M.O. 485 (Formerly M.O.M. 476)

AIR MINISTRY

QUARTERLY SURFACE CURRENT CHARTS

OF THE

WESTERN NORTH PACIFIC OCEAN

Westward of Longitude 160° W.

WITH MONTHLY CHARTLETS OF THE CHINA SEAS

Second Edition

Prepared in the Marine Branch of the Meteorological Office

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1949

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Contents

EXPLANATION OF THE CHARTS

THESE CHARTS are compiled from observations sent in to the Meteorological Office by the Corps of Voluntary Marine Observers in British Merchant Ships, and from observations made in H.M. Ships which were kindly supplied by the Hydrographer of the Navy. The observations cover the period 1855 to 1939.

In addition surface current observations have been included from the following foreign publications :—

The Hydrographic Bulletin, Tokyo, Japan, Numbers 5 to 12 of 1931 and Numbers 1 to 4 of 1932, for the area Lat. 20° N. to 50° N., Long. 110° E. to 161° E.

Annalen der Hydrographie und Maritimen Meteorologie, May, 1939, by Schott, for the months December to March and June to September, for the area Lat. 0° to 15° N., Long. 124° E. to 160° E.

CHARTS OF CURRENT ROSES.

Each rose summarises all the observations of surface current available within the pecked line area to which it refers. Each area is numbered in red figures for easy comparison with the Chart of Predominant Direction and Rate also with the Vector Mean or Resultant Current Chart.

Each rose shows the degree of variability to which the current in the area is subject, owing largely to wind variation. The rose is divided to sixteen points, each arrow showing the percentage frequencies of the various rates of current observed in that direction.

CHARTS OF PREDOMINANT DIRECTION AND RATE OF CURRENT.

The flow lines showing the predominant direction and rate of current are derived as follows :—The rose areas shown by pecked lines and numbered in red are mainly divided into areas of 2° of latitude by 4° of longitude. The observations within these areas are totalled in successive 90° sectors around the whole compass, each sector being displaced 15° from its predecessor. The mid-direction of the sector containing the largest number of observations is the direction on which the flow lines are based. The rate given is the average rate, in miles per day, of all currents observed flowing within 45° on either side of the direction shown on the chart.

Within the Bering and Okhotsk seas the arrows are identical in each quarter, as knowledge of the current in these seas is insufficient to establish variations during the year.

CHARTS OF RESULTANT DIRECTION AND RATE OF CURRENT (VECTOR MEANS).

These charts show the mean resultant direction and rate of current, that is the overall movement of water over a considerable period. It defines as closely as possible the geographical limits of the various currents and shows the difference in mean direction and rate of the set of individual current streams. Each arrow shown on the vector mean chart is the resultant of all currents observed in the area to which it refers. In computing this mean current opposite components cancel out. The mean rate shown is therefore less than the rate of all currents averaged, irrespective of direction.

USE OF THE CHARTS IN NAVIGATION.

In day to day navigation the predominant chart and the rose chart should be used in conjunction. The predominant chart shows the direction and average rate of current chiefly recorded at any place. The degree of probability that the current shown on this chart will be the one experienced varies very much in different regions, depending on the constancy of the current, which is indicated by the thickness of the arrows on the chart. It is important to know the extent to which the current experienced on any occasion may differ from the predominant current shown on the chart. This should be ascertained by reference to the appropriate rose on the rose chart.

When the constancy shown on the predominant chart exceeds 50%, the predominant direction, or one very close to it, is that most likely to be experienced on any given occasion, i.e., it will more probably occur than a current in any other direction whatsoever. This probability is still higher if the constancy is shown to exceed 74%. Nowhere in the ocean does the constancy reach 100%, so that no current anywhere can be predicted with absolute certainty.

When the constancy shown is less than 50%, the degree of variability is such that no direction can be singled out as the most likely one on any given occasion. It is still worth while to show a predominant current in such a region, since more currents will flow in the direction specified than in any other single direction. In the long run, however, in such a region, the total number of currents flowing in all other directions added together will exceed the number flowing in the predominant direction.

The vector mean chart should be consulted for the purpose of calculating drifts of boats or derelicts, or for ascertaining the overall movement of water over a considerable period. The reason for this is that the vector mean in any region is calculated as a mean of all currents in all directions over a considerable period of time, whereas the direction and rate of the predominant current at any point is derived only from the currents in the quadrant containing the largest number of observations.

EFFECT OF LOCAL WIND ON THE CURRENT.

The effect of local wind in producing a current is not immediate, but if it is known that a moderate or strong wind has been blowing in the region for a day or more, with reasonable steadiness of direction, some modification of the current to be expected may be made with due discretion.

This mainly applies to regions where the current is least constant, i.e. outside the main flows of currents such as the Equatorial Current and the Kuro Shio. In the temperate regions of the North Pacific, through which successive depressions pass, the current at any time is likely to approximate to that produced by a wind which has been blowing with some constancy of direction for a day or more. Judgment should however be exercised by taking into consideration the occurrence of strong winds or gales in the surrounding neighbourhood during the previous day or two. Thus though the wind may have fallen light in the region of the ship, a current may still be running in a direction produced by recent gales there or elsewhere. Just as the onset of wind does not give rise immediately to a corresponding current, so a fall or change of wind does not result in its immediate cessation.

The rate of current produced by wind may be considered to be approximately 1/50th of the wind strength in knots in latitude 45° and 1/70th in latitude 60°. Its direction is up to 30° or more to the right of the wind in the northern hemisphere, except near the equator, where it is downwind.

Over the region of more constant current flow, if the wind has been stronger than usual for at least one day and has a component in the direction of the predominant current set, the effect of the wind will tend to accelerate the rate of the current shown on the chart. Similarly a wind stronger than usual, with a component in opposition to the current, will tend to retard it. It must be remembered, however, that from about October to April the normal wind direction is in opposition to the flow of the Kuro Shio from Luzon to the Japanese coasts and that the retardation due to this cause is already allowed for in the predominant current charts. If however the wind at any time were markedly stronger than the average, some further retardation might be expected ; the meteorological atlas M.O. 484 (Western Pacific Ocean) must therefore be consulted.

IMPORTANT

M.O. 485, Quarterly Surface Current Charts of the Western North Pacific Ocean

Users of M.O.485 in Chinese waters are warned that the Government of the People's Republic of China objects to 'Formosa' on any map or chart and has confiscated maps and charts showing that name. Other names which apparently cause offence are Manchuria, Annam and Cambodia Point.

Such users of these charts are therefore advised to delete the names concerned wherever they appear. Formosa can be replaced by Tai Wan, and Cambodia Pt. by Pte. de Camau.

Marine Division,
Meteorological Office.
5th June, 1961

LONDON: HER MAJESTY'S STATIONERY OFFICE: 1961

SURFACE CURRENT ROSES

SEPTEMBER OCTOBER NOVEMBER

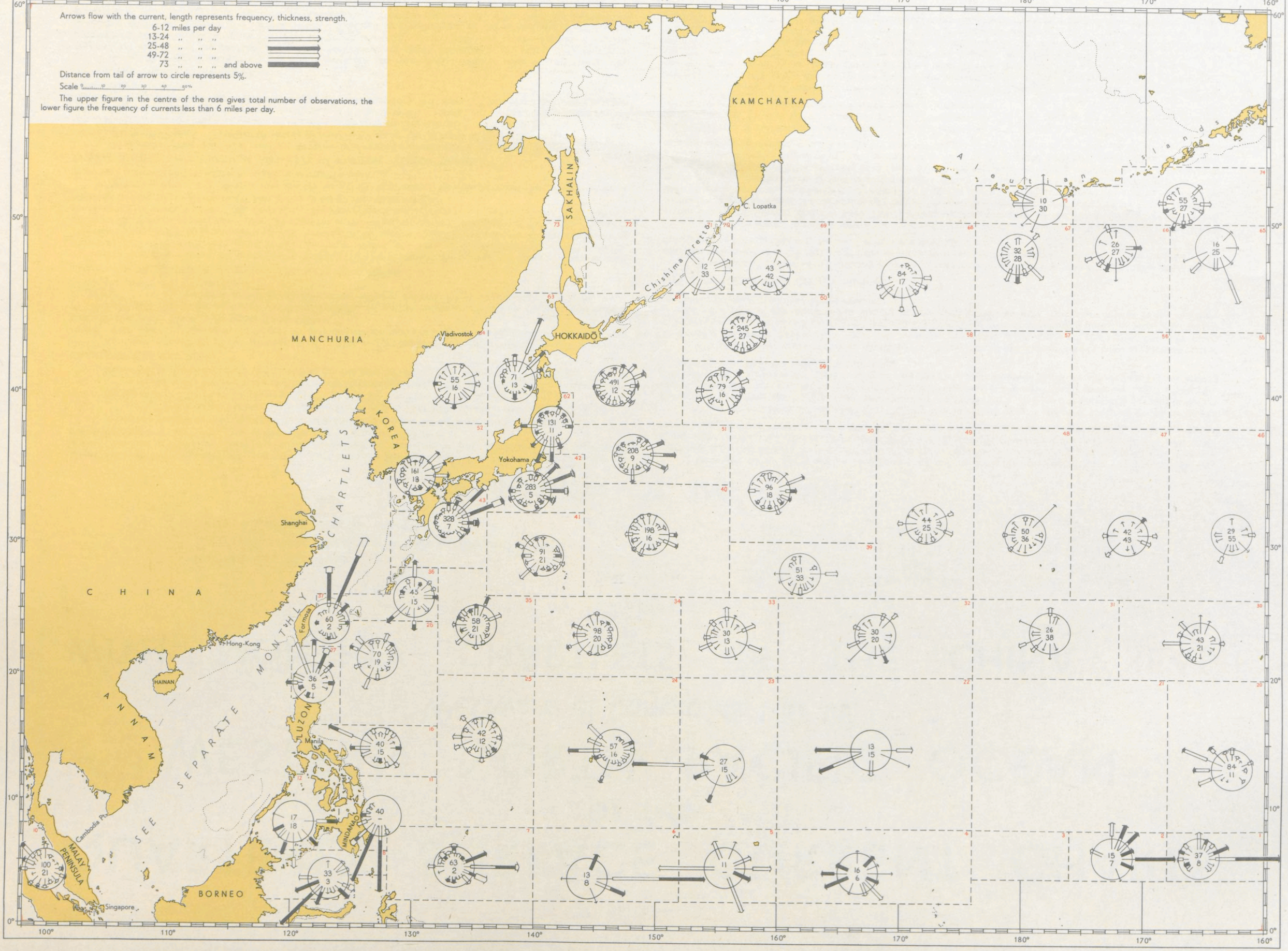
Arrows flow with the current, length represents frequency, thickness, strength.

6-12 miles per day
13-24 ,, ,, ,,
25-48 ,, ,, ,,
49-72 ,, ,, ,,
73 ,, ,, ,, and above

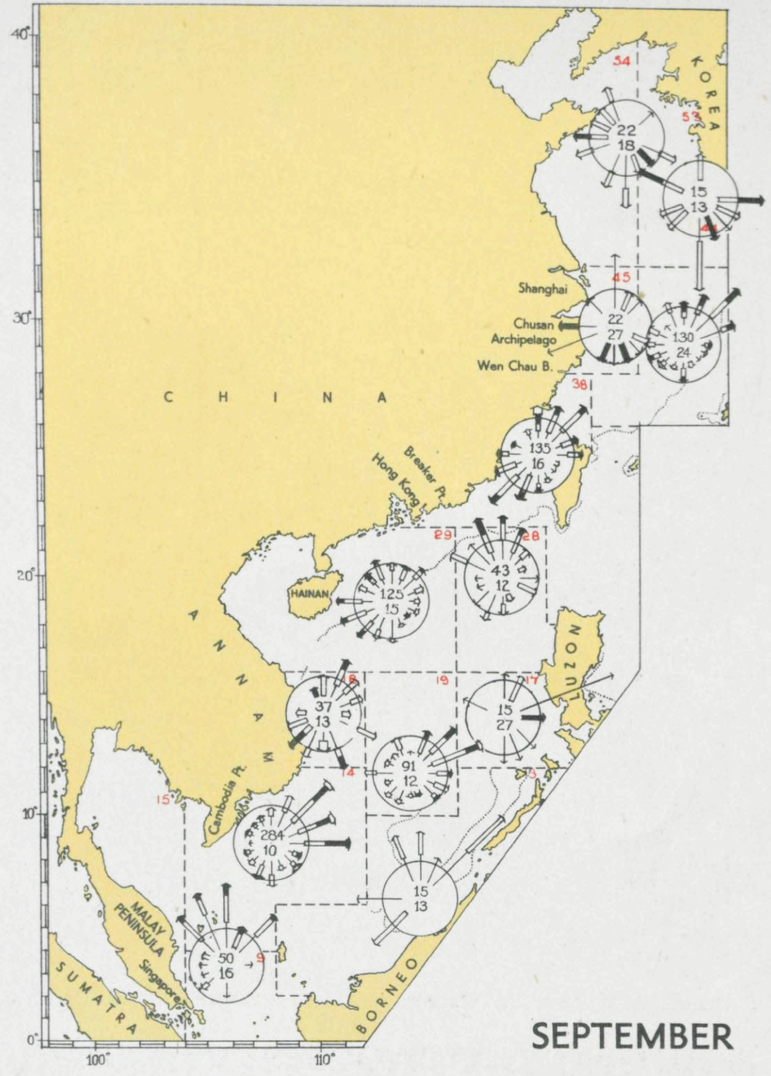
Distance from tail of arrow to circle represents 5%.

Scale 0 10 20 30 40 50%

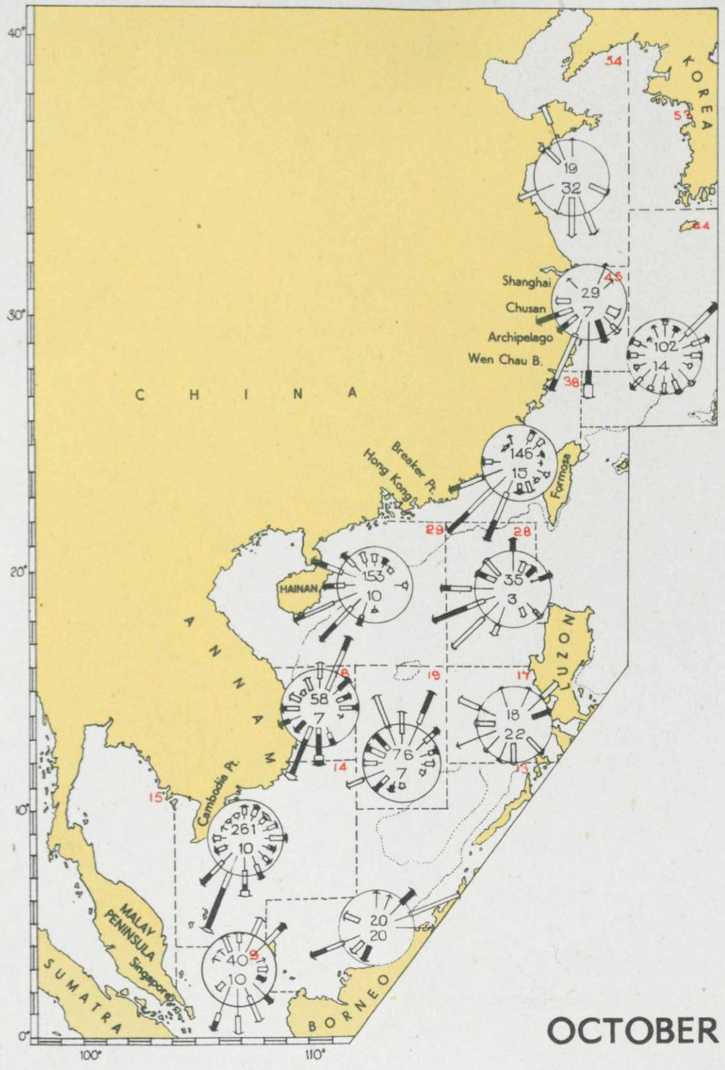
The upper figure in the centre of the rose gives total number of observations, the lower figure the frequency of currents less than 6 miles per day.



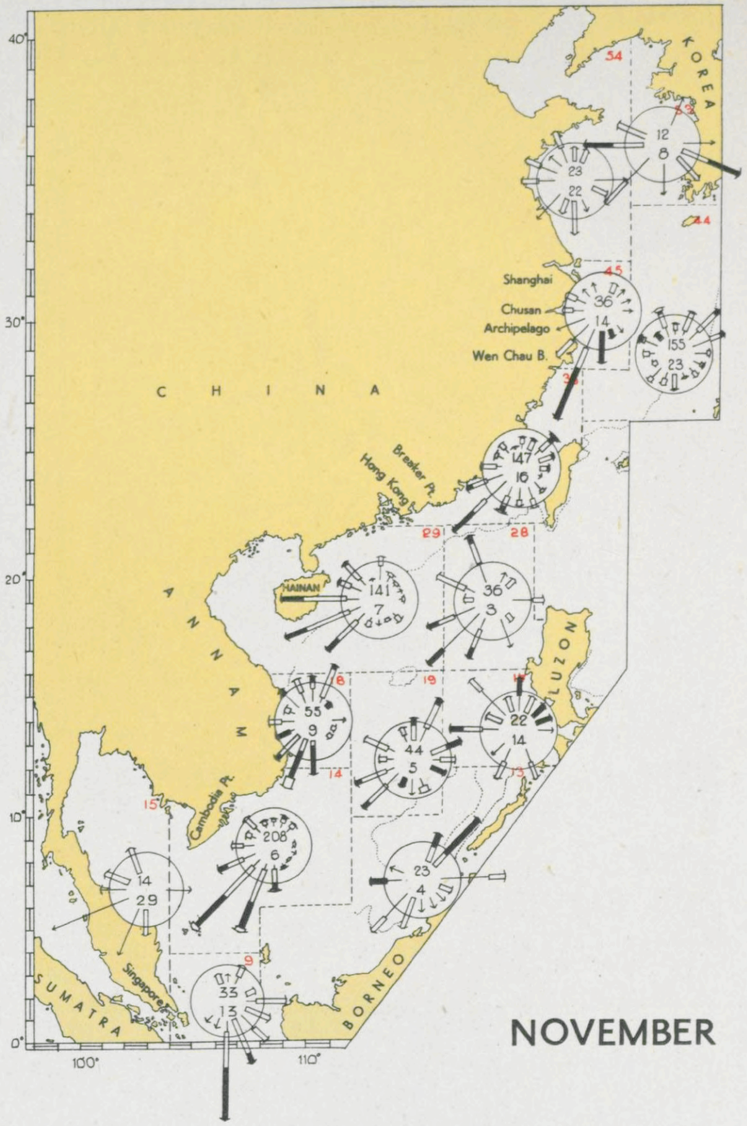
CHINA SEA, SURFACE CURRENT ROSES



SEPTEMBER

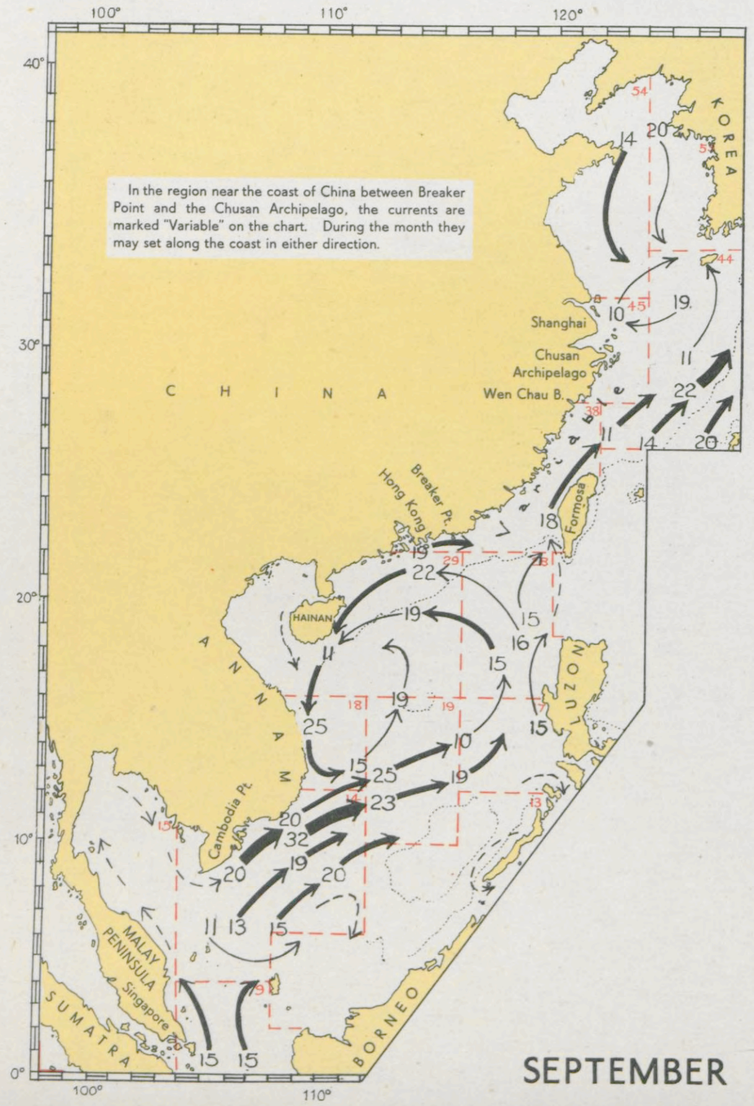


OCTOBER



NOVEMBER

CHINA SEA, PREDOMINANT DIRECTION AND RATE



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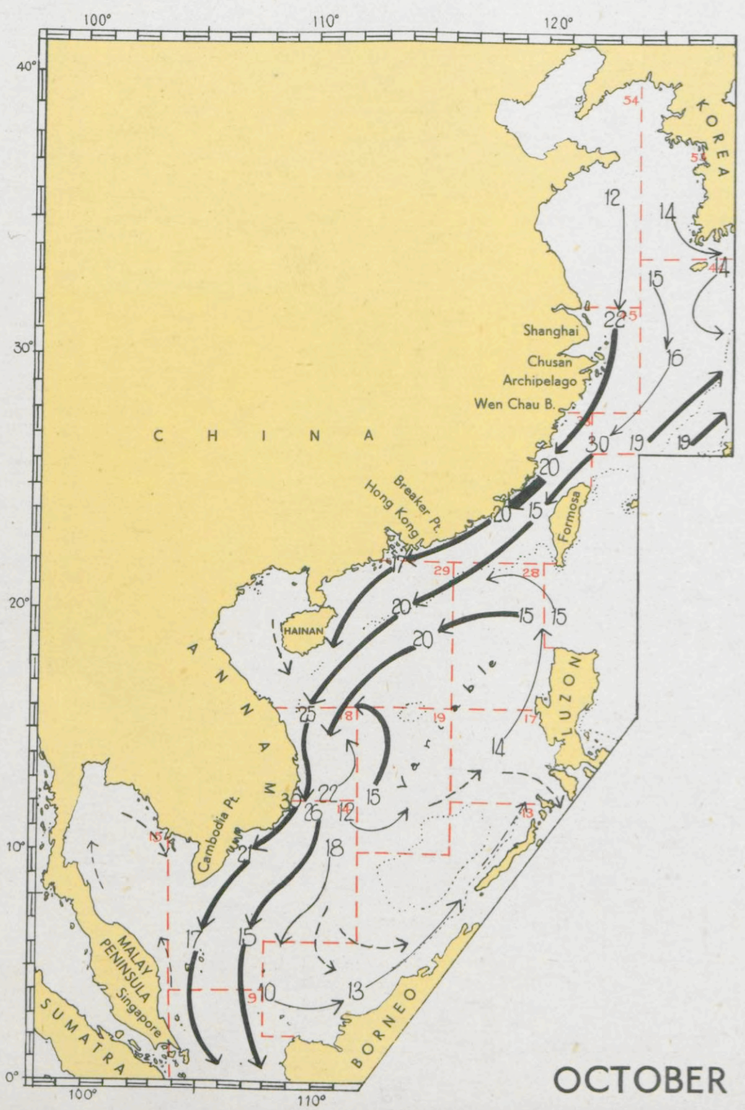
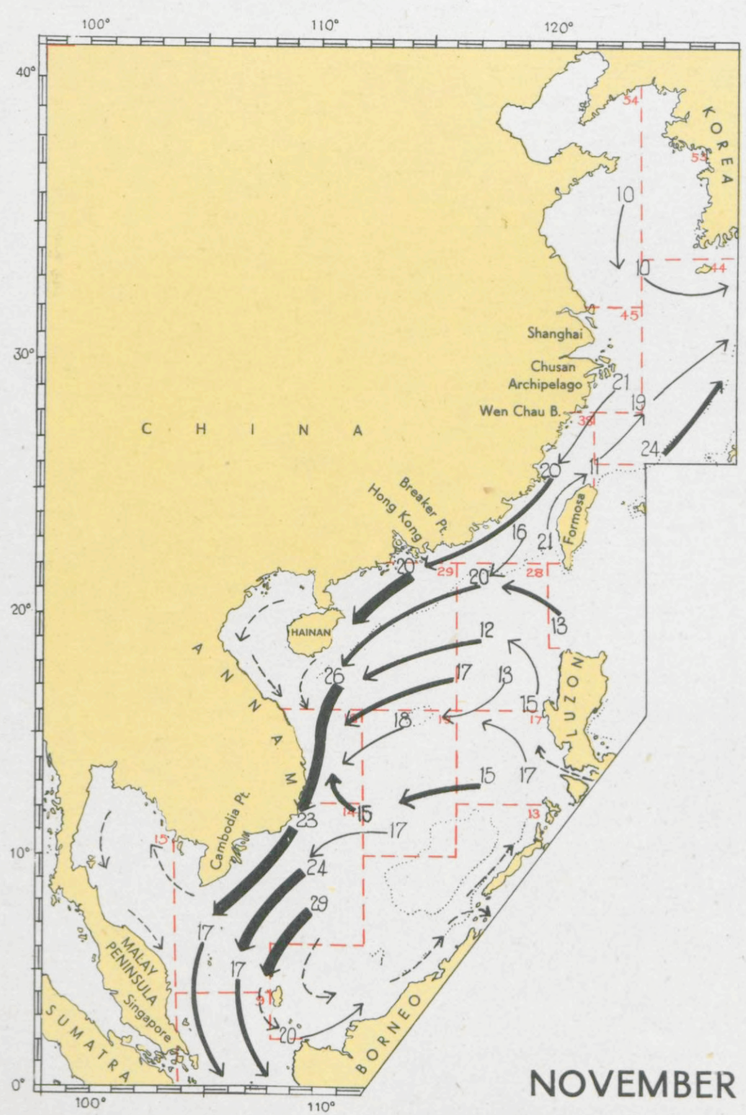


OCTOBER



NOVEMBER

SURFACE CURRENT, PREDOMINANT DIRECTION AND RATE

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25 - 49% ——→
50 - 74% ═══→
75 - 100% ▬▬▬→

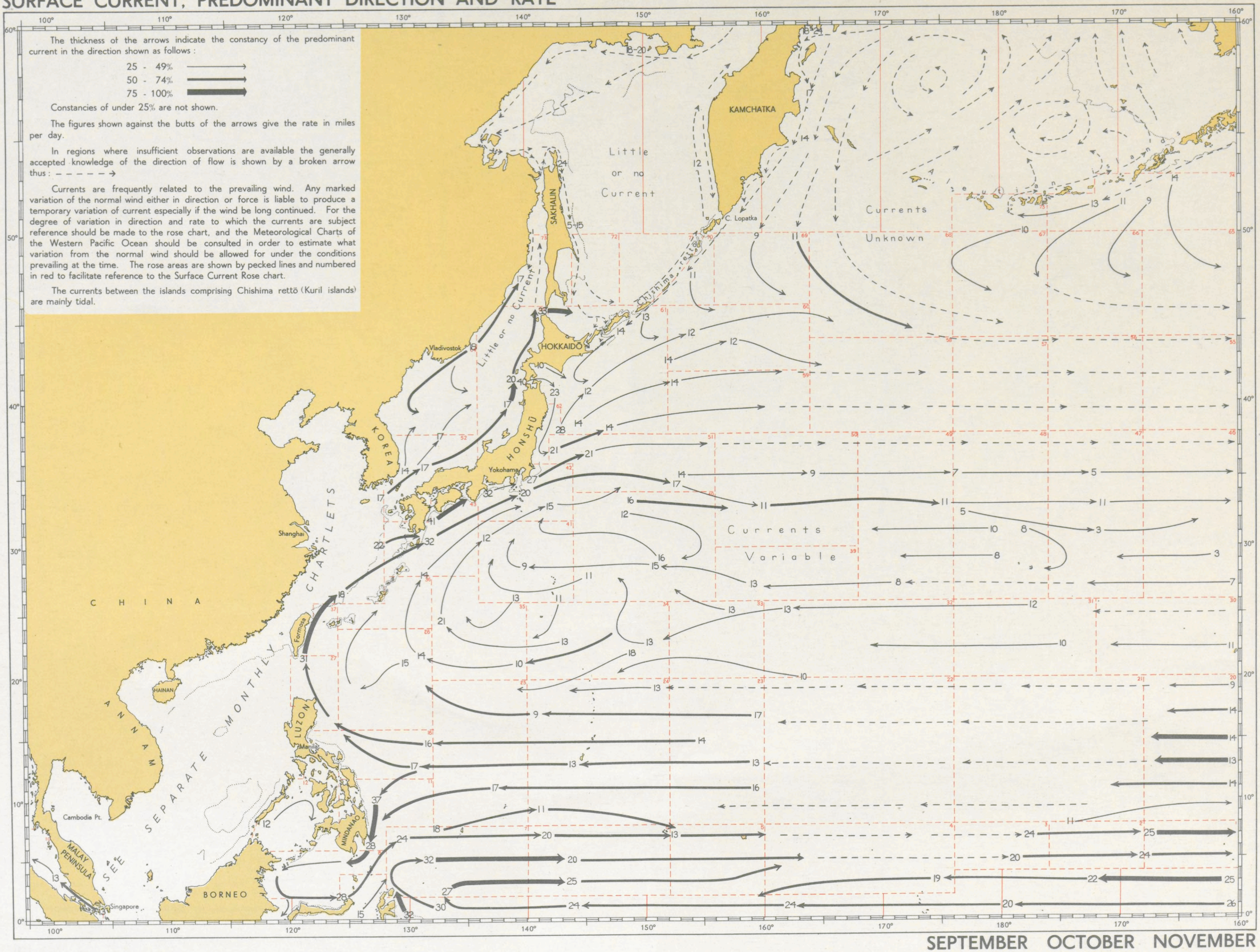
Constancies of under 25% are not shown.

The figures shown against the butts of the arrows give the rate in miles per day.

In regions where insufficient observations are available the generally accepted knowledge of the direction of flow is shown by a broken arrow thus : – – – – – →

Currents are frequently related to the prevailing wind. Any marked variation of the normal wind either in direction or force is liable to produce a temporary variation of current especially if the wind be long continued. For the degree of variation in direction and rate to which the currents are subject reference should be made to the rose chart, and the Meteorological Charts of the Western Pacific Ocean should be consulted in order to estimate what variation from the normal wind should be allowed for under the conditions prevailing at the time. The rose areas are shown by pecked lines and numbered in red to facilitate reference to the Surface Current Rose chart.

The currents between the islands comprising Chishima rettō (Kuril islands) are mainly tidal.



SEPTEMBER OCTOBER NOVEMBER

SURFACE CURRENT ROSES

DECEMBER JANUARY FEBRUARY

Arrows flow with the current, length represents frequency, thickness, strength.

6-12 miles per day
13-24 ,, ,, ,,
25-48 ,, ,, ,,
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73 ,, ,, ,, and above

Distance from tail of arrow to circle represents 5%.

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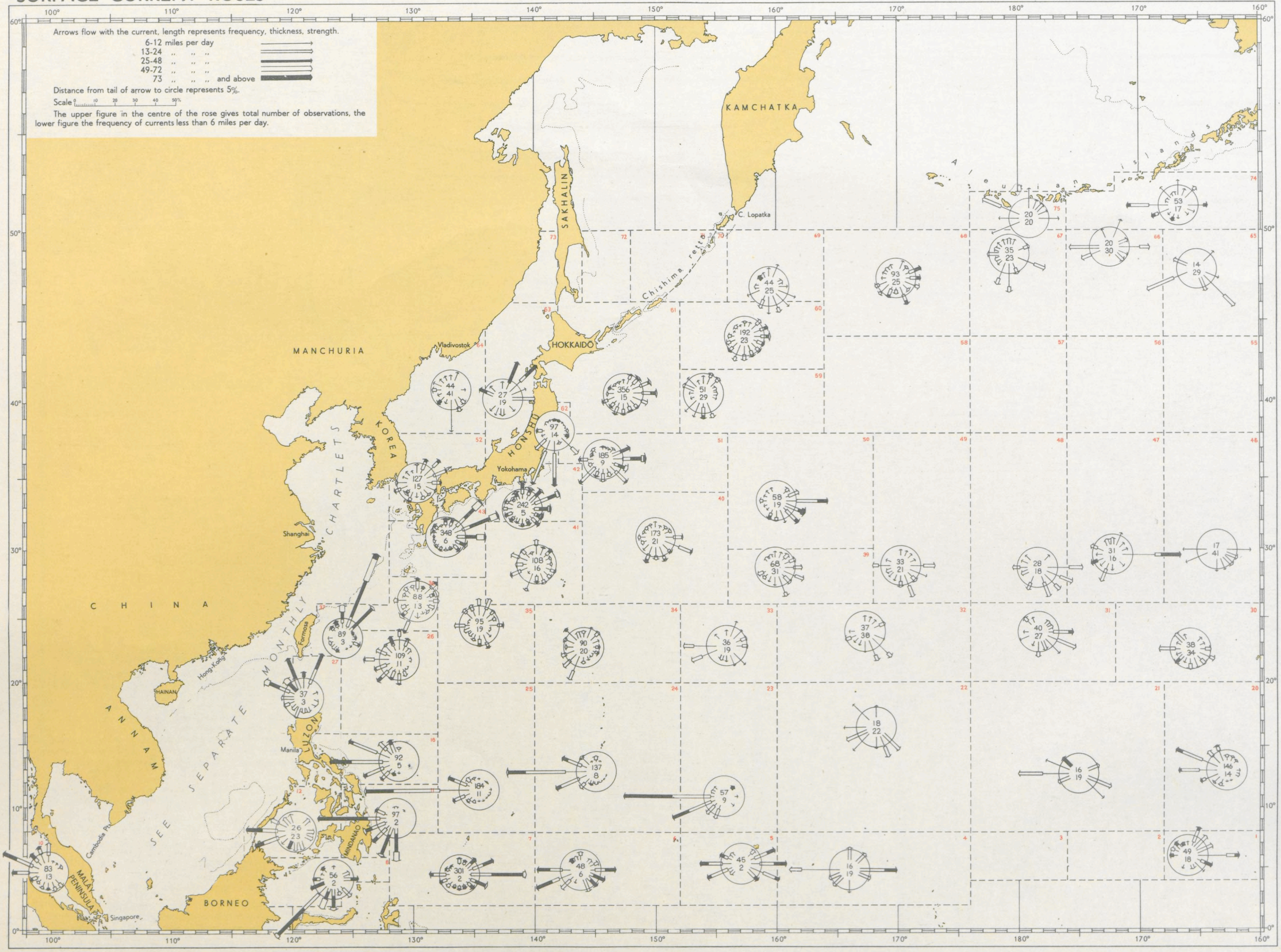
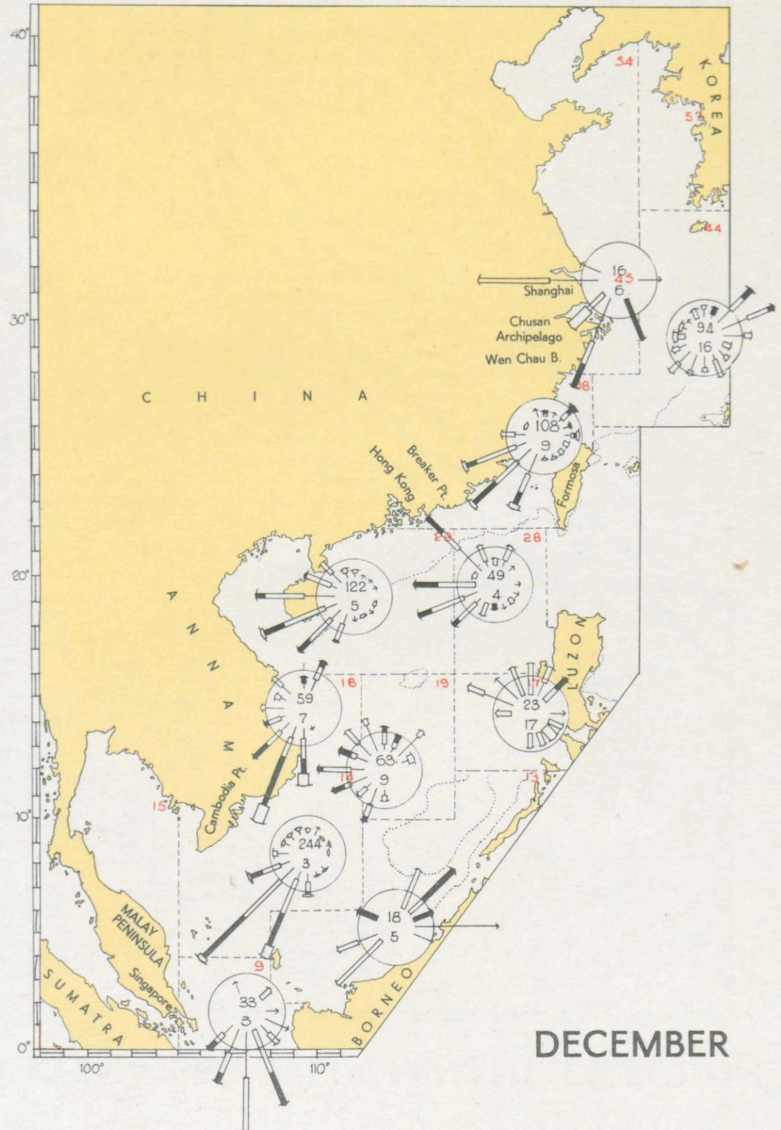
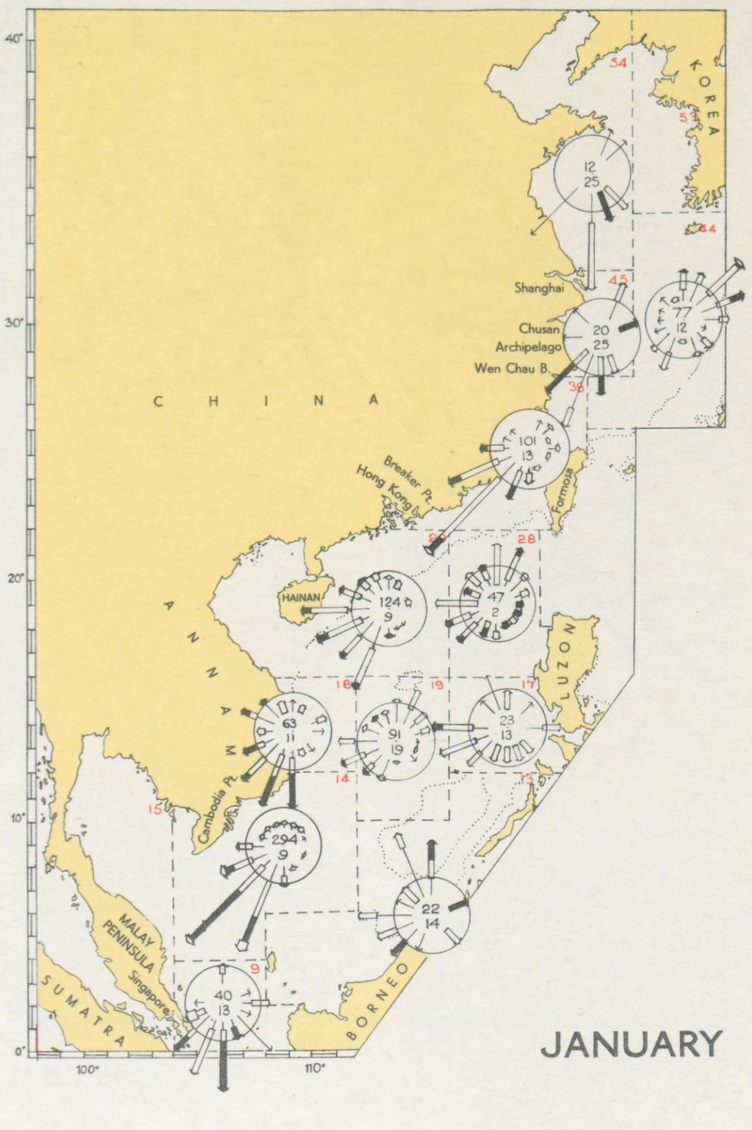
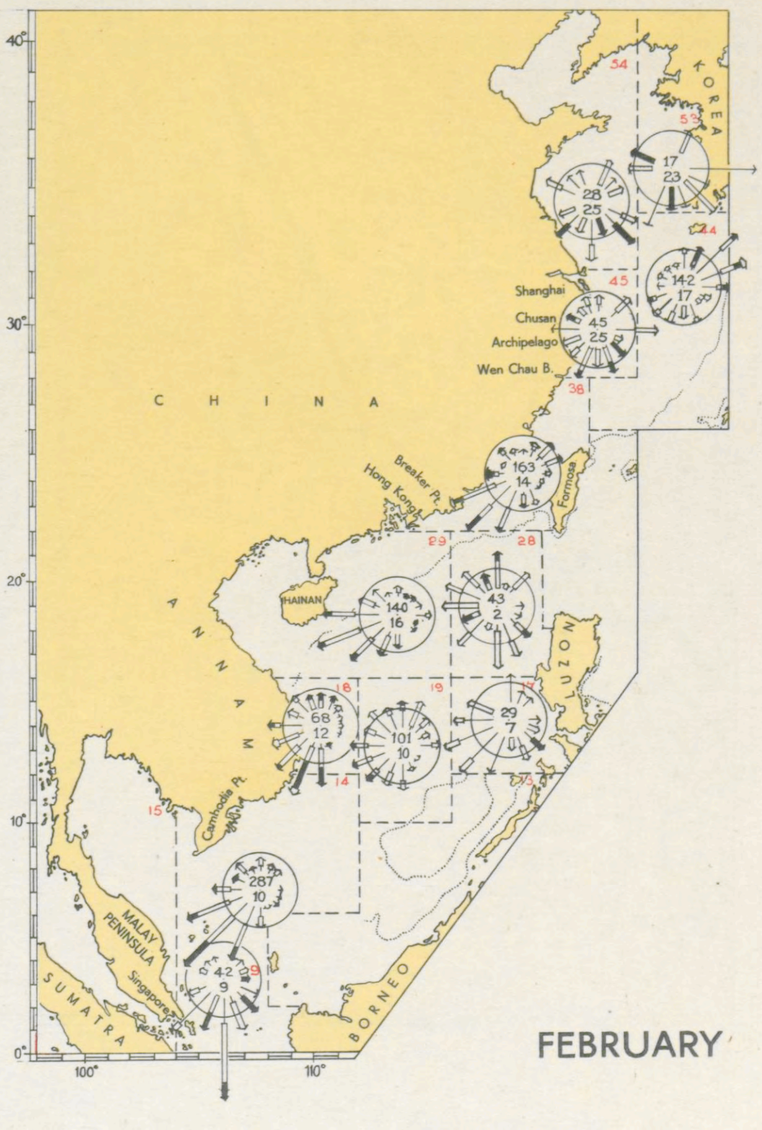


CHINA SEA, SURFACE CURRENT ROSES







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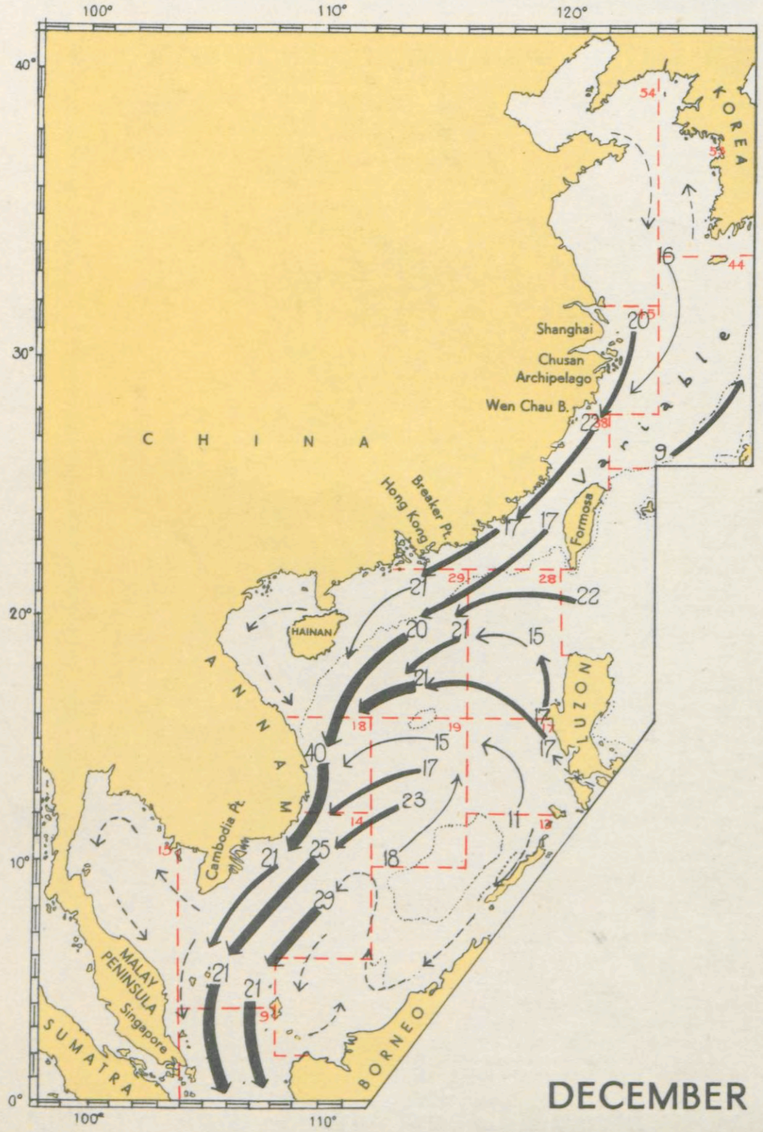

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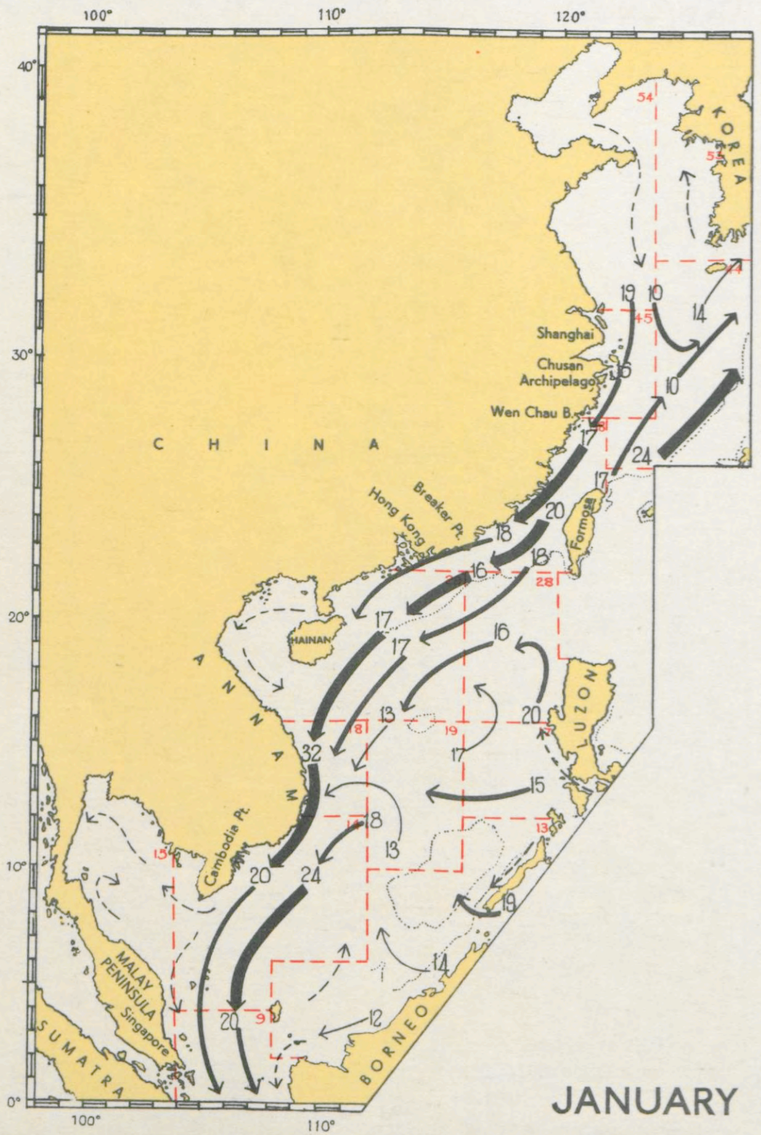
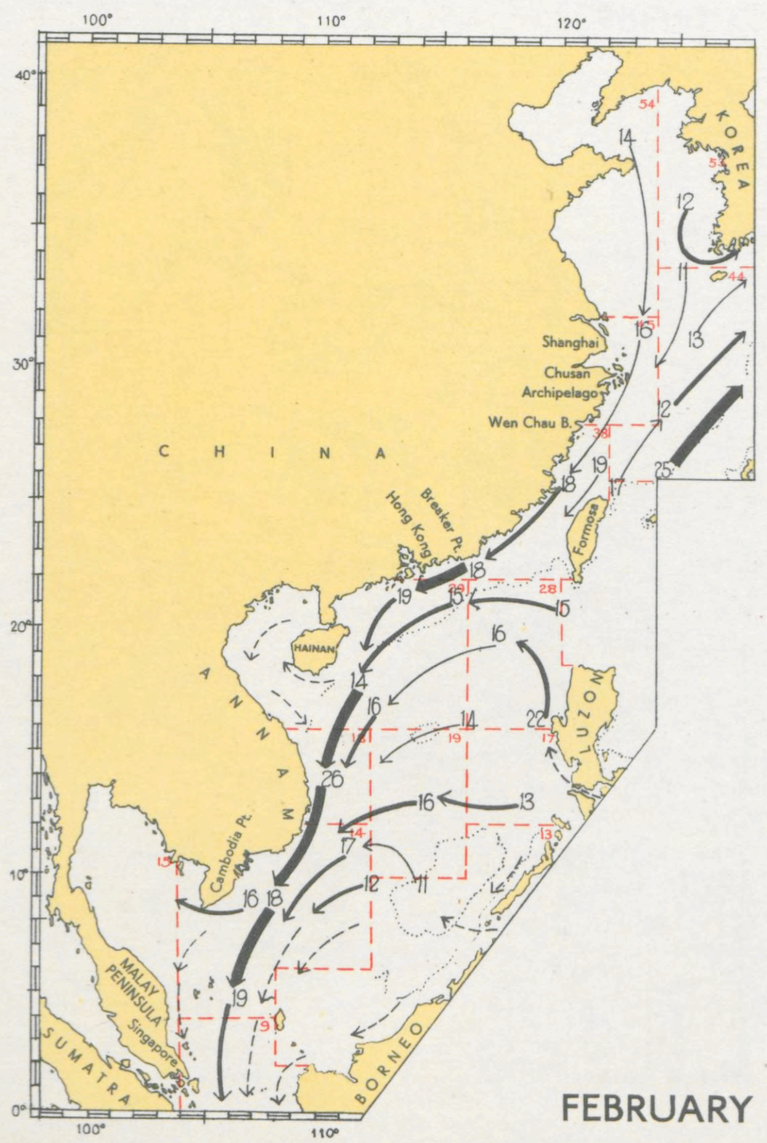


JANUARY



FEBRUARY

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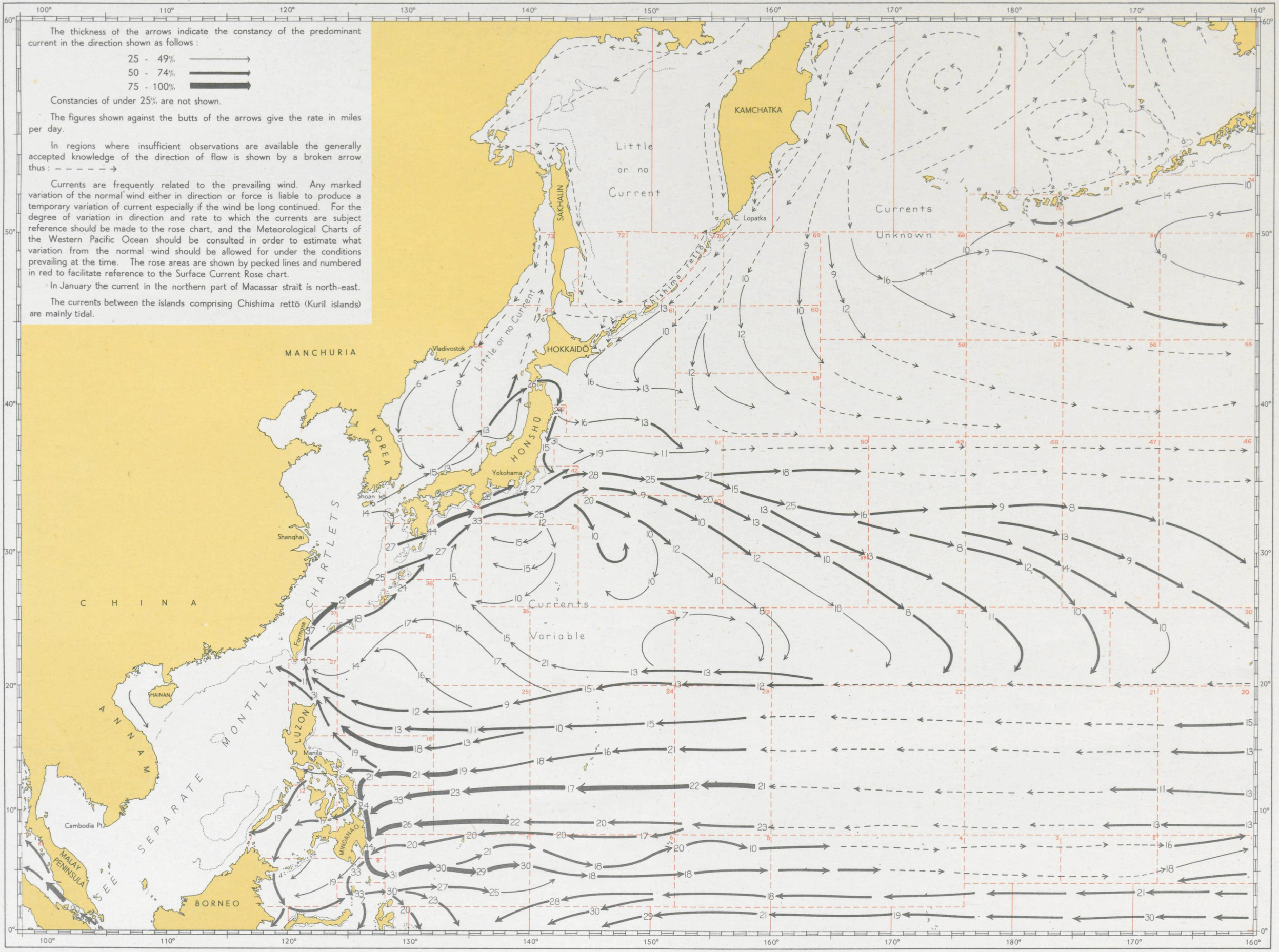
In January the current in the northern part of Macassar strait is north-east.

The currents between the islands comprising Chishima rettō (Kuril islands) are mainly tidal.



DECEMBER JANUARY FEBRUARY

SURFACE CURRENT ROSES

MARCH APRIL MAY

Arrows flow with the current, length represents frequency, thickness, strength.

6-12 miles per day
13-24 ,, ,, ,,
25-48 ,, ,, ,,
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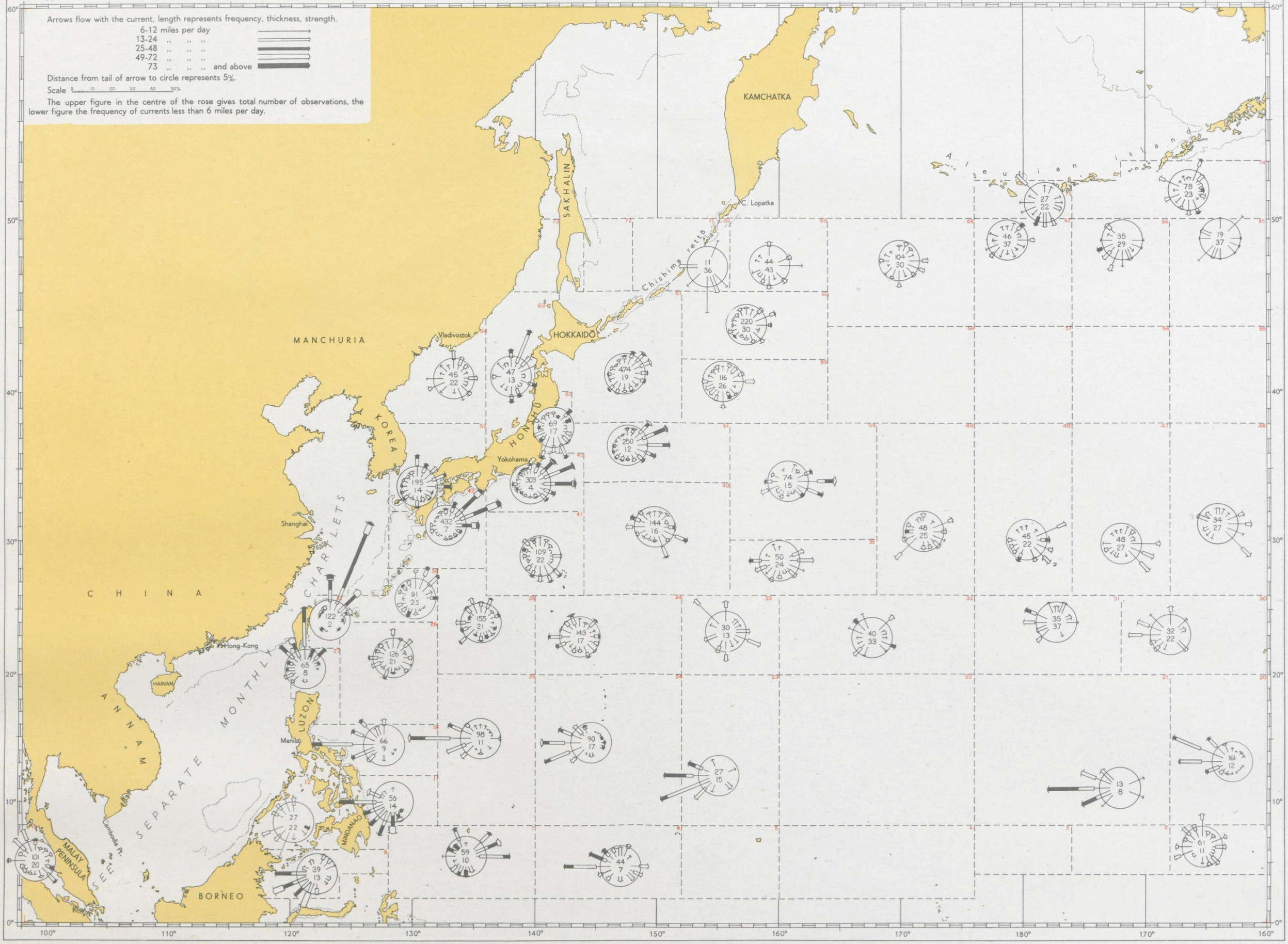
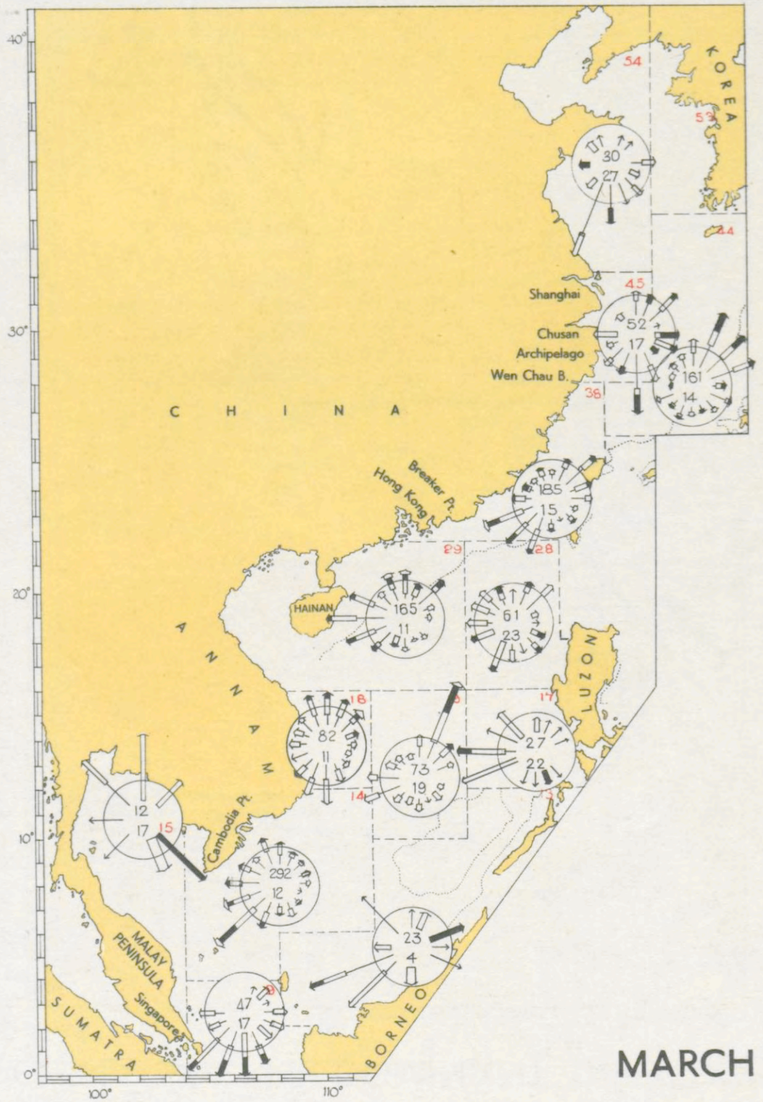
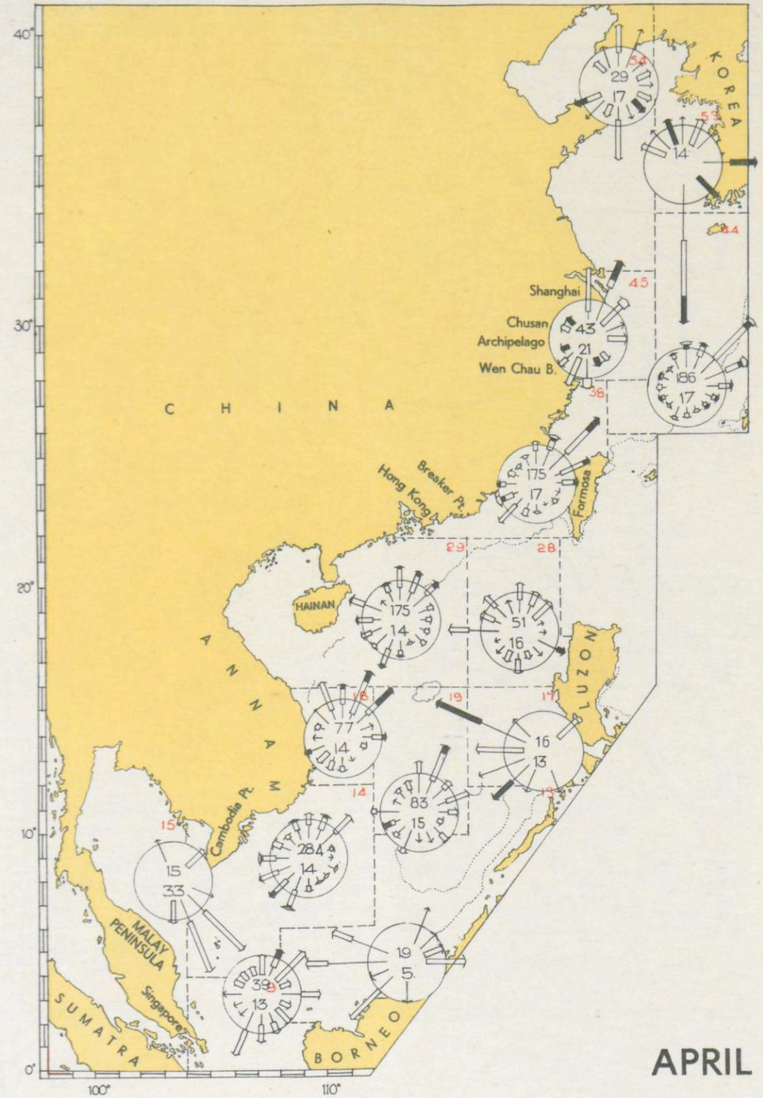


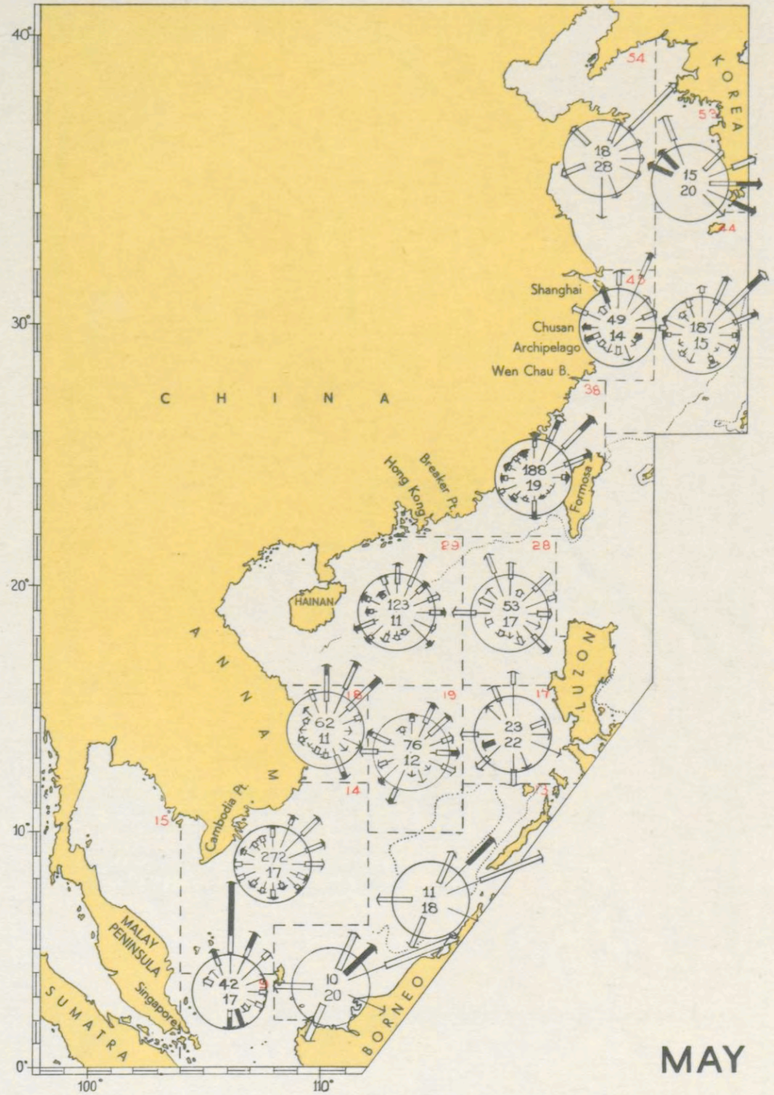
CHINA SEA, SURFACE CURRENT ROSES



MARCH

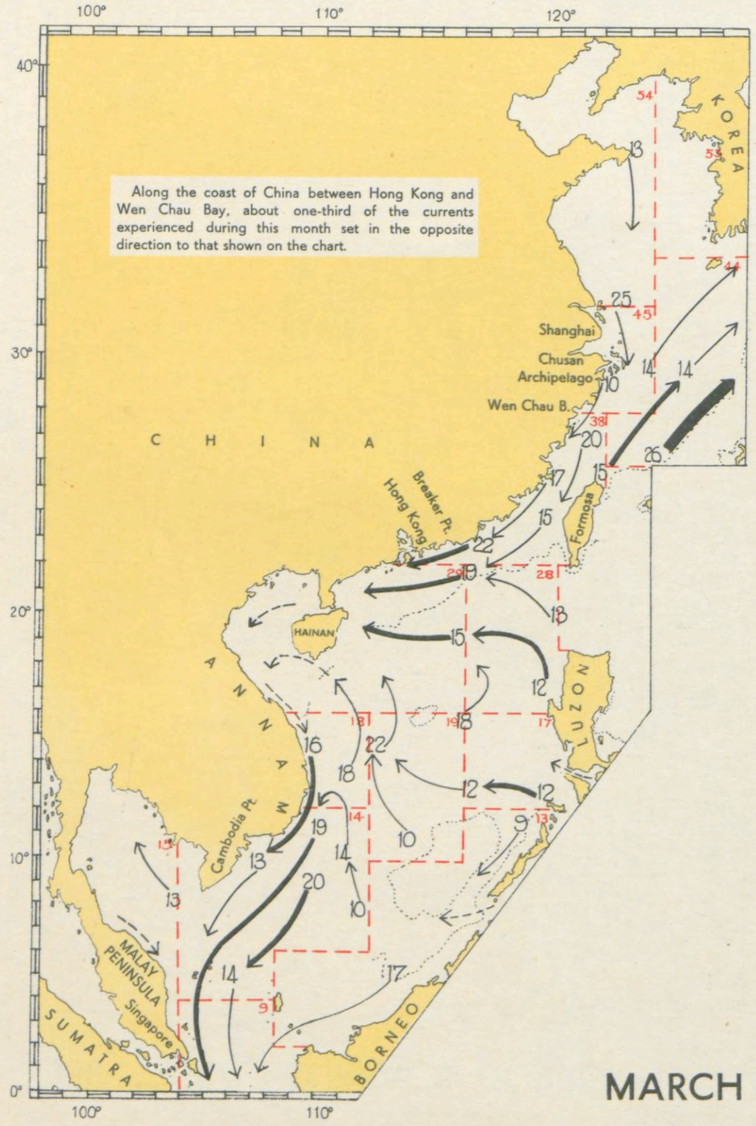


APRIL

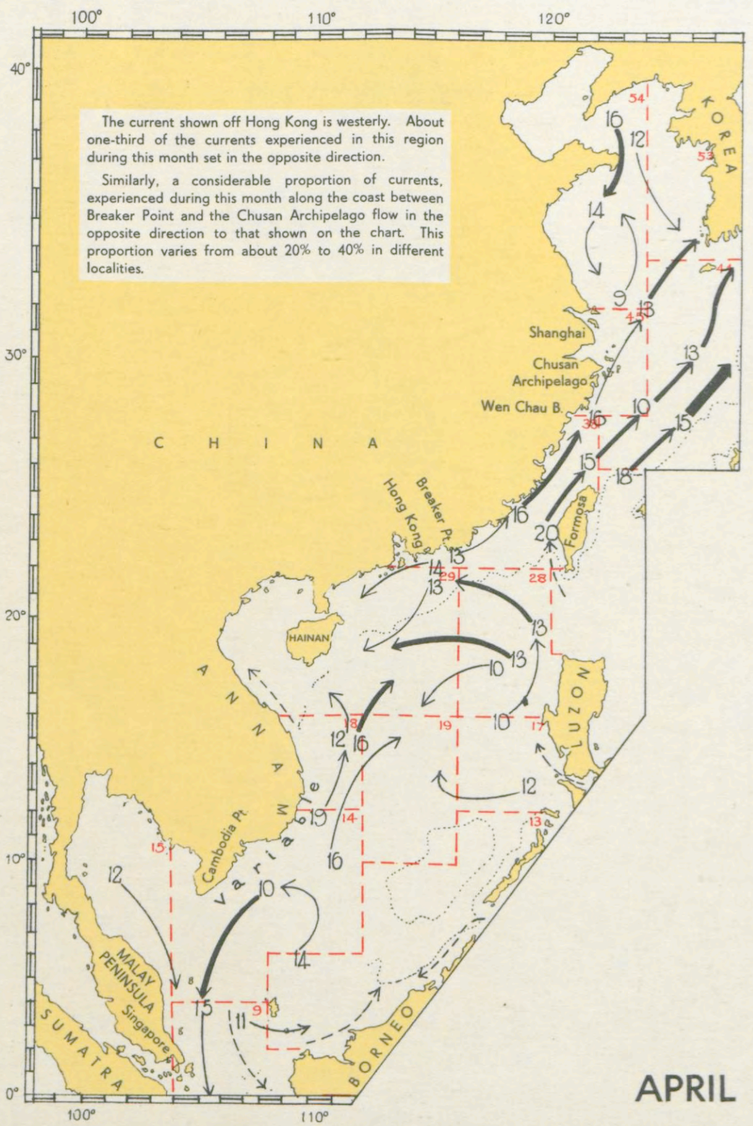


MAY

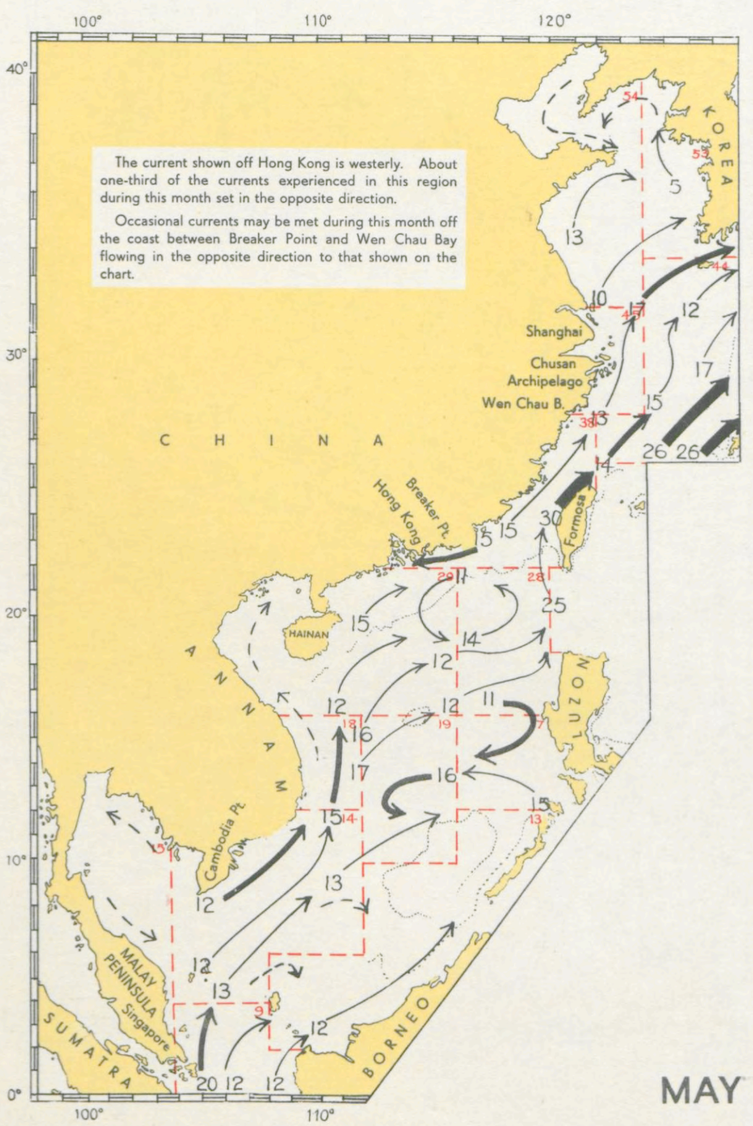
CHINA SEA, PREDOMINANT DIRECTION AND RATE



MARCH



APRIL



MAY

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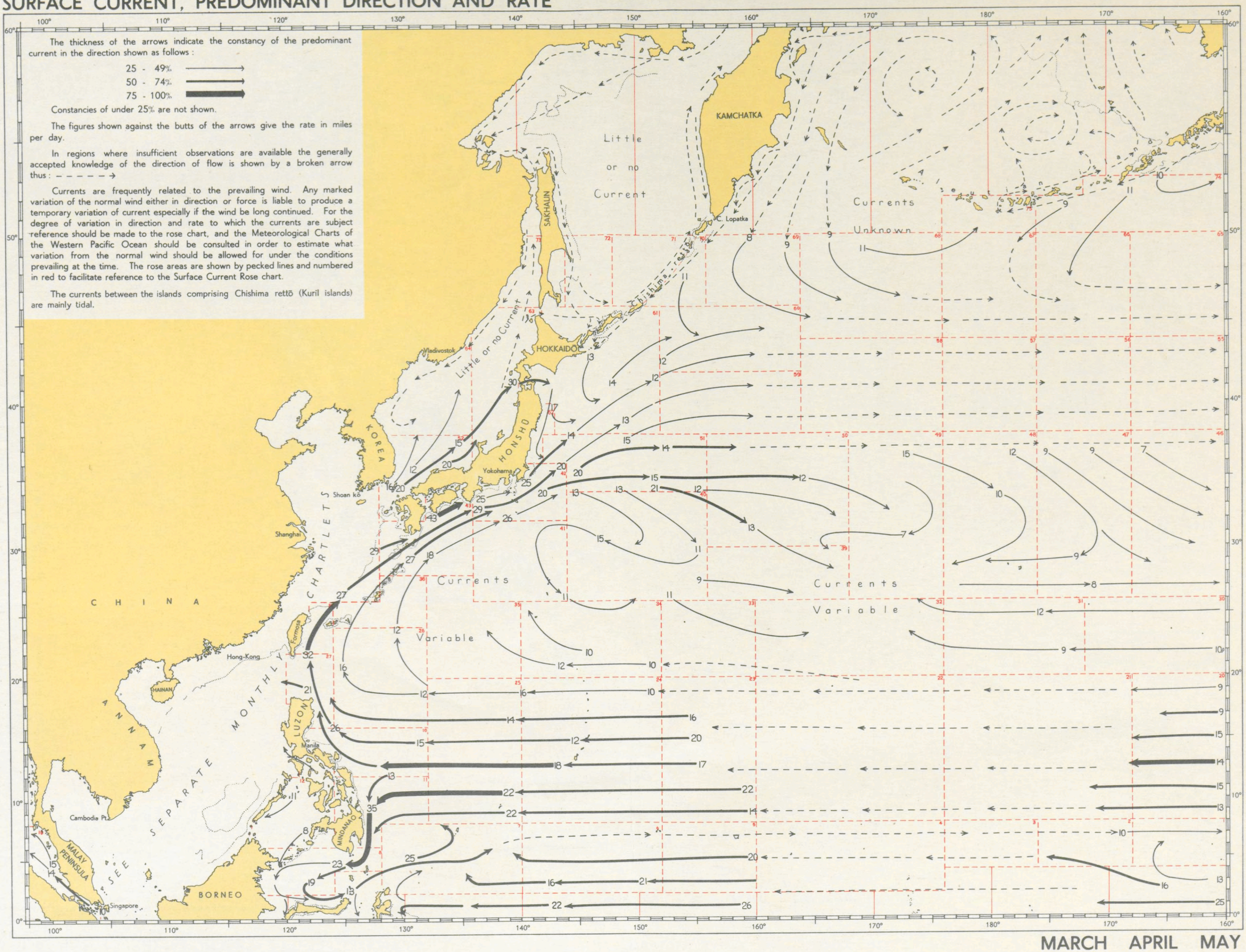
The currents between the islands comprising Chishima rettō (Kuril islands) are mainly tidal.



MARCH APRIL MAY

SURFACE CURRENT ROSES

JUNE JULY AUGUST

Arrows flow with the current, length represents frequency, thickness, strength.

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13-24 ,, ,, ,,
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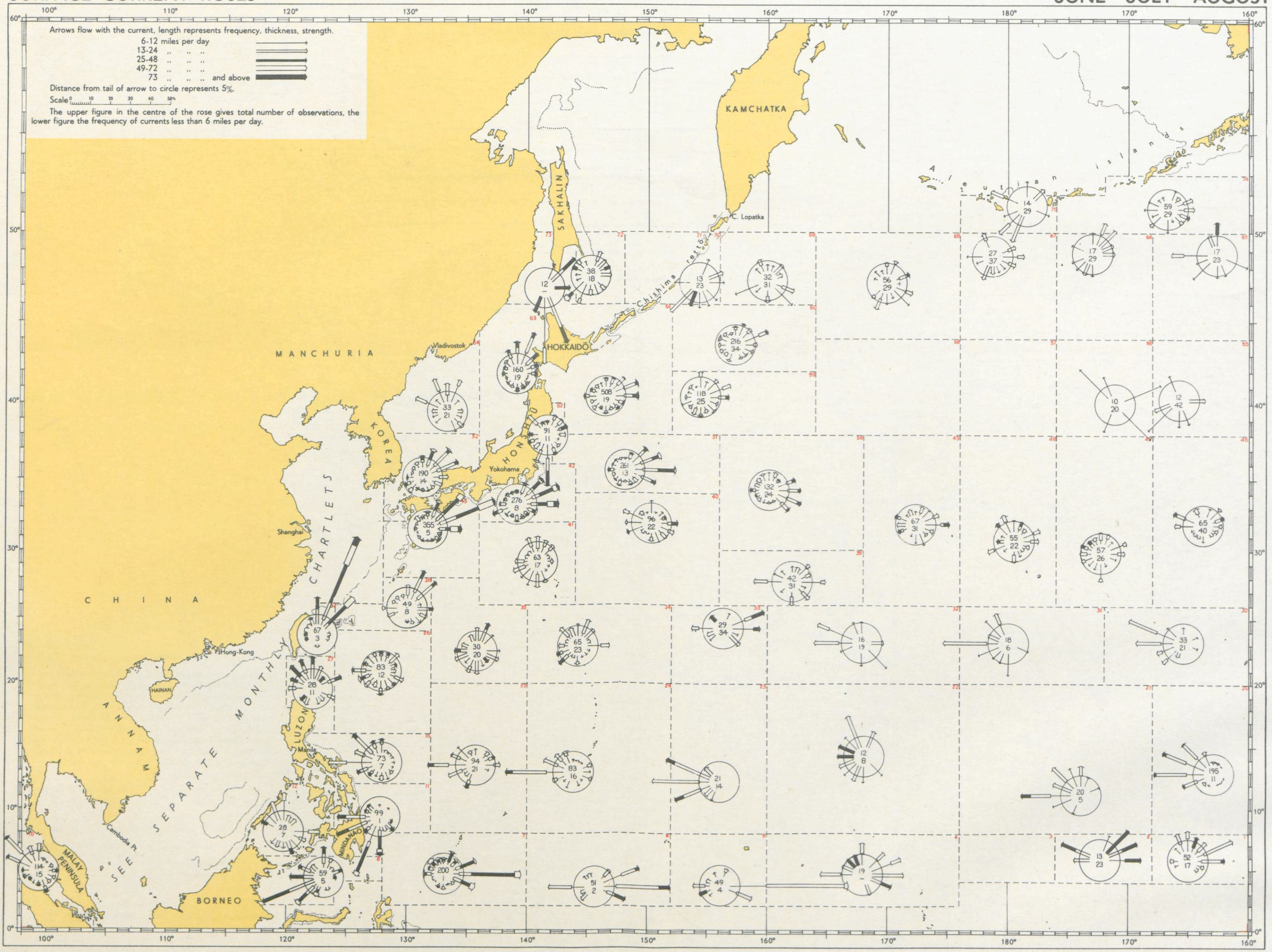
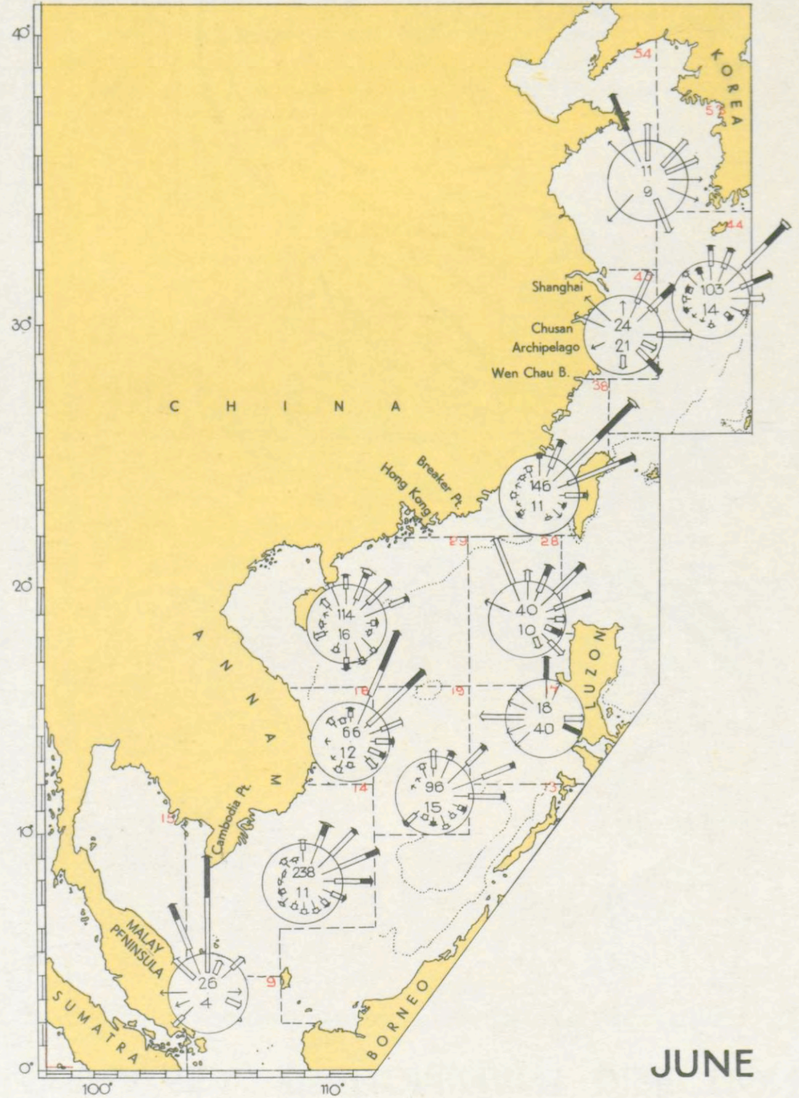
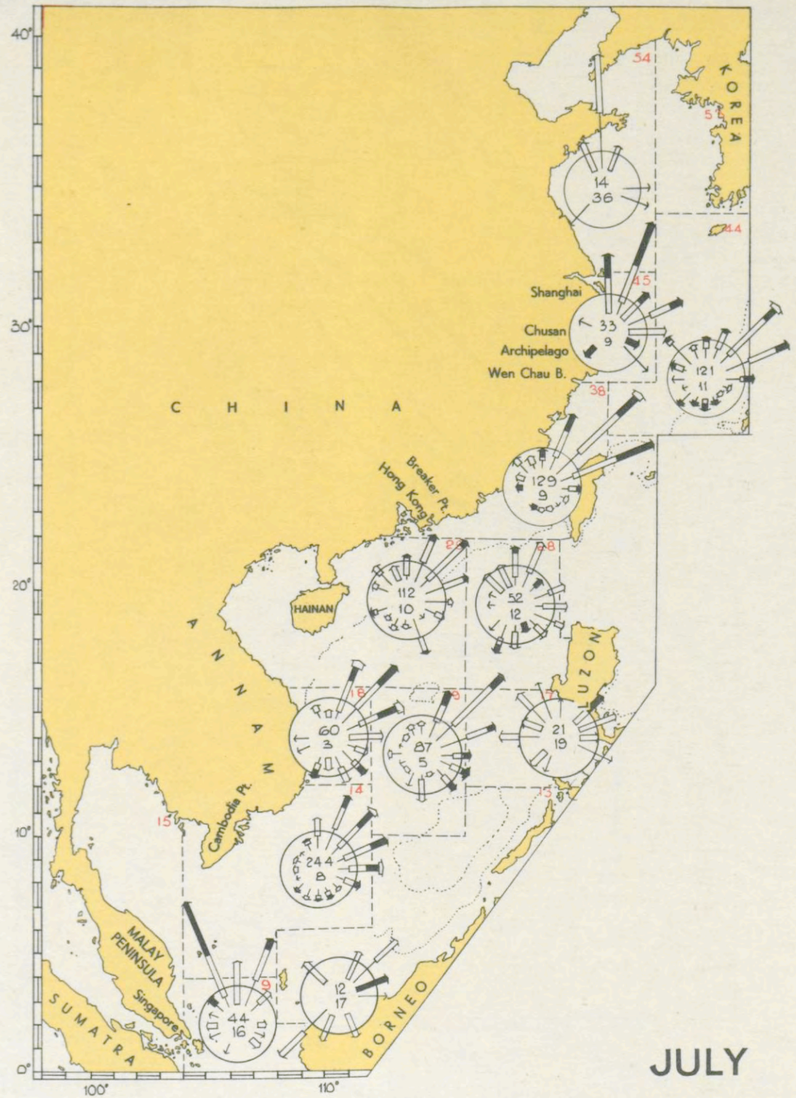


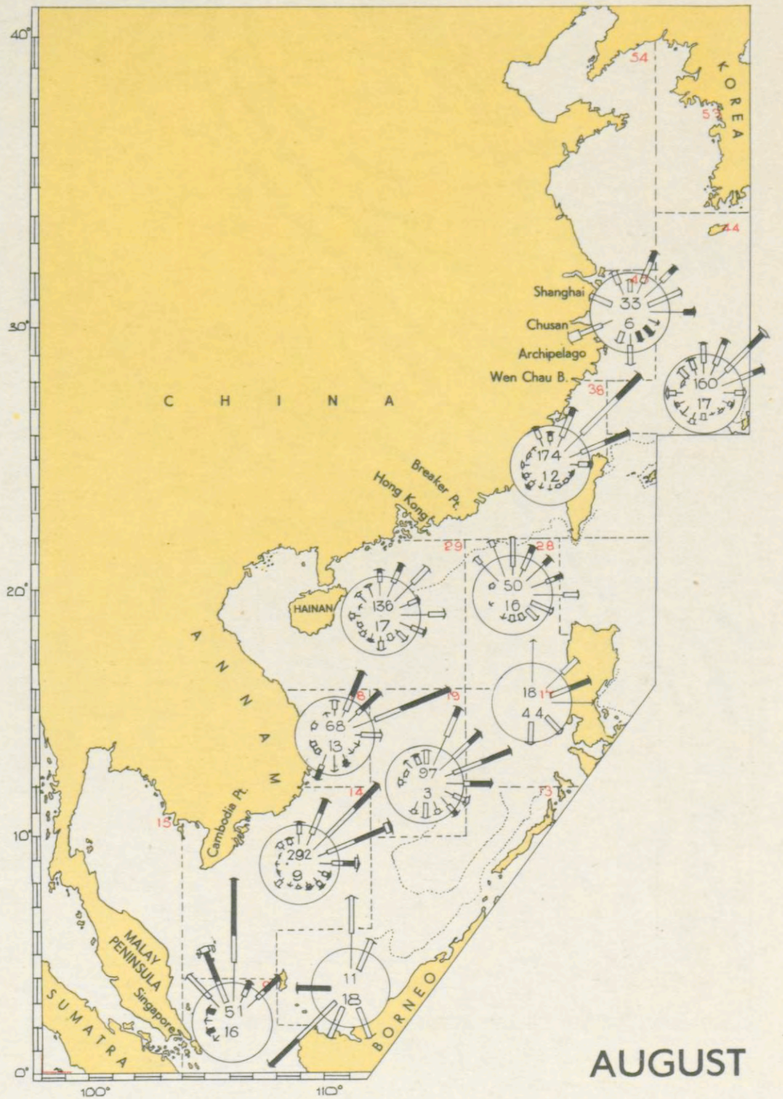
CHINA SEA, SURFACE CURRENT ROSES



JUNE

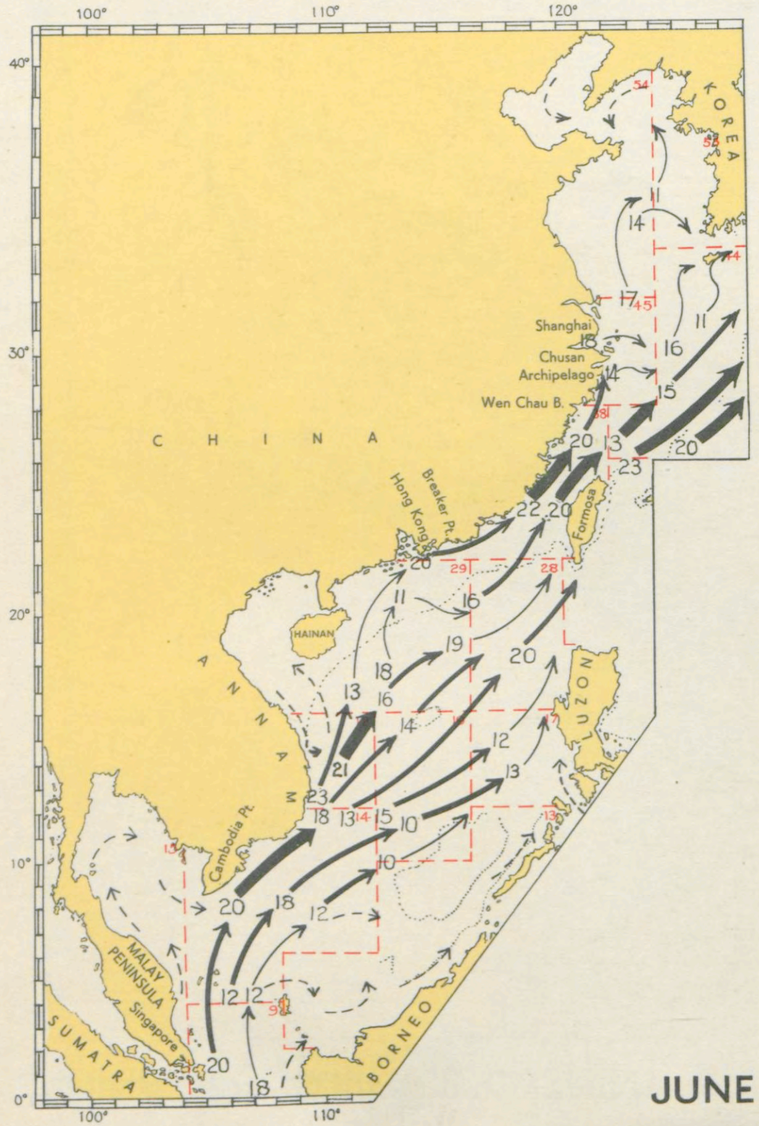


JULY



AUGUST

CHINA SEA, PREDOMINANT DIRECTION AND RATE



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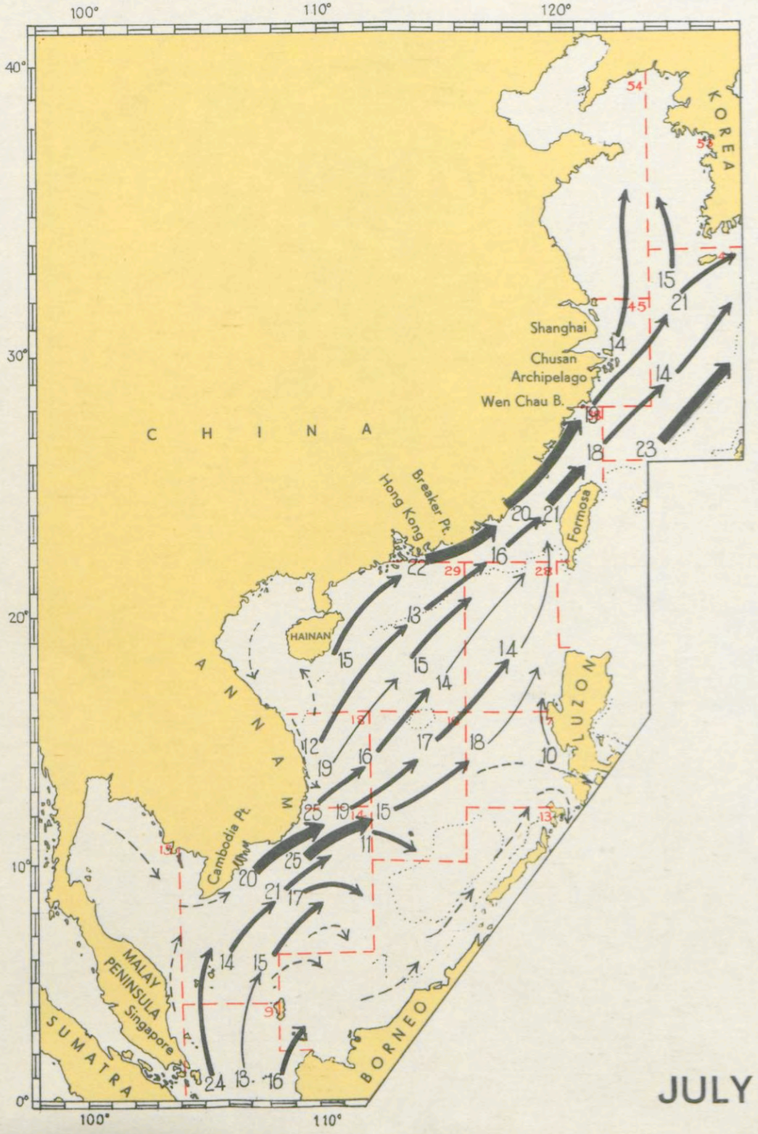
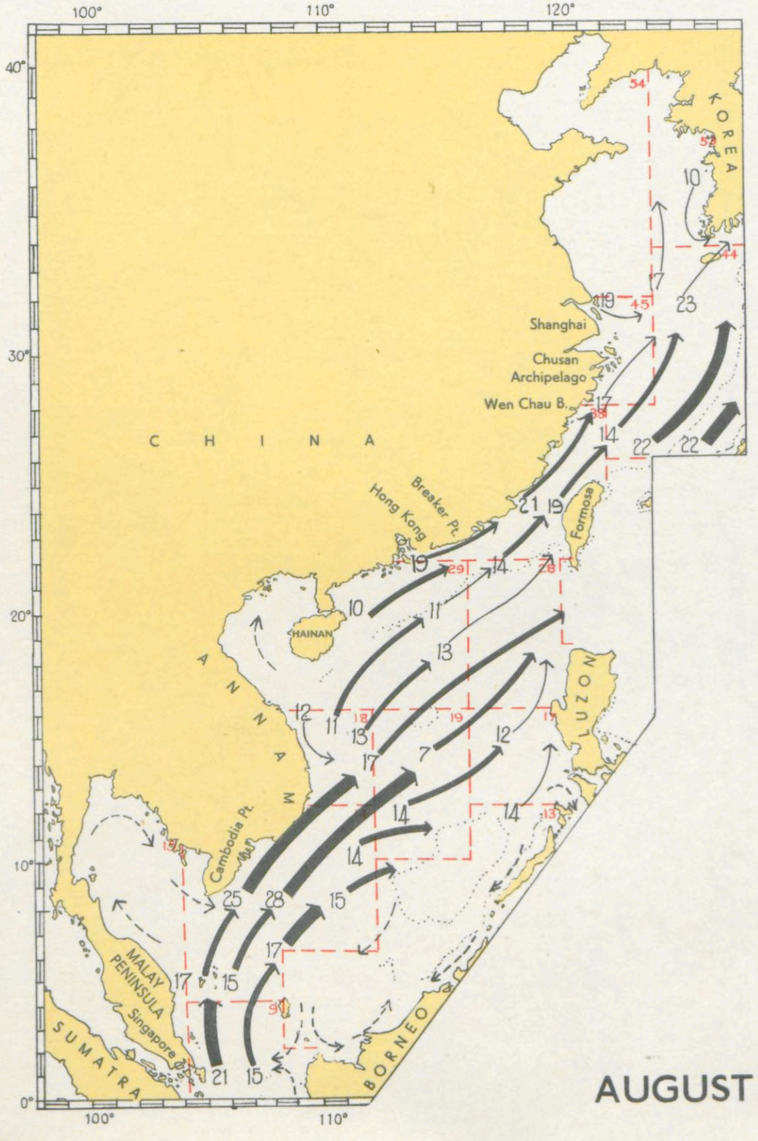


JULY



AUGUST

SURFACE CURRENT, PREDOMINANT DIRECTION AND RATE

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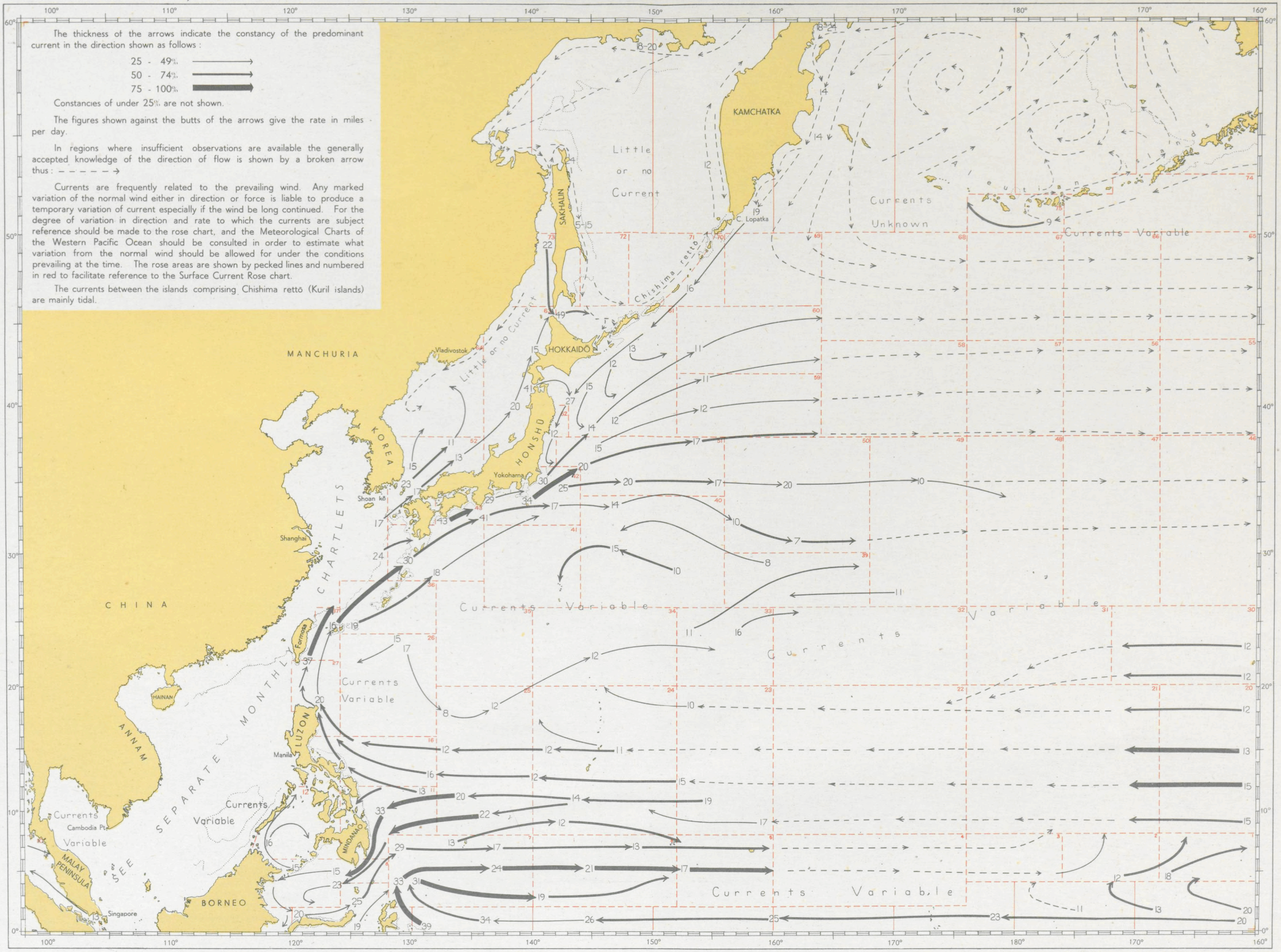
The currents between the islands comprising Chishima rettō (Kuril islands) are mainly tidal.



JUNE JULY AUGUST

SURFACE CURRENT, VECTOR MEANS

SEPTEMBER OCTOBER NOVEMBER

Arrows flow with the current and represent its mean resultant direction and strength in each region. The mean position of the observations is at the centre of each arrow. The upper figure is the strength in miles per day, to the nearest mile ; the lower figure is the number of observations. The length and thickness of each arrow represents strength, on the following scale :

1 - 5	miles per day
6 - 12	,, ,, ,,
13 - 24	,, ,, ,,
25 - 36	,, ,, ,,
37	,, ,, ,, and above

The rose areas are shown by pecked lines and numbered in red to facilitate reference to the rose chart.

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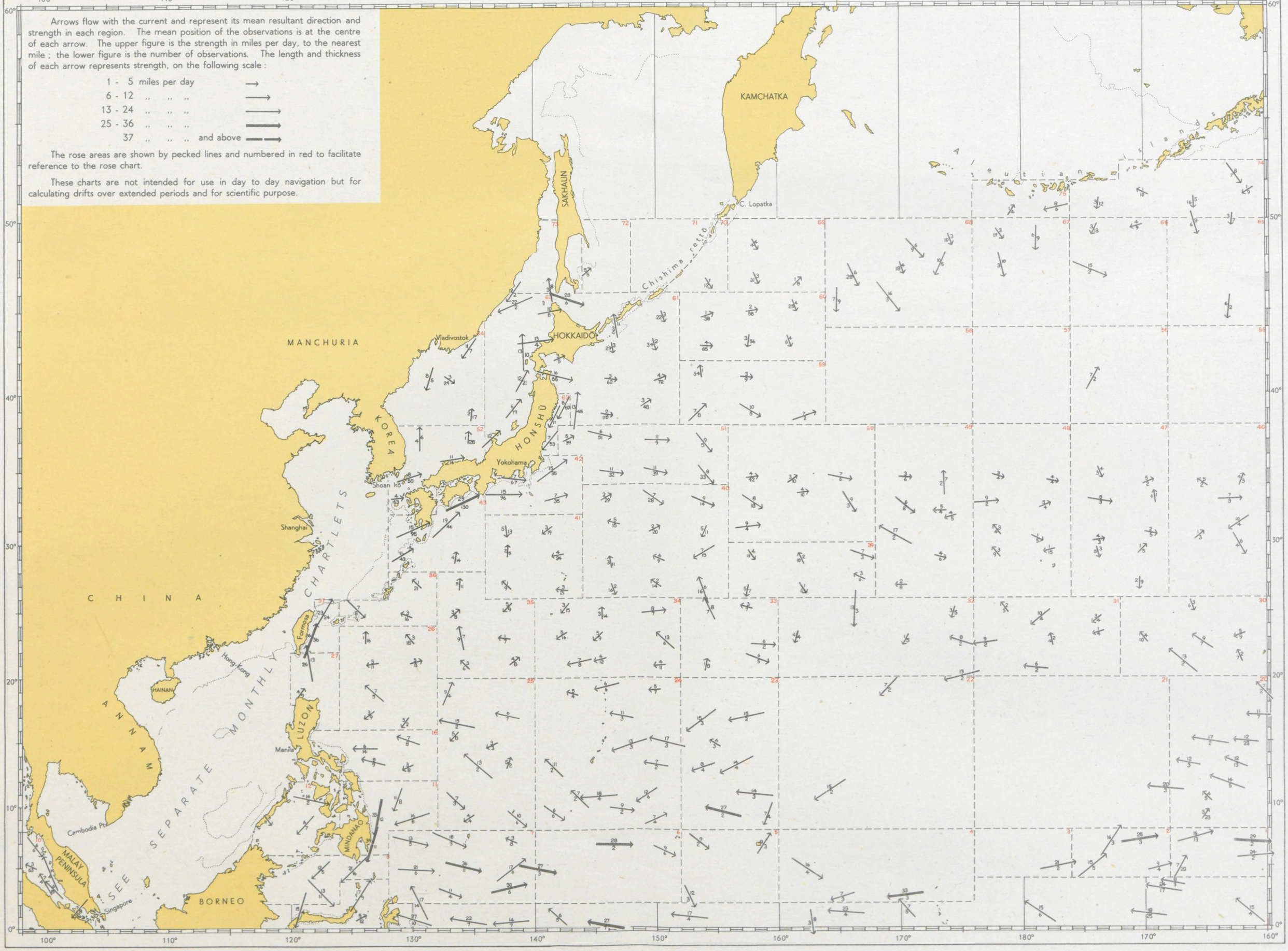
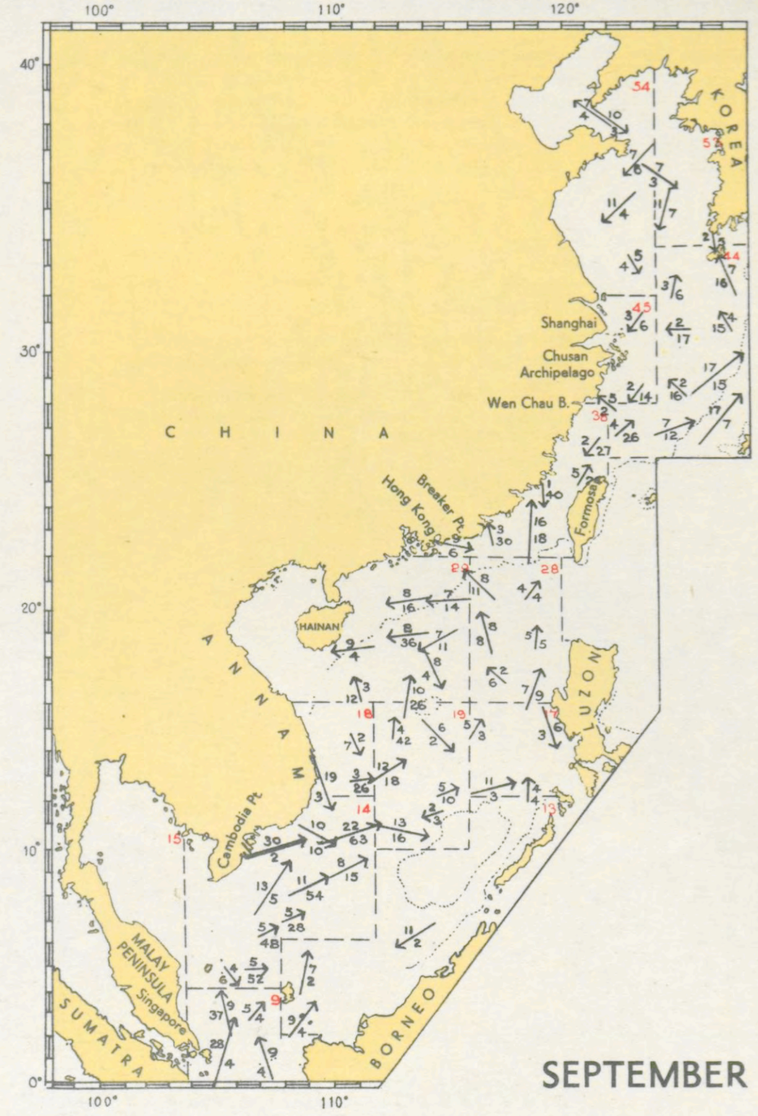


CHINA SEA, VECTOR MEANS



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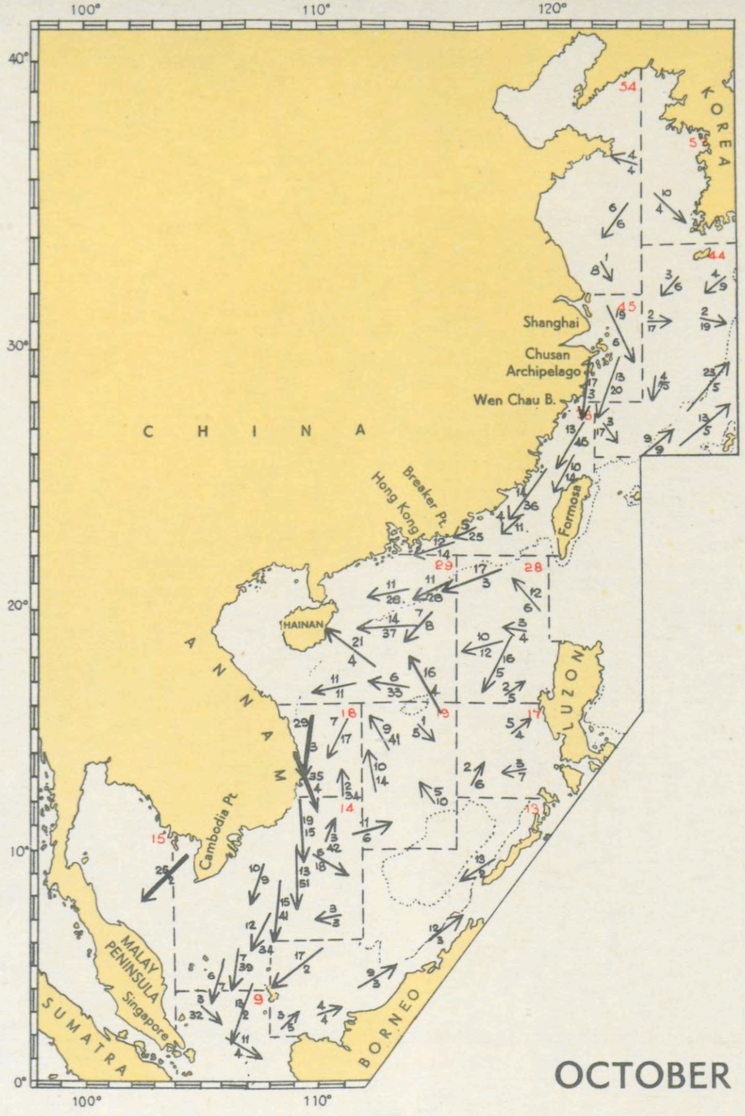

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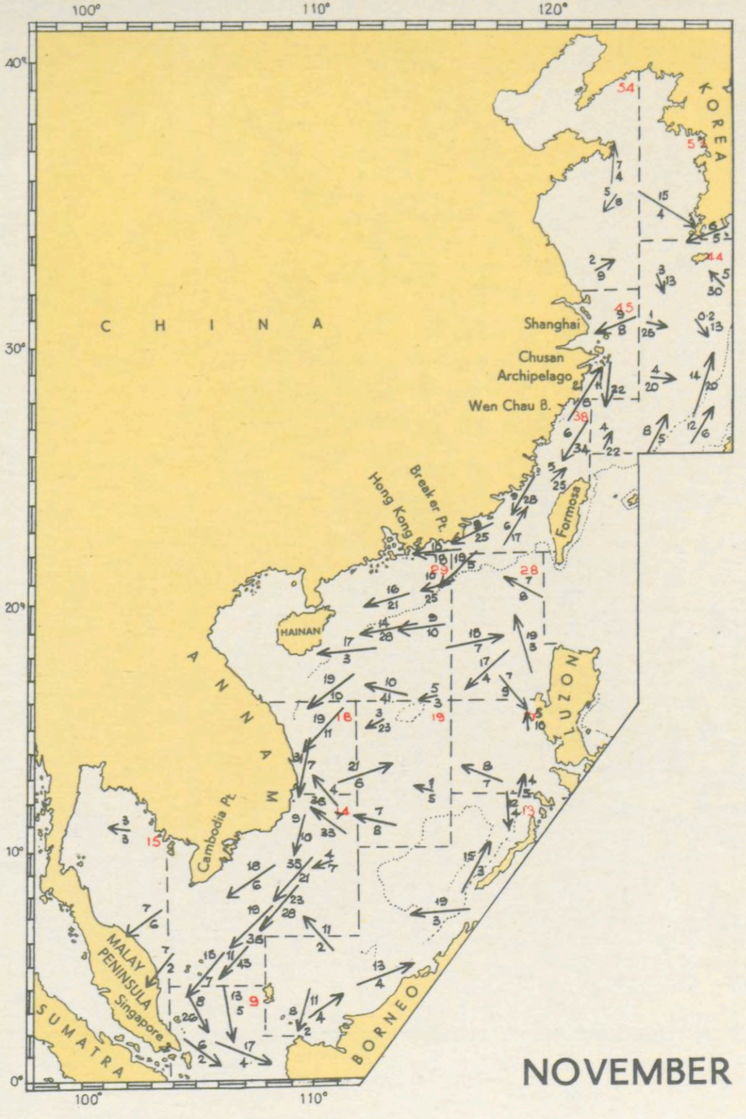

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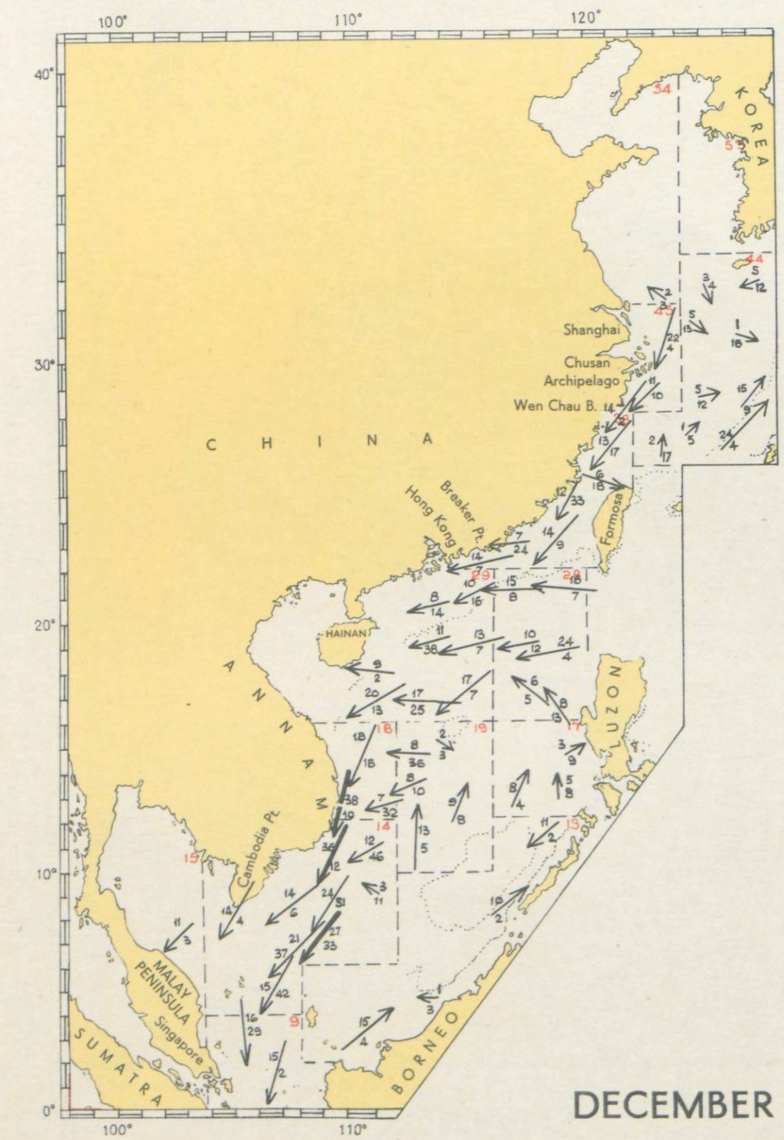
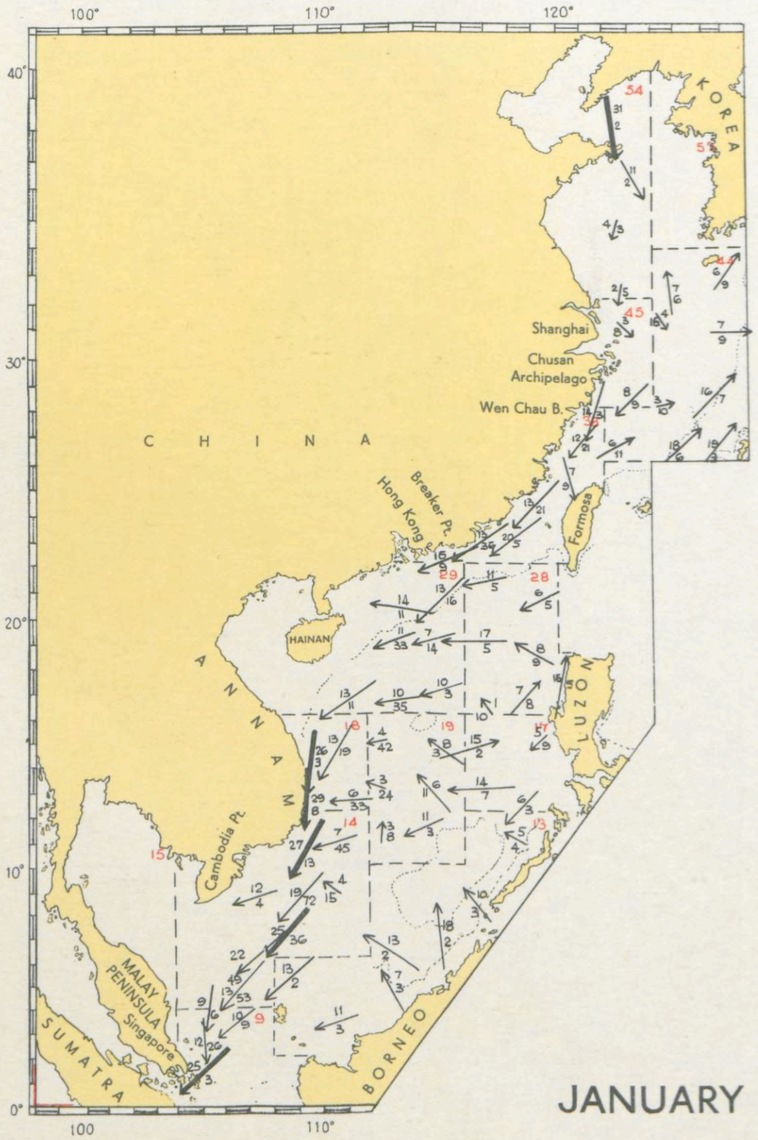
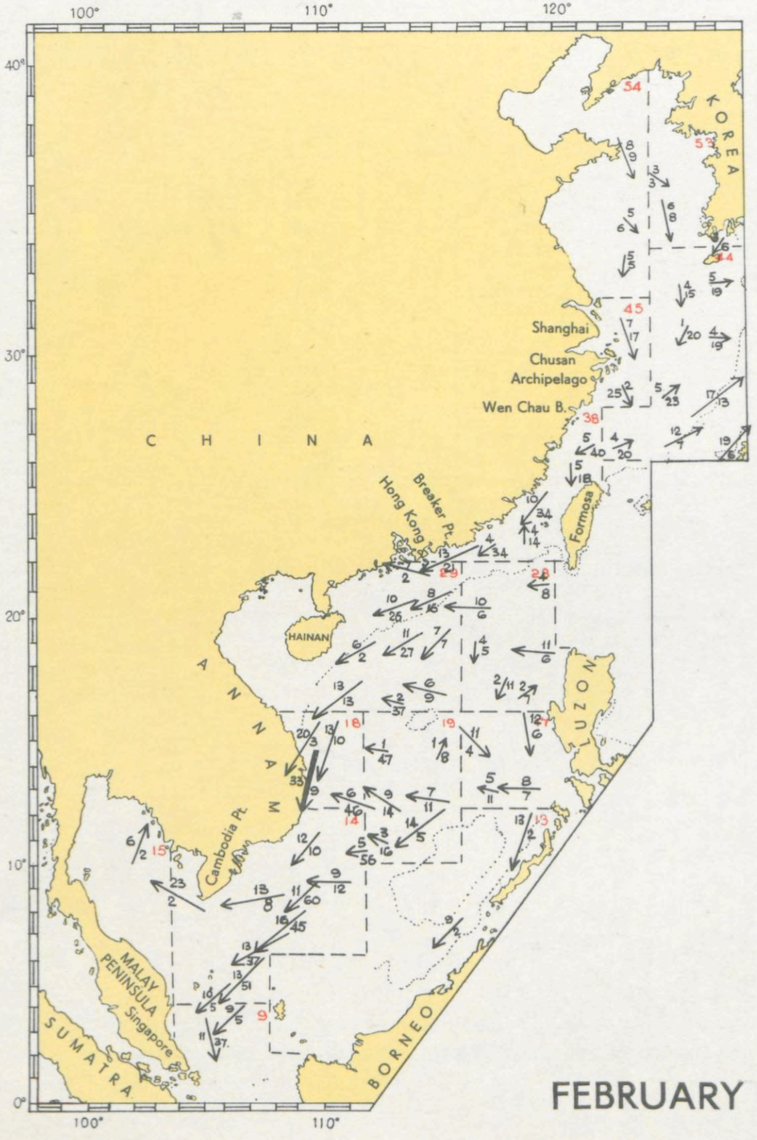


DECEMBER



JANUARY



FEBRUARY

SURFACE CURRENT, VECTOR MEANS

Arrows flow with the current and represent its mean resultant direction and strength in each region. The mean position of the observations is at the centre of each arrow. The upper figure is the strength in miles per day, to the nearest mile ; the lower figure is the number of observations. The length and thickness of each arrow represents strength, on the following scale :

1 - 5	miles per day	→
6 - 12	,, ,, ,,	⟶
13 - 24	,, ,, ,,	⟶
25 - 36	,, ,, ,,	⟶
37	,, ,, ,, and above	⟶

The rose areas are shown by pecked lines and numbered in red to facilitate reference to the rose chart.

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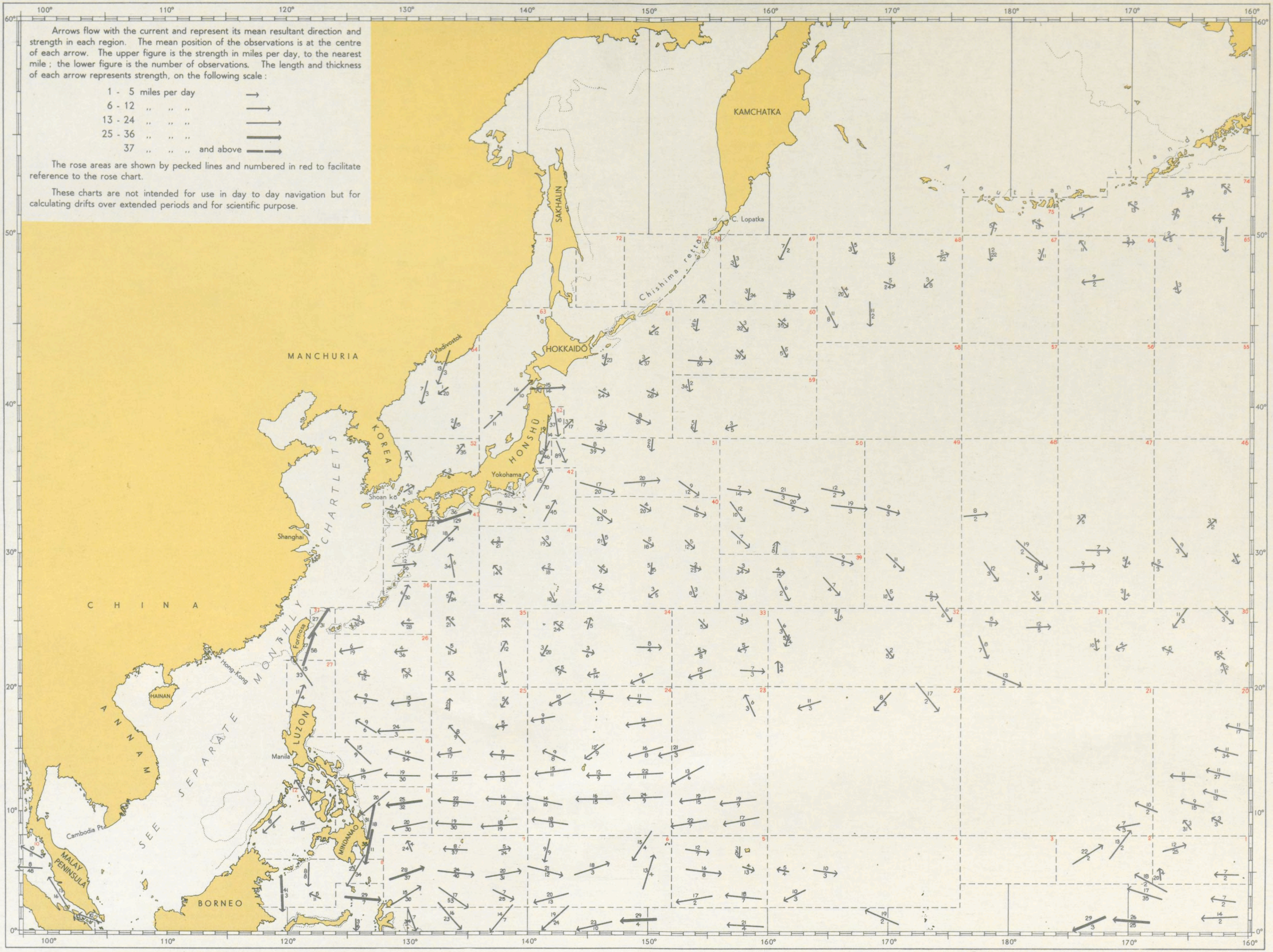

DECEMBER JANUARY FEBRUARY

SURFACE CURRENT, VECTOR MEANS

MARCH APRIL MAY

Arrows flow with the current and represent its mean resultant direction and strength in each region. The mean position of the observations is at the centre of each arrow. The upper figure is the strength in miles per day, to the nearest mile ; the lower figure is the number of observations. The length and thickness of each arrow represents strength, on the following scale :

1 - 5 miles per day	→
6 - 12 ,, ,, ,,	→
13 - 24 ,, ,, ,,	→
25 - 36 ,, ,, ,,	→
37 ,, ,, ,, and above	→

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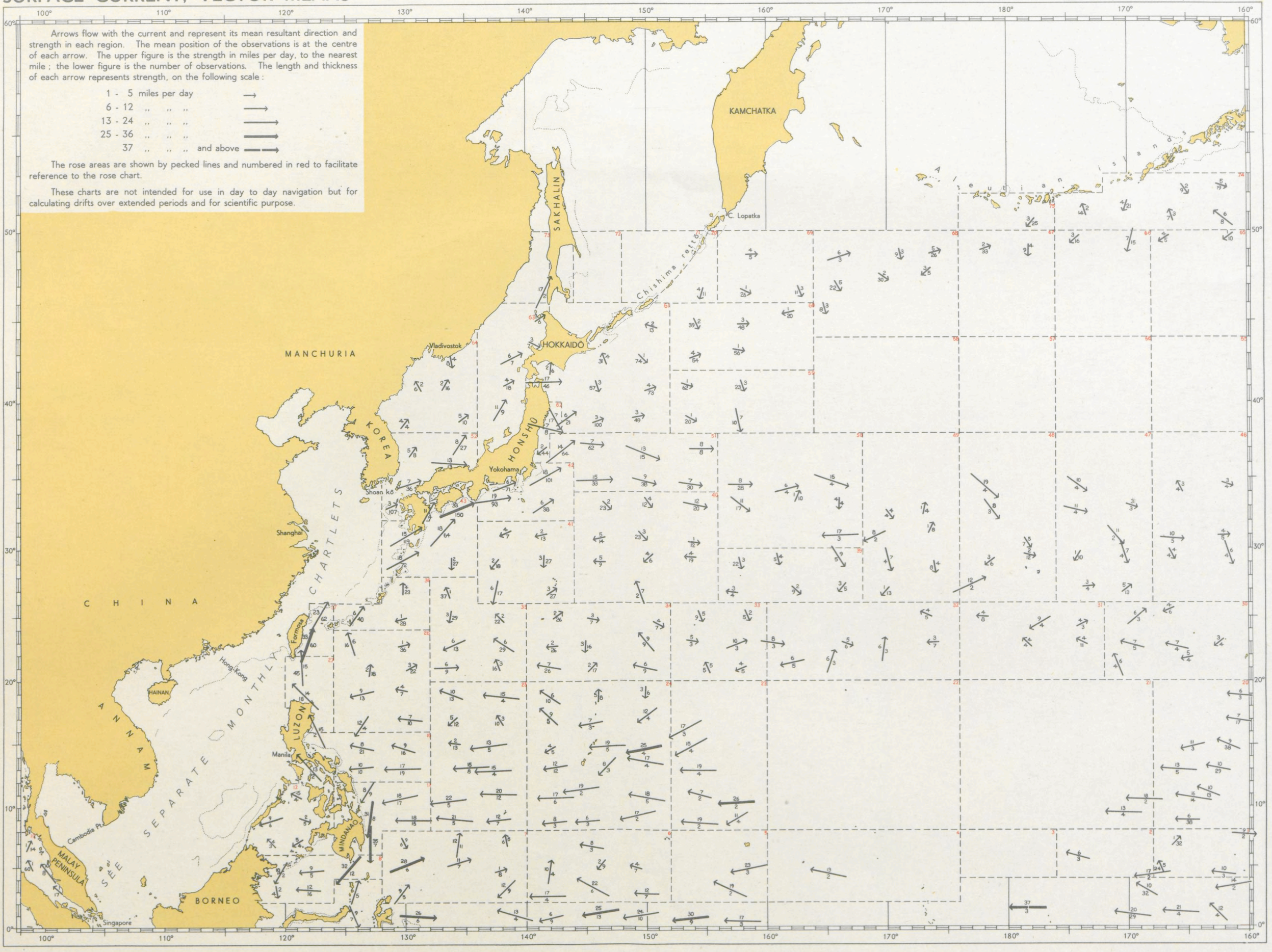
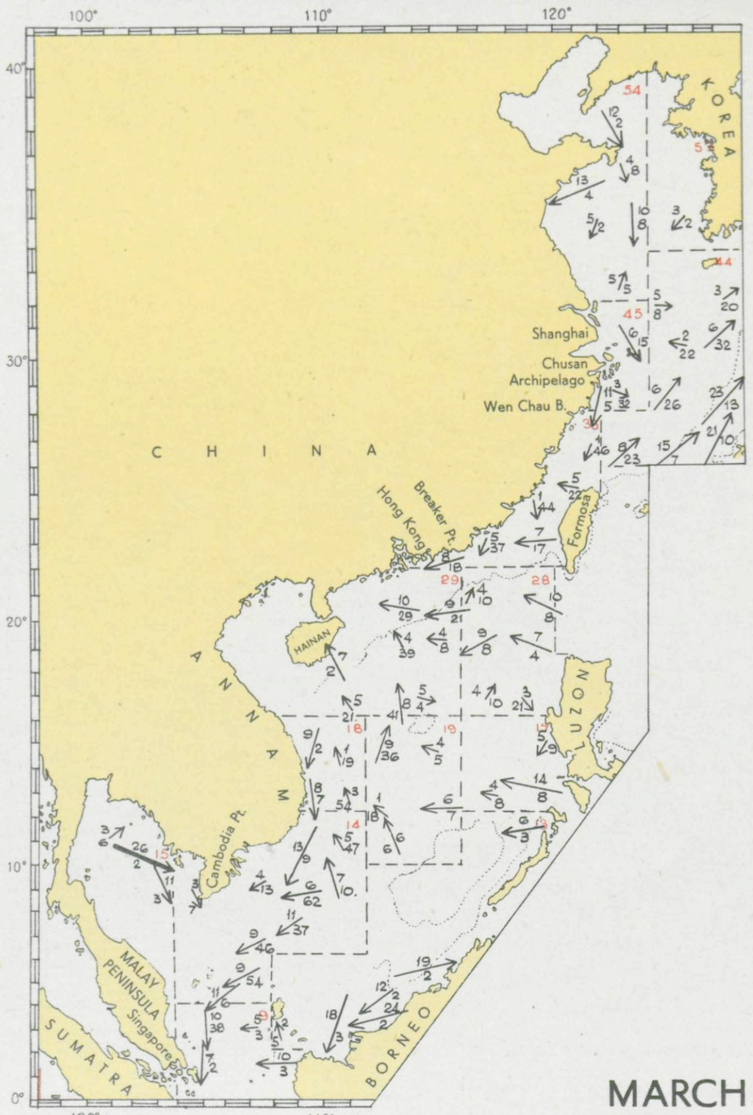


CHINA SEA, VECTOR MEANS



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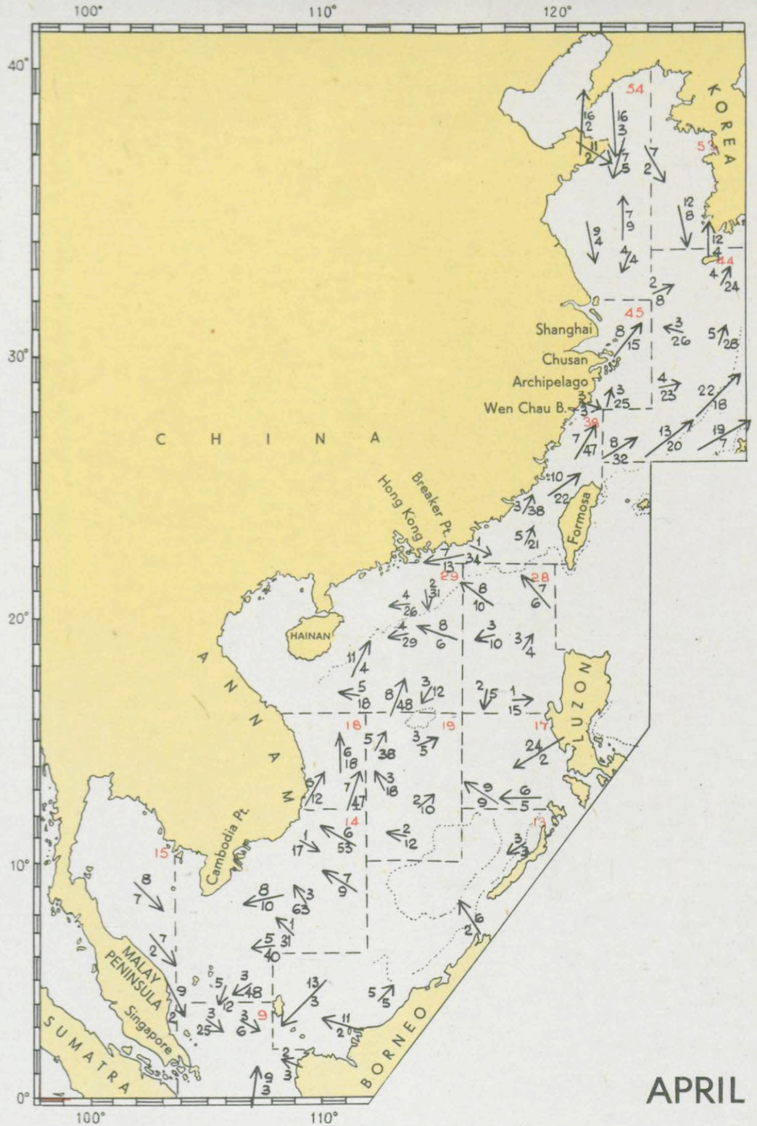
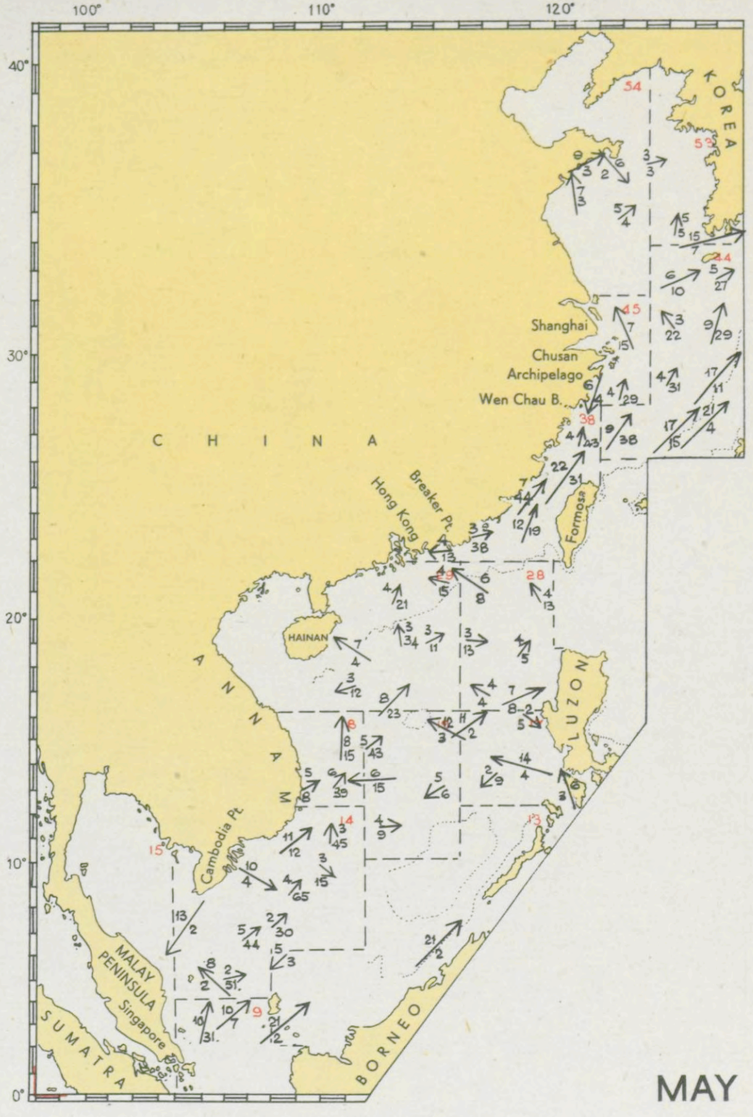
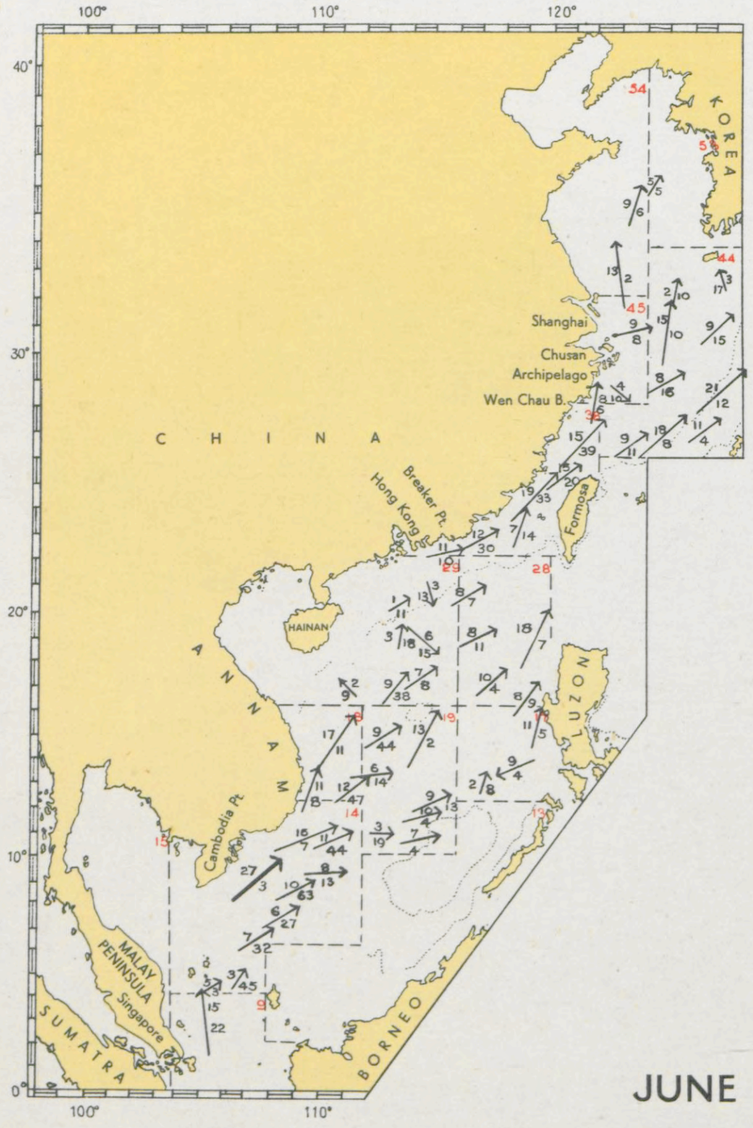


APRIL

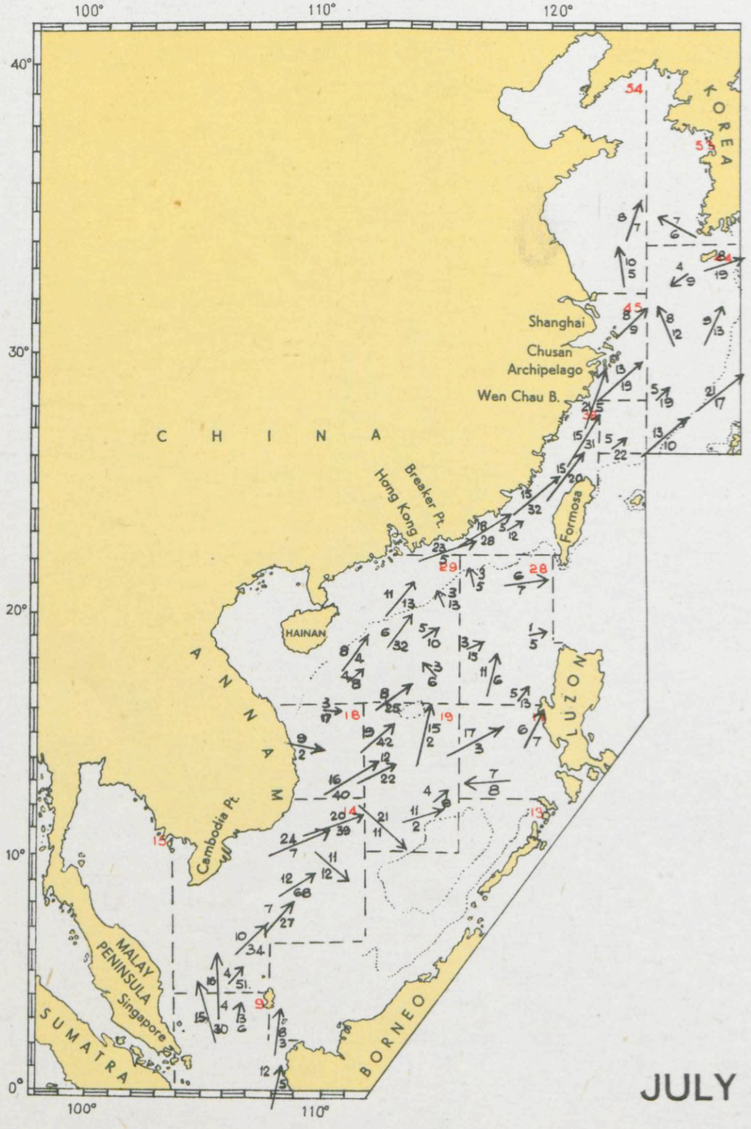


MAY

CHINA SEA, VECTOR MEANS



JUNE



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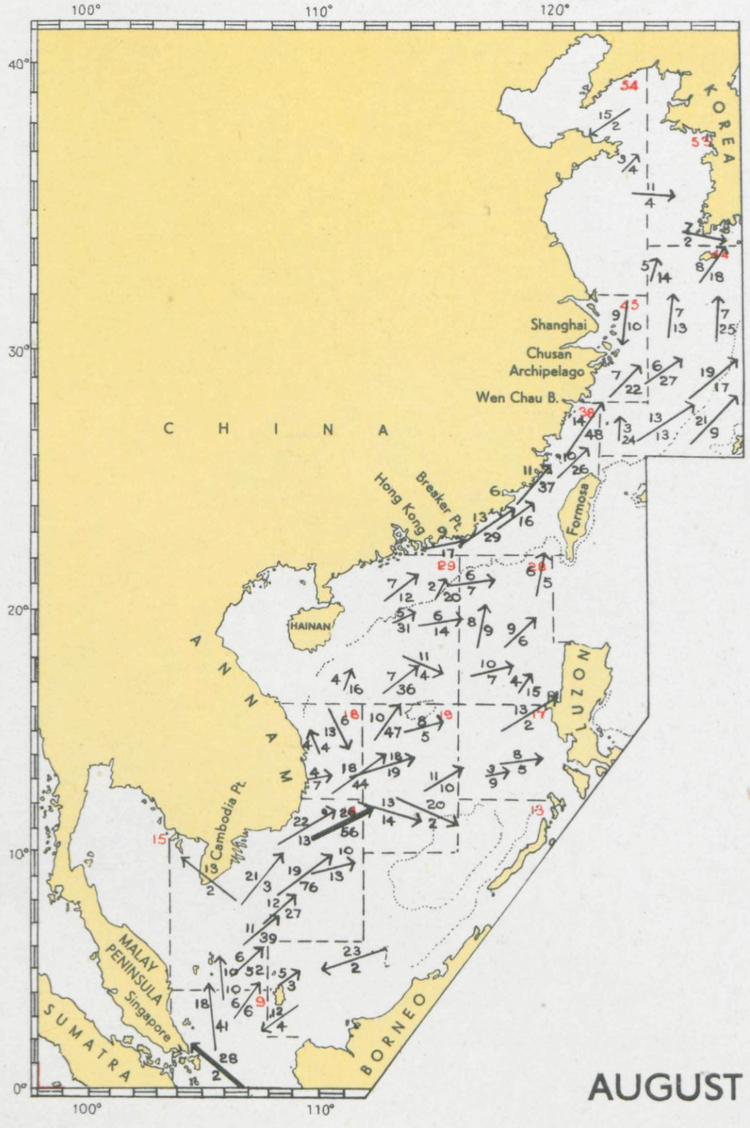

AUGUST

SURFACE CURRENT, VECTOR MEANS

Arrows flow with the current and represent its mean resultant direction and strength in each region. The mean position of the observations is at the centre of each arrow. The upper figure is the strength in miles per day, to the nearest mile ; the lower figure is the number of observations. The length and thickness of each arrow represents strength, on the following scale :

1 - 5 miles per day	→
6 - 12 ,, ,, ,,	⟶
13 - 24 ,, ,, ,,	⟶
25 - 36 ,, ,, ,,	⟶
37 ,, ,, ,, and above	⟶

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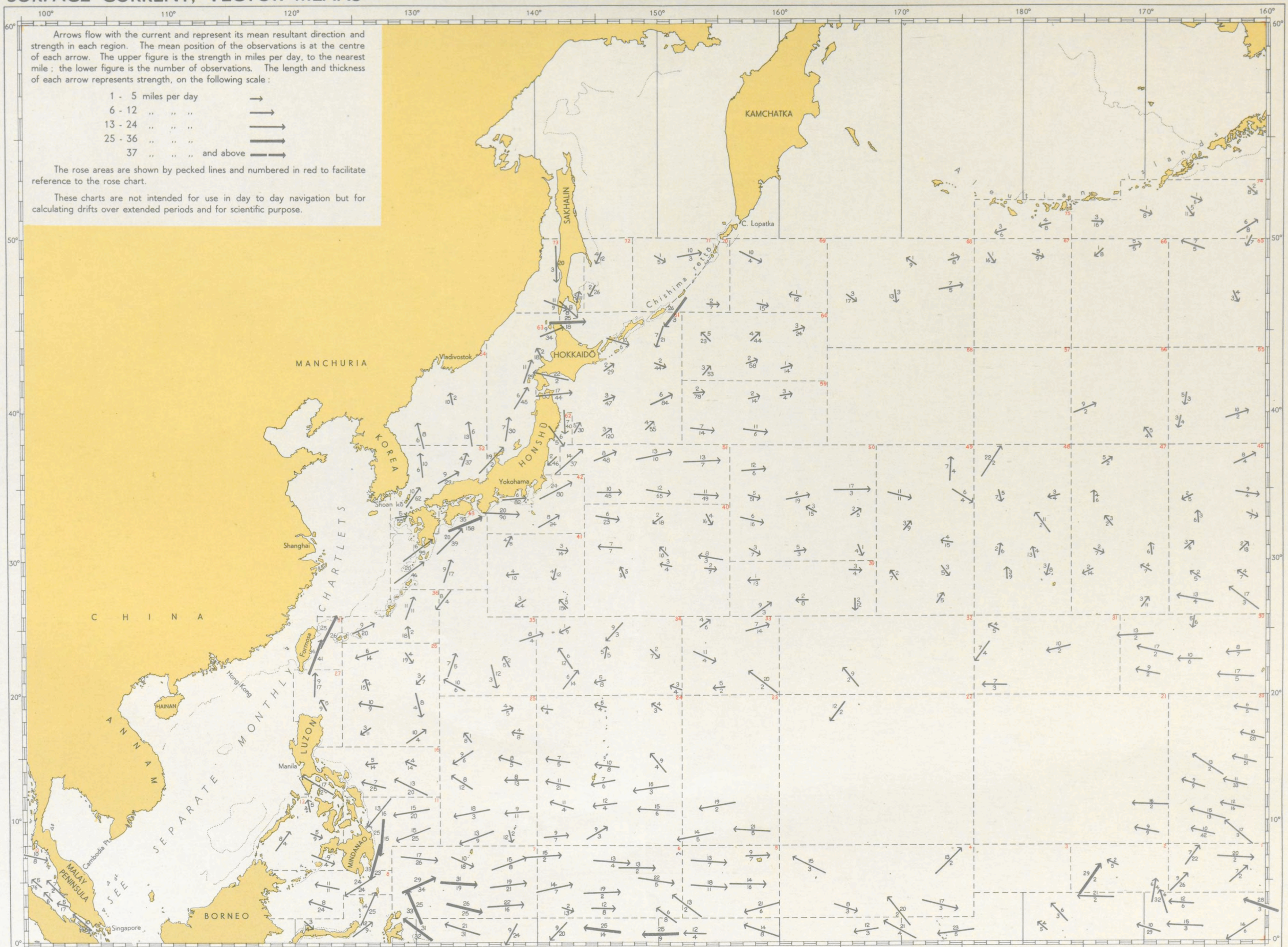

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