

EASTERN - WESTERN
ARCTIC SEA ICE ANALYSIS
1993

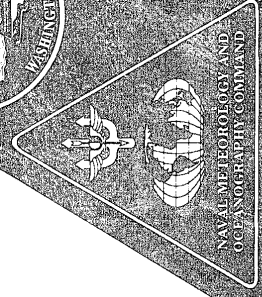
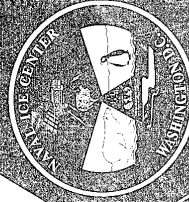
PREPARED BY
NAVAL ICE CENTER
SUITLAND, MD

PREPARED UNDER AUTHORITY OF
COMMANDER, NAVAL METEOROLOGY AND
OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

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NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND

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FOREWORD

The U.S. Navy has a long and eventful history of polar exploration, including the exploits of Robert E. Peary in the Arctic to Richard E. Byrd in the Antarctic. Recently, the strategic importance and expanded polar research produced greater national and international requirements for environmental information. Since 1976, the National Oceanic and Atmospheric Administration (NOAA) and the Navy (Naval Ice Center) have worked together at the Joint Ice Center (JIC) in Suitland, Maryland; the combination of their resources and efforts continues to satisfy the demand for environmental information in both polar regions.

This publication is the 20th edition of the annual Arctic sea-ice atlases prepared by the JIC. The atlas contains weekly charts depicting Northern Hemisphere ice conditions and extent. The significant use of high resolution satellite imagery, combined with valuable ice reconnaissance data from various sources, has greatly improved the accuracy of these analyses.

The purpose of this atlas is to provide the user with reliable weekly hemispheric ice analyses. These charts are prepared by experienced Navy and NOAA ice analysts, who plot and evaluate numerous data sources:

- a. Conventional shore station, ship, and aerial reconnaissance observations;
- b. Satellite data from various sensors. Table 1, located on the inside back cover, lists these sensors and their availability;

A final product is synthesized from the inputs described above. When insufficient data is available, estimated boundaries are plotted, using meteorological data and computer generated ice drift vectors to determine estimated ice position.

Joint Ice Center
Naval Ice Center
4251 Suitland Rd, FB#4
Washington, D.C. 20395

REPORT DOCUMENTATION PAGE

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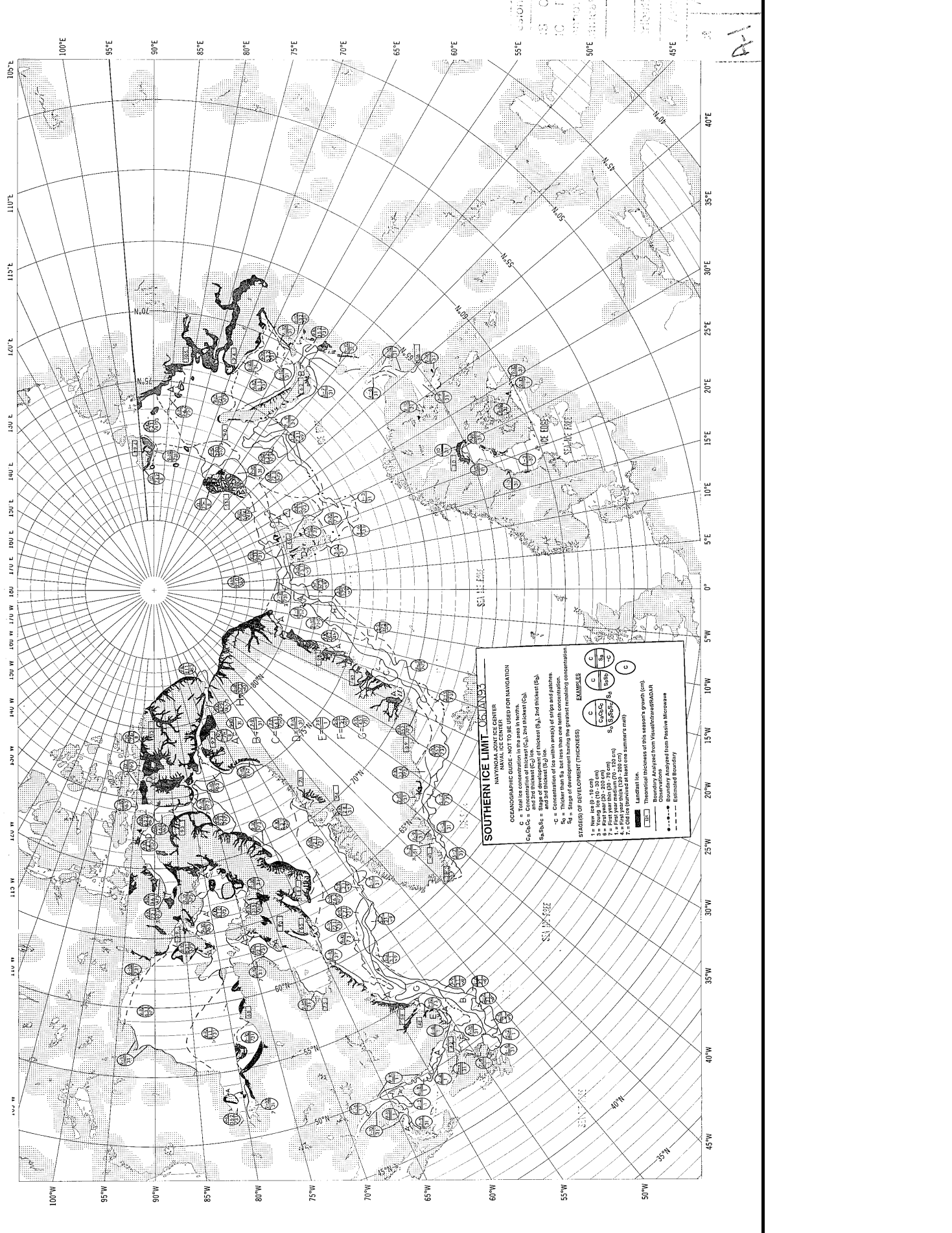
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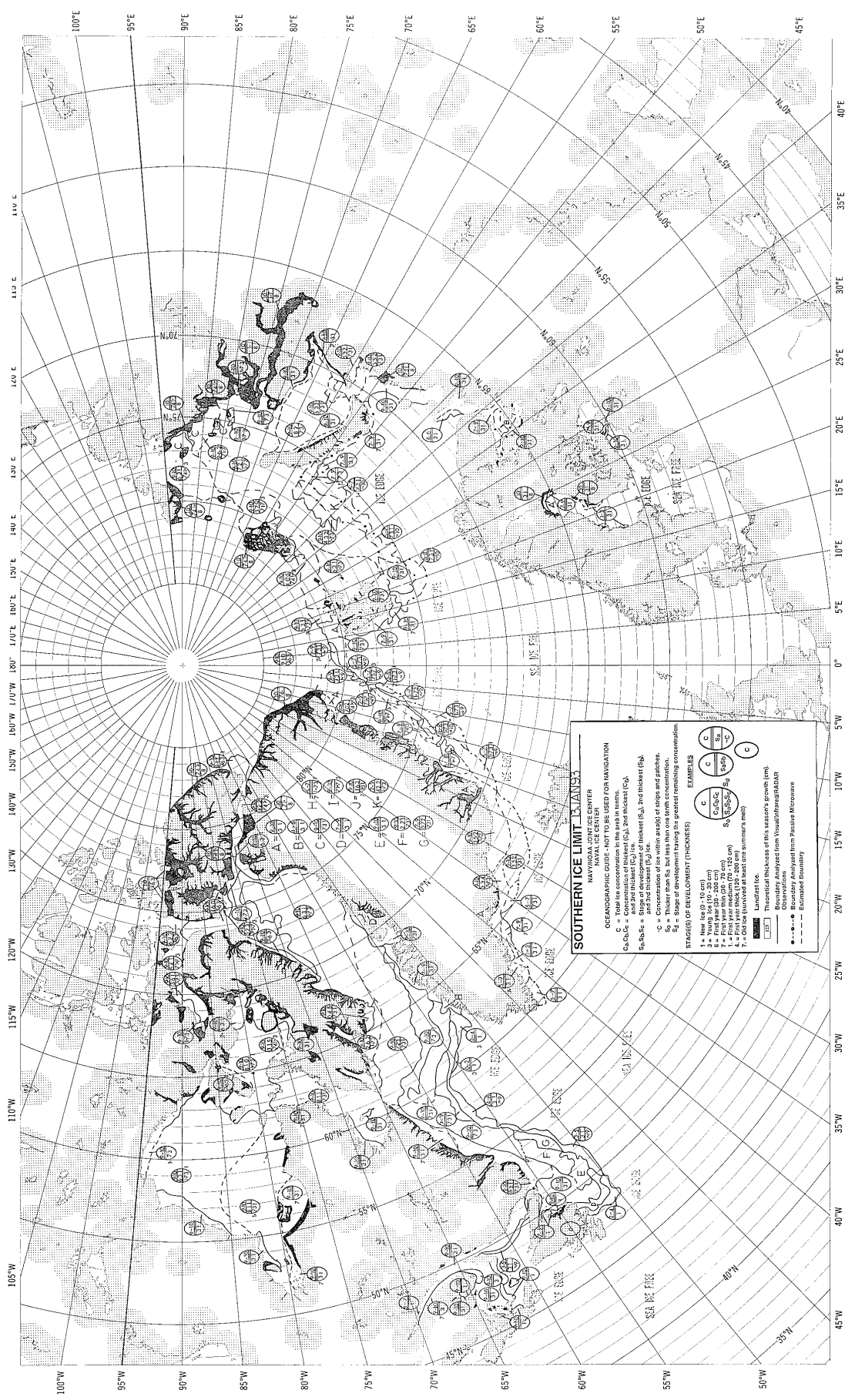
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SOUTHERN ICE LIMIT ISLANDS
 NAVY/NOAA JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
C₁C₂C₃ = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) in area(s) of slope and patches.
S₁S₂S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) in area(s) of slope and patches.
S₁ = Thicker than S₂, but less than one tenth concentration.
S₂ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

EXAMPLES

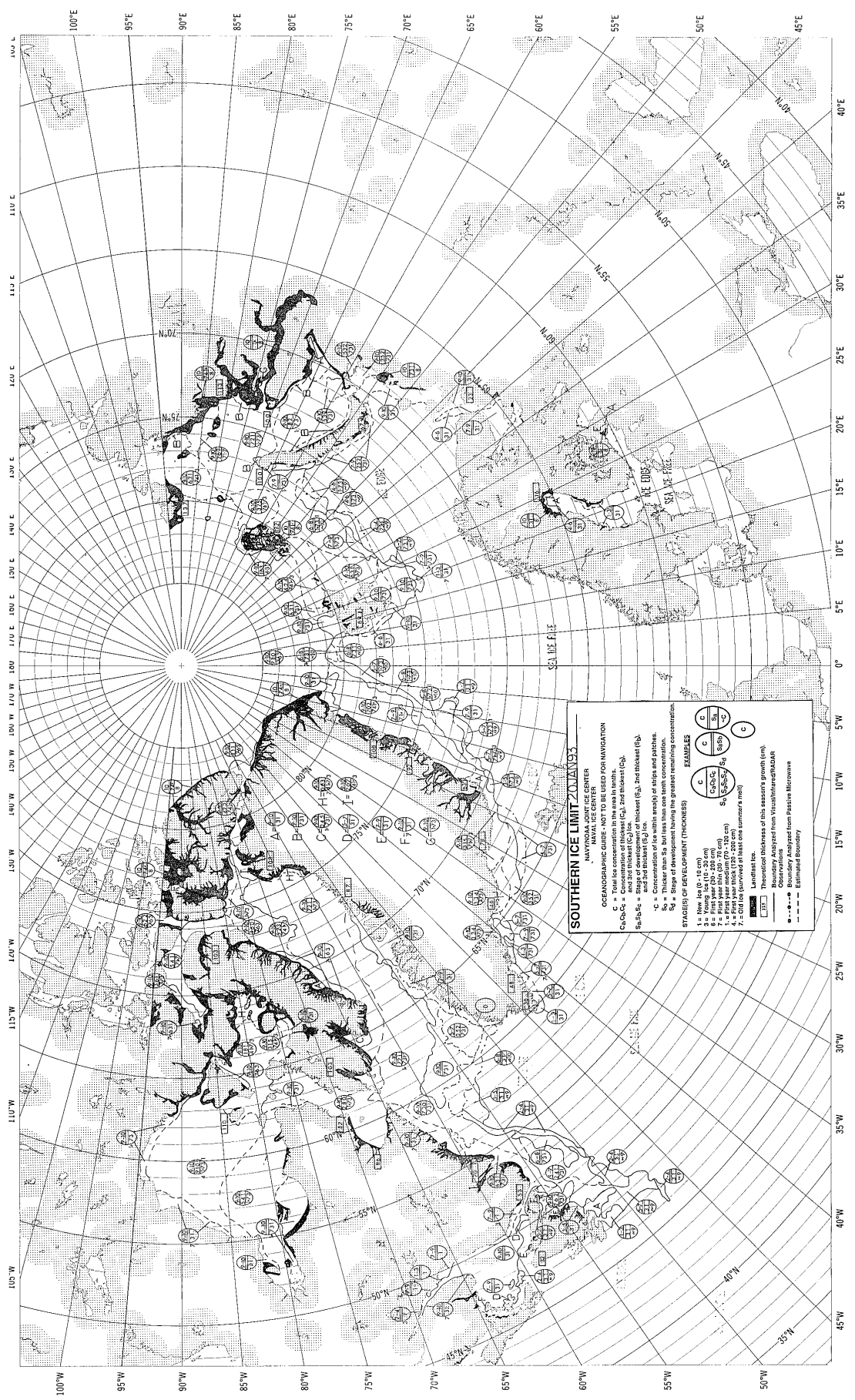
C	C	C	C
C₁C₂C₃	C₁C₂C₃	C₁C₂C₃	C₁C₂C₃
S₁S₂S₃	S₁S₂S₃	S₁S₂S₃	S₁S₂S₃

STAGES OF DEVELOPMENT (THICKNESS)

- 1 = New ice (0 - 10 cm)
- 2 = First year thin (10 - 100 cm)
- 3 = First year medium (100 - 150 cm)
- 4 = First year thick (150 - 200 cm)
- 5 = First year very thick (200 - 250 cm)
- 6 = First year ice (250 - 300 cm)
- 7 = First year ice (300 - 350 cm)

LEGEND

- Landfast ice**
- THEORY** Theoretical thickness of this season's growth (cm)
- Boundary Analyzed from Visual/Infrared/RADAR**
- Observation**
- Estimated from Passive Microwave**
- Estimated Boundary**



SOUTHERN ICE LIMIT ZONATIONS
 NAVY/NOAA JOINT ICE CENTER
 NAVAL ICE CENTER

OCCASIONAL SYMBOLS FOR INFORMATION

C = Total ice concentration in the pack in percent.
 C₁C₂C₃ = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice.
 S₁S₂S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) ice.
 C = Concentration of ice within width of strip and patch.
 S = Stage of development having the greatest remaining concentration.

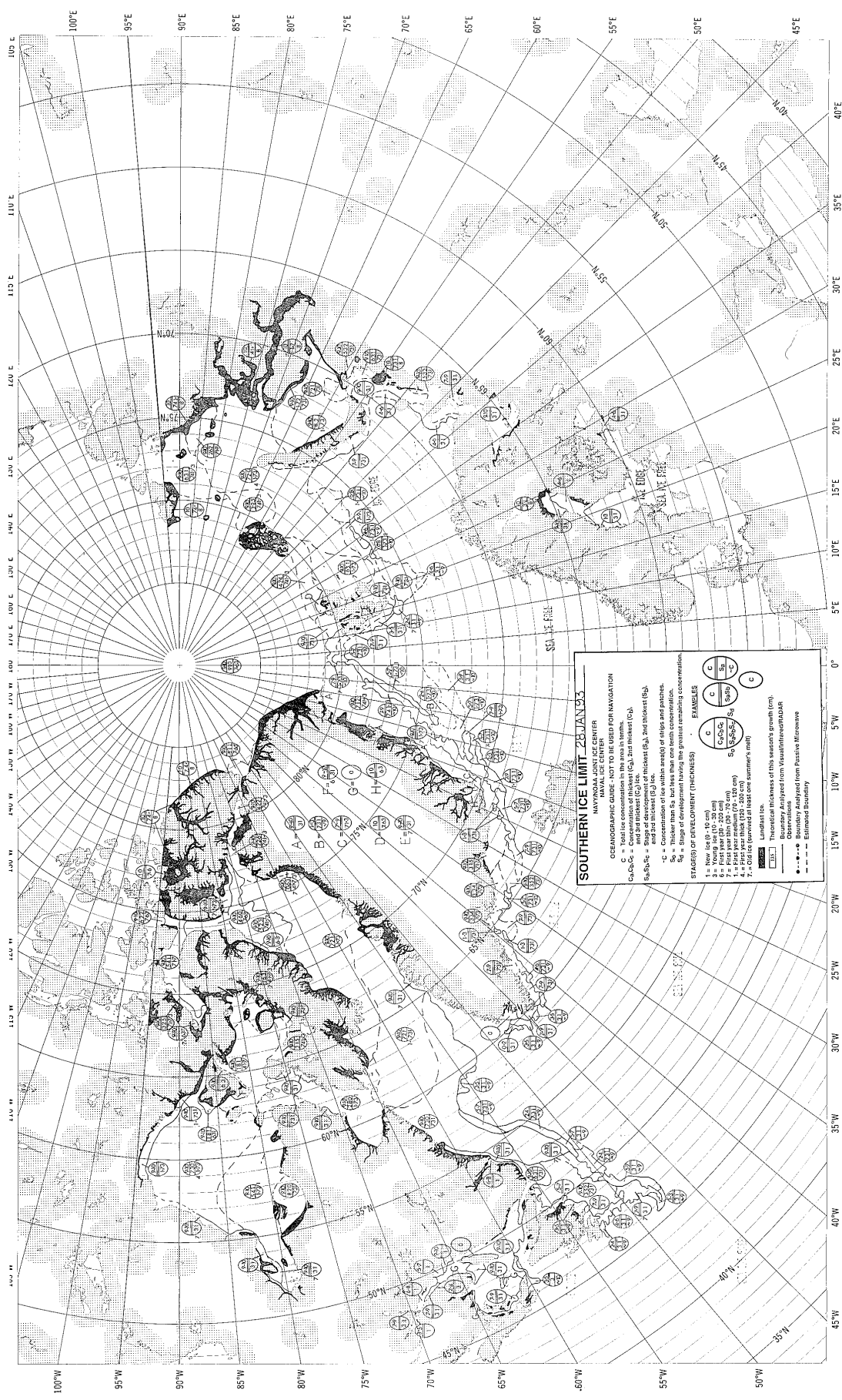
STAGES OF DEVELOPMENT (THICKNESSES)

1 = New ice (0 - 15 cm)
 2 = Young ice (15 - 30 cm)
 3 = First year thin (30 - 70 cm)
 4 = First year thick (70 - 200 cm)
 5 = Second year thin (200 - 300 cm)
 6 = Second year thick (300 - 500 cm)
 7 = Old ice (formed at least one summer's age)

EXAMPLES

$\frac{C}{C_1 C_2 C_3}$	$\frac{C}{S_1 S_2 S_3}$	$\frac{C}{S_1 S_2 S_3}$
$\frac{C}{C_1 C_2 C_3}$	$\frac{C}{S_1 S_2 S_3}$	$\frac{C}{S_1 S_2 S_3}$

Legend:
 Landline Ice
 Boundary Assigned from Visual Observations
 Boundary Assigned from Satellite Radar
 Boundary Assigned from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT - 25 JAN 93
 NAVY/NOAA JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

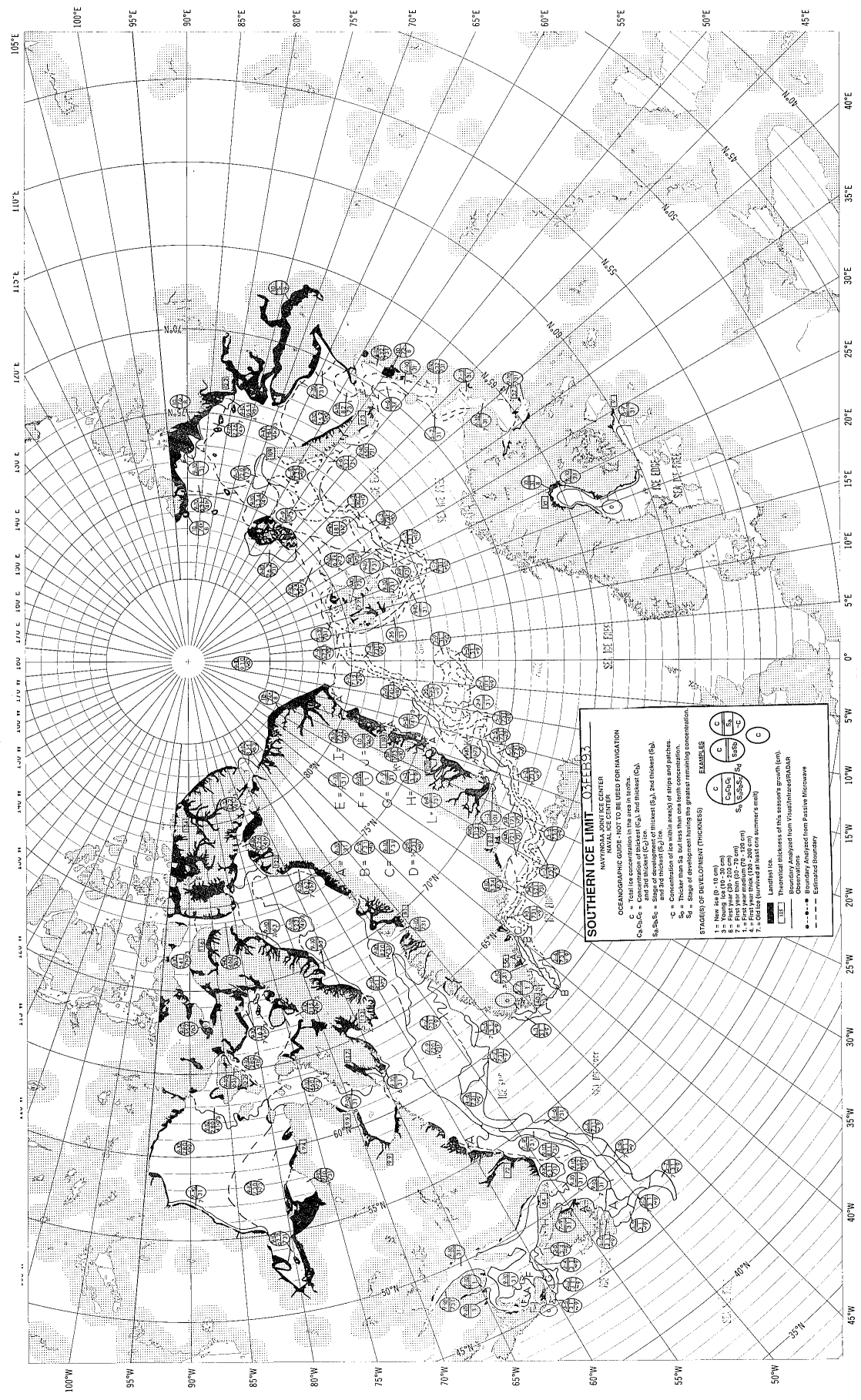
C = Total ice concentration in the area in berth.
 C₁C₂C₃ = Concentration of C₁ (thick), C₂ (medium), and C₃ (thin) ice.
 S₁S₂S₃S₄ = Stage of development of thickness (S₁, 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄)) of ice within area of 100 square nautical miles (or for within area) of ridge and passage.
 S₁ = Thicker than S₂, but less than one term concentration.
 S₂ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS) **EXAMPLES**

1 = New ice (0 - 10 cm)
 2 = First year (10 - 200 cm)
 3 = First year medium (70 - 120 cm)
 4 = First year thick (150 - 200 cm)
 5 = First year very thick (200 cm and over summer's work)

LEGEND

Landmass
 Theoretical thickness of this season's growth (cm)
 Boundary Analyzed from Visual/Infrared/RAR
 Boundary Analyzed from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT - 1953
 NAVY/MONITOR ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentrations of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice in area(s) of strips and patches.
 S₁, S₂, S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) ice in area(s) of strips and patches.
 S₄ = Thicker than S₃, but less than one tenth concentration.
 S₅ = Stage of development having the greatest remaining concentration.

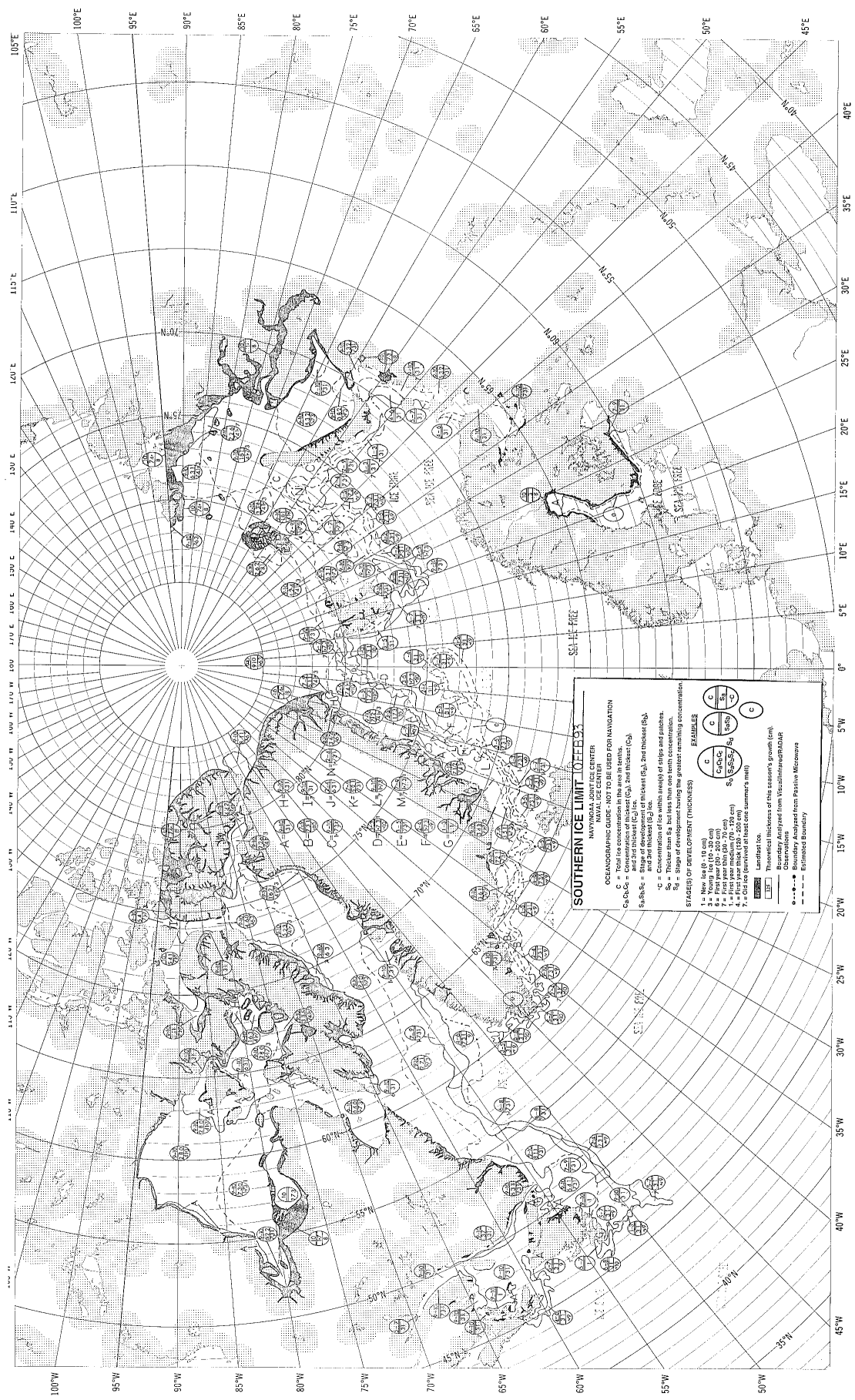
STAGES OF DEVELOPMENT (THICKNESS)

1 = New ice (0 - 10 cm)	6 = Young ice (10 - 200 cm)
2 = Young ice (10 - 200 cm)	7 = First year ice (20 - 200 cm)
3 = First year ice (20 - 200 cm)	8 = First year ice (20 - 200 cm)
4 = First year ice (20 - 200 cm)	9 = Old ice (beyond the limit one summer's age)

EXAMPLES

C	C ₁	C ₂	C ₃
10	10	10	10
S	S ₁	S ₂	S ₃
1	1	1	1

[Symbol: Dotted area] = Landward thickness of this season's growth (cm).
 [Symbol: Dashed line] = Boundary Analyzed from Visual/Infrared/Radar
 [Symbol: Solid line] = Observations
 [Symbol: Dotted line] = Estimated boundary from Russian Microwave
 [Symbol: Dashed line] = Estimated boundary



SOUTHERN ICE LIMIT (Q100E83)
 NEW HAVELT ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C₁, C₂, C₃ = Total ice concentration in the area in tenths, and first, second, and third thickest (C₁ is top, C₂ is middle, C₃ is bottom) ice thickness (cm).
 S₁, S₂, S₃ = Ice concentration in the area in tenths, and first, second, and third thickest (S₁ is top, S₂ is middle, S₃ is bottom) ice thickness (cm).
 C = Concentration of ice with energy of strips and patches.
 S = Thickness of ice, but less than one tenth concentration.
 S₀ = Concentration of ice with energy of strips and patches.
 S₁ = First year medium (70 - 150 cm).
 S₂ = Second year medium (150 - 200 cm).
 S₃ = Old ice (formed at least one summer's melt).

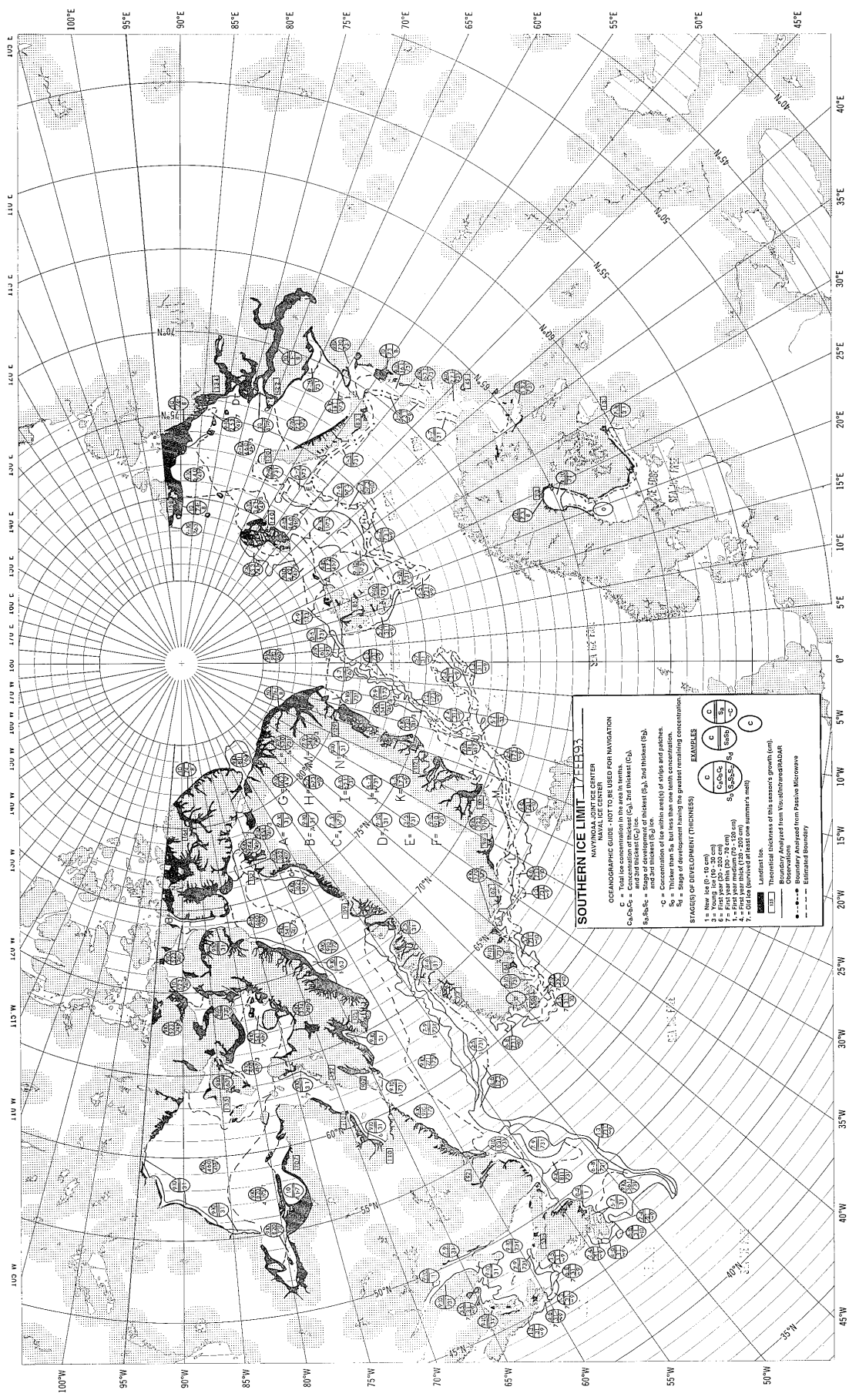
STAGES OF DEVELOPMENT (THICKNESS)

1 = Newly ice (10-30 cm)
 2 = First year (30-200 cm)
 3 = Second year (200-300 cm)
 4 = First year medium (70-150 cm)
 5 = Second year medium (150-200 cm)
 6 = Old ice (formed at least one summer's melt)

EXAMPLES

Landfast Ice:
 C₁ C₂ C₃ S₁ S₂ S₃ S₀ C
 C₁ C₂ C₃ S₁ S₂ S₃ S₀ C
 C₁ C₂ C₃ S₁ S₂ S₃ S₀ C

Theoretical thickness of this season's growth (cm):
 Boundary Analyzed from VisulimaregPDArt
 Boundary Analyzed from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT - FEBRUARY
 NAVAL ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁C₂C₃C₄ = Range of development of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice. (C₄) 2nd thickest (C₃).

S₁S₂S₃S₄S₅S₆ = Range of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), 4th thickest (S₄), and 5th thickest (S₅) ice. (S₆) 2nd thickest (S₅).

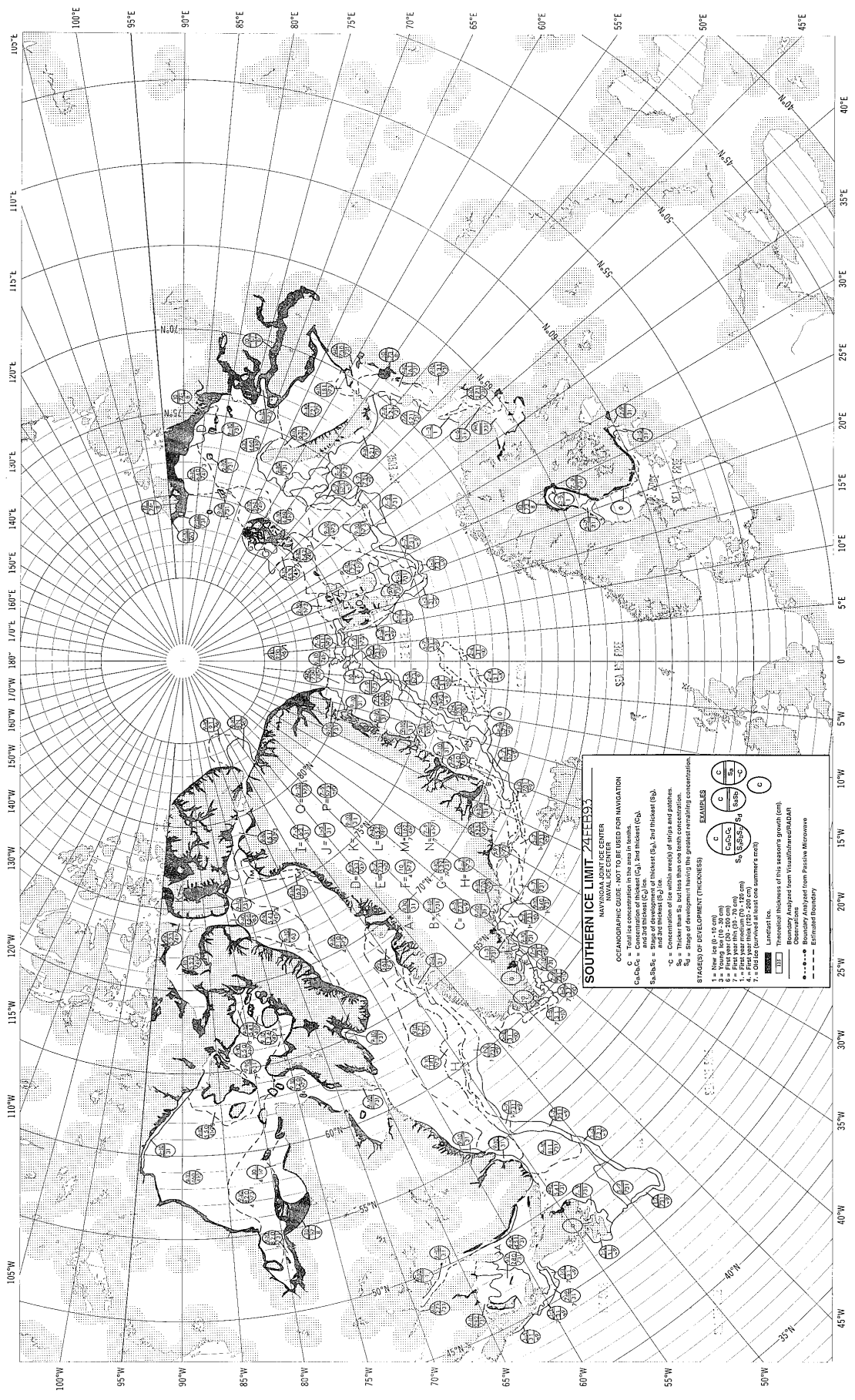
C = Concentration of ice within area(s) of ridges and patches.
 S = Thicker than S₁, but less than one tenth concentration.
 S₁ = First year maximum (75 - 200 cm).
 S₂ = Second year maximum (200 - 400 cm).
 S₃ = Old ice (formed at least one summer's melt).

S (RINGS) OR DEVELOPMENT (THICKNESS)
 1 = New ice (0 - 10 cm)
 2 = First year (10 - 200 cm)
 3 = Second year (200 - 400 cm)
 4 = First year maximum (75 - 200 cm)
 5 = Second year maximum (200 - 400 cm)
 6 = Old ice (formed at least one summer's melt)

EXAMPLES

LEGEND

- Landfast ice
- Theoretical thickness of this season's growth (cm)
- Boundary analyzed from Visual/RESEARCHER
- Boundary analyzed from Passive Microwave
- Estimated Boundary



SOUTHERN ICE LIMIT 24 FEB 83

NAVYAL ICE CENTER
 OCEANOGRAPHIC CODE - NOT TO BE USED FOR NAVIGATION

C₁, C₂, C₃ = Concentration of thickest (C₁), and thickest (C₂) and old thickest (C₃) ice.
 S₁, S₂, S₃ = Thickness (S₁), and thickest (S₂), and old thickest (S₃) ice.
 S₄ = Thicker than S₃, but less than S₂ with concentration.
 S₅ = Thicker than S₄, but less than S₃ with concentration.
 S₆ = Thicker than S₅, but less than S₄ with concentration.
 S₇ = Old ice (survived at least one summer's melt)

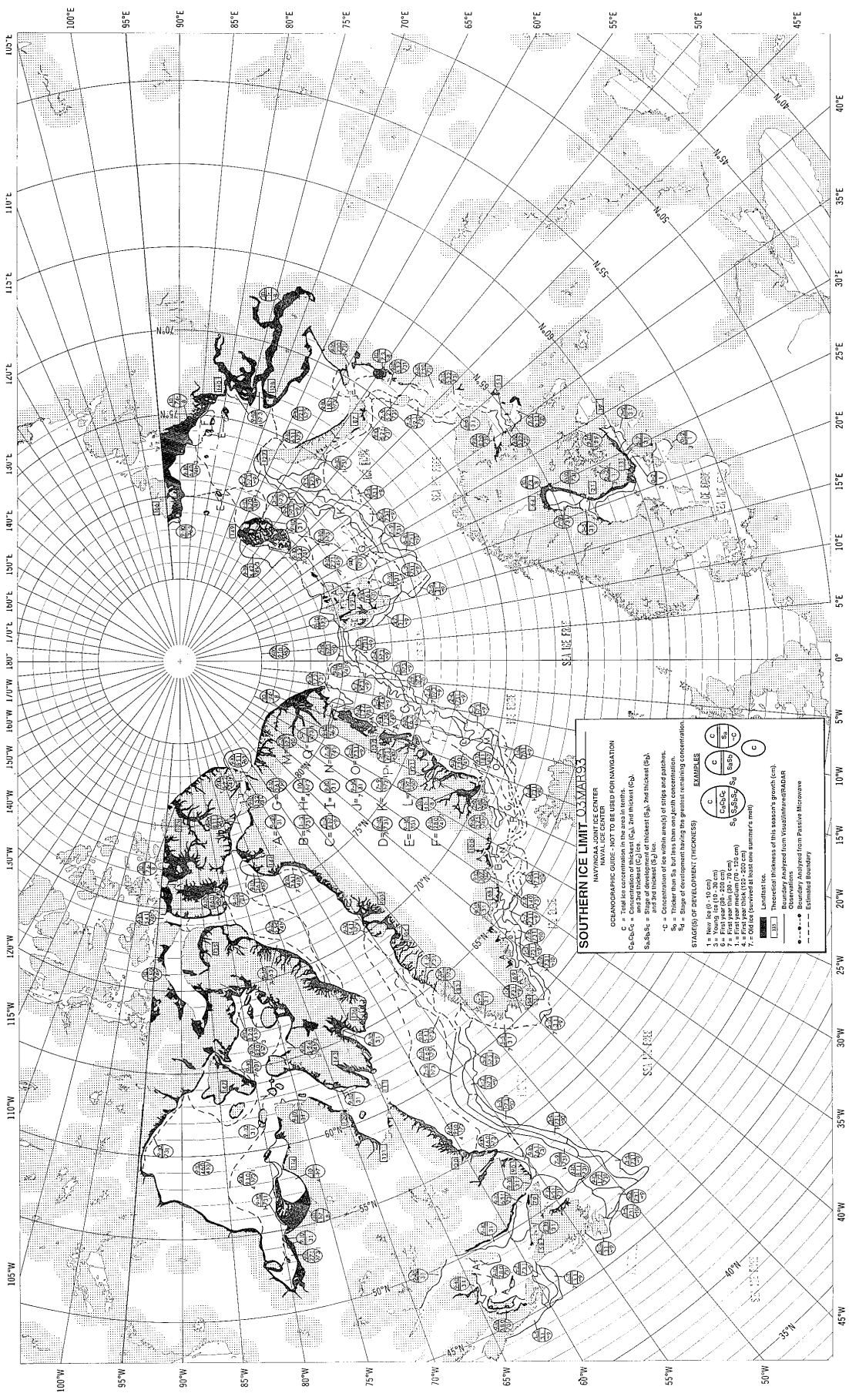
STAGES OF DEVELOPMENT (THICKNESS)

1 = New ice (0 - 15 cm)
 2 = Young ice (15 - 30 cm)
 3 = First year ice (30 - 70 cm)
 4 = First year ice (70 - 100 cm)
 5 = First year ice (100 - 200 cm)
 6 = First year ice (200 - 300 cm)
 7 = Old ice (survived at least one summer's melt)

EXAMPLES

C	C	C	C
C ₁	C ₂	C ₃	C ₄
S ₁	S ₂	S ₃	S ₄
S ₅	S ₆	S ₇	S ₈

Landfast ice.
 Theoretical thickness of this season's growth (cm).
 Observations analyzed from Visual Air Photo Recon.
 Observations analyzed from Passive Microwave.
 Estimated boundary.



SOUTHERN ICE LIMIT 2013
 NAVY/NOAA JOINT ICE CENTER

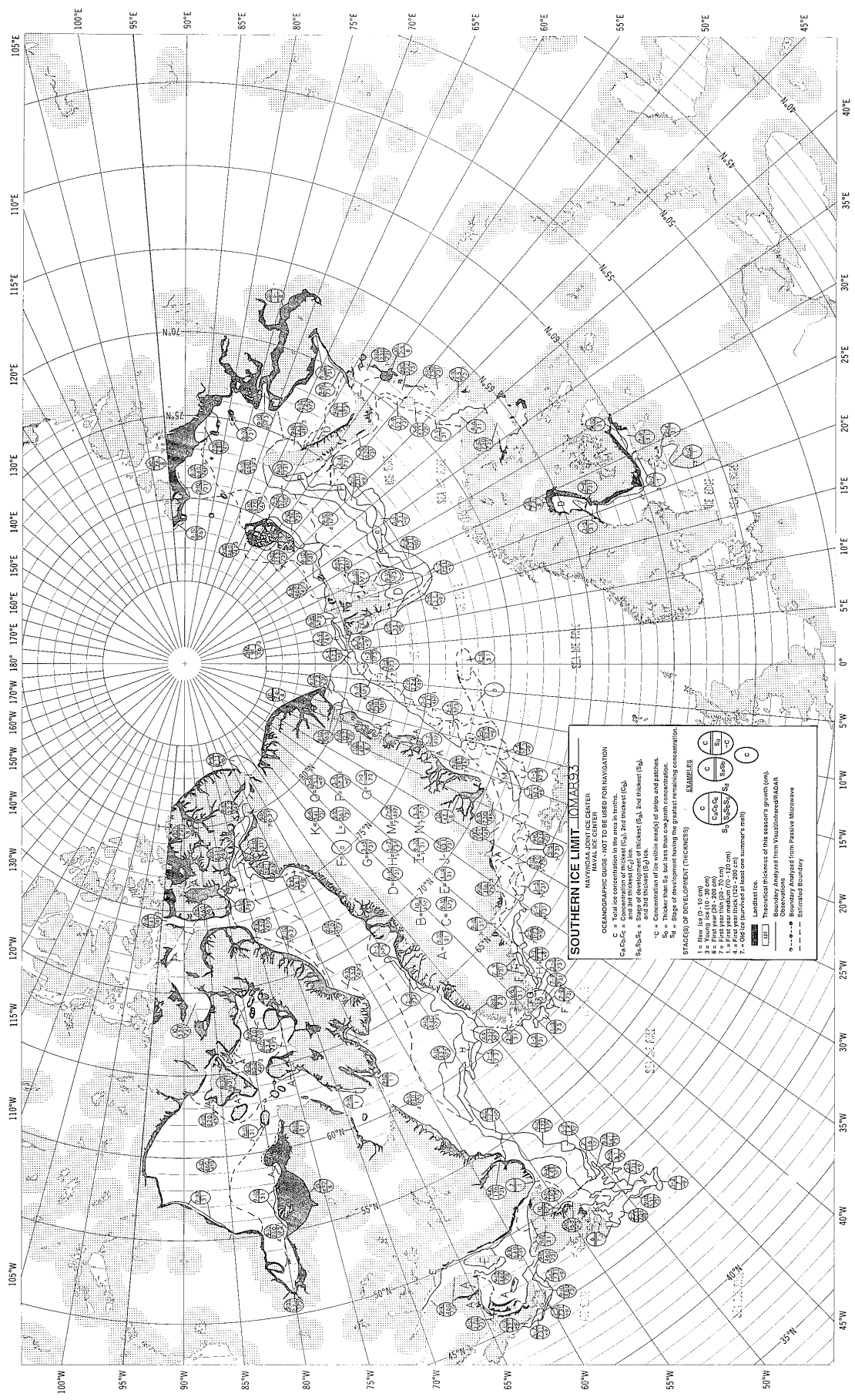
ICE CHARACTERISTICS
 C₁ = Concentration of ice within area of strips and patches.
 S₁ = Thickness (ft.)
 S₂ = Thickness (ft.)
 S₃ = Thickness (ft.)
 S₄ = Thickness (ft.)
 S₅ = Thickness (ft.)
 S₆ = Thickness (ft.)
 S₇ = Thickness (ft.)

STAGES OF DEVELOPMENT (THICKNESS)

EXAMPLES

1 = New Ice (10-15 cm)
 2 = Young Ice (15-30 cm)
 3 = First year ice (30-70 cm)
 4 = First year ice (70-125 cm)
 5 = First year ice (125-175 cm)
 6 = First year ice (175-225 cm)
 7 = Old Ice (removed at least one summer's melt)

Legend:
 Landfast Ice
 Theoretical thickness of this season's growth (cont.)
 Boundary Analyzed from Visual/Microwave Observations
 Boundary Analyzed from Passive Microwave Observations
 Estimated Boundary



SOUTHERN ICE LIMIT - CONTINUED

NAVYAL OCEANOGRAPHIC CENTER
NAVAL OCEANOGRAPHIC CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁C₂C₃ = 1st, 2nd, and 3rd thickness (C₁, 2nd thickest (C₂), and thickest (C₃)).
 S₁S₂S₃S₄ = Stages of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄) of strips and patches.
 S₀ = Concentration of ice within area(s) of strips and patches.
 S₀ = Thicker than S₁, but less than one year's growth.
 S₀ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

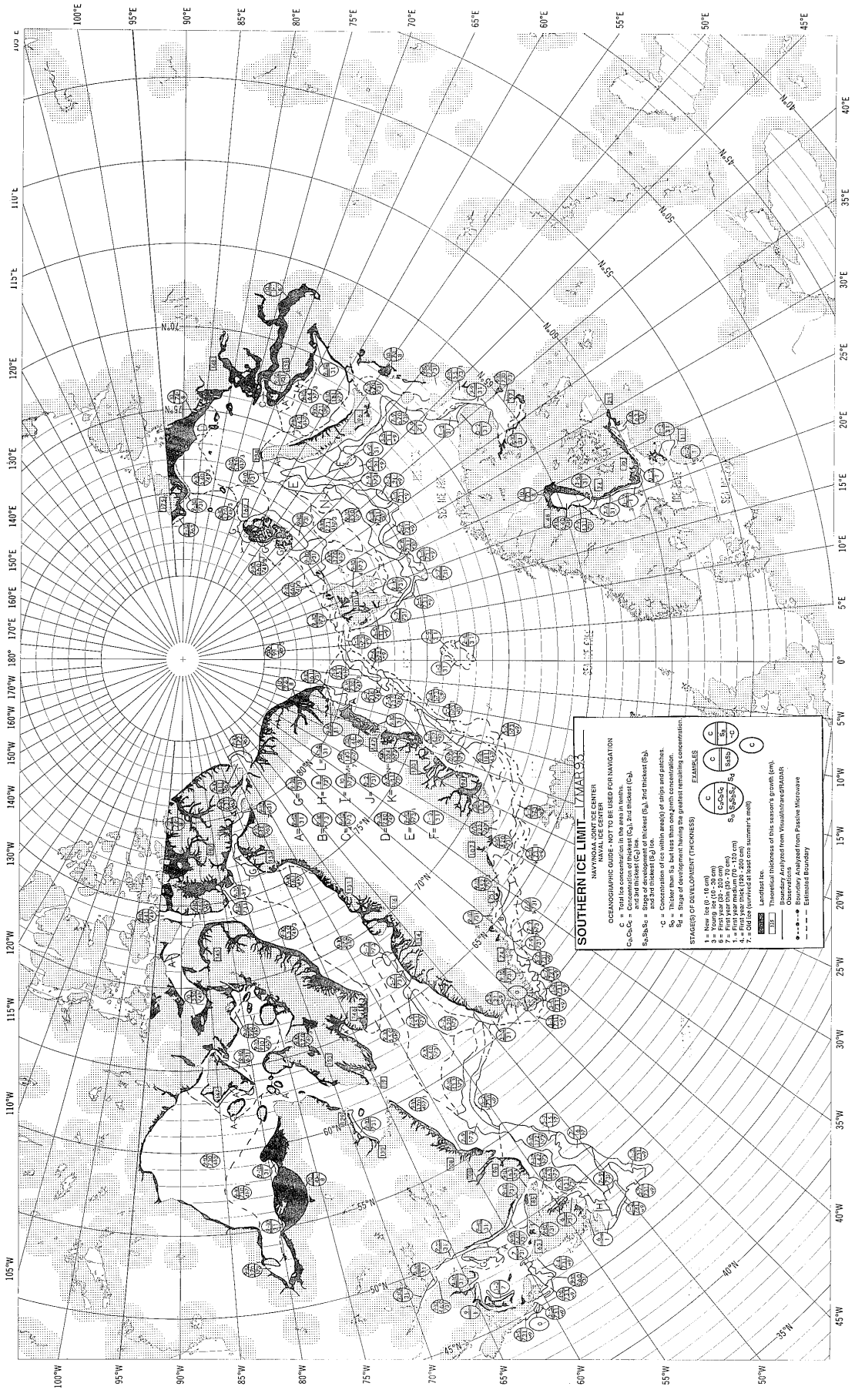
1 = New ice (0-10 cm)
 2 = First year (10-200 cm)
 3 = First year medium (20-225 cm)
 4 = First year medium (225-275 cm)
 5 = Old ice (formed at least one summer's age)
 6 = Old ice (formed at least two summer's age)

EXAMPLES

C	C ₁ C ₂ C ₃	S ₁	S ₂	S ₃	S ₄
10	10010	1	2	3	4

Landmass too.

— Theoretical thickness of this season's growth (cm).
 --- Boundary analyzed from Visual Infrared Radar
 - - - - - Boundary analyzed from Passive Microwave
 - - - - - Estimated boundary



SOUTHERN ICE LIMIT - 7 MAR 53
 NAVY/NOAA JOINT ICE CENTER
 NAVAL ICE CENTER

OROGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice thickness (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice.

CC = Concentration of ice within areas of strips and patches.

Rd = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

EXAMPLES

1 = New ice (0 - 10 cm)
 2 = Young ice (10 - 30 cm)
 3 = First year thin (30 - 70 cm)
 4 = First year thick (70 - 200 cm)
 5 = Old ice (200 - 300 cm)
 6 = Old ice (300 - 400 cm)
 7 = Old ice (400 - 600 cm)

LEGEND

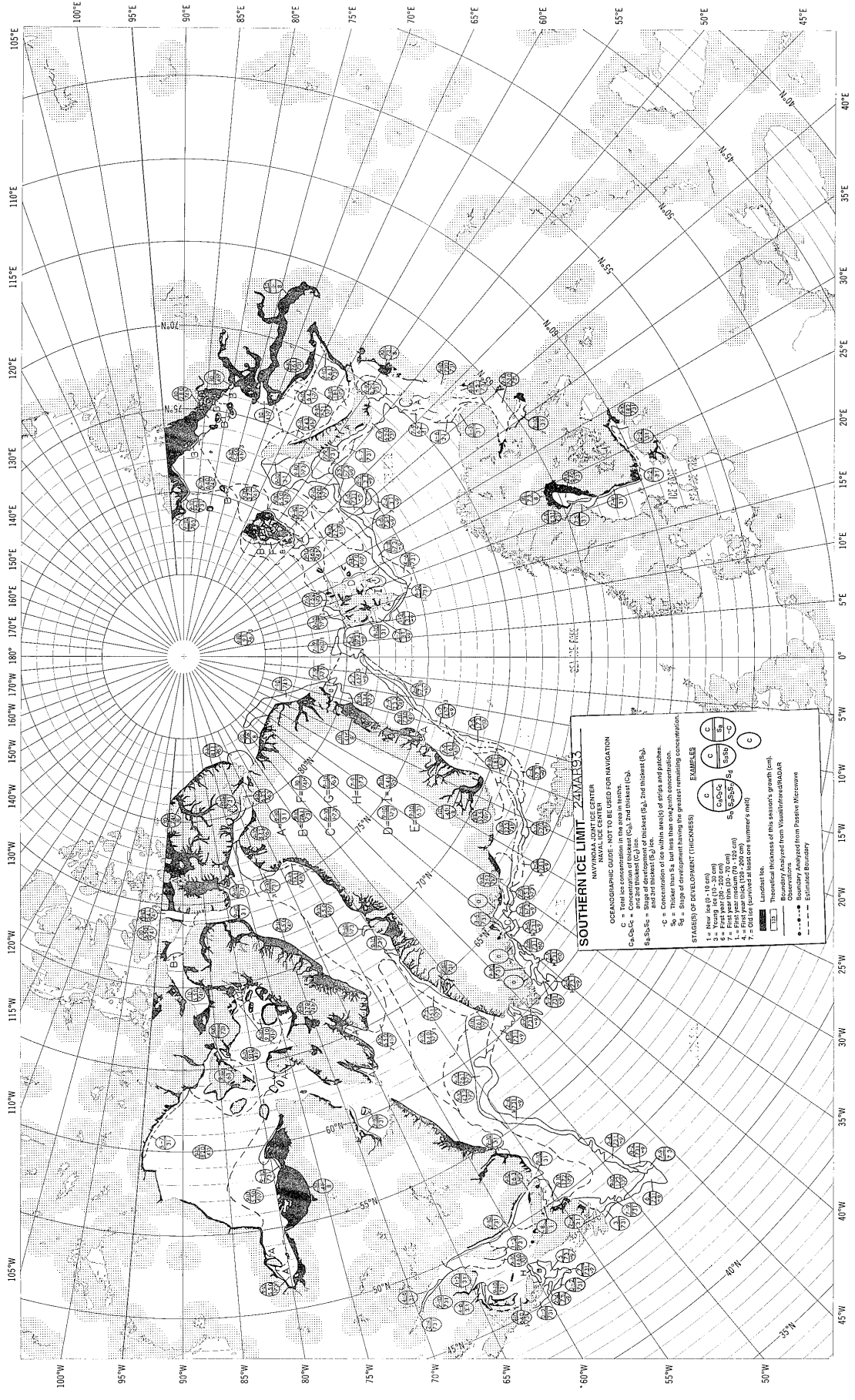
Landfast ice: [Symbol]

Theoretical thickness of this season's growth (cm): [Symbol]

Observations: [Symbol]

Boundary Analyzed from Passive Microwave: [Symbol]

Estimated Boundary: [Symbol]



SOUTHERN ICE LIMIT - ZIMMER
 NAVY/NOAA JOINT ICE CENTER
 NAVAL ICE CENTER

OGONOGRAPHIC GRID IS TO BE USED FOR NAVIGATION

C, C₁, C₂ = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C) ice in pack in meters.

S₁, S₂, S₃ = Stages of development having the greatest remaining concentration.

C = Concentration of ice within area(s) of 100 sq. mi. and patches.

S₁ = Stage of development having the greatest remaining concentration.

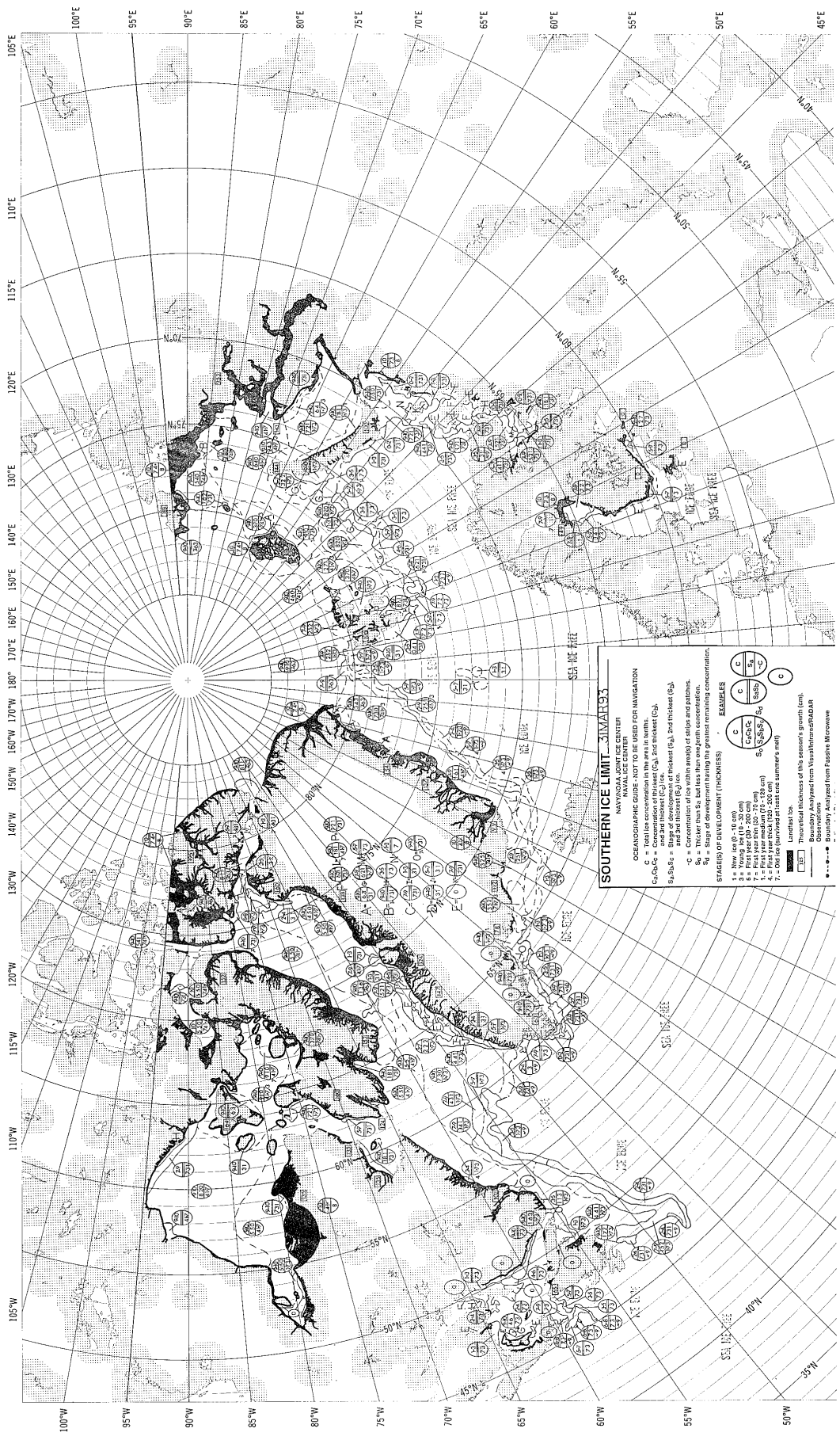
STAGES OF DEVELOPMENT (THICKNESS)

1 = Thin ice (0-10 cm)
 2 = Young ice (10-30 cm)
 3 = First year thin (30-70 cm)
 4 = First year thick (70-100 cm)
 5 = Old ice (100-200 cm)
 6 = Old ice (200-300 cm)
 7 = Old ice (300-400 cm)

EXAMPLES

$\frac{C}{C_1 C_2 C_3}$	$\frac{C}{S_1 S_2 S_3}$
$\frac{C}{C_1 C_2 C_3}$	$\frac{C}{S_1 S_2 S_3}$

Landfast ice: $\frac{C}{C_1 C_2 C_3}$
 Transitional thickness of this sector's growth from
 Observations Analyzed from Visualizations/RADAR
 Observations
 --- Estimated Boundary



SOUTHERN ICE LIMIT - MARCH 1993
 NEW ZEALAND JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
C₁C₂C₃ = Concentration of 1st (C₁), 2nd thickest (C₂), 3rd thickest (C₃) ice.
S₁S₂S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃) ice.
C = Concentration of ice (cube area) of slabs and patches.
S₁ = Thicker than S₂, but less than one-fourth concentration.
S₂ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS) **EXAMPLES**

1 = New ice (0 - 10 cm) $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$

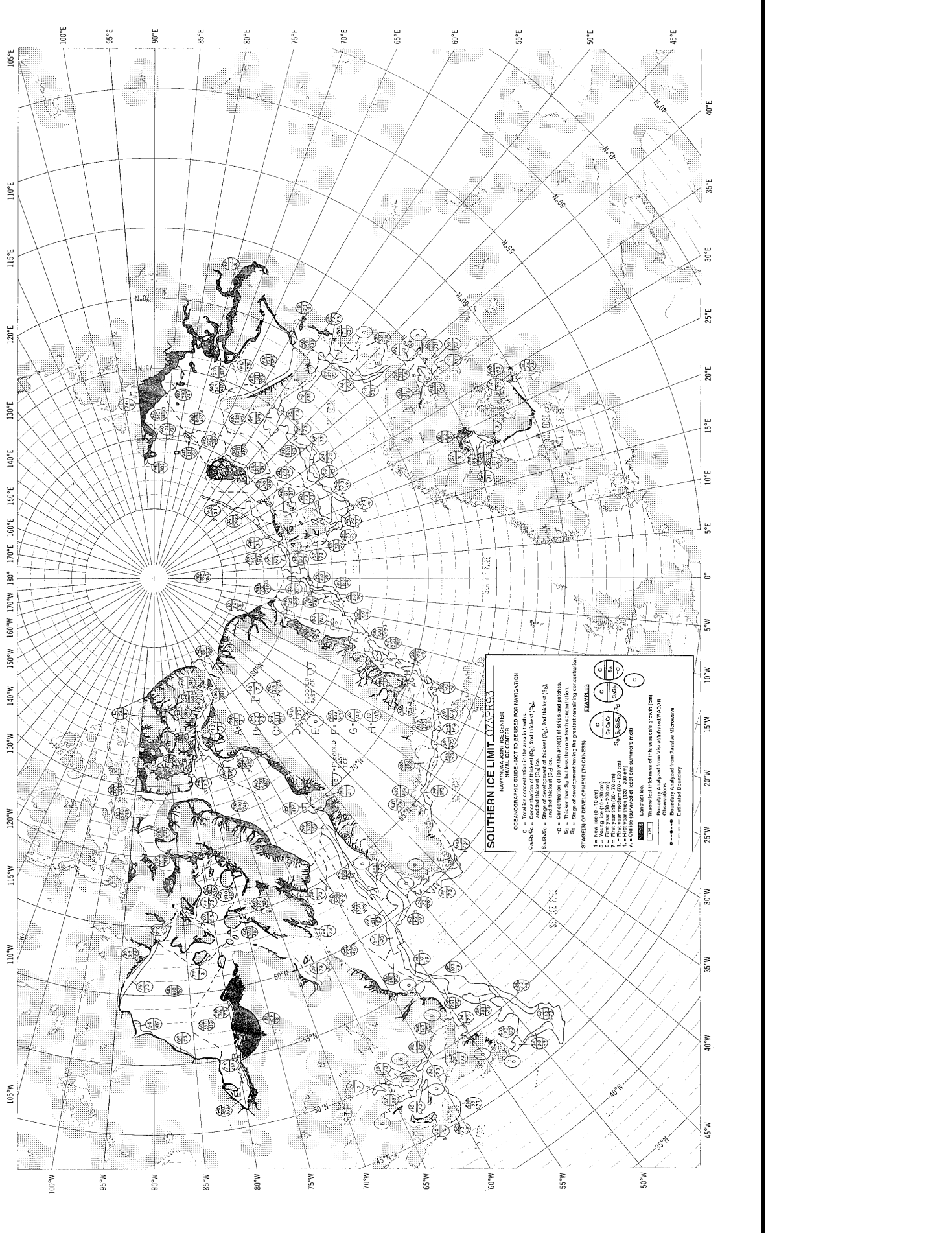
2 = First Year (10 - 200 cm) $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$

3 = First Year medium (70 - 200 cm) $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$

4 = First Year thick (150 - 200 cm) $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$

5 = First Year very thick (200 cm and summer's melt) $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{C_1 C_2 C_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$ $\frac{C}{S_1 S_2 S_3}$

Legend:
 [---] Icebergs
 [---] Locality box
 [---] Theoretical thickness of this season's growth (cm).
 [---] Boundary Analyzed from Visual/Radar
 [---] Observations
 [---] Boundary Analyzed from Passive Microwave



SOUTHERN ICE LIMIT (ZAP-13)
NAVY/OA/LJ/ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
C₁C₂C₃ = Concentration of thickest (C₁), and thickest (C₂) and thickest (C₃) at (0-10) fms.
S₁S₂S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and thickest (S₃) at (0-10) fms. (Stages of ice and snow).
S₁ = Thicker than S₂, but less than one tenth concentration.
S₂ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

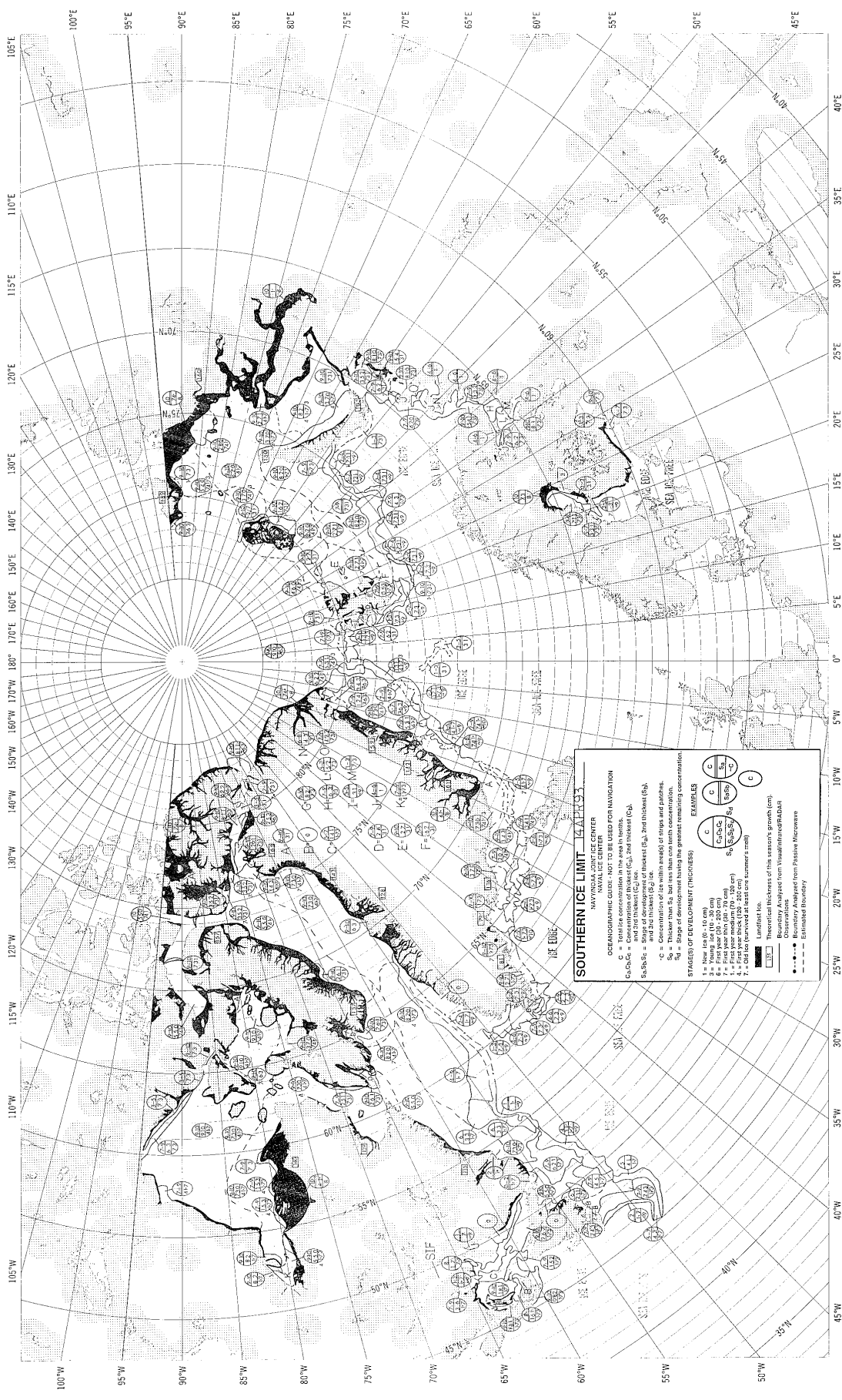
STAGE	THICKNESS (cm)
1 = New ice (0 - 10 cm)	
2 = First year (10 - 200 cm)	
3 = Second year (200 - 300 cm)	
4 = Third year (300 - 500 cm)	
5 = Old year (500 - 2000 cm)	
6 = Ice that has melted and refrozen during the summer's melt	

EXAMPLES

$\frac{C}{C_1 C_2 C_3} \frac{S_1}{S_2 S_3}$	$\frac{C}{C_1 C_2 C_3} \frac{S_1}{S_2}$	$\frac{C}{C_1 C_2 C_3} \frac{S_1}{S_2 S_3}$	$\frac{C}{C_1 C_2 C_3} \frac{S_1}{S_2}$
$\frac{10}{100 200 300} \frac{10}{200 300}$	$\frac{10}{100 200} \frac{10}{200}$	$\frac{10}{100 200} \frac{10}{200 300}$	$\frac{10}{100 200} \frac{10}{200}$

LEGEND

- Landmass line
- Theoretical thickness of this season's growth (cm)
- Boundary Analyzed from Visual/Infrared Data
- Boundary Analyzed from Passive Microwave
- Estimated Boundary



SOUTHERN ICE LIMIT - 1953
 NAVY OPERATIONAL CENTER
 NAVAL ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in percent.
 C₁C₂C₃C₄ = Stage of development of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice.
 S₁S₂S₃S₄ = Stage of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄) ice within an area of strips and patches.
 *C = Concentration of ice within an area of strips and patches.
 *S = Thicker than S₄ but less than one tenth concentration.
 *N = Stage of development having the greatest remaining concentration.

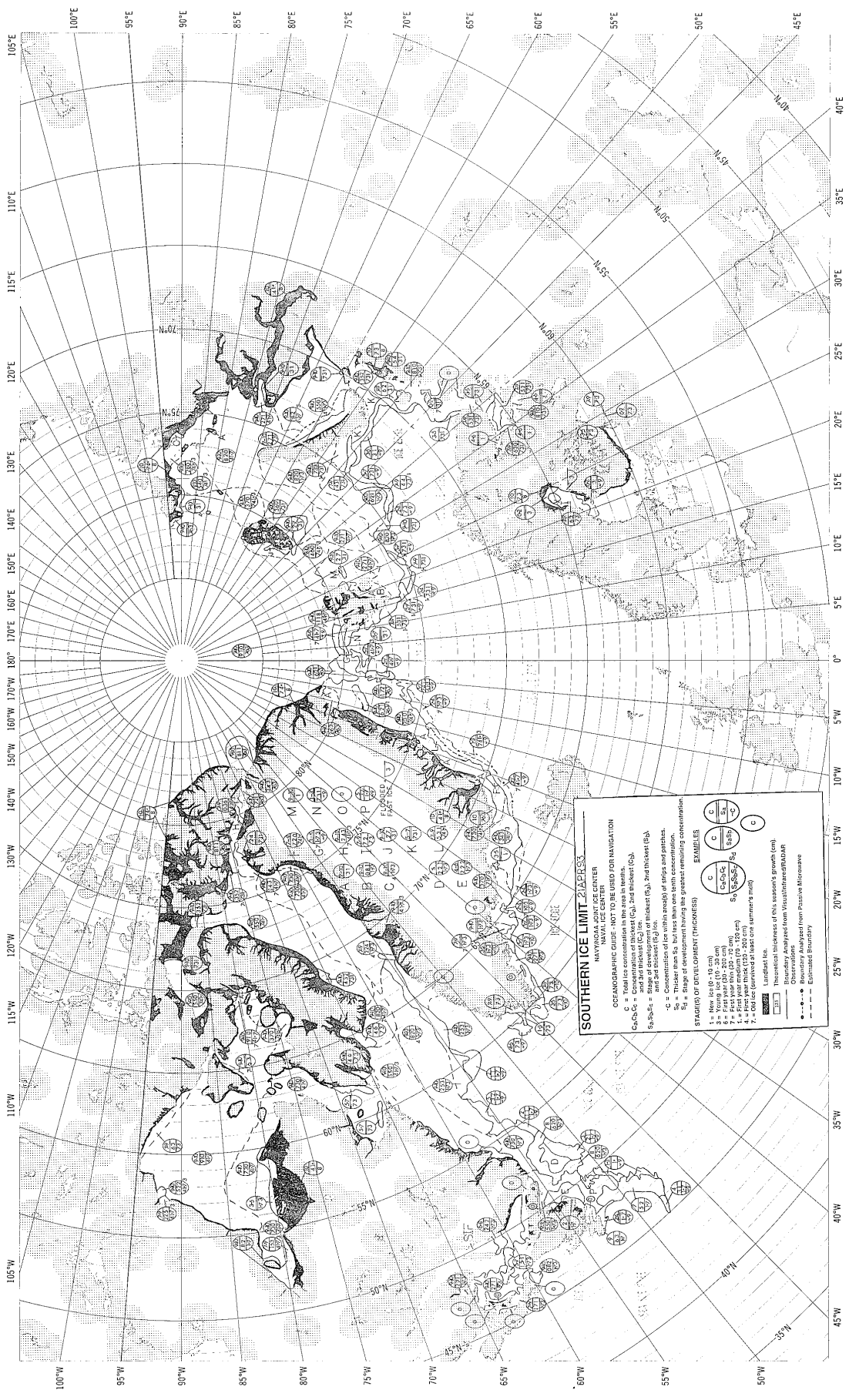
STAGES OF DEVELOPMENT (THICKNESS)

EXAMPLES

1 = New ice (0 - 10 cm)
 2 = First year (10 - 200 cm)
 3 = First year (200 - 300 cm)
 4 = First year medium (300 - 400 cm)
 5 = First year medium (400 - 500 cm)
 6 = First year medium (500 - 600 cm)
 7 = Old ice (formed at least one summer's melt)

Landfast ice

— Theoretical thickness of this season's growth (cm).
 — Boundary Analyzed from Visual/Microwave Data.
 — Boundary Analyzed from Passive Microwave
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT ZAPRESS
 NAVY NAVAL MOUNT ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in percent
 C₁C₂C₃C₄ = 1st, 2nd, 3rd, and 4th thickness (C₁ in cm, C₂ in inches, C₃ in feet, C₄ in meters)
 S₁S₂S₃S₄S₅ = Stage of development (S₁ = first year, S₂ = second year, S₃ = third year, S₄ = fourth year, S₅ = fifth year)
 G = Concentration of ice within length of strips and patches.
 S₆ = Thicker than S₅, but less than one term concentration.
 S₇ = Stage of development (thickness)

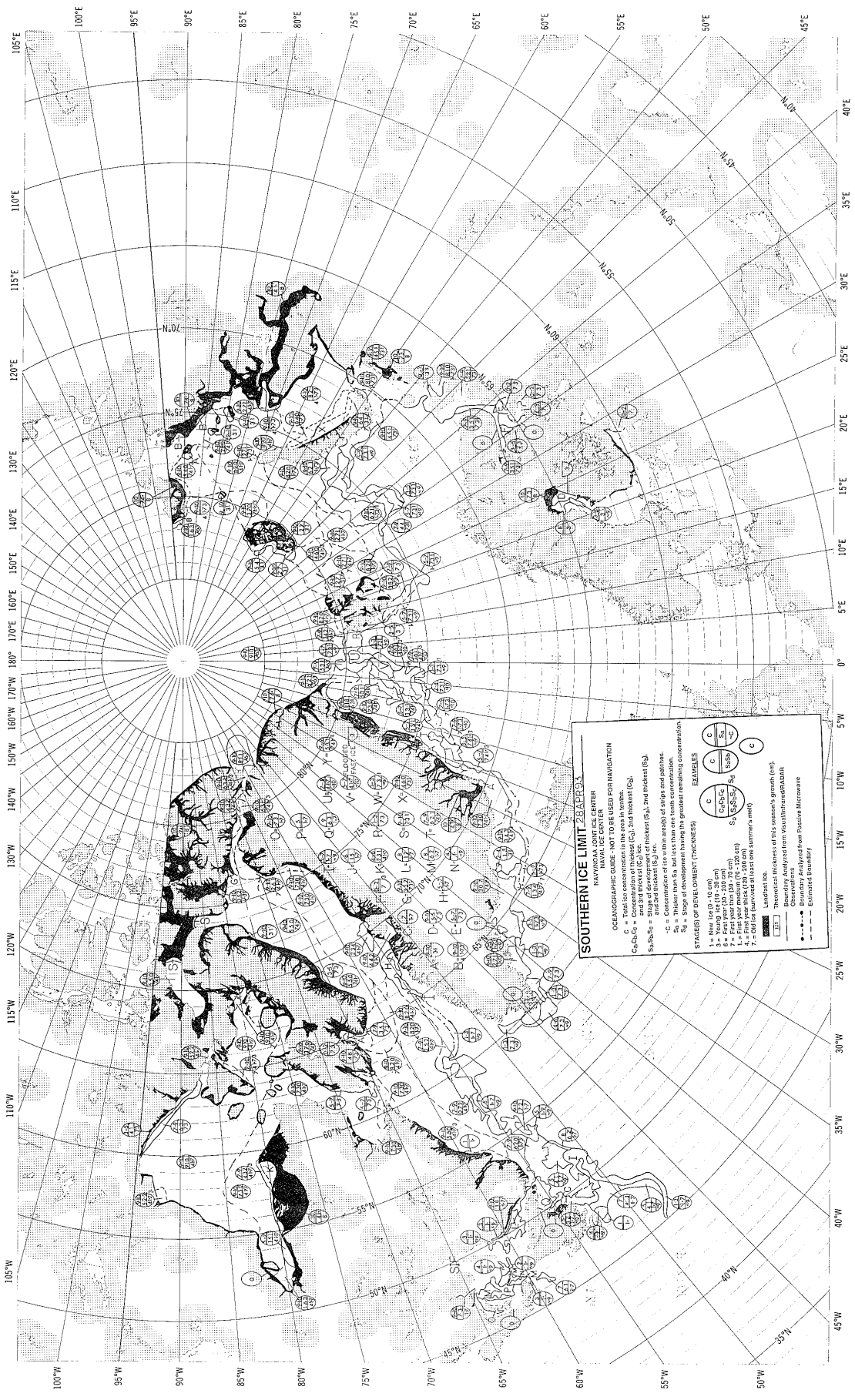
STAGES OF DEVELOPMENT (THICKNESS)

1	2	3	4	5	6	7
10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
4-8 in	8-12 in	12-16 in	16-20 in	20-24 in	24-28 in	28-32 in

REMARKS

C	C ₁	C ₂	C ₃	C ₄	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	G
---	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	---

[Symbol: Dotted line] Theoretical thickness of this season's growth (cm)
 [Symbol: Solid line] Boundary Analyzed from Visual Observations
 [Symbol: Dashed line] Boundary Analyzed from Passive Microwave
 [Symbol: Dotted line with dots] Estimated Boundary



SOUTHERN ICE LIMIT ZONE
NAVY/NOAA JOINT PROJECT CENTER

OCEANOGRAPHIC CODE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁C₂C₃ = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃).
 S₁S₂S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃).
 C = Concentration of ice in the area in tenths.
 S₁ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

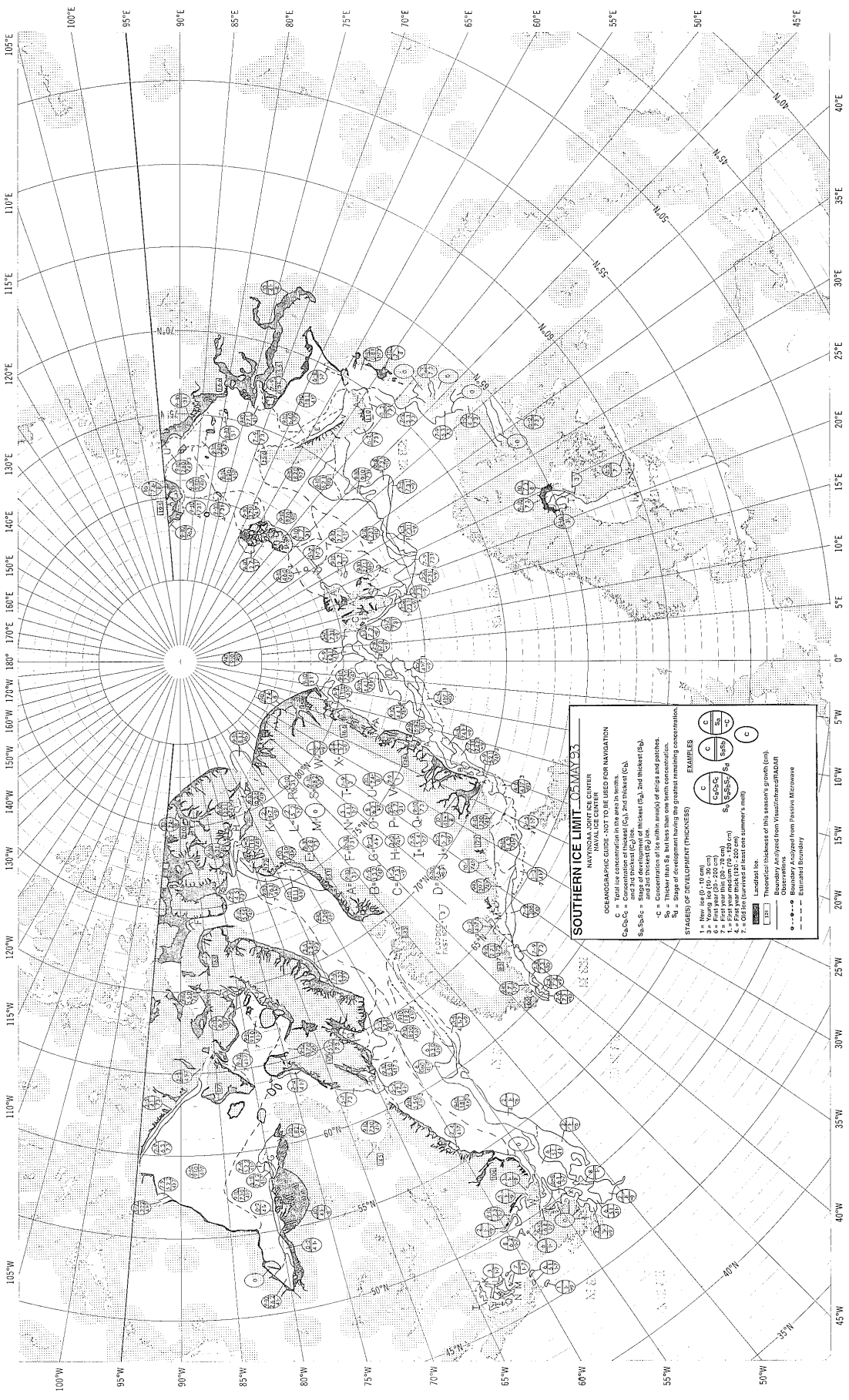
1 = New ice (0 - 10 cm)
 2 = Young ice (10 - 200 cm)
 3 = First year thin (20 - 250 cm)
 4 = First year thick (250 - 300 cm)
 5 = Old ice (various thicknesses over summer's work)

EXAMPLES

C	C ₁ C ₂ C ₃	S ₁	S ₂	S ₃
10	10000	1	2	3
10	10000	1	2	3

LEGEND

- Landmass
- Ice limit boundary of this season's growth (cm)
- Boundary Analyzed from VASHTI/INTELRADAR
- Observations
- Estimated boundary



SOUTHERN ICE LIMIT - MAY 1953

NAVY AND JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

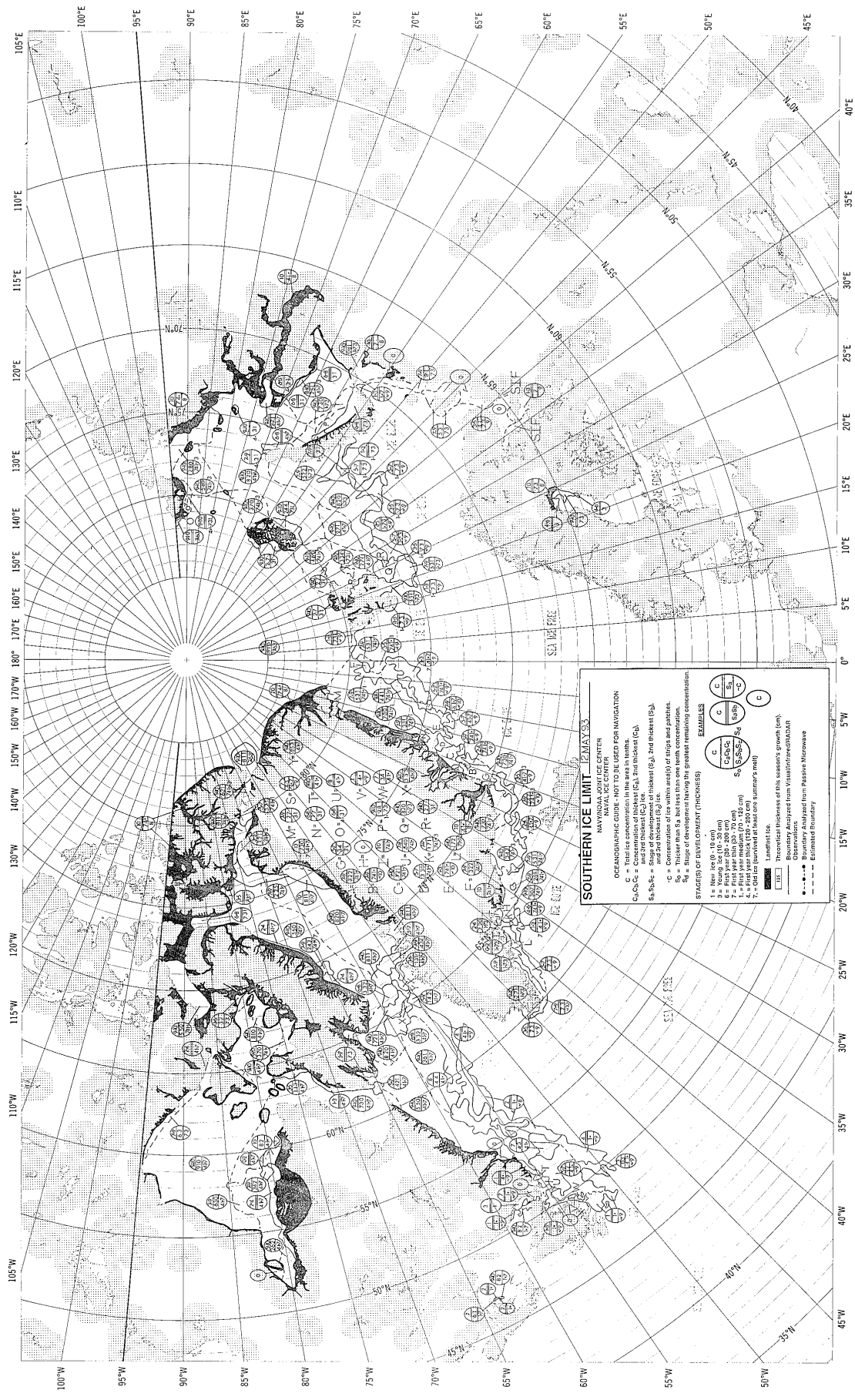
C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentrations of thickest (C₁), 2nd thickest (C₂), and thickest (C₃).
 S₁, S₂, S₃, S₄ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) ice areas.
 - C = Characteristic of ice area (analysis) of area and patches.
 S₁ = Thicker than S₂, but less than one sixth concentration.
 S₂ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

1 = New ice (0 - 10 cm)
 2 = First year (10 - 200 cm)
 3 = First year (200 - 250 cm)
 4 = First year (250 - 300 cm)
 5 = First year (300 - 350 cm)

EXAMPLES

Thickest thickness of this season's growth (cm)
 Boundary Analyzed from Visual/Infrared/RADAR
 Boundary Analyzed from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT - JANUARY 1983
 NAVY NAVAL ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁C₂C₃ = Range of development of thickest (C₁), 2nd thickest (C₂), and thickest (C₃) ice.
 S₁S₂S₃S₄ = Range of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄) ice.
 S₁ = Thickest ice within area(s) of single and patches.
 S₂ = Thicker than S₁, but less than one tenth concentration.
 S₃ = Range of development having the greatest remaining concentration.

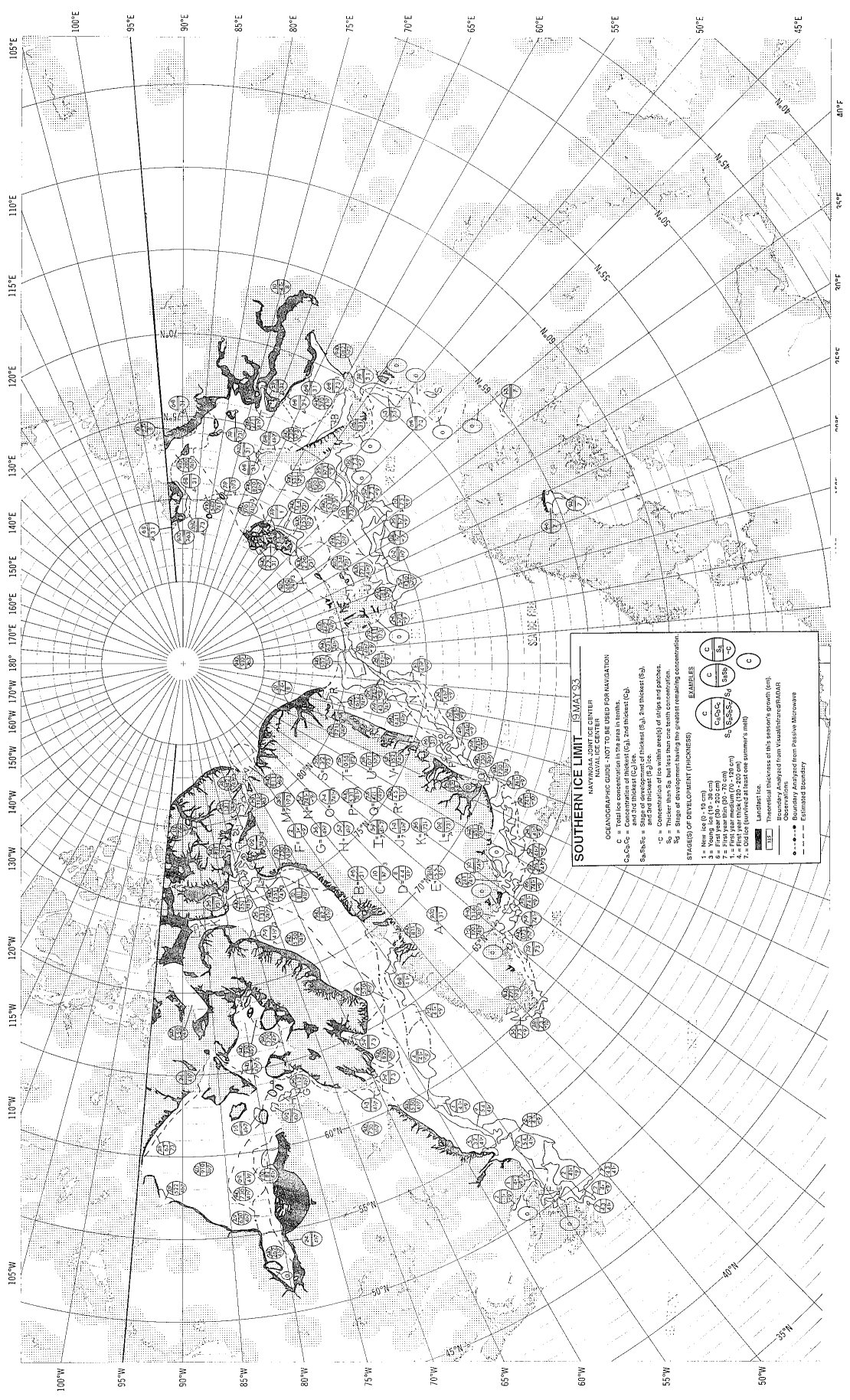
STAGES OF DEVELOPMENT (THICKNESS)

1 = Near ice (0 - 10 cm)
 2 = Ring year (20 - 200 cm)
 3 = Ring year (200 - 300 cm)
 4 = Ring year (300 - 400 cm)
 5 = Ring year (400 - 500 cm)
 6 = Ring year (500 - 600 cm)
 7 = Ring year (600 - 700 cm)
 8 = Ring year (700 - 800 cm)
 9 = Ring year (800 - 900 cm)
 10 = Ring year (900 - 1000 cm)

EXAMPLES

C₁C₂C₃ S₁ S₂ S₃ S₄ (with various symbols)

Legend:
 Landmass top
 Theoretical thickness of this season's growth (cm)
 Boundary Analyzed from Visual/Infrared/MADAR
 Boundary Analyzed from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT - 15 MAY 93
 NATIONAL ICE CENTER
 NAVAL OCEANOGRAPHIC CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁C₂C₃C₄ = Concentration of thickest (C₁), 2nd thickest (C₂), 3rd thickest (C₃), and 4th thickest (C₄) ice.

S₁S₂S₃S₄ = Stage of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄) ice.

⊙ = Concentration of ice within area(s) of strip(s) and patches.
 ⊙ = Thicker than S₄, but less than one term concentration.
 ⊙ = Stage of development (thickness).

STAGES OF DEVELOPMENT (THICKNESS)

1 = New ice (0 - 10 cm)
 2 = First year (10 - 20 cm)
 3 = First year (20 - 30 cm)
 4 = First year (30 - 40 cm)
 5 = First year (40 - 50 cm)
 6 = First year (50 - 60 cm)
 7 = First year (60 - 70 cm)
 8 = First year (70 - 80 cm)
 9 = First year (80 - 90 cm)
 10 = First year (90 - 100 cm)
 11 = First year (100 - 110 cm)
 12 = First year (110 - 120 cm)
 13 = First year (120 - 130 cm)
 14 = First year (130 - 140 cm)
 15 = First year (140 - 150 cm)
 16 = First year (150 - 160 cm)
 17 = First year (160 - 170 cm)
 18 = First year (170 - 180 cm)
 19 = First year (180 - 190 cm)
 20 = First year (190 - 200 cm)
 21 = First year (200 - 210 cm)
 22 = First year (210 - 220 cm)
 23 = First year (220 - 230 cm)
 24 = First year (230 - 240 cm)
 25 = First year (240 - 250 cm)
 26 = First year (250 - 260 cm)
 27 = First year (260 - 270 cm)
 28 = First year (270 - 280 cm)
 29 = First year (280 - 290 cm)
 30 = First year (290 - 300 cm)
 31 = First year (300 - 310 cm)
 32 = First year (310 - 320 cm)
 33 = First year (320 - 330 cm)
 34 = First year (330 - 340 cm)
 35 = First year (340 - 350 cm)
 36 = First year (350 - 360 cm)
 37 = First year (360 - 370 cm)
 38 = First year (370 - 380 cm)
 39 = First year (380 - 390 cm)
 40 = First year (390 - 400 cm)
 41 = First year (400 - 410 cm)
 42 = First year (410 - 420 cm)
 43 = First year (420 - 430 cm)
 44 = First year (430 - 440 cm)
 45 = First year (440 - 450 cm)
 46 = First year (450 - 460 cm)
 47 = First year (460 - 470 cm)
 48 = First year (470 - 480 cm)
 49 = First year (480 - 490 cm)
 50 = First year (490 - 500 cm)
 51 = First year (500 - 510 cm)
 52 = First year (510 - 520 cm)
 53 = First year (520 - 530 cm)
 54 = First year (530 - 540 cm)
 55 = First year (540 - 550 cm)
 56 = First year (550 - 560 cm)
 57 = First year (560 - 570 cm)
 58 = First year (570 - 580 cm)
 59 = First year (580 - 590 cm)
 60 = First year (590 - 600 cm)
 61 = First year (600 - 610 cm)
 62 = First year (610 - 620 cm)
 63 = First year (620 - 630 cm)
 64 = First year (630 - 640 cm)
 65 = First year (640 - 650 cm)
 66 = First year (650 - 660 cm)
 67 = First year (660 - 670 cm)
 68 = First year (670 - 680 cm)
 69 = First year (680 - 690 cm)
 70 = First year (690 - 700 cm)
 71 = First year (700 - 710 cm)
 72 = First year (710 - 720 cm)
 73 = First year (720 - 730 cm)
 74 = First year (730 - 740 cm)
 75 = First year (740 - 750 cm)
 76 = First year (750 - 760 cm)
 77 = First year (760 - 770 cm)
 78 = First year (770 - 780 cm)
 79 = First year (780 - 790 cm)
 80 = First year (790 - 800 cm)
 81 = First year (800 - 810 cm)
 82 = First year (810 - 820 cm)
 83 = First year (820 - 830 cm)
 84 = First year (830 - 840 cm)
 85 = First year (840 - 850 cm)
 86 = First year (850 - 860 cm)
 87 = First year (860 - 870 cm)
 88 = First year (870 - 880 cm)
 89 = First year (880 - 890 cm)
 90 = First year (890 - 900 cm)
 91 = First year (900 - 910 cm)
 92 = First year (910 - 920 cm)
 93 = First year (920 - 930 cm)
 94 = First year (930 - 940 cm)
 95 = First year (940 - 950 cm)
 96 = First year (950 - 960 cm)
 97 = First year (960 - 970 cm)
 98 = First year (970 - 980 cm)
 99 = First year (980 - 990 cm)
 100 = First year (990 - 1000 cm)

EXAMPLES

1. $\frac{C}{S_1}$ (New ice)

2. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

3. $\frac{C}{S_1}$ (New ice)

4. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

5. $\frac{C}{S_1}$ (New ice)

6. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

7. $\frac{C}{S_1}$ (New ice)

8. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

9. $\frac{C}{S_1}$ (New ice)

10. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

11. $\frac{C}{S_1}$ (New ice)

12. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

13. $\frac{C}{S_1}$ (New ice)

14. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

15. $\frac{C}{S_1}$ (New ice)

16. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

17. $\frac{C}{S_1}$ (New ice)

18. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

19. $\frac{C}{S_1}$ (New ice)

20. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

21. $\frac{C}{S_1}$ (New ice)

22. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

23. $\frac{C}{S_1}$ (New ice)

24. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

25. $\frac{C}{S_1}$ (New ice)

26. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

27. $\frac{C}{S_1}$ (New ice)

28. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

29. $\frac{C}{S_1}$ (New ice)

30. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

31. $\frac{C}{S_1}$ (New ice)

32. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

33. $\frac{C}{S_1}$ (New ice)

34. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

35. $\frac{C}{S_1}$ (New ice)

36. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

37. $\frac{C}{S_1}$ (New ice)

38. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

39. $\frac{C}{S_1}$ (New ice)

40. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

41. $\frac{C}{S_1}$ (New ice)

42. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

43. $\frac{C}{S_1}$ (New ice)

44. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

45. $\frac{C}{S_1}$ (New ice)

46. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

47. $\frac{C}{S_1}$ (New ice)

48. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

49. $\frac{C}{S_1}$ (New ice)

50. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

51. $\frac{C}{S_1}$ (New ice)

52. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

53. $\frac{C}{S_1}$ (New ice)

54. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

55. $\frac{C}{S_1}$ (New ice)

56. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

57. $\frac{C}{S_1}$ (New ice)

58. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

59. $\frac{C}{S_1}$ (New ice)

60. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

61. $\frac{C}{S_1}$ (New ice)

62. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

63. $\frac{C}{S_1}$ (New ice)

64. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

65. $\frac{C}{S_1}$ (New ice)

66. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

67. $\frac{C}{S_1}$ (New ice)

68. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

69. $\frac{C}{S_1}$ (New ice)

70. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

71. $\frac{C}{S_1}$ (New ice)

72. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

73. $\frac{C}{S_1}$ (New ice)

74. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

75. $\frac{C}{S_1}$ (New ice)

76. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

77. $\frac{C}{S_1}$ (New ice)

78. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

79. $\frac{C}{S_1}$ (New ice)

80. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

81. $\frac{C}{S_1}$ (New ice)

82. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

83. $\frac{C}{S_1}$ (New ice)

84. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

85. $\frac{C}{S_1}$ (New ice)

86. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

87. $\frac{C}{S_1}$ (New ice)

88. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

89. $\frac{C}{S_1}$ (New ice)

90. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

91. $\frac{C}{S_1}$ (New ice)

92. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

93. $\frac{C}{S_1}$ (New ice)

94. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

95. $\frac{C}{S_1}$ (New ice)

96. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

97. $\frac{C}{S_1}$ (New ice)

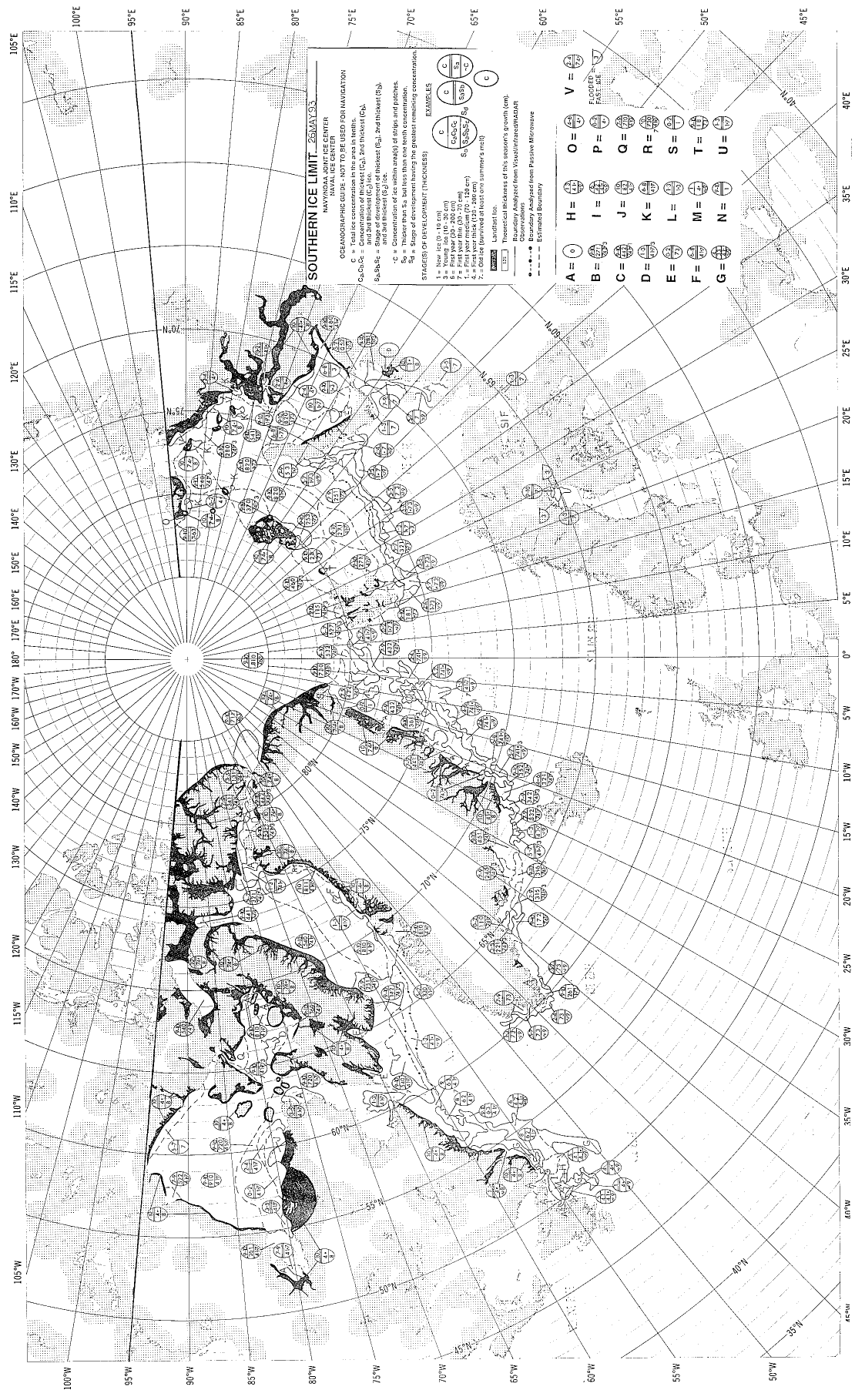
98. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

99. $\frac{C}{S_1}$ (New ice)

100. $\frac{C_1C_2C_3C_4}{S_1S_2S_3S_4}$ (First year)

Legend:

- Theoretical thickness at this season's growth (cm)
- Boundary Analyzed from Visual/Infrared/AR
- Observations
- Analyzed from Russian Microwave
- Estimated Boundary



SOUTHERN ICE LIMIT - 25 MAY 63
 NAVAL ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 S₁ = Thickness of the thickest ice in the area in feet.
 S₂ = Thickness of the second thickest ice in the area in feet.
 S₃ = Thickness of the third thickest ice in the area in feet.
 S₄ = Thickness of the fourth thickest ice in the area in feet.
 S₅ = Thickness of the fifth thickest ice in the area in feet.
 S₆ = Thickness of the sixth thickest ice in the area in feet.
 S₇ = Thickness of the seventh thickest ice in the area in feet.
 S₈ = Thickness of the eighth thickest ice in the area in feet.
 S₉ = Thickness of the ninth thickest ice in the area in feet.
 S₁₀ = Thickness of the tenth thickest ice in the area in feet.

STAGES OF DEVELOPMENT (INCENTERS)

1 = First year ice (20-300 cm)
 2 = Second year ice (30-300 cm)
 3 = Young ice (10-30 cm)
 4 = Thin ice (10-30 cm)
 5 = First year ice (70-120 cm)
 6 = Second year ice (70-120 cm)
 7 = Old ice (formed at least one summer's age)

EXAMPLES

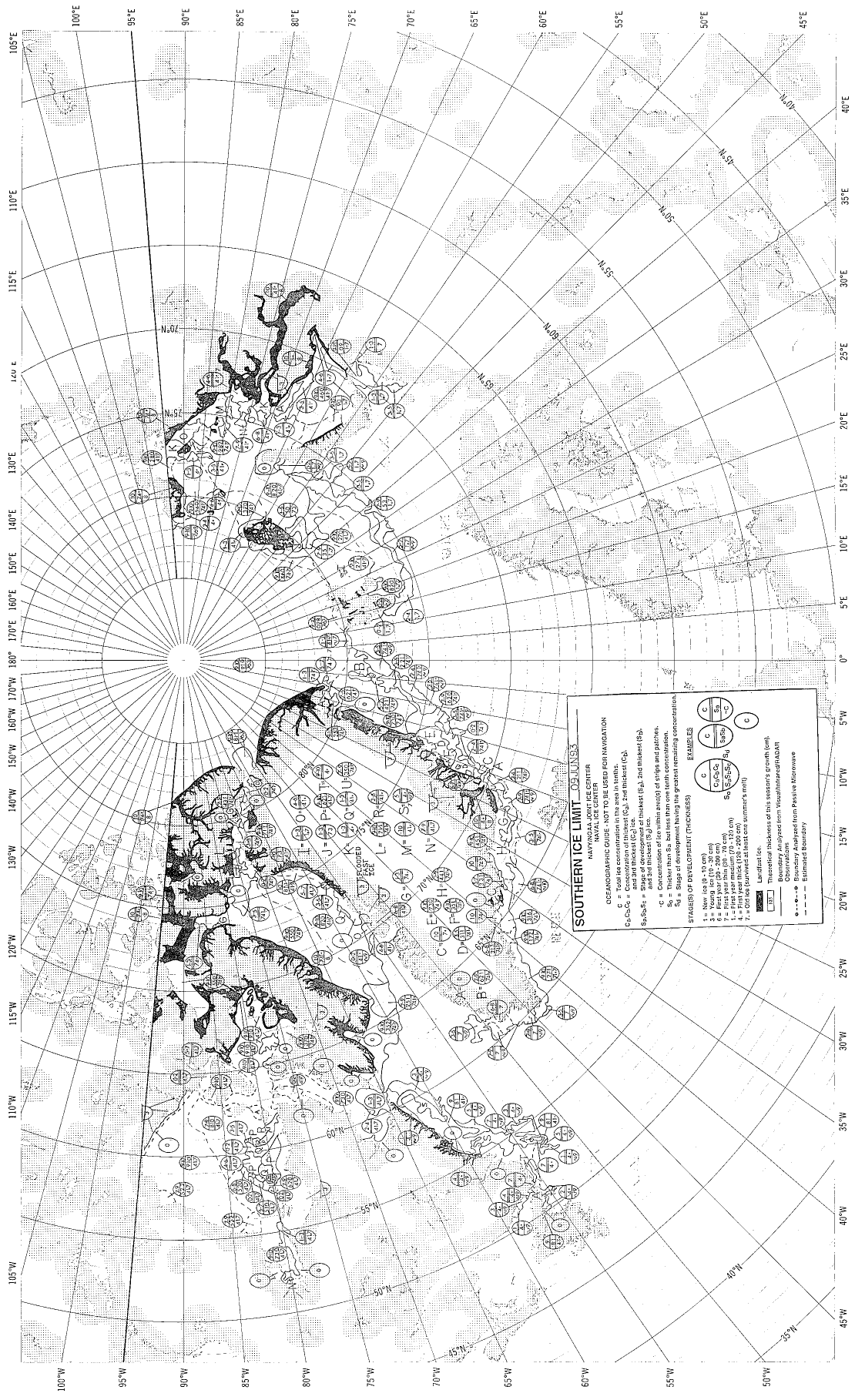
$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
 $\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
 $\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
 $\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$

THEORETICAL THICKNESS OF THIS SECTION'S GROWTH (cm)

Boundary Analyzed from Visual Microarray

--- Estimated Boundary

A =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	H =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	O =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	V =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
B =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	I =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	P =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	FLOBERG	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
C =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	J =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	Q =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	FAST ICE	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$
D =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	K =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	R =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$		
E =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	L =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	S =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$		
F =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	M =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	T =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$		
G =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	N =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$	U =	$\frac{C}{S_1 S_2 S_3 S_4 S_5 S_6 S_7 S_8 S_9 S_{10}}$		



SOUTHERN ICE LIMIT - OBSERVES
 NAVY/NOAA JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice.
 S₁, S₂, S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) ice.
 C₁ = Thicker than S₁, but less than one tenth remaining concentration.
 S₁ = Stage of development having the greatest remaining concentration.

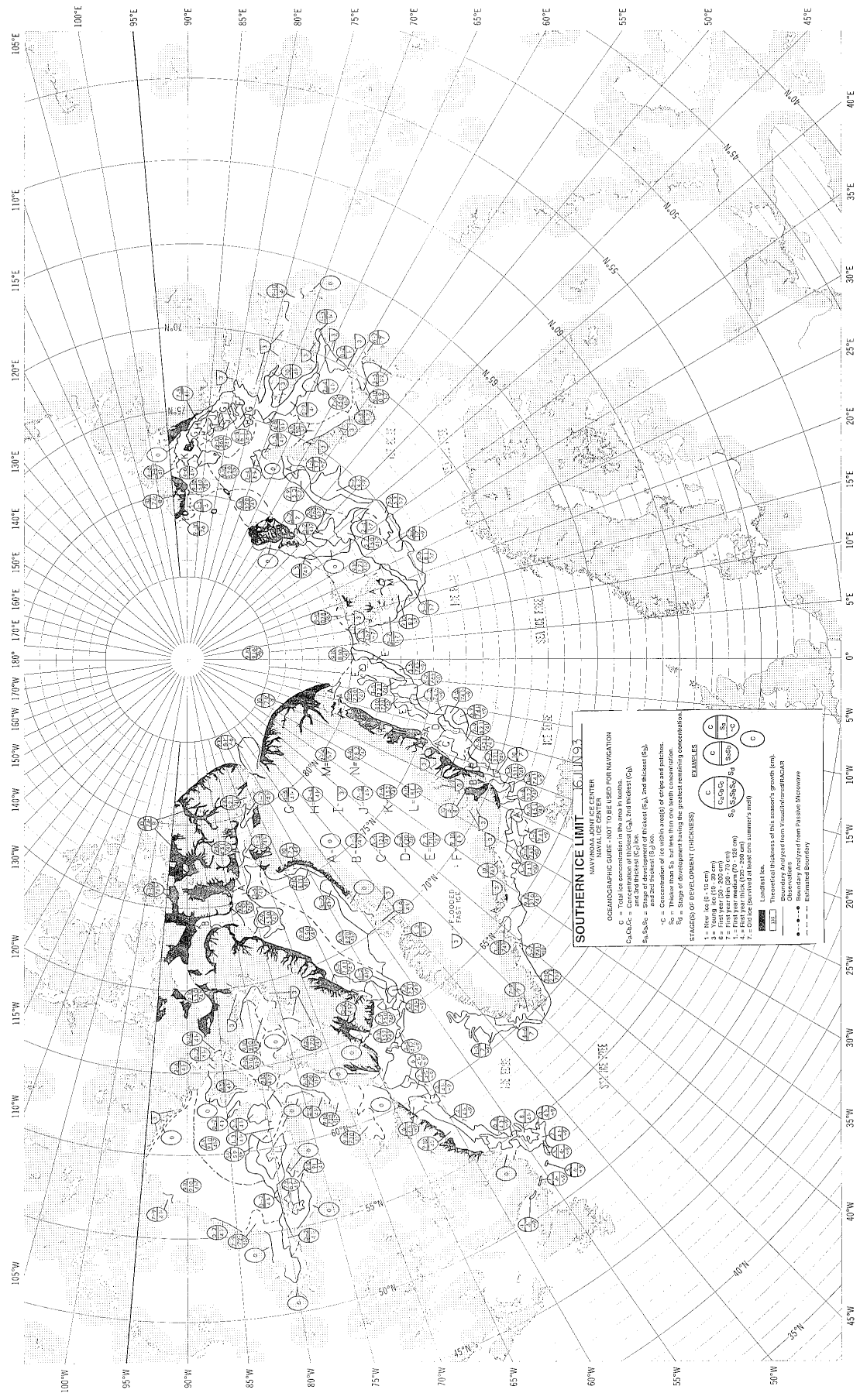
STAGES OF DEVELOPMENT (THICKNESS)

1 = New (ca. 10 cm)
 2 = Young (ca. 100 - 200 cm)
 3 = First year thin (ca. 200 - 300 cm)
 4 = First year thick (ca. 300 - 400 cm)
 5 = First year thick (ca. 400 - 500 cm)
 6 = Old (ice survives at least one summer's melt)

EXAMPLES

C ₁	C ₂	C ₃	S ₁	S ₂	S ₃

Legend:
 Landfast ice
 Boundary between ice types
 Boundary between ice types from visual/remote sensing
 Observation
 Estimated
 Boundary of Boundary



SOUTHERN ICE LIMIT
 NAVYAL ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C_1, C_2, C_3 = Concentration of thickest (C₁), 2nd thickest (C₂), and 3rd thickest (C₃) ice.
 S_1, S_2, S_3 = Thickness (T) in meters (m), and 2nd thickest (S₂) and 3rd thickest (S₃) ice.

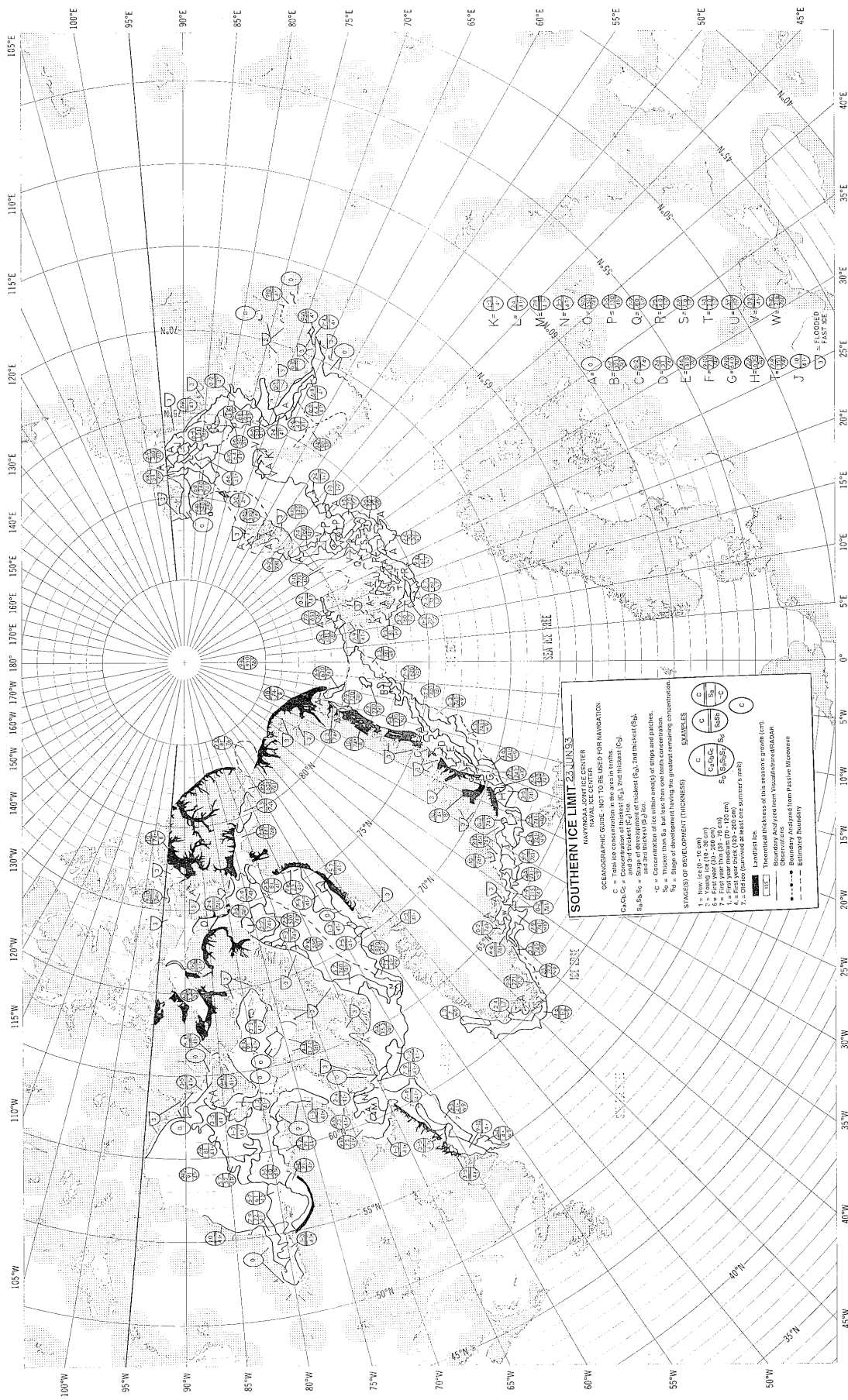
STAGES OF DEVELOPMENT (THICKNESS)

- 1 = New ice (< 15 cm)
- 2 = Young ice (15 - 30 cm)
- 3 = First year medium (30 - 100 cm)
- 4 = First year old (100 - 200 cm)
- 5 = Second year medium (200 - 300 cm)
- 6 = Second year old (300 - 400 cm)
- 7 = Old ice (Survived at least one summer's melt)

EMBELLISHES

C	C	C
C ₁	C ₂	C ₃
S ₁	S ₂	S ₃

Landfast ice
 Theoretical thickness of this season's growth (m)
 Observations (m) from Visual/Underwater
 Boundary Analyzed from Polar Ice Microwave
 Estimated Boundary



SOUTHERN ICE LIMIT (SIL) - JUNE 1953
 NAVY/NOAA JOINT ICE CENTER
 NAVAL ICE CENTER

OROGRAPHIC GUIDE: See the back of this chart.
 O.S.S.C. = Concentration of thickness (C), 2nd thickest (C₂) and 3rd thickest (C₃) ice.
 S₁, S₂, S₃ = 1st, 2nd and 3rd thickest (S) ice.
 C = Concentration of ice within width of strip and probe.
 S = Stage of development having the greatest remaining concentration.

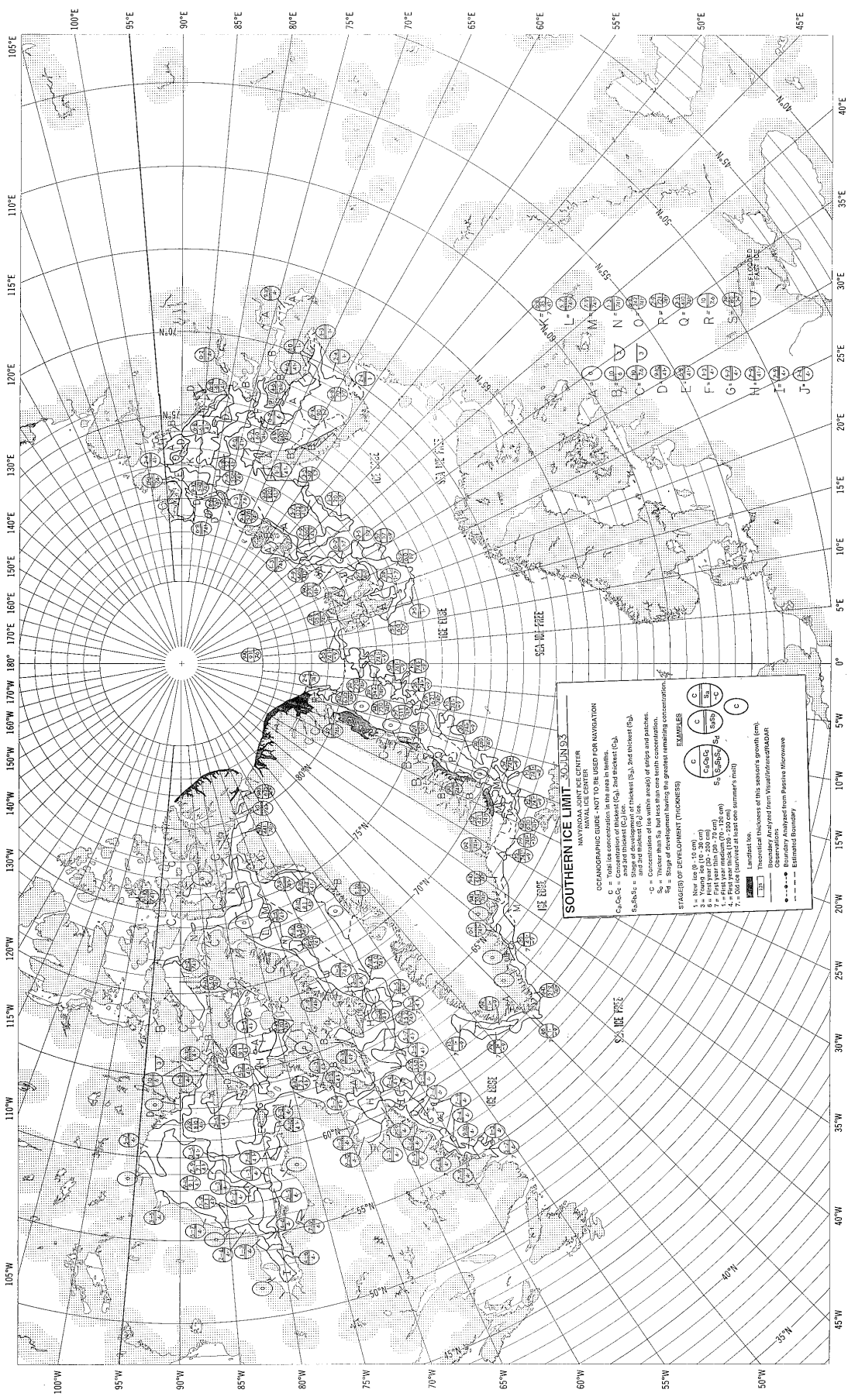
STAGES OF DEVELOPMENT (THICKNESS)

EXAMPLES

1 = New ice (0 - 10 cm)	
2 = Young ice (10 - 30 cm)	
3 = First year thin (30 - 70 cm)	
4 = First year thick (70 - 100 cm)	
5 = Second year thin (100 - 200 cm)	
6 = Second year thick (200 - 300 cm)	
7 = Old ice (survived at least one summer's melt)	

Landfast ice:
 Theoretical thickness of the pack's growth (cm)
 Direction of drift from Acoustic/Bathymetric Data (cm)
 Direction of drift

Boundary:
 ———— Boundary analyzed from Passive Borehole
 - - - - - Estimated boundary



SOUTHERN ICE LIMIT - SOULINESS
 NAVY/NOAA ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

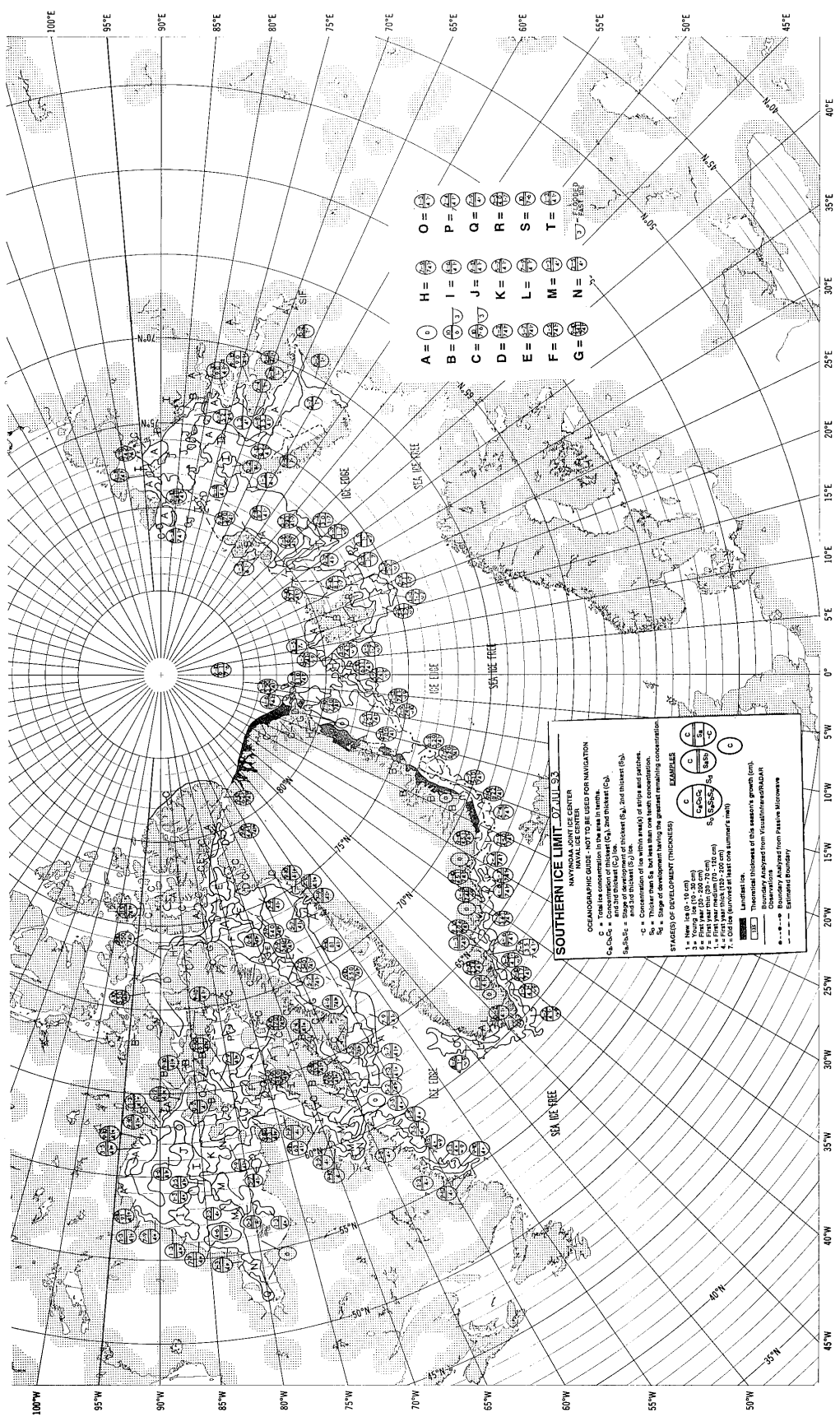
C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration of ice types (C₁, 2nd thickest (S₂), and 3rd thickest (S₃), in the area of ice within area) of strips and patches.
 S₁, S₂, S₃ = Stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃) of ice within area) of strips and patches.
 S₄ = Thicker than S₃, but less than one tenth concentration.
 S₅ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)
 1 = New ice (0 - 10 cm)
 2 = First year thin ice (10 - 20 cm)
 3 = First year medium ice (20 - 30 cm)
 4 = First year thick (30 - 50 cm)
 5 = First year very thick (50 - 100 cm)
 6 = Second year thin (10 - 20 cm)
 7 = Second year medium (20 - 30 cm)
 8 = Second year thick (30 - 50 cm)
 9 = Second year very thick (50 - 100 cm)
 10 = Third year thin (10 - 20 cm)
 11 = Third year medium (20 - 30 cm)
 12 = Third year thick (30 - 50 cm)
 13 = Third year very thick (50 - 100 cm)
 14 = Fourth year thin (10 - 20 cm)
 15 = Fourth year medium (20 - 30 cm)
 16 = Fourth year thick (30 - 50 cm)
 17 = Fourth year very thick (50 - 100 cm)
 18 = Fifth year thin (10 - 20 cm)
 19 = Fifth year medium (20 - 30 cm)
 20 = Fifth year thick (30 - 50 cm)
 21 = Fifth year very thick (50 - 100 cm)
 22 = Sixth year thin (10 - 20 cm)
 23 = Sixth year medium (20 - 30 cm)
 24 = Sixth year thick (30 - 50 cm)
 25 = Sixth year very thick (50 - 100 cm)

EXAMPLES

C	C	C	C
C ₁	C ₂	C ₃	C ₄
S ₁	S ₂	S ₃	S ₄

Legend:
 [Symbol] = Ice edge
 [Symbol] = Boundary Analyzed from VISAT/ICEGRADAR
 [Symbol] = Observations
 [Symbol] = Estimated Boundary



- A =
- B =
- C =
- D =
- E =
- F =
- G =
- H =
- I =
- J =
- K =
- L =
- M =
- N =
- O =
- P =
- Q =
- R =
- S =
- T =

SOUTHERN ICE LIMIT - 07 JUL 53
 NAVY/NOAA JOINT CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration of classes.
 S₁, S₂, S₃, S₄ = Stage of development of thickest (S₁), 2nd thickest (S₂), 3rd thickest (S₃), and 4th thickest (S₄) of sixty yard patches.
 T = Concentration of the within reach (T) of sixty yard patches.
 S₀ = Thicker than S₁, but less than one tenth concentration.
 S_{1/2} = Stage of development having the greatest remaining concentration.

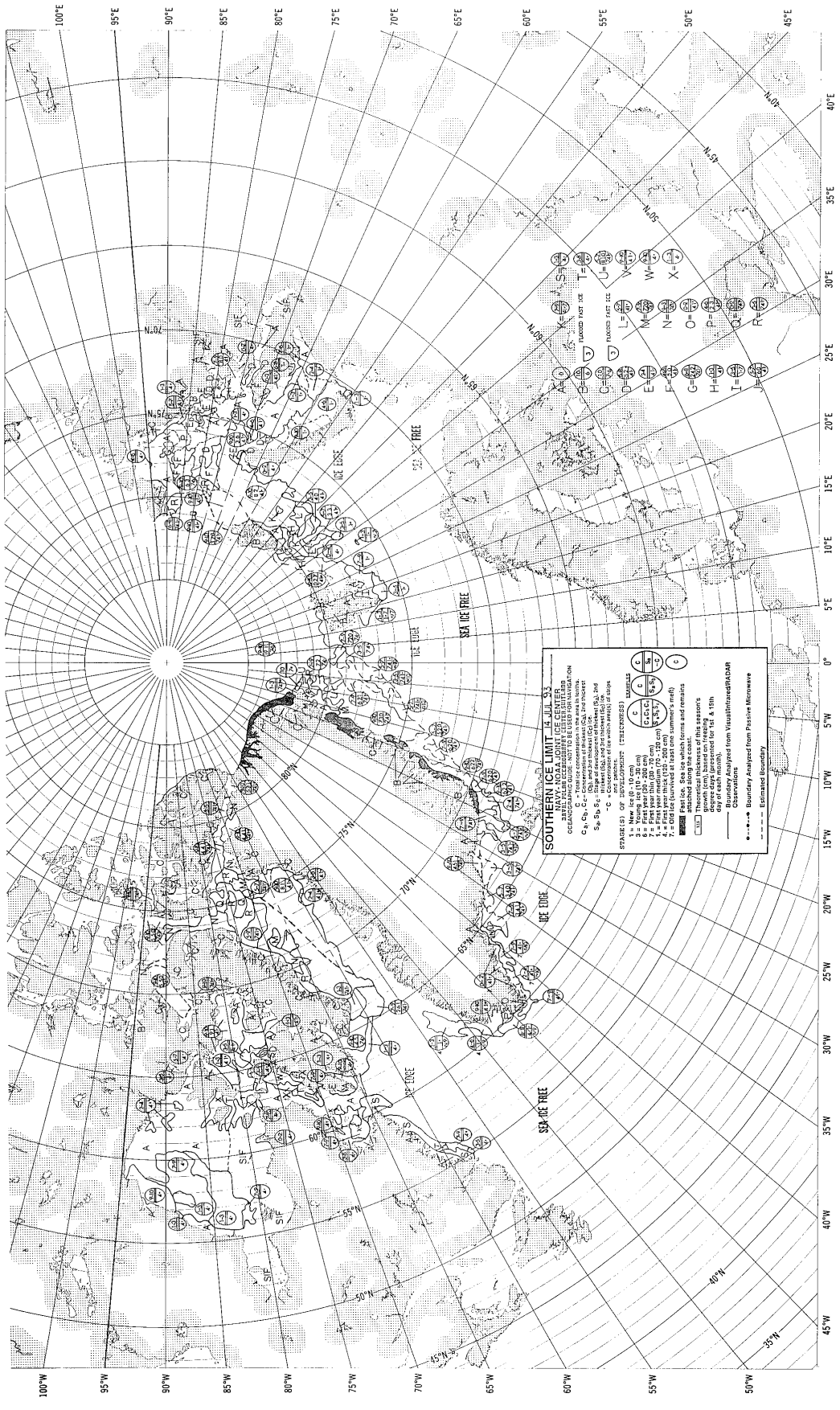
STAGES OF DEVELOPMENT (THICKNESS)

1 = New ice (0 to 10 cm)
 2 = First year ice (10 to 20 cm)
 3 = First year ice (20 to 30 cm)
 4 = First year ice (30 to 40 cm)
 5 = First year ice (40 to 50 cm)
 6 = First year ice (50 to 75 cm)
 7 = Old ice (formed at least one summer's melt)

EXAMPLES

Legend:

- Landfall ice.
- Theoretical thickness of this season's growth (tenths).
- Ice thickness from 100 statute yard patch.
- Ocean current.
- Current velocity.
- Boundary analyzed from passive microwave.
- Estimated boundary.

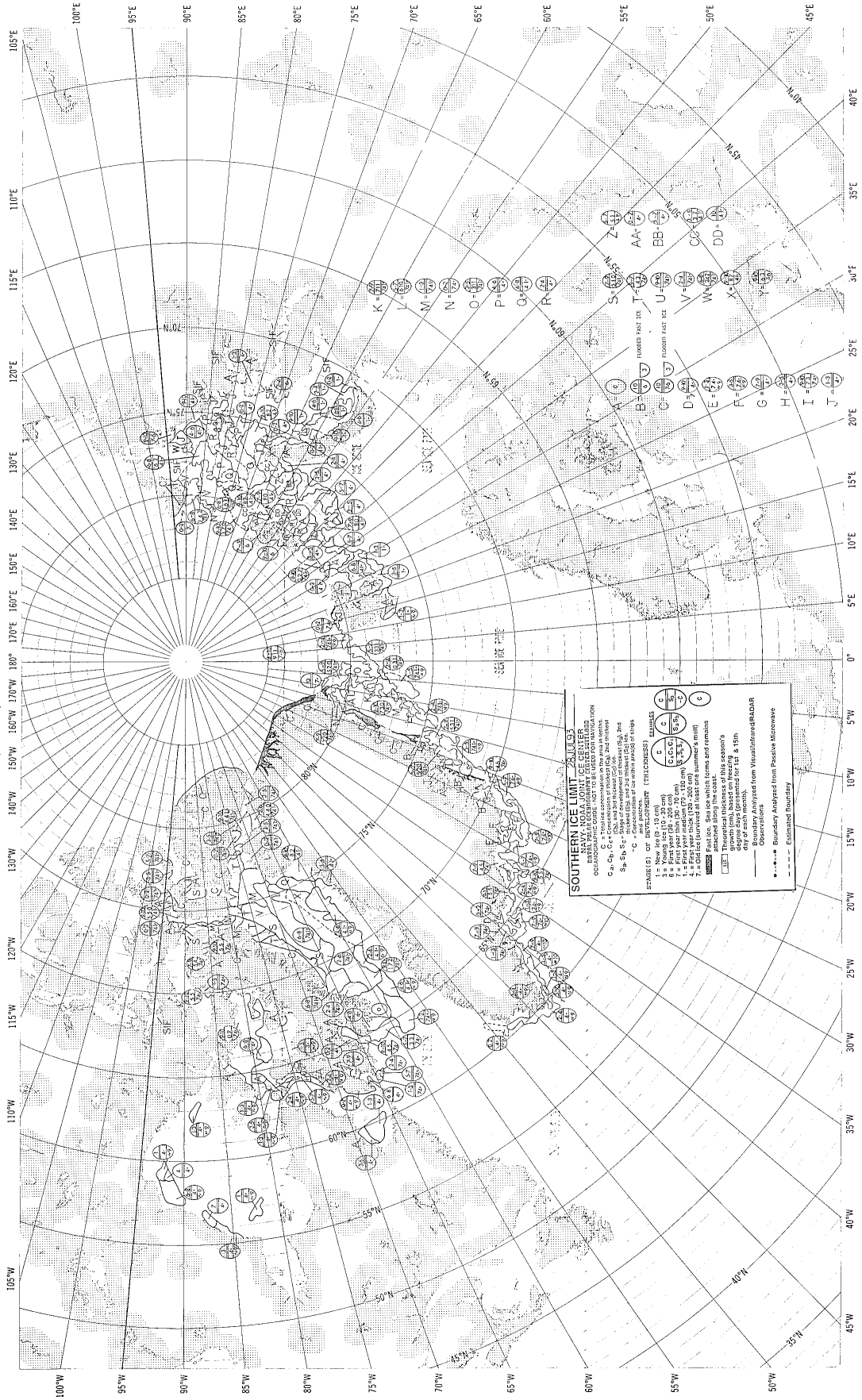


SOUTHERN ICE LIMIT JUL 83
 AREA: 100°E-100°W, 45°S-60°S
 DATA SOURCES: 1. VISUAL OBSERVATION
 2. AIRBORNE PHOTOGRAMMETRY
 3. SATELLITE DATA (SAR, RADARSAT, etc.)
 4. HISTORICAL DATA (1950-1980)

SYMBOLS:
 C = Full ice concentration in the area shown
 C₁ = 100% (100% ice concentration)
 C₂ = 75% (75% ice concentration)
 C₃ = 50% (50% ice concentration)
 C₄ = 25% (25% ice concentration)
 C₅ = 10% (10% ice concentration)
 C₆ = 5% (5% ice concentration)
 C₇ = 0% (0% ice concentration)

STAGES OF ICE PROGRESSION (CYCLES):
 1 = New ice (0-10 cm)
 2 = First year (10-20 cm)
 3 = First year (20-30 cm)
 4 = First year (30-40 cm)
 5 = First year (40-50 cm)
 6 = First year (50-60 cm)
 7 = First year (60-70 cm)
 8 = First year (70-80 cm)
 9 = First year (80-90 cm)
 10 = First year (90-100 cm)
 11 = Old ice (100+ cm)
 12 = Old ice (100+ cm)
 13 = Old ice (100+ cm)
 14 = Old ice (100+ cm)
 15 = Old ice (100+ cm)
 16 = Old ice (100+ cm)
 17 = Old ice (100+ cm)
 18 = Old ice (100+ cm)
 19 = Old ice (100+ cm)
 20 = Old ice (100+ cm)

BOUNDARIES:
 - - - - - Estimated Boundary
 - - - - - Boundary Analyzed from Passive Microwave
 - - - - - Boundary Analyzed from Pushive Microwave



SOUTHERN ICE LIMIT - 2011/12
 NAVY - NOAA JOINT ICE CENTER
 OCCASIONAL DATE CODE: NOT TO BE USED FOR PRODUCTION

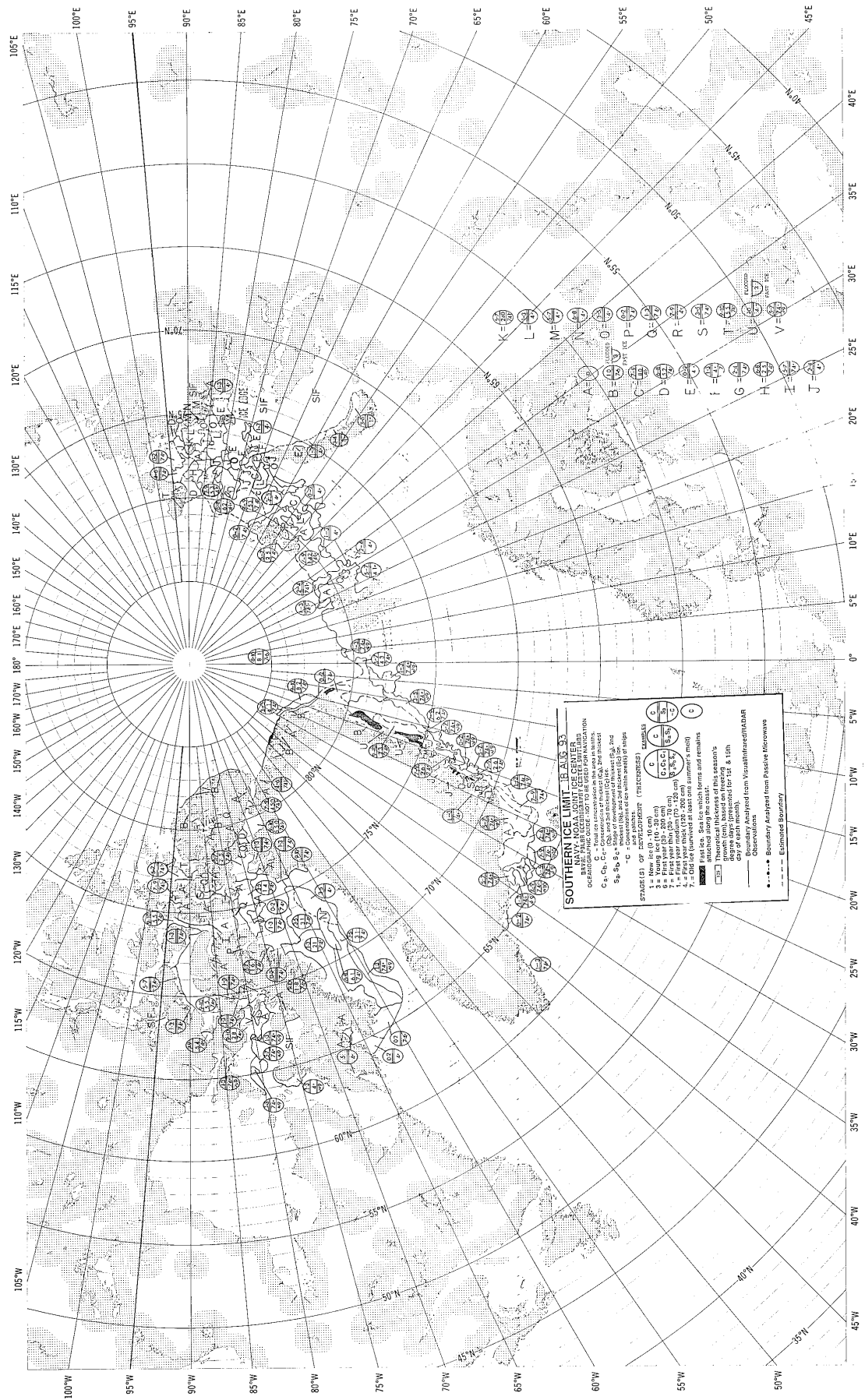
ABBREVIATIONS:
 C = Ch. C = Concentration of pack ice, and thickness
 S, Sh, S, c = Slope of development of thickness, and
 C = Concentration of ice within a unit of strips

EXAMPLES OF DEVELOPMENT (TELECOPIERS)

1 = New field (10-150 km)
 2 = First year (50-200 km)
 3 = First year (200-500 km)
 4 = First year (500-1000 km)
 5 = First year (1000-1500 km)
 6 = First year (1500-2000 km)
 7 = Old ice (formed at least one summer's growth)

EXAMPLES OF DEVELOPMENT (RADAR)

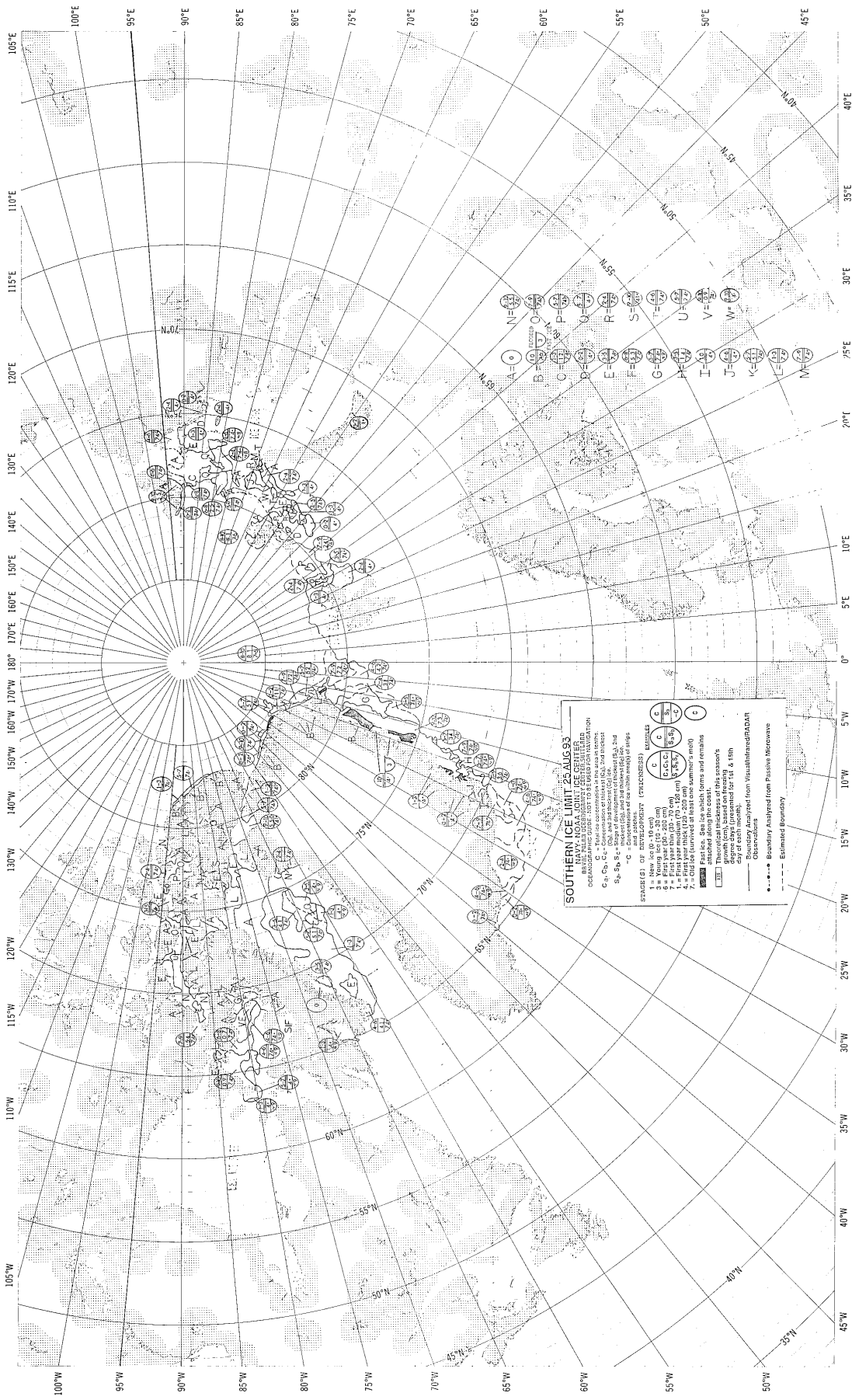
1 = Theoretical thickness of this season's
 slope (km) (presented for Oct. & 15th
 day of each month)
 2 = Actual thickness of ice analyzed from
 Observations
 3 = Boundary Analyzed from Passive Microwave
 Observations
 4 = Estimated Boundary



SOUTHERN OCEAN LIMIT DATA AUG 93
 SOUTHERN OCEAN LIMIT DATA CENTER
 NATIONAL CENTER FOR ENVIRONMENTAL INFORMATION
 4801 RINGGOLD DRIVE, WOOD BRIDGE, VIRGINIA 22192
 TEL: 703/336-6000 FAX: 703/336-6001
 WWW: WWW.NCEM.NCEI.NOAA.GOV

ICE TYPES
 A = New Ice (< 10 cm)
 B = Young Ice (10 - 200 cm)
 C = First year thin (200 - 425 cm)
 D = First year medium (425 - 725 cm)
 E = First year thick (725 - 2000 cm)
 F = Multi-year thin (< 100 cm summer's melt)
 G = Multi-year medium (100 - 300 cm summer's melt)
 H = Multi-year thick (> 300 cm summer's melt)

BOUNDARIES
 - - - - - Boundary Analyzed from Visual Satellite Radar Observations
 - - - - - Boundary Analyzed from Passive Microwave Observations
 - - - - - Estimated Boundary

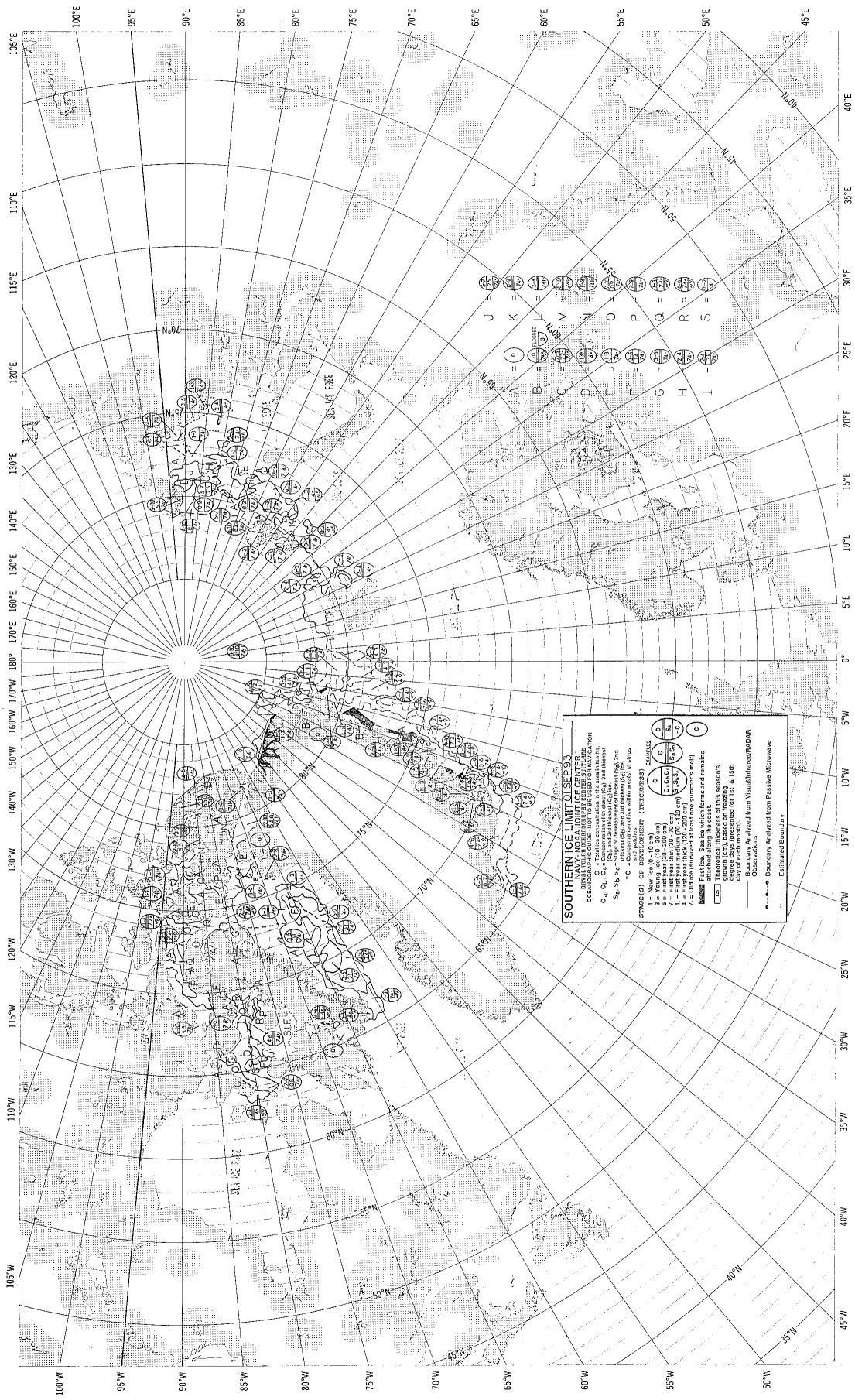


SOUTHERN ICE LIMIT 25 AUG 93
 NAVY-NOAA JOINT ICE CENTER
 ARCTIC REGIONAL DATA CENTER
 OCEANOGRAPHIC DATA CENTER
 C, Ch, Cc - Common name or acronym for the station
 S, Ss, Ss, Ss - Stage of development of the ice
 C - Concentration of ice in the vicinity of ships

STAGES OF DEVELOPMENT (ICE CONCENTRATIONS)

1 = New ice (0-15 cm)	6 = Old ice (150-200 cm)
2 = First year ice (15-30 cm)	7 = Old ice (survived at least one summer's melt)
3 = First year ice (30-60 cm)	
4 = First year ice (60-120 cm)	
5 = First year ice (120-150 cm)	

ICE - Thickness of this season's growth (cm) measured on 1st & 15th day of each month.
 - - - - - Boundary Analyzed from IceultraRADAR
 - - - - - Boundary
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT OF SEP-93
 NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC CHIEF, NOT TO BE USED FOR NAVIGATION

C-1, C-2 = Concentration of snow (C1, 2 = inches)
 S-1, S-2 = Stage of development of brine (S1, 2 = 1st, 2nd
 = Conversion of ice when melted) of stage

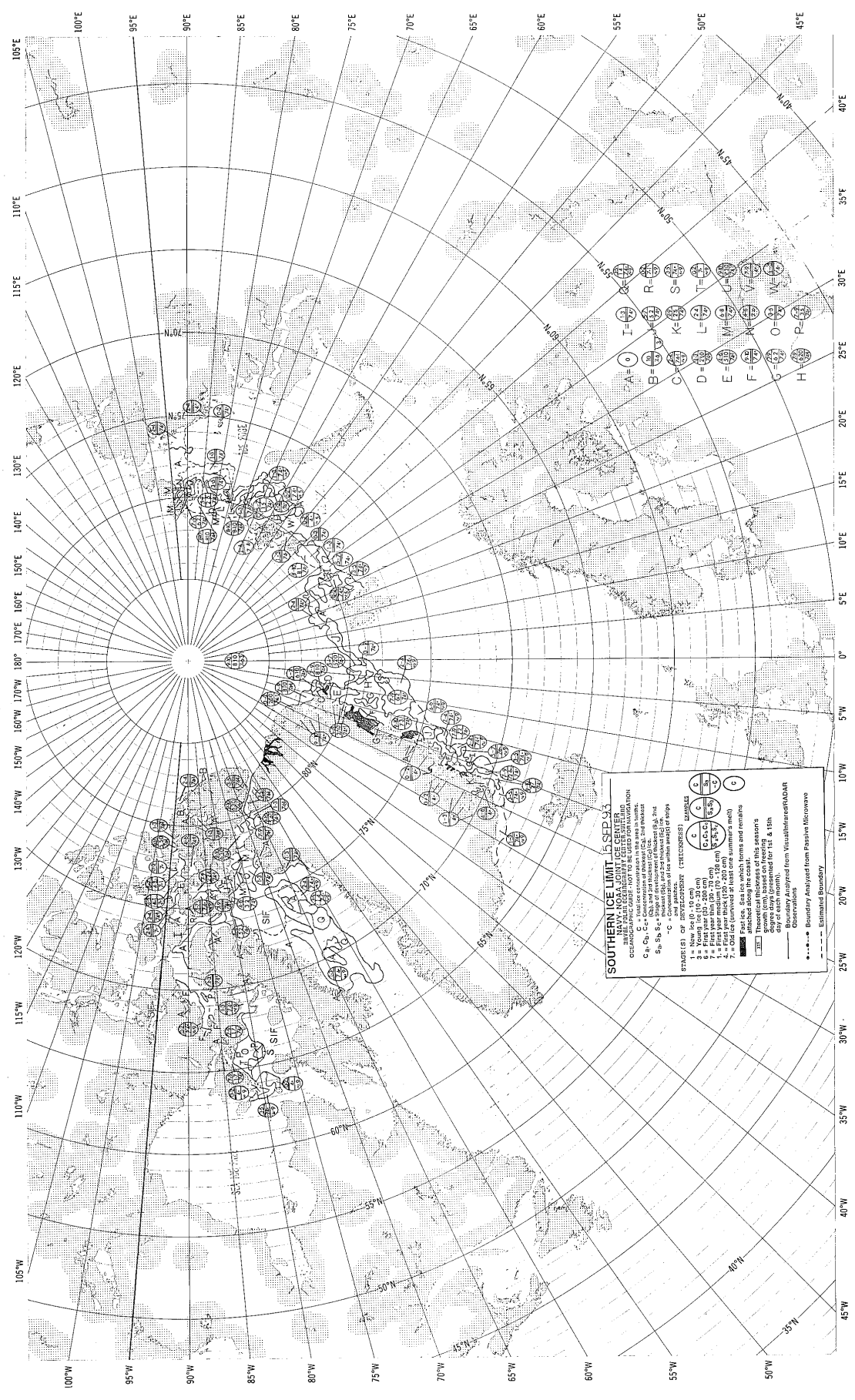
STAGES OF DEVELOPMENT (TEMPERATURE)

1 = New ice (0-10 cm)	10 = 1st year (10-200 cm)
2 = First year (10-200 cm)	11 = 1st year medium (70-120 cm)
3 = 1st year (10-200 cm)	12 = 1st year (10-200 cm)
4 = 1st year (10-200 cm)	13 = 1st year (10-200 cm)
5 = 1st year (10-200 cm)	14 = 1st year (10-200 cm)
6 = 1st year (10-200 cm)	15 = 1st year (10-200 cm)
7 = Old ice (formed in first two summer months)	

SYMBOLS

○	C	10
○	C	20
○	C	30
○	C	40
○	C	50
○	C	60
○	C	70
○	C	80
○	C	90
○	C	100
○	C	110
○	C	120
○	C	130
○	C	140
○	C	150
○	C	160
○	C	170
○	C	180
○	C	190
○	C	200
○	C	210
○	C	220
○	C	230
○	C	240
○	C	250
○	C	260
○	C	270
○	C	280
○	C	290
○	C	300
○	C	310
○	C	320
○	C	330
○	C	340
○	C	350
○	C	360
○	C	370
○	C	380
○	C	390
○	C	400
○	C	410
○	C	420
○	C	430
○	C	440
○	C	450
○	C	460
○	C	470
○	C	480
○	C	490
○	C	500
○	C	510
○	C	520
○	C	530
○	C	540
○	C	550
○	C	560
○	C	570
○	C	580
○	C	590
○	C	600
○	C	610
○	C	620
○	C	630
○	C	640
○	C	650
○	C	660
○	C	670
○	C	680
○	C	690
○	C	700
○	C	710
○	C	720
○	C	730
○	C	740
○	C	750
○	C	760
○	C	770
○	C	780
○	C	790
○	C	800
○	C	810
○	C	820
○	C	830
○	C	840
○	C	850
○	C	860
○	C	870
○	C	880
○	C	890
○	C	900
○	C	910
○	C	920
○	C	930
○	C	940
○	C	950
○	C	960
○	C	970
○	C	980
○	C	990
○	C	1000

○ First ice. Sea ice which forms and remains
 through the summer months.
 □ Theoretical thickness of this season's
 growth (cm), based on freezing
 growth rate of 1.27 & 1.04
 cm per month.
 ○ Boundary Analyzed from Visual/Microwave/RADAR
 ○ Boundary Analyzed from Passive Microwave
 --- Estimated Boundary



SOUTHERN ICE LIMIT 15 SEP 53
HEAVY NOAA SOUTHERN ICE CENTER

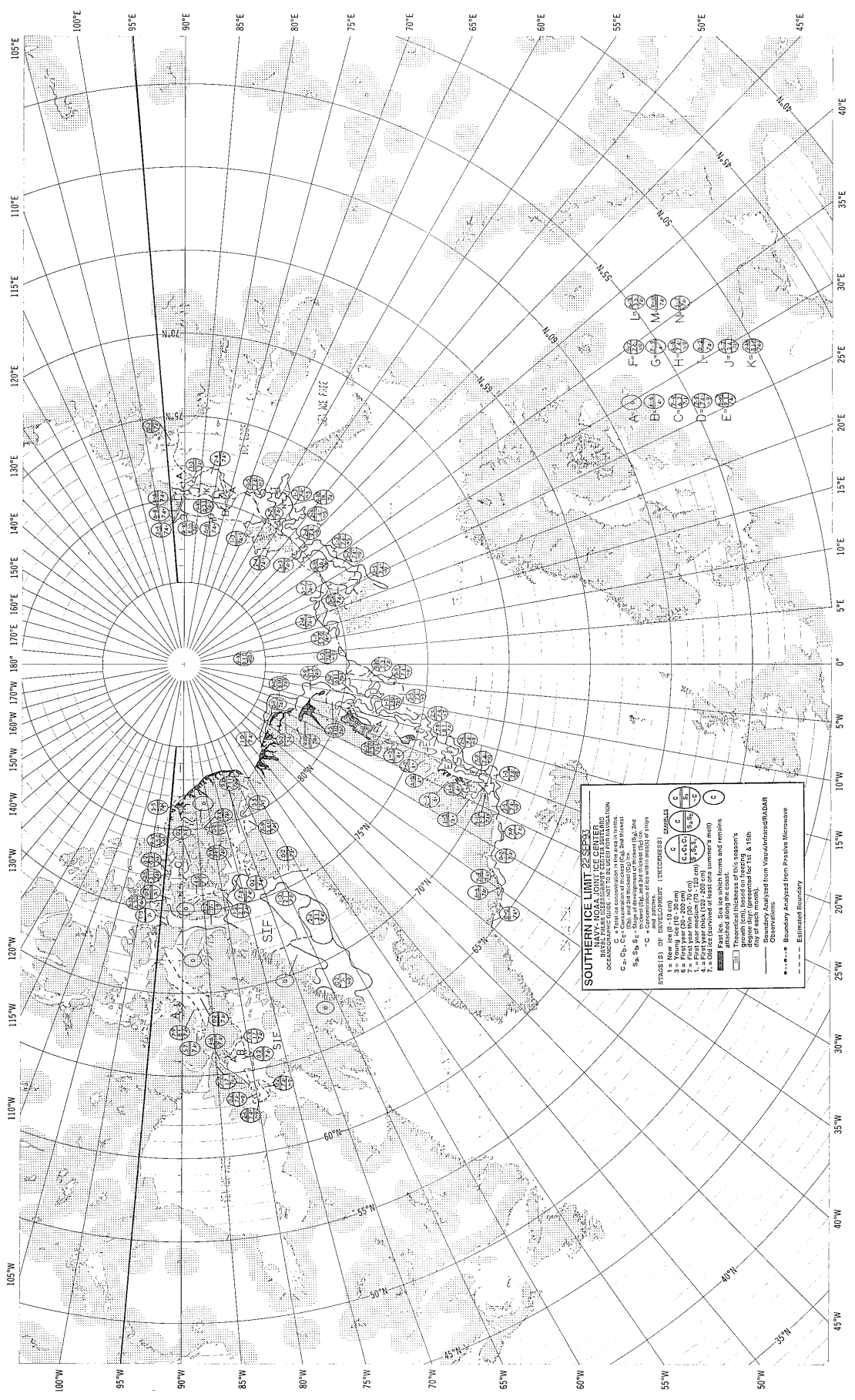
ALL DATA POINTS SHOWN ARE NOT TO BE USED FOR NAVIGATION

C = Coastline
 C, C, C, C = Coastline (1st, 2nd, 3rd, 4th) (1st, 2nd, 3rd, 4th)
 S, S, S, S = Sea ice (1st, 2nd, 3rd, 4th) (1st, 2nd, 3rd, 4th)
 S, S, S, S = Sea ice (1st, 2nd, 3rd, 4th) (1st, 2nd, 3rd, 4th)

1 = New Ice (0 - 10 cm)
 2 = Young Ice (10 - 20 cm)
 3 = First Year Ice (20 - 50 cm)
 4 = First Year Ice (50 - 100 cm)
 5 = First Year Ice (100 - 200 cm)
 6 = First Year Ice (200 - 300 cm)
 7 = First Year Ice (300 - 400 cm)

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S = Station number
 1, 2, 3, 4, 5, 6, 7 = Ice thickness (cm)

--- Boundary Analyzed from Visual Observations
 - - - - - Estimated Boundary
 --- Observations
 --- Boundary Analyzed from Visual Observations



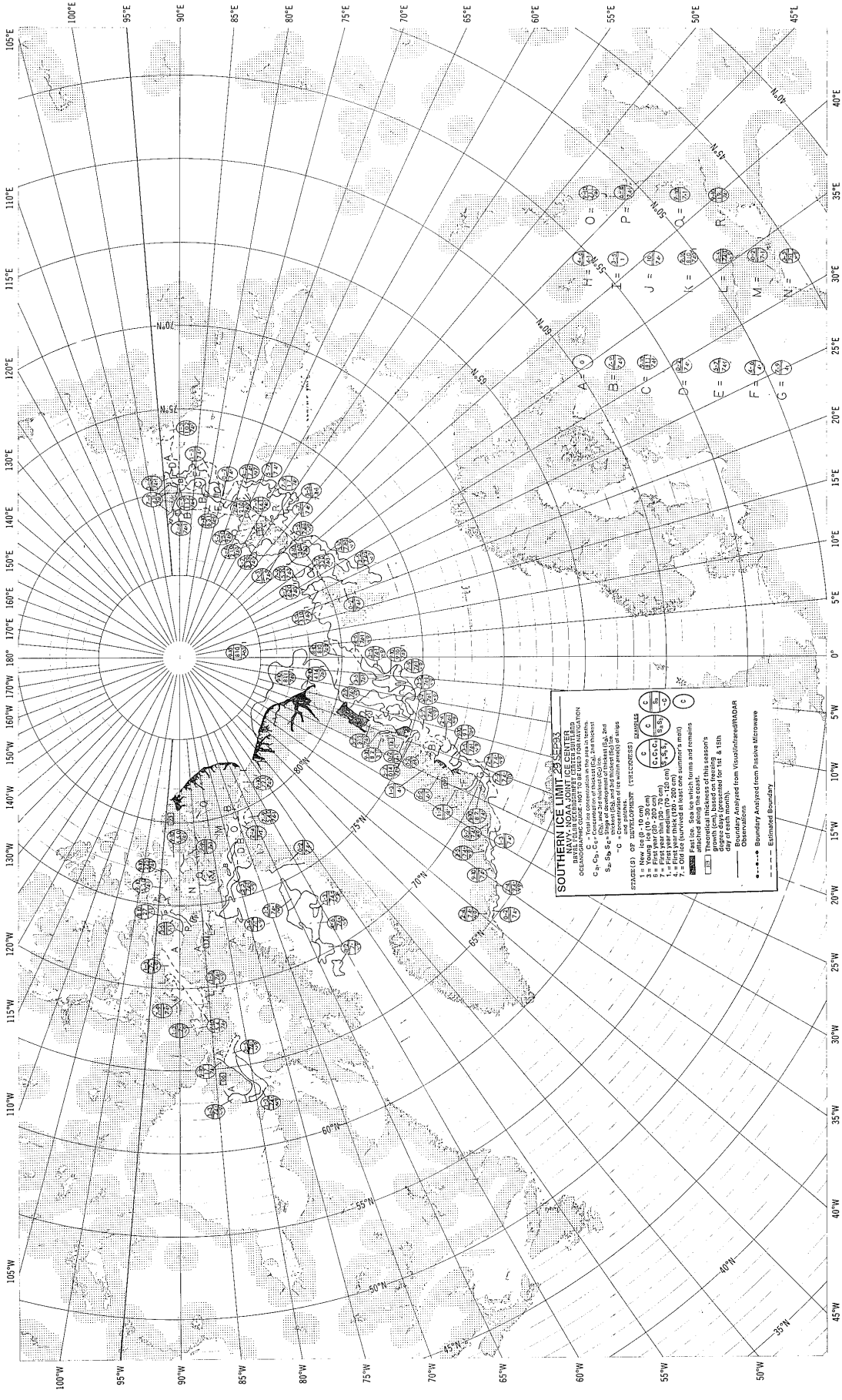
SOUTHERN ICE LIMIT 22 SEP 93
 NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC CODE - NOT TO BE DISTRIBUTED

C = Chl. C = Chlorophyll concentration
 S, S₁, S₂ = Stage of development of bloom (S₁ and S₂ = Completion of diurnal cycle)
 S₃, S₄, S₅ = Stage of development of bloom (S₃ and S₄ = Completion of diurnal cycle)
 S₆ = Completion of diurnal cycle of bloom

STATIONS OF INTEREST (ATC020629)

1 = New Ice (< 10 cm)
 2 = First year ice (< 100 cm)
 3 = First year ice (100 - 200 cm)
 4 = First year ice (> 200 cm)
 5 = First year ice (> 200 cm) with melt
 6 = First year ice (> 200 cm) with melt
 7 = Old ice (remained at least one summer's melt)

Other Symbols:
 [] = Fast ice. Sea ice which forms and remains
 [] = Theoretical ice edge of this season's
 growth (cm), based on freezing & 15th
 day of each month
 [] = Boundary Analyzed from Visual/Infrared/SAR
 [] = Boundary Analyzed from Passive Microwave
 [] = Estimated Boundary



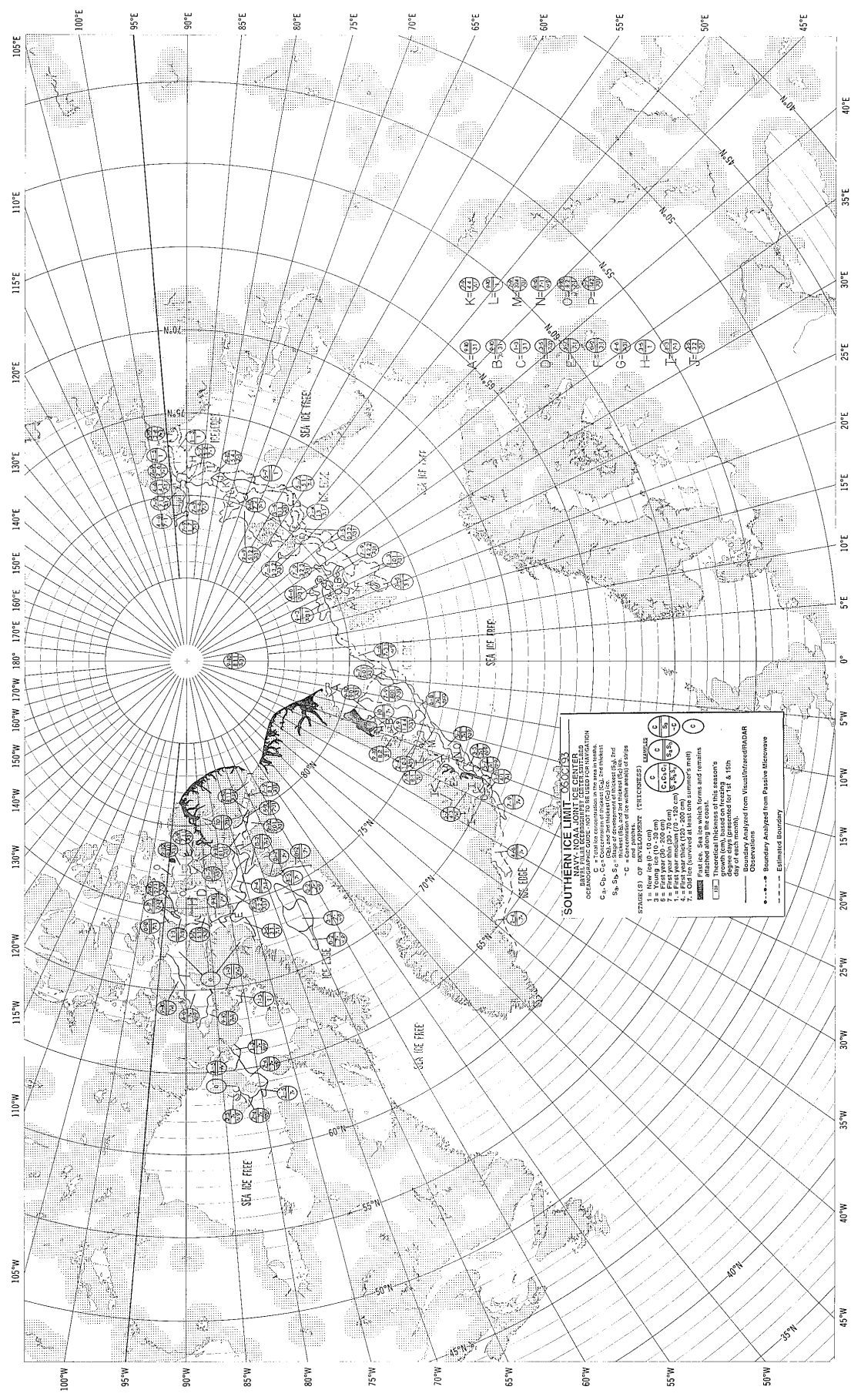
SOUTHERN OCEAN LIMIT 1953
 SOUTHERN ICE LIMIT DATA CENTER
 MARINE DATA CENTER
 WASHINGTON, D.C. 20341

ALL DATA ARE FROM THE 1953-54 SEASON
 UNLESS OTHERWISE NOTED AS BEING FROM ANOTHER YEAR

SYMBOLS:
 C = Point on coast (ice limit, ice edge, ice shelf edge)
 C₁ - C₈ = (1) and (2) are ice limit, (3) and (4) are ice edge, (5) and (6) are ice shelf edge, (7) and (8) are ice shelf edge
 S₁ - S₈ = (1) and (2) are ice limit, (3) and (4) are ice edge, (5) and (6) are ice shelf edge, (7) and (8) are ice shelf edge
 C = Point on coast (ice limit, ice edge, ice shelf edge)
 C₁ - C₈ = (1) and (2) are ice limit, (3) and (4) are ice edge, (5) and (6) are ice shelf edge, (7) and (8) are ice shelf edge

NUMBERS:
 1 = New Ice (0 - 10 cm)
 2 = First Year Ice (10 - 20 cm)
 3 = First Year Ice (20 - 30 cm)
 4 = First Year Ice (30 - 40 cm)
 5 = First Year Ice (40 - 50 cm)
 6 = First Year Ice (50 - 60 cm)
 7 = First Year Ice (60 - 70 cm)
 8 = First Year Ice (70 - 80 cm)

BOUNDARIES:
 - - - - - Boundary Analyzed from Vessels/Radar
 - - - - - Boundary Analyzed from Passive Microwave
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT 0600Z 1953
 MAP OF SOUTHERN OCEAN AND ANTARCTIC CONTINENT
 SHOWING SOUTHERN ICE LIMITS AND STAGES OF DEVELOPMENT
 OBSERVATIONAL DATA - NOT TO BE USED FOR NAVIGATION

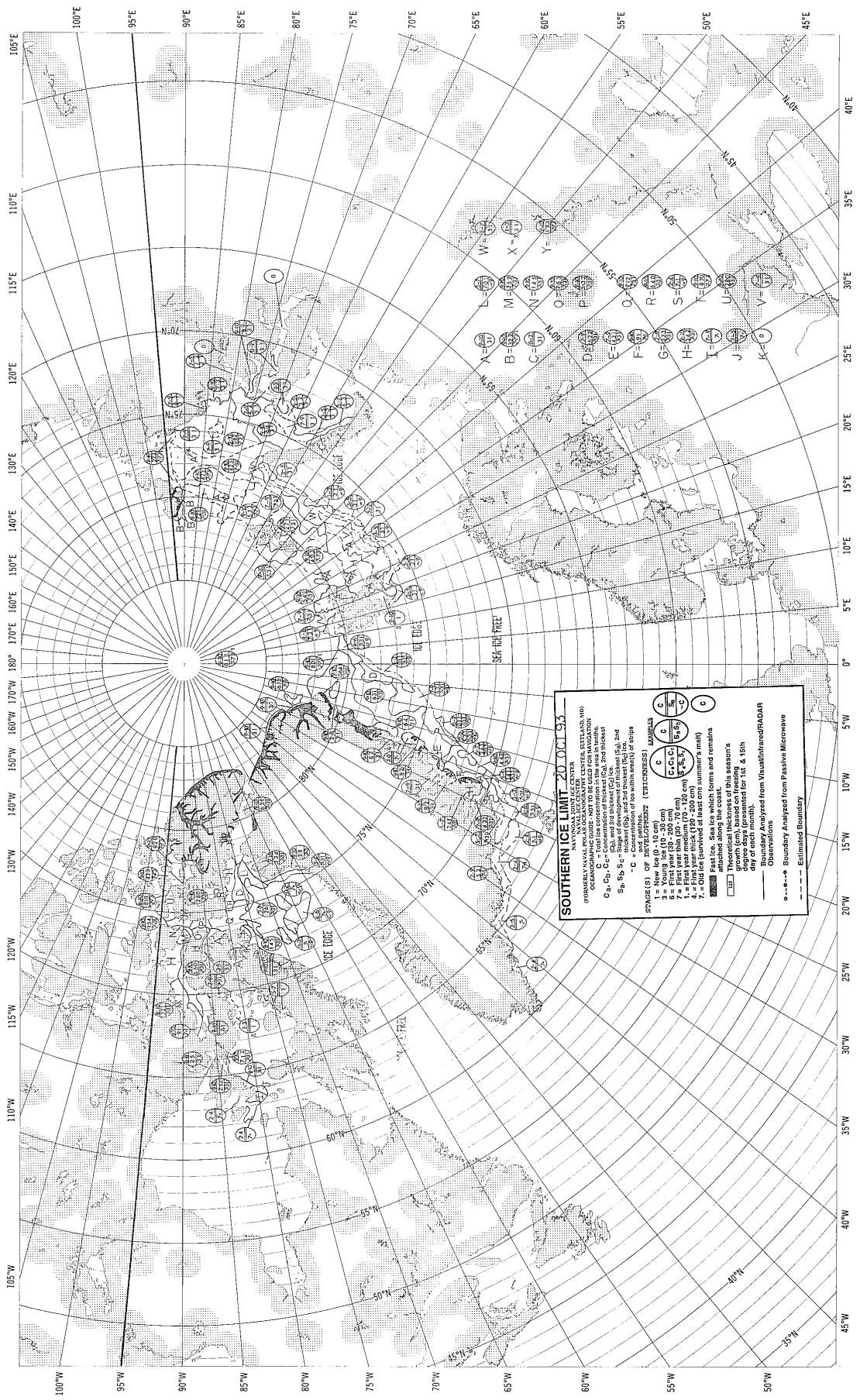
G, H, C, S - Code of development of ice (see text)
 S₁, S₂, S₃ - Stage of development of ice (see text)
 C - Concentration of the whole weight of ships

STAGES OF DEVELOPMENT (THICKNESS) SAMPLES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)	(Symbol)

1 = New ice (0 - 10 cm)
 2 = First year (10 - 20 cm)
 3 = First year (20 - 30 cm)
 4 = First year (30 - 40 cm)
 5 = First year (40 - 50 cm)
 6 = First year (50 - 75 cm)
 7 = Old ice (survived at least one summer's melt)
 8 = Old ice (survived at least one summer's melt)
 9 = Old ice (survived at least one summer's melt)
 10 = Old ice (survived at least one summer's melt)
 11 = Old ice (survived at least one summer's melt)
 12 = Old ice (survived at least one summer's melt)
 13 = Old ice (survived at least one summer's melt)
 14 = Old ice (survived at least one summer's melt)
 15 = Old ice (survived at least one summer's melt)

□ Theoretical thickness of this season's snow (in cm) (assumed for 1st & 15th day of each month)
 ● Observations analyzed from Visual/Sensor/Radar
 ○ Observations analyzed from Visual/Sensor/Radar
 --- Boundary Analyzed from Pastive Microwave
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT 20 OCT 53

FORMERLY NAVAL POLAR RESEARCH CENTER, SCOTLAND, AND
 NAVAL POLAR RESEARCH CENTER, ANTARCTICA, AND
 OCEANOGRAPHIC OFFICE, WASHINGTON, D.C.

C = Concentration of floes (% of total area)
 C₁, C₂, C₃ = Concentration of floes (100, 200, 300 cm)

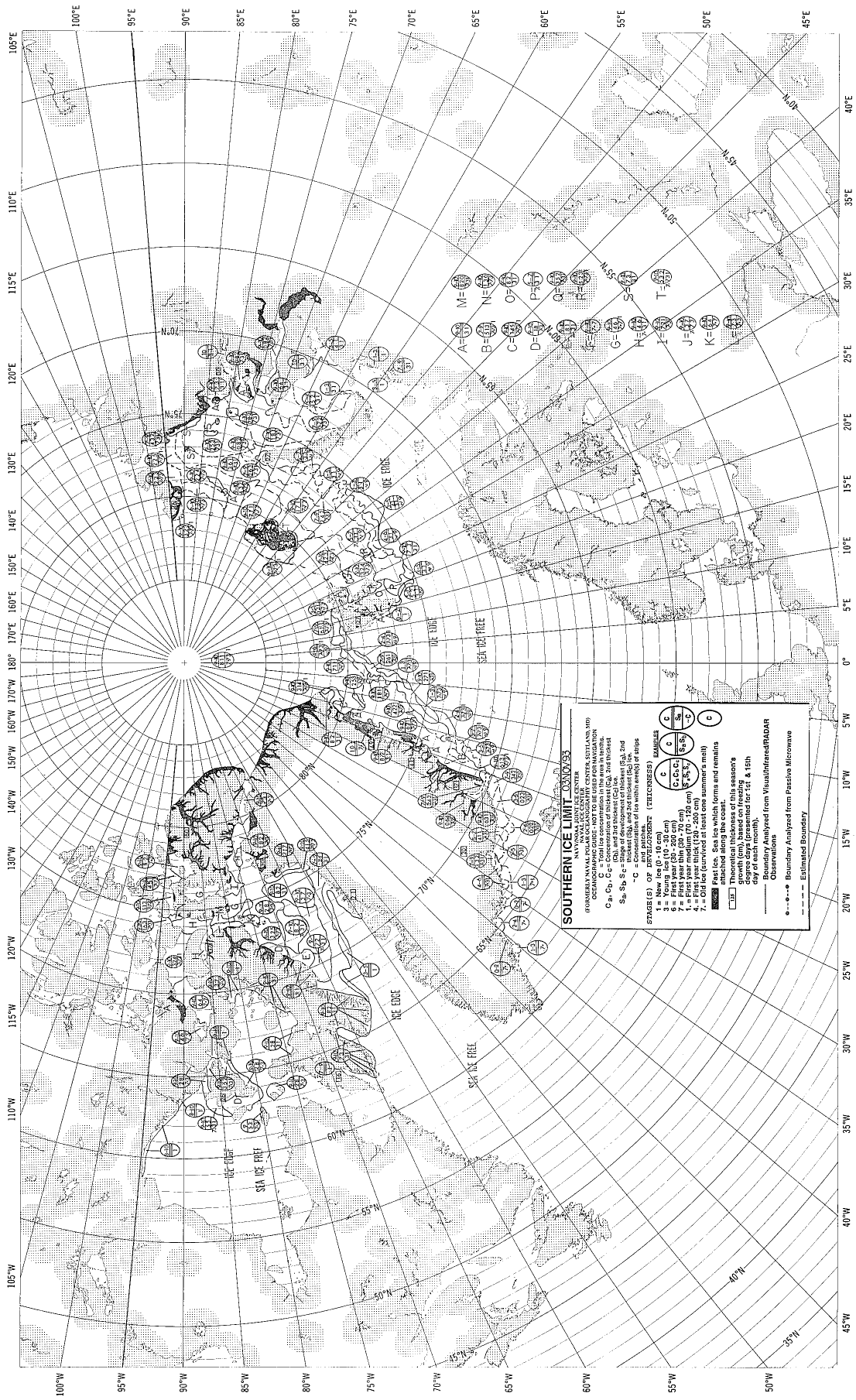
S₁, S₂, S₃ = Stage of development of thickness (1st, 2nd, 3rd)

E = Estimated
 - C = Concentration of floes within area(s) of ships

STAGE(S) OF DEVELOPMENT (THICKNESS) SYMBOLS

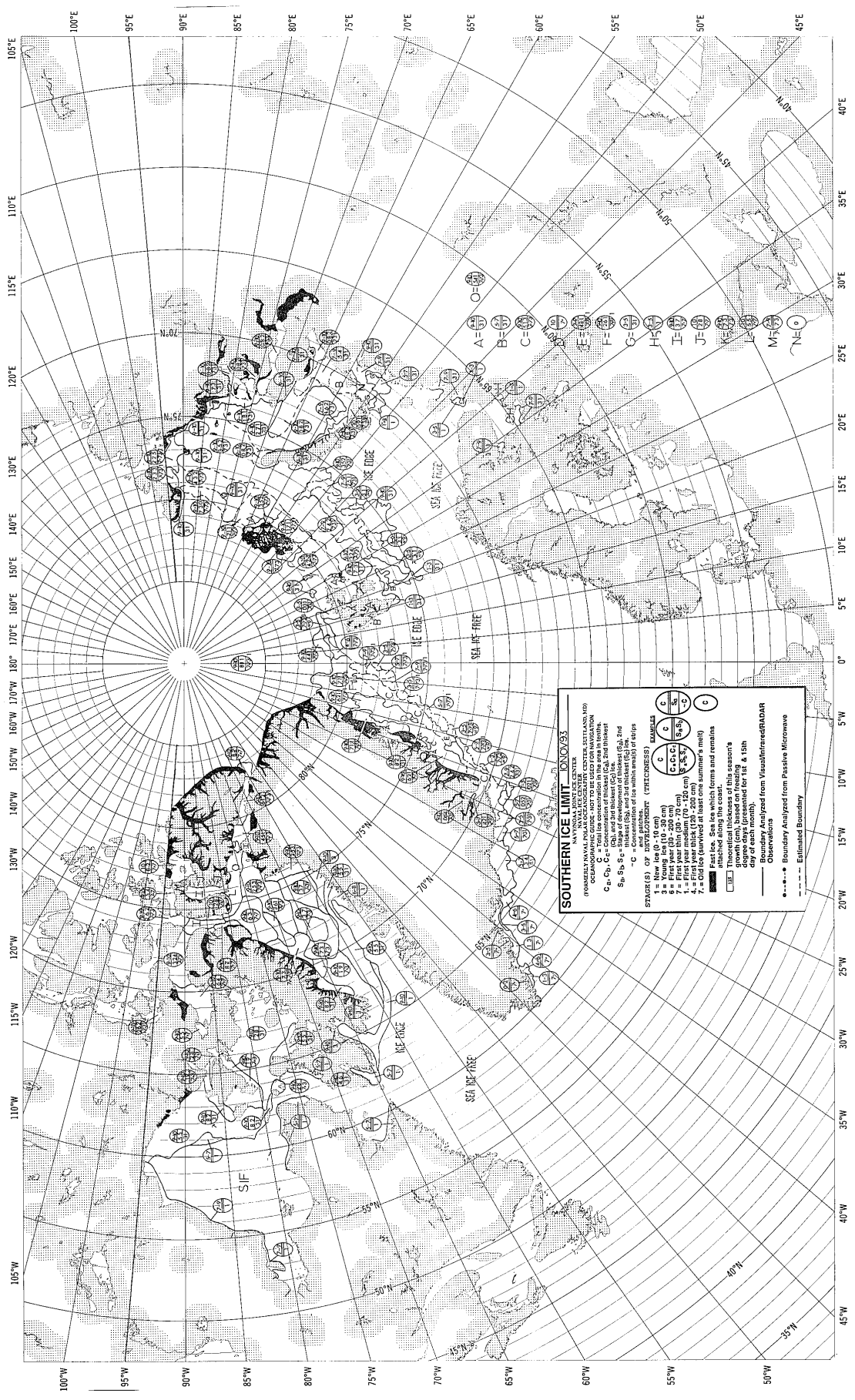
1 = New ice (0 - 10 cm)	C
2 = First year thin (10 - 20 cm)	C ₁
3 = First year medium (20 - 30 cm)	C ₂
4 = First year thick (30 - 40 cm)	C ₃
5 = Old ice (survives from previous season)	S
6 = Old ice (survives from previous season and remains attached along the coast)	S ₁

Theoretical thickness of this season's ice
 Theoretical thickness of this season's ice by day of each month (presented for 1st & 15th of each month)
 Observations analyzed from Visual/iceRADAR
 Observations analyzed from Passive Microwave
 Boundary Analyzed from Passive Microwave
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT

FROM THE NATIONAL ICE DATA CENTER
 AND THE U.S. NAVY OPERATIONAL OCEANOGRAPHIC CENTER
 OCCASIONAL DATA: NOT TO BE USED FOR SCIENTIFIC PURPOSES
 C = Total Ice Concentration in the area in brackets
 C₁, C₂, C₃ = 1st, 2nd, and 3rd thickest ice
 C₄, C₅ = 4th and 5th thickest ice
 S₁, S₂, S₃, S₄ = Buckets (S₁ and S₂ in 1st 2nd
 C = 1st bucket of ice within ends of trips
 STAGES OF DEVELOPMENT (TELESCOPED) SAMPLES
 1 = Young ice (10-30 cm)
 2 = First year thin (30-70 cm)
 3 = First year medium (70-150 cm)
 4 = First year old (150-300 cm)
 5 = Old ice (survived at least one summer's melt)
 6 = Fast ice, Sea ice which forms and remains
 attached along the coast
 7 = Ice accretion, the ice accretion's
 growth (cm), based on freezing
 day of sea ice formation
 - - - - - Boundary Analyzed from Visual/Infrared/RADAR
 - - - - - Observations
 - - - - - Boundary Analyzed from Passive Microwave
 - - - - - Estimated Boundary



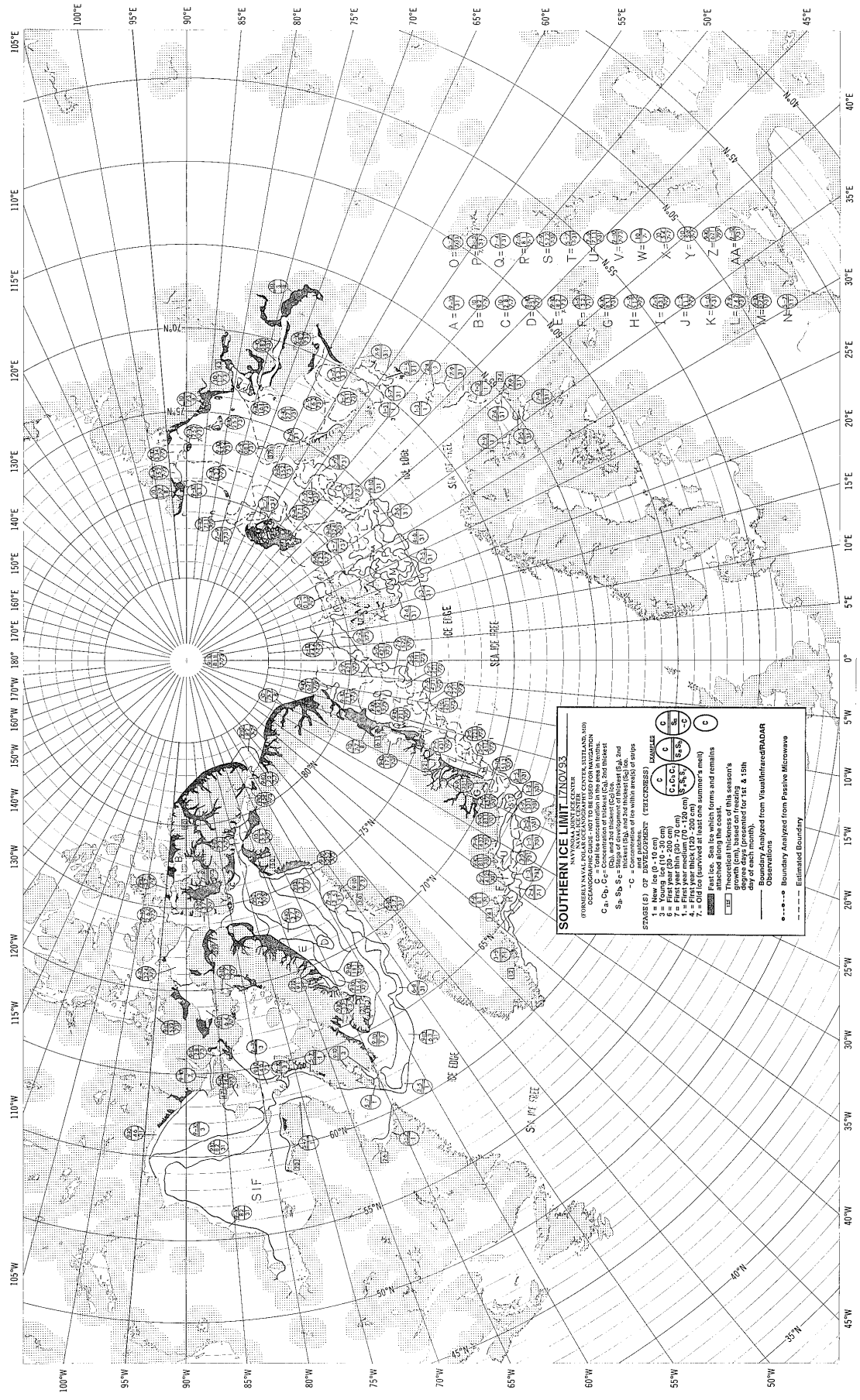
SOUTHERN ICE LIMIT 10X00/93

NAVY NAVAL FACILITY CENTER
 FORMERLY NAVAL FACILITY CENTER, CENTRAL ISLANDS AID
 OCCASIONALLY USED FOR OBSERVATIONS IN THE AREA IN SOUTH
 OCEANIC C - Total ice concentration in the area in south
 C₁, C₂, C₃ - 10%, 20% and 30% ice concentration (C₁ is the thickest
 S₁, S₂, S₃ - Stage of development of thickness (Eq. 1, End
 of season)
 C - Concentration of ice within analysis of ships

STAGES (S) OF DEVELOPMENT (THICKNESS) EXAMPLES

1 = New ice (0 - 10 cm)	$\frac{C}{S_1}$	$\frac{C}{S_2}$	$\frac{C}{S_3}$
2 = First year (10 - 200 cm)	$\frac{C_1}{S_1}$	$\frac{C_2}{S_2}$	$\frac{C_3}{S_3}$
3 = First year (200 - 2000 cm)	$\frac{C_1}{S_1}$	$\frac{C_2}{S_2}$	$\frac{C_3}{S_3}$
4 = First year (2000 - 20000 cm)	$\frac{C_1}{S_1}$	$\frac{C_2}{S_2}$	$\frac{C_3}{S_3}$

1 = First year (200 - 2000 cm) (average melt)
 2 = First year (2000 - 20000 cm) (average melt)
 3 = First year (20000 - 200000 cm) (average melt)
 4 = First year (200000 - 2000000 cm) (average melt)
 Sea ice free. Sea ice which forms and remains attached along the coast.
 Theoretical thickness of this season's ice days (presented for 1st & 15th day of season only).
 Observations Analyzed from Visultrareadar
 Observations
 --- Boundary Analyzed from Passive Microwave
 - - - - - Estimated Boundary



SOUTHERN ICE LIMIT (NOV.83)
 NAVY NAVAL CENTER
 FORMERLY NAVAL NAVAL CENTER (ANTARCTIC, ISLAND, AND OCEANOGRAPHIC CENTER)
 C, S, C₁, C₂ = Concentration of ice (C₁, 2nd thickest; C₂, 1st thickest)
 S₁, S₂, S₃ = Stage of development of thickest (S₁, 2nd; S₂, 1st; S₃, 3rd)
 - C = Concentration of ice within area(s) of strips

STAGES (S) OF DEVELOPMENT (THICKNESS)

1 = New (0 - 10 cm)	2 = First year (10 - 200 cm)	3 = Second year (200 - 300 cm)
4 = First year thick (120 - 200 cm)	5 = First year medium (70 - 120 cm)	6 = First year thin (10 - 70 cm)

SYMBOLS

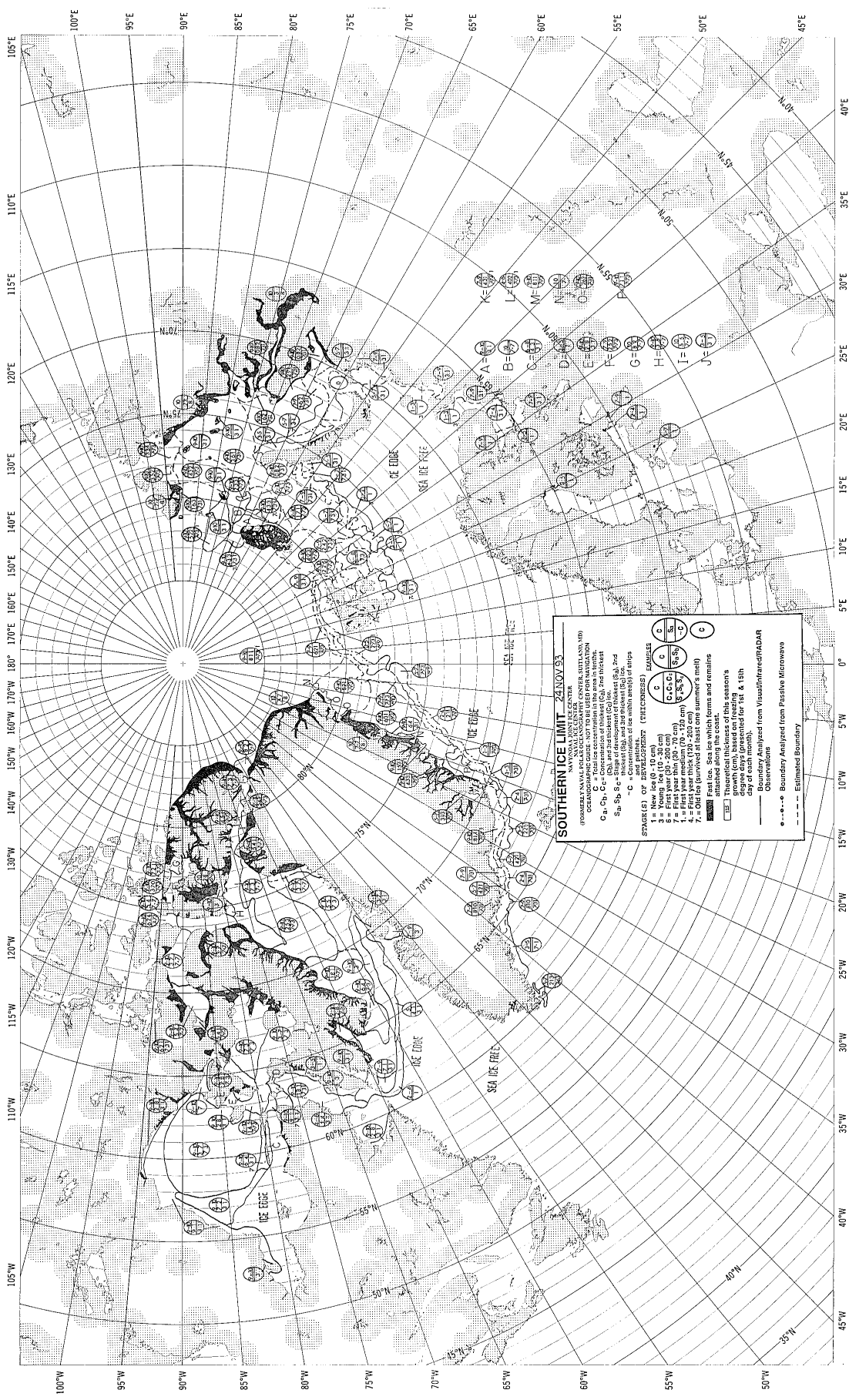
(A)	(B)	(C)	(S ₁)	(S ₂)	(S ₃)
(1)	(2)	(3)	(4)	(5)	(6)

NOTES

- 1. Theoretical thickness of this season's ice.
- 2. Theoretical thickness of this season's ice.
- 3. Theoretical thickness of this season's ice.
- 4. Theoretical thickness of this season's ice.
- 5. Theoretical thickness of this season's ice.
- 6. Theoretical thickness of this season's ice.

BOUNDARIES

- Boundary Analyzed from Visual Observations
- Boundary Analyzed from Passive Microwave Observations
- Estimated Boundary



SOUTHERN ICE LIMIT - 24 NOV 83
 NATIONAL ICE CENTER
 (PROCESSED BY THE NATIONAL ICE CENTER)
 (DO NOT USE FOR NAVIGATION)
 C = Ice concentration in the area to be
 C₁, C₂, C₃ = Ice concentration in the area to be
 C₄, C₅, C₆ = Ice concentration in the area to be
 C₇, C₈ = Ice concentration in the area to be
 S₁, S₂, S₃ = Ice thickness (cm)
 S₄, S₅, S₆ = Ice thickness (cm)
 S₇, S₈ = Ice thickness (cm)

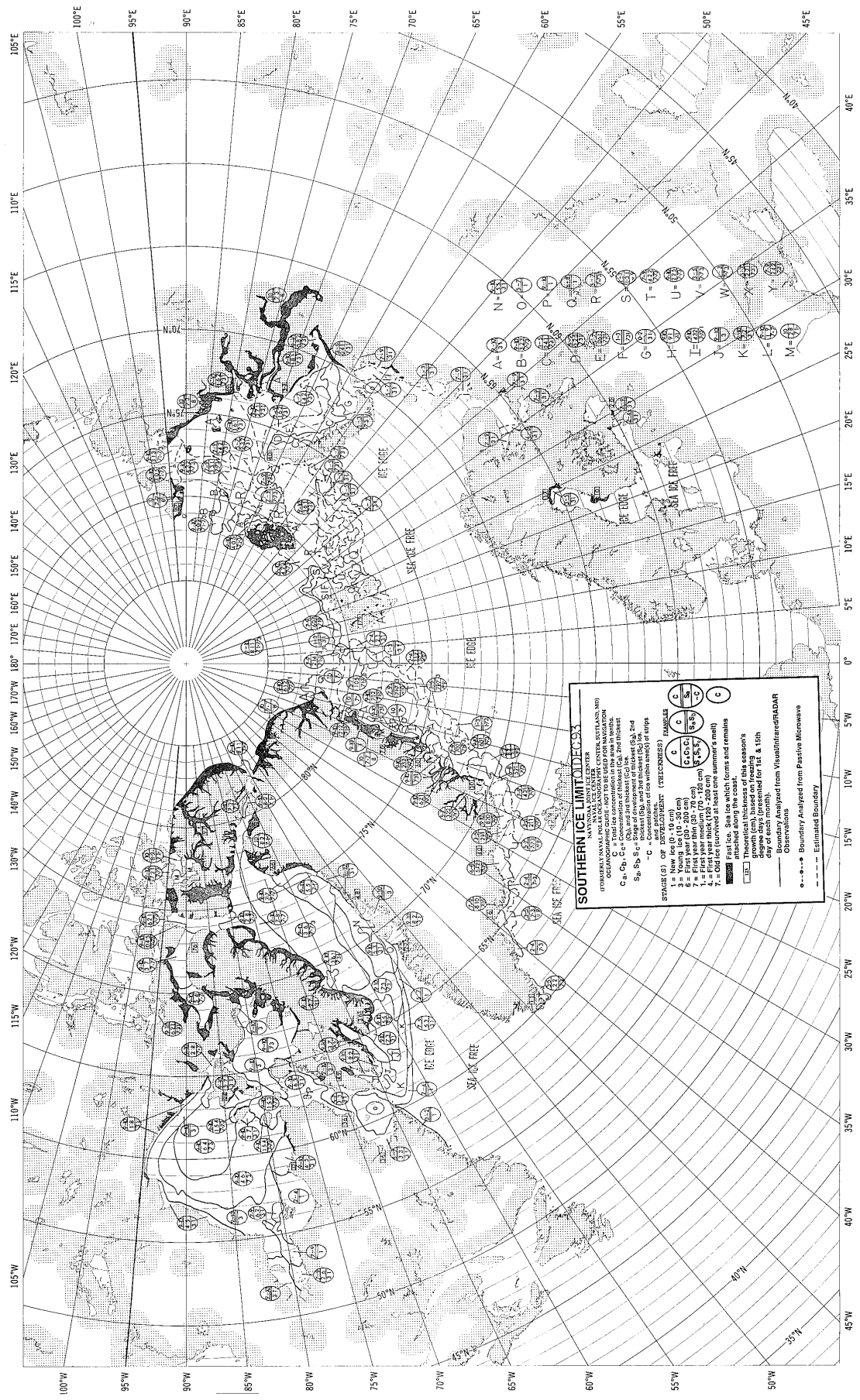
SYMBOLS OF DEVELOPMENT (ICEBERGS) EXAMPLES

1	2	3	4	5	6	7	8
(C)	(C)	(C)	(C)	(C)	(C)	(C)	(C)
(C)	(C)	(C)	(C)	(C)	(C)	(C)	(C)
(C)	(C)	(C)	(C)	(C)	(C)	(C)	(C)

1 = First year ice (10-30 cm)
 2 = Young ice (30-70 cm)
 3 = First year medium (70-120 cm)
 4 = First year old (120-200 cm)
 5 = First year thick (200-300 cm)
 6 = First year very thick (300-500 cm)
 7 = Old ice (survived at least one summer's melt)
 8 = Old ice (survived at least two summer's melt)

Sea ice which forms and remains attached along the coast.
 This ocean's degree days (integrated for 1st & 15th degree days)

Boundary Analyzed from Visual/Infrared/RADAR
 Observations
 Boundary Analyzed from Passive Microwave
 Estimated Boundary



SOUTHERN ICE LIMITS (CS)
 NAVY NAVAL DATA CENTER
 (FORMERLY NAVAL POLAR OCEANOGRAPHIC CENTER, SIO, SAN DIEGO)
 OCEANOGRAPHIC DATA REPORT 10-73-100

C = Total ice concentration in the area in which
 C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, C₁₅, C₁₆, C₁₇, C₁₈, C₁₉, C₂₀
 C₁ - C₂₀ = Stages of ice thickness (see legend)

S₁, S₂, S₃, S₄ = Stages of flow and pressure (see legend)

C = Concentration of ice within width of strips

STAGES (S) OF DEVELOPMENT (THICKNESS) PARALLELS

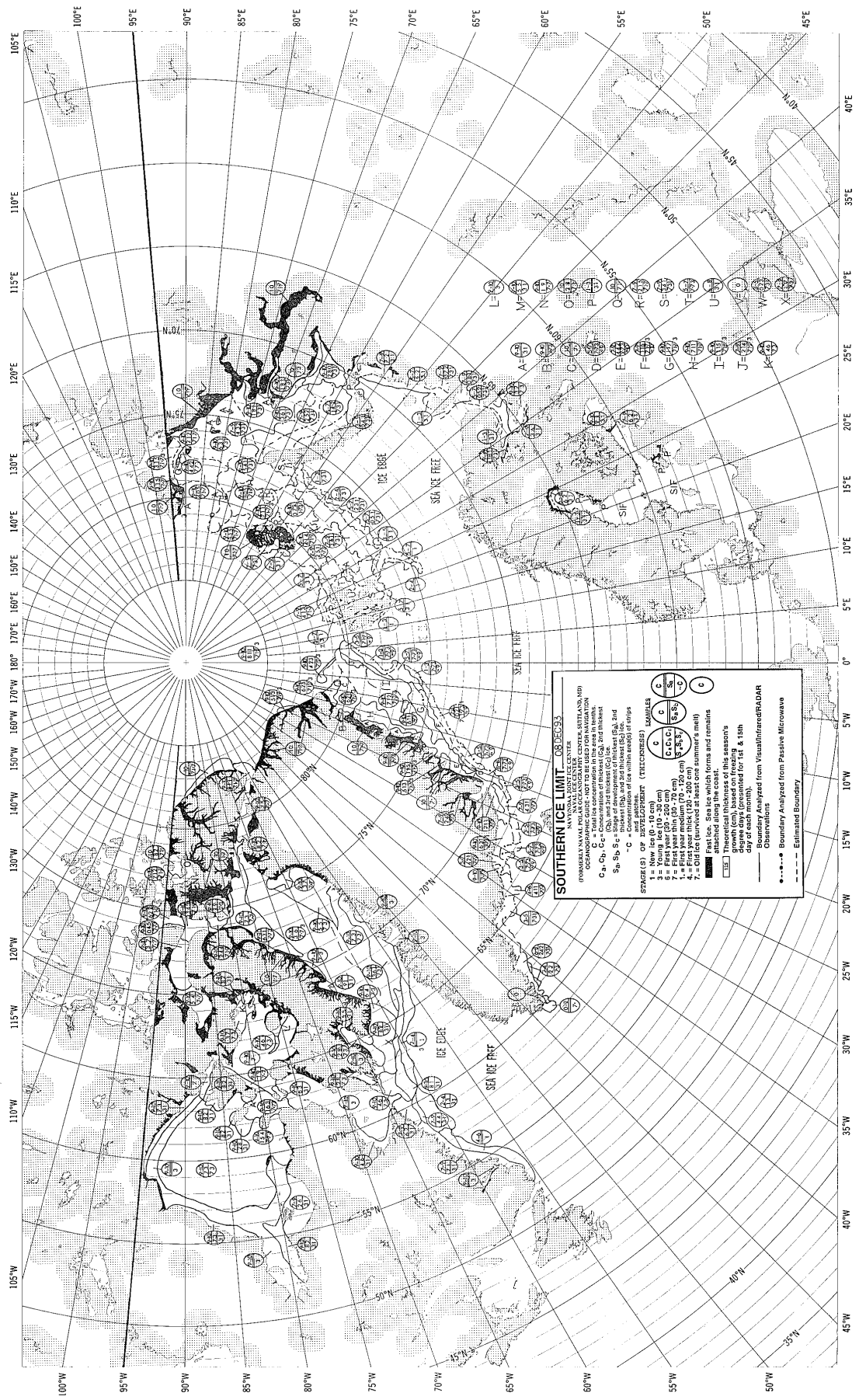
1 = New Ice (10 - 20 cm)	C
2 = First year (20 - 50 cm)	C
3 = First year medium (50 - 75 cm)	C
4 = First year thick (75 - 100 cm)	C
5 = First year very thick (100 - 125 cm)	C
6 = First year extremely thick (125 - 150 cm)	C
7 = First year ice (150 - 200 cm)	C
8 = Second year (200 - 250 cm)	C
9 = Second year medium (250 - 300 cm)	C
10 = Second year thick (300 - 350 cm)	C
11 = Second year very thick (350 - 400 cm)	C
12 = Second year extremely thick (400 - 450 cm)	C
13 = Third year (450 - 500 cm)	C
14 = Third year medium (500 - 550 cm)	C
15 = Third year thick (550 - 600 cm)	C
16 = Third year very thick (600 - 650 cm)	C
17 = Third year extremely thick (650 - 700 cm)	C
18 = Fourth year (700 - 750 cm)	C
19 = Fourth year medium (750 - 800 cm)	C
20 = Fourth year thick (800 - 850 cm)	C

ICE = Sea ice which forms and remains attached along the coast.

IB = Iceberg (see legend for ice season's degree days) presented for 1st & 15th

OB = Observation Analyzed from Visual Interferometer RADAR

○ = Observation
○ = Boundary Analyzed from Passive Microwave
--- = Estimated Boundary

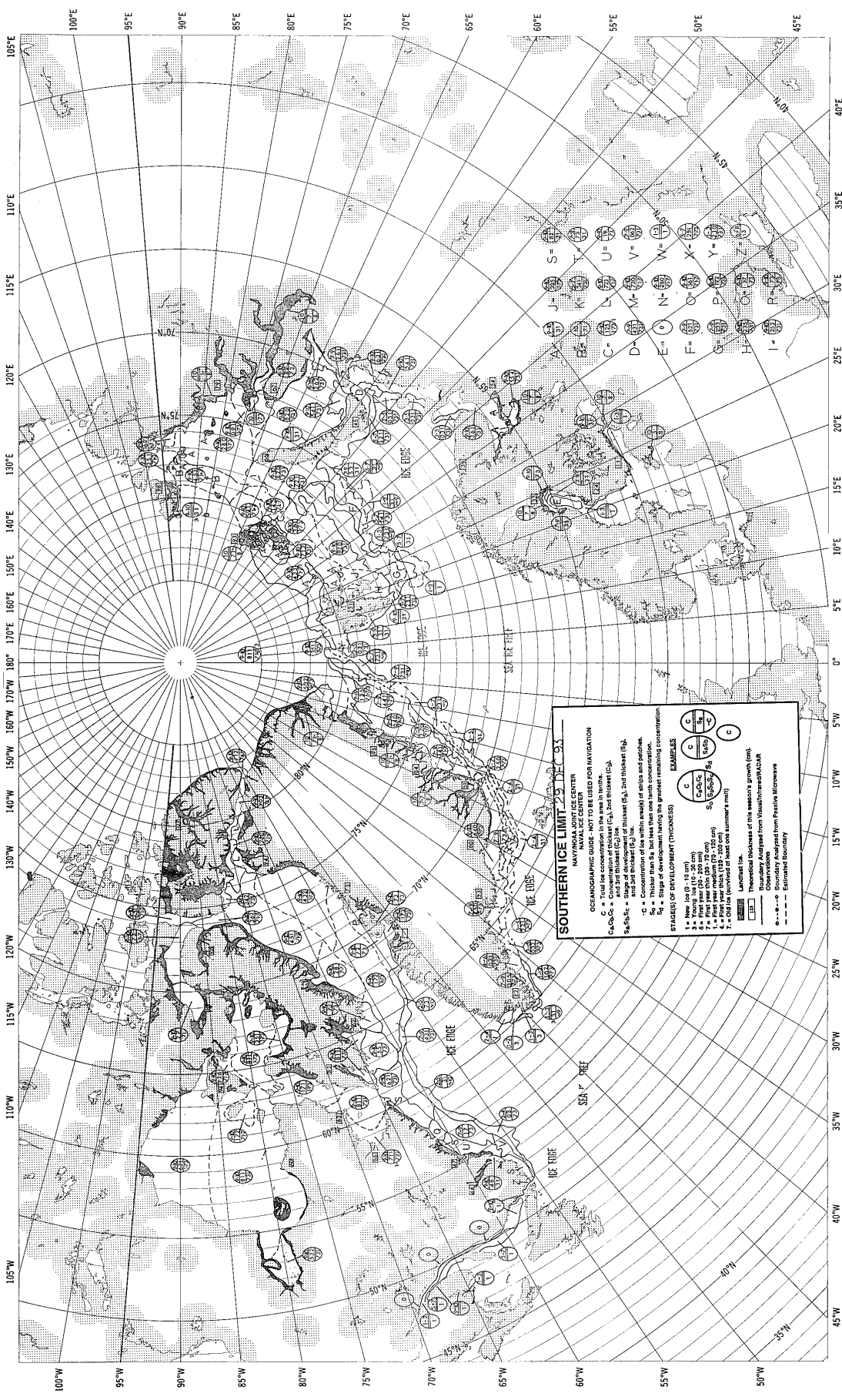


SOUTHERN ICE LIMIT 08 DEC 93
 AN NAVAL MONITORING CENTER
 (FORMERLY NAVAL POLAR OCEANOGRAPHY CENTER (SITRA AND NPO)
 DISSEMINATION CENTER)
 C = Total ice concentration in the area in tenths
 C₁, C₂, C₃ = 10%, 20%, and 30 percent (C₁ for 1st thickest)
 S₁, S₂, S₃, S₄ = Stages of development of thickness (S₁ and S₂ are 1st and 2nd thickest) (C for concentration of ice within area) of strips

STAGE (S) OF DEVELOPMENT (TEMPERATURE) MARKERS

1 = New ice (0-10 cm)	1 = New ice (0-10 cm)
2 = First year (10-200 cm)	2 = First year (10-200 cm)
3 = First year medium (70-170 cm)	3 = First year medium (70-170 cm)
4 = First year thick (100-200 cm) (summer's melt)	4 = First year thick (100-200 cm) (summer's melt)

[Symbol] Ice which forms and remains attached along the coast.
 [Symbol] Theoretical thickness of ice in seasons's degree days (presented for Feb & 15th of season)
 [Symbol] Boundary Analyzed from Visual/Radar
 [Symbol] Observations
 [Symbol] Boundary Analyzed from Passive Microwave
 [Symbol] Estimated Boundary



SOUTHERN ICE LIMIT 22 DEC 55

MAP CENTER
MANTA ICE CENTER

OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

C = Total ice concentration in the area in tenths.
C₁C₂C₃ = 1st, 2nd, and 3rd thickness (C₁, 2nd thickness (C₂), and 3rd thickness (C₃)).
S₁S₂S₃ = a stage of development of thickest (S₁), 2nd thickest (S₂), and 3rd thickest (S₃).
C = Concentration of ice within 100 m of ship and patches.
S₁ = Thicker than S₂, but less than one tenth concentration.
S₂ = Stage of development having the greater remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)

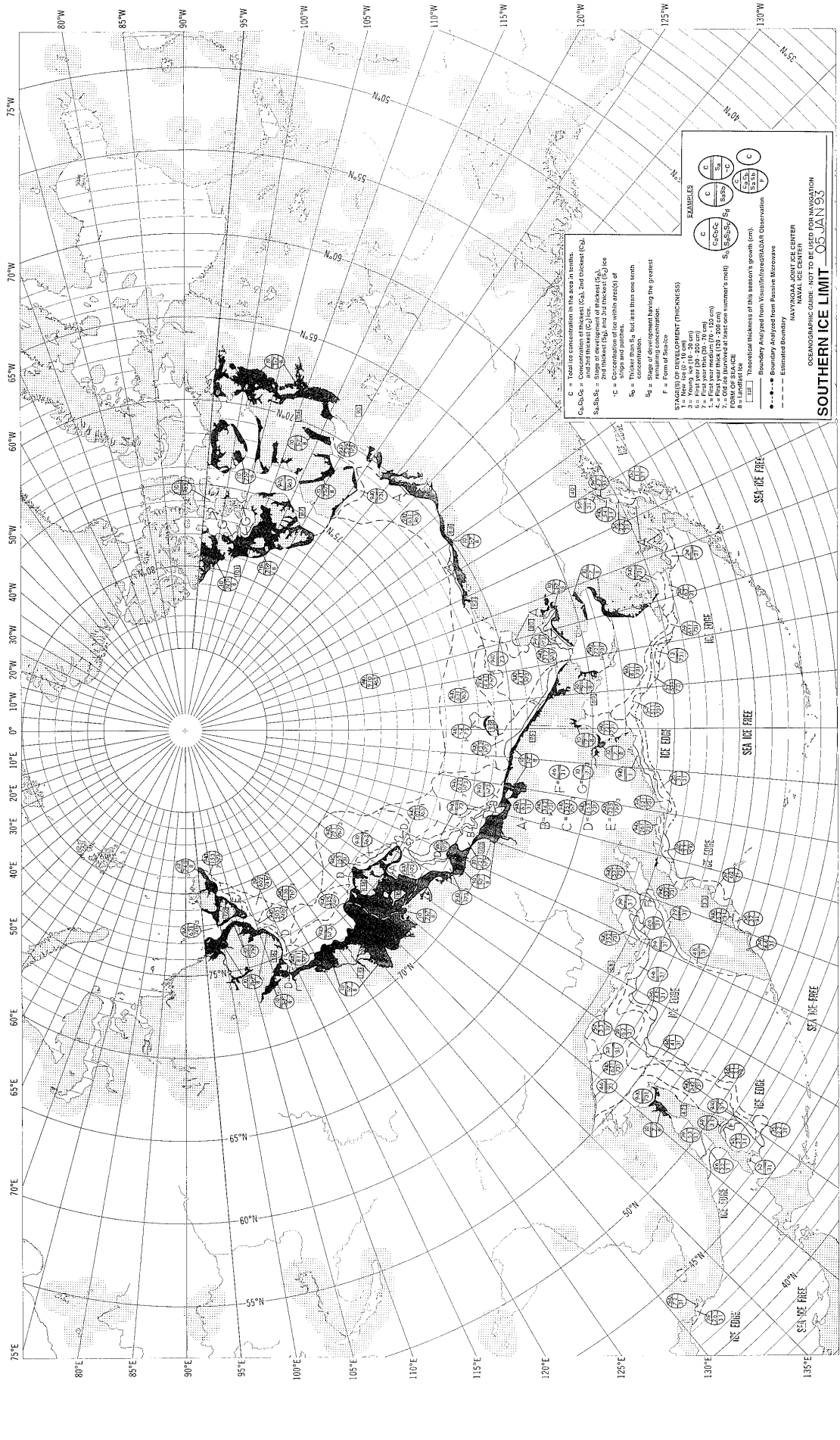
1 = New ice (0-10 cm)
2 = First year (10-20 cm)
3 = First year (20-30 cm)
4 = First year (30-50 cm)
5 = First year (50-100 cm)
6 = Old ice (100-150 cm)
7 = Old ice (150-200 cm)
8 = Old ice (200-300 cm)
9 = Old ice (300-400 cm)
10 = Old ice (400-500 cm)
11 = Old ice (500-600 cm)
12 = Old ice (600-700 cm)
13 = Old ice (700-800 cm)
14 = Old ice (800-900 cm)
15 = Old ice (900-1000 cm)

EXAMPLES

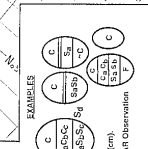
C₁C₂C₃ S₁S₂S₃ C

Legend:

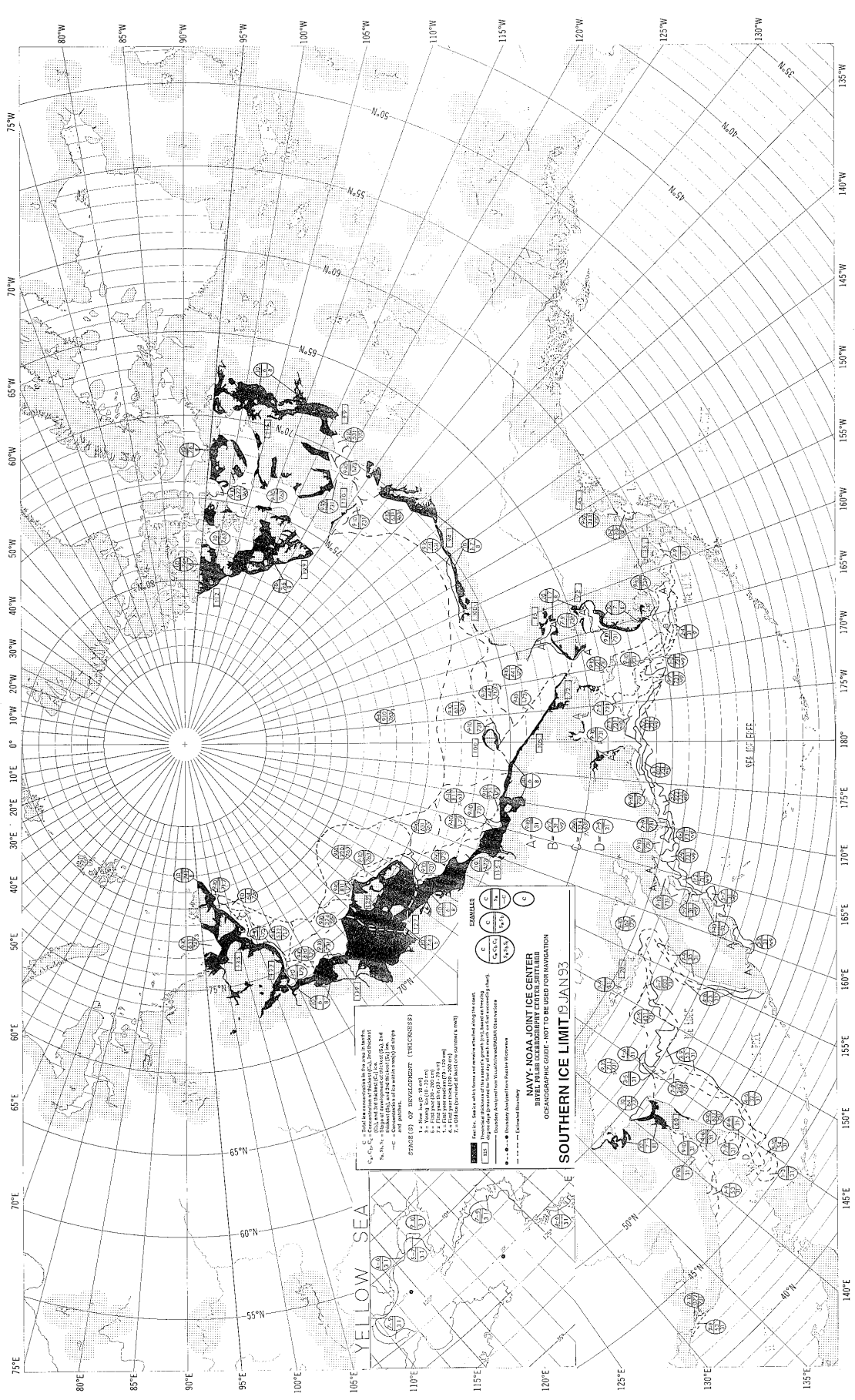
- ▭ Landmass (sh)
- ▭ Theoretical thickness of this season's growth (sh)
- Boundary Analyzed from Visual Observations
- Boundary Analyzed from Passive Microwave
- Estimated Boundary



C = Total ice concentration in the area in tenths.
 C₀, C₁₀₀ = ... and ...
 S₀, S₁₀₀ = ...
 C₀ = Concentration of ice within areas of ...
 S₀ = Thickness ...
 F = ...
 S₀ = Stage of development having the greatest remaining concentration.
 STAGES FOR DEVELOPMENT (THICKNESS)
 1 = New ice (< 10 cm)
 2 = First year ice (10 - 20 cm)
 3 = First year ice (20 - 50 cm)
 4 = First year ice (50 - 100 cm)
 5 = First year ice (100 - 200 cm)
 6 = First year ice (> 200 cm)
 7 = Multi-year ice (< 100 cm)
 8 = Multi-year ice (> 100 cm)
 B = Leadfast ice
 C = Boundary Analyzed from Visual Observations
 E = Estimated Boundary



OCEANOGRAPHIC DATA CENTER
 NAVAL ICE CENTER
 7700 ROUTE 1
 WASHINGTON, DC 20340
SOUTHERN ICE LIMIT - 05 JAN 93

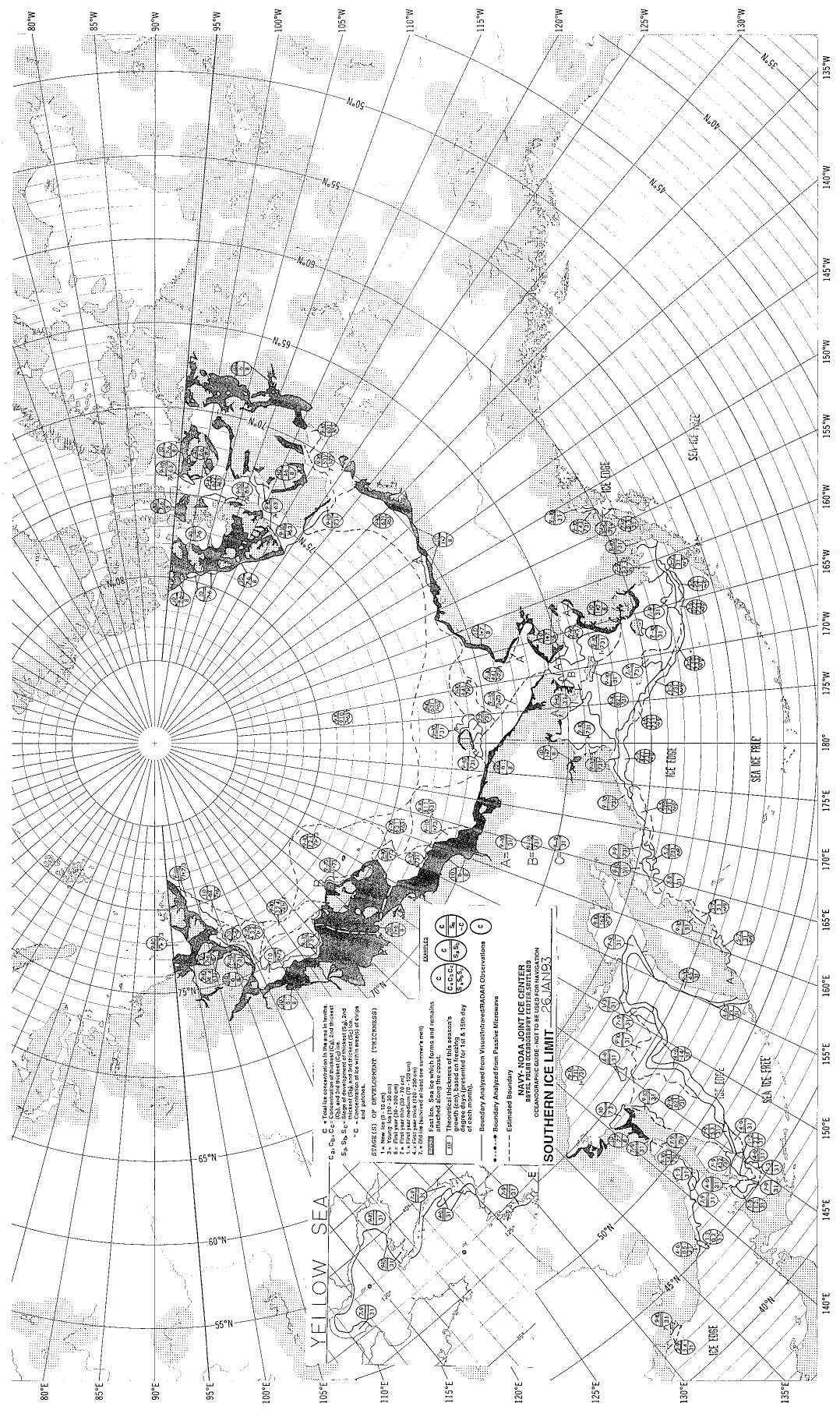


SYMBOLS: See the symbols and explanations along the back.
SCALE: 1:100,000
VERTICAL SCALE: 1:100,000
Horizontal Scale: 1:100,000
VERTICAL SCALE: 1:100,000
Horizontal Scale: 1:100,000

SYMBOLS (OF DEVELOPMENT) (ENCLOSURES)
ENCLOSURE: 1. 1000000000
ENCLOSURE: 2. 1000000000
ENCLOSURE: 3. 1000000000
ENCLOSURE: 4. 1000000000
ENCLOSURE: 5. 1000000000

NAVY, NOAA JOINT ICE CENTER
ROYAL NAVY HYDROGRAPHY DEPARTMENT
OCEANOGRAPHIC CHART - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT 19 JAN 93

ENCLOSURE: 1. 1000000000
ENCLOSURE: 2. 1000000000
ENCLOSURE: 3. 1000000000
ENCLOSURE: 4. 1000000000
ENCLOSURE: 5. 1000000000



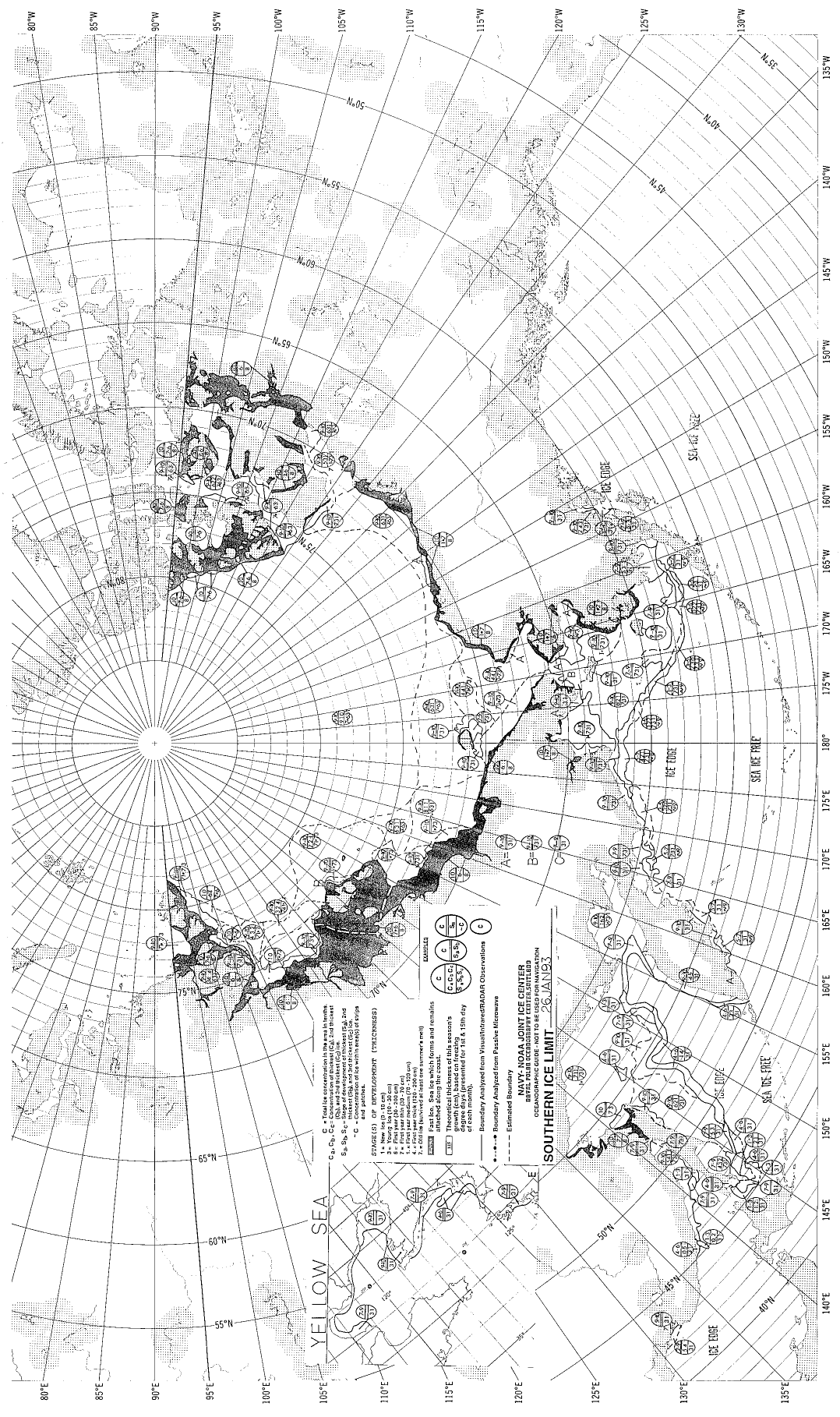
C - Total ice concentration in the area in tenths
C₁, C₂, C₃ - (C₁ and C₂ in tenths; C₃ in hundredths)
S₁, S₂, S₃ - (S₁ in tenths; S₂ and S₃ in hundredths)
T - Thickness of ice in meters (or feet)
D - Direction of ice movement (or drift)

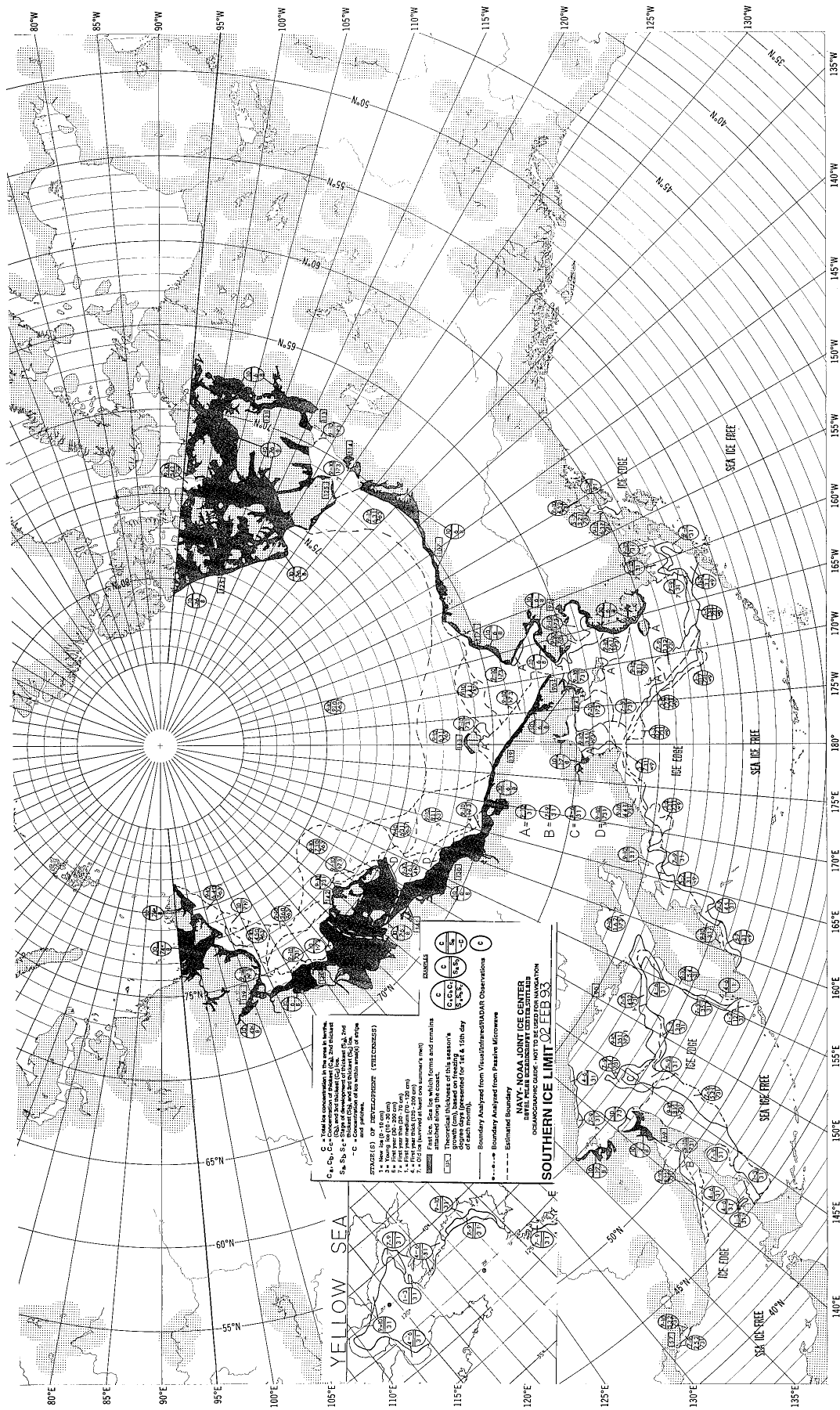
STAGES OF DEVELOPMENT (THICKNESSES)
 1 - New snow (10-20 cm)
 2 - First year (20-30 cm)
 3 - First year (30-40 cm)
 4 - First year (40-50 cm)
 5 - First year (50-60 cm)
 6 - First year (60-70 cm)
 7 - Old ice (thawed at least one summer's work)

EXAMPLE
 C 100
 C₁ 50
 C₂ 50
 C₃ 0
 S₁ 0
 S₂ 0
 S₃ 0
 T 0
 D 0

LEGEND
 [Symbol] Theoretical thickness of this season's ice in meters (or feet) and direction of ice movement (or drift) (presented for 1st, 15th day of each month).
 [Symbol] Boundary Analyzed from Visual/Radar Observations
 [Symbol] Estimated Boundary

NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - 26 JAN 1953





C = Total ice concentration in the area in tenths.
C₁, C₂, C₃ = (C₁ = 1st ice layer, C₂ = 2nd ice layer, C₃ = 3rd ice layer) (See note on thickness).
S₁, S₂, S₃ = Percent of total area of ice in tenths (C₁, C₂, and C₃ multiplied by S₁, S₂, and S₃ respectively).
T = Total ice thickness in tenths (C multiplied by T).
W = Wind speed in tenths (W multiplied by W).

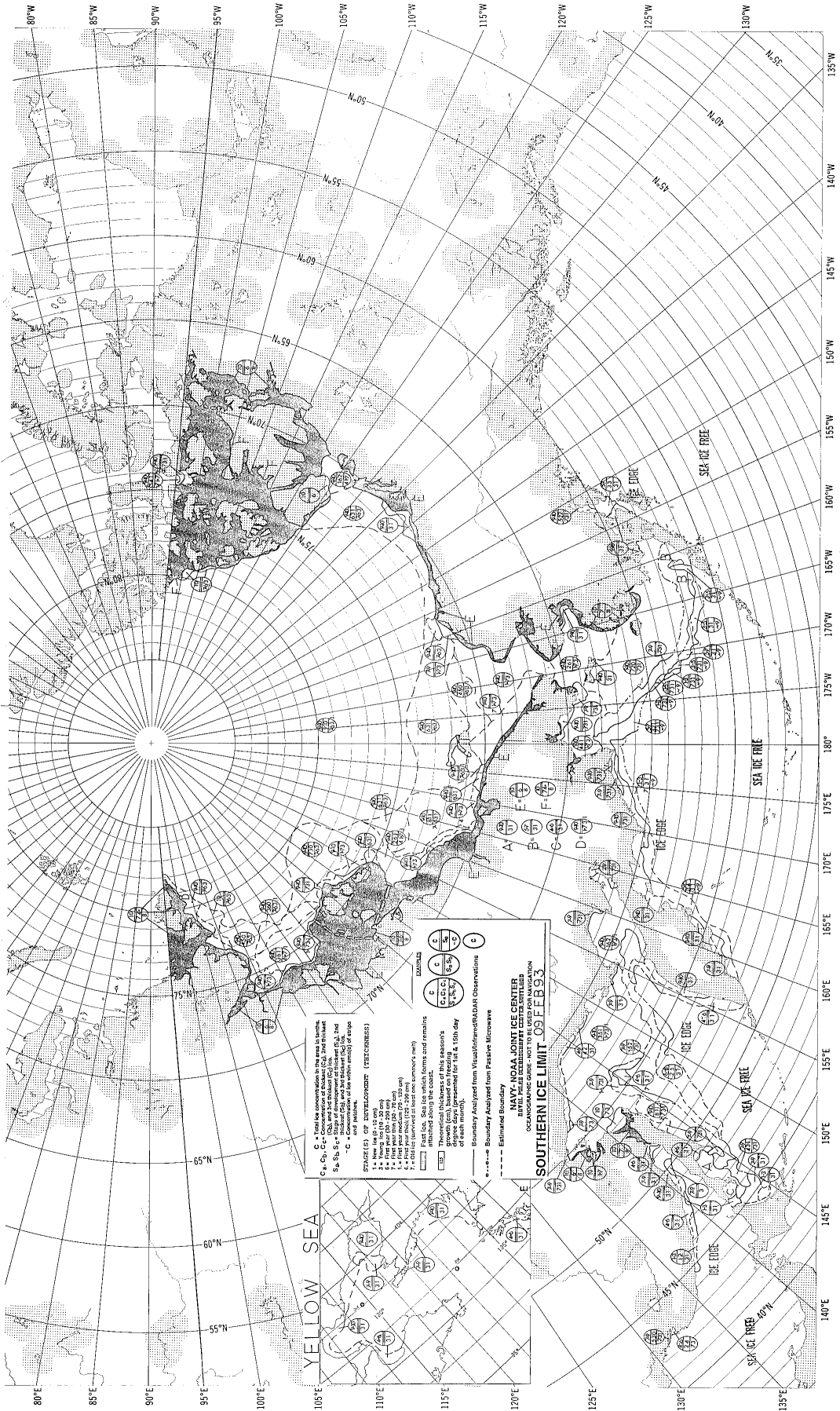
STAGES OF DEVELOPMENT (TELESCOPES)

1. New ice (0-10 cm)
2. First year ice (10-20 cm)
3. First year medium ice (20-50 cm)
4. First year medium ice (50-100 cm)
5. First year medium ice (100-150 cm)
6. First year medium ice (150-200 cm)
7. Old ice (formed at least one summer's time)

THEORETICAL THICKNESS
 Theoretical thickness of this season's ice is determined by the following formula:
 $T = \frac{C \cdot S \cdot W}{100}$
 where T = theoretical thickness in tenths of each month.
 (Note: T is based on 1st & 15th day of each month.)

BOUNDARIES
 --- Boundary Analyzed from Visual/Radar Observations
 - - - - - Estimated Boundary

NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC DATA - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT 02 FEB 83



NAVY, NOAA JOINT ICE CENTER
 OCEANOGRAPHIC DATA - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - 09 FEB 93

Legend:

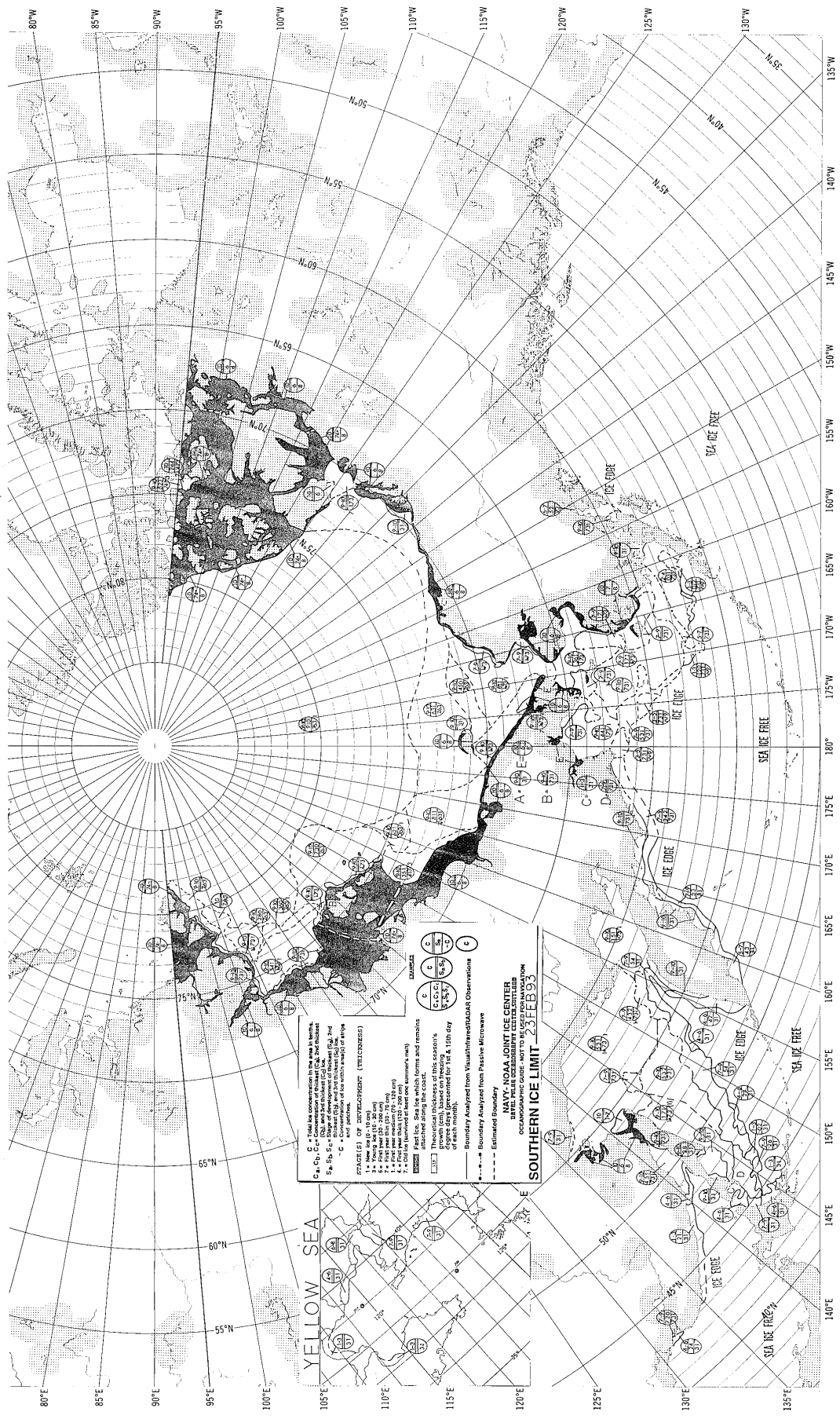
- C** - Total ice concentration in the sea in percent
- C₁, C₂, C₃** - Concentration of ice in the first, second, and third thickness categories
- S₁, S₂, S₃** - Stage of development of ice in the first, second, and third thickness categories
- C** - Concentration of ice within a grid cell (if origin is center)

STAGES OF DEVELOPMENT (THICKNESS)

1. New ice (< 10 cm)
2. First year ice (10 - 25 cm)
3. Second year ice (25 - 50 cm)
4. Third year ice (50 - 100 cm)
5. Fourth year ice (> 100 cm)
6. Old ice (> 100 cm)
7. Ice ditch (formed at least once summer's melt)

EXAMPLES:

Boundary Analyzed from Visual/Radar Observations
 - - - - - Estimated Boundary

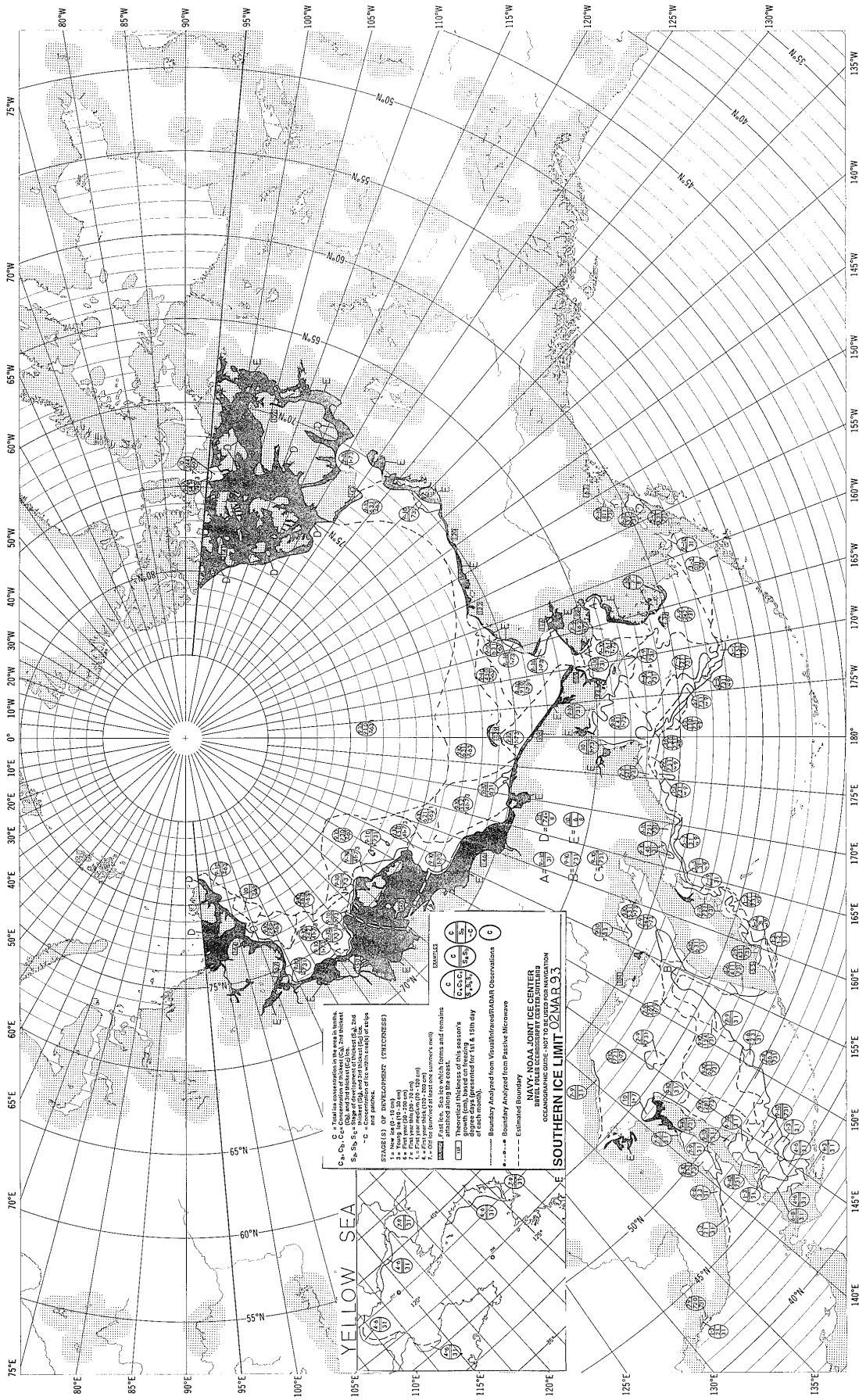


NAVY - NOAA JOINT ICE CENTER
 NAVAL PHILADELPHIA CENTER/LEEDS
 OBSERVATIONS FROM 1500 GMT 23 FEB 63
SOUTHERN ICE LIMIT

SYMBOLS:
 C, C1, C2, C3 - Concentration of ice in the form of
 floes, icebergs, and icebergs (C1, C2, C3)
 S, S1, S2 - Observations of icebergs (S1, S2)
 B - Boundaries of icebergs (B1, B2, B3, B4)
 and patches.
 (C) - Concentration of ice (PERCENTAGE)
 (S) - Size of icebergs (METERS)
 (B) - Boundaries of icebergs (METERS)
 (C1, C2, C3) - Concentration of ice (PERCENTAGE)
 (S1, S2) - Size of icebergs (METERS)
 (B1, B2, B3, B4) - Boundaries of icebergs (METERS)

BOUNDARIES:
 - - - - - Boundary Analyzed from Visual/Radar Observations
 - - - - - Estimated Boundary

NOTES:
 1. Area 300 (10-300 km)
 2. Area 100 (10-100 km)
 3. Area 50 (10-50 km)
 4. Area 25 (10-25 km)
 5. Area 10 (10-10 km)
 6. Area 5 (10-5 km)
 7. Area 2 (10-2 km)
 8. Area 1 (10-1 km)
 9. Area 0.5 (10-0.5 km)
 10. Area 0.2 (10-0.2 km)
 11. Area 0.1 (10-0.1 km)
 12. Area 0.05 (10-0.05 km)
 13. Area 0.02 (10-0.02 km)
 14. Area 0.01 (10-0.01 km)
 15. Area 0.005 (10-0.005 km)
 16. Area 0.002 (10-0.002 km)
 17. Area 0.001 (10-0.001 km)
 18. Area 0.0005 (10-0.0005 km)
 19. Area 0.0002 (10-0.0002 km)
 20. Area 0.0001 (10-0.0001 km)



YELLOW SEA

LEGEND

ICE CONCENTRATION

G, A, Ch, C = Total ice concentration in the north hemisphere
 S, B, S₁, S₂ = Range of development of thickness (G, A, and S, B, S₁, S₂ = concentration of ice which is thick) for each ice type

ICE TYPE

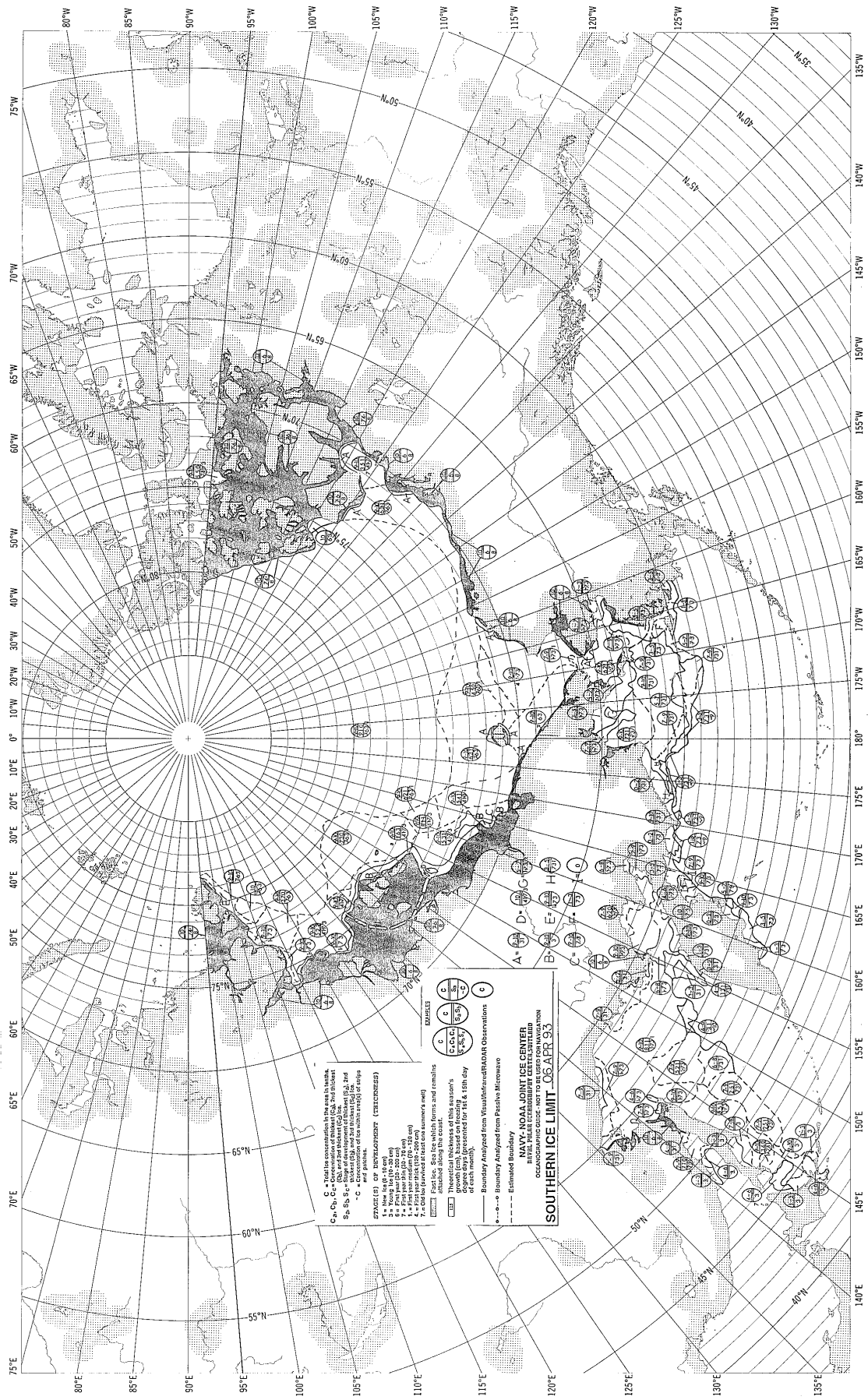
1 = New ice (0 - 15 cm)
 2 = First year ice (15 - 200 cm)
 3 = First year medium ice (200 - 500 cm)
 4 = First year old ice (500 - 1000 cm)
 5 = First year old ice (1000 - 1500 cm)
 6 = First year old ice (1500 - 2000 cm)
 7 = First year old ice (2000 - 2500 cm)
 8 = First year old ice (2500 - 3000 cm)

BOUNDARIES

— Estimated Boundary
 - - - - - Boundary Analyzed from Visual/Radar Observations

DATA SOURCES

— NOAA JOINT ICE CENTER
 — NAVY JOINT ICE CENTER
 — PACIFIC MICROWAVE OCEANOGRAPHY CENTER
 — PACIFIC MICROWAVE OCEANOGRAPHY CENTER
SOUTHERN ICE LIMIT 02 MAR 93



C₁, C₂, C₃ = Contours of ice concentration in the each bath
 C₄ = Concentration of detritus (ice, sand, silt, etc.)
 S₁, S₂, S₃ = Edge of development of thickets (Fig. 2nd
 ed.)
 S₄ = Concentration of ice within a ring of single
 ice floes
 T₁ = Concentration of ice within a ring of single
 ice floes (thickness)
 T₂ = Concentration of ice within a ring of single
 ice floes (thickness)
 T₃ = Concentration of ice within a ring of single
 ice floes (thickness)
 T₄ = Concentration of ice within a ring of single
 ice floes (thickness)

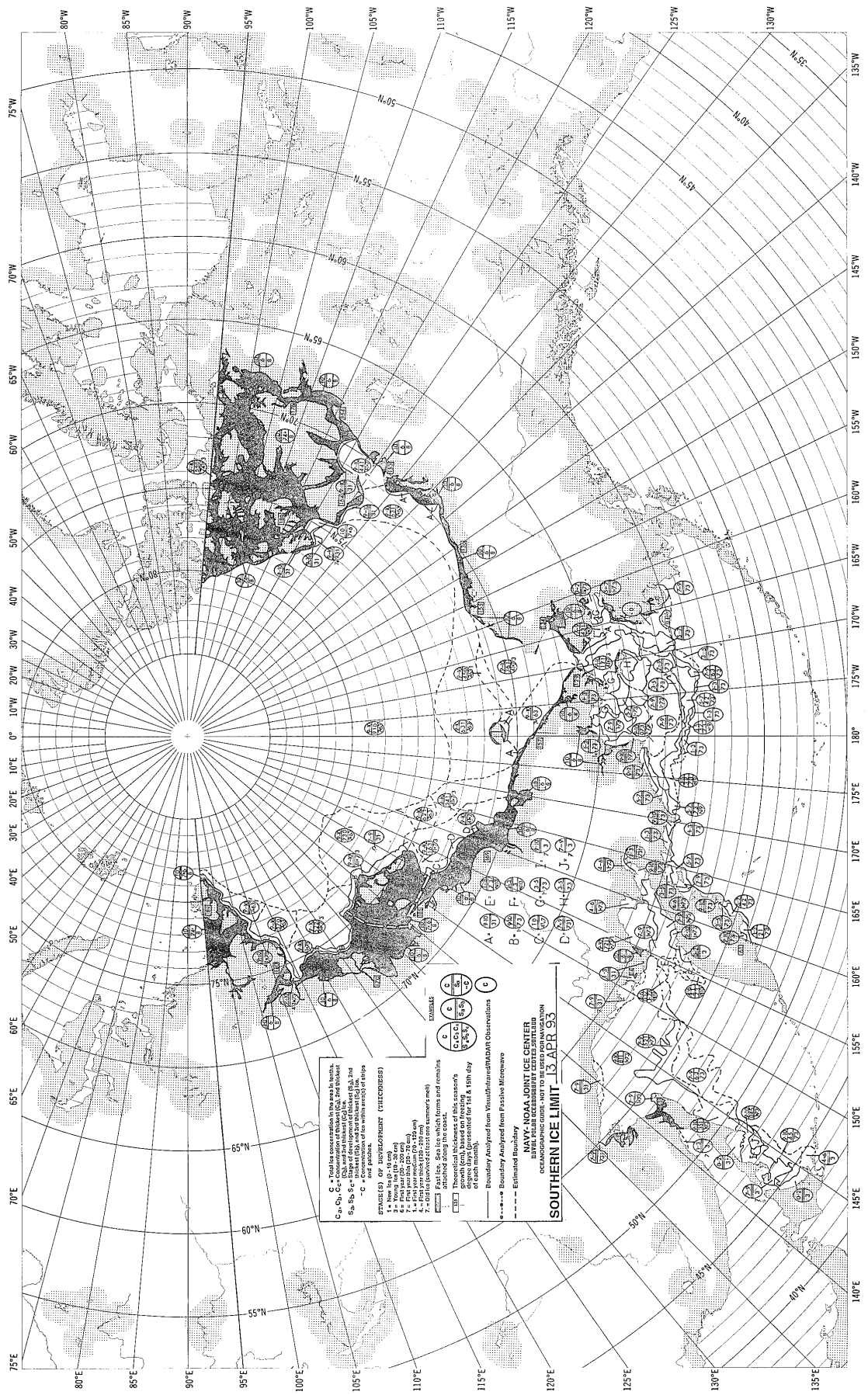
ICE TYPES

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1 = New ice (0-15 cm)
 2 = Young ice (15-30 cm)
 3 = First year ice (30-100 cm)
 4 = First year ice (100-200 cm)
 5 = First year ice (200-300 cm)
 6 = First year ice (300-400 cm)
 7 = Older ice (400-500 cm)
 8 = Older ice (500-600 cm)
 9 = Older ice (600-700 cm)
 10 = Older ice (700-800 cm)
 11 = Older ice (800-900 cm)
 12 = Older ice (900-1000 cm)

- - - - - Estimated Boundary
 --- Boundary Analyzed from Passive Microwave
 Observations

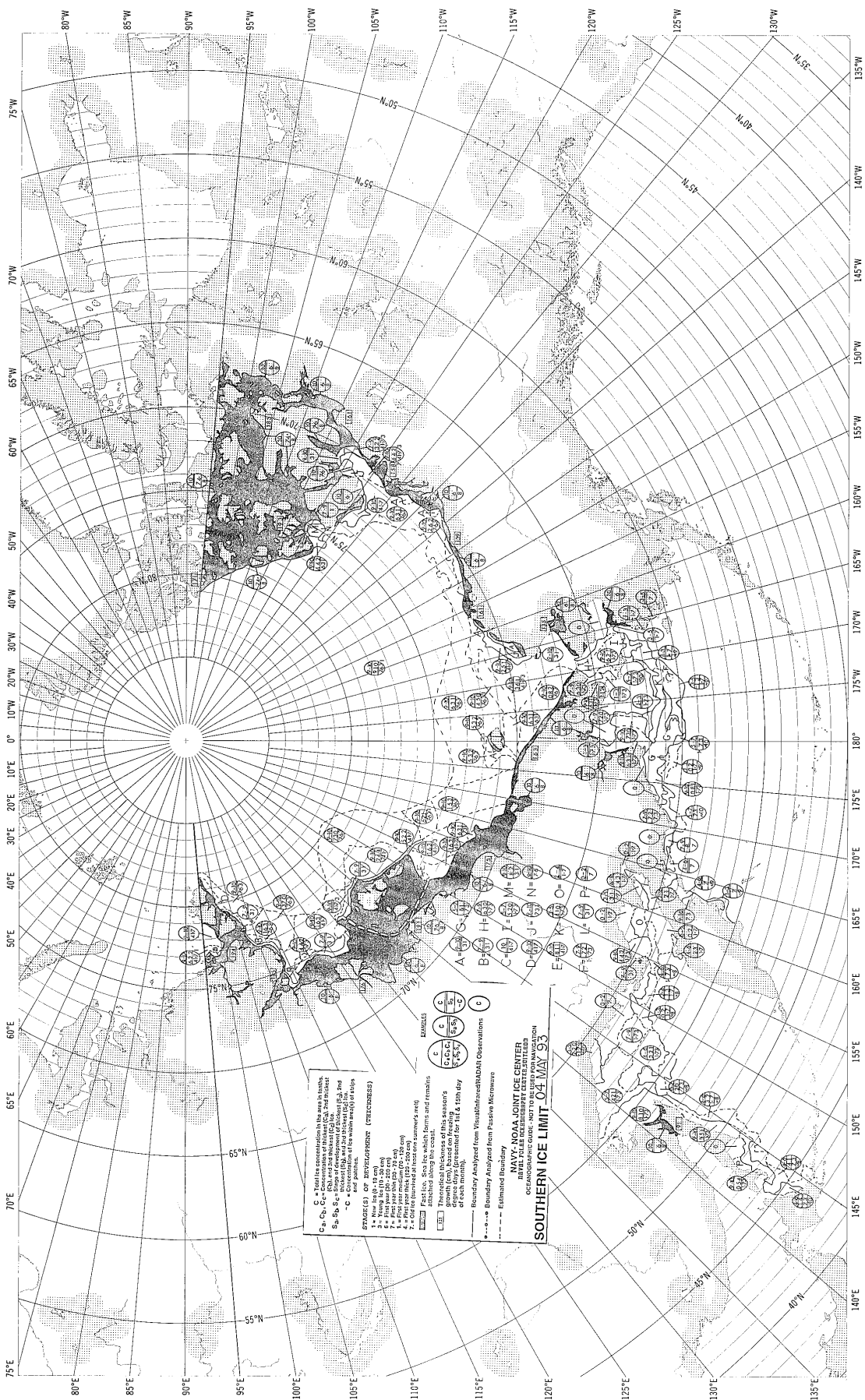
NAVY, NOAA, JOINT ICE CENTER
 NORTHERN ICE CENTER
 SOUTHERN ICE LIMIT - 05 APR 93



C, C₁, C₂ - Ice thickness in feet (1 ft = 0.3048 m)
 C₁, C₂ - Location of thickness (C₁ = 100 ft thick
 C₂ = 200 ft thick)
 S₁, S₂, S₃ - Date of onset of ice (S₁ = 1st onset, S₂ = 2nd
 onset, S₃ = 3rd onset)
 - C - Date of last sighting (C₁ = 1st sighting, C₂ = 2nd
 sighting)

SYMBOLS OF INTEREST (CIRCLES)
 1 - Ice (100-200 ft)
 2 - Ice (200-300 ft)
 3 - Ice (300-400 ft)
 4 - Ice (400-500 ft)
 5 - Ice (500-600 ft)
 6 - Ice (600-700 ft)
 7 - Ice (700-800 ft)
 8 - Ice (800-900 ft)
 9 - Ice (900-1000 ft)
 10 - Ice (1000-1100 ft)
 11 - Ice (1100-1200 ft)
 12 - Ice (1200-1300 ft)
 13 - Ice (1300-1400 ft)
 14 - Ice (1400-1500 ft)
 15 - Ice (1500-1600 ft)
 16 - Ice (1600-1700 ft)
 17 - Ice (1700-1800 ft)
 18 - Ice (1800-1900 ft)
 19 - Ice (1900-2000 ft)
 20 - Ice (2000-2100 ft)
 21 - Ice (2100-2200 ft)
 22 - Ice (2200-2300 ft)
 23 - Ice (2300-2400 ft)
 24 - Ice (2400-2500 ft)
 25 - Ice (2500-2600 ft)
 26 - Ice (2600-2700 ft)
 27 - Ice (2700-2800 ft)
 28 - Ice (2800-2900 ft)
 29 - Ice (2900-3000 ft)
 30 - Ice (3000-3100 ft)
 31 - Ice (3100-3200 ft)
 32 - Ice (3200-3300 ft)
 33 - Ice (3300-3400 ft)
 34 - Ice (3400-3500 ft)
 35 - Ice (3500-3600 ft)
 36 - Ice (3600-3700 ft)
 37 - Ice (3700-3800 ft)
 38 - Ice (3800-3900 ft)
 39 - Ice (3900-4000 ft)
 40 - Ice (4000-4100 ft)
 41 - Ice (4100-4200 ft)
 42 - Ice (4200-4300 ft)
 43 - Ice (4300-4400 ft)
 44 - Ice (4400-4500 ft)
 45 - Ice (4500-4600 ft)
 46 - Ice (4600-4700 ft)
 47 - Ice (4700-4800 ft)
 48 - Ice (4800-4900 ft)
 49 - Ice (4900-5000 ft)
 50 - Ice (5000-5100 ft)

NAVY-NOAA JOINT ICE CENTER
ARCTIC ICE OCCURRENCE DATA CENTER, WASHINGTON,
D.C.
SOUTHERN ICE LIMIT - 30 APR 59

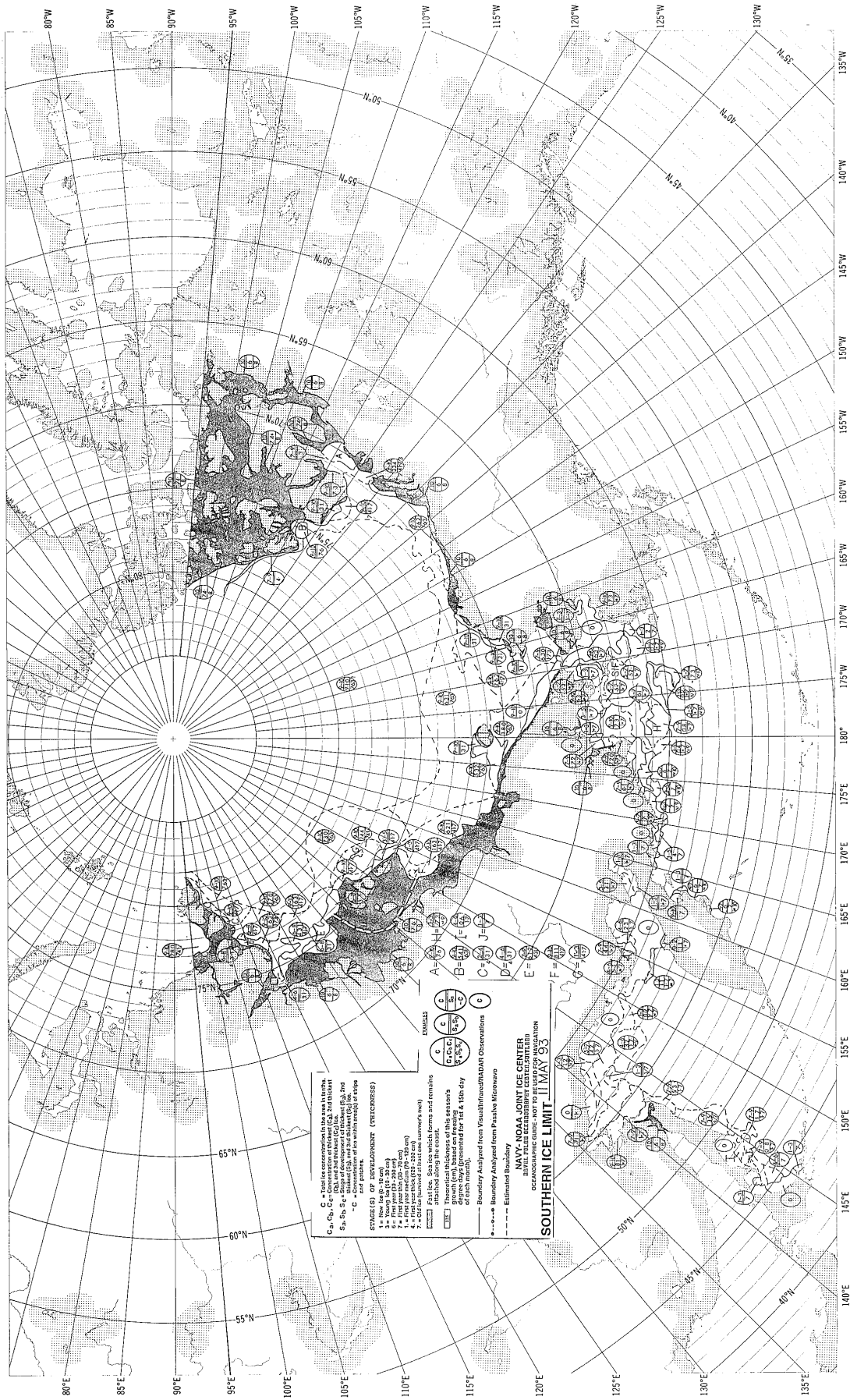


C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 S₁, S₂, S₃ = Thickness in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 C = Total ice concentration in the area in tenths.
 S = Thickness in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 C₁, C₂, C₃ = Concentration in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 S₁, S₂, S₃ = Thickness in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 C = Total ice concentration in the area in tenths.
 S = Thickness in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 C₁, C₂, C₃ = Concentration in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
 S₁, S₂, S₃ = Thickness in 10% intervals (10, 20, 30, 40, 50, 60, 70, 80, 90, 100).

EXAMPLES OF DEVELOPMENT (PRECEDENCES)
 1 = Young ice (1st year)
 2 = Young ice (2nd year)
 3 = First year ice (1st year)
 4 = First year ice (2nd year)
 5 = First year ice (3rd year)
 6 = First year ice (4th year)
 7 = First year ice (5th year)
 8 = First year ice (6th year)
 9 = First year ice (7th year)
 10 = First year ice (8th year)
 11 = First year ice (9th year)
 12 = First year ice (10th year)

SOUTHERN ICE LIMIT - 04 MAY 53
 NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

--- Estimated Boundary
 --- Boundary Analyzed from Visual Infrared-Radiometer Observations
 --- Boundary Analyzed from Passive Microwave

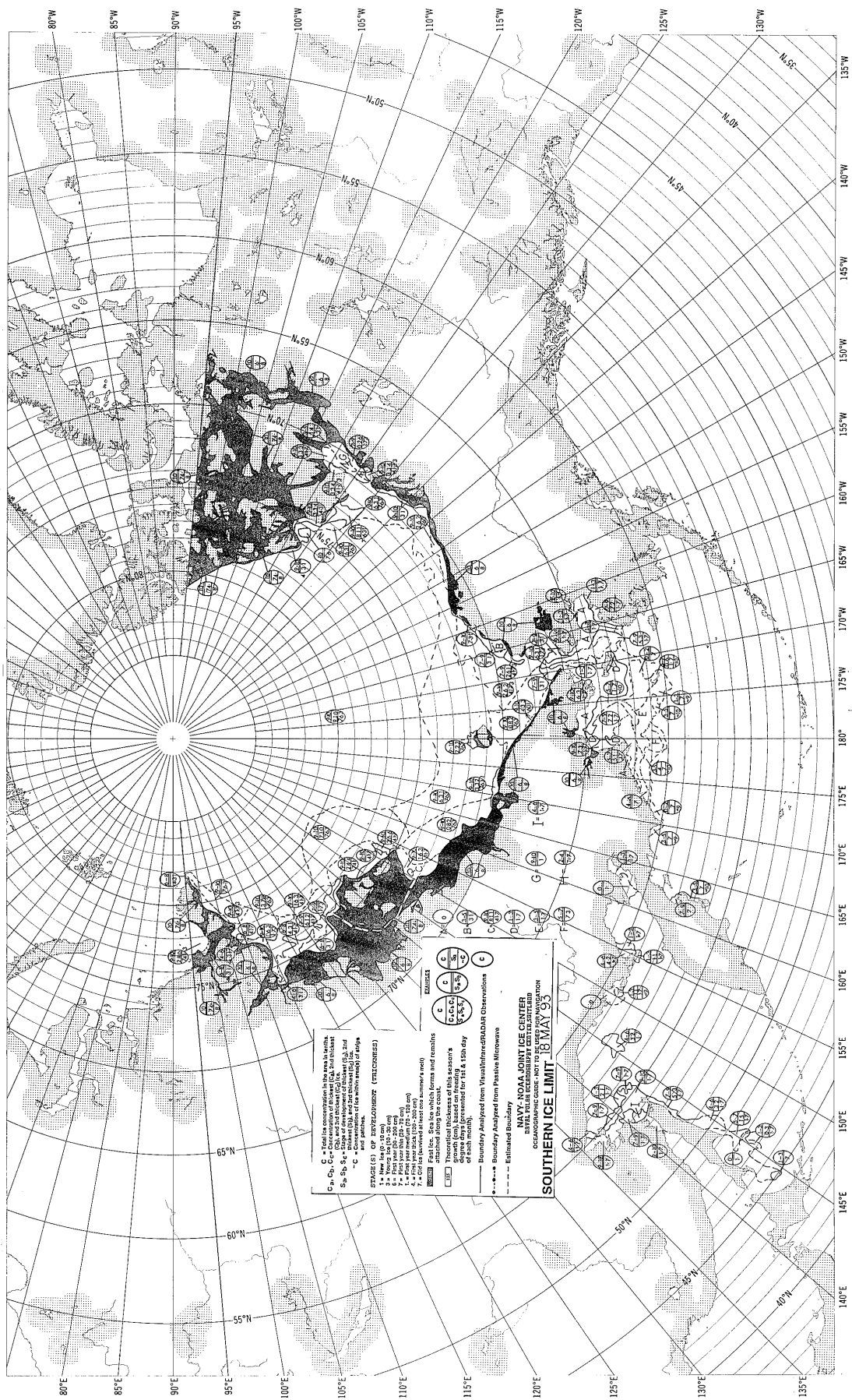


C = Total ice concentration in the area in tenths.
 Ca, Cb, Cc = Old and new floes (CO) ice, and floe bank
 ice (CB) ice, respectively.
 S₁, S₂, S₃ = Stages 1, 2, and 3 (see text) (S₁ is the
 ice of the winter season) of floes.
STAGES OF DEVELOPMENT (PRECOMPRESSES)
 1 = Young ice (10-30 cm)
 2 = First year ice (30-70 cm)
 3 = First year ice (70-100 cm)
 4 = First year ice (100-200 cm)
 5 = First year ice (200-300 cm)
 6 = First year ice (300-500 cm)
 7 = Old ice floes (one summer, two)

EXAMPLES
 A = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$
 B = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$
 C = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$
 D = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$
 E = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$
 F = $\frac{C}{S_1}$ $\frac{C}{S_2}$ $\frac{C}{S_3}$

Theoretical thickness of this season's
 degree day (presented for 1st & 15th day
 of each month).
 --- Boundary Analyzed from Visual/Microwave Observations
 - - - - - Estimated Boundary

NATIONAL JOINT ICE CENTER
 AND THE CANADIAN ICE CENTER
 OCEANOGRAPHIC CODE - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - II MAY 93



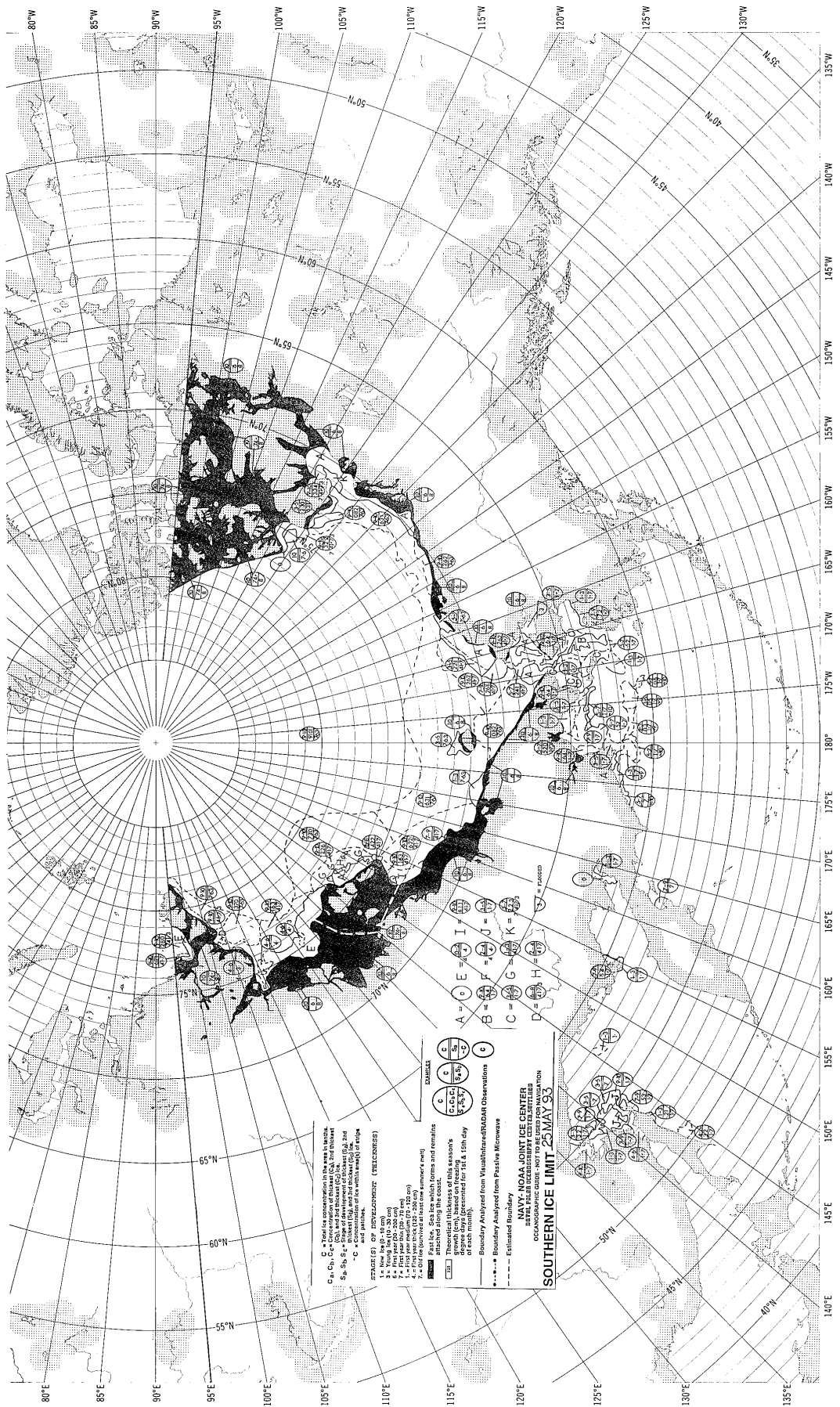
C = Total ice concentration in the area in tenths.
C₁, C₂, C₃ = Concentration of ice in stages 1, 2, and 3.
S₁, S₂, S₃ = Stage of ice development (see text).
C₁, C₂, C₃ = Concentration of ice in stages 1, 2, and 3.
S₁, S₂, S₃ = Stage of ice development (see text).
C₁, C₂, C₃ = Concentration of ice in stages 1, 2, and 3.
S₁, S₂, S₃ = Stage of ice development (see text).

STAGES OF DEVELOPMENT (THICKNESS)
S₁ = New ice (0-15 cm)
S₂ = Young ice (15-30 cm)
S₃ = First year ice (30-70 cm)
S₄ = First year ice (70-150 cm)
S₅ = First year ice (150-300 cm)
S₆ = First year ice (300-600 cm)
S₇ = First year ice (600-1200 cm)
S₈ = First year ice (1200-2400 cm)
S₉ = First year ice (2400-4800 cm)
S₁₀ = First year ice (4800-9600 cm)
S₁₁ = First year ice (9600-19200 cm)
S₁₂ = First year ice (19200-38400 cm)
S₁₃ = First year ice (38400-76800 cm)
S₁₄ = First year ice (76800-153600 cm)
S₁₅ = First year ice (153600-307200 cm)
S₁₆ = First year ice (307200-614400 cm)
S₁₇ = First year ice (614400-1228800 cm)
S₁₈ = First year ice (1228800-2457600 cm)
S₁₉ = First year ice (2457600-4915200 cm)
S₂₀ = First year ice (4915200-9830400 cm)
S₂₁ = First year ice (9830400-19660800 cm)
S₂₂ = First year ice (19660800-39321600 cm)
S₂₃ = First year ice (39321600-78643200 cm)
S₂₄ = First year ice (78643200-157286400 cm)
S₂₅ = First year ice (157286400-314572800 cm)
S₂₆ = First year ice (314572800-629145600 cm)
S₂₇ = First year ice (629145600-1258291200 cm)
S₂₈ = First year ice (1258291200-2516582400 cm)
S₂₉ = First year ice (2516582400-5033164800 cm)
S₃₀ = First year ice (5033164800-10066329600 cm)

EXAMPLES
C = Total ice concentration in the area in tenths.
C₁, C₂, C₃ = Concentration of ice in stages 1, 2, and 3.
S₁, S₂, S₃ = Stage of ice development (see text).
C₁, C₂, C₃ = Concentration of ice in stages 1, 2, and 3.
S₁, S₂, S₃ = Stage of ice development (see text).

THEORETICAL THICKNESS OF THIS SEASON'S ICE
1 = Theoretical thickness of this season's ice (in centimeters) for each degree day (accumulated for 15 & 15th day of each month).
2 = Theoretical thickness of this season's ice (in centimeters) for each degree day (accumulated for 15 & 15th day of each month).
3 = Theoretical thickness of this season's ice (in centimeters) for each degree day (accumulated for 15 & 15th day of each month).

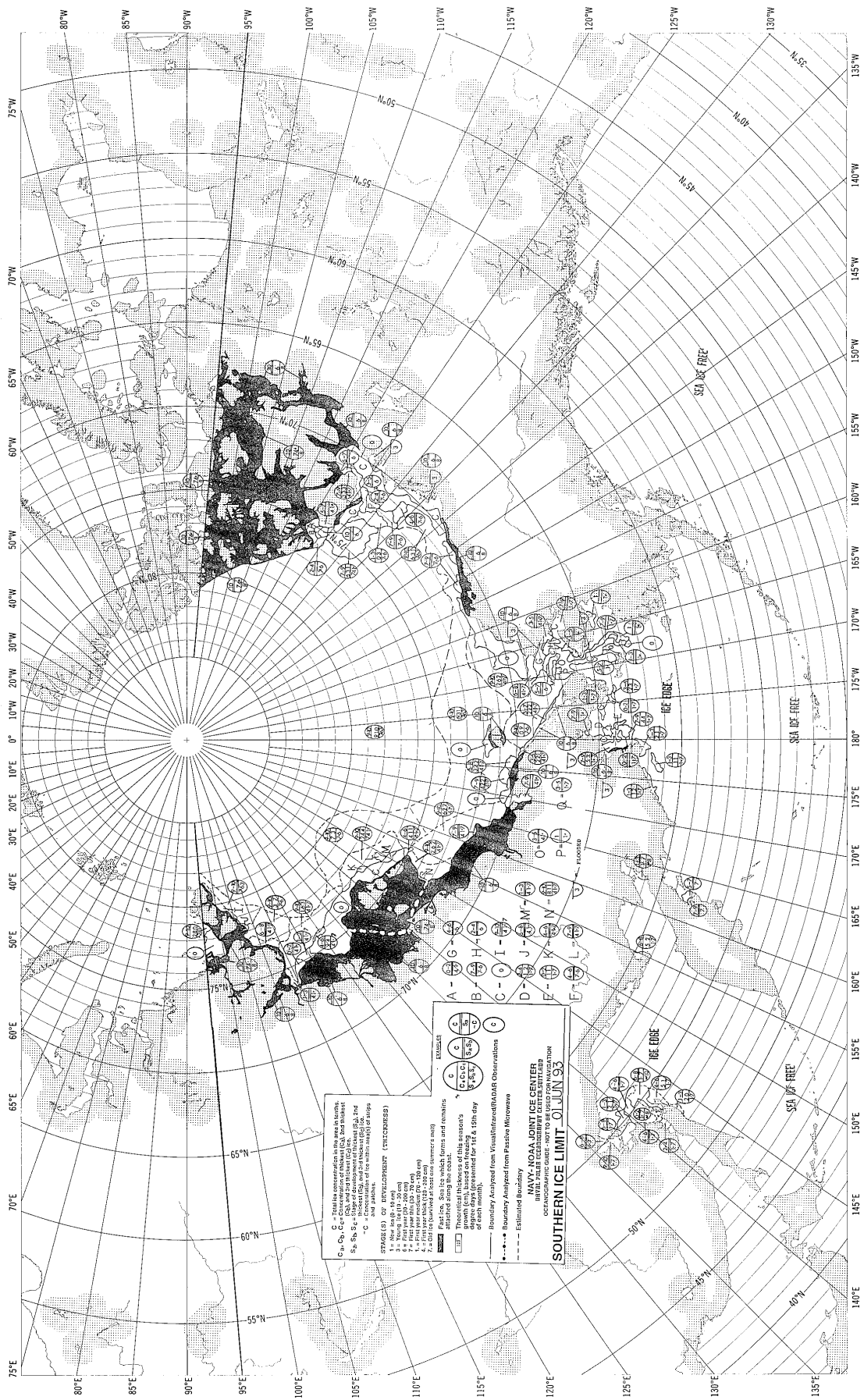
Boundary Analyzed from VISUAL/INTERRADAR Observations
--- Estimated Boundary
NAVY-NOAA JOINT ICE CENTER
ICE CHART
OCEANOGRAPHIC CHART - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - 18 MAY 93

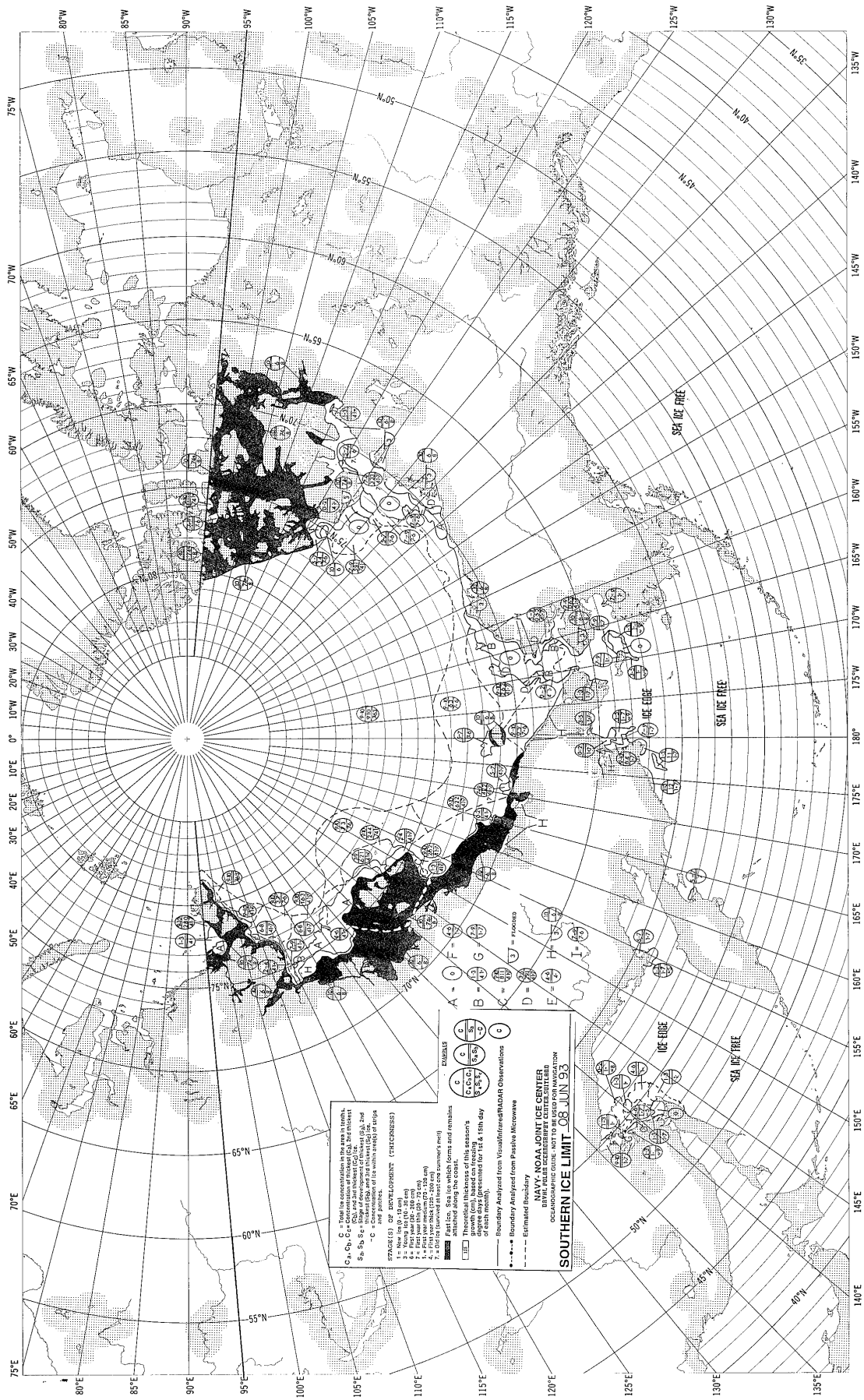


C = Total ice concentration in the area in tenths.
G, C₁, C₂, C₃ = 0, 10, 20, and 30 tenths of ice (0, 10, 20, 30 percent).
S₁, S₂, S₃ = Slopes of the isotherms of thickness (10, 20, 30 m) in tenths of the width (width of the area in tenths) of the trip.
STAGE (S) OF DEVELOPMENT (TEMPERATURES)
 1 = New ice (< 10 cm)
 2 = First year ice (10 - 200 cm)
 3 = First year medium ice (200 - 300 cm)
 4 = First year old ice (> 300 cm)
 5 = Old ice (growth of last two summer's ice)
IS = Ice line which forms and remains
IT = Theoretical thickness of this season's
 growth (only based on freezing
 growth rate, extrapolated for 24 h a 10th day
 of each month).
 --- Boundary Analyzed from Visual and RADAR Observations
 - - - - - Estimated Boundary

NAVY - NOAA JOINT ICE CENTER
 1993
 SOUTHERN ICE LIMIT 25 MAY 93
 GEOGRAPHIC CODE: NOT TO BE USED FOR NAVIGATION

- QUANTITIES**
- A = $\frac{C_1}{C}$
 - B = $\frac{C_2}{C}$
 - C = $\frac{C_3}{C}$
 - D = $\frac{S_1}{C}$
 - E = $\frac{S_2}{C}$
 - F = $\frac{S_3}{C}$
 - G = $\frac{IT}{C}$
 - H = $\frac{IS}{C}$
 - I = $\frac{IT}{S_1}$
 - J = $\frac{IT}{S_2}$
 - K = $\frac{IT}{S_3}$
 - L = $\frac{IS}{S_1}$
 - M = $\frac{IS}{S_2}$
 - N = $\frac{IS}{S_3}$





C = Total ice concentration in the month (with
 C_h, C_l, C_e = concentration of thick ice (CB, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st) and
 S_h, S_l, S_e = Slope of concentration of thick ice (CB, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st) and
 -C = Concentration of ice which is not of thick ice

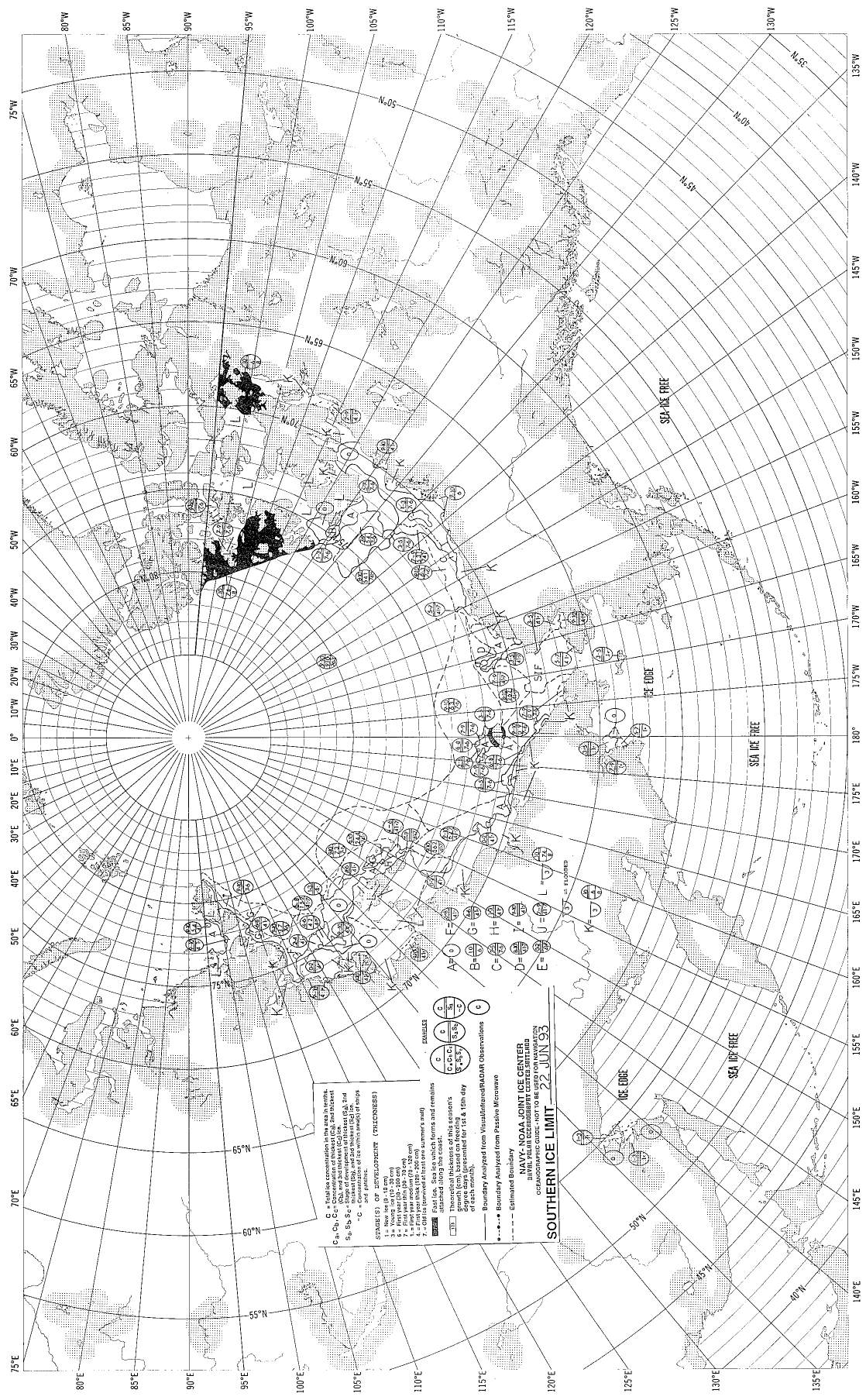
EXAMPLES

C	C _h	C _l	C _e
C	C _h	C _l	C _e
C	C _h	C _l	C _e
C	C _h	C _l	C _e

SPIN/ICE(S) FOR SPIN/ICE(S) (TEMPERATURES)

1 = New ice (0 - 10 cm)
 2 = First year ice (10 - 20 cm)
 3 = First year ice (20 - 30 cm)
 4 = First year ice (30 - 40 cm)
 5 = First year ice (40 - 50 cm)
 6 = First year ice (50 - 60 cm)
 7 = First year ice (60 - 70 cm)
 8 = First year ice (70 - 80 cm)
 9 = First year ice (80 - 90 cm)
 10 = First year ice (90 - 100 cm)
 11 = First year ice (100 - 110 cm)
 12 = First year ice (110 - 120 cm)
 13 = First year ice (120 - 130 cm)
 14 = First year ice (130 - 140 cm)
 15 = First year ice (140 - 150 cm)
 16 = First year ice (150 - 160 cm)
 17 = First year ice (160 - 170 cm)
 18 = First year ice (170 - 180 cm)
 19 = First year ice (180 - 190 cm)
 20 = First year ice (190 - 200 cm)
 21 = First year ice (200 - 210 cm)
 22 = First year ice (210 - 220 cm)
 23 = First year ice (220 - 230 cm)
 24 = First year ice (230 - 240 cm)
 25 = First year ice (240 - 250 cm)
 26 = First year ice (250 - 260 cm)
 27 = First year ice (260 - 270 cm)
 28 = First year ice (270 - 280 cm)
 29 = First year ice (280 - 290 cm)
 30 = First year ice (290 - 300 cm)
 31 = First year ice (300 - 310 cm)
 32 = First year ice (310 - 320 cm)
 33 = First year ice (320 - 330 cm)
 34 = First year ice (330 - 340 cm)
 35 = First year ice (340 - 350 cm)
 36 = First year ice (350 - 360 cm)
 37 = First year ice (360 - 370 cm)
 38 = First year ice (370 - 380 cm)
 39 = First year ice (380 - 390 cm)
 40 = First year ice (390 - 400 cm)
 41 = First year ice (400 - 410 cm)
 42 = First year ice (410 - 420 cm)
 43 = First year ice (420 - 430 cm)
 44 = First year ice (430 - 440 cm)
 45 = First year ice (440 - 450 cm)
 46 = First year ice (450 - 460 cm)
 47 = First year ice (460 - 470 cm)
 48 = First year ice (470 - 480 cm)
 49 = First year ice (480 - 490 cm)
 50 = First year ice (490 - 500 cm)
 51 = First year ice (500 - 510 cm)
 52 = First year ice (510 - 520 cm)
 53 = First year ice (520 - 530 cm)
 54 = First year ice (530 - 540 cm)
 55 = First year ice (540 - 550 cm)
 56 = First year ice (550 - 560 cm)
 57 = First year ice (560 - 570 cm)
 58 = First year ice (570 - 580 cm)
 59 = First year ice (580 - 590 cm)
 60 = First year ice (590 - 600 cm)
 61 = First year ice (600 - 610 cm)
 62 = First year ice (610 - 620 cm)
 63 = First year ice (620 - 630 cm)
 64 = First year ice (630 - 640 cm)
 65 = First year ice (640 - 650 cm)
 66 = First year ice (650 - 660 cm)
 67 = First year ice (660 - 670 cm)
 68 = First year ice (670 - 680 cm)
 69 = First year ice (680 - 690 cm)
 70 = First year ice (690 - 700 cm)
 71 = First year ice (700 - 710 cm)
 72 = First year ice (710 - 720 cm)
 73 = First year ice (720 - 730 cm)
 74 = First year ice (730 - 740 cm)
 75 = First year ice (740 - 750 cm)
 76 = First year ice (750 - 760 cm)
 77 = First year ice (760 - 770 cm)
 78 = First year ice (770 - 780 cm)
 79 = First year ice (780 - 790 cm)
 80 = First year ice (790 - 800 cm)
 81 = First year ice (800 - 810 cm)
 82 = First year ice (810 - 820 cm)
 83 = First year ice (820 - 830 cm)
 84 = First year ice (830 - 840 cm)
 85 = First year ice (840 - 850 cm)
 86 = First year ice (850 - 860 cm)
 87 = First year ice (860 - 870 cm)
 88 = First year ice (870 - 880 cm)
 89 = First year ice (880 - 890 cm)
 90 = First year ice (890 - 900 cm)
 91 = First year ice (900 - 910 cm)
 92 = First year ice (910 - 920 cm)
 93 = First year ice (920 - 930 cm)
 94 = First year ice (930 - 940 cm)
 95 = First year ice (940 - 950 cm)
 96 = First year ice (950 - 960 cm)
 97 = First year ice (960 - 970 cm)
 98 = First year ice (970 - 980 cm)
 99 = First year ice (980 - 990 cm)
 100 = First year ice (990 - 1000 cm)

NAVY - NOAA JOINT ICE CENTER
 ICEBERG POSITION DATA CENTER
 SOUTHERN ICE LIMIT 08 JUN 93



CONCENTRATION OF SEA ICE (PERCENTAGE)
 C = 0-10%
 D = 11-20%
 E = 21-30%
 F = 31-40%
 G = 41-50%
 H = 51-60%
 I = 61-70%
 J = 71-80%
 K = 81-90%
 L = 91-100%

EXAMPLES
 A = 100% (100%)
 B = 100% (100%)
 C = 100% (100%)
 D = 100% (100%)
 E = 100% (100%)

CONCENTRATION OF ICE WITHIN A UNIT OF AREA
 C = 0-10%
 D = 11-20%
 E = 21-30%
 F = 31-40%
 G = 41-50%
 H = 51-60%
 I = 61-70%
 J = 71-80%
 K = 81-90%
 L = 91-100%

EXAMPLES
 A = 100% (100%)
 B = 100% (100%)
 C = 100% (100%)
 D = 100% (100%)
 E = 100% (100%)

CONCENTRATION OF ICE WITHIN A UNIT OF AREA
 C = 0-10%
 D = 11-20%
 E = 21-30%
 F = 31-40%
 G = 41-50%
 H = 51-60%
 I = 61-70%
 J = 71-80%
 K = 81-90%
 L = 91-100%

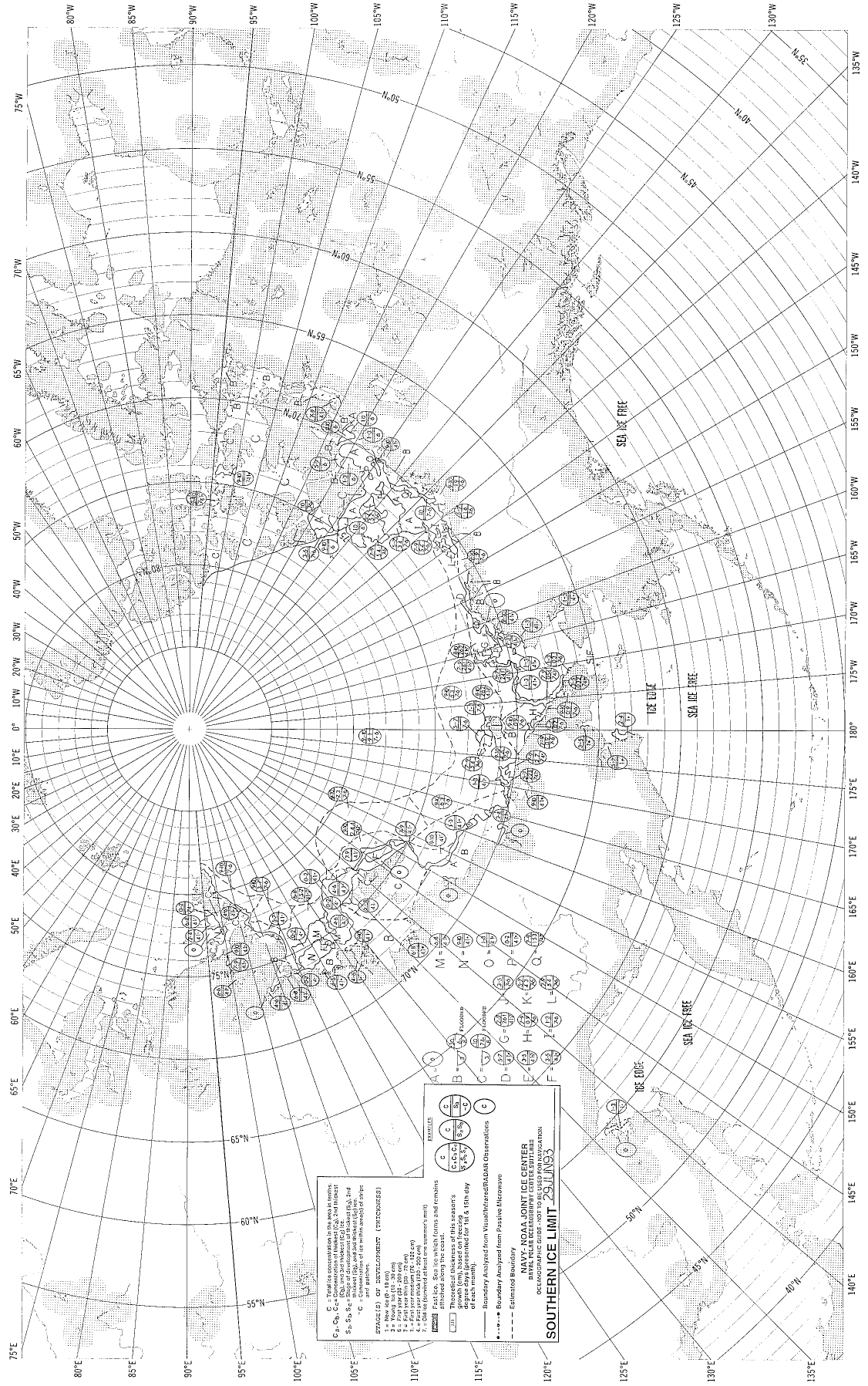
EXAMPLES
 A = 100% (100%)
 B = 100% (100%)
 C = 100% (100%)
 D = 100% (100%)
 E = 100% (100%)

CONCENTRATION OF ICE WITHIN A UNIT OF AREA
 C = 0-10%
 D = 11-20%
 E = 21-30%
 F = 31-40%
 G = 41-50%
 H = 51-60%
 I = 61-70%
 J = 71-80%
 K = 81-90%
 L = 91-100%

EXAMPLES
 A = 100% (100%)
 B = 100% (100%)
 C = 100% (100%)
 D = 100% (100%)
 E = 100% (100%)

NAVY-NOAA JOINT ICE CENTER
 22 JUN 93

SOUTHERN ICE LIMIT



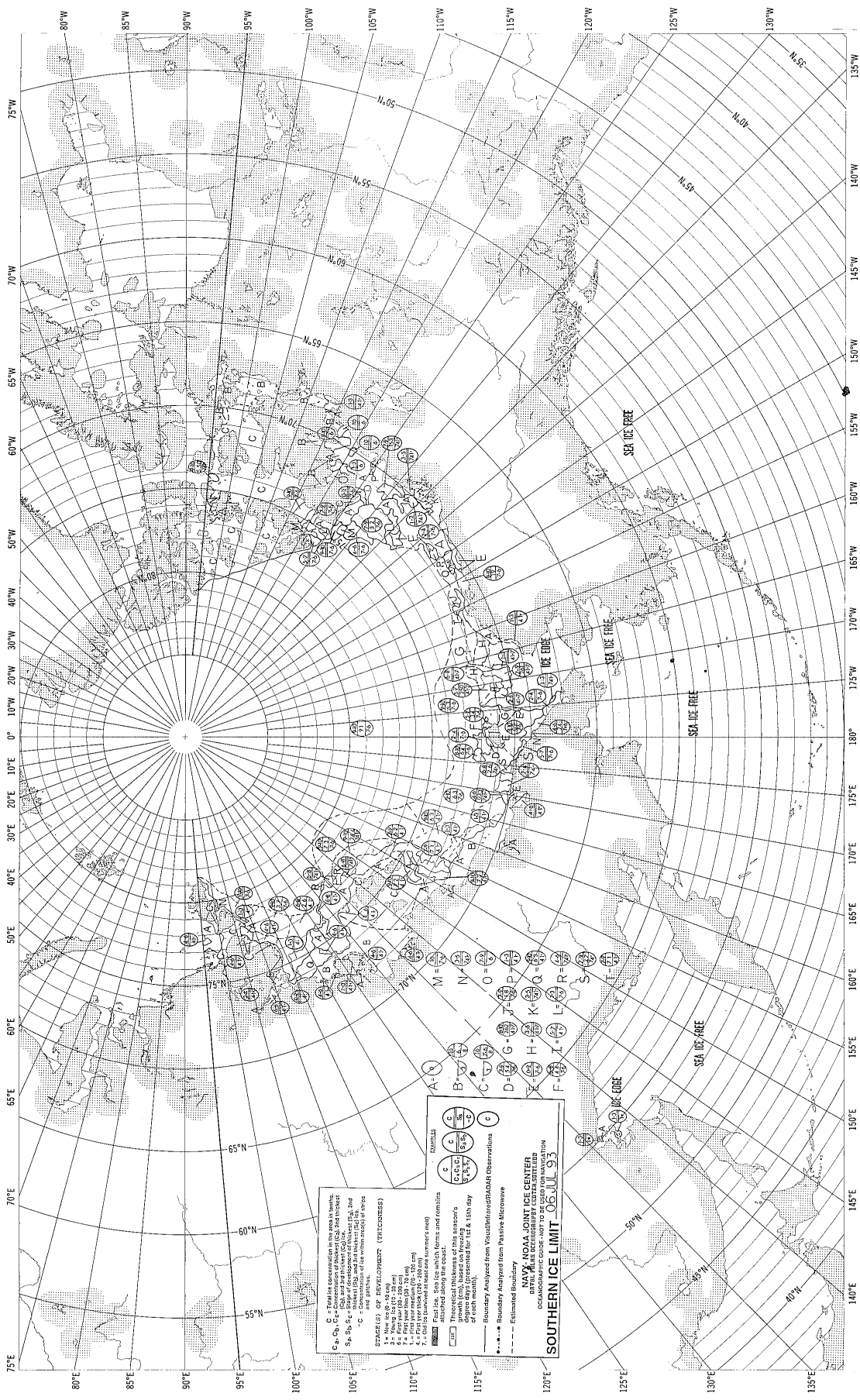
C₁, C₂, C₃ - Consecutive months (C₁, C₂, C₃) in which
 (C₁ or C₂ or C₃) or (C₁ and C₂) or (C₂ and C₃) or (C₁ and C₃)
 S₁, S₂, S₃ - Consecutive months (S₁, S₂, S₃) in which
 (S₁ or S₂ or S₃) or (S₁ and S₂) or (S₂ and S₃) or (S₁ and S₃)
 °C - Centigrade temperature (°C) (Fahrenheit temperature
 and parties.

STAGES OF SUPERSTABILITY (FIRST OBSERVED)
 1 - None for the 30 days
 2 - None for the 60 days
 3 - Part periods for 30 days
 4 - Part periods for 60 days
 5 - Part periods for 90 days
 6 - Part periods for 120 days
 7 - Part periods for 150 days
 8 - Part periods for 180 days
 9 - Part periods for 210 days
 10 - Part periods for 240 days
 11 - Part periods for 270 days
 12 - Part periods for 300 days
 13 - Part periods for 330 days
 14 - Part periods for 360 days

EXAMPLES
 A = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁
 B = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 C = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 D = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 E = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 F = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 G = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 H = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 I = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 J = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 K = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 L = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 M = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 N = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 O = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 P = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 Q = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 R = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 S = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 T = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 U = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 V = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 W = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 X = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 Y = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁
 Z = (C₁)₁ (S₁)₁ (C₂)₁ (S₂)₁ (C₃)₁ (S₃)₁

- - - - - Estimated boundary
 ——— Boundary Analyzed from Visual/Retrospective Observations
 - - - - - Boundary Analyzed from Passive Microsonar
 - - - - - Estimated boundary
 - - - - - Estimated boundary

SOUTHERN ICE LIMIT ZONINGS
 NOAA FRONT ICE CENTER
 1978-1979 ARCTIC OCEANIC DATA REPORT
 ARCTIC OCEANIC DATA REPORT



SOUTHERN ICE LIMIT

NAVY, NOAA, IONIC ICE CENTER
 OBSERVATIONS COURSE-WAY TO DESIGNATION
 DATA, AND ESTIMATED LIMITS

LEGEND

SYMBOLS

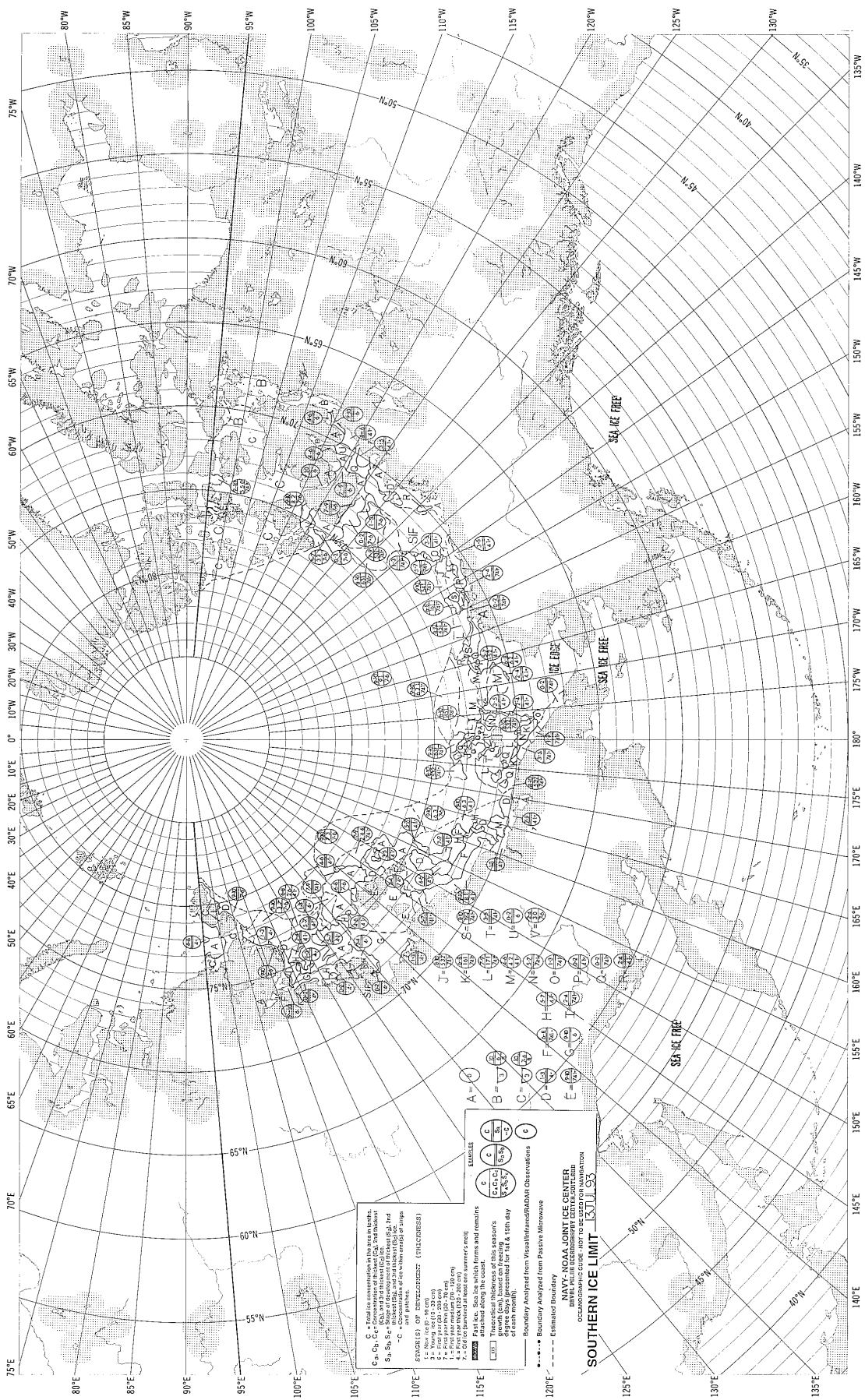
A - New 1000' square
B - New 1000' square
C - New 1000' square
D - New 1000' square
E - New 1000' square
F - New 1000' square
G - New 1000' square
H - New 1000' square
I - New 1000' square
J - New 1000' square
K - New 1000' square
L - New 1000' square
M - New 1000' square
N - New 1000' square
O - New 1000' square
P - New 1000' square
Q - New 1000' square
R - New 1000' square
S - New 1000' square

CONTOUR

1 - New 1000' square
2 - New 1000' square
3 - New 1000' square
4 - New 1000' square
5 - New 1000' square
6 - New 1000' square
7 - New 1000' square
8 - New 1000' square
9 - New 1000' square
0 - New 1000' square

BOUNDARY ANALYSIS

1 - Boundary Analyzed from Visual Observations
2 - Boundary Analyzed from Satellite Observations
3 - Estimated Boundary



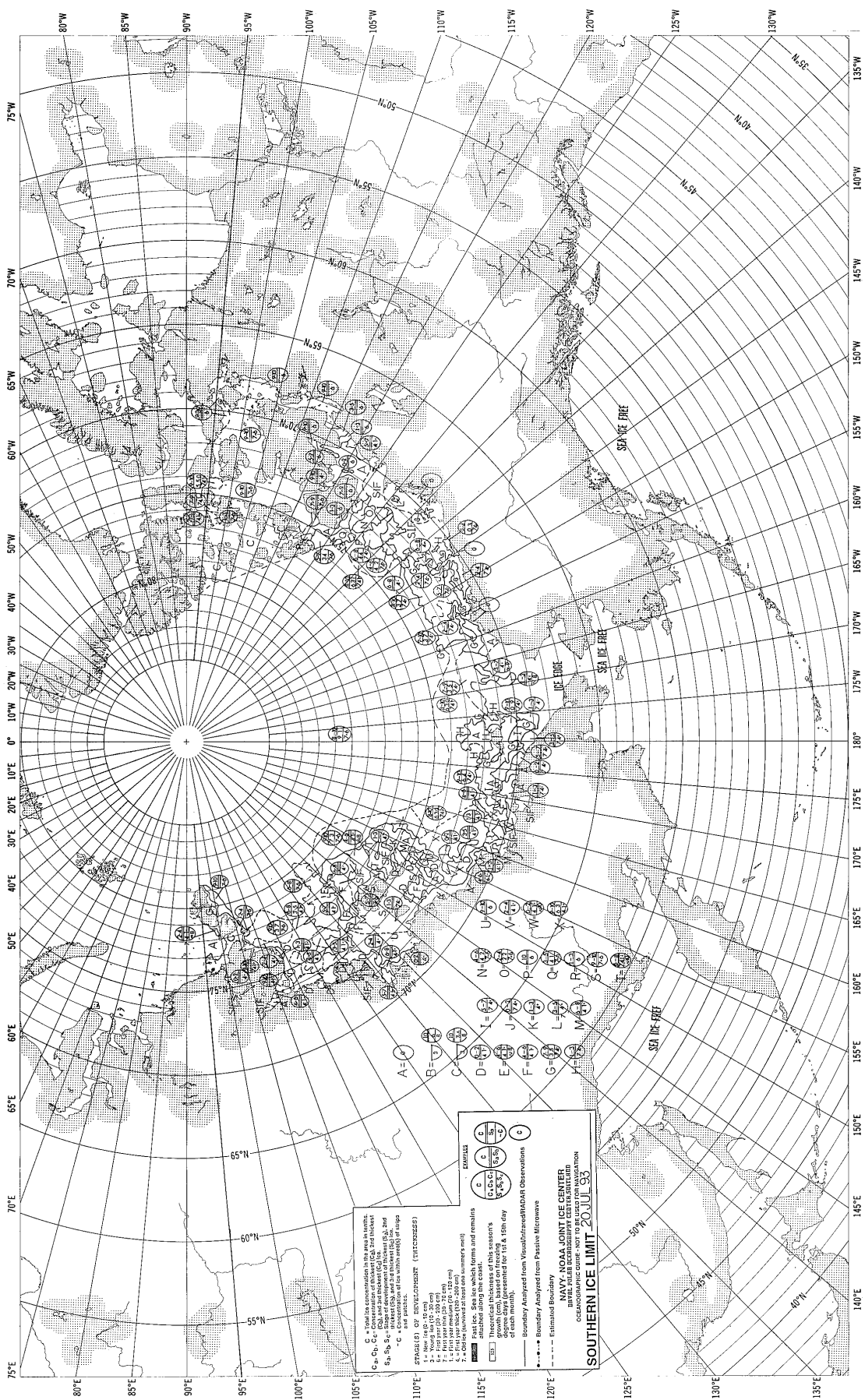
C = Total ice concentration in the area in north.
 C₁, C₂, C₃ = Ice and snow thickness (ICE, medium and thin).
 S₁, S₂, S₃ = Ice and snow thickness (ICE, medium and thin).
 C = Ice concentration in the area in north.
 C₁, C₂, C₃ = Ice and snow thickness (ICE, medium and thin).
 S₁, S₂, S₃ = Ice and snow thickness (ICE, medium and thin).

EXAMPLES OF INTERPRETATION (THICKNESSES)
 1 = None or ice (0-30 cm)
 2 = First year ice (30-100 cm)
 3 = Second year ice (100-150 cm)
 4 = Third year ice (150-200 cm)
 5 = Fourth year ice (200-250 cm)
 6 = Ice of unknown age (250-300 cm)
 7 = Ice of unknown age (300-350 cm)

[Symbol] = Theoretical thickness of this season's ice.
 [Symbol] = Actual thickness of this season's ice.
 [Symbol] = Average days presented for the 15th day of each month.

--- Boundary Analyzed from Visual/Infrared/RADAR Observations
 - - - - - Estimated Boundary

NAVY - NOAA JOINT ICE CENTER
 OCCANOGRAPHIC CODE (NOT TO BE USED FOR NAVIGATION)
SOUTHERN ICE LIMIT 131153

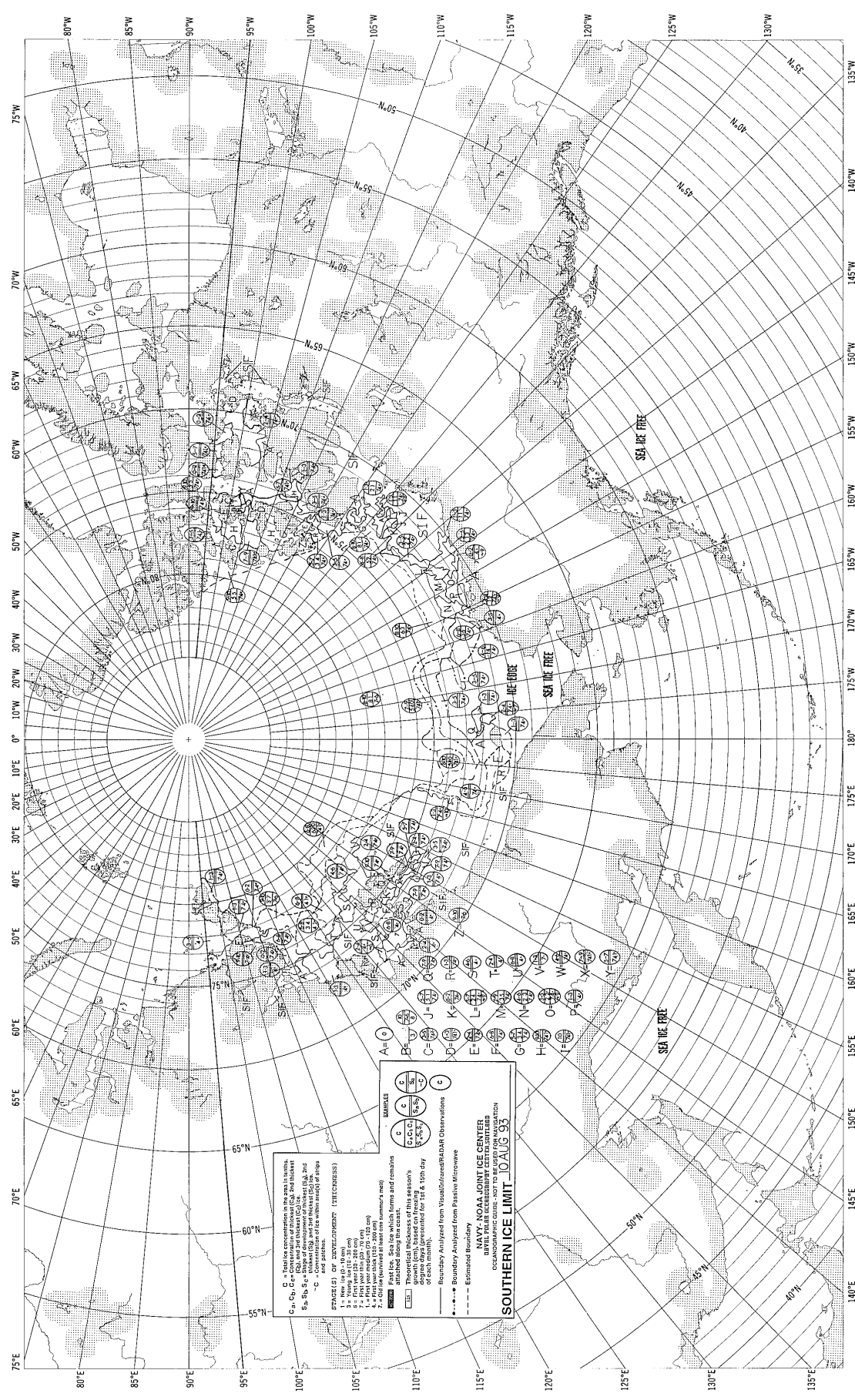


C = Total ice concentration in the area in percent.
 C₁, C₂, C₃ = Percentages of ice in the area in percent.
 S₁, S₂, S₃ = Average ice thickness in feet.
 T₁, T₂, T₃ = Average ice thickness in feet.
 A = Ice thickness in feet.
 B = Ice thickness in feet.
 C = Ice thickness in feet.

EXAMPLES OF OBSERVATIONS (WITH COMMENTS)
 1. Ice thickness 100 ft (30 m)
 2. Ice thickness 100 ft (30 m)
 3. Ice thickness 100 ft (30 m)
 4. Ice thickness 100 ft (30 m)
 5. Ice thickness 100 ft (30 m)
 6. Ice thickness 100 ft (30 m)
 7. Ice thickness 100 ft (30 m)

SOUTHERN ICE LIMIT 20 JUL 59
 OCEANOGRAPHIC CENTER - NOT TO BE REPRODUCED
 WITHOUT PERMISSION

Boundary Analyzed from Visual/Infrared Observations
 Estimated Boundary
 Boundary Analyzed from Passive Microwave



C₁ - C₂ - Ship's position (Latitude, Longitude, Date, Time)
 C₃ - C₄ - Concentration of ice (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%)
 S₁ - S₂ - Ship's speed (knots) and direction (true)
 C - Current (Speed and direction) in knots and degrees
 W - Wind (Speed and direction) in knots and degrees
 P - Pressure (inches of mercury) at sea level
 H - Humidity (percent)
 T - Temperature (degrees Fahrenheit) at surface
 T₁ - 1000 ft (300 m)
 T₂ - 2000 ft (600 m)
 T₃ - 3000 ft (900 m)
 T₄ - 4000 ft (1200 m)
 T₅ - 5000 ft (1500 m)
 T₆ - 6000 ft (1800 m)
 T₇ - 7000 ft (2100 m)
 T₈ - 8000 ft (2400 m)
 T₉ - 9000 ft (2700 m)
 T₁₀ - 10000 ft (3000 m)

SYMBOLS: (1) Ice concentration (2) Ice thickness
 1 - 100% (300 m)
 2 - 100% (600 m)
 3 - 100% (900 m)
 4 - 100% (1200 m)
 5 - 100% (1500 m)
 6 - 100% (1800 m)
 7 - 100% (2100 m)
 8 - 100% (2400 m)
 9 - 100% (2700 m)
 10 - 100% (3000 m)

100% - First ice. Sea ice which forms and remains attached along the coast.
 100% - Second ice. Sea ice which forms and remains detached along the coast.
 100% - Third ice. Sea ice which forms and remains detached along the coast.
 100% - Fourth ice. Sea ice which forms and remains detached along the coast.
 100% - Fifth ice. Sea ice which forms and remains detached along the coast.

100% - Boundary Analyzed from Visual/Infrared Observations
 100% - Estimated Boundary
 100% - NOAA JOINT ICE CENTER
 100% - NAVAL OCEANOGRAPHIC CENTER
 100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS
 100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

SOUTHERN ICE LIMIT 10 AUG 53
 100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

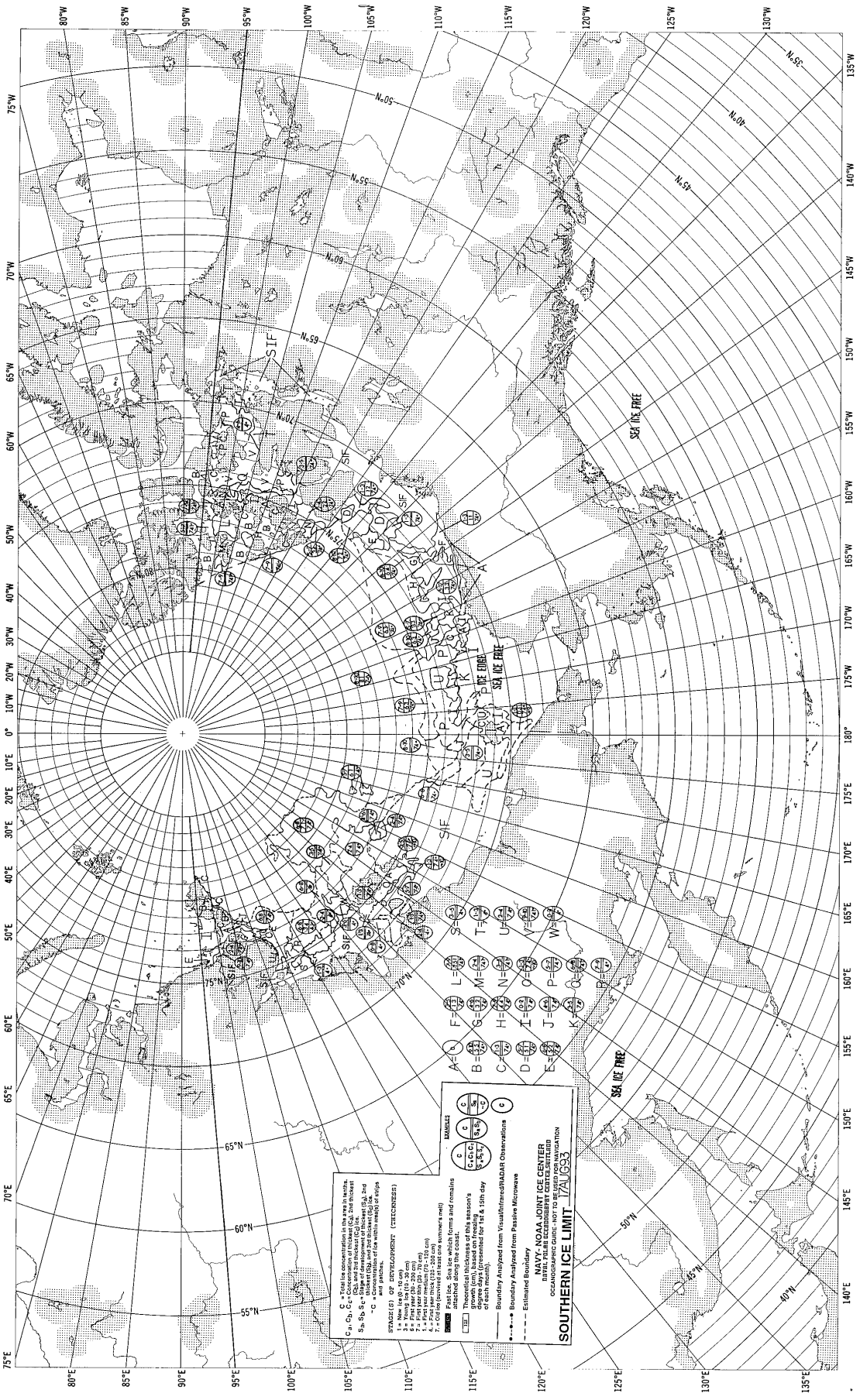
100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS

100% - U.S. NAVY
 100% - U.S. AIR FORCE
 100% - U.S. ARMY
 100% - U.S. MARINE CORPS



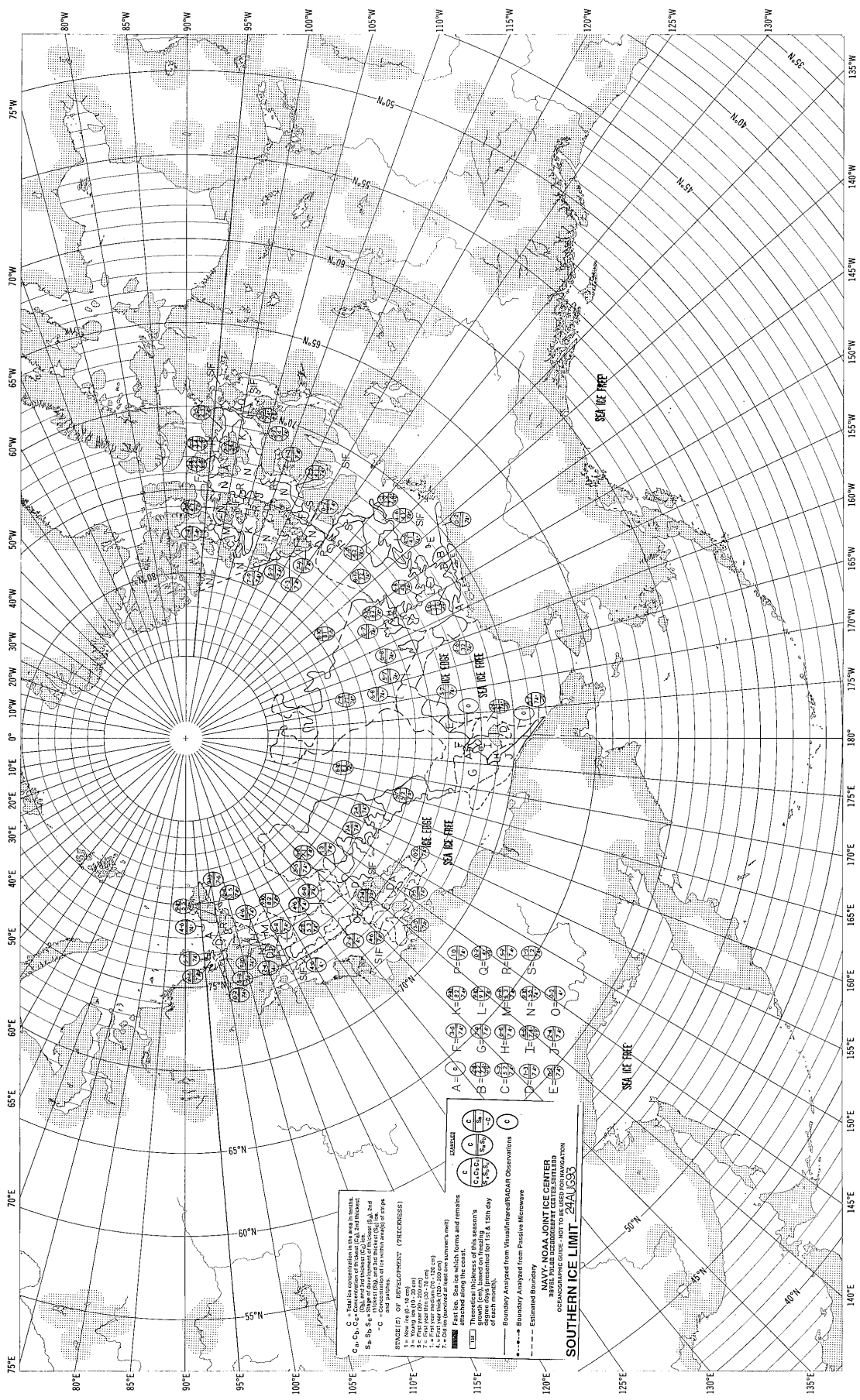
C = Concentration (percent) in the area shown.
 S = Sea ice thickness (meters) in the area shown.
 S₁, S₂, S₃, S₄ = Thickness of ice in meters (10, 20, 30, 40).
 C = Concentration (percent) in the area shown.
 S = Sea ice thickness (meters) in the area shown.
 S₁, S₂, S₃, S₄ = Thickness of ice in meters (10, 20, 30, 40).
 C = Concentration (percent) in the area shown.

SYMBOLS OF OBSERVATIONS (TECHNIQUES)
 1 = New (1940-1950)
 2 = First year (1951-1959)
 3 = Second year (1960-1969)
 4 = Third year (1970-1979)
 5 = Fourth year (1980-1989)
 6 = Fifth year (1990-1999)
 7 = Sixth year (2000-2009)
 8 = Seventh year (2010-2019)
 9 = Eighth year (2020-2029)

SYMBOLS OF ESTIMATED BOUNDARIES
 - - - - - Estimated Boundary
 - - - - - Boundary Analyzed from Passive Microwave
 - - - - - Boundary Analyzed from Visual/Aircraft Observations

SEA ICE FREE
 NAVY, NOAA, JOINT ICE CENTER
 DATA, FIELD DEPARTMENT CENTER/LEAD
 OBSERVATION CENTER - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - 17 AUGUST

SYMBOLS
 A = 100%
 B = 90%
 C = 80%
 D = 70%
 E = 60%
 F = 50%
 G = 40%
 H = 30%
 I = 20%
 J = 10%
 K = 5%
 L = 0%
 M = 100%
 N = 90%
 O = 80%
 P = 70%
 Q = 60%
 R = 50%
 S = 40%
 T = 30%
 U = 20%
 V = 10%
 W = 5%



C - Total ice concentration in the area in tenths.
 G, H, C, S, E, O, S, and P are in tenths. (G, H, and S are in tenths of the area of the ice cover; O, S, and P are in tenths of the area of the ice cover.)
 S, H, S, E, O, S, and P are in tenths of the area of the ice cover.
 C - Concentration of ice with angle of slope.

STAGES OF DEVELOPMENT (DEGREES)

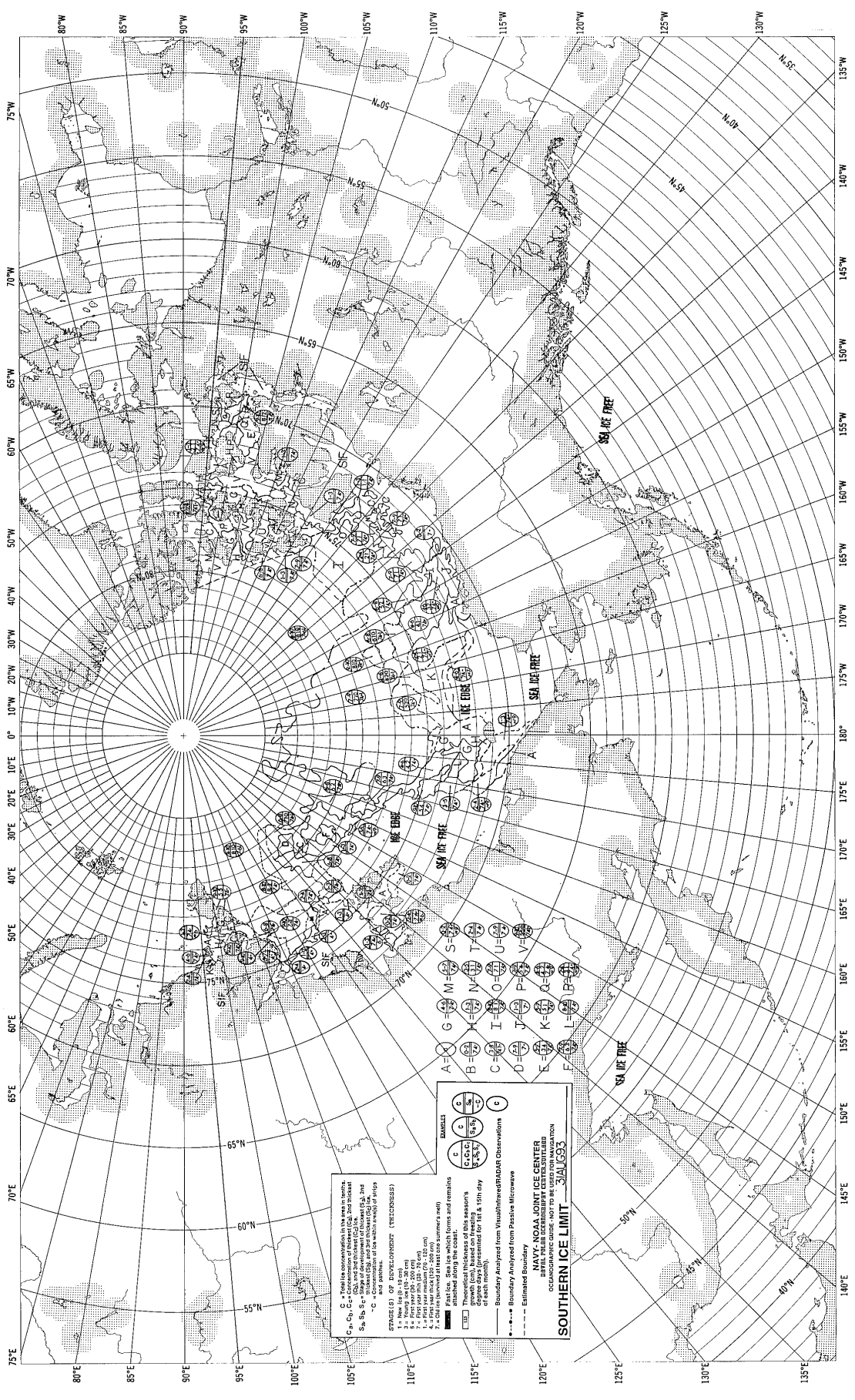
1. New ice (0-10 cm)
2. First year ice (10-30 cm)
3. First year ice (30-50 cm)
4. First year ice (50-100 cm)
5. Old ice (100-150 cm)
6. Old ice (150-200 cm)
7. Old ice (200-300 cm)
8. Old ice (300-400 cm)
9. Old ice (400-500 cm)
10. Old ice (500-600 cm)
11. Old ice (600-700 cm)
12. Old ice (700-800 cm)
13. Old ice (800-900 cm)
14. Old ice (900-1000 cm)

Fast ice: Sea ice which forms and remains in place.
 Theoretical thickness of this season's growth (cm), based on freezing point depression for 10 & 10th day of each month.

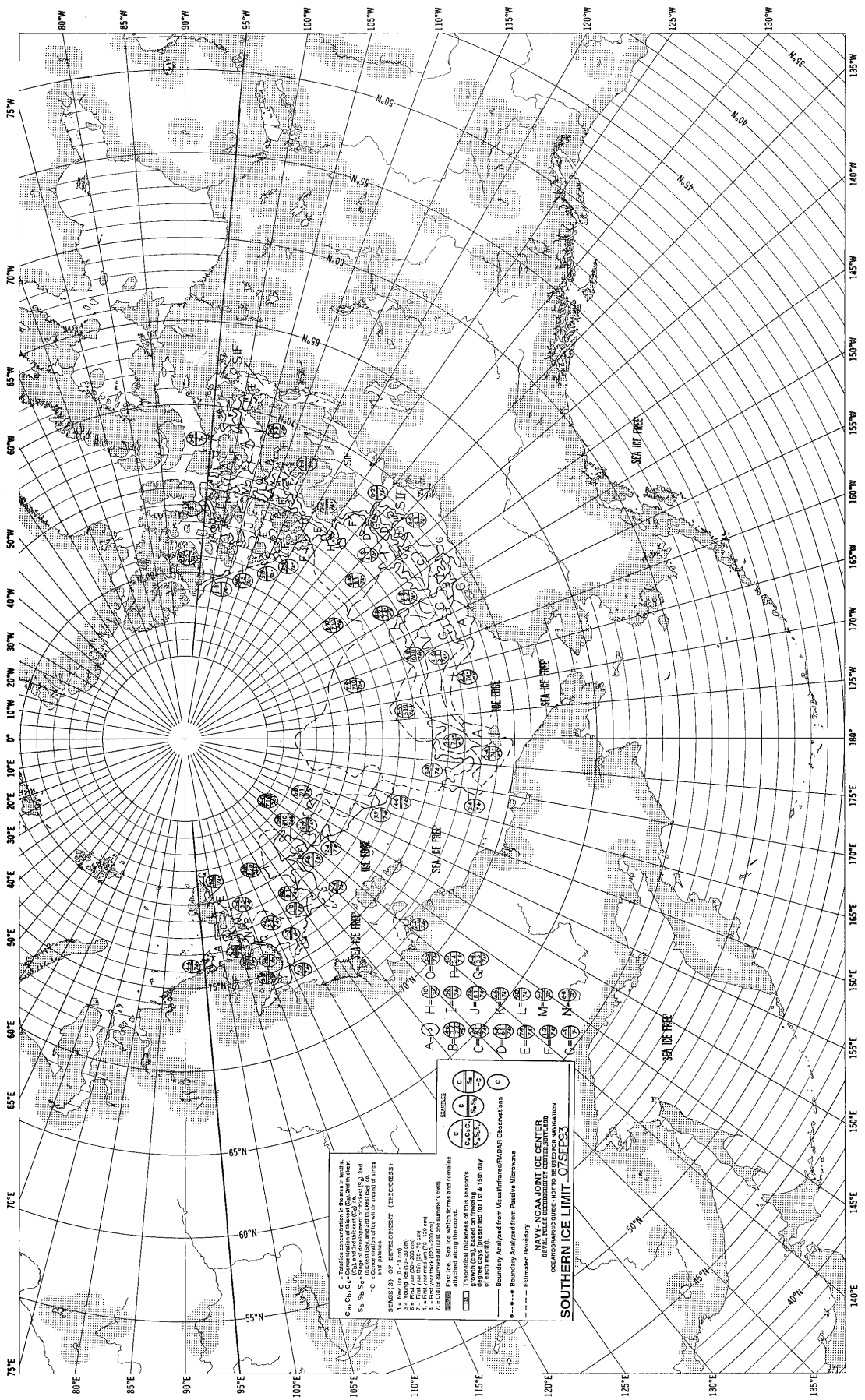
Boundary Analyzed from Visual/Radar Observations
 Boundary Analyzed from Passive Microwave
 Estimated Boundary

NAVY, NOAA JOINT ICE CENTER
 1000 EAST 17TH AVENUE
 DENVER, COLORADO 80202
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR
 SOUTHERN ICE LIMIT 24AUG93

A = $\frac{1}{2}$	F = $\frac{1}{2}$	K = $\frac{1}{2}$	P = $\frac{1}{2}$
B = $\frac{1}{2}$	G = $\frac{1}{2}$	L = $\frac{1}{2}$	Q = $\frac{1}{2}$
C = $\frac{1}{2}$	H = $\frac{1}{2}$	M = $\frac{1}{2}$	R = $\frac{1}{2}$
D = $\frac{1}{2}$	I = $\frac{1}{2}$	N = $\frac{1}{2}$	S = $\frac{1}{2}$
E = $\frac{1}{2}$	J = $\frac{1}{2}$	O = $\frac{1}{2}$	T = $\frac{1}{2}$



SYMBOLS
 C = Total ice concentration in the area in tenths.
 G = G.I. = Extent of permanent ice (G.I. 200 thickens).
 S₁, S₂, S₃ = Stage of development of thickness (G.I. and
 S.I. = Concentration of ice within a stage of development.
 C = Concentration of ice within a stage of development.
STAGES (S) OF DEVELOPMENT (RECORDS)
 1 = New ice (0 - 10 cm)
 2 = First year medium (10 - 20 cm)
 3 = First year old (20 - 40 cm)
 4 = First year old (40 - 60 cm)
 5 = First year old (60 - 80 cm)
 6 = First year old (80 - 100 cm)
 7 = First year old (100 - 120 cm)
ICE TYPES - Size in which forms and remains
 A = Ice
 B = Ice
 C = Ice
 D = Ice
 E = Ice
 F = Ice
 G = Ice
 H = Ice
 I = Ice
 J = Ice
 K = Ice
 L = Ice
 M = Ice
 N = Ice
 O = Ice
 P = Ice
 Q = Ice
 R = Ice
 S = Ice
 T = Ice
 U = Ice
 V = Ice
 W = Ice
 X = Ice
 Y = Ice
 Z = Ice
THEORETICAL THICKNESS OF THIS SEASON'S GROWTH - based on freezing growth from 1000 hours of daylight per day of each month.
 - - - - - Boundary Analyzed from Visual/Radar Observations
 - - - - - Estimated Boundary
NAVY - NOAA JOINT ICE CENTER
 OCEANOGRAPHIC DIVISION, NOT IN A CLOSED OR UNCLASSIFIED
SOUTHERN ICE LIMIT - 31AL033



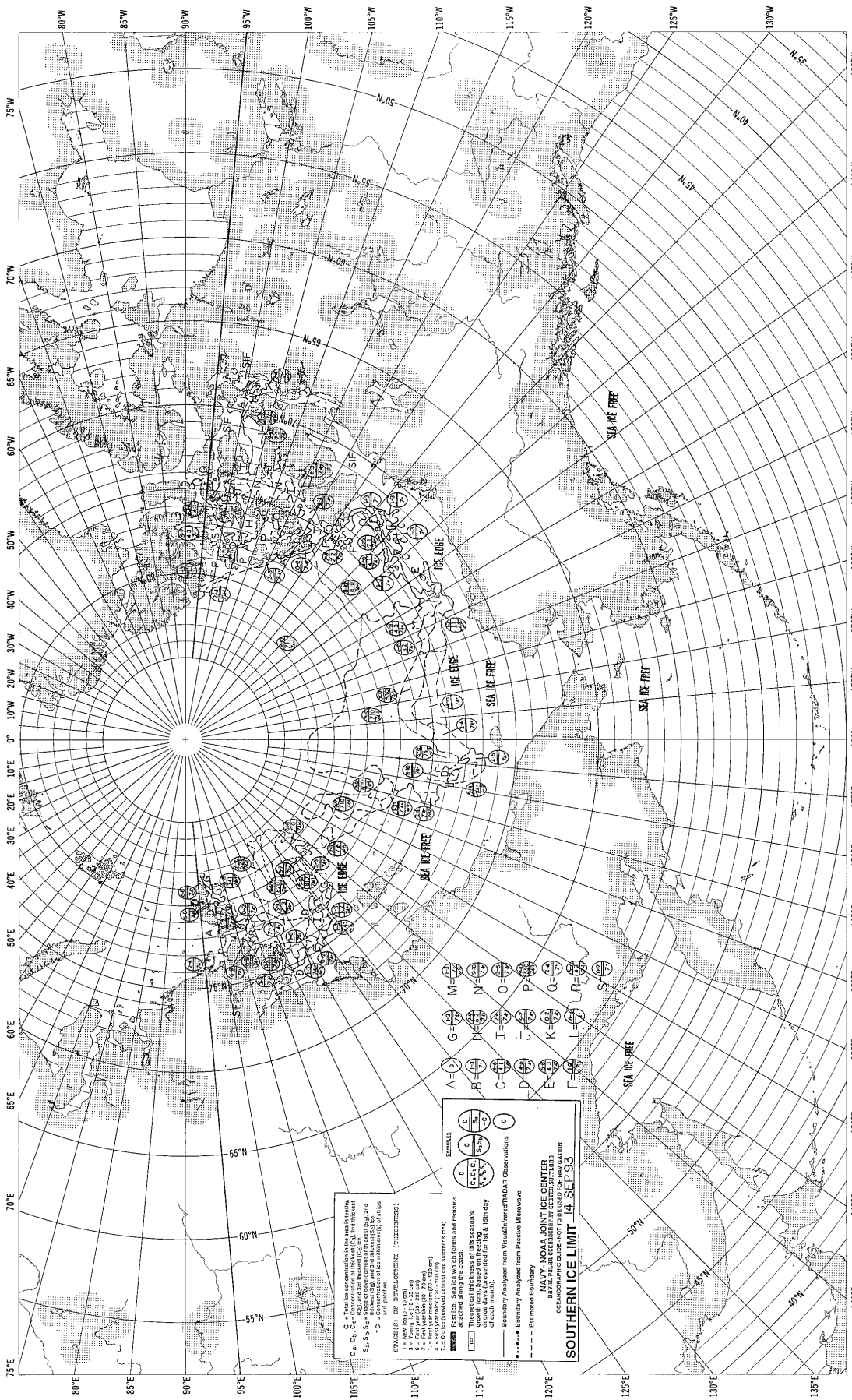
C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀ = Percentages of ice in each thickness category.
 S₁, S₂, S₃, S₄, S₅, S₆, S₇, S₈, S₉, S₁₀ = Percentages of ice in each thickness category.
 C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀ = Percentages of ice in each thickness category.
 S₁, S₂, S₃, S₄, S₅, S₆, S₇, S₈, S₉, S₁₀ = Percentages of ice in each thickness category.

STAGES OF DEVELOPMENT (THICKNESS)
 1 = New ice (0-10 cm)
 2 = Young ice (10-20 cm)
 3 = First year ice (20-70 cm)
 4 = First year ice (70-100 cm)
 5 = First year ice (100-150 cm)
 6 = First year ice (150-200 cm)
 7 = First year ice (200-250 cm)
 8 = First year ice (250-300 cm)
 9 = First year ice (300-350 cm)
 10 = First year ice (350-400 cm)

SYMBOLS
 A = H
 B = I
 C = J
 D = K
 E = L
 F = M
 G = N
 H = O
 I = P
 J = Q
 K = R
 L = S

[Symbol] = Theoretical thickness of this season's ice
 [Symbol] = Actual thickness of this season's ice
 [Symbol] = Approximate date (month and day) of ice onset
 [Symbol] = Approximate date (month and day) of ice retreat
 [Symbol] = Boundary Analyzed from Visual/Infrared Observations
 [Symbol] = Estimated Boundary

SOUTHERN ICE LIMIT - 07SEP83
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION



C = Total ice concentration in the area in tenths.
 G, C, Ch, S = 0.05, 0.10, and 0.15 respectively (0.5, 1.0, and 1.5 percent).
 Sub. S, S₁, S₂, S₃ = 1, 2, 3, and 4 respectively (1, 2, 3, and 4 percent).
 C₁, C₂, C₃ = 1, 2, and 3 respectively (1, 2, and 3 percent).
 C₄, C₅, C₆ = 4, 5, and 6 respectively (4, 5, and 6 percent).
 C₇, C₈, C₉ = 7, 8, and 9 respectively (7, 8, and 9 percent).
 C₁₀, C₁₁, C₁₂ = 10, 11, and 12 respectively (10, 11, and 12 percent).
 C₁₃, C₁₄, C₁₅ = 13, 14, and 15 respectively (13, 14, and 15 percent).
 C₁₆, C₁₇, C₁₈ = 16, 17, and 18 respectively (16, 17, and 18 percent).
 C₁₉, C₂₀ = 19 and 20 respectively (19 and 20 percent).
 C₂₁, C₂₂ = 21 and 22 respectively (21 and 22 percent).
 C₂₃, C₂₄ = 23 and 24 respectively (23 and 24 percent).
 C₂₅, C₂₆ = 25 and 26 respectively (25 and 26 percent).
 C₂₇, C₂₈ = 27 and 28 respectively (27 and 28 percent).
 C₂₉, C₃₀ = 29 and 30 respectively (29 and 30 percent).
 C₃₁, C₃₂ = 31 and 32 respectively (31 and 32 percent).
 C₃₃, C₃₄ = 33 and 34 respectively (33 and 34 percent).
 C₃₅, C₃₆ = 35 and 36 respectively (35 and 36 percent).
 C₃₇, C₃₈ = 37 and 38 respectively (37 and 38 percent).
 C₃₉, C₄₀ = 39 and 40 respectively (39 and 40 percent).
 C₄₁, C₄₂ = 41 and 42 respectively (41 and 42 percent).
 C₄₃, C₄₄ = 43 and 44 respectively (43 and 44 percent).
 C₄₅, C₄₆ = 45 and 46 respectively (45 and 46 percent).
 C₄₇, C₄₈ = 47 and 48 respectively (47 and 48 percent).
 C₄₉, C₅₀ = 49 and 50 respectively (49 and 50 percent).
 C₅₁, C₅₂ = 51 and 52 respectively (51 and 52 percent).
 C₅₃, C₅₄ = 53 and 54 respectively (53 and 54 percent).
 C₅₅, C₅₆ = 55 and 56 respectively (55 and 56 percent).
 C₅₇, C₅₈ = 57 and 58 respectively (57 and 58 percent).
 C₅₉, C₆₀ = 59 and 60 respectively (59 and 60 percent).
 C₆₁, C₆₂ = 61 and 62 respectively (61 and 62 percent).
 C₆₃, C₆₄ = 63 and 64 respectively (63 and 64 percent).
 C₆₅, C₆₆ = 65 and 66 respectively (65 and 66 percent).
 C₆₇, C₆₈ = 67 and 68 respectively (67 and 68 percent).
 C₆₉, C₇₀ = 69 and 70 respectively (69 and 70 percent).
 C₇₁, C₇₂ = 71 and 72 respectively (71 and 72 percent).
 C₇₃, C₇₄ = 73 and 74 respectively (73 and 74 percent).
 C₇₅, C₇₆ = 75 and 76 respectively (75 and 76 percent).
 C₇₇, C₇₈ = 77 and 78 respectively (77 and 78 percent).
 C₇₉, C₈₀ = 79 and 80 respectively (79 and 80 percent).
 C₈₁, C₈₂ = 81 and 82 respectively (81 and 82 percent).
 C₈₃, C₈₄ = 83 and 84 respectively (83 and 84 percent).
 C₈₅, C₈₆ = 85 and 86 respectively (85 and 86 percent).
 C₈₇, C₈₈ = 87 and 88 respectively (87 and 88 percent).
 C₈₉, C₉₀ = 89 and 90 respectively (89 and 90 percent).
 C₉₁, C₉₂ = 91 and 92 respectively (91 and 92 percent).
 C₉₃, C₉₄ = 93 and 94 respectively (93 and 94 percent).
 C₉₅, C₉₆ = 95 and 96 respectively (95 and 96 percent).
 C₉₇, C₉₈ = 97 and 98 respectively (97 and 98 percent).
 C₉₉, C₁₀₀ = 99 and 100 respectively (99 and 100 percent).

STAGES OF DEVELOPMENT (ICEBERGS):
 1 = New ice (10-30 cm)
 2 = First year ice (30-70 cm)
 3 = First year ice (70-100 cm)
 4 = First year ice (100-150 cm)
 5 = First year ice (150-200 cm)
 6 = First year ice (200-300 cm)
 7 = First year ice (300-400 cm)
 8 = First year ice (400-500 cm)
 9 = First year ice (500-600 cm)
 10 = First year ice (600-700 cm)
 11 = First year ice (700-800 cm)
 12 = First year ice (800-900 cm)
 13 = First year ice (900-1000 cm)
 14 = First year ice (1000-1200 cm)
 15 = First year ice (1200-1500 cm)
 16 = First year ice (1500-2000 cm)
 17 = First year ice (2000-3000 cm)
 18 = First year ice (3000-4000 cm)
 19 = First year ice (4000-5000 cm)
 20 = First year ice (5000-6000 cm)
 21 = First year ice (6000-7000 cm)
 22 = First year ice (7000-8000 cm)
 23 = First year ice (8000-9000 cm)
 24 = First year ice (9000-10000 cm)
 25 = First year ice (10000-12000 cm)
 26 = First year ice (12000-15000 cm)
 27 = First year ice (15000-20000 cm)
 28 = First year ice (20000-30000 cm)
 29 = First year ice (30000-40000 cm)
 30 = First year ice (40000-50000 cm)
 31 = First year ice (50000-60000 cm)
 32 = First year ice (60000-70000 cm)
 33 = First year ice (70000-80000 cm)
 34 = First year ice (80000-90000 cm)
 35 = First year ice (90000-100000 cm)
 36 = First year ice (100000-120000 cm)
 37 = First year ice (120000-150000 cm)
 38 = First year ice (150000-200000 cm)
 39 = First year ice (200000-300000 cm)
 40 = First year ice (300000-400000 cm)
 41 = First year ice (400000-500000 cm)
 42 = First year ice (500000-600000 cm)
 43 = First year ice (600000-700000 cm)
 44 = First year ice (700000-800000 cm)
 45 = First year ice (800000-900000 cm)
 46 = First year ice (900000-1000000 cm)
 47 = First year ice (1000000-1200000 cm)
 48 = First year ice (1200000-1500000 cm)
 49 = First year ice (1500000-2000000 cm)
 50 = First year ice (2000000-3000000 cm)
 51 = First year ice (3000000-4000000 cm)
 52 = First year ice (4000000-5000000 cm)
 53 = First year ice (5000000-6000000 cm)
 54 = First year ice (6000000-7000000 cm)
 55 = First year ice (7000000-8000000 cm)
 56 = First year ice (8000000-9000000 cm)
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 R = 17
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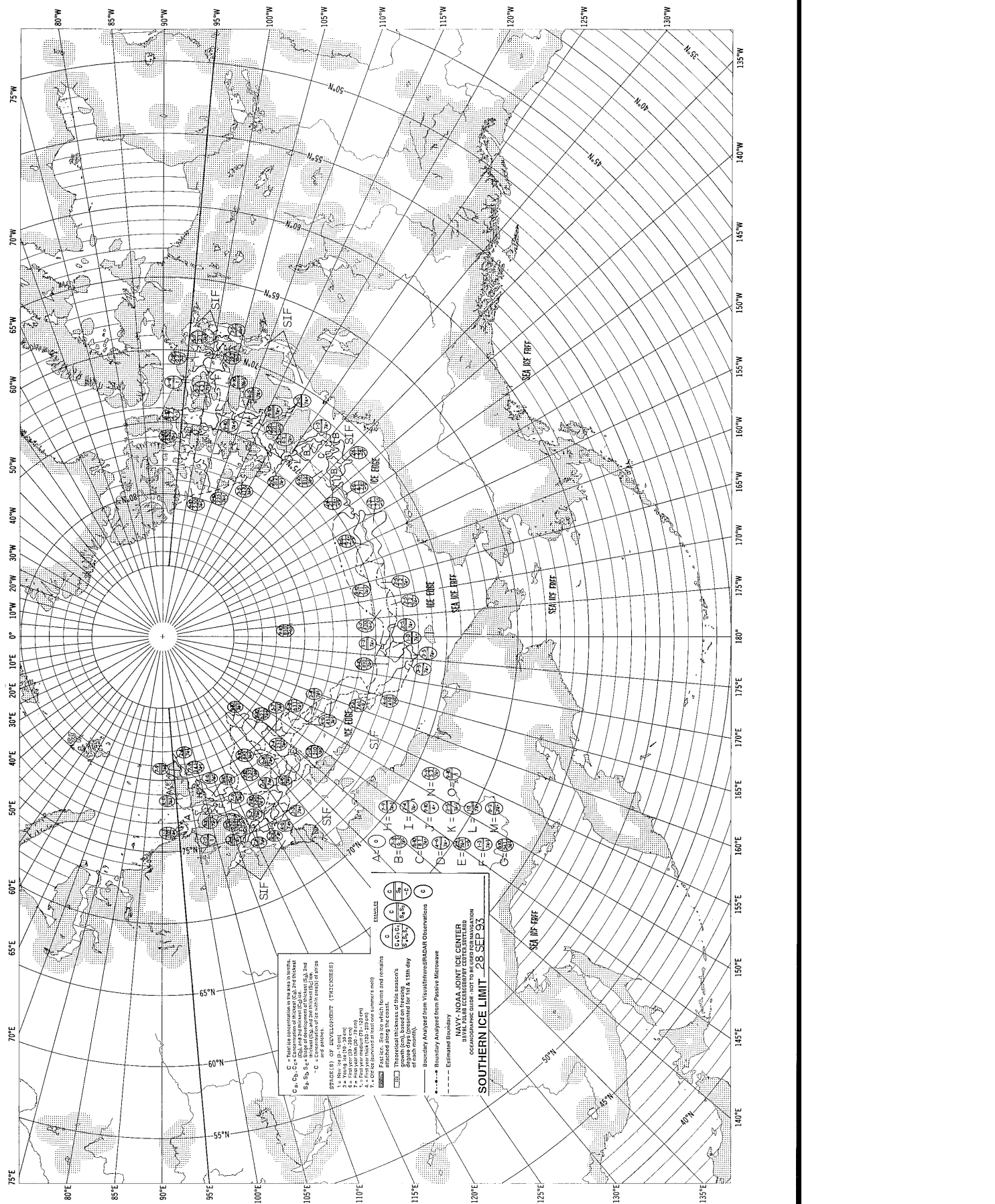
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SOUTHERN ICE LIMIT 14 SEP 93
 NAVY AND NOAA JOINT USE CENTER
 ARMY NAVAL OBSERVATORY
 WASHINGTON, D.C. 20315-5061
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

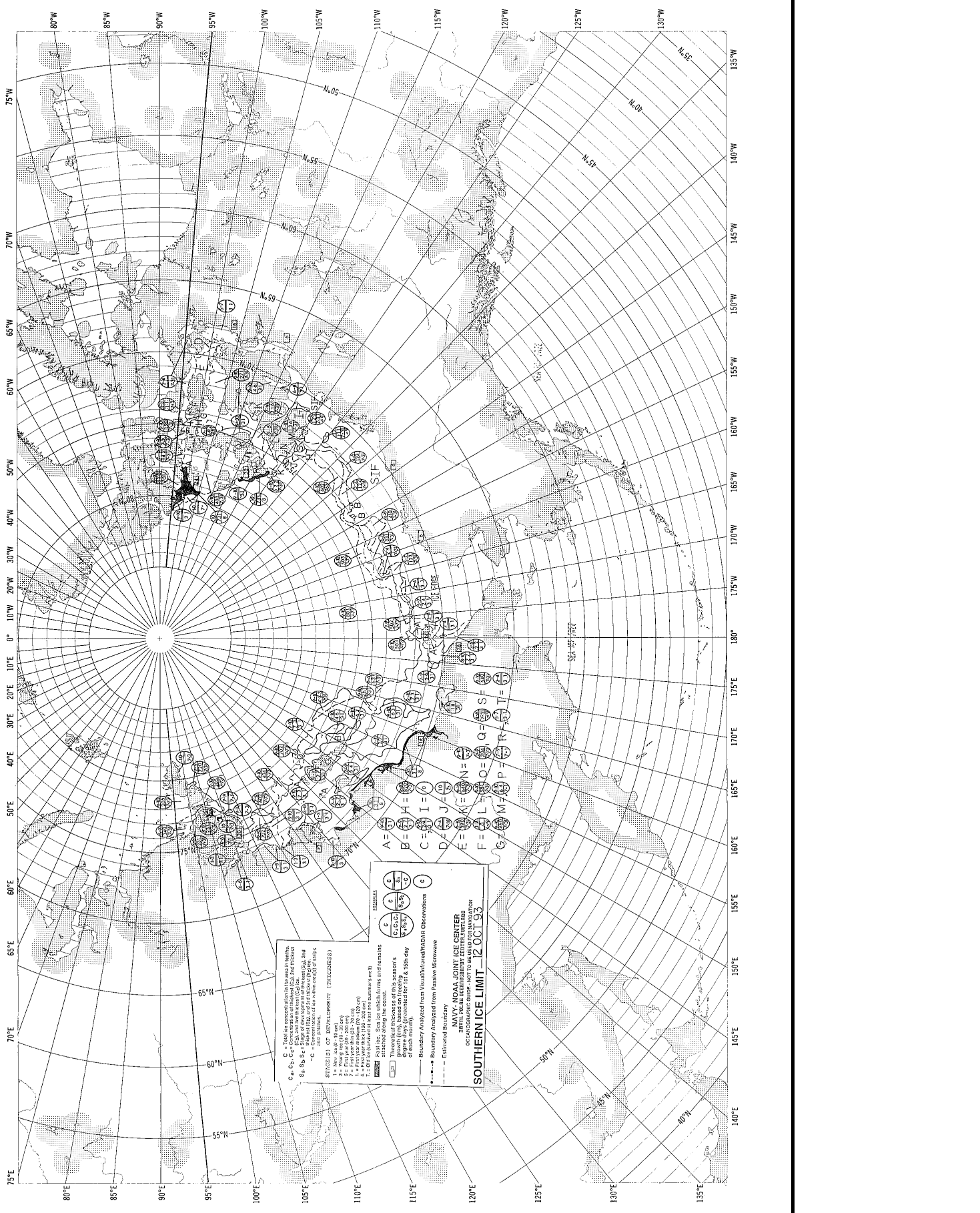


C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration of ice in the 1st, 2nd, and 3rd stages of development.
 S₁, S₂, S₃ = Stages of ice development (S₁ and S₂ are the first two stages of ice development, S₃ is the third stage of ice development).
 S₁, S₂, S₃ = Stages of ice development (S₁ and S₂ are the first two stages of ice development, S₃ is the third stage of ice development).
 S₁, S₂, S₃ = Stages of ice development (S₁ and S₂ are the first two stages of ice development, S₃ is the third stage of ice development).

STAGES OF DEVELOPMENT (TEMPERATURES)
 1 = 1st stage (10°C to 15°C)
 2 = 2nd stage (5°C to 10°C)
 3 = 3rd stage (0°C to 5°C)
 4 = 4th stage (below 0°C)

EXAMPLES
 A = 0
 B = 10
 C = 20
 D = 30
 E = 40
 F = 50
 G = 60

Boundary Analyzed from Visible/Infrared/RADAR Observations
 NAVY-NOAA JOINT ICE CENTER
 OCEANOGRAPHIC SOURCE - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT - 28 SEP 93

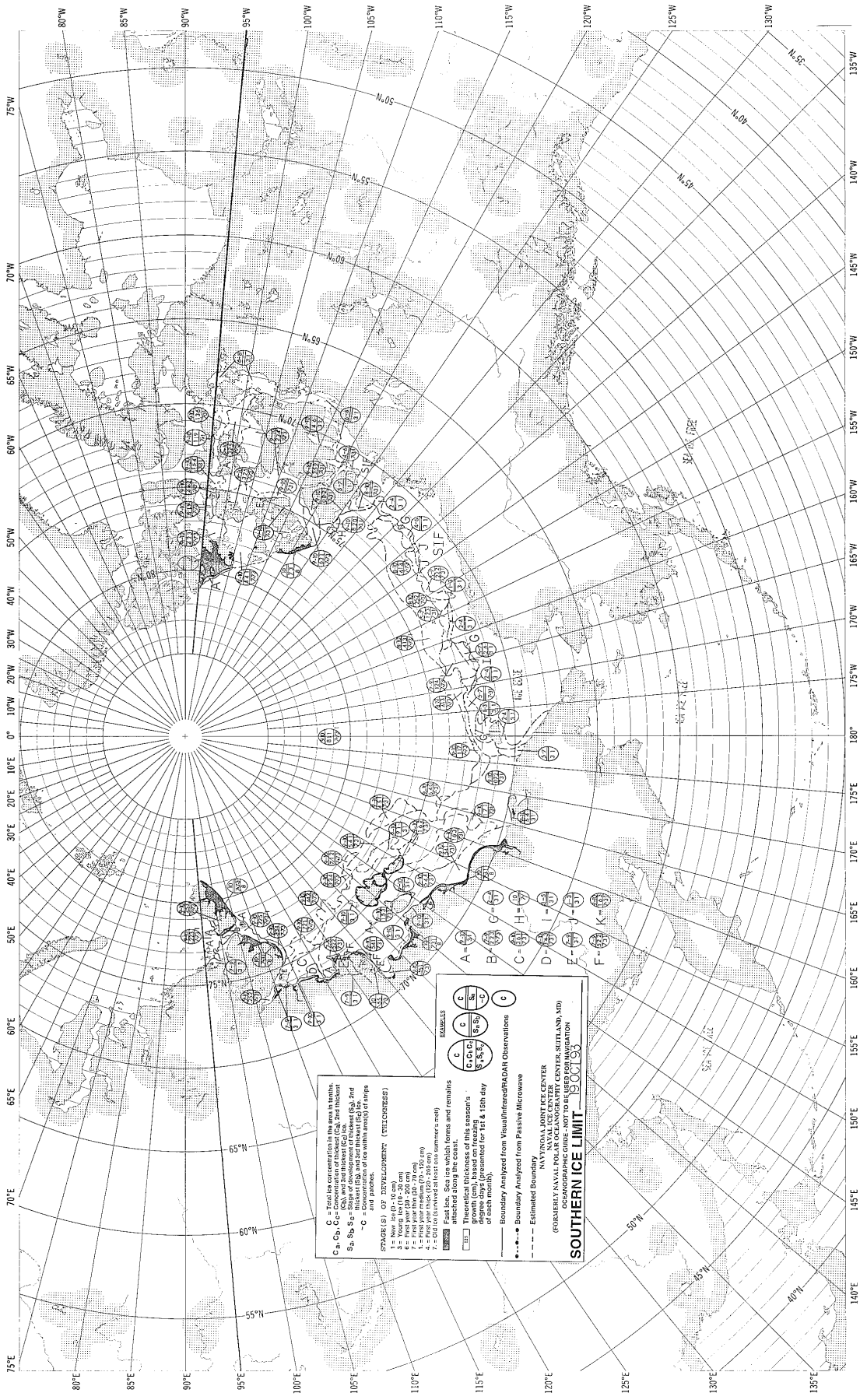


C = Total ice concentration for each in north
 C_h, C_l = 10% concentration of ice (10% of thickness)
 S_h, S_l = 5% of concentration of ice (5% of thickness)
 C = Superimposed for within each of rings
 STATIONS (SIP, BGC, etc.) (271212Z0993)
 1 = New (400 - 100 cm)
 2 = First year (100 - 200 cm)
 3 = Second year (200 - 300 cm)
 4 = Third year (300 - 400 cm)
 5 = Old ice (400 - 500 cm)
 6 = Old ice (500 - 600 cm)
 7 = Old ice (600 - 700 cm)
 8 = Old ice (700 - 800 cm)
 9 = Old ice (800 - 900 cm)
 0 = Old ice (900 - 1000 cm)

ICE THICKNESS
 C_h, C_l, S_h, S_l
 C = 10% of concentration of ice (10% of thickness)
 S = 5% of concentration of ice (5% of thickness)
 C = Superimposed for within each of rings
 BOUNDARY ANALYZED FROM PASSIVE MICROWAVE
 - - - - - Estimated Boundary

NAVY-NOAA JOINT ICE CENTER
 OPERATIONAL OPERATIONAL CENTER CENTER
 SOUTHERN ICE LIMIT - 12 OCT 93

A = 100
 B = 100
 C = 100
 D = 100
 E = 100
 F = 100
 G = 100
 H = 100
 I = 100
 J = 100
 K = 100
 L = 100
 M = 100
 N = 100
 O = 100
 P = 100
 Q = 100
 R = 100
 S = 100
 T = 100
 U = 100
 V = 100
 W = 100
 X = 100
 Y = 100
 Z = 100



C = Total ice concentration in the area in tenths (0 to 100) (C1-C9 and 3 thickness (C1-C3) ice, 2nd thickness (S1) and 3rd thickness (S2) ice, 2nd and 3rd thickness of ice within analysis of maps

STAGES OF DEVELOPMENT (TELEGRAPHS)

1 = New ice (0 - 10 cm)
 2 = First year ice (10 - 200 cm)
 3 = First year ice (200 - 500 cm)
 4 = First year ice (500 - 1000 cm)
 5 = Old ice (1000 - 2000 cm)
 6 = Old ice (2000 - 3000 cm)
 7 = Old ice (3000 - 4000 cm)
 8 = Old ice (4000 - 5000 cm)

SEAS: Sea ice which forms and remains attached along the coast.

□ Theoretical thickness of this season's degree days (presented for 1st & 15th day of each month).

--- Boundary Analyzed from Visual/Infrared/RADAR Observations

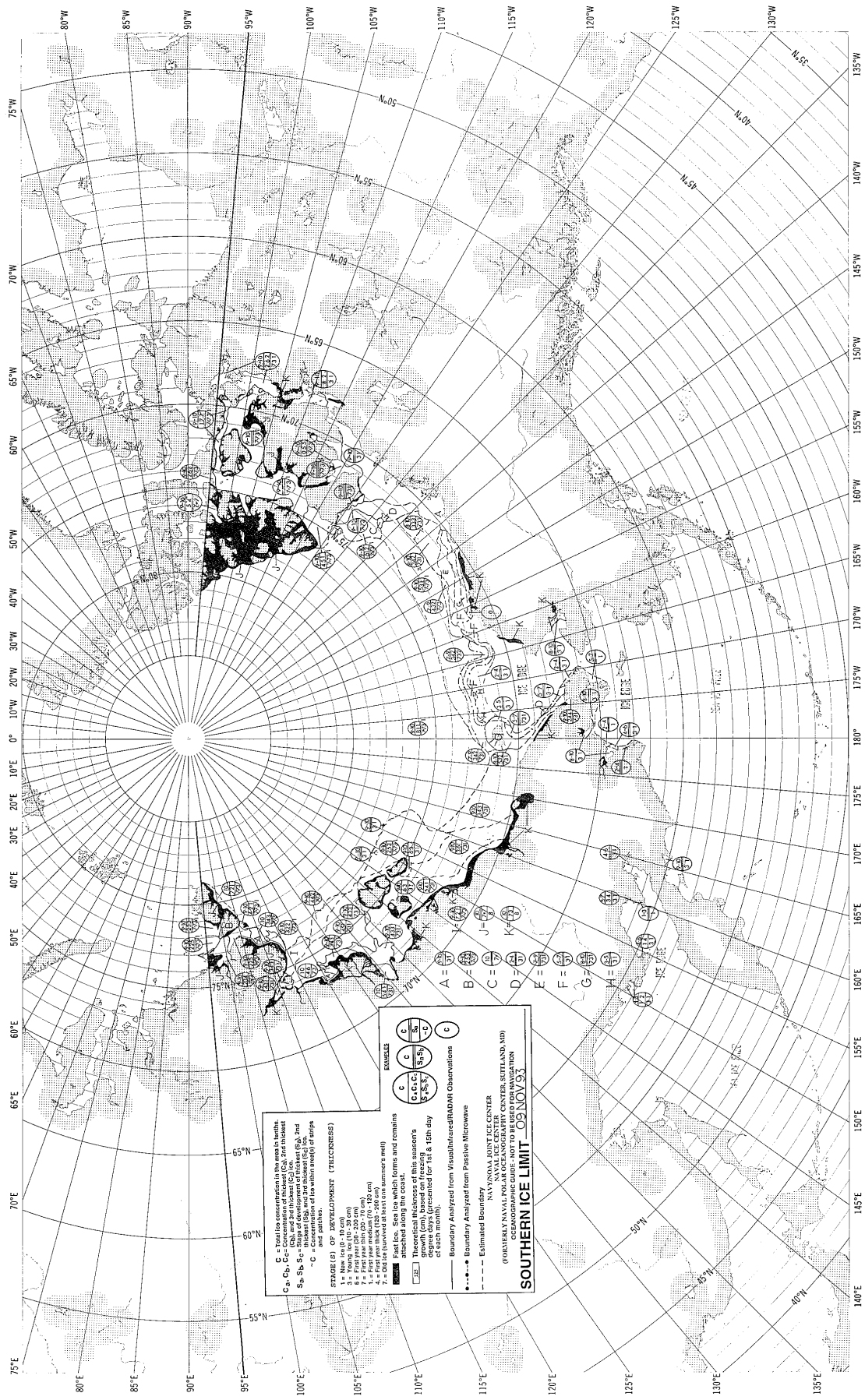
--- Estimated Boundary

TABLES

C	C	C	C
C	C	C	C
C	C	C	C
C	C	C	C

NAVY/NOAA JOINT ICE CENTER
 (FORMERLY NAVAL POLAR OCEANOGRAPHY CENTER, SUTLAND, MD)
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

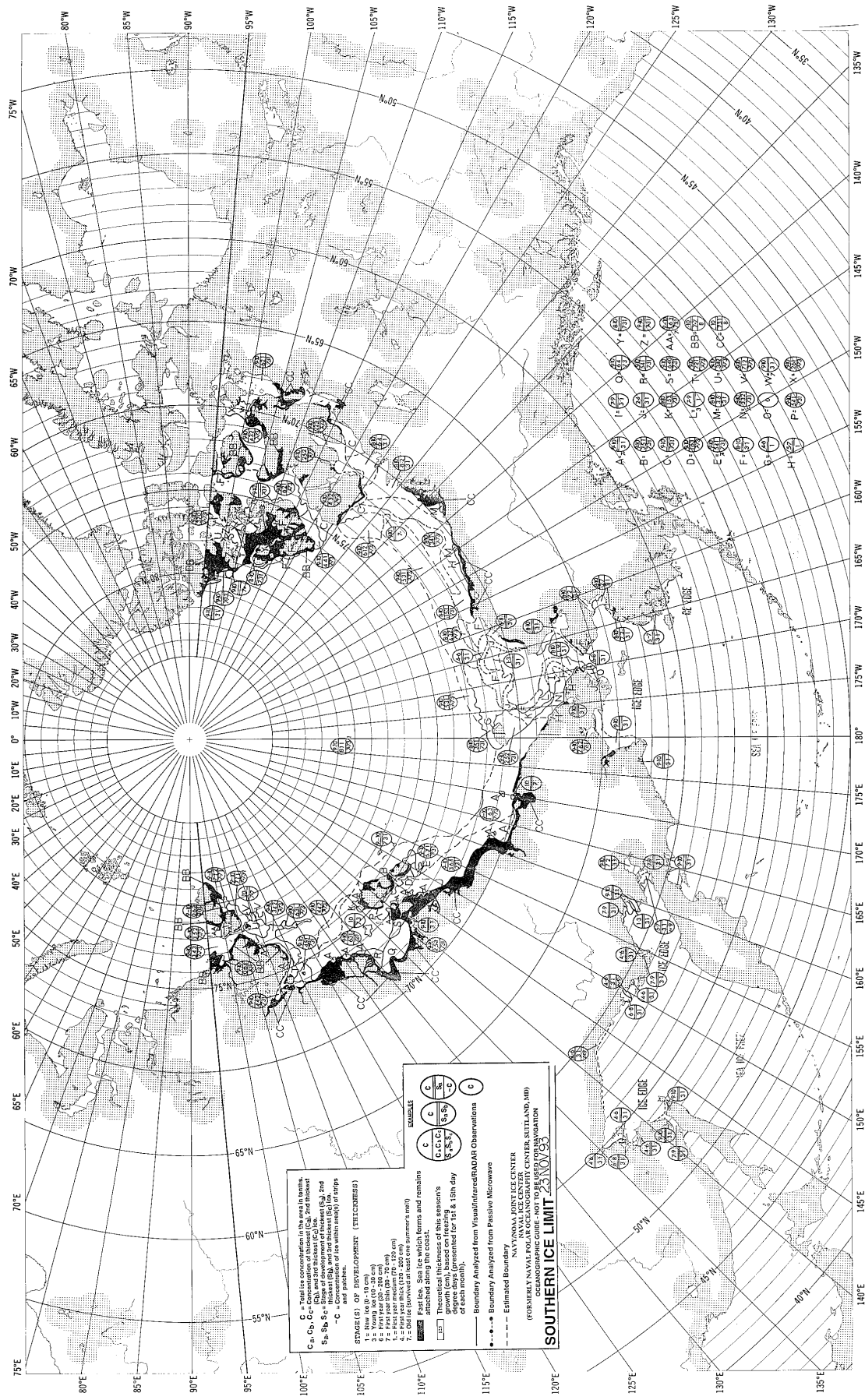
SOUTHERN ICE LIMIT - 150°E 155°W



C = Total ice concentration in the area in health.
C₁, C₂, C₃ = Concentrations of icebergs (C₁, 2nd thickest; C₂, 3rd thickest; C₃, 4th thickest).
S₁, S₂, S₃ = Stages of development of thickness (S₁, 2nd; S₂, 3rd; S₃, 4th).
C = Concentration of ice within area(s) of strips and patches.
STAGES OF DEVELOPMENT (THICKNESS)
1 = Young ice (50-30 cm)
2 = First year ice (70-70 cm)
3 = First year ice (100-100 cm)
4 = First year ice (120-120 cm)
5 = Old ice (140-140 cm)
6 = Old ice (160-160 cm)
7 = Old ice (180-180 cm)
8 = Old ice (200-200 cm)
9 = Old ice (220-220 cm)
10 = Old ice (240-240 cm)
11 = Old ice (260-260 cm)
12 = Old ice (280-280 cm)
13 = Old ice (300-300 cm)
14 = Old ice (320-320 cm)
15 = Old ice (340-340 cm)
16 = Old ice (360-360 cm)
17 = Old ice (380-380 cm)
18 = Old ice (400-400 cm)
19 = Old ice (420-420 cm)
20 = Old ice (440-440 cm)
21 = Old ice (460-460 cm)
22 = Old ice (480-480 cm)
23 = Old ice (500-500 cm)
24 = Old ice (520-520 cm)
25 = Old ice (540-540 cm)
26 = Old ice (560-560 cm)
27 = Old ice (580-580 cm)
28 = Old ice (600-600 cm)
29 = Old ice (620-620 cm)
30 = Old ice (640-640 cm)
31 = Old ice (660-660 cm)
32 = Old ice (680-680 cm)
33 = Old ice (700-700 cm)
34 = Old ice (720-720 cm)
35 = Old ice (740-740 cm)
36 = Old ice (760-760 cm)
37 = Old ice (780-780 cm)
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42 = Old ice (880-880 cm)
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51 = Old ice (1060-1060 cm)
52 = Old ice (1080-1080 cm)
53 = Old ice (1100-1100 cm)
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94 = Old ice (1920-1920 cm)
95 = Old ice (1940-1940 cm)
96 = Old ice (1960-1960 cm)
97 = Old ice (1980-1980 cm)
98 = Old ice (2000-2000 cm)
99 = Old ice (2020-2020 cm)
100 = Old ice (2040-2040 cm)

EXAMPLES
1 = Young ice (50-30 cm)
2 = First year ice (70-70 cm)
3 = First year ice (100-100 cm)
4 = First year ice (120-120 cm)
5 = Old ice (140-140 cm)
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94 = Old ice (1920-1920 cm)
95 = Old ice (1940-1940 cm)
96 = Old ice (1960-1960 cm)
97 = Old ice (1980-1980 cm)
98 = Old ice (2000-2000 cm)
99 = Old ice (2020-2020 cm)
100 = Old ice (2040-2040 cm)

BOUNDARY ANALYZED FROM VISUAL/INFRARED/RADAR OBSERVATIONS
BOUNDARY ANALYZED FROM PASSIVE MICROWAVE
ESTIMATED BOUNDARY
FORMERLY NAVAL NAVY NAVAL JOINT ICE CENTER
NAVAL ICE CENTER CENTER SUTLAND, MD
GEODESIC CENTER CENTER SUTLAND, MD
SOUTHERN ICE LIMIT - 03 NOV 93



C = Total ice concentration in the area in tenths.
C₁, C₂, C₃ = Concentration of first, second, and third year ice.
S₁, S₂, S₃ = Slope of development of thickness (S₁, 2nd year; S₂, 3rd year; S₃, 4th year).
C = Concentration of ice within straggle of straggle and patches.

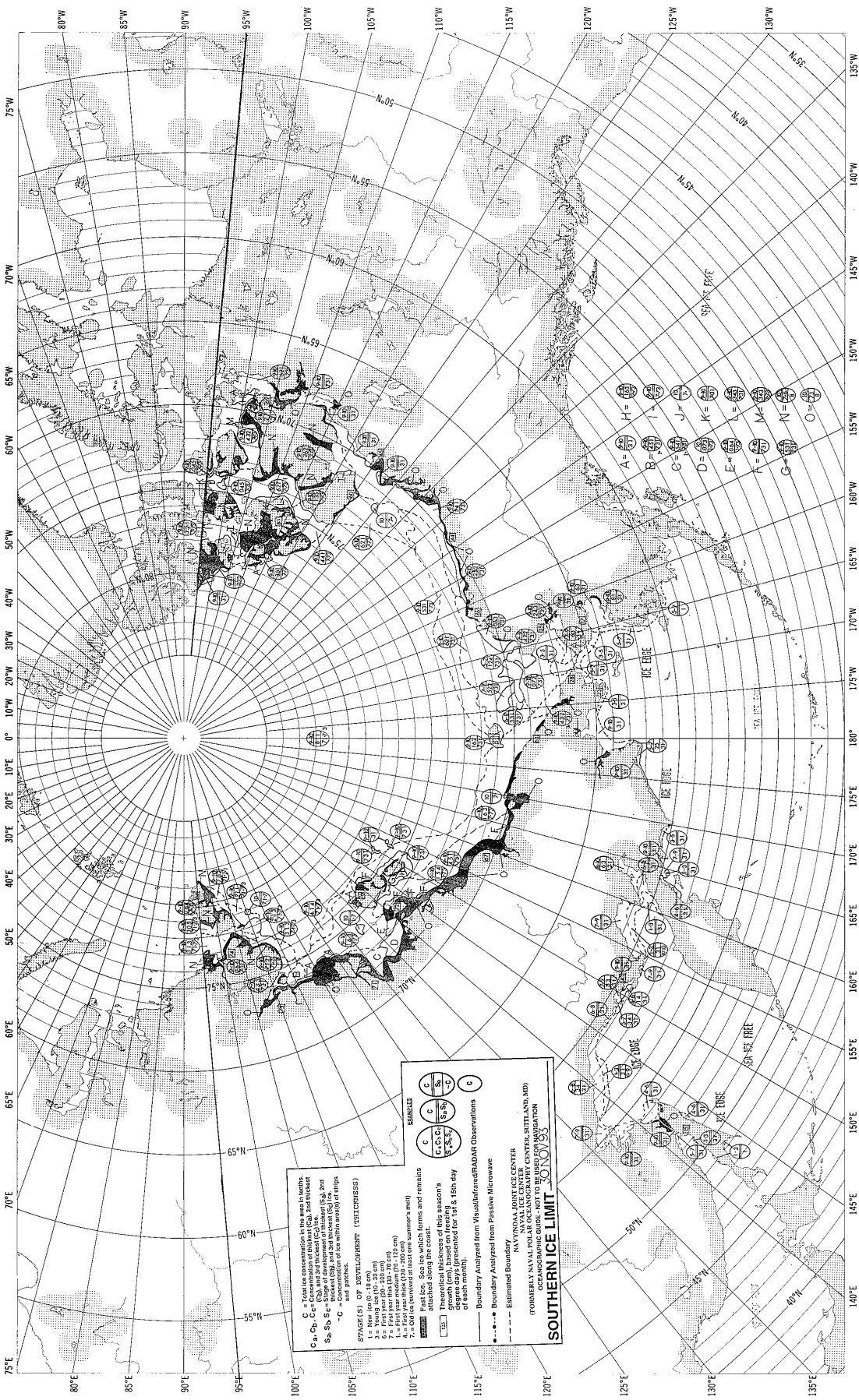
SPICES (S₁) OF DEVELOPMENT (TENTH CENTESIMS)
 1 = Young ice (10-30 cm)
 2 = First year ice (30-70 cm)
 3 = First year ice (70-100 cm)
 4 = First year ice (100-150 cm)
 5 = First year ice (150-200 cm)
 6 = Old ice (thickness at least one summer melt)

EXAMPLE

C	C ₁	C ₂	C ₃	S ₁	S ₂	S ₃
5	1	1	1	1	1	1

SPICES = Thickness of this season's growth (cm), based on freezing growth (cm) multiplied by 100 and divided by 100 of each month.
Boundary Analyzed from Visual/Radar Observations
Boundary Analyzed from Passive Microwave
Estimated Boundary from Passive Microwave

FORMERLY NAVAL POLAR RESEARCH CENTER, SUTLAND, AND
 NAVY AND NAVAL CENTER FOR POLAR OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT 23 NOV 93



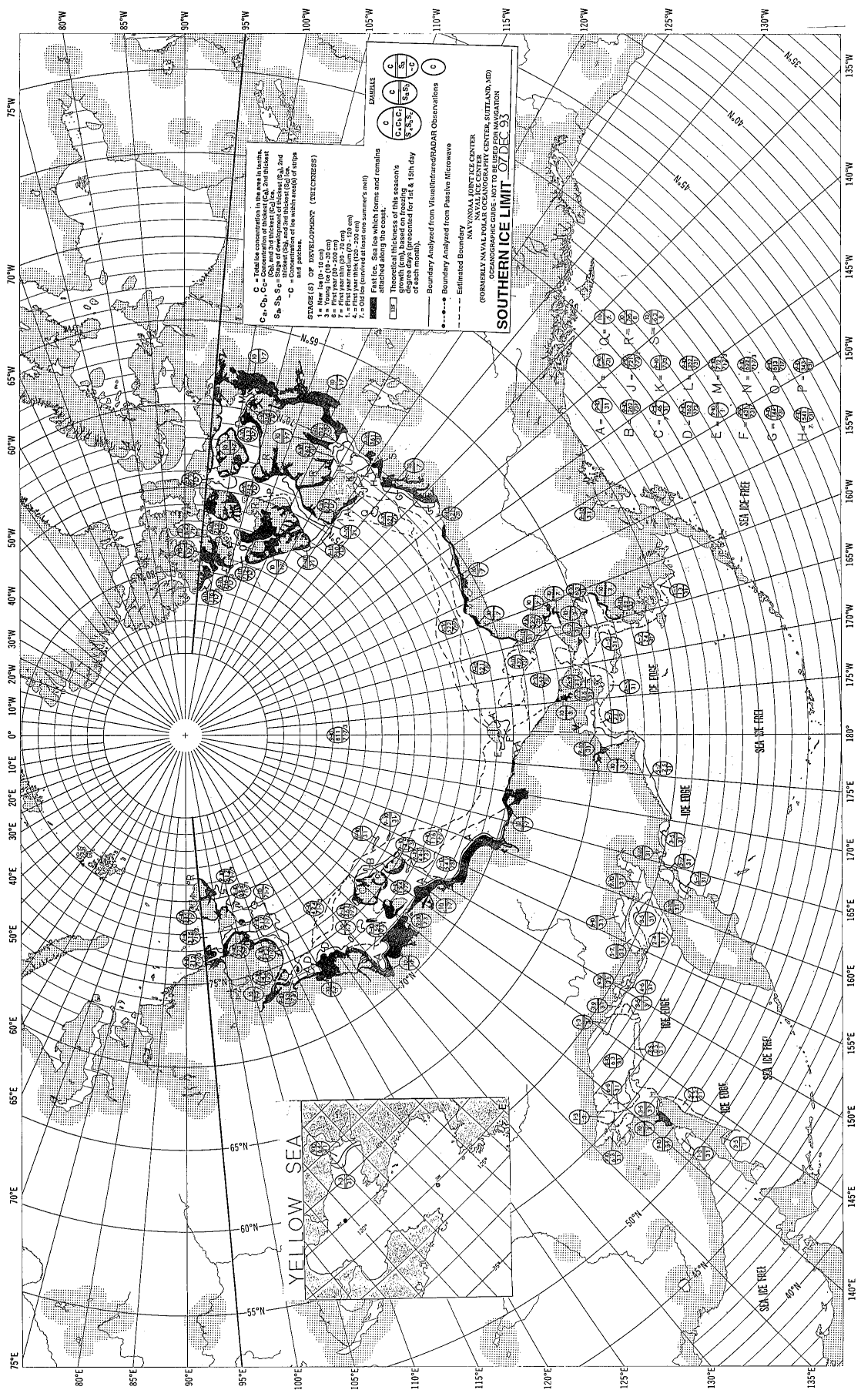
C = Total ice concentration in the area in tenths.
 C₁, C₂, C₃ = Concentration of medium (C₁), and thickest (C₂) ice.
 S₁, S₂, S₃ = Slope of development of thickness (S₁), S₂ and S₃ = Slope of development of thickness (S₁), S₂ and S₃ = Concentration of ice within area(s) of steps and patches.
 C = Concentration of ice within area(s) of steps and patches.

STAGES OF DEVELOPMENT (TENTHES)
 1 = No ice
 2 = Snowing ice (10% - 20%)
 3 = Snowing ice (20% - 30%)
 4 = First year ice (30% - 40%)
 5 = First year medium (40% - 50%)
 6 = First year medium (50% - 60%)
 7 = Old ice (formed at least one summer's melt)

EXAMPLES
 C = C₁ C₂ C₃ S₁ S₂ S₃ C
 C = C₁ C₂ C₃ S₁ S₂ S₃ C
 C = C₁ C₂ C₃ S₁ S₂ S₃ C

Fast Ice: Sea ice which forms and remains attached to the shore or other fixed objects.
 Thickness: Thickness of this season's growth (cm), based on freezing degree month (FDM) and presented for 1st & 15th day of each month.
 Boundary Analyzed from Passive Microwave
 Estimated Boundary
 (FORMERLY NAVAL JOINT ICE CENTER, SUTLAND, MD)
 (FORMERLY NAVAL JOINT ICE CENTER, SUTLAND, MD)
SOUTHERN ICE LIMIT - 30 NOV 93

A = $\frac{C}{C_1}$ H = $\frac{C}{C_2}$
 B = $\frac{C}{C_3}$ I = $\frac{C}{S_1}$
 C = $\frac{C}{S_2}$ J = $\frac{C}{S_3}$
 D = $\frac{C}{C_1 C_2}$ K = $\frac{C}{C_1 C_3}$
 E = $\frac{C}{C_2 C_3}$ L = $\frac{C}{S_1 S_2}$
 F = $\frac{C}{S_1 S_3}$ M = $\frac{C}{S_2 S_3}$
 G = $\frac{C}{C_1 C_2 C_3}$ N = $\frac{C}{C_1 C_2 S_1}$
 O = $\frac{C}{C_1 C_2 S_2}$



ICE STAGES
 A - New ice (0 - 10 cm)
 B - Thin ice (10 - 20 cm)
 C - First year ice (20 - 200 cm)
 D - First year ice (200 - 500 cm)
 E - First year ice (500 - 1000 cm)
 F - First year ice (1000 - 2000 cm)
 G - First year ice (2000 - 3000 cm)
 H - First year ice (3000 - 4000 cm)
 I - First year ice (4000 - 5000 cm)
 J - First year ice (5000 - 6000 cm)
 K - First year ice (6000 - 7000 cm)
 L - First year ice (7000 - 8000 cm)
 M - First year ice (8000 - 9000 cm)
 N - First year ice (9000 - 10000 cm)
 O - First year ice (10000 - 11000 cm)
 P - First year ice (11000 - 12000 cm)

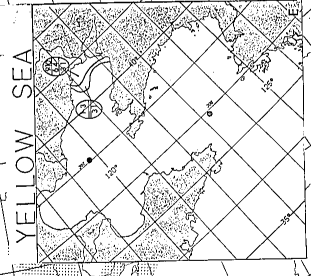
ICE STAGES OF DEVELOPMENT (TELESCOPES)
 1 - New ice (0 - 10 cm)
 2 - Thin ice (10 - 20 cm)
 3 - First year ice (20 - 200 cm)
 4 - First year ice (200 - 500 cm)
 5 - First year ice (500 - 1000 cm)
 6 - First year ice (1000 - 2000 cm)
 7 - First year ice (2000 - 3000 cm)
 8 - First year ice (3000 - 4000 cm)
 9 - First year ice (4000 - 5000 cm)
 10 - First year ice (5000 - 6000 cm)
 11 - First year ice (6000 - 7000 cm)
 12 - First year ice (7000 - 8000 cm)
 13 - First year ice (8000 - 9000 cm)
 14 - First year ice (9000 - 10000 cm)
 15 - First year ice (10000 - 11000 cm)
 16 - First year ice (11000 - 12000 cm)

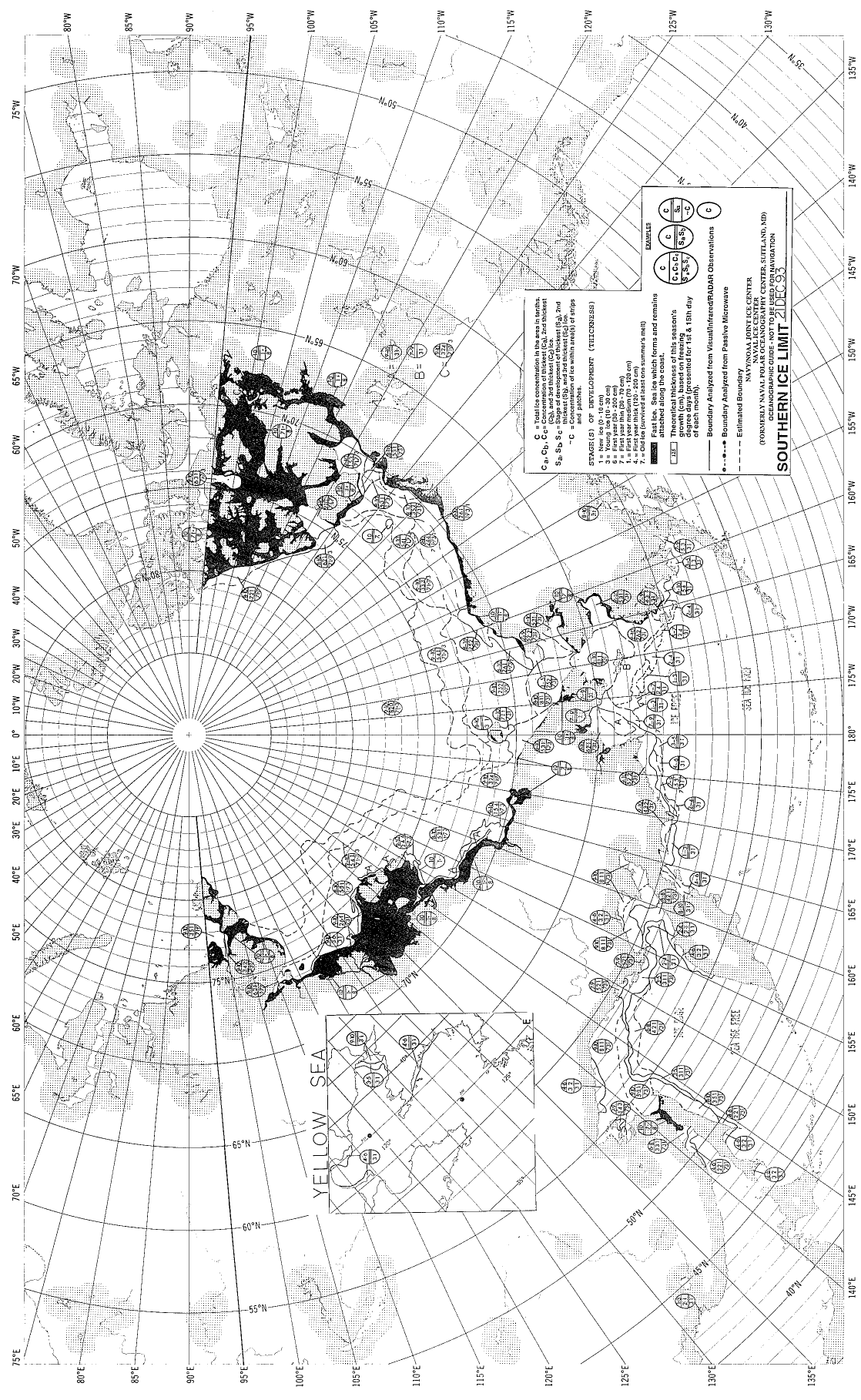
EXPLANATION
 C - Total ice concentration in the area in tenths.
 C₁, C₂, C₃, C₄, and C₅ - Ice concentration in tenths.
 C₁ - Ice concentration in tenths.
 C₂ - Ice concentration in tenths.
 C₃ - Ice concentration in tenths.
 C₄ - Ice concentration in tenths.
 C₅ - Ice concentration in tenths.
 C₆ - Ice concentration in tenths.
 C₇ - Ice concentration in tenths.
 C₈ - Ice concentration in tenths.
 C₉ - Ice concentration in tenths.
 C₁₀ - Ice concentration in tenths.
 C₁₁ - Ice concentration in tenths.
 C₁₂ - Ice concentration in tenths.
 C₁₃ - Ice concentration in tenths.
 C₁₄ - Ice concentration in tenths.
 C₁₅ - Ice concentration in tenths.
 C₁₆ - Ice concentration in tenths.
 C₁₇ - Ice concentration in tenths.
 C₁₈ - Ice concentration in tenths.
 C₁₉ - Ice concentration in tenths.
 C₂₀ - Ice concentration in tenths.

BOUNDARY ANALYZED FROM VISUAL/INFRARED/RADAR OBSERVATIONS
 - - - - - Estimated Boundary

ANTARCTIC JUNCTICE CENTER
 (FORMERLY NAVAL POLAR CENTER, GAITHERSBURG, MD)
 OCEANOGRAPHIC GUIDE - NOT TO BE USED FOR NAVIGATION

SOUTHERN ICE LIMIT OF DEC 93





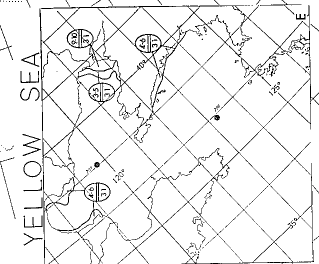
C = Total concentration of the ice in the area
C₁, **C₂**, **C₃** = Concentration of thickness (C₁ = 1st thickness, C₂ = 2nd thickness, C₃ = 3rd thickness)
S₁, **S₂**, **S₃** = Ice thickness (S₁ = 1st thickness, S₂ = 2nd thickness, S₃ = 3rd thickness)
A = Ice area (in square miles)
B = Ice perimeter (in miles)
C = Ice patches

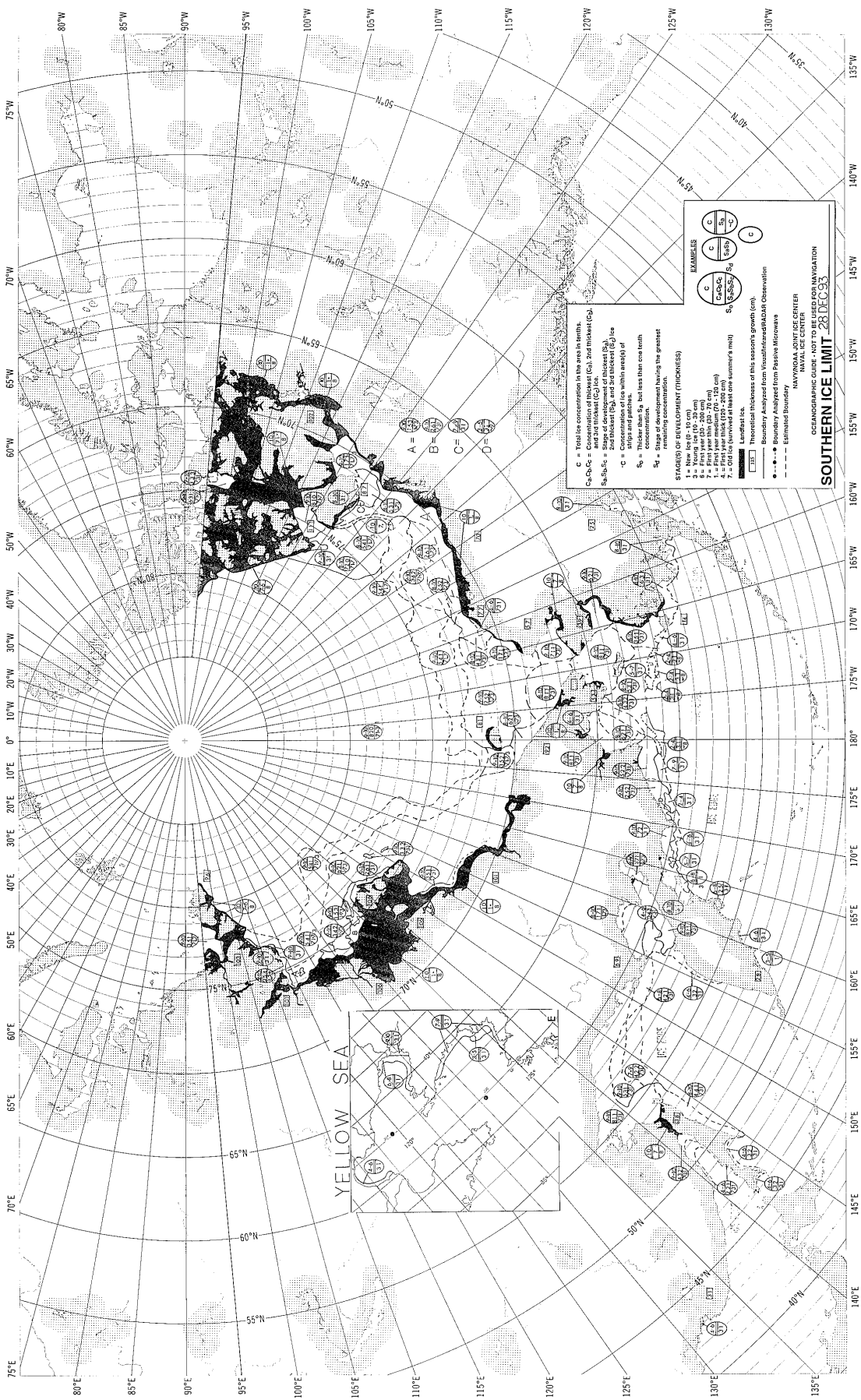
STAGES (S) OF DEVELOPMENT (THICKNESS)
 1 = New ice (0 - 10 cm)
 2 = First year (10 - 200 cm)
 3 = First year (200 - 300 cm)
 4 = First year (300 - 400 cm)
 5 = First year (400 - 500 cm)
 6 = First year (500 - 600 cm)
 7 = Old ice (more than 600 cm)

SEAS = Sea ice which forms and remains attached along the coast.
THEORETICAL = Theoretical thickness of this season's degree days presented for 1st & 15th day of each month.

- - - - - Boundary Analyzed from Visual/Infrared/RADAR Observations
 - - - - - Estimated Boundary

NAVY/NAVAL JOINT ICE CENTER
 (FORMERLY NAVAL POLAR OCEANOGRAPHY CENTER, SITLAND, AID)
 DEPENDABLE SOURCE - NOT TO BE USED FOR NAVIGATION
SOUTHERN ICE LIMIT

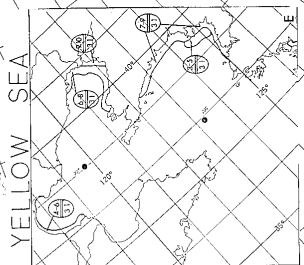
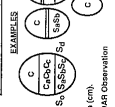




C = Total ice concentration in the area in tenths.
C₁C₂C₃ = Stage of development of thickest (C₁) and thickest (C₂) and thickest (C₃) ice strips and patches.
S₁S₂S₃ = Concentration of ice within area(s) of concentration, but less than one tenth remaining concentration.
S₄ = Stage of development having the greatest remaining concentration.

STAGES OF DEVELOPMENT (THICKNESS)
 1 = New ice (10-20 cm)
 2 = Young ice (20-30 cm)
 3 = First year medium (30-70 cm)
 4 = First year medium (70-120 cm)
 5 = First year medium (120-150 cm)
 6 = First year medium (150-200 cm)
 7 = Old ice (survived at least one summer's melt)

Landfast ice
 [Symbol] = Boundary Analyzed from Visual/Infrared/SAR Observation
 [Symbol] = Boundary Analyzed from Passive Microwave
 [Symbol] = Estimated Boundary from Passive Microwave



SOUTHERN ICE LIMIT 28 DEC 53
 OCEANOGRAPHIC GUIDE - 1037 TO THE ARCTIC NAVIGATION
 NAVY/NOAA JOINT ICE CENTER
 NAVAL ICE CENTER

TABLE 1. SATELLITE DATA UTILIZED IN 1993

From	To	Sensor Platform	Sensor Type	Spectral Region	Resolution	Coverage
1-93	12-93	NOAA 10,11,12	<u>AVHRR</u> <u>HRPT/LAC</u> VIS NIR IR	0.58-0.68 um 0.725-1.10 um 10.5-12.5 um	1.1 km at nadir	Regional
			<u>GAC</u> VIS IR	0.58-0.68 um 10.5-12.5 um	4 km	Global
1-93	12-93	DMSP F-10,11	<u>OLS FINE</u> VIS IR	0.4-1.1 um 10.2-12.8 um	0.55 km 0.55 km	Regional Regional
			SSM/I PMW	1.55 cm (19.35 Ghz) and 0.81 cm (37.00 Ghz)	50 km 25 km	Global Global
1-93	12-93	ERS-1	<u>SAR</u> AMW	C-Band (5.3 Ghz)	100 m -240 m	Local Local

Abbreviations and Acronyms:

AVHRR--Advanced Very High Resolution Radiometer
 AMW--Active Microwave
 cm--centimeter
 GAC--Global Area Coverage
 GHZ--Giga-Hertz
 HRPT--High Resolution Picture Transmission
 IR--Infrared
 km--kilometer
 LAC--Local Area Coverage
 NIR--Near Infrared
 OLS--Operational Line Scan System
 PMW--Passive Microwave
 SSM/I--Special Sensor Microwave Imager
 um--micrometer
 VIS--Visible