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P.J. Emck

An Example of the Importance of the Surface Observations from OWS "M" in Forecasting High Water along the Netherlands Coast.

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Koninklijk Nederlands Meteorologisch Instituut,
Centrale Weerdienst,
Postbus 201,
3730 AE De Bilt,
Nederland.

U.D.C.: 551.507.22

P.J. Emck heeft in de winter 1978-1979 deze studie verricht als bijdrage voor de " WMO Informal Planning Meeting on the Integrated Observing System Study over the Ocean".
In de zomer van 1979 heeft hij de nadere bewerking van tekst en kaartmateriaal nog gedeeltelijk kunnen volgen.
Hij is helaas overleden voordat dit verslag in druk verscheen.

Abstract

For most meteorologist there's no doubt at the importance of the weather observations from ocean-weatherships. The necessary financial investment and increasing operating costs of an ocean weather observing system are however starting discussions about their real impact again and again.

This synoptic case study describes a situation where both meteorological and economic benefit of the observations from OWS "M" (66° N and 02° E) are evident.

A small synoptic-scale low pressure area, timely discovered thanks to the surface observations at OWS "M", had a significant influence on strengthening the pressure gradient over the North Sea as it moved rapidly southward toward the Dutch coast. Observations from neither the U.K. nor the Norwegian weather stations indicated the existence of this disturbance.
Without the observations from OWS "M" the low over the North Sea would have been detected too late to be able to issue timely warnings. However, based on the data from OWS "M" more useful warnings concerning gales and storm surges along the Netherlands coast could be issued.

An Example of the Importance of the Surface Observations from OWS "M" in Forecasting High Water along the Netherlands Coast

Introduction

1. Observations from Ocean Weather Station "M" (66°N and 02°E) are in many cases of great meteorological and economic importance for the Netherlands.
The synoptic case study reported in this paper is one example taken from about 110 situations during the years 1952 to 1976 in which the rise of the water level at the time of high tide exceeded by at least 1 meter the level for the lunar tide predicted in the tables for Hook of Holland (a station at the Dutch west-coast). The study was initiated whith the purpose to illustrate the indispensability of regular surface weather-observations from a strategic position as OWS "M". As such the results were presented to the WMO Informal Planning Meeting on the Integrated Observing System Study over the Ocean (jan. 1979).

2. A small synoptic-scale low pressure area, timely discovered thanks to the surface observations at OWS "M", had a significant influence on strengthening the pressure gradient over the North Sea as it moved rapidly southward toward the Dutch coast. Observations from neither the U.K. nor the Norwegian weather stations indicated the existence of this disturbance. Without the observations from OWS "M" the low over the North Sea would have been detected too late to be able to issue timely warnings. However, based on the data from OWS "M" more useful warnings concerning gales and storm surges along the Netherlands coast could be issued.

Discussion of the weather situation and forecast

3. The evolution of the weather situation is illustrated in Charts 1 through 8 which give the sea-level syncptic charts for the period 0300 GMT, 14 December 1973 to 0000 GMT, 15 December 1973. The sea-level isobars are depicted at 5 millibar intervals to define areas of low-pressure and strong pressure gradient. Figures in circles between isobars are the computer wind velocities. **Areas of falling pressure (isallobars)** are depicted as shaded areas on each chart.

4. At 0300 GMT on 14 December 1973 (Chart 1), a synoptic-scale low has crossed the southern tip of Norway and is located over southern Sweden. It caused a northnorthwesterly gale over the North Sea and two stormsurges along the Dutch coast (140500 and 141800 at Hook of Holland). Later on (150000 GMT) a third storm surge occured, and this case study refers to the last-mentioned.

5. Imbedded in the northerly flow over the North Sea are two small-scale but vigorous lows. The westernmost low (995 mb) has been located at 140300 GMT by the station network over northern Scotland. Its subsequent movement (depicted on Chart 1 by the "dashed" track) is too far west to cause a significant increase in surface pressure gradient (and resulting storm surge) along the Dutch coast. However, the more northerly low (985 mb), could already have existed some time over the Norwegian sea, but is located exclusively by the observation of 1403000 GMT at OWS "M". At 140600 GMT it has passed OWS "M" and later moves rapidly southward between the observation networks over Norway and U.K. (see the "dot-dashed" track on Chart 1). Due to the different track this second low causes a significant increase in the winds over the western part of the North Sea and hence an extra rise of the waterlevel along the Netherlands coast around 0000 GMT on December 15 (compare Chart 5 with Charts 7 and 8). The timely detection of the low as it passed over OWS "M" allowed the forecaster to calculate not only the rise resulting from the already existing windforce 8 Beaufort, but moreover an additional rise of 2 to 3 decimetres due to the gale increasing to 10 or even 11 Beaufort. He could issue his warnings 18 hours in advance of the stormsurge.

6. The hight of the additional rise can be determined by comparing charts 6 to 8 with charts 6B to 8B. The weathermaps numbered 6B to 8B for 1800 GMT, 14 December 1973 to 0000 GMT, 15 December 1973, are drawn started from the assumption that no observations at OWS "M" had been available. One would have had some doubts concerning certain irregularities in the wind observations of the available ship-reports. The streampattern is more smoothly analysed and due to the dominant pressure rises after the passing of the first small-scale low one shall forecast a weakening wind all over the North-sea and a lower tide accordingly.

7. If not noticed by the observations at OWS "M", the next opportunity to detect the low was between 1800 and 2100 GMT as it passed over a group of selected ship stations off the Norwegian coast (see Charts 6 and 7). Perhaps the most critical observation was the 50 knot wind from ship LHHT at 142100 GMT (Chart 7). However, discovery of the low at that time would not have allowed sufficient time for issuing timely warnings for the storm-surge occuring around 150000 GMT. Furthermore: no adequate galewarnings could have been issued for shipping in the central and eastern part of the North Sea, since the recommended time of issue is 6 hours in advance.

8. It should be noted that the speed of the low in question increased as it moved southward over the North Sea; that is, from 30 knots as it passed over OWS "M" to 40 knots as it reached the Dutch coast. The system decreased in strenght during this period. This resulted in a maximum of the highwater-level two hours before the maximum lunar tide. If the development had been otherwise and if the stormsurge had been not the third but the first of a series, the situation and the consequences could have been far more dangerous.

Conclusions

9. The following conclusions can be drawn from this study:

(a) The storm-surge case described in this paper represents a situation with significant extra rise of the waterlevel around high tides, which has occurred 110 timesduring the 24 years between 1952 and 1976. Therefore, it is not a rare event.

(b) The existence of a stationary observing platform, such as OWS "M" from which regular, reliable surface observations can be obtained, is critical in locating small-scale disturbances which cause increased strong winds over the North Sea and resulting storm-surge along the Dutch coast.

(c) The strategic location of the observation platform, far enough up-stream from the areas of critical interest, allows the timely issuing of both gale warnings for shipping in the North Sea and storm-surges along the Netherlands coast.

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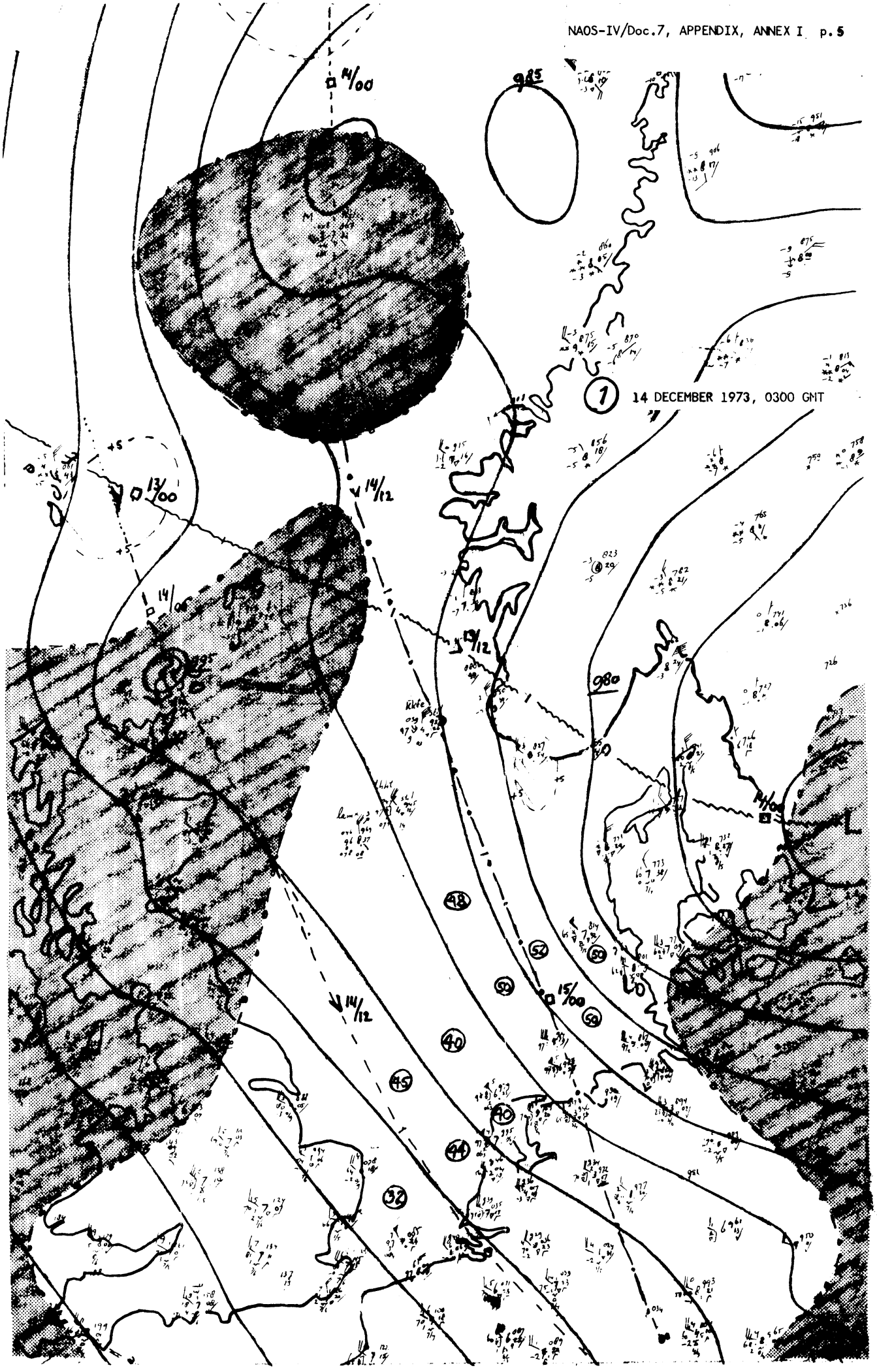
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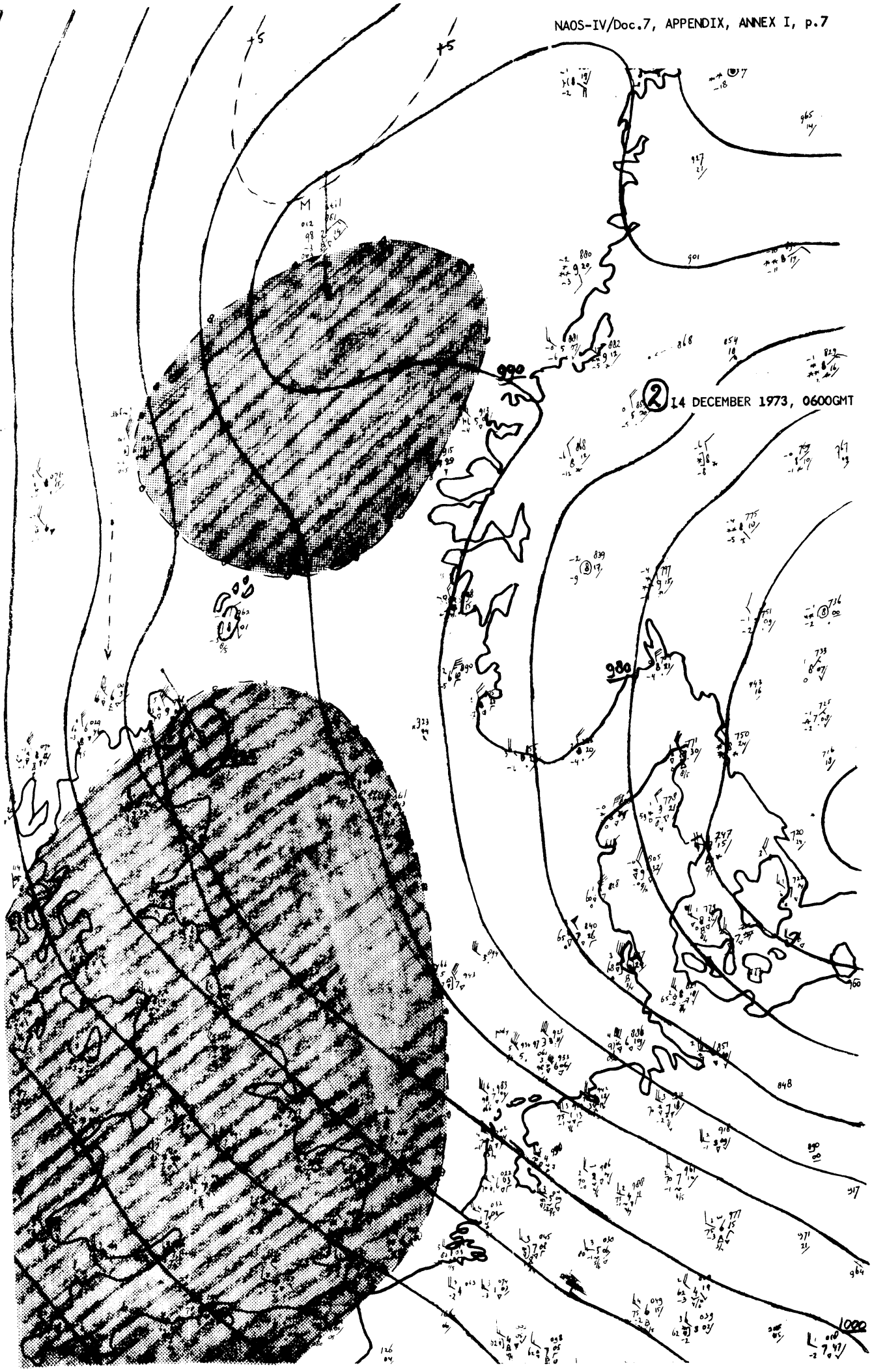
14 DECEMBER 1973, 0300 GMT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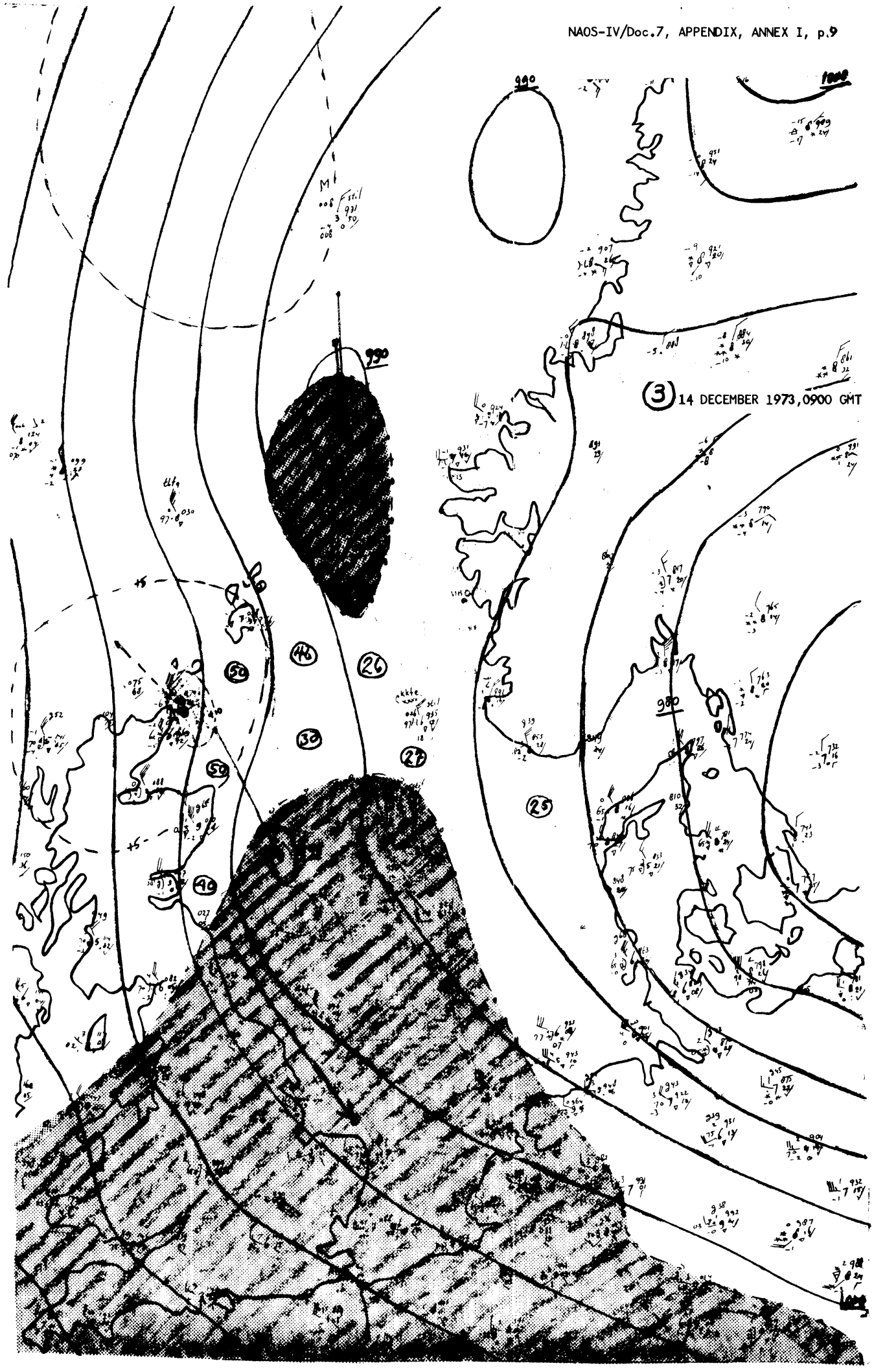
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1000
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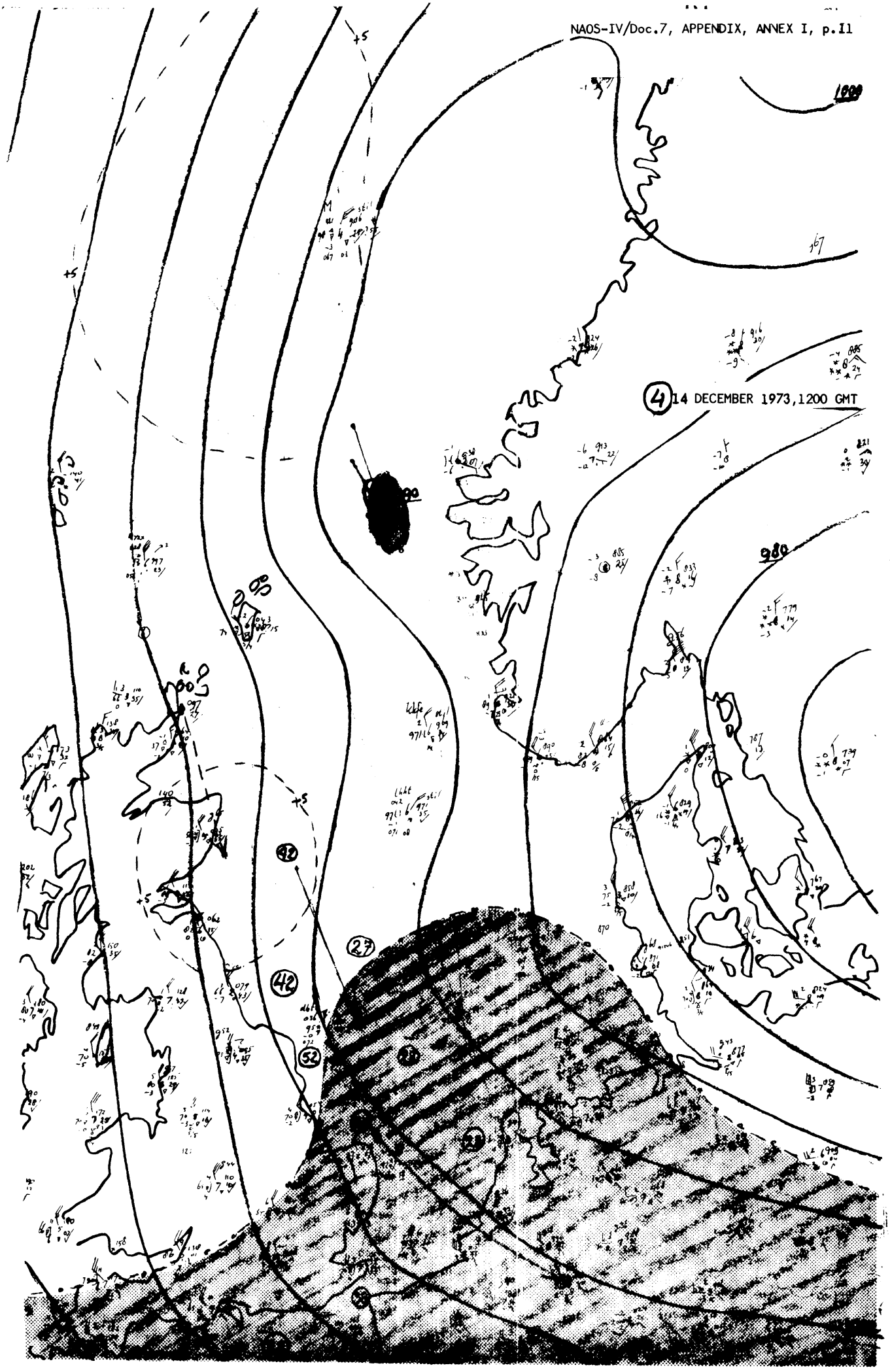
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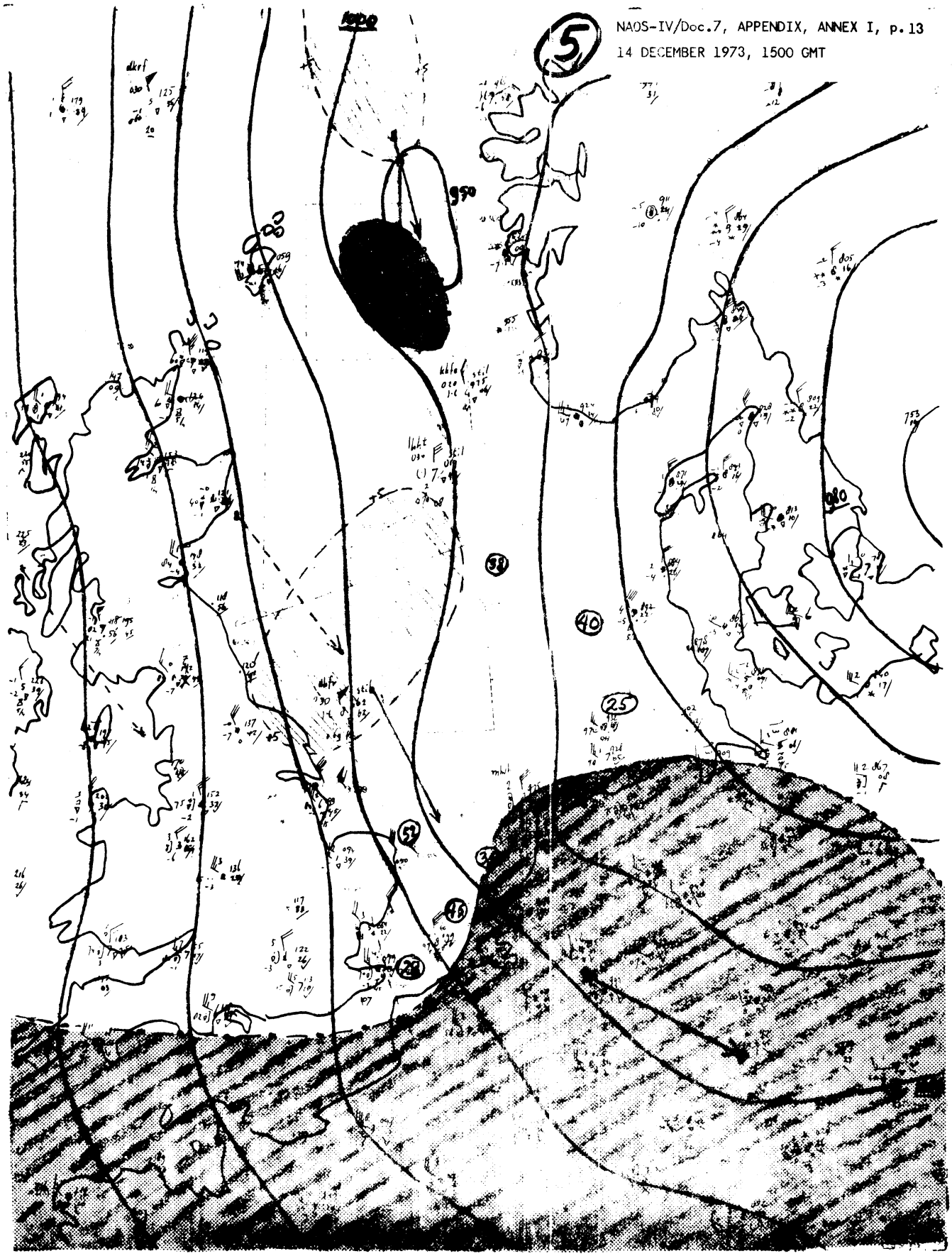

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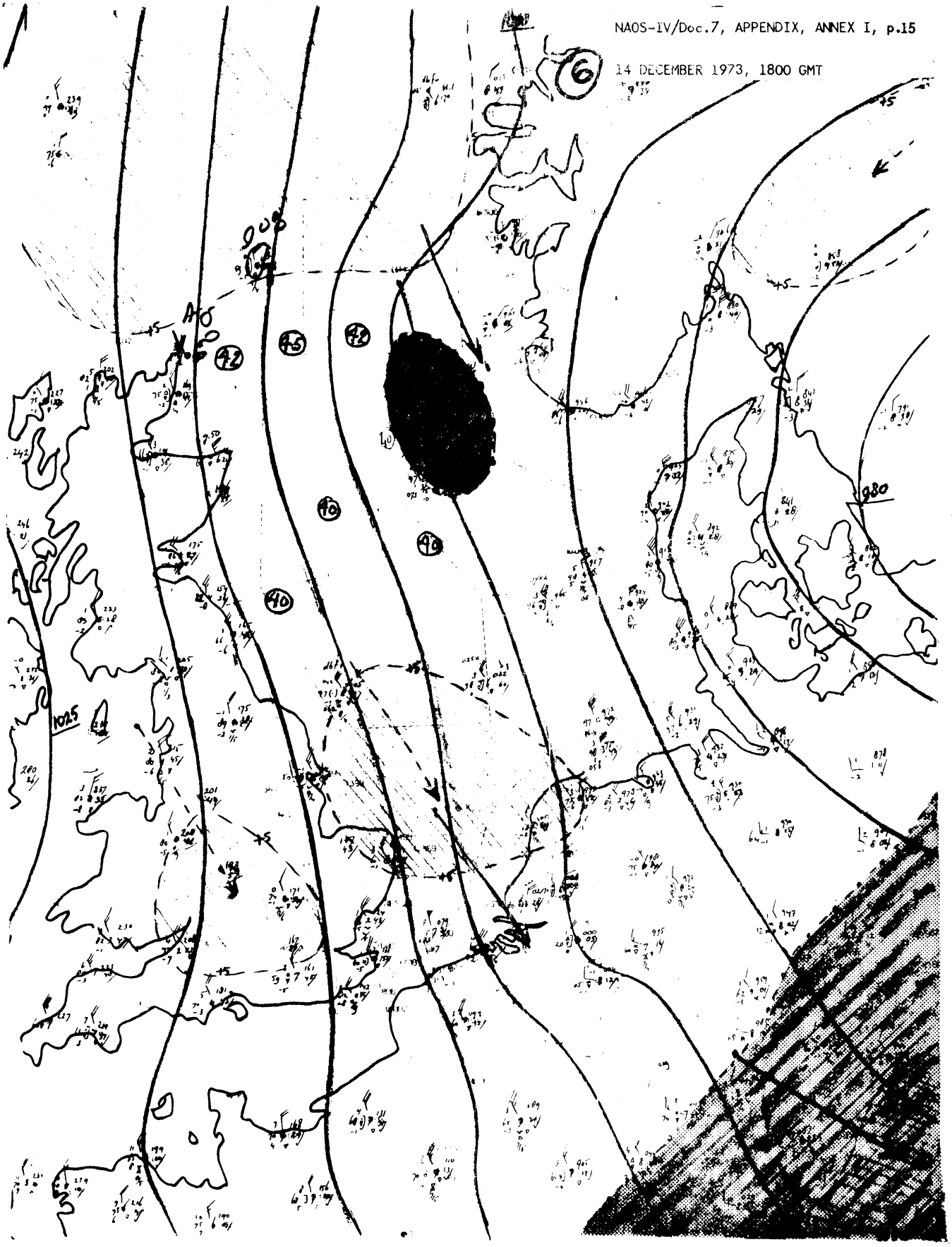

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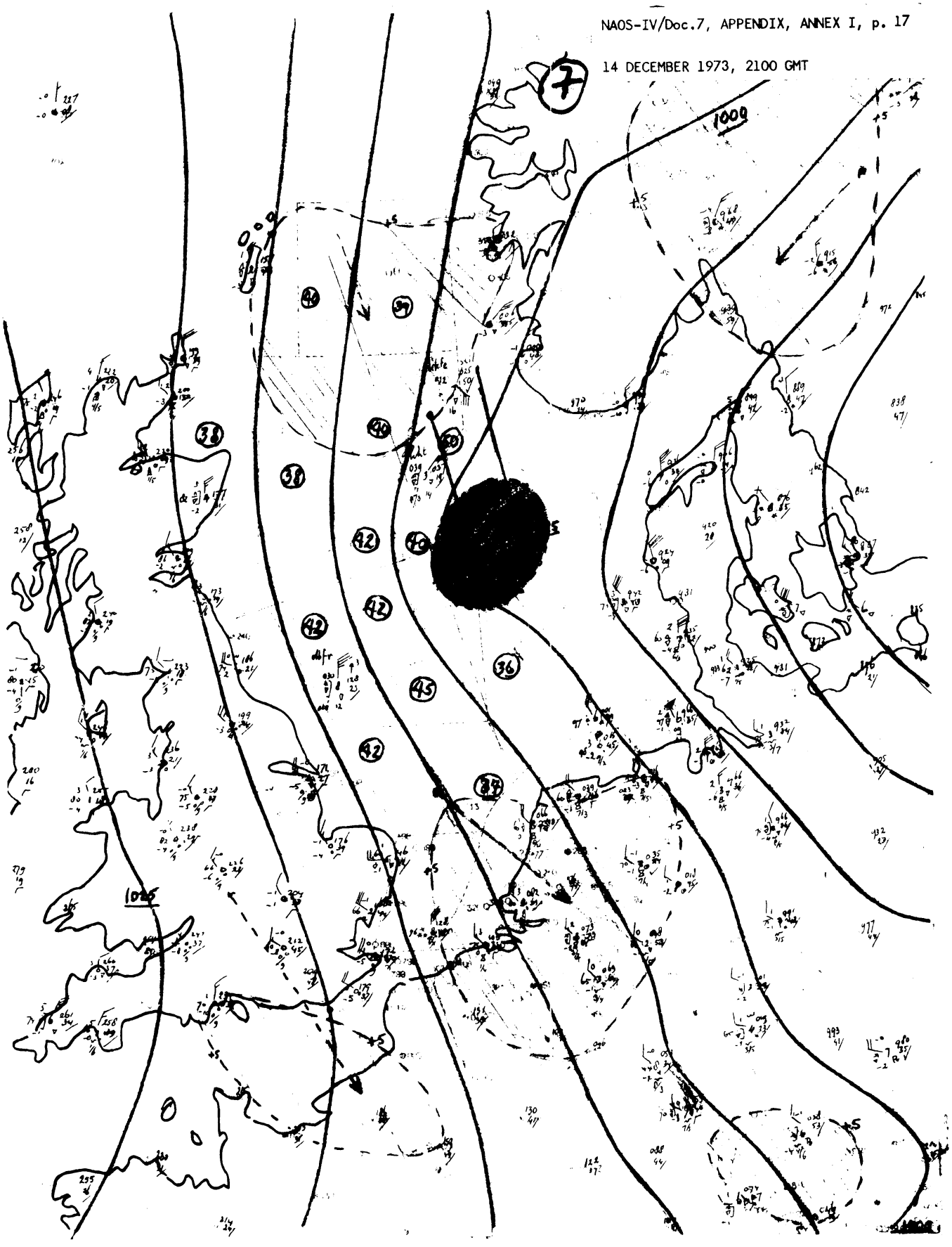

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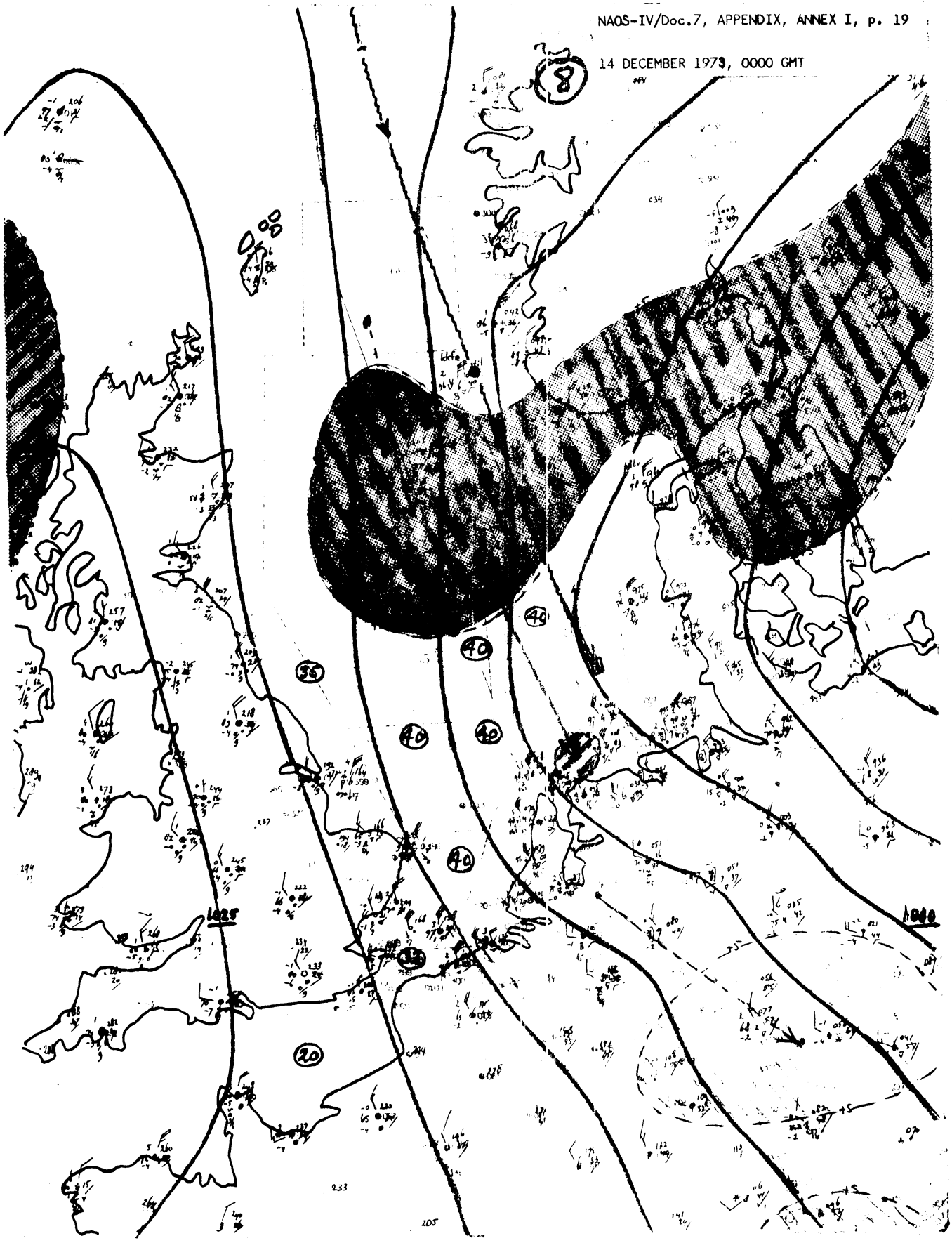

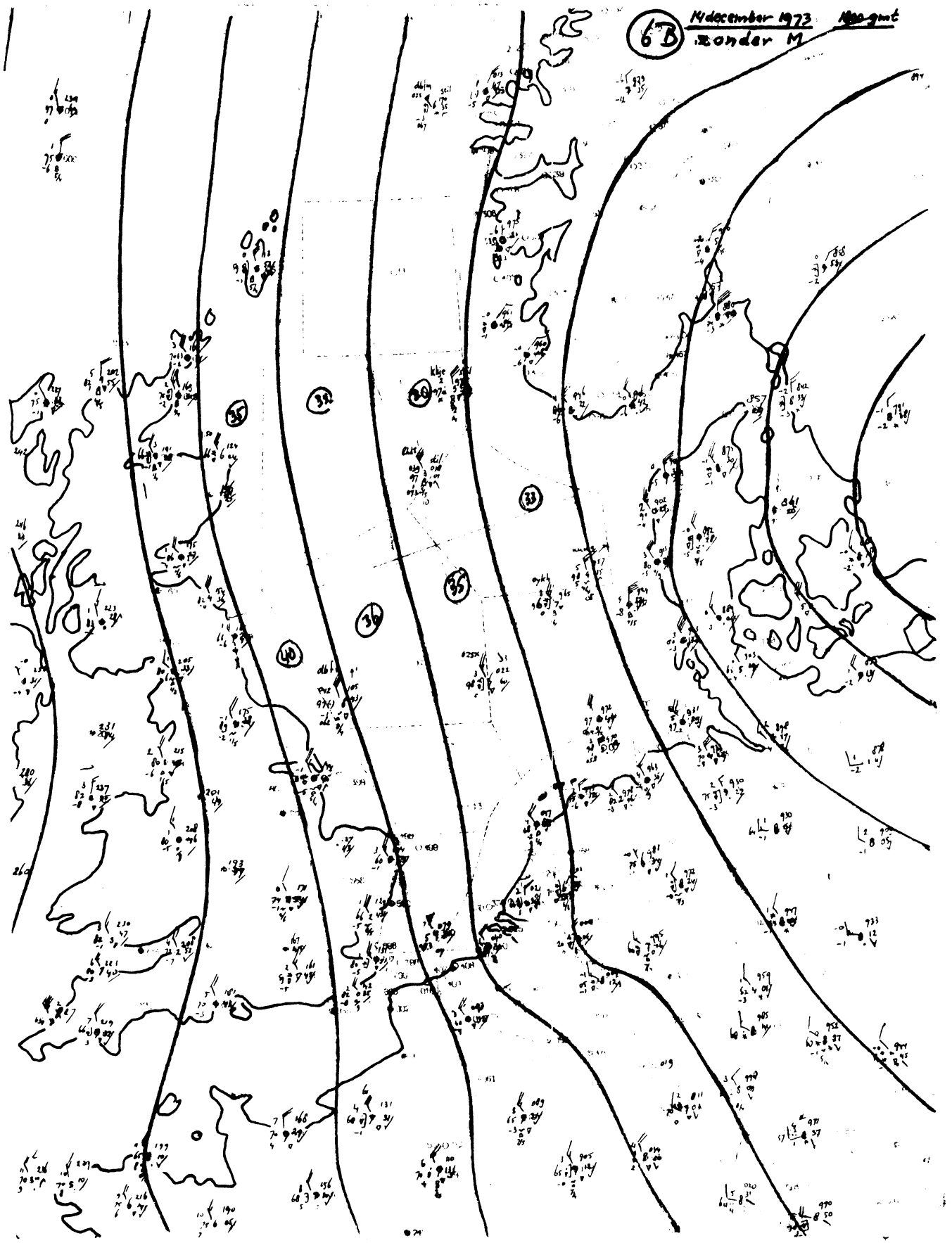
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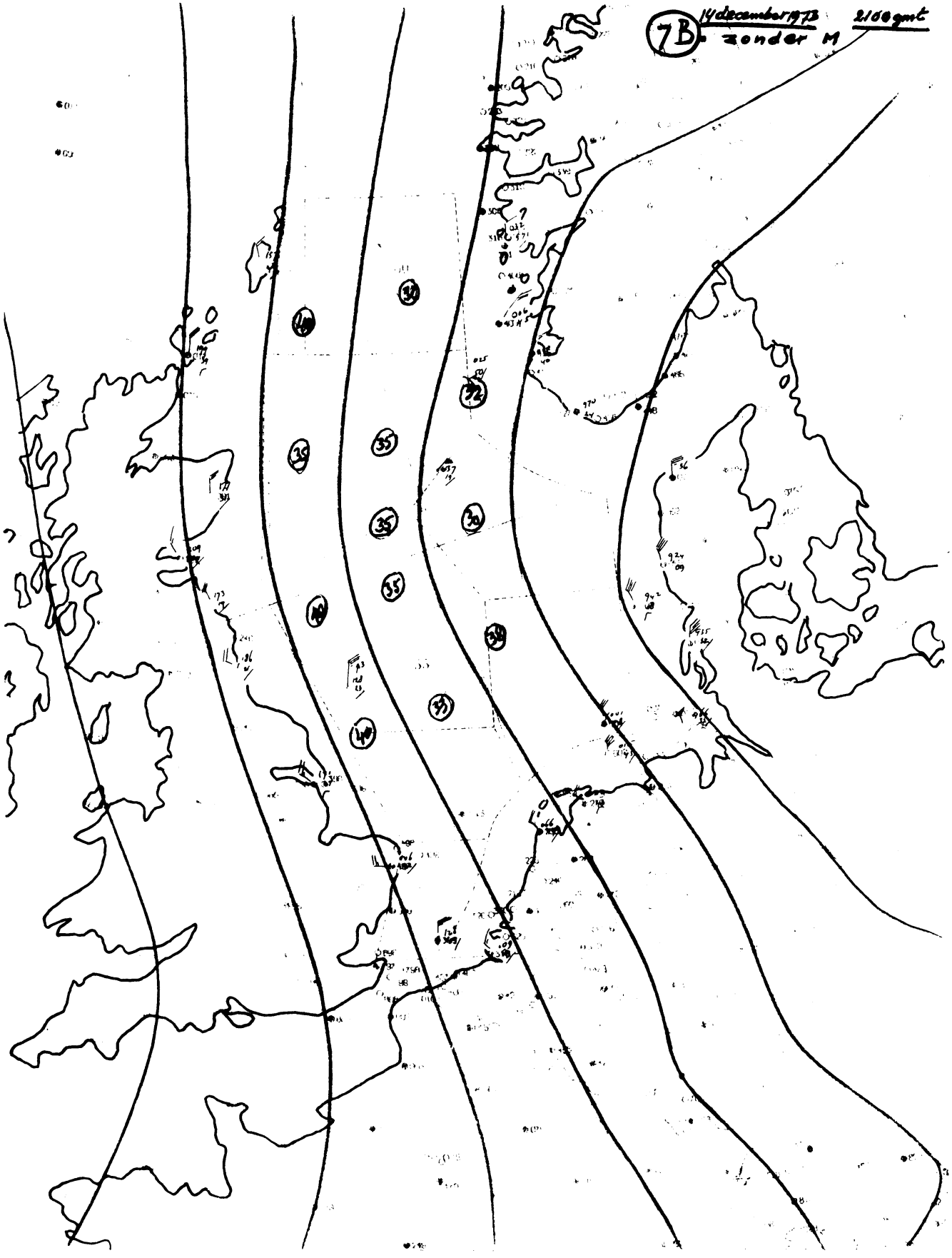
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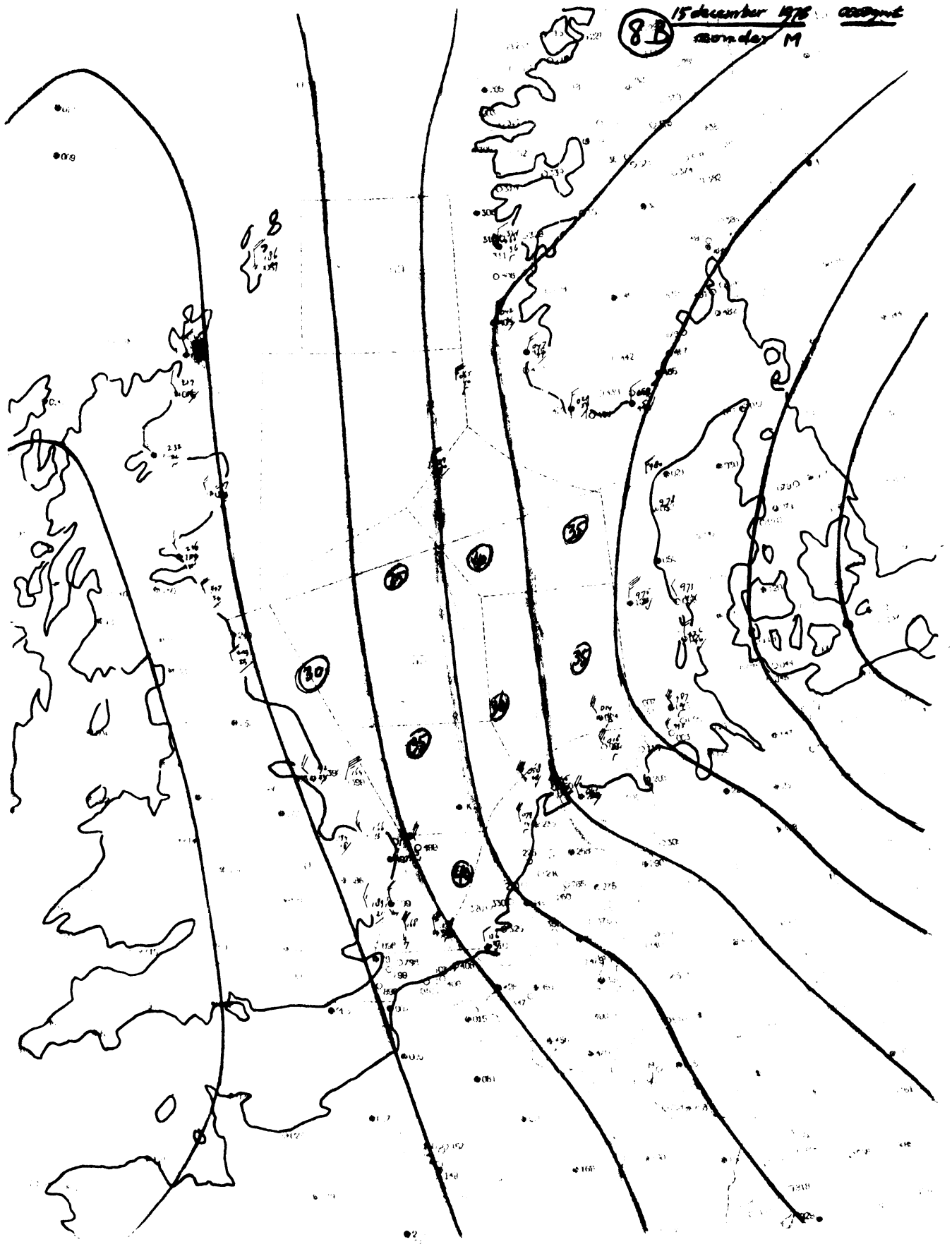
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15 december 1978
zondag M