

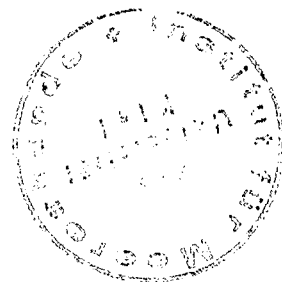
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General Atmospheric Circulation and Weather
Conditions in the Greenland-Scotland Area for
August and September 1973*

by

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*Overflow '73-Expedition Contribution No. 17

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Introduction

This report is a summary on weather conditions in the Greenland-Scotland area for the period August to September 1973 when the ICES Expedition Overflow '73 was carried out (1). Maps of mean monthly values and their deviations from long-term means are given for sea level and 500 mb together with twice-daily synoptic surface pressure distributions and a few tables on wind statistics. The data set is intended to supplement the oceanographic observations in this area and thus help to elucidate the dynamics of the water mass exchange between the Atlantic Ocean and the adjacent Norwegian and Greenland Seas.

Data Sources

For the evaluation of the actual atmospheric conditions in the Overflow '73 area all observations according to WMO-routine from research vessels (observations from Bj. Saemundsson, B. Davydov, Explorer, Hudson, Meerkatze 2, Meteor and W. Herwig were available to the authors), fishing vessels, weather ships and appropriate land stations were compiled in the Seewetteramt Hamburg and used to construct the atmospheric pressure distributions at sea level for 06.00 and 18.00 GMT daily from August 1 to September 15, 1973. The maps on monthly mean conditions in August and September 1973 and their deviations from long-term means were constructed using grid point values computed by Deutscher Wetterdienst, Zentralamt Offenbach (2). This information is extracted by objective analysis from routinely available synoptic weather observations. The wind-statistics given in this report are based on observations of the research vessels Bj. Saemundsson, Explorer, Hudson, Meerkatze 2, Meteor and W. Herwig, which were sufficient for this purpose. Only values for synoptic GMT-hours (± 1 hour) were used. Climatological means for winds are tabulated according to (3) and (4).

Circulation

Map 1 shows the mean pressure distribution at sea level for August 1973. Prominent features are the climatological Iceland depression and another depression over Bear Isle. Although the deviations from long-term means as shown in map 2 are small, the Iceland and the Bear Isle depressions are significantly deeper than the climatological expectation. The mean height of the 500 mb level for August 1973 and its deviation from long-term means are given in maps 3 and 4. They also show a more intense Iceland depression and a significant positive deviation over the North Sea and the British Isles. Compared with long-term mean values the gradients for the area between Iceland and Scotland (labelled as areas II and III in map 9) were stronger, thus resulting in an intensified circulation in this area. Since the frontal zone was cutting across area II/III from southwest towards northeast during August 1973, its steering effect on lower level processes resulted in simultaneous changes of pressure and wind fields for areas II and III, whereas those changes were different, partly even inverse for area I between Iceland and Greenland (see map 9).

Maps 5 to 8 demonstrate that for September 1973 the Iceland depression was located further west with its pressure level somewhat deepened. This is in agreement with climatology and in contrast to August 1973. Consequently the mean frontal zone was shifted into westerly direction and intensified. This took already place in the end of August. The depressions and their troughs were guided more often into area I, resulting in stronger pressure gradients there as compared to area II/III. In addition the orographic effect of the Greenlandic massif enforced the frequently occurring northeasterly winds in area I. In general, however, the changes of the atmospheric parameters were similar to August 1973, i.e. they were simultaneous for areas II and III and different in time and character for area I. The intensity of changes in area II/III, however, was less than in August, quite in contrast to area I.

Wind-Statistics

The frequency distributions of wind-forces as observed by selected research vessels are given in table 1. Since observation periods and number of observations are different, a comparison of individual vessels with respect to spatial differences is not meaningful. To relate the wind-statistics to the circulation as described before it was found feasible to compare an average from area II/III with the extremely homogeneous data set obtained by "Hudson" in area I. This comparison is given in table 2. It shows significant differences which are readily explained by the westward shift of the Iceland depression in late August and by the Greenlandic orographic effects. To demonstrate the deviation of the Overflow '73 conditions from the climatological mean, table 3 was compiled from (3) and (4). Although the areas used in table 3 do not exactly correspond to the areas I to III, a comparison is practicable, since the mean values are nearly identical for all areas and periods: light to fresh winds occur for 90 % of the time, strong winds about 10 % and storm has a frequency of 1-4 %. These values do correspond with the actual observations for area II/III, but observations for area I show a significant deviation to larger Beaufort-values during August/September 1973.

Conclusion

The atmospheric circulation during August/September 1973 was not an "out-side" situation. The anomalies observed were small, but they slightly intensified the circulation for all areas between Greenland and Scotland in August, and for the area between Greenland and Iceland in September. The actual meteorological conditions were identical for areas II and III between Iceland and Scotland, whereas they were different, partly even inverse for area I between Greenland and Iceland.

Acknowledgement

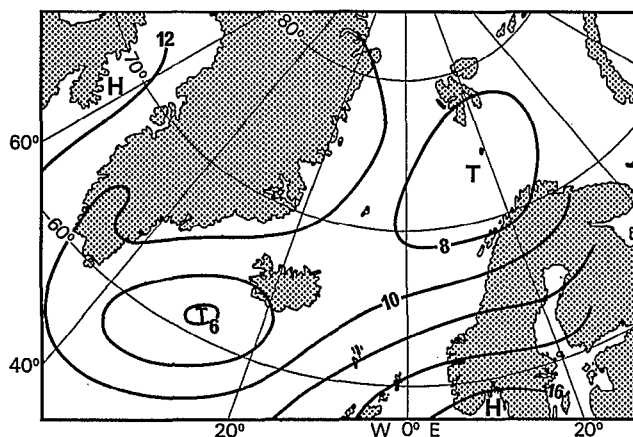
The authors are grateful to R. Moritzen and H. v. Janowski for their help in preparing the maps and tables for this report and to the cartography-group at the Institut für Meereskunde for the final drawing of the maps.

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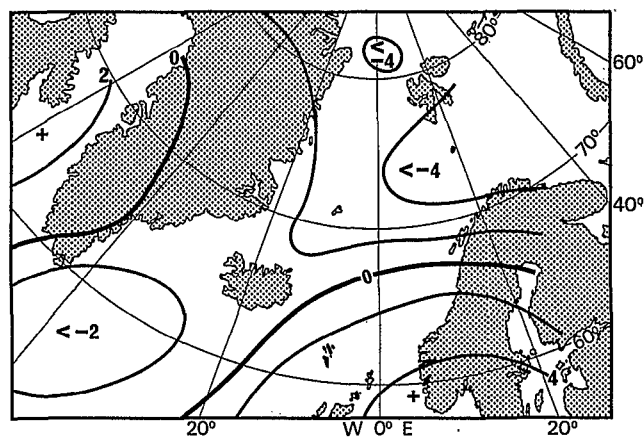
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- (3) RODEWALD, M.
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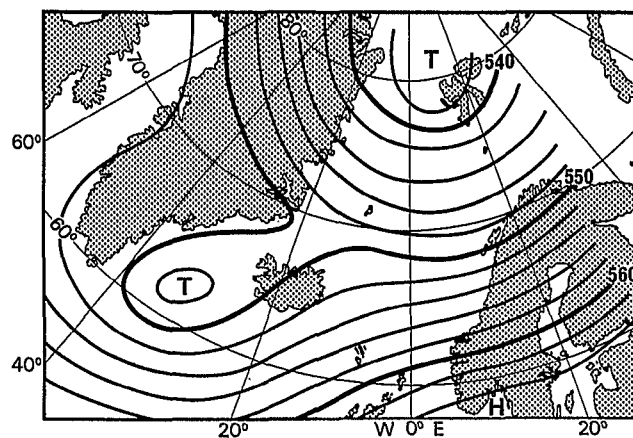
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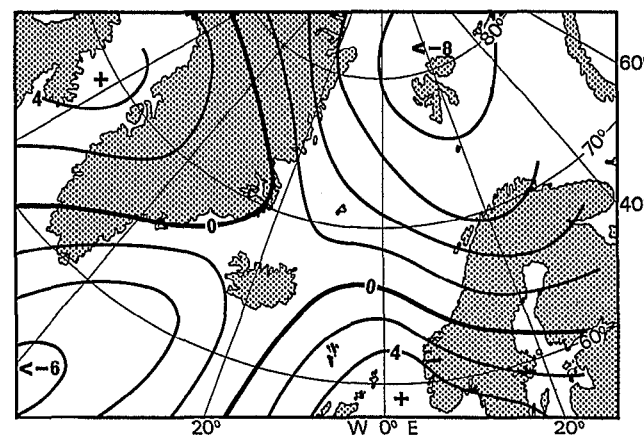
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AT SEA LEVEL (mb)



2 DEVIATION OF MONTHLY MEAN
PRESSURE AT SEA LEVEL FROM
MEAN VALUE 1900-1939 (mb)

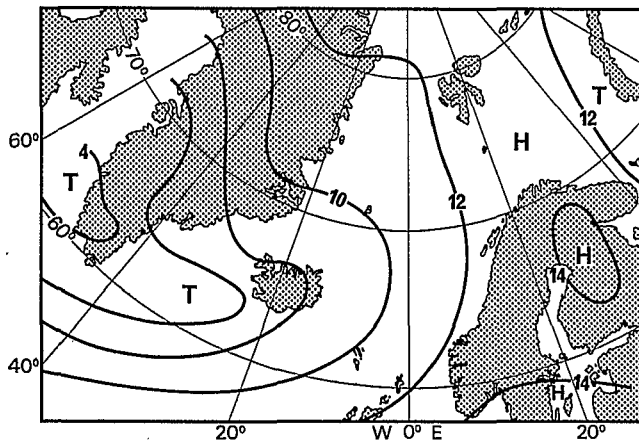


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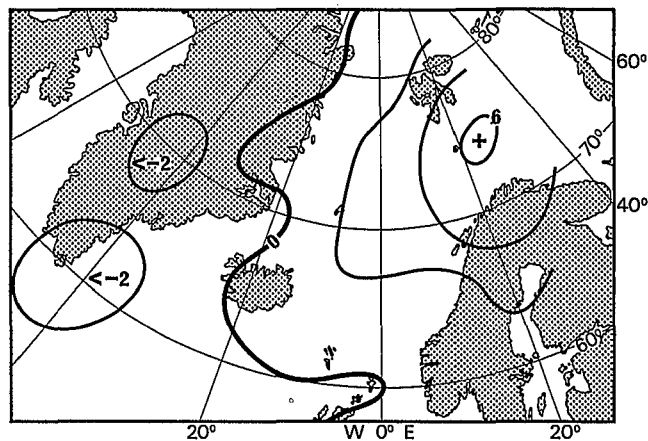


4 DEVIATION OF MONTHLY MEAN
HEIGHT OF 500 mb LEVEL
FROM MEAN VALUE 1949-1968
(GEOPOT. DECAMETER)

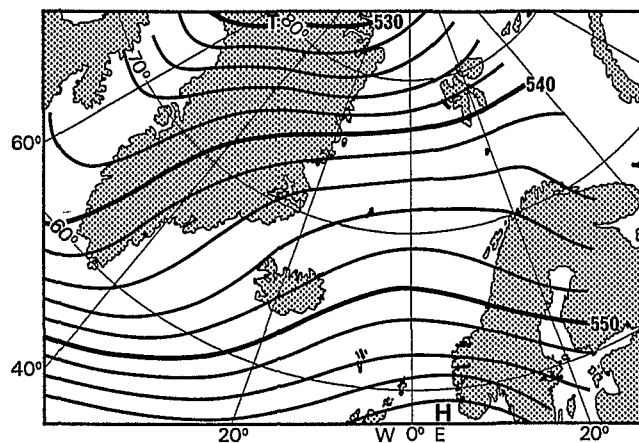
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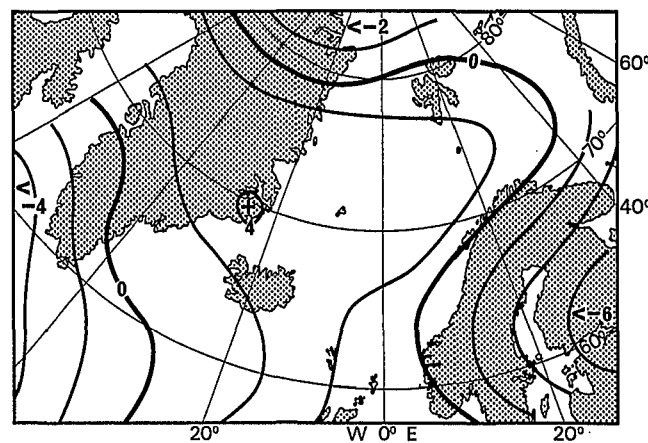
5 MONTHLY MEAN PRESSURE
AT SEA LEVEL (mb)



6 DEVIATION OF MONTHLY MEAN
PRESSURE AT SEA LEVEL FROM
MEAN VALUE 1900-1939 (mb)



7 MONTHLY MEAN HEIGHT
OF 500 mb LEVEL
(GEOPOT. DECAMETER)



8 DEVIATION OF MONTHLY MEAN
HEIGHT OF 500 mb LEVEL
FROM MEAN VALUE 1949-1968
(GEOPOT. DECAMETER)

Table 1: Frequency distribution of wind forces as observed by selected research vessels during "Overflow '73". For areas see map 9.

SHIP :	HUDSON		B.SAEMUNDSSON		MEERKATZE 2		METEOR		W.HERWIG		EXPLORER	
PERIOD:	17.08.-17.09.		11.08.-09.09.		11.08.-19.09.		10.08.-21.09.		12.08.-15.09.		15.08.-15.09.	
AREA :	I		I/II		II/(III)		II/(III)		II/(III)		III/(II)	
BEAUFORT	N	%	N	%	N	%	N	%	N	%	N	%
0	1	0.5	12	6	10	5	3	1	5	3	8	5
1	1	0.5	25	13	6	3	2	1	51	27	27	16
2	3	2	34	18	16	7.5	10	5	22	11	19	11
3	15	10	54	28	42	20	25	11	37	19	56	35
4	28	18	18	10	43	20	72	32	22	11	26	16
5	38	24	13	7	44	21	73	32	24	13	24	15
6	33	21	14	7	36	18	26	11	17	9	3	2
7	18	11	11	6	10	5	12	5	14	7		
8	14	9	6	3	1	0.5	5	2				
9	7	4	4	2								
SUM :	158	100	191	100	208	100	228	100	192	100	163	100

Table 2: Frequency distribution of wind forces for areas I and II/III as observed during "Overflow '73". For areas see map 9.

AREA I : HUDSON

17.08.-17.09.: 158 wind-observations

FORCE	BFT	:	0	1	2	3	4	5	6	7	8	9
FREQUENCY	%	:	0.5	0.5	2	10	18	24	21	11	9	4

AREA II/III : EXPLORER/MEERKATZE/METEOR/W.HERWIG

10.08.-21.09.: 791 wind-observations

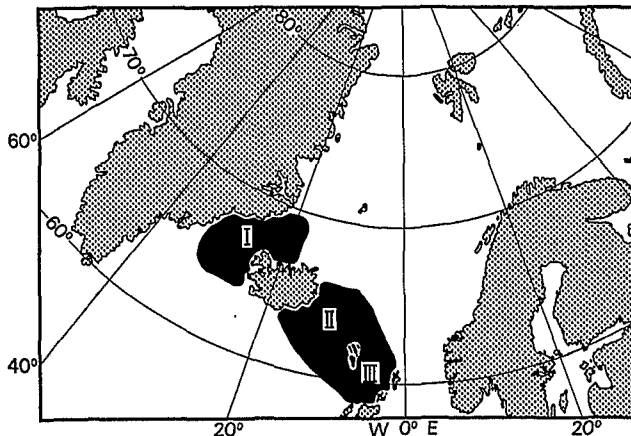
FORCE	BFT	:	0	1	2	3	4	5	6	7	8	9
FREQUENCY	%	:	3	11	8	20	21	21	10	5	1	-

COMPARISON

Beaufort	:	0 - 5	6 - 7	8 - 9
Area I	:	55 %	32 %	13 %
Area II/III	:	84 %	15 %	1 %

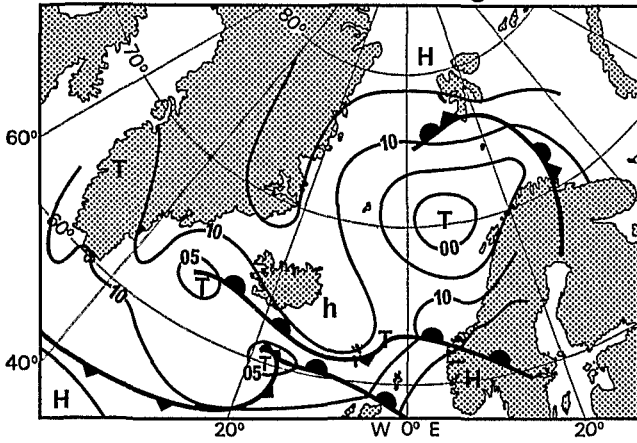
Table 3: Frequency distribution of climatological means of wind force groups.

Areas	Period	0-5 Bft	6-7 Bft	=8 Bft	Bibliography
SW of Iceland	August	91 %	8 %	1 %	(3)
	September	83 %	13 %	4 %	(3)
SE of Iceland	August	89 %	10 %	1 %	(3)
	September	86 %	10 %	4 %	(3)
Dohrnbank/ Angmagsalik	Summer	90 %	9 %	1 %	(4)

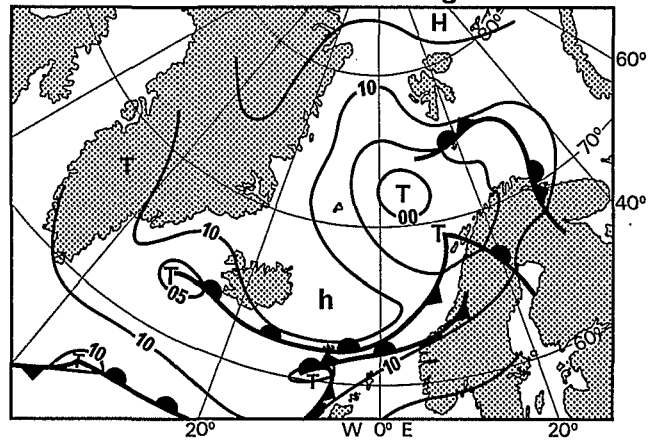


9 DESIGNATION OF AREAS

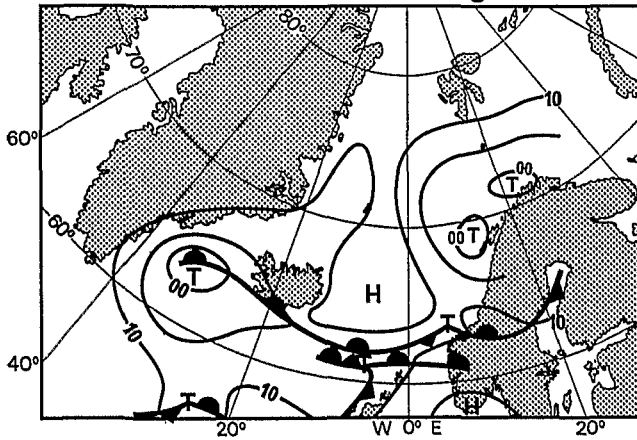
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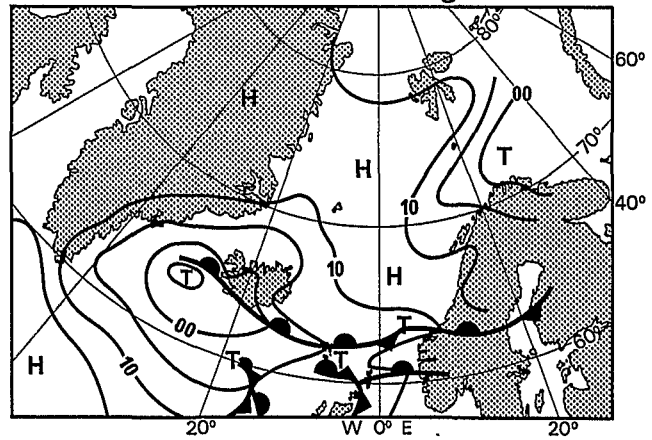
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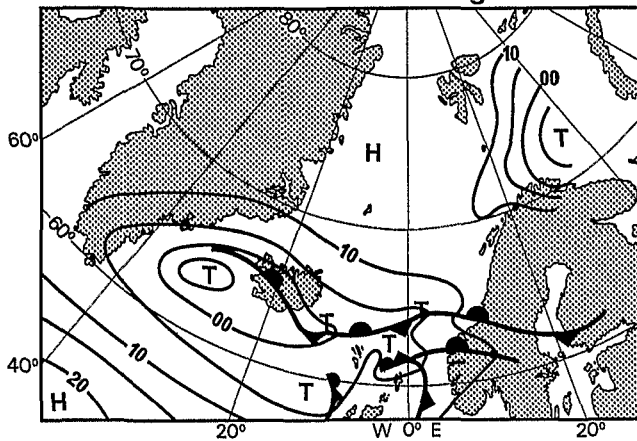
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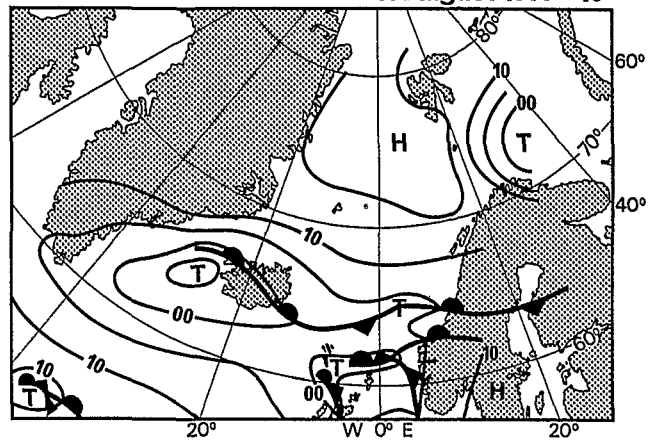
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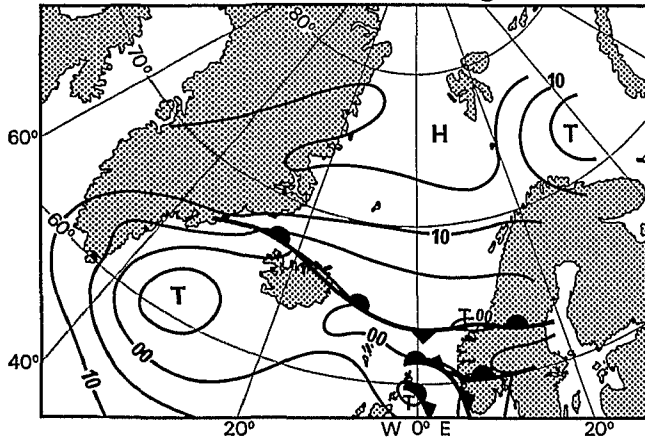
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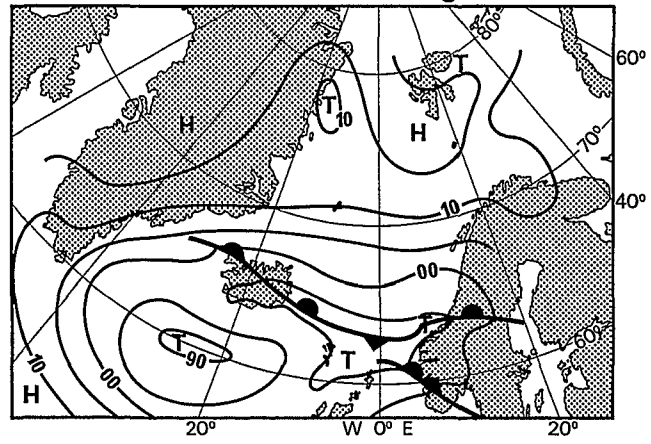
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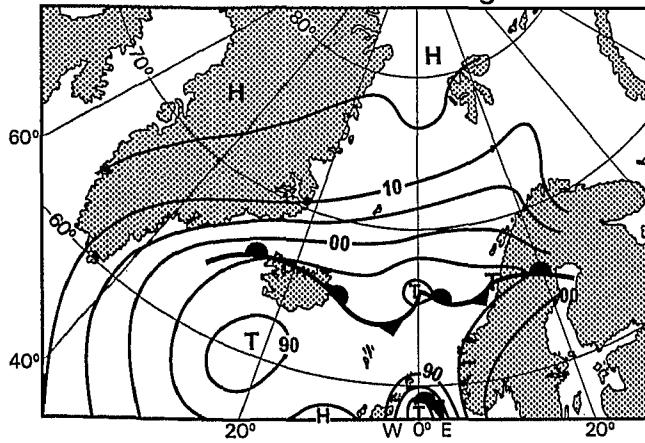
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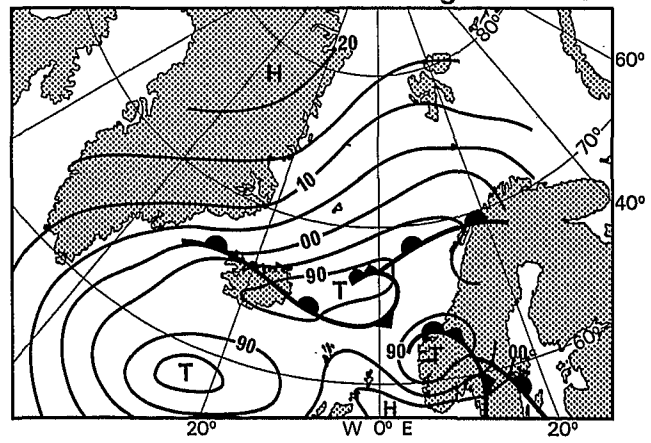
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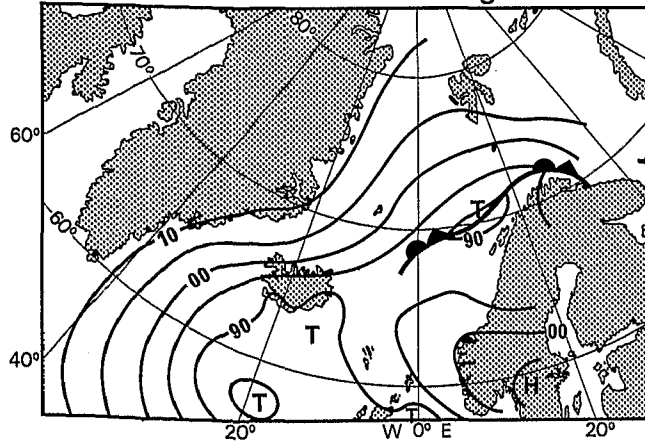
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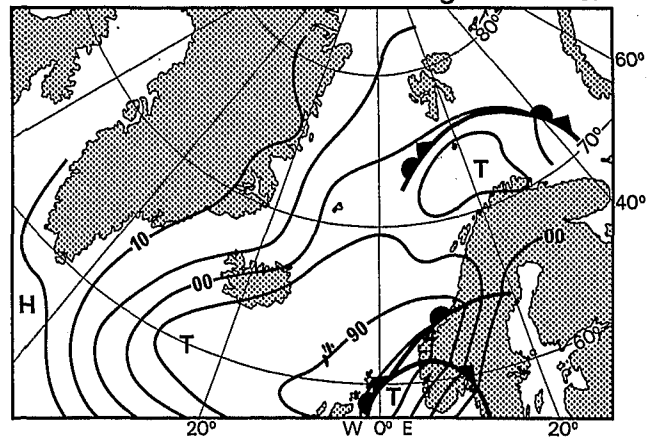
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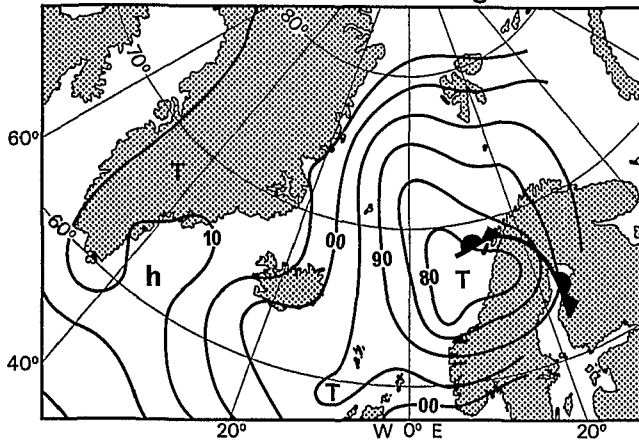
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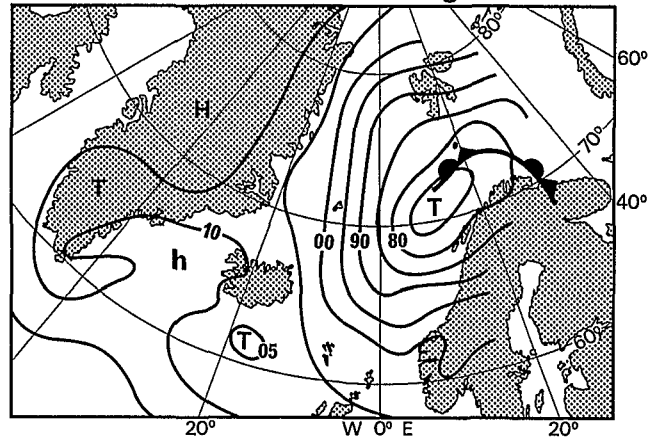
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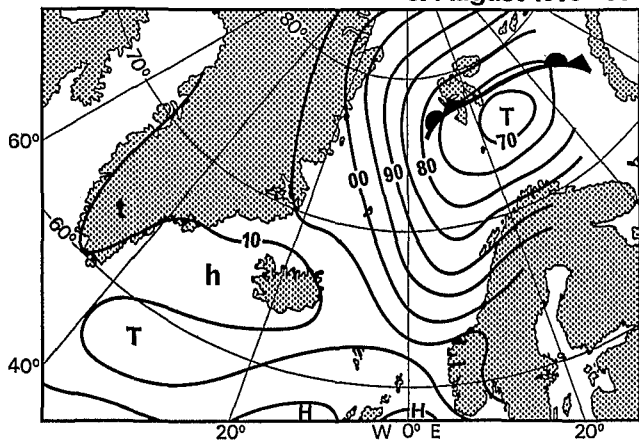
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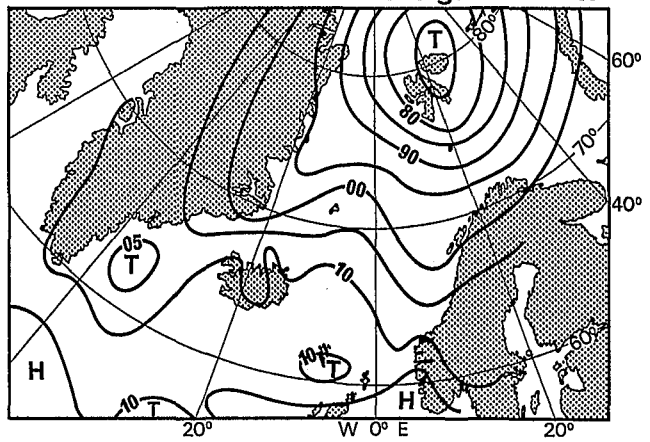
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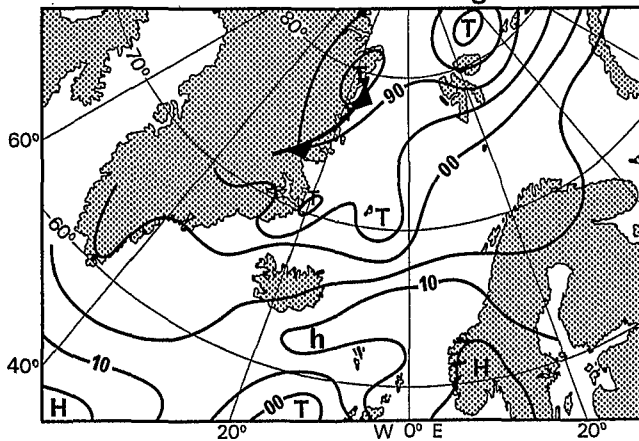
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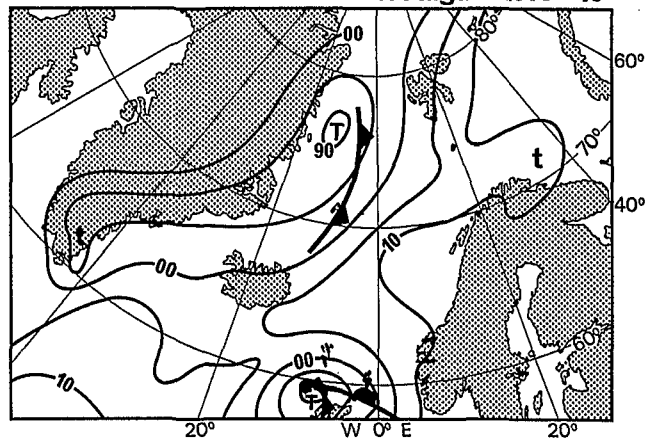
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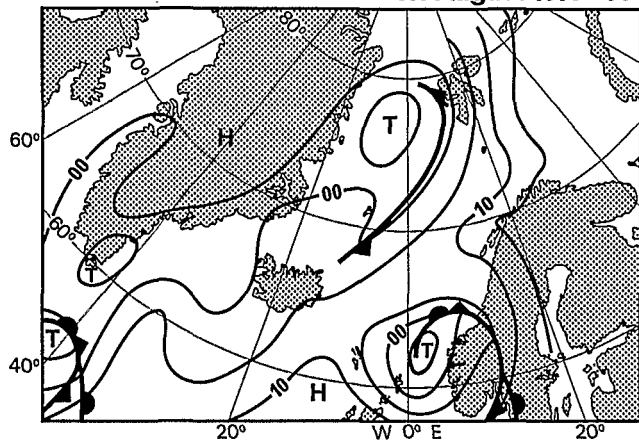
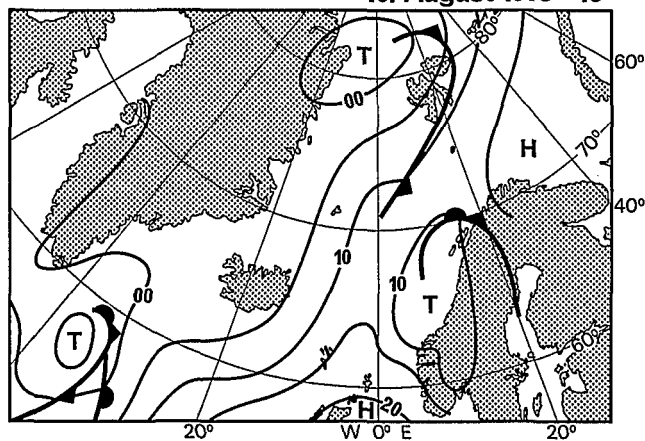
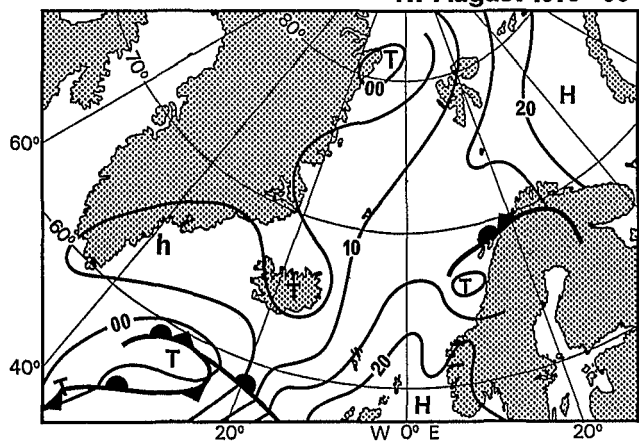
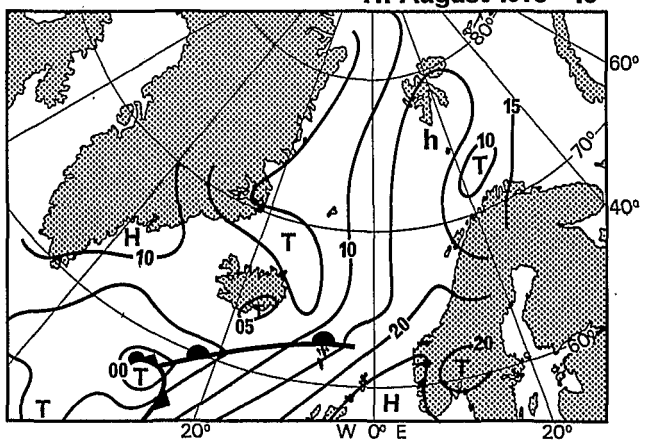
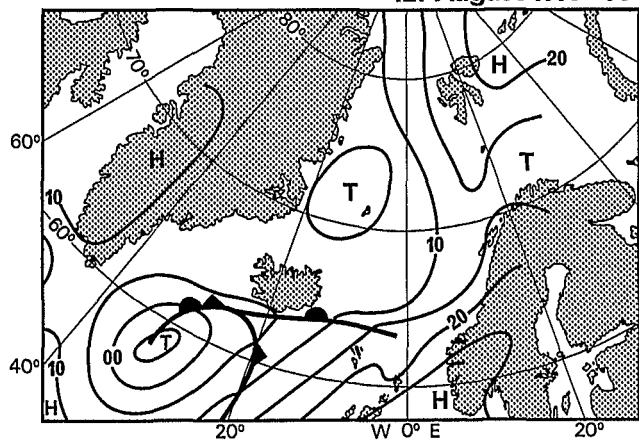
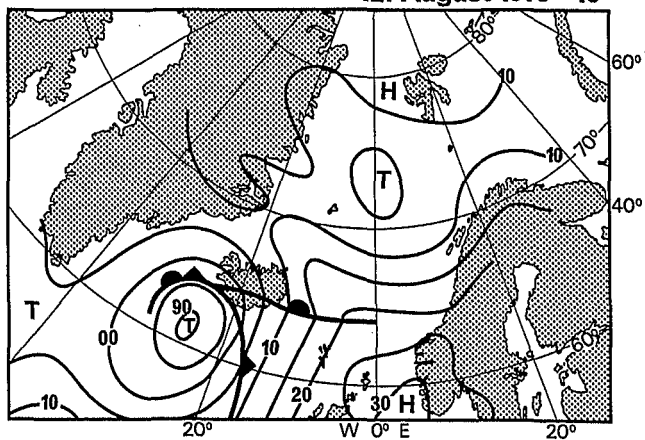


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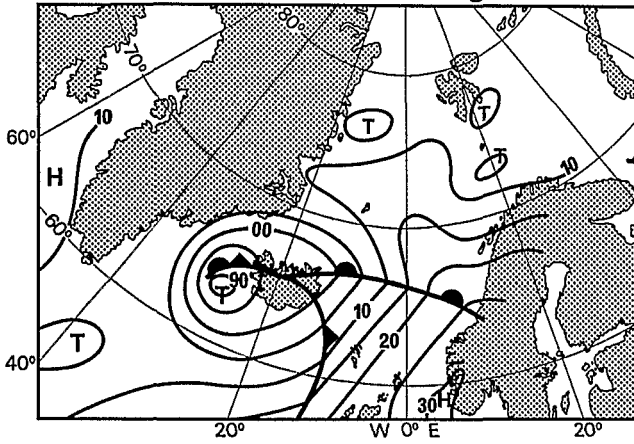


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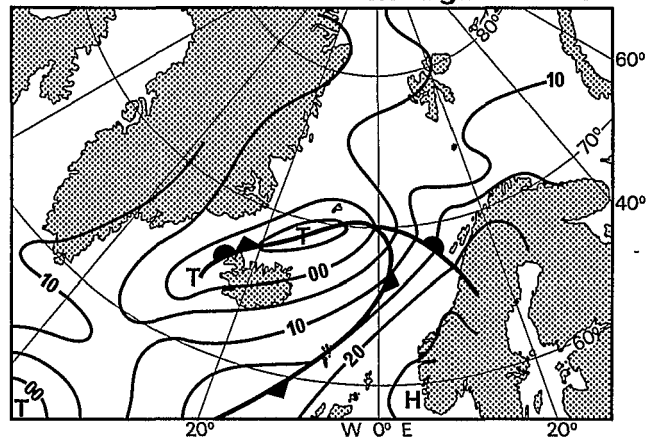


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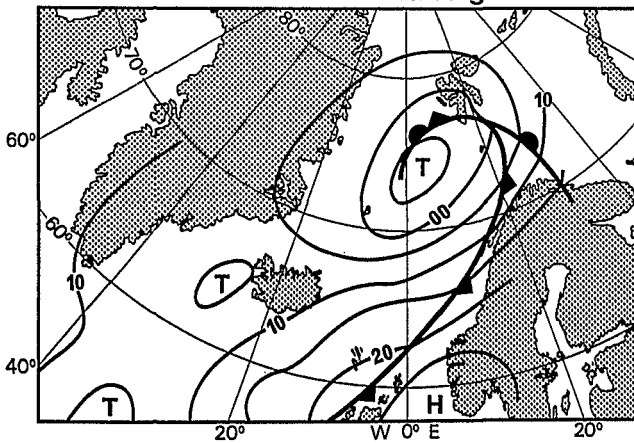
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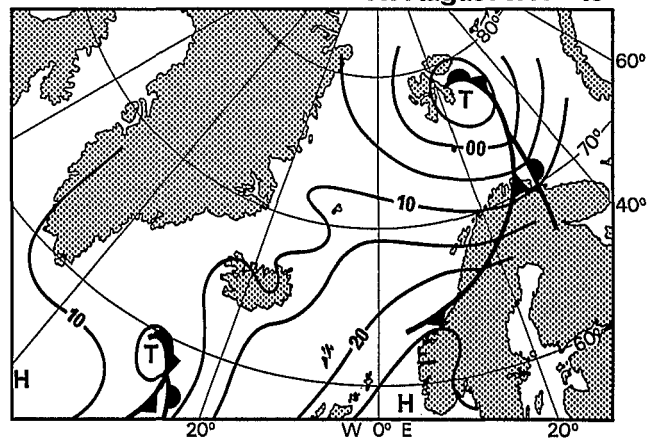
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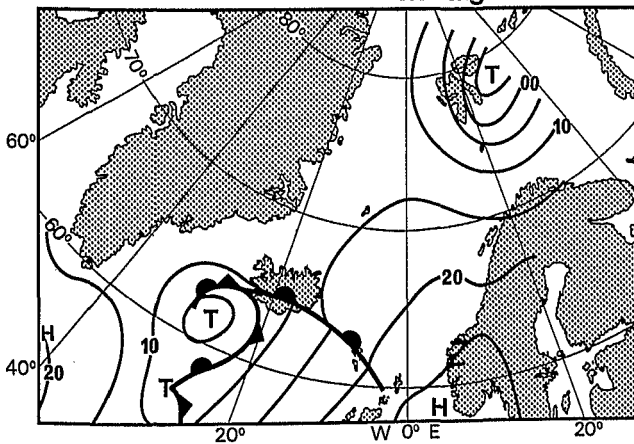
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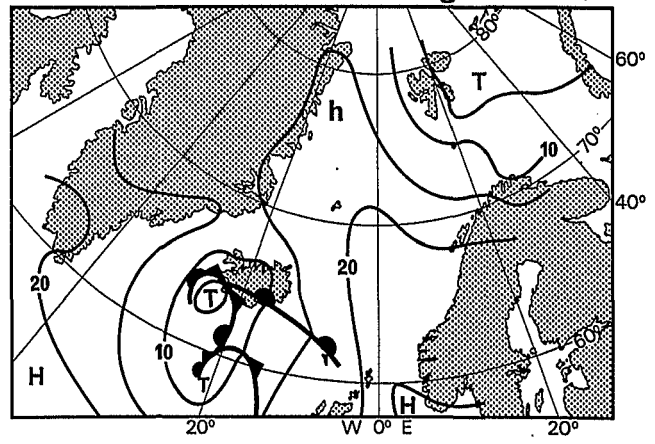
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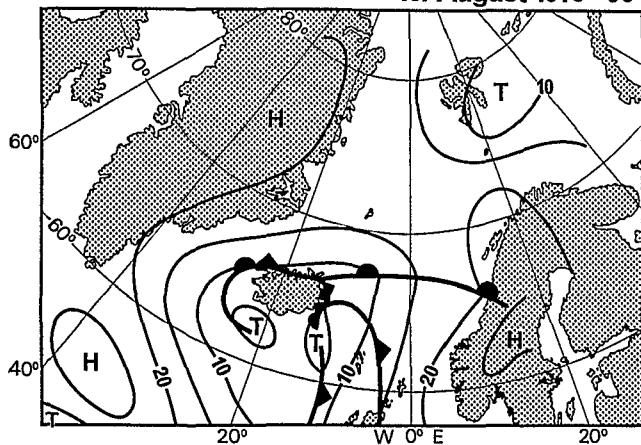
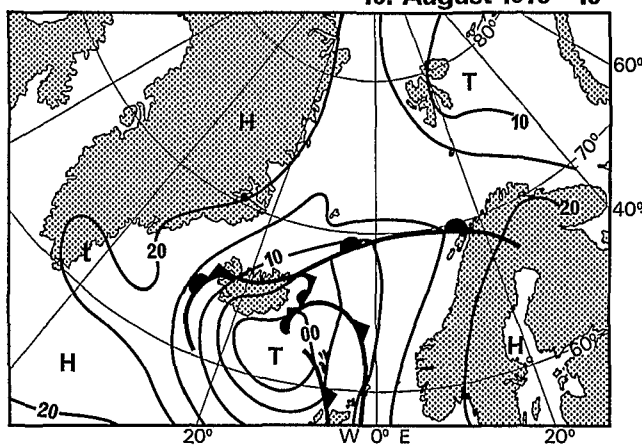
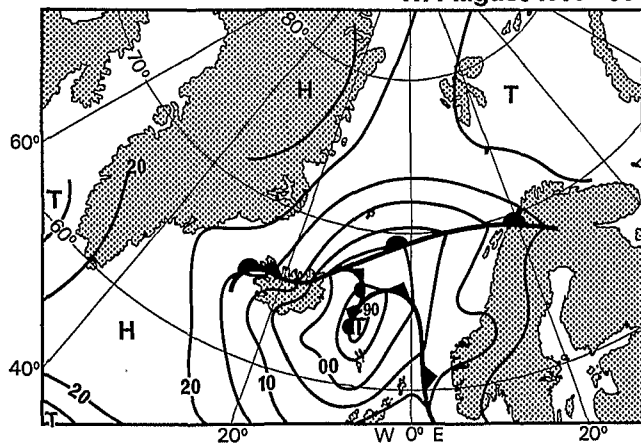
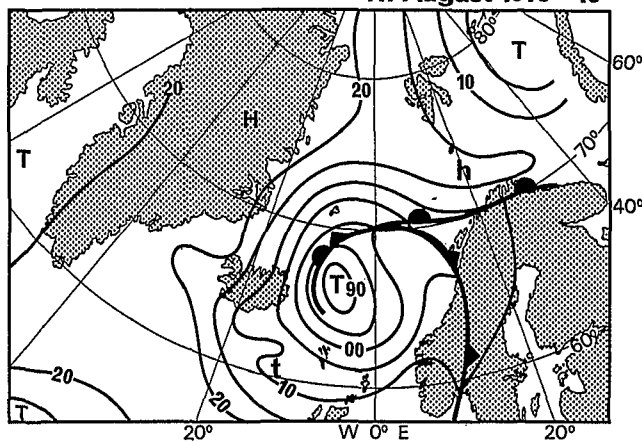
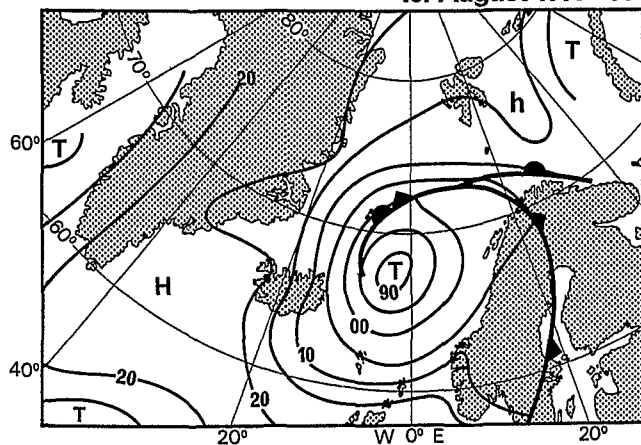
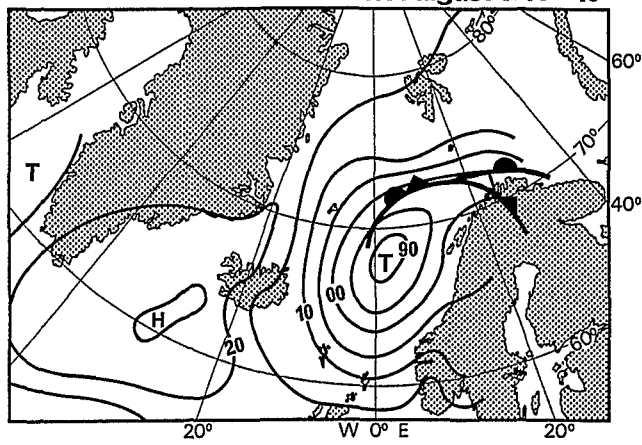


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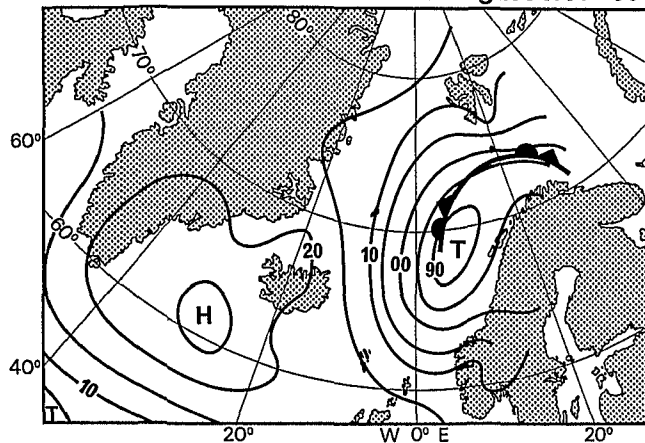


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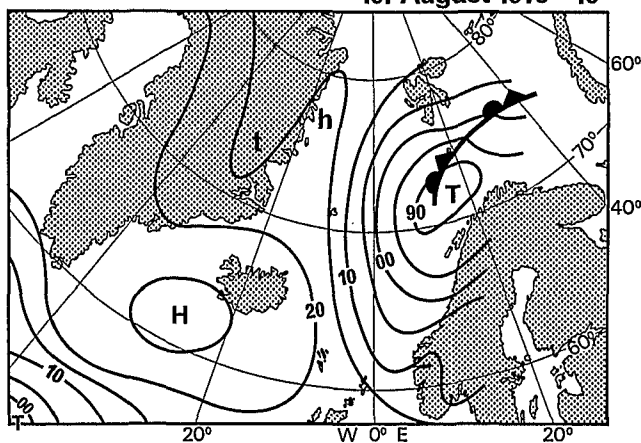


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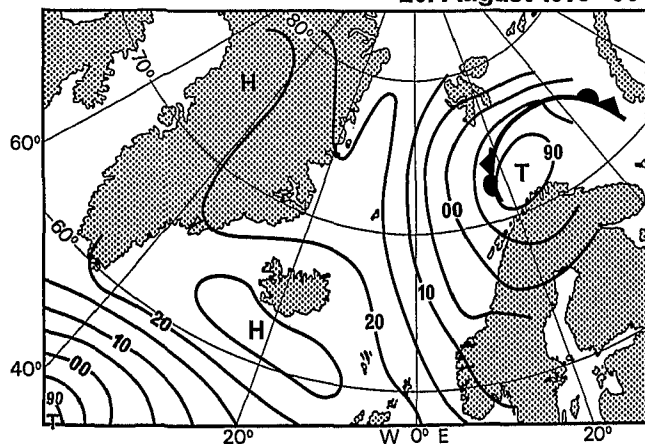
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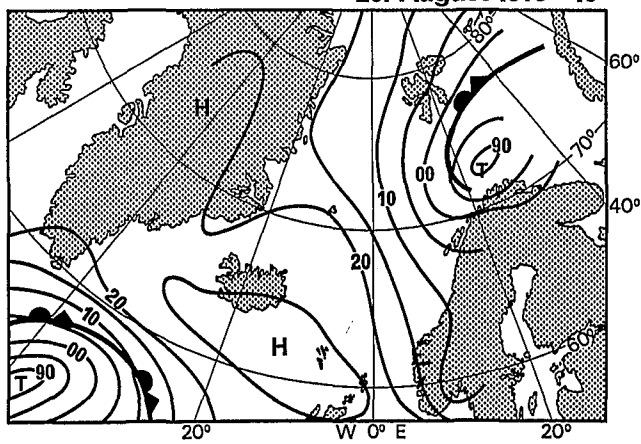
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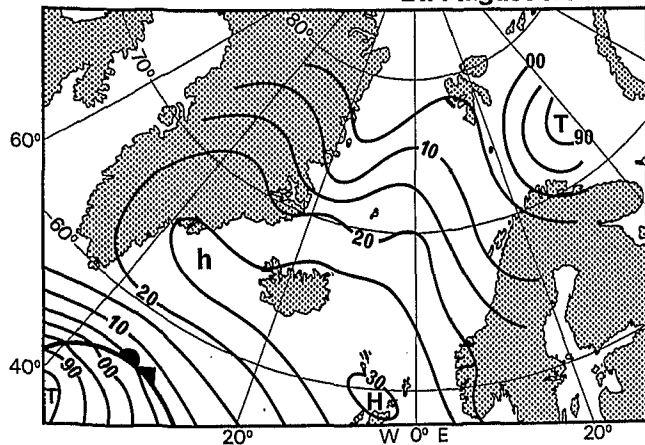
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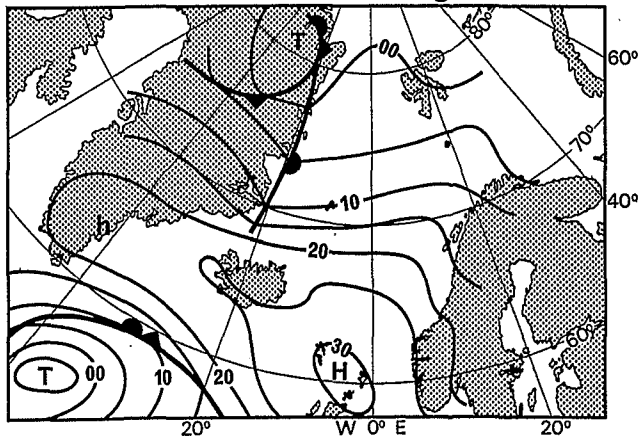
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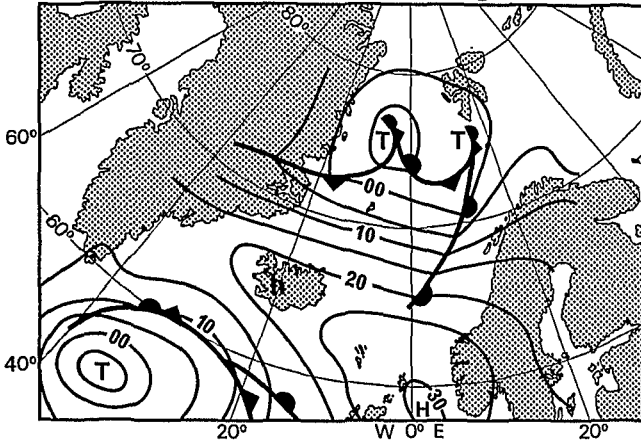
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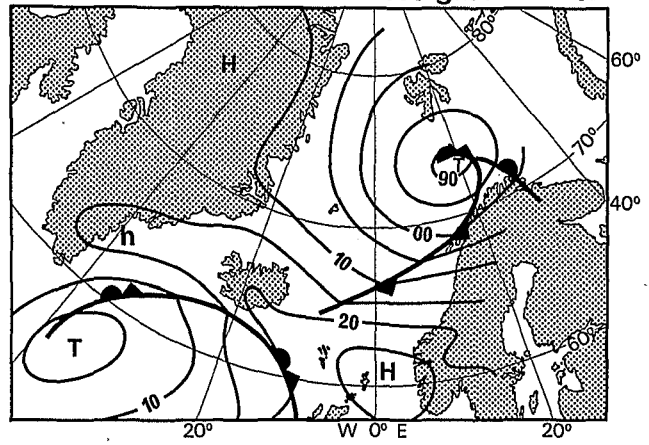
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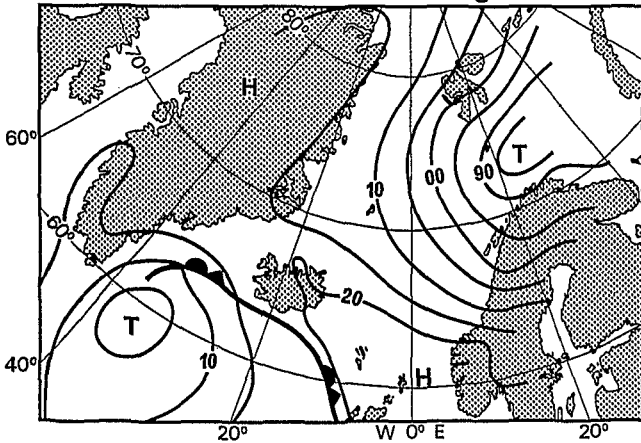
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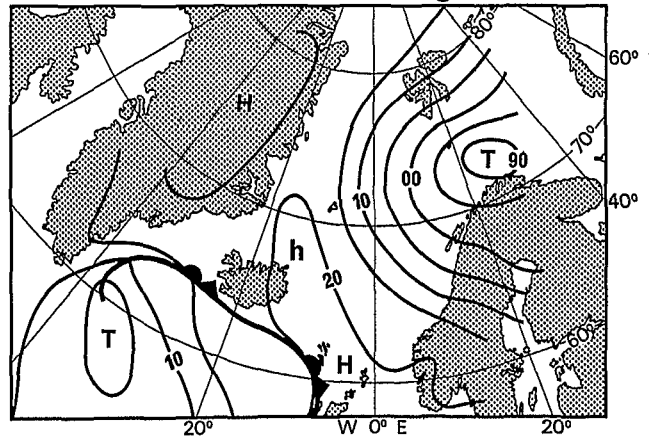
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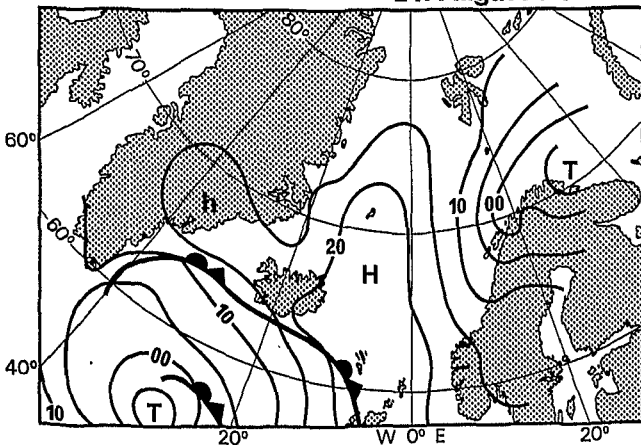
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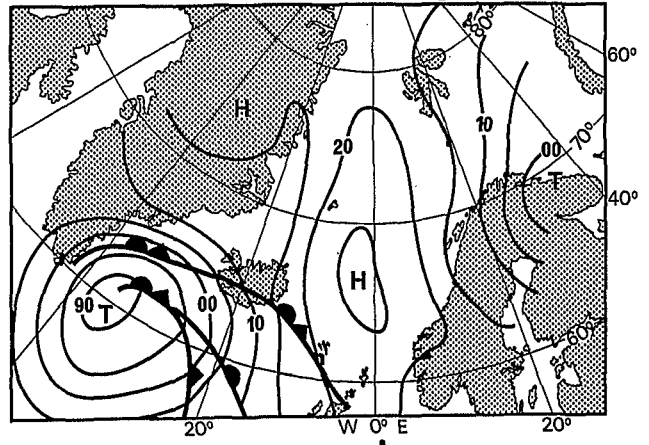
23. August 1973 18^h

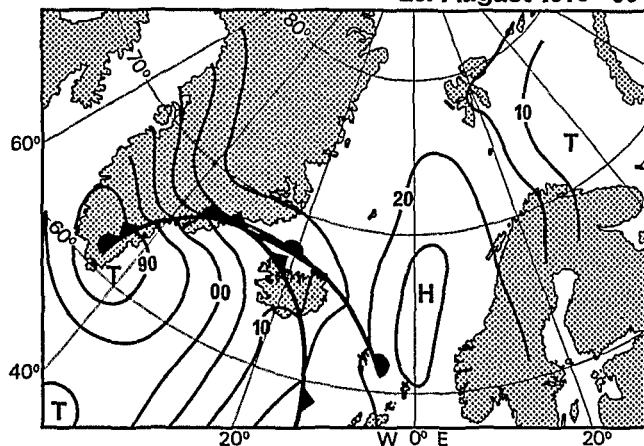
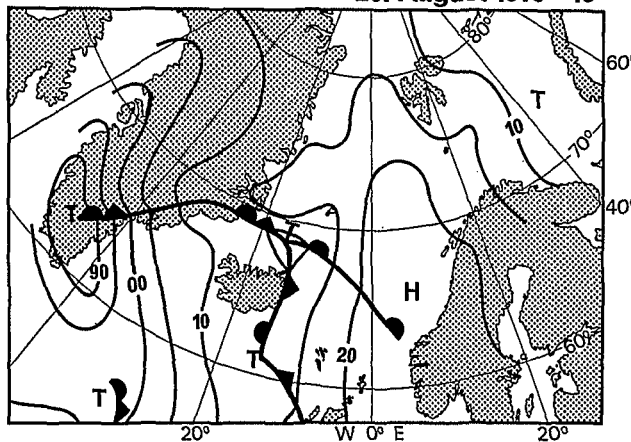
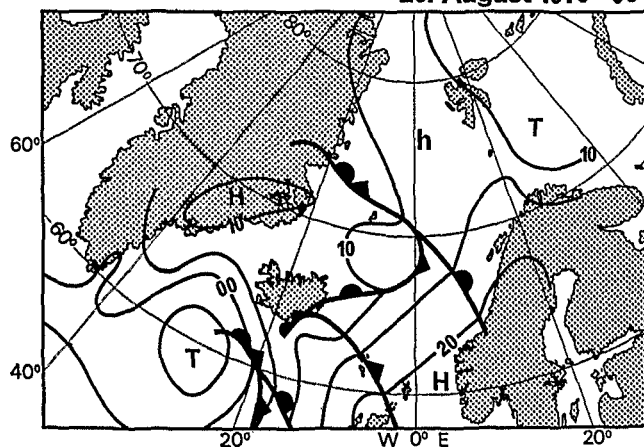
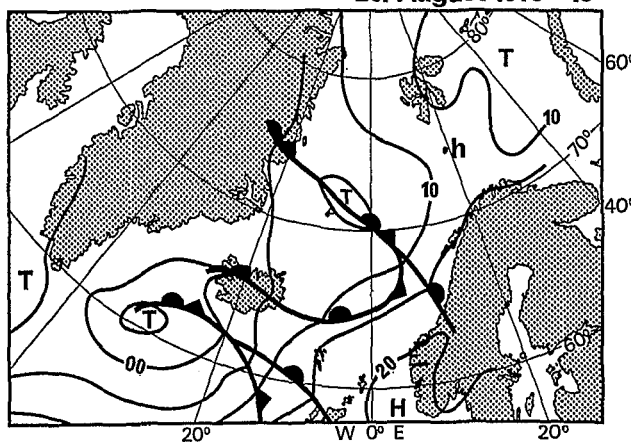
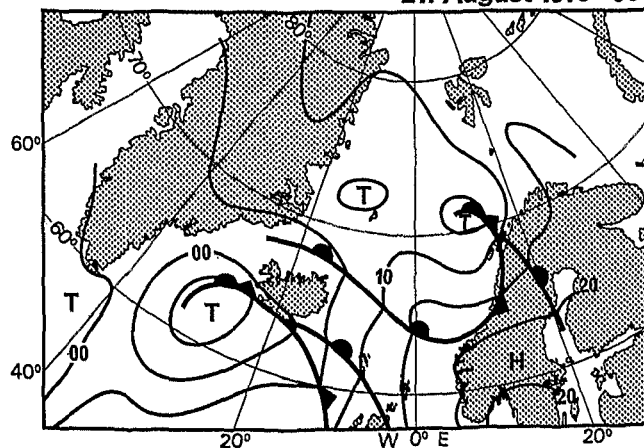
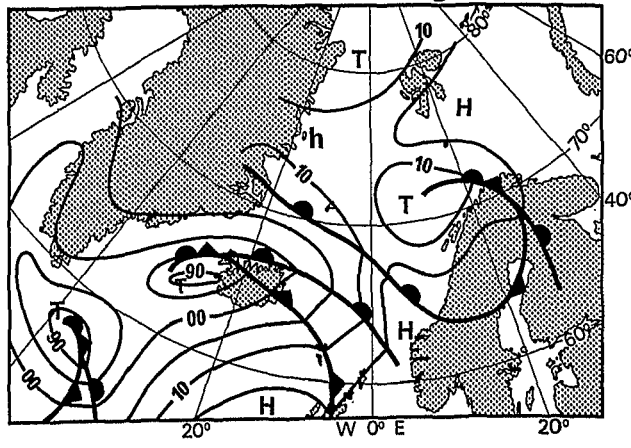


24. August 1973 06^h

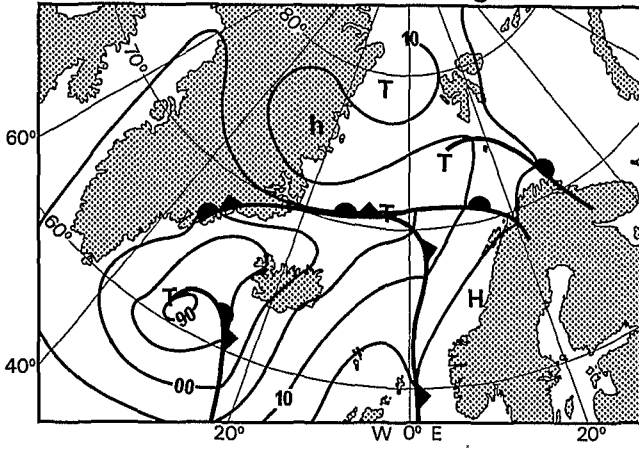


24. August 1973 18^h

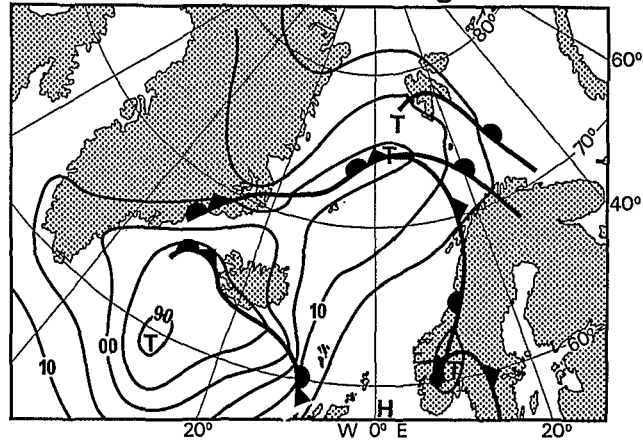


25. August 1973 06^h25. August 1973 18^h26. August 1973 06^h26. August 1973 18^h27. August 1973 06^h27. August 1973 18^h

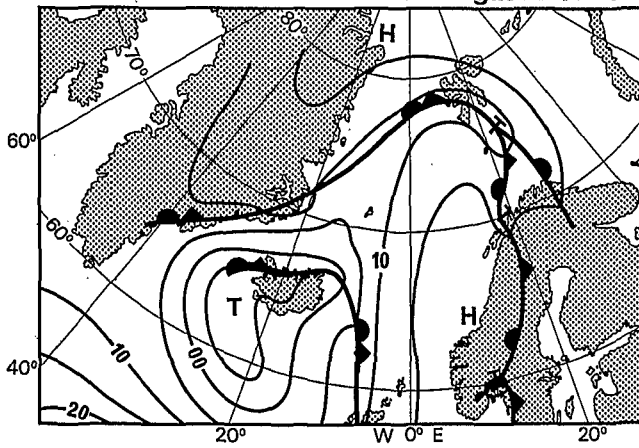
28. August 1973 06^h



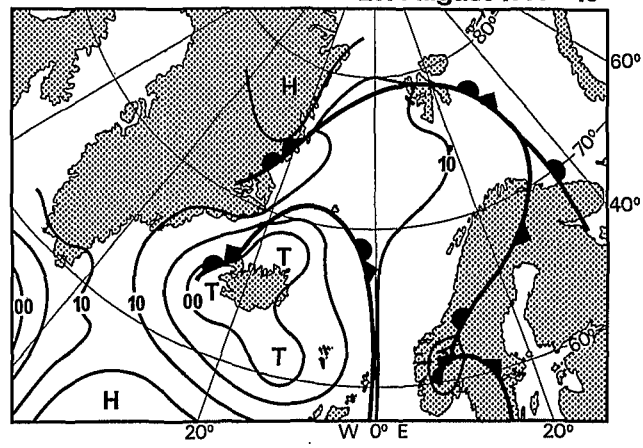
28. August 1973 18^h



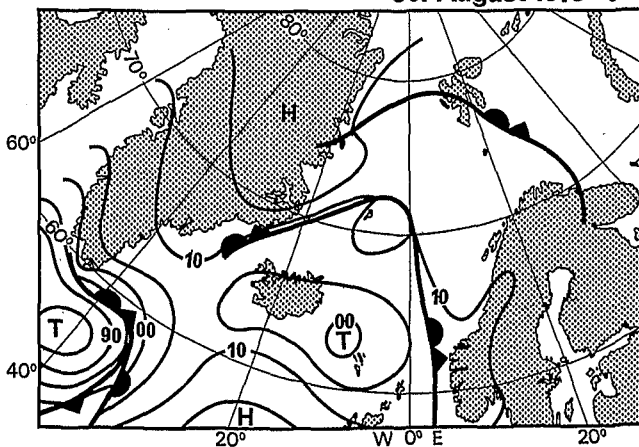
29. August 1973 06^h



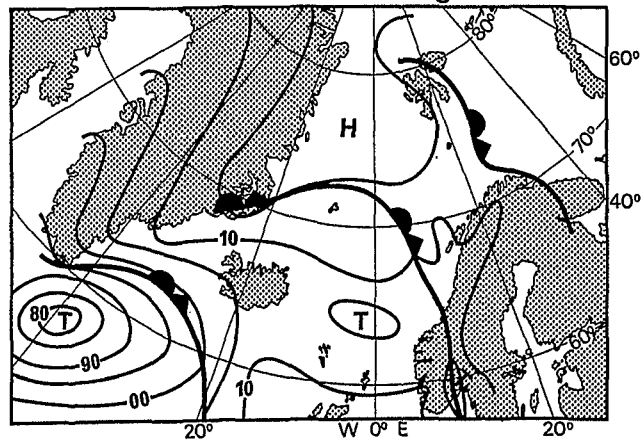
29. August 1973 18^h



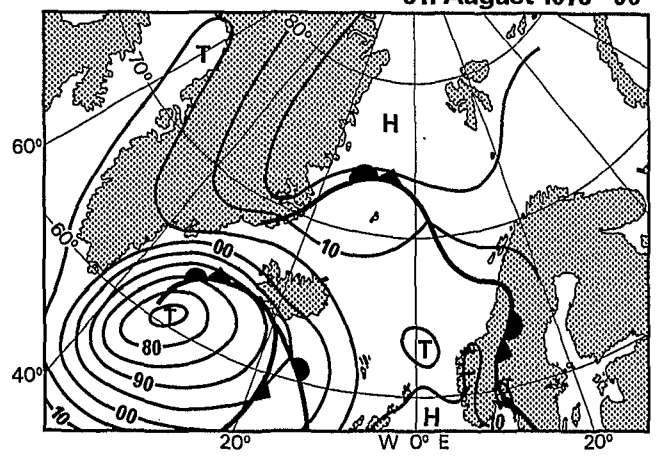
30. August 1973 06^h



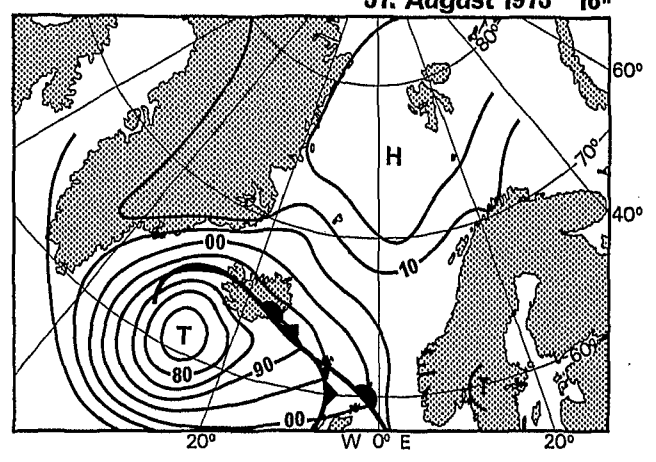
30. August 1973 18^h



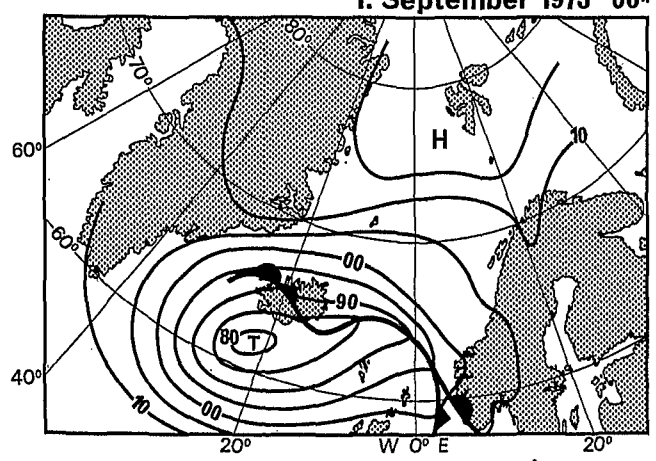
31. August 1973 06h



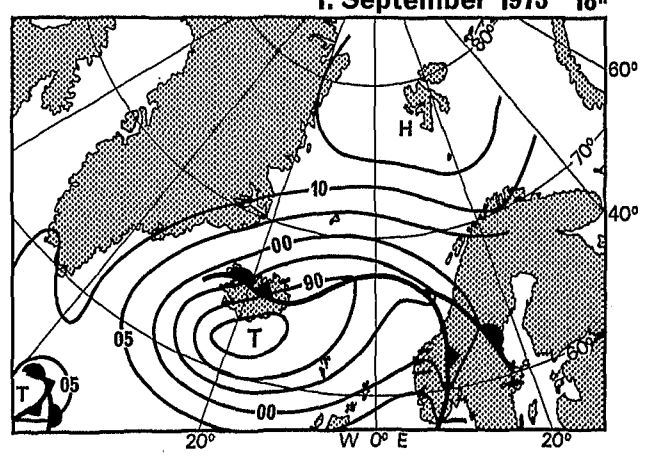
31. August 1973 18h



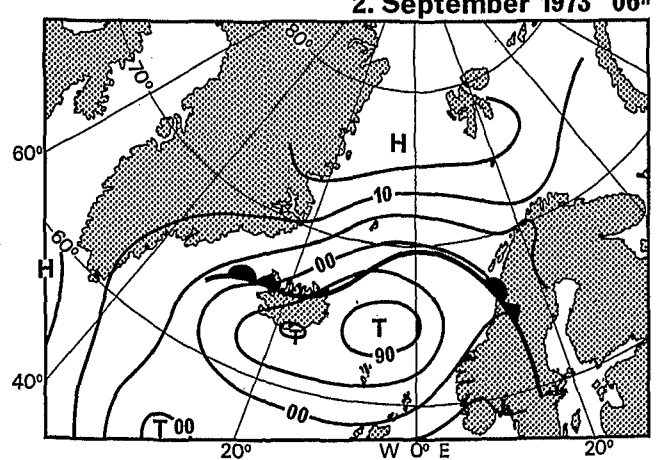
1. September 1973 06h



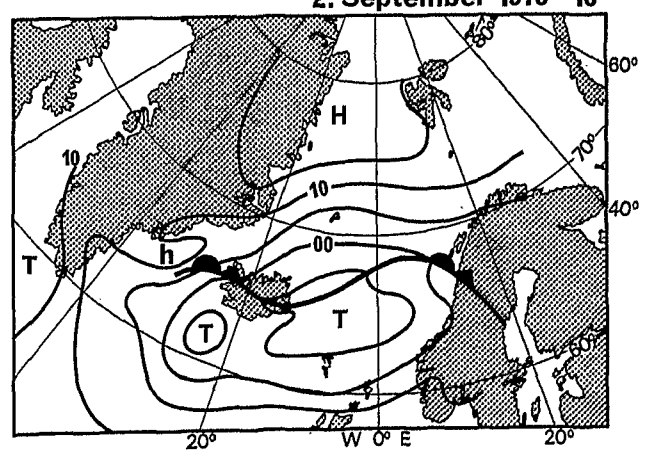
1. September 1973 18h

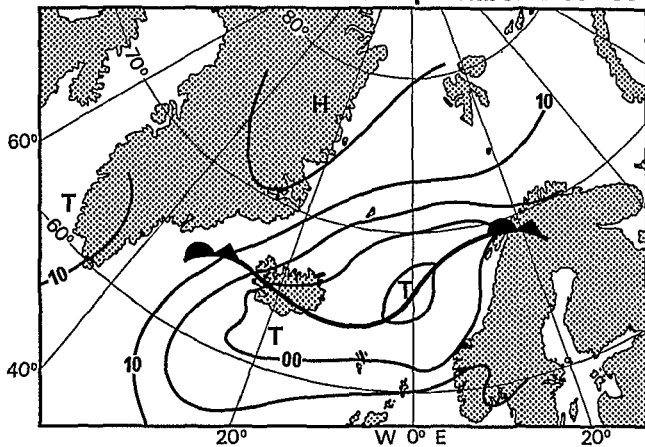
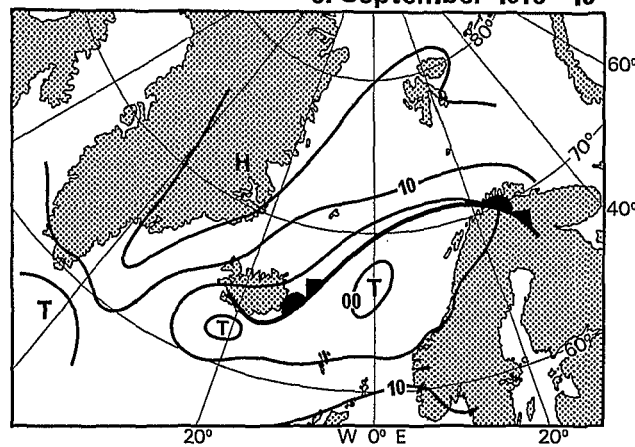
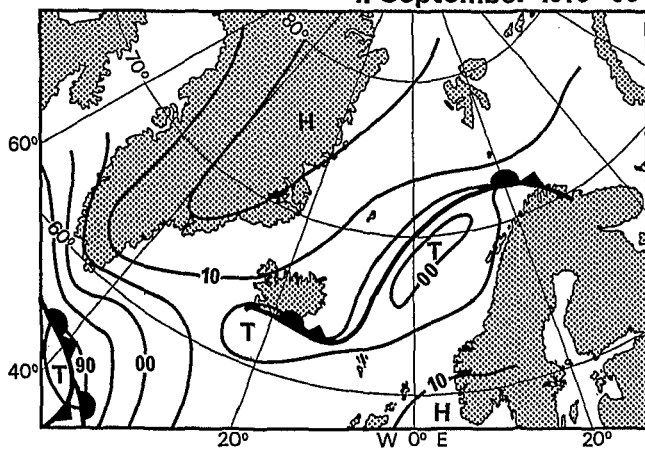
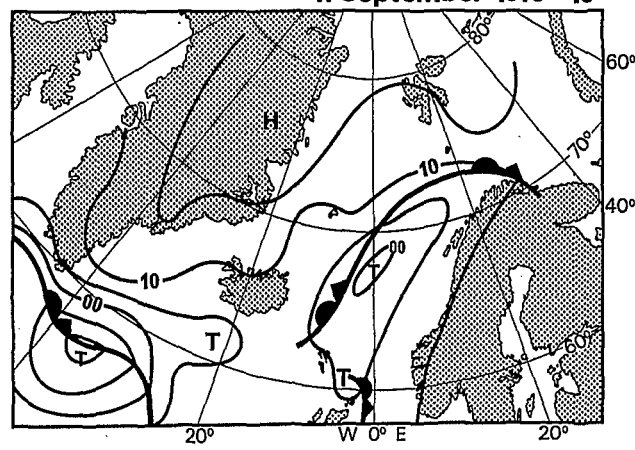
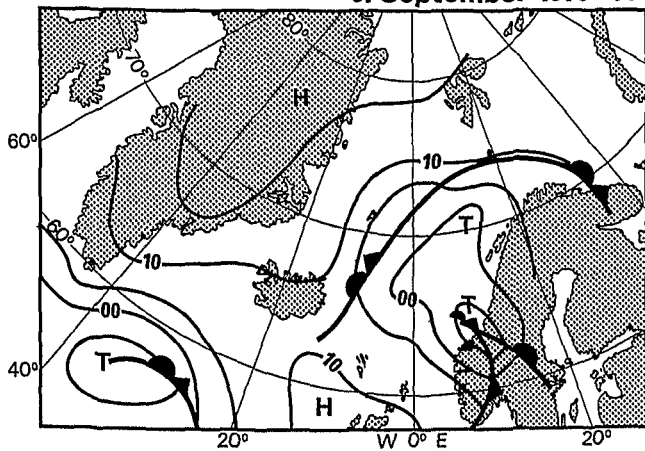
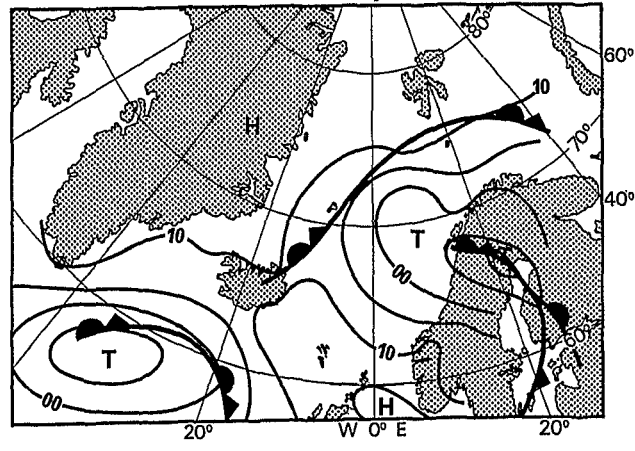


2. September 1973 06h

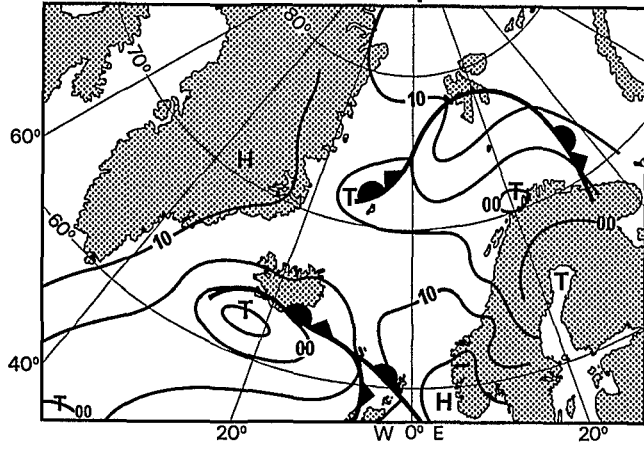


2. September 1973 18h

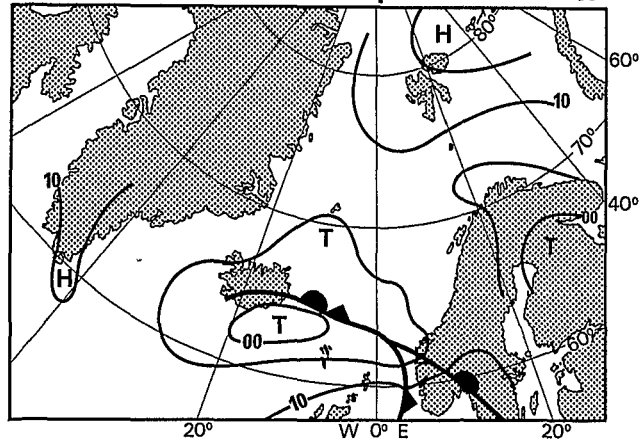


3. September 1973 06^h3. September 1973 18^h4. September 1973 06^h4. September 1973 18^h5. September 1973 06^h5. September 1973 18^h

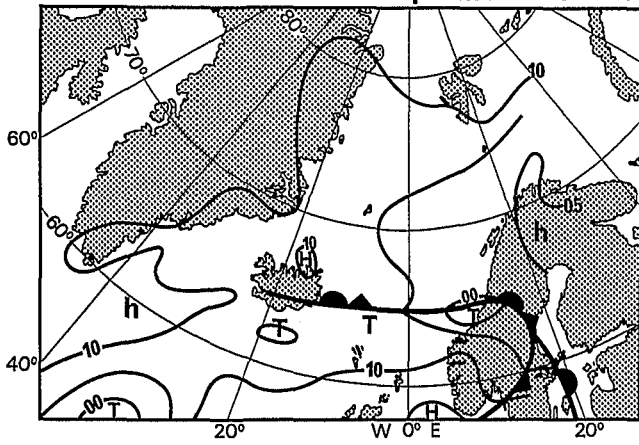
6. September 1973 06^h



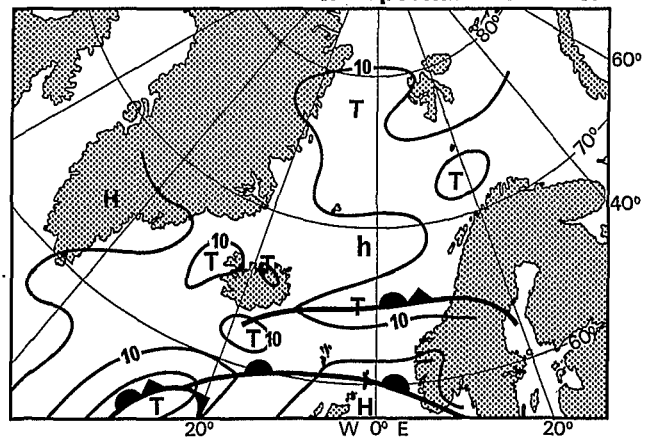
6. September 1973 18^h



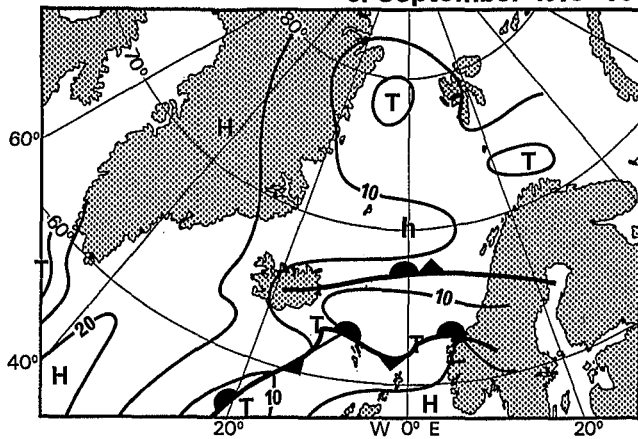
7. September 1973 06^h



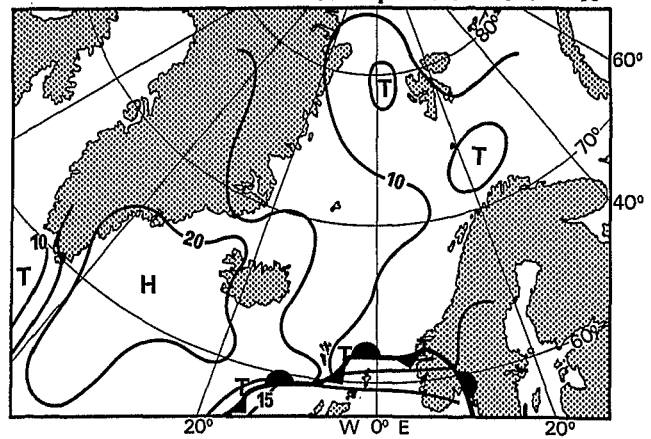
7. September 1973 18^h



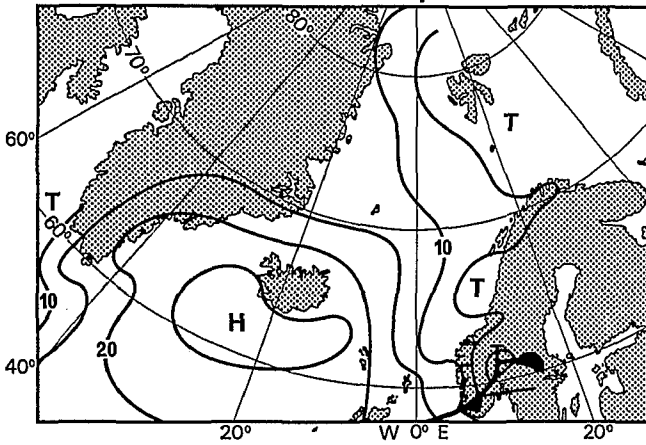
8. September 1973 06^h



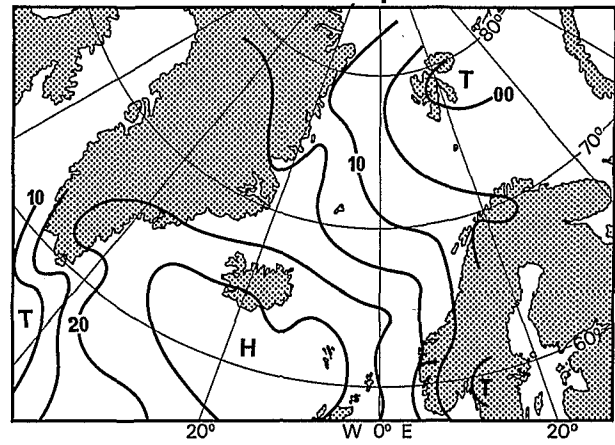
8. September 1973 18^h



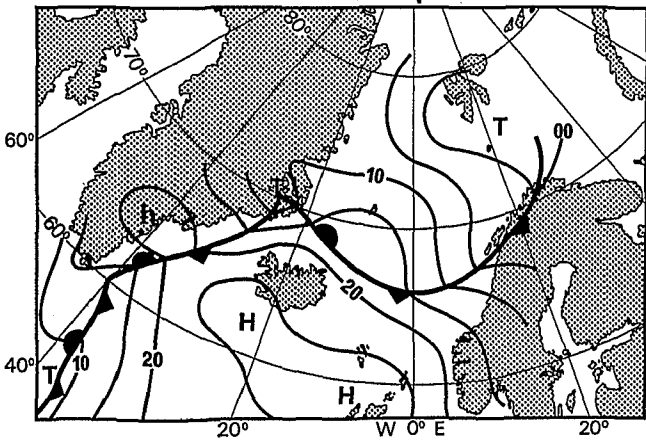
9. September 1973 06^h



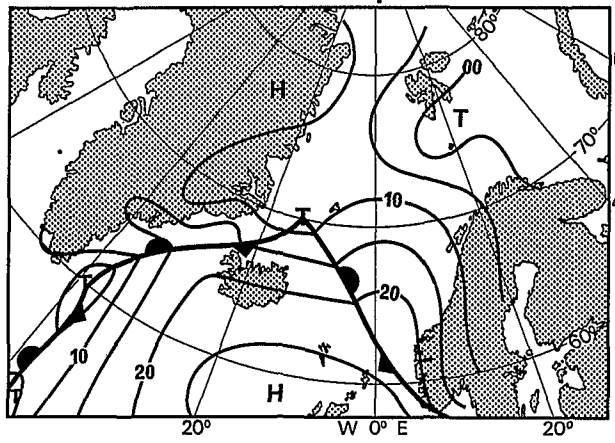
9. September 1973 18^h



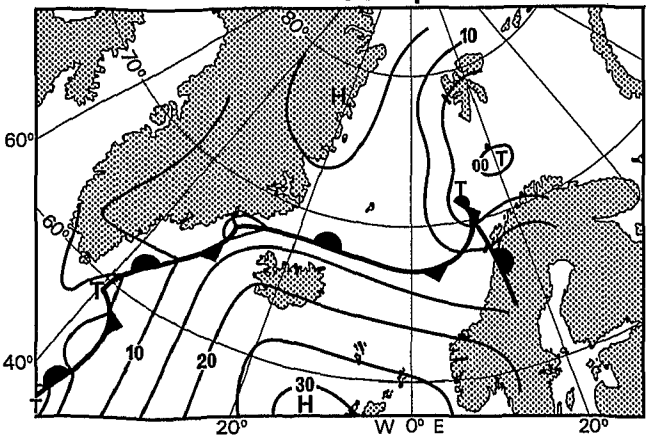
10. September 1973 06^h



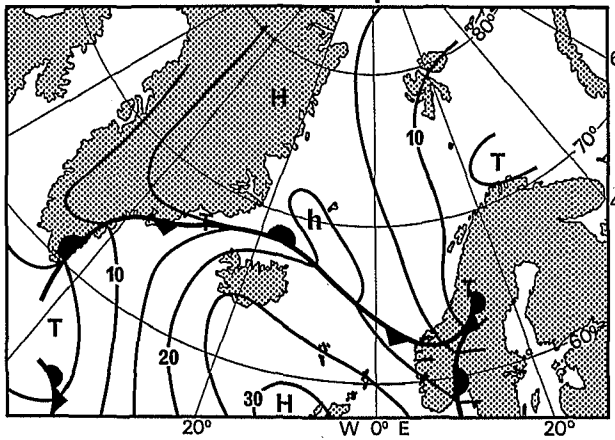
10. September 1973 18^h

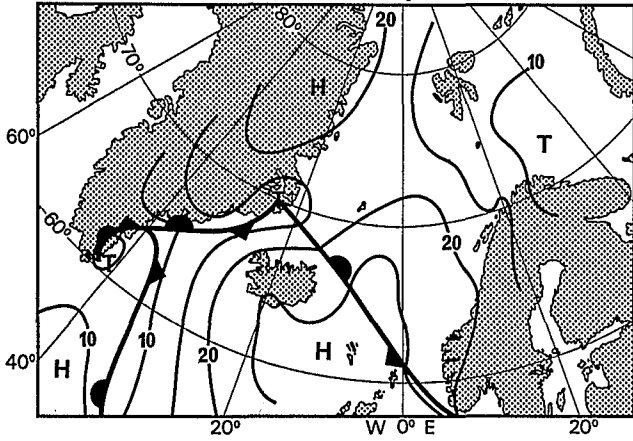
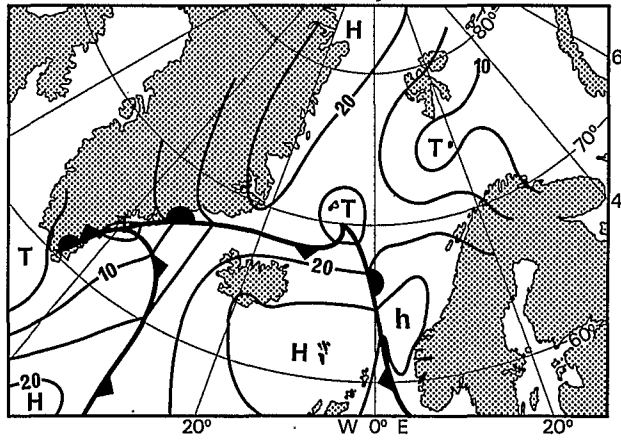
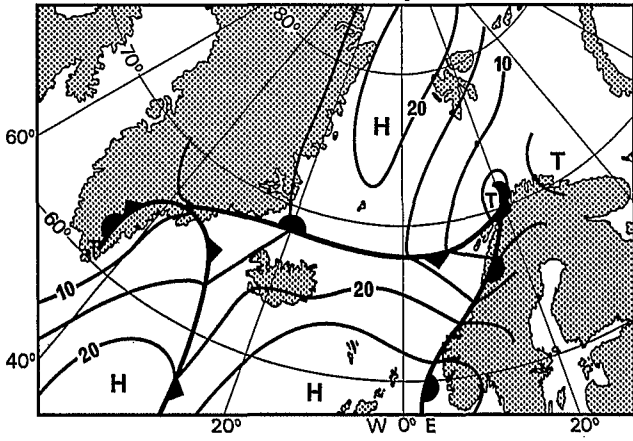
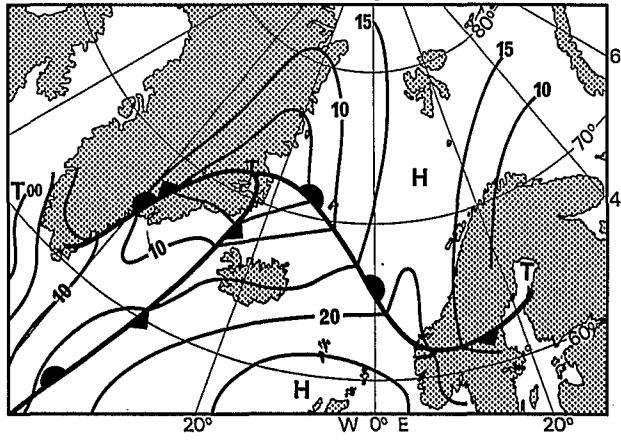
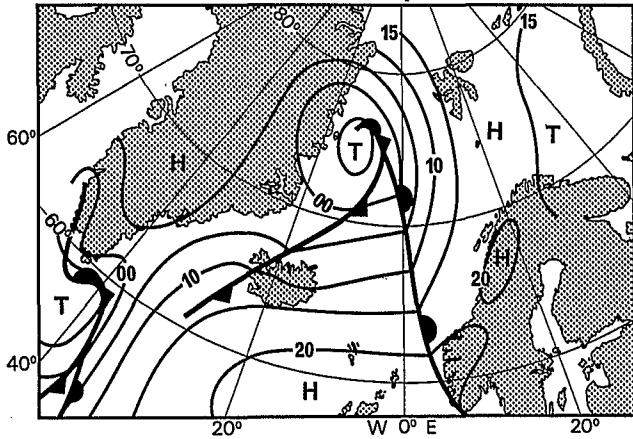
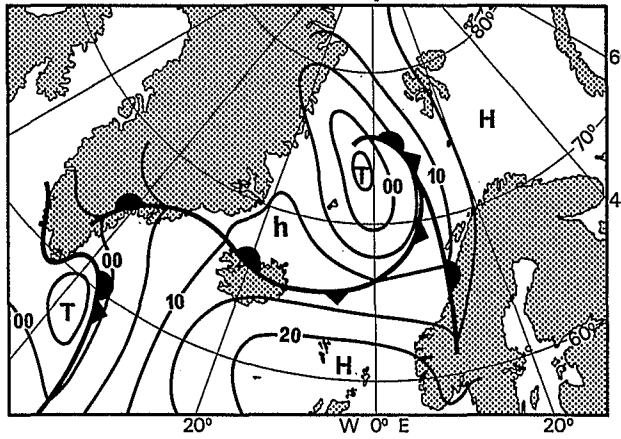


11. September 1973 06^h

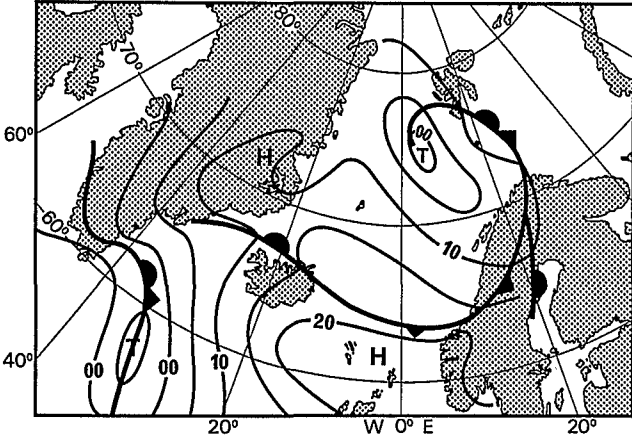


11. September 1973 18^h



12. September 1973 06^h12. September 1973 18^h13. September 1973 06^h13. September 1973 18^h14. September 1973 06^h14. September 1973 18^h

15. September 1973 06^h



15. September 1973 18^h

