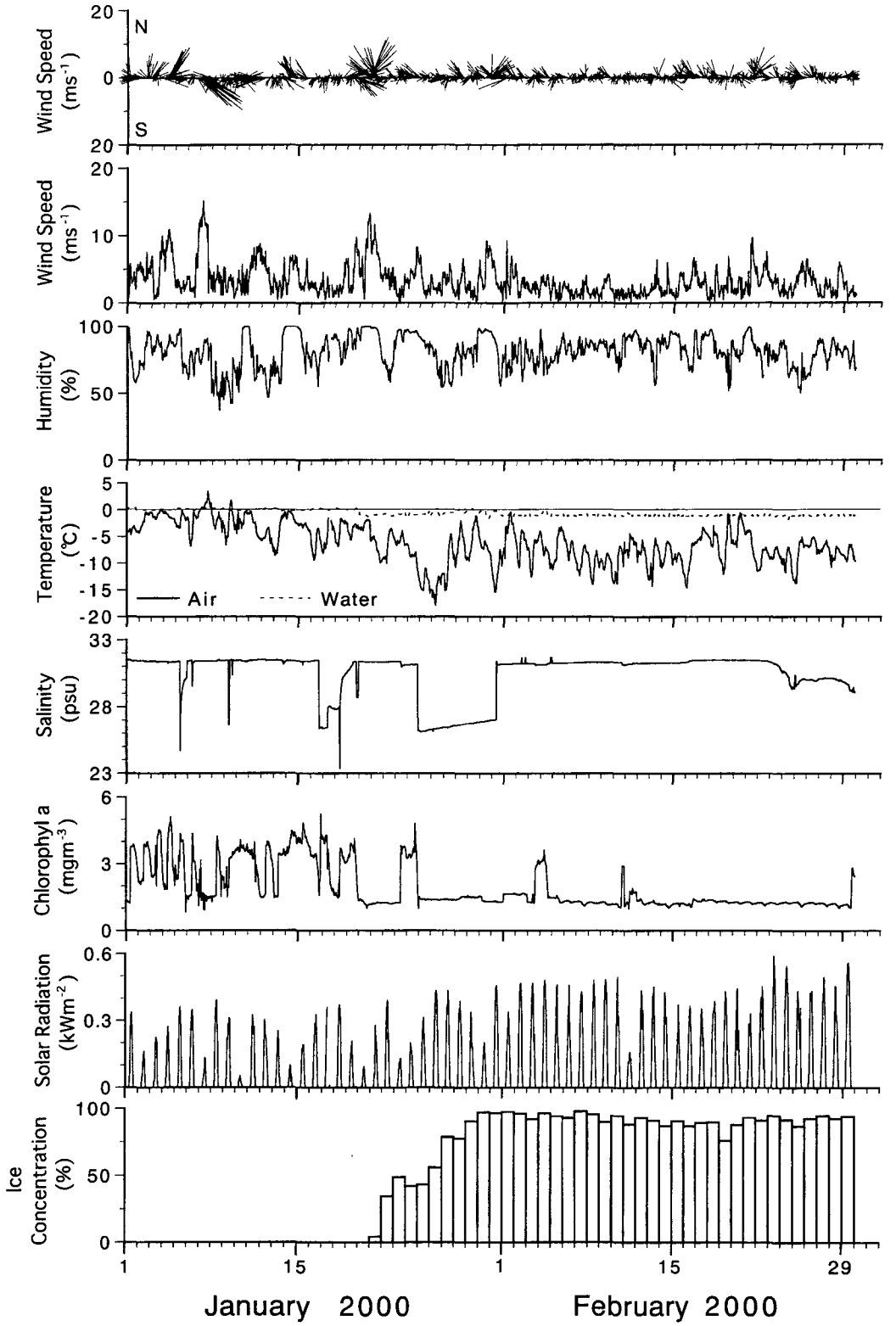
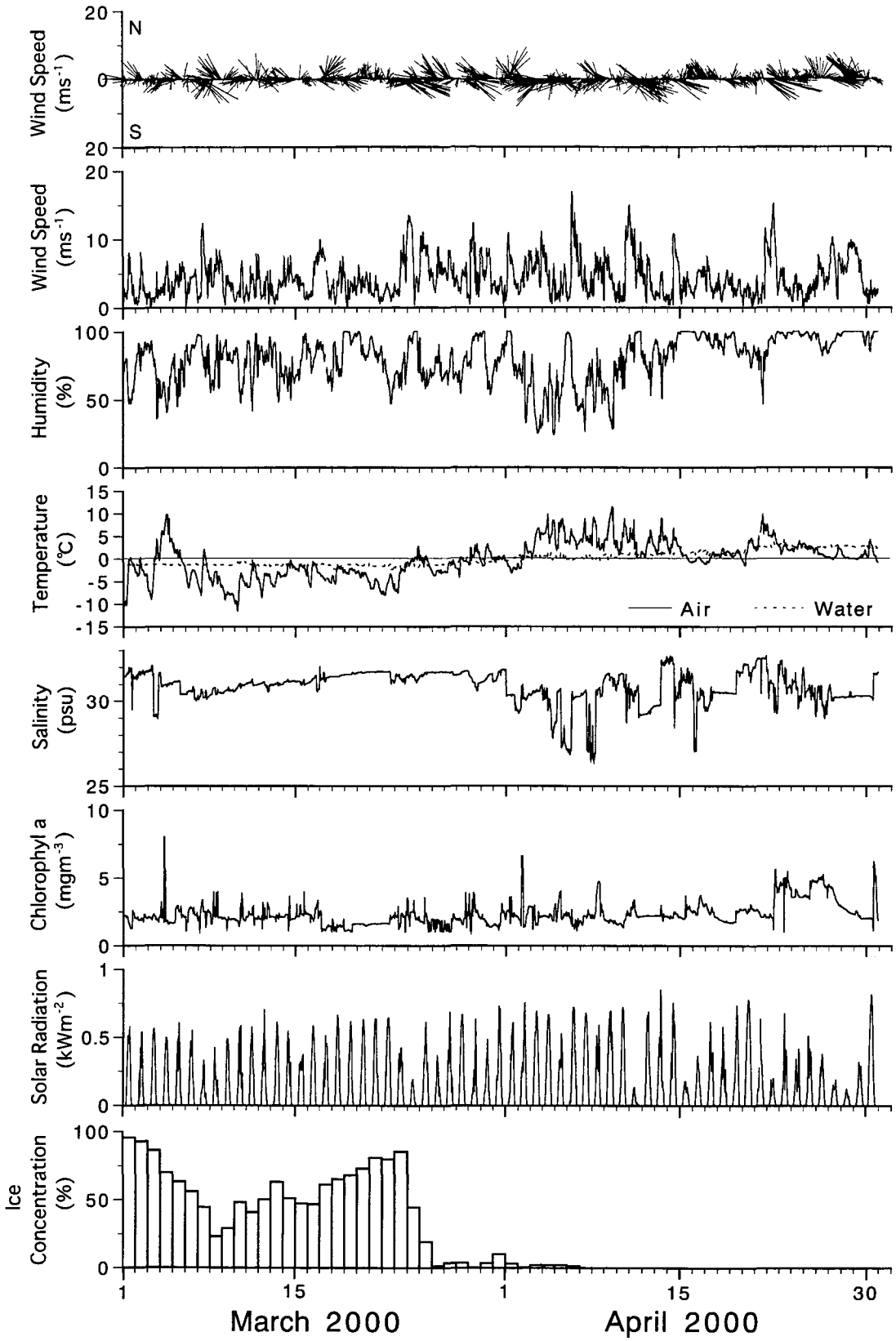
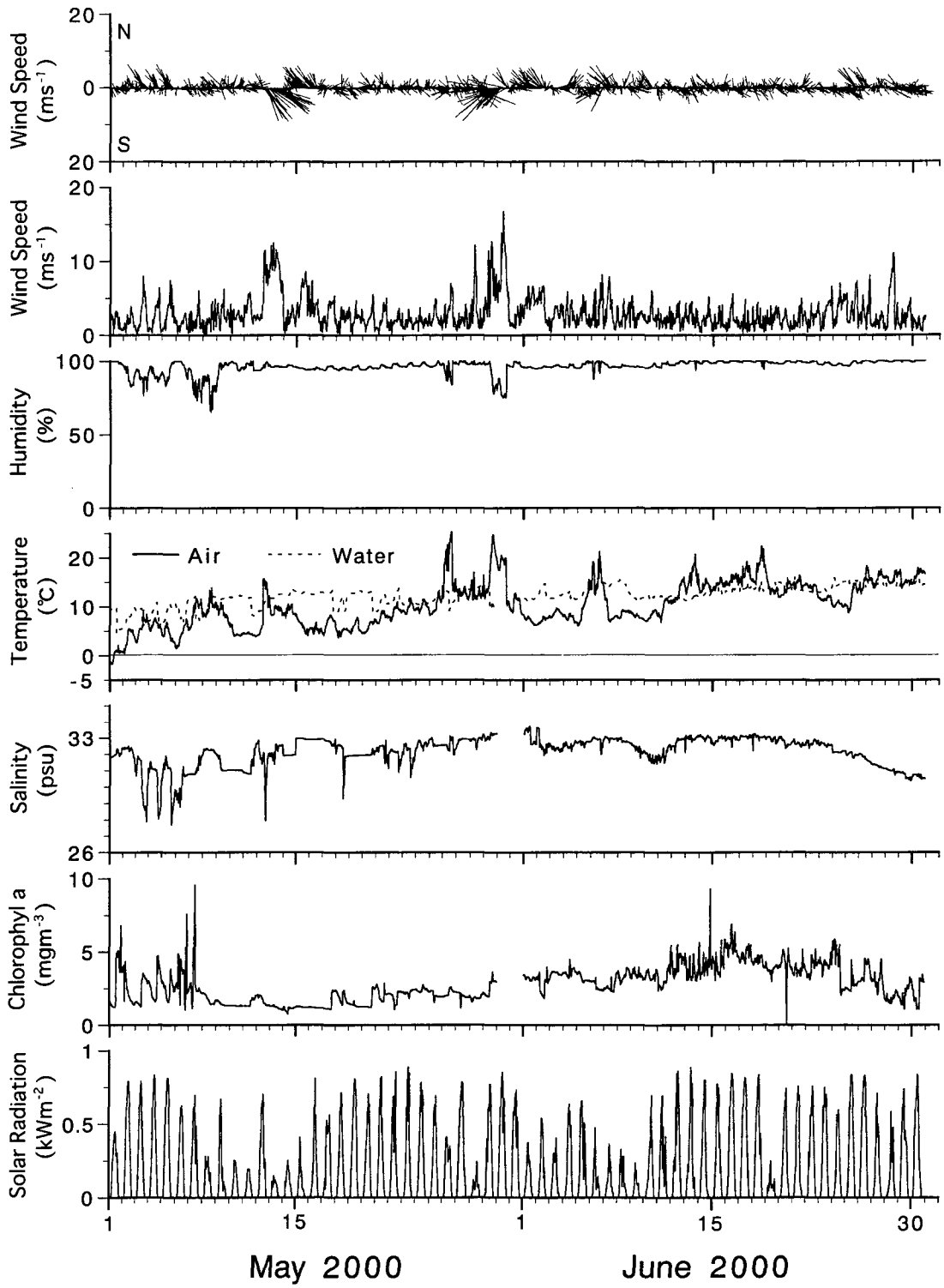
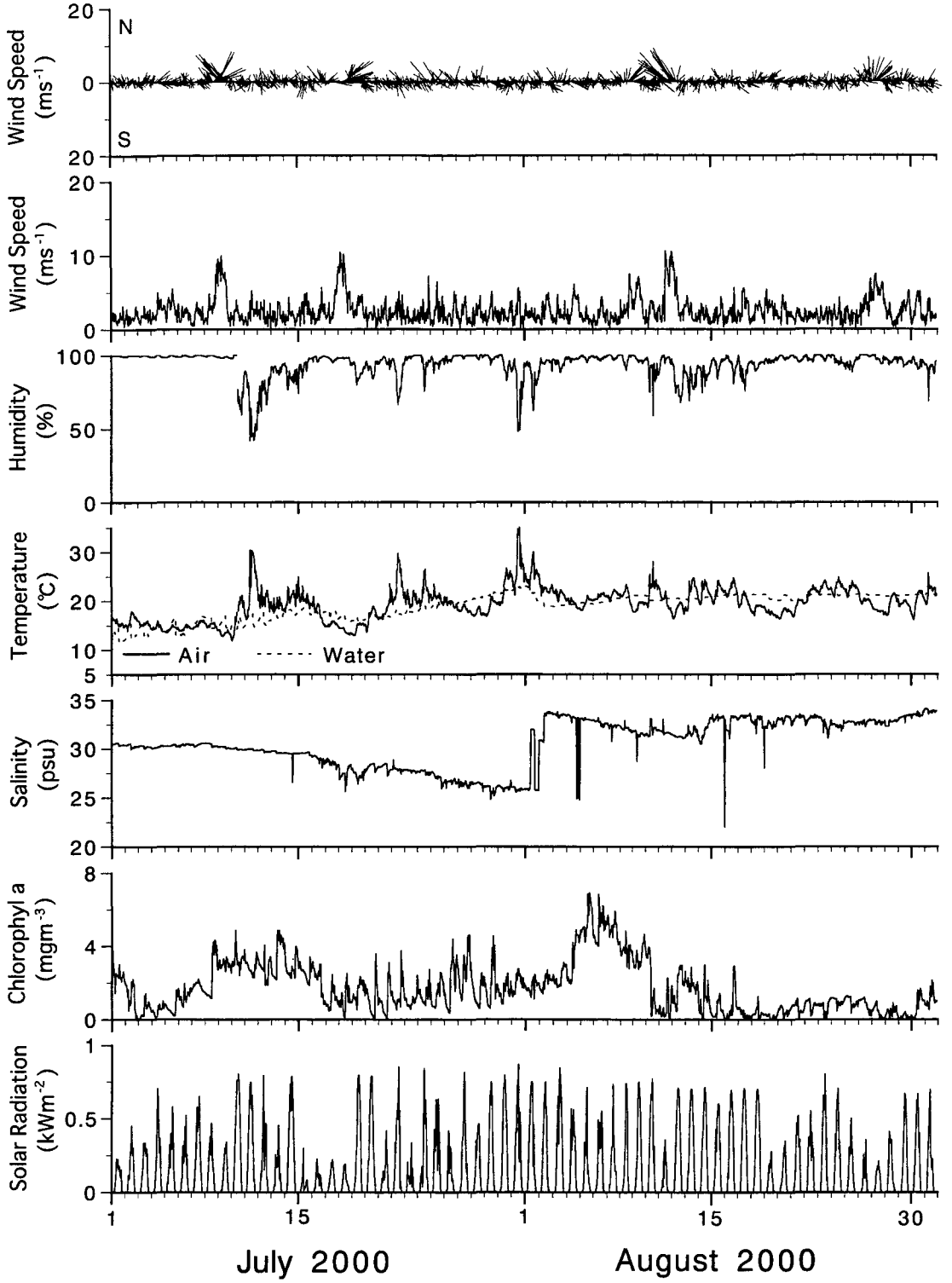
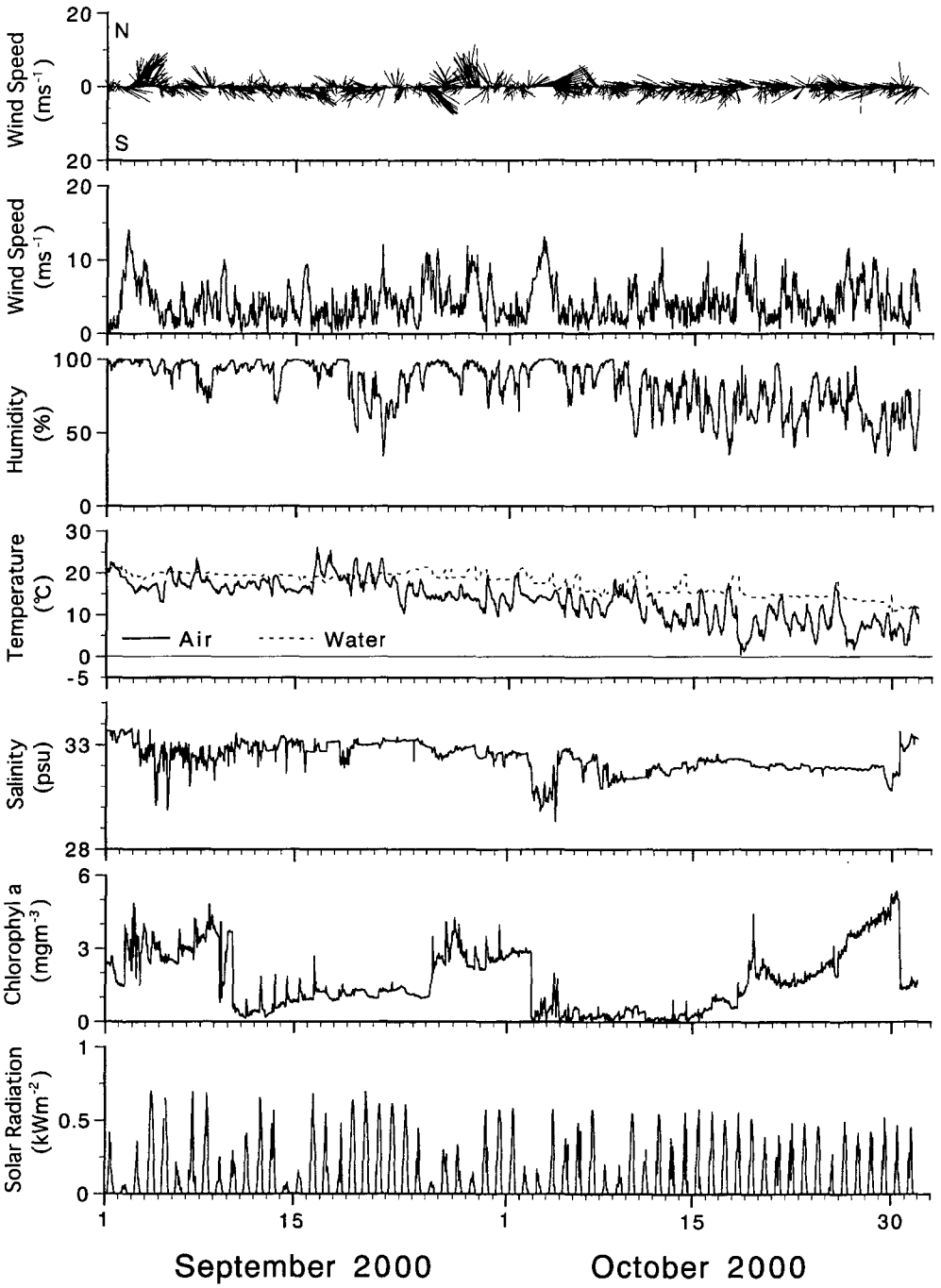


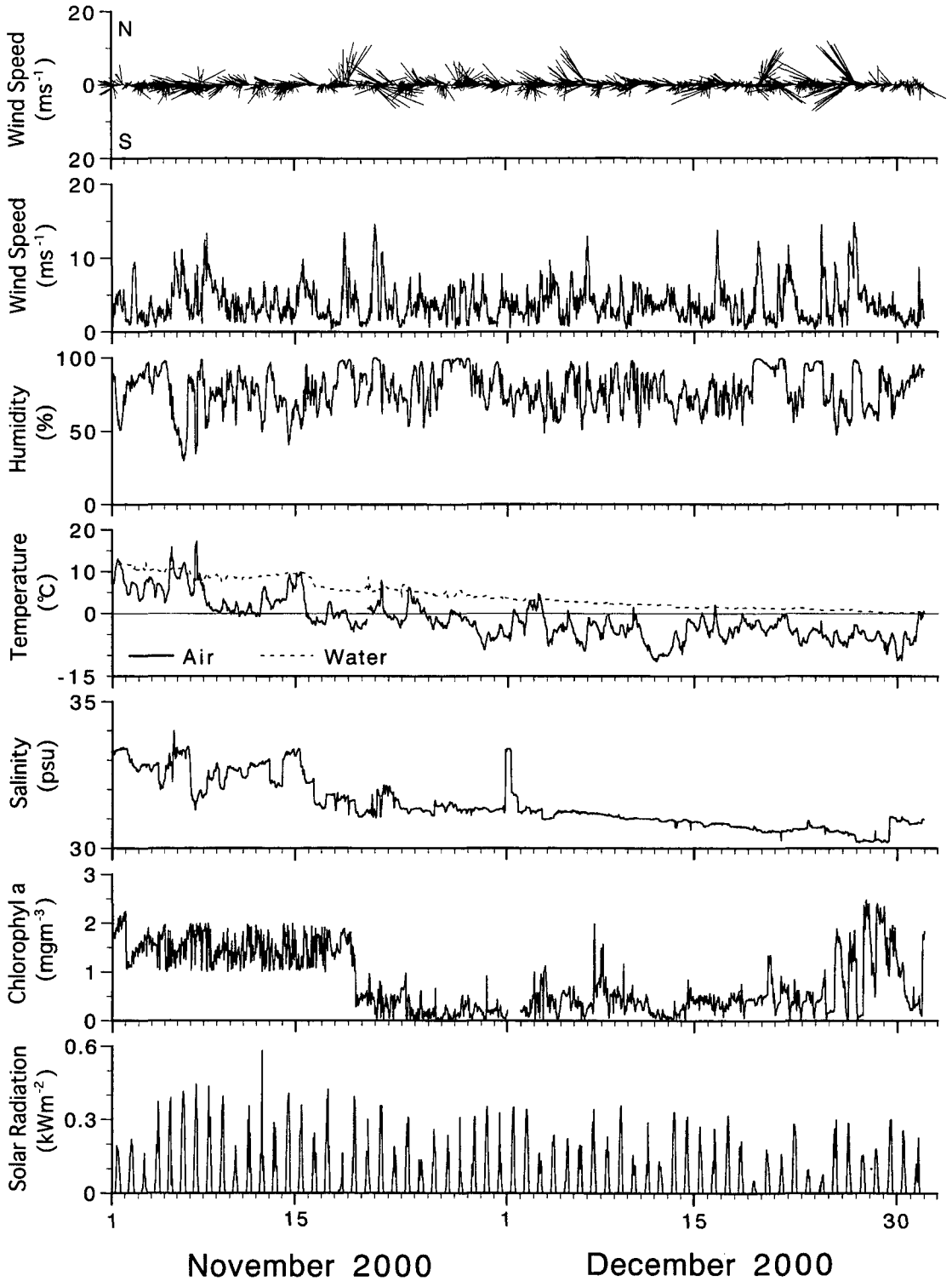
Fig. 2 Time series of wind speed and direction, humidity, air temperature and solar radiation obtained from the ASIOS tower and of water temperature, salinity and chlorophyl a obtained from the Okhotsk Tower during the period from January to December 2000, together with the ice concentration observed by the sea-ice radar at the Mombetsu station.


Wind Speed (ms-1)
N
S
Wind Speed (ms-1)
Humidity (%)
Temperature (℃)
Air
Water
Salinity (psu)
Chlorophyl a (mgm-3)
Solar Radiation (kWm-2)
Ice Concentration (%)
March 2000
April 2000


Wind Speed (ms-1)
N
S
Wind Speed (ms-1)
Humidity (%)
Air
Water
Temperature (°C)
Salinity (psu)
Chlorophyl a (mgm-3)
Solar Radiation (kWm-2)
May 2000
June 2000


Wind Speed (ms-1)
N
S
20
0
20
Wind Speed (ms-1)
20
10
0
Humidity (%)
100
50
0
Temperature (℃)
30
20
10
5
Air
Water
Salinity (psu)
35
30
25
20
Chlorophyl a (mgm-3)
8
4
0
Solar Radiation (kWm-2)
1
0.5
0
1
15
1
15
30
July 2000
August 2000


Wind Speed (ms-1)
20
N
0
S
20
Wind Speed (ms-1)
20
10
0
Humidity (%)
100
50
0
Temperature (°C)
30
20
10
0
-5
Air
Water
Salinity (psu)
33
28
Chlorophyl a (mgm-3)
6
3
0
Solar Radiation (kWm-2)
1
0.5
0
1
15
1
15
30
September 2000
October 2000


Wind Speed (ms-1)
20
N
0
S
20
Wind Speed (ms-1)
20
10
0
Humidity (%)
100
50
0
Temperature (℃)
20
10
0
-15
Air
Water
Salinity (psu)
35
30
Chlorophyl a (mgm-3)
3
2
1
0
Solar Radiation (kWm-2)
0.6
0.3
0
1
15
1
15
30
November 2000
December 2000

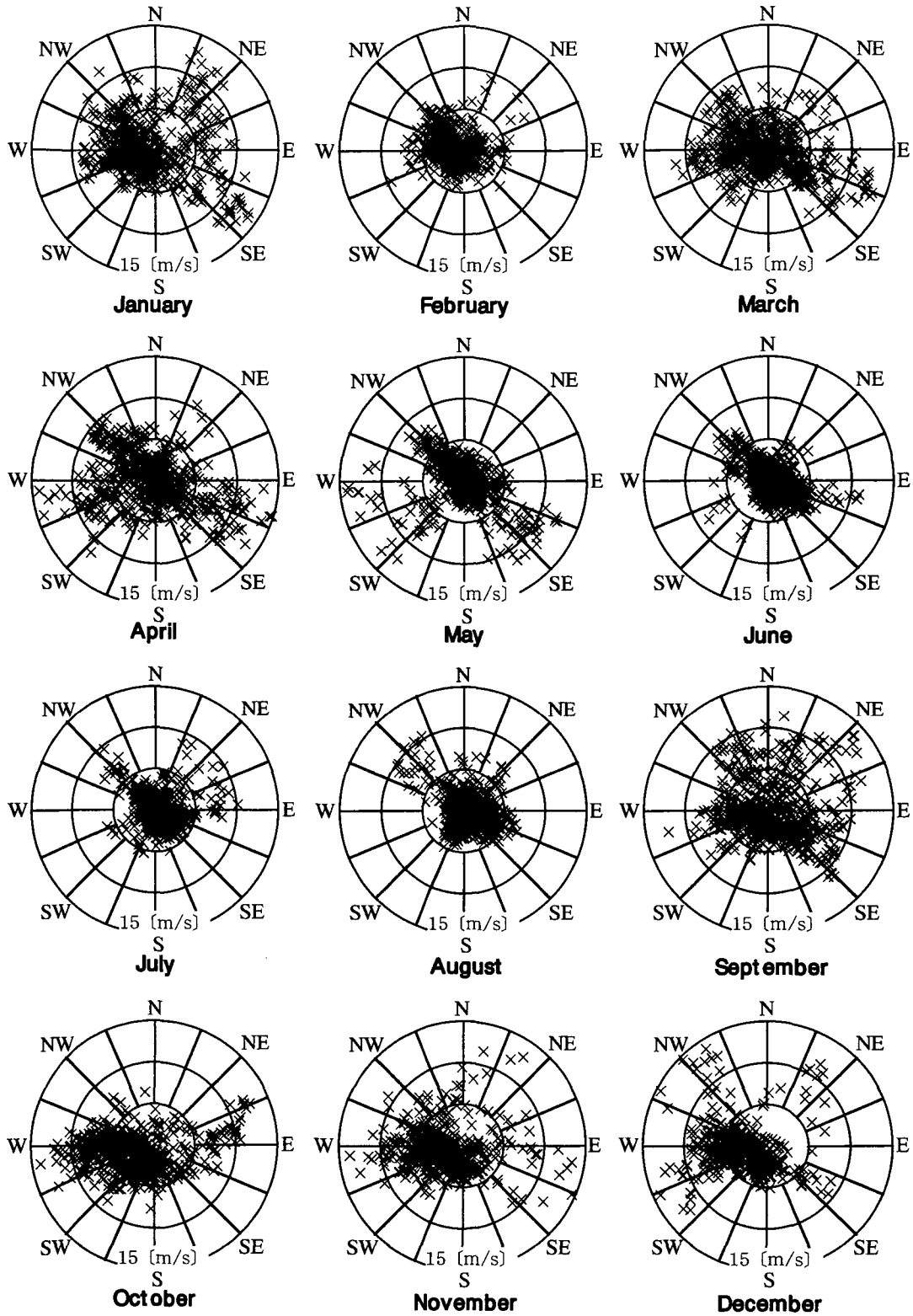


Fig. 3 Monthly wind roses obtained from the ASIOS tower during the period from January to December 2000.