DNMI-REPORT

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OIL DRIFT STATISTICS

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SUMMARY

The operational oil drift model at the Norwegian Meteorological Institute (DNMI) has been used to present statistical oil drift data for the position 58°45'N,03°50'E with oil density : 850 kg/m^3 and discharge rate : 60 tons/hour.

SIGNATURE

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PROJ. RESPONSIBLE

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HEAD OF DIVISION

DET NORSKE METEOROLOGISKE INSTITUTT

OIL DRIFT STATISTICS

FOR

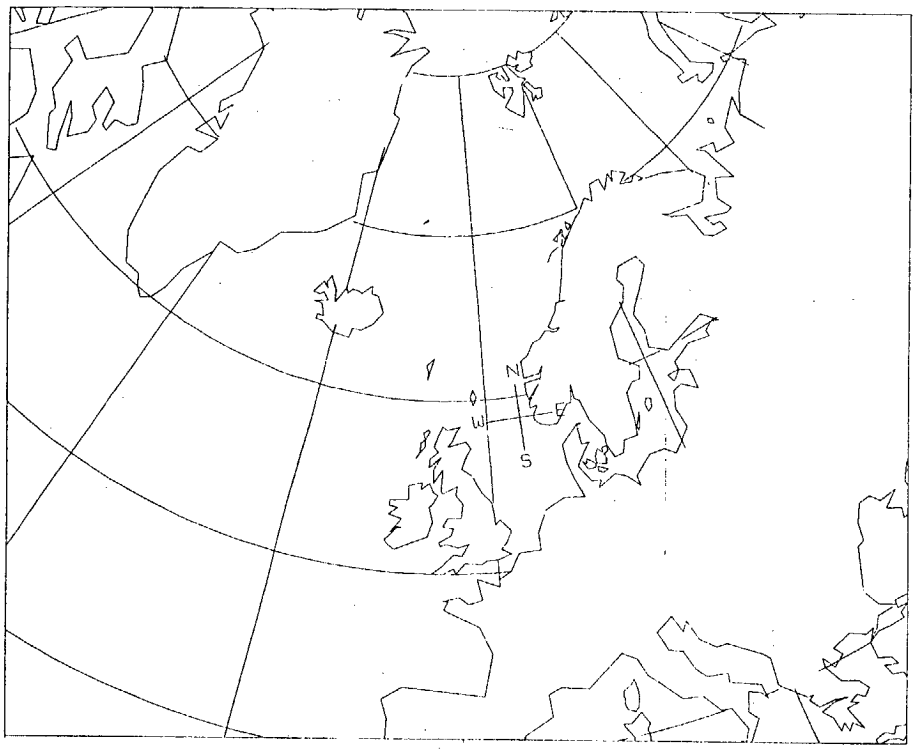
58°45'N 03°50'E

OSLO 1992

SUMMARY

The operational oil drift model at The Norwegian Meteorological Institute (DNMI) has been used to present statistical oil drift data for the position 58°45'N,03°50'E with oil density: 850 kg/m^3 and discharge rate: 60 tons/hour.

The discharge posisition is given on the map below.



The statistics have been obtained from simulated oil drift trajectories, computed by the operational oil drift model at DNMI. The basic data are historical wind fields for every 6. hours during 1955-1984, from the upgraded Hindcast database at DNMI. In addition a background current field is incorporated in the model. Starting every 6 hour from 1955 the trajectories of oil patches together with the oil amount remaining on the sea surface have been calculated. Every oil patch is simulated during a 30 days period. The statistical information on the oil drift is obtained by analyzing all the simulated oil trajectories and amounts for the whole period from 1955-1984.

The statistics are computed from information about position and amount of oil each 24 hour and for each of the simulated oil trajectory. The results are presented as geographical distribution of the five statistical parameters:

- ARRIVAL FREQUENCY
- MINIMUM DRIFT TIME
- MEAN DRIFT TIME
- MAXIMUM AMOUNT OF OIL
- MEAN AMOUNT OF OIL

for the four seasons :

Winter (Dec.-Feb.)
Spring (March-May)
Summer (June-Aug.)
Autumn (Sept.-Nov).

The model domain consists of a given number of grid boxes each measuring 10 x 10 km^2. The five statistical parameters are computed at the positions of the different grid boxes. Thus the statistical results may be presented as contour-plots over the model domain. The interpretation of the different maps are discussed in some detail below.

A more comprehensive description of the oil drift model and the statistical treatment is given i the report :

Oljedriftstatistikk på norsk sokkel, Hovedrapport Technical Report No. 64a, 1985, Det norske meteorologiske institutt.

ARRIVAL FREQUENCY PER 10x10 KM^2 AREA

This plot indicates the geographical distribution of oil trajectories. The unit of the values on the contour lines are per cent of the total numbers of the simulated oil patches.

However, the plot does not show how many trajectories that have passed through the different grid boxes (cf. the low values near the oil spill position). Since the information concerning the various oil patches are only used every 24 hours, this statistical parameter does not express the total number of occasions where oil was found in a grid box. For instance, with a wind of 10 m/s the oil can move a distance of about 25 km during 24 hours. Thus it will pass through a couple of grid boxes before it is registered in the statistics, then being in another grid box. In this way the grid boxes that the oil passed through will be "empty" at the sampling time !

MINIMUM DRIFT TIME

The unit of the contour lines is days. The plot shows the minimum number of days an oil patch needs to drift a certain distance from the spill site. Thus the plot shows the statistical "worst case".

In other words, the contour lines show how far away from the spill site the oil can drift during 1, 5, 10, 15, 20, 25 and 30 days.

MEAN DRIFT TIME

The unit of the contour lines is days. The plot shows the mean number of days an oil patch needs to drift a certain distance from the spill site. Thus the plot shows the statistical "mean case".

The contour line showing a mean drift time of 1 day is often not drawn. This is because variations in the wind direction may force some oil patches back to the oil spill position increasing the mean drift time above 1 day.

Another feature which must be mentioned is that the contour lines, showing the longest drifting times, for the minimum and mean drift time is nearly similar. This is because the areas are far away from the oil spill position so only one or a few oil patches have reached these areas. Therefore the information from these areas has less statistical value.

MAXIMUM AMOUNT OF OIL

This plot gives information about the maximum amount of oil which has reached the various locations, i.e. how far away from the oil spill position an oil patch may have an amount of oil of 100, 90, 80, ..., 0 % of the effective spillage rate. Since the unit of the contour lines is percent of the effective spillage rate, the amount of oil left at the sea surface at one particular position is found by multiplying the effective spillage rate with 6(hours) and then multiply the result with the percentage value from the plot for the particular locations.

Because the oil drift model which was used in the statistical calculations does not take into account the spreading of oil, the plot does not show the concentration (amount per unit area) of oil at a given position. Instead it shows the percentage value of oil at the mass centre, i.e. if all the oil was gathered at one particular position. In case of an oil spill the oil will be spread over an area which will increase with increasing drifting time.

Therefore the concentration of the oil will decrease faster than the values indicated in the plot.

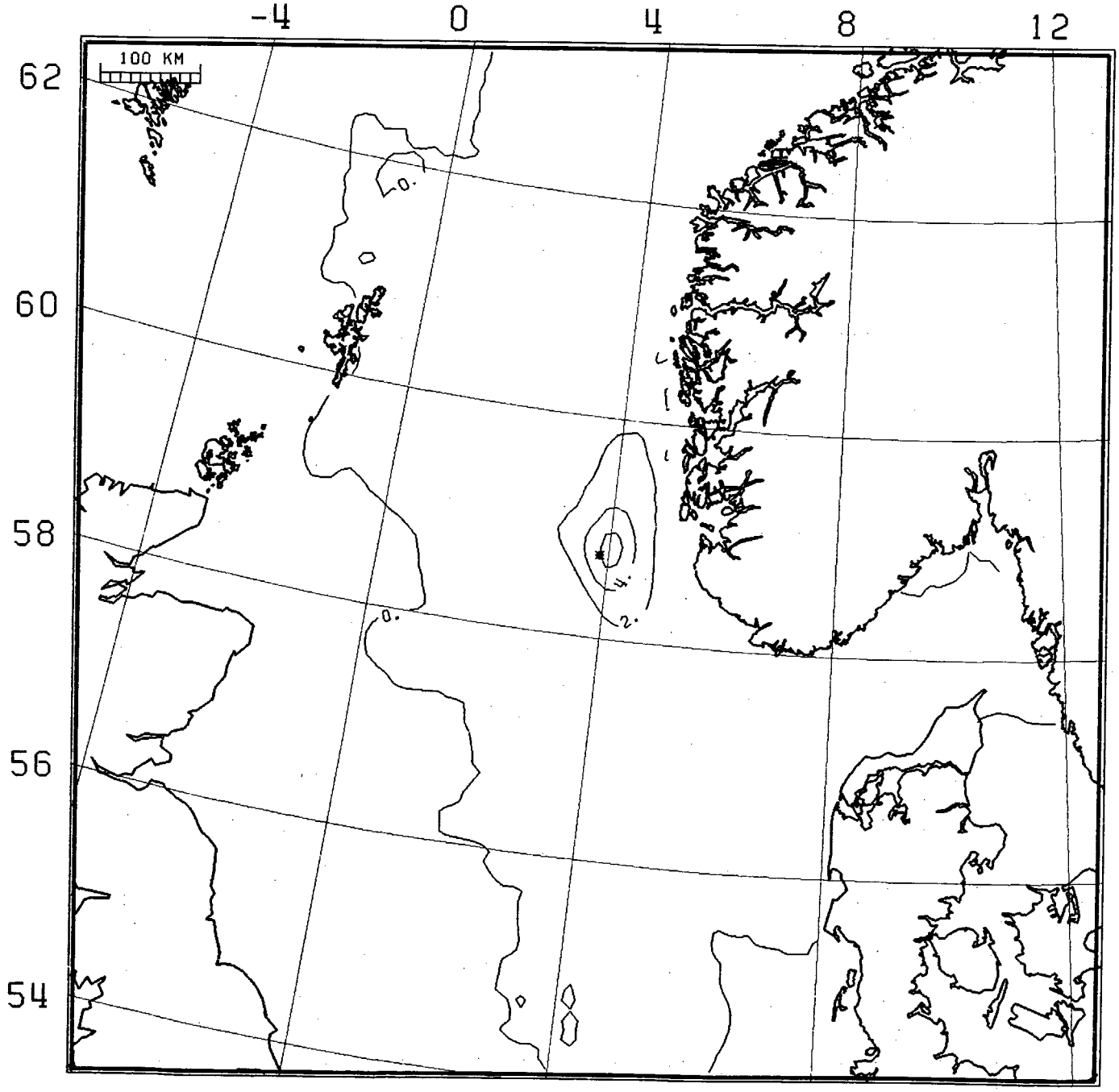
MEAN AMOUNT OF OIL

The unit of the contour lines is percent of the effective spillage rate. The plot gives information about the mean amount of oil which has reached the various locations, i.e. how far away from the oil spill position the oil patches may have a mean amount of oil of 100,90,.....,0 % of the effective spillage rate. The estimation of the amount of oil left at the sea surface is found in the same way as described in the explanation for the maximum amount of oil. In addition the same comments apply.

WINTER

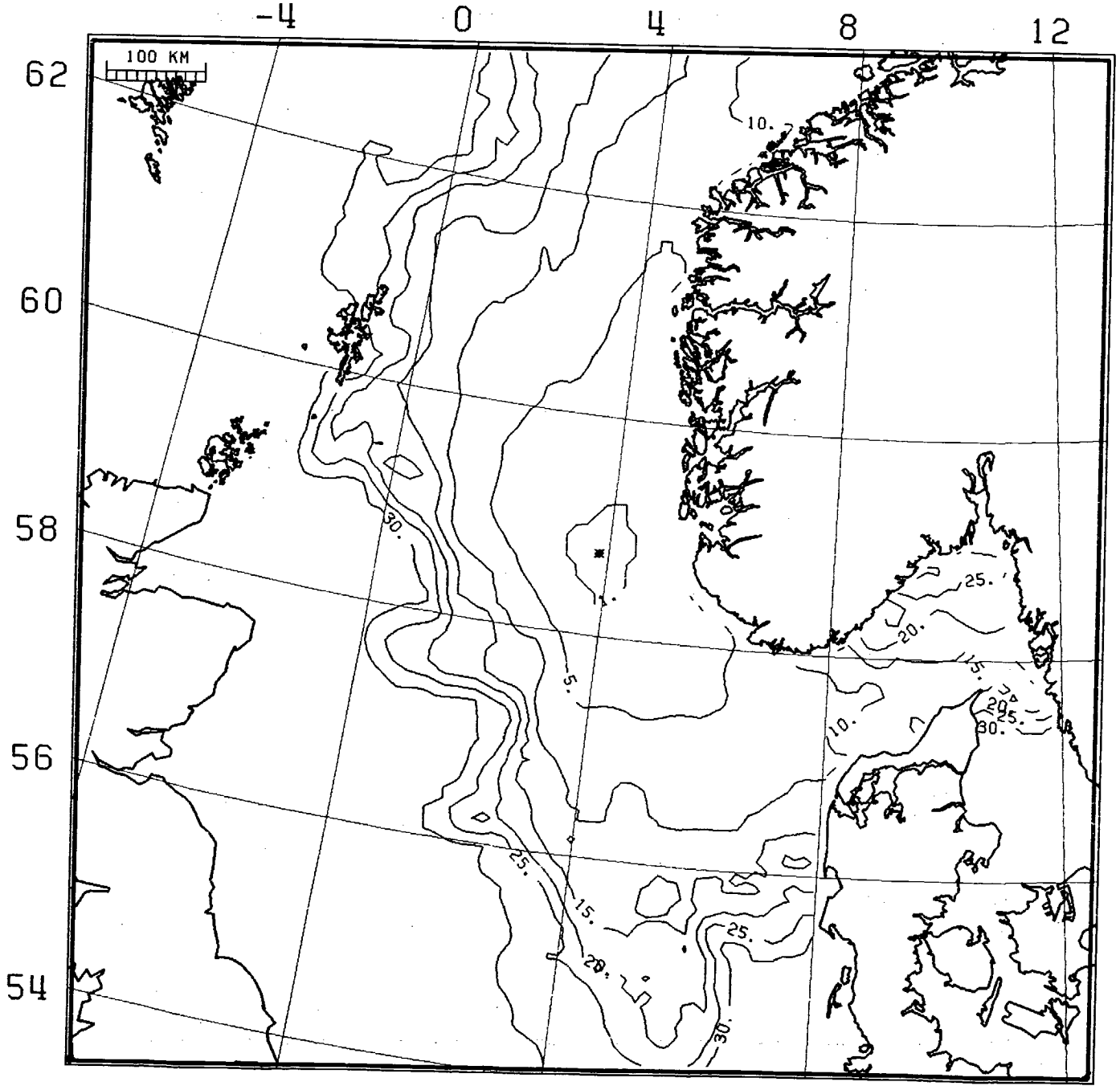
OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : DEC, JAN, FEB 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

ARRIVAL FREQUENCY PER. 10X10 KM AREA
UNIT: % OF TOTAL NUMBER OF SPILLS



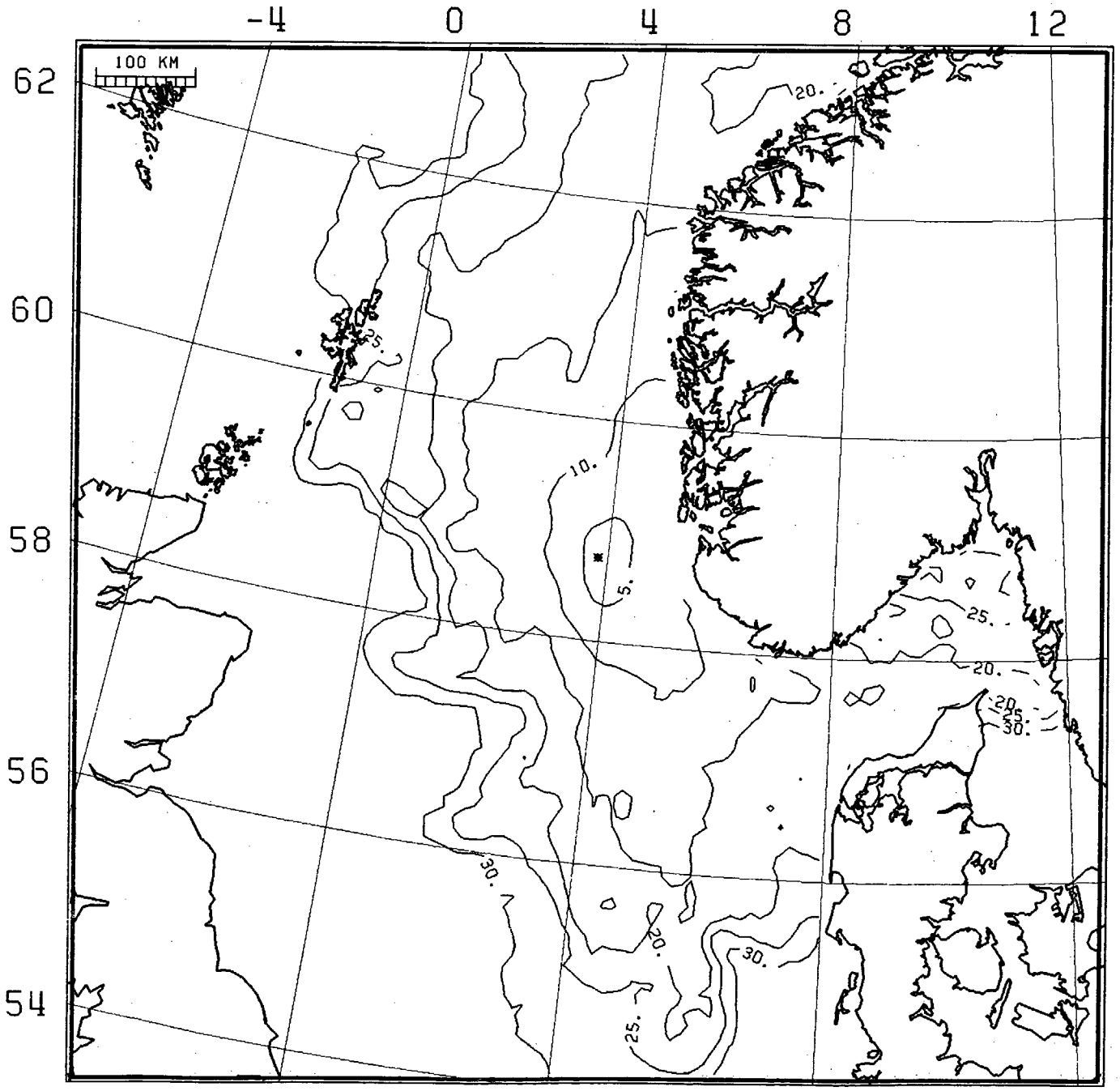
OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : DEC, JAN, FEB 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MINIMUM DRIFT TIME
UNIT : DAYS



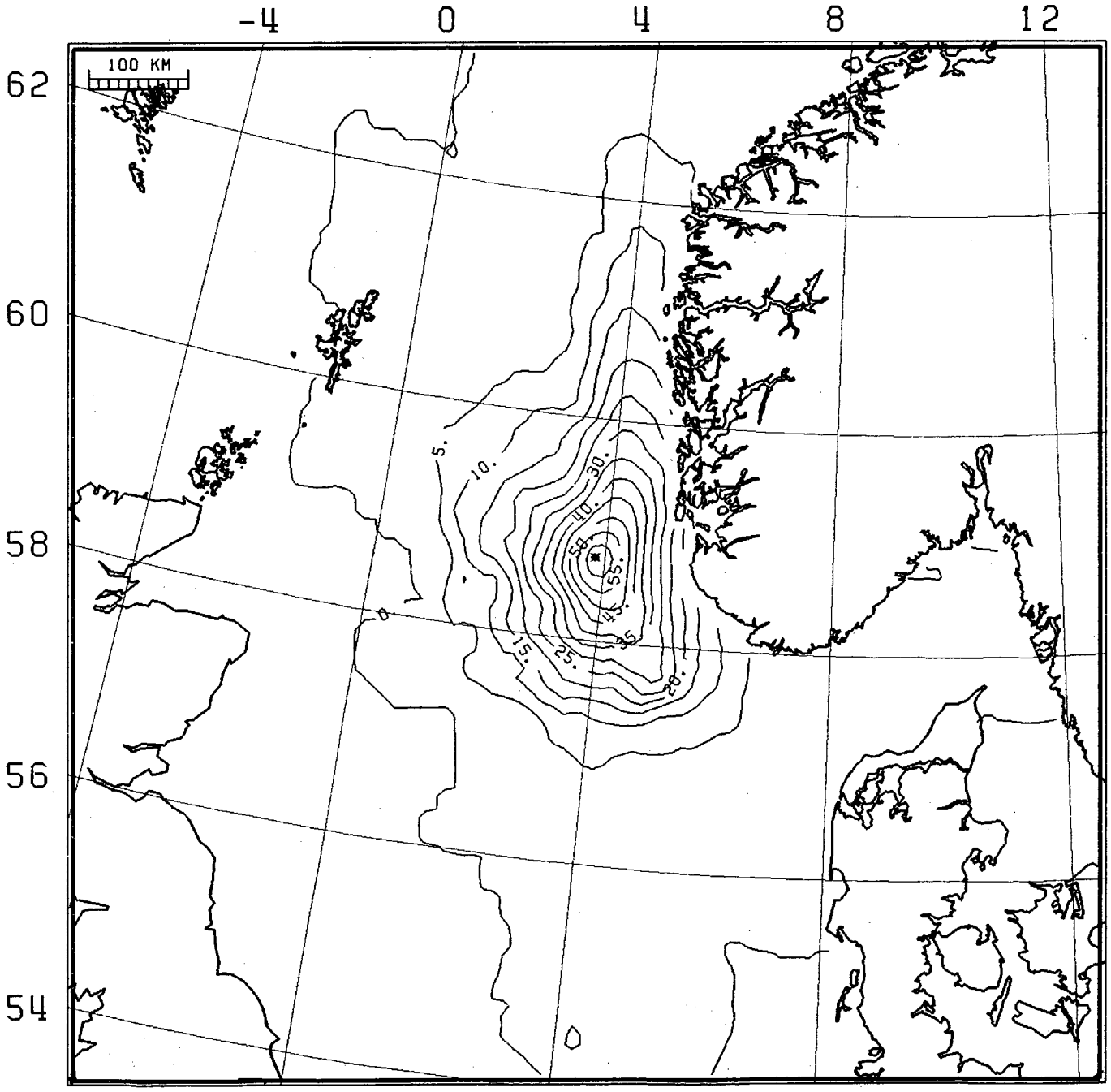
OIL SPILL POSITION:58°45'N 3°50'E
PERIOD : DEC,JAN,FEB 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MEAN DRIFT TIME
UNIT : DAYS



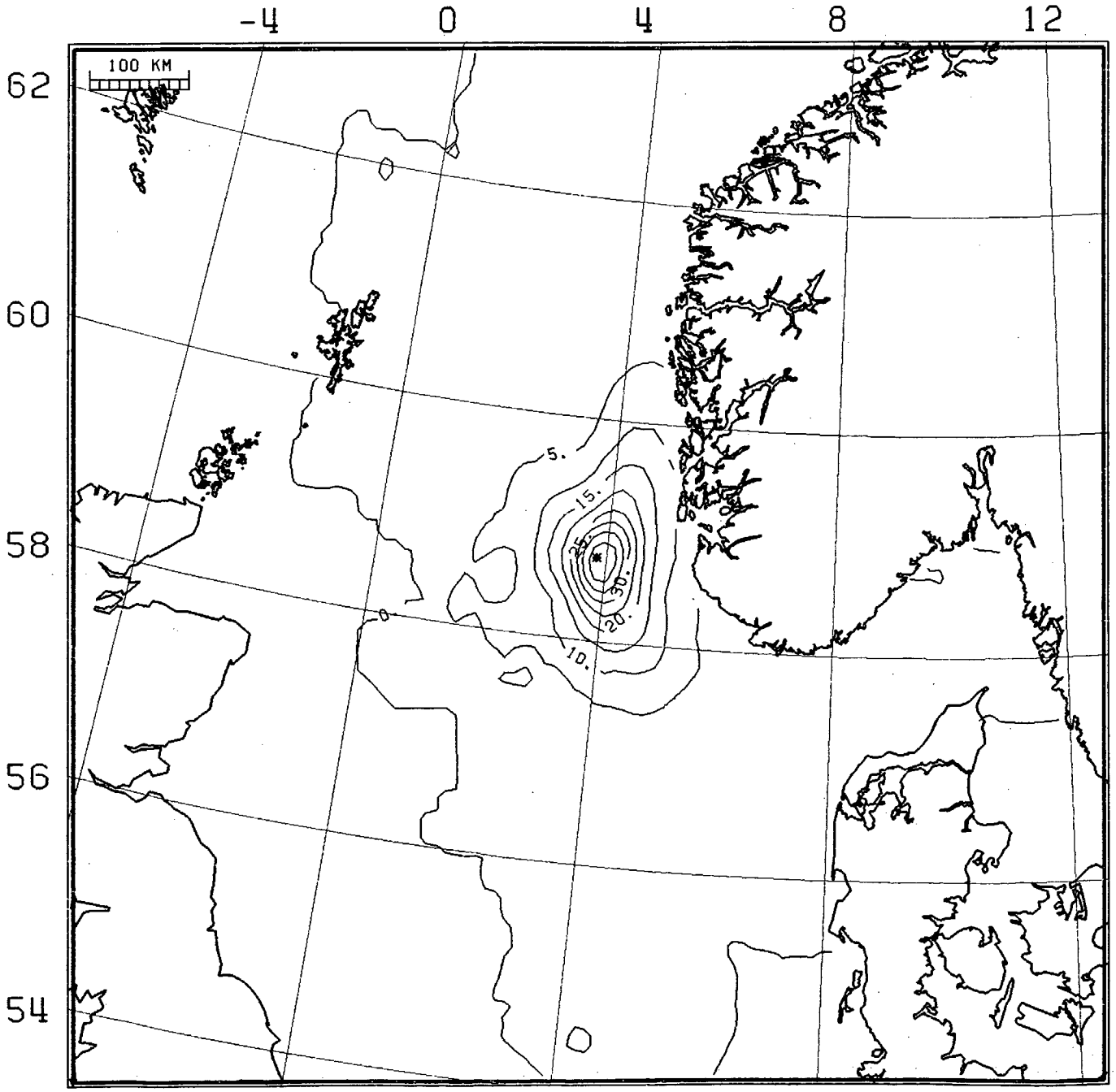
OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : DEC, JAN, FEB 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MAXIMUM AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



OIL SPILL POSITION:58°45'N 3°50'E
PERIOD : DEC,JAN,FEB 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

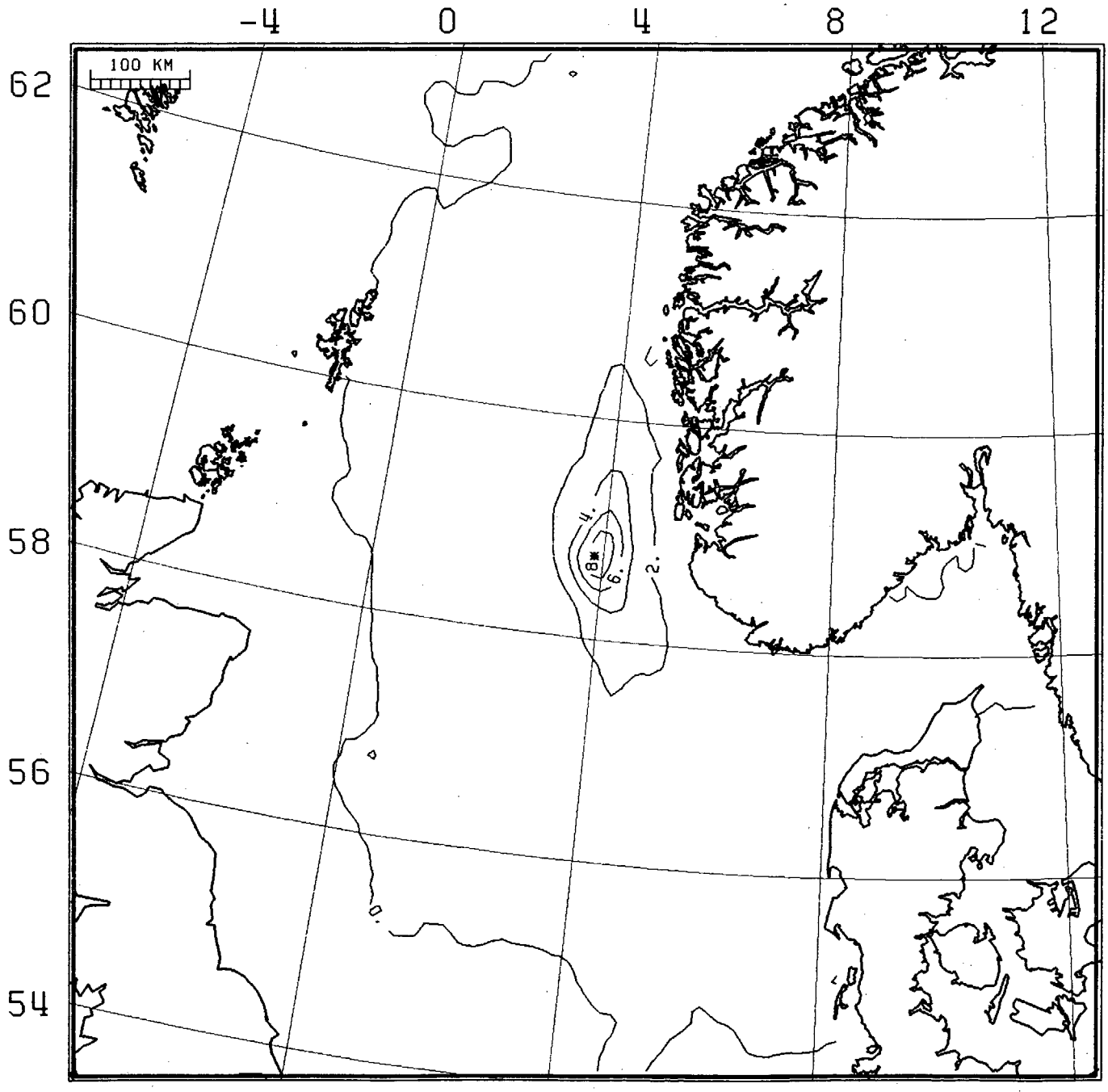
MEAN AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



SPRING

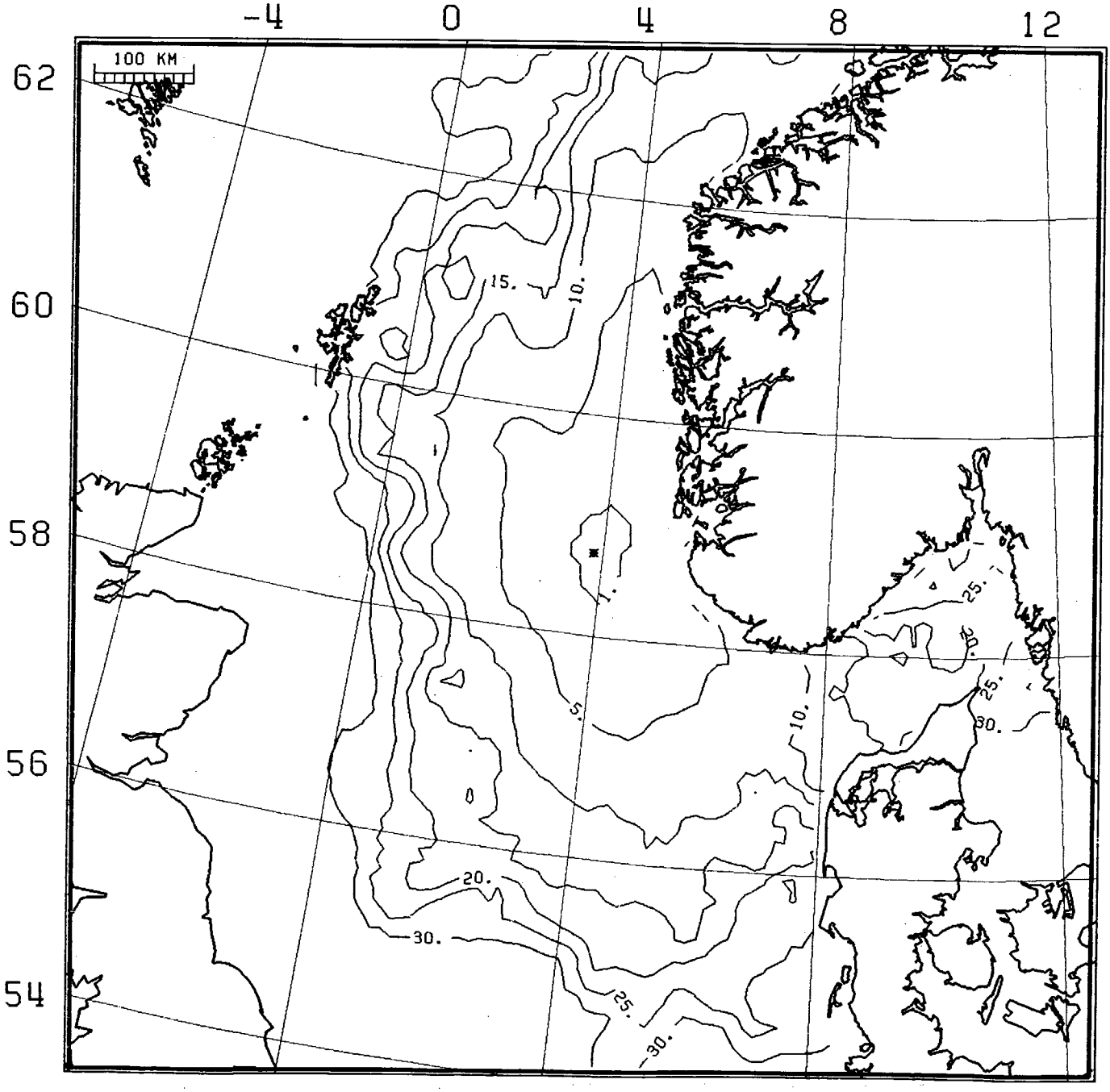
OIL SPILL POSITION:58°45'N 3°50'E
PERIOD : MAR,APR,MAY 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

ARRIVAL FREQUENCY PER.10X10 KM AREA
UNIT: % OF TOTAL NUMBER OF SPILLS



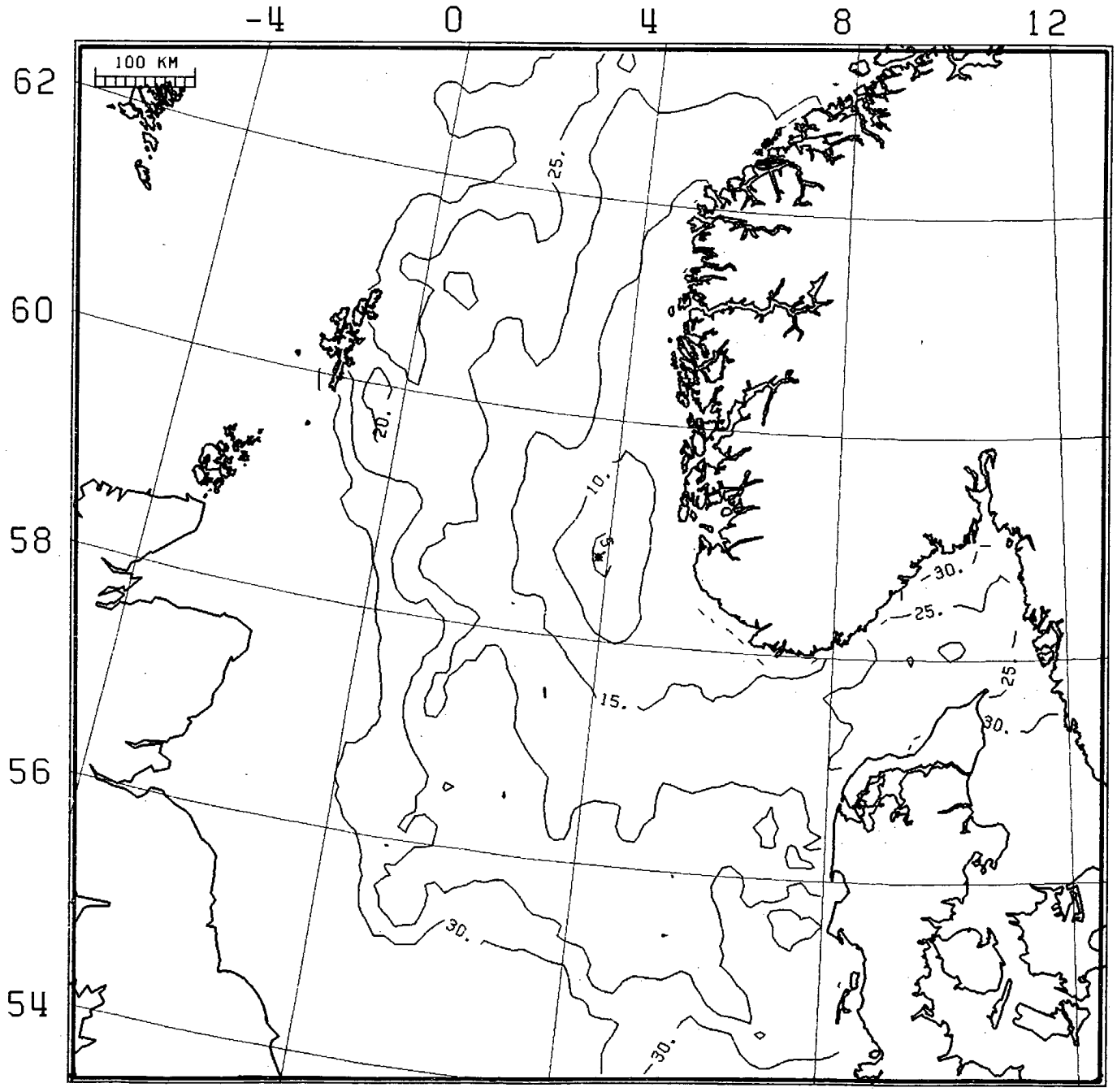
ØIL SPILL PØSITIØN:58°45'N 3°50'E
PERIØD : MAR,APR,MAY 1955-1984
SPILLAGE RATE: 60 TONN/HØUR
DENSITY : 850 KG/M**3

MINIMUM DRIFT TIME
UNIT : DAYS



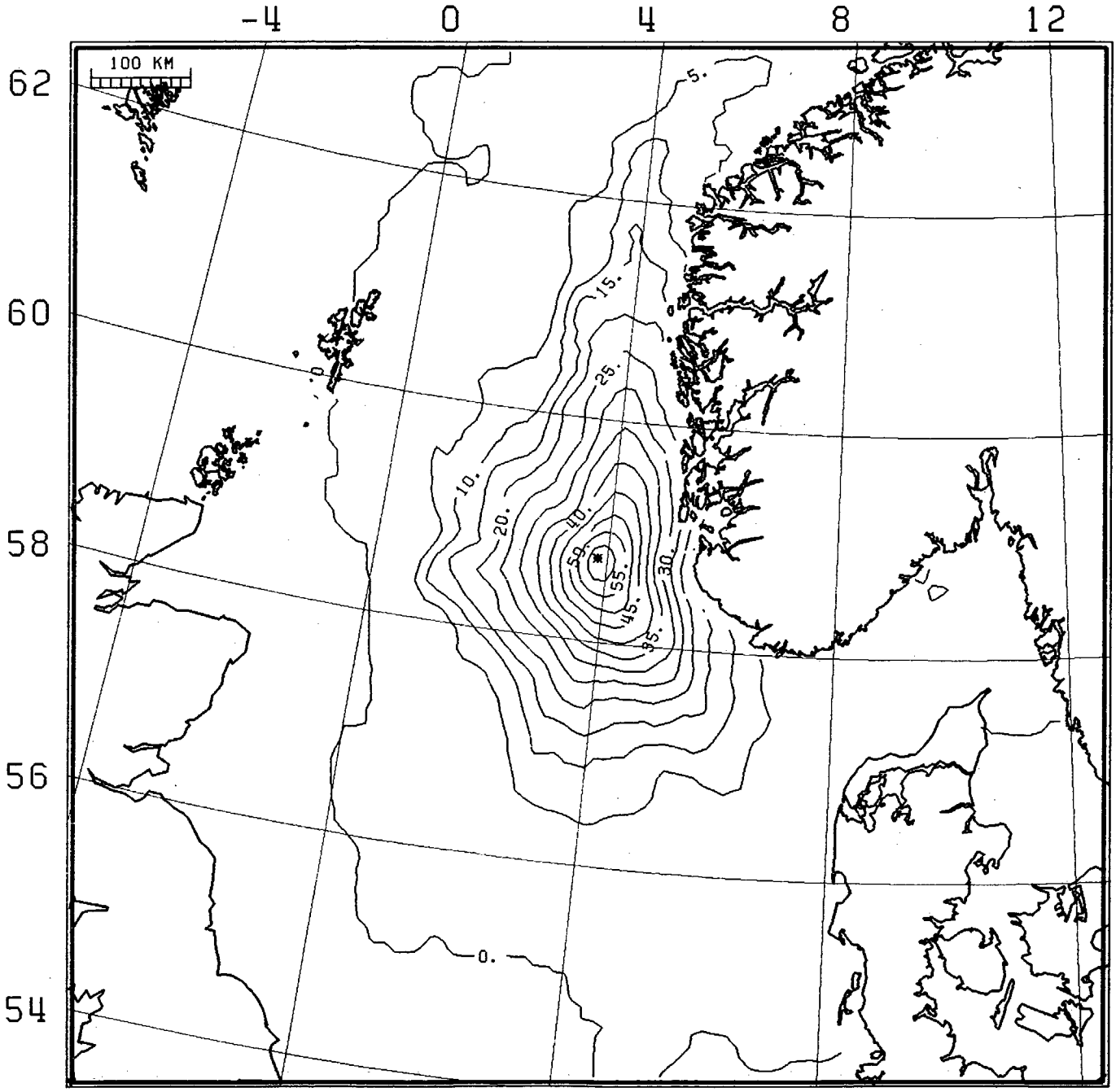
OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : MAR, APR, MAY 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MEAN DRIFT TIME
UNIT : DAYS



OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : MAR, APR, MAY 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MAXIMUM AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



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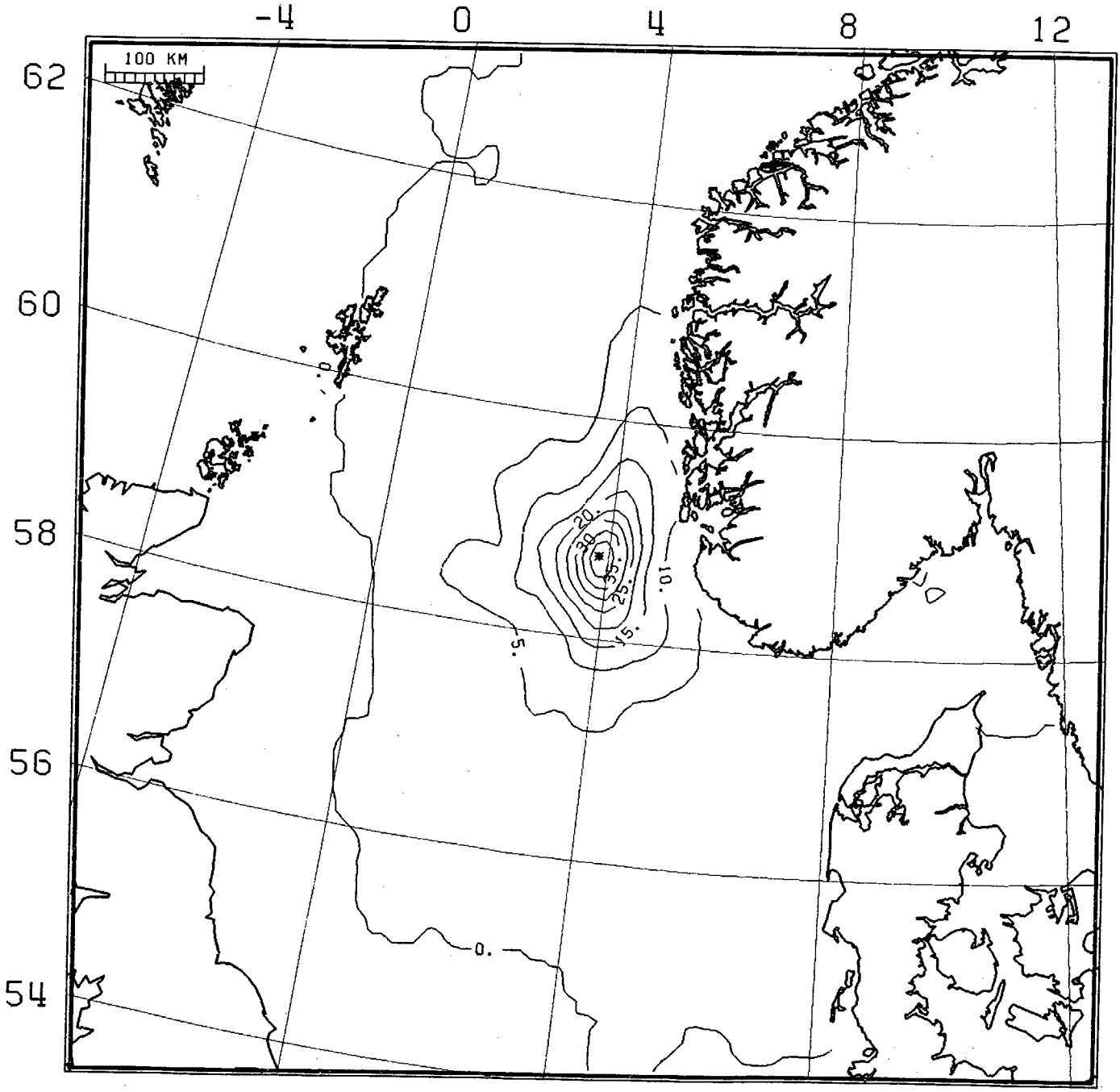
PERIOD : MAR, APR, MAY 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

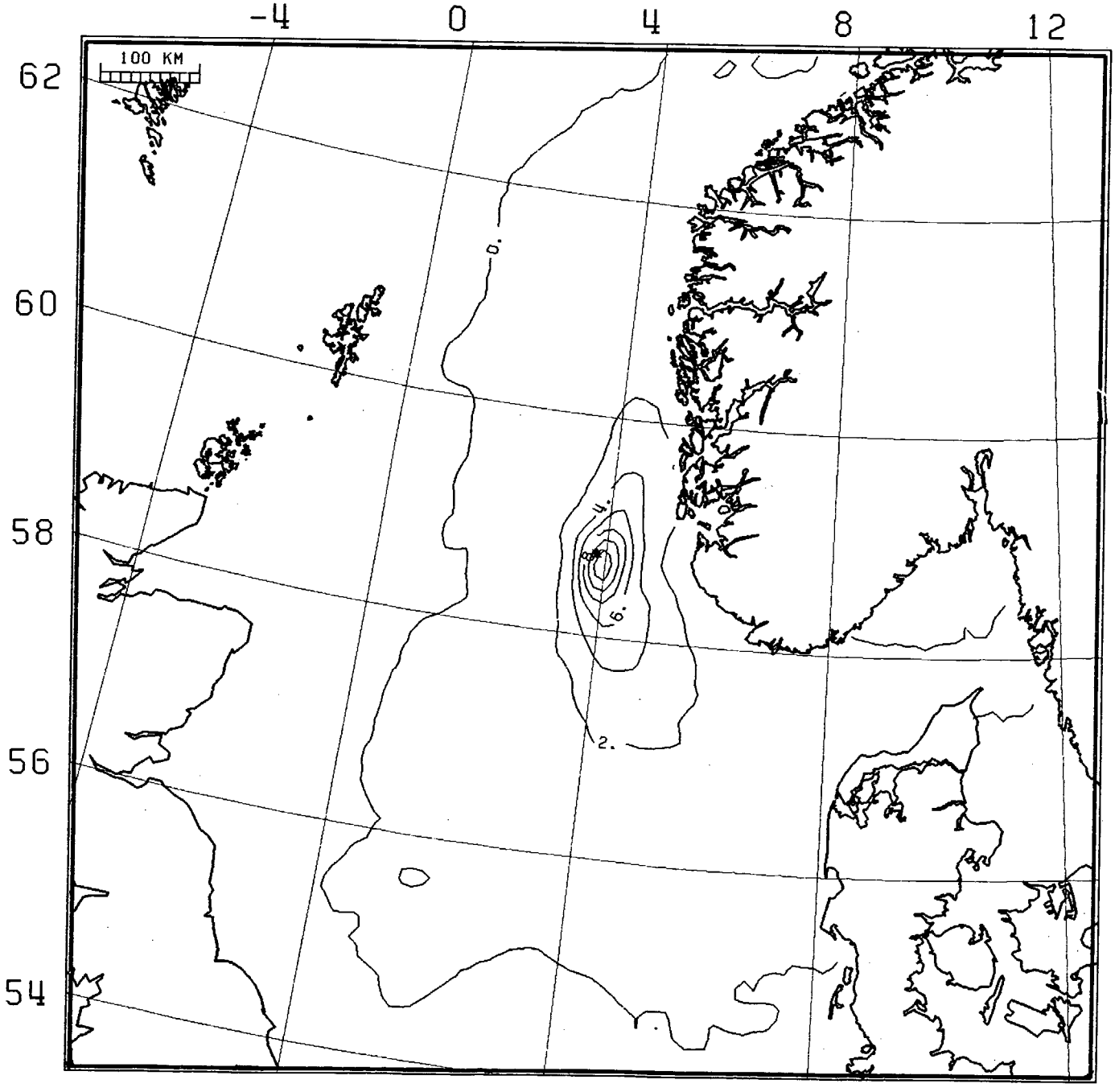
MEAN AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



SUMMER

ØIL SPILL PØSITIØN:58°45'N 3°50'E
PERIØD : JUN,JUL,AUG 1955-1984
SPILLAGE RATE: 60 TONN/HØUR
DENSITY : 850 KG/M**3

ARRIVAL FREQUENCY PER.10X10 KM AREA
UNIT: % ØF TØTAL NUMBER ØF SPILLS



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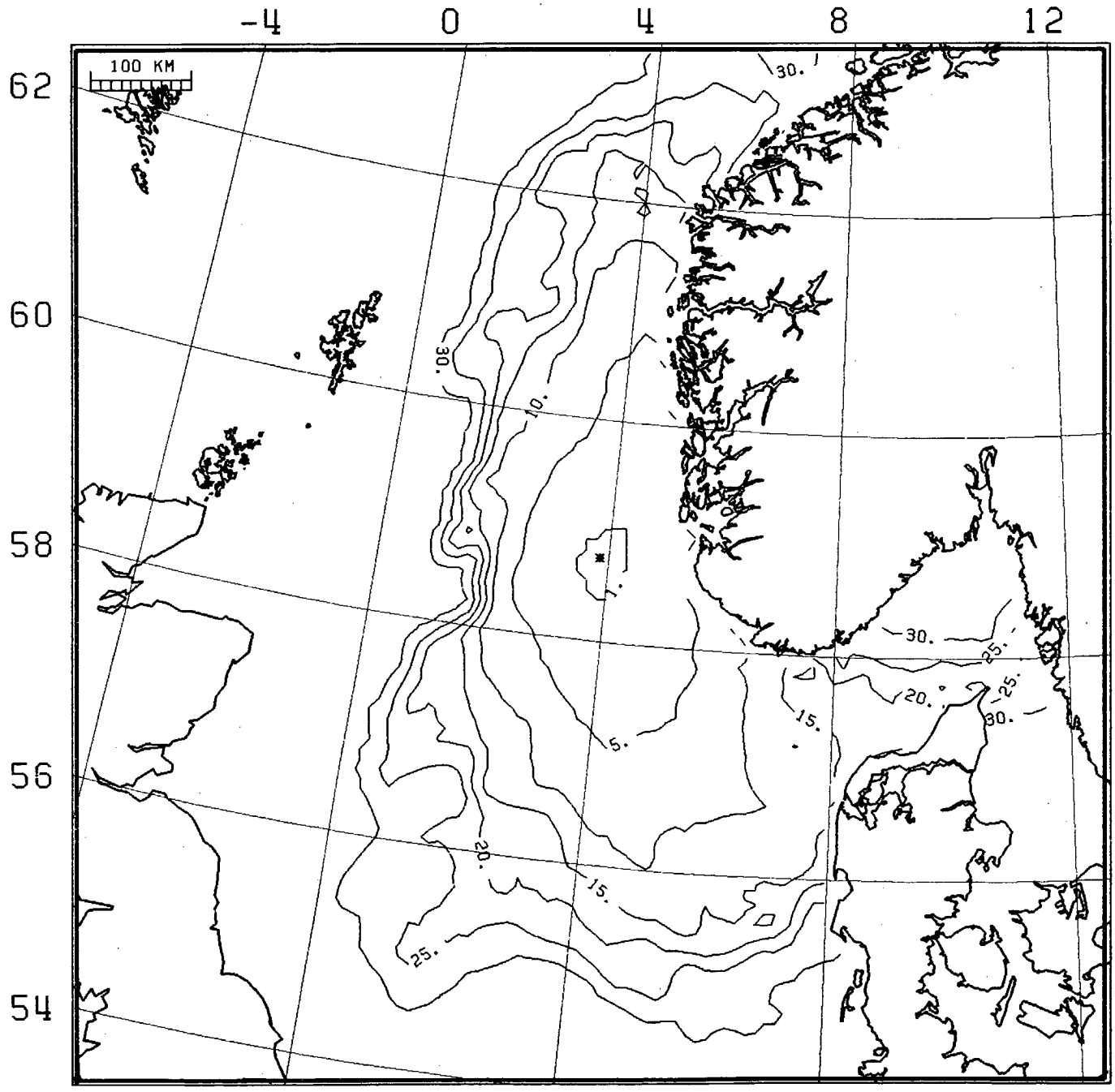
PERIOD : JUN, JUL, AUG 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MINIMUM DRIFT TIME
UNIT : DAYS



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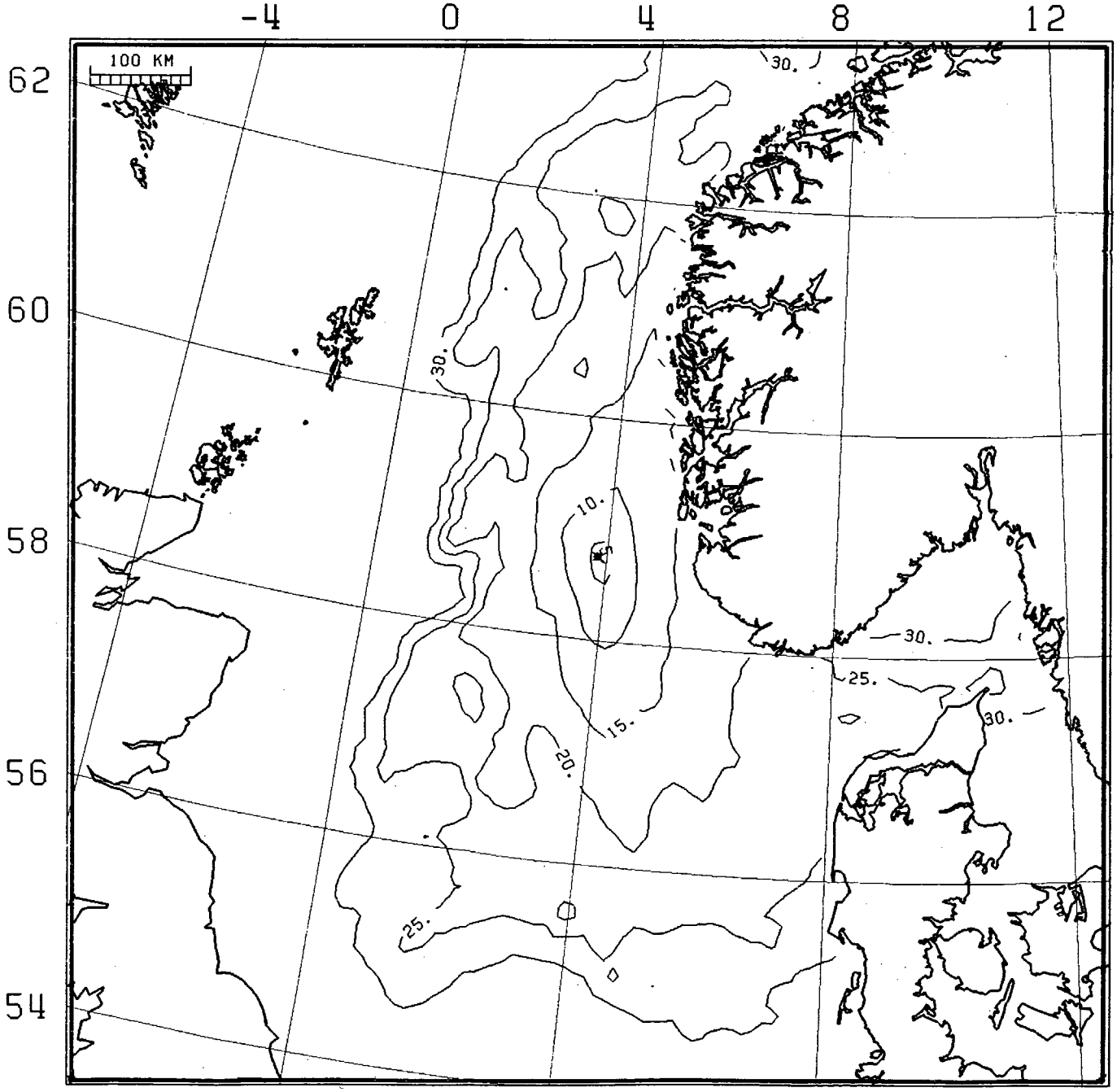
PERIOD : JUN,JUL,AUG 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MEAN DRIFT TIME
UNIT : DAYS



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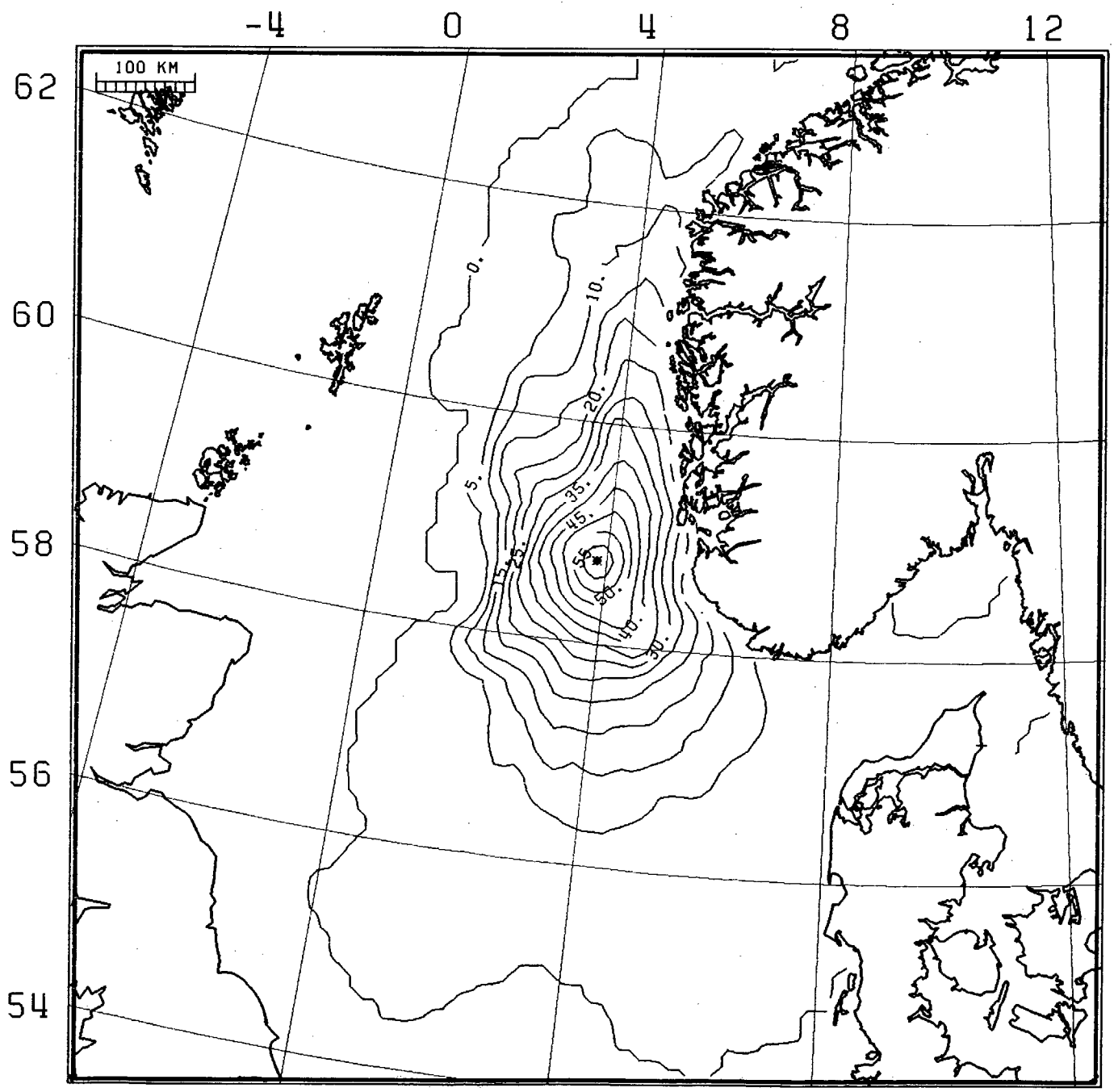
MAXIMUM AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



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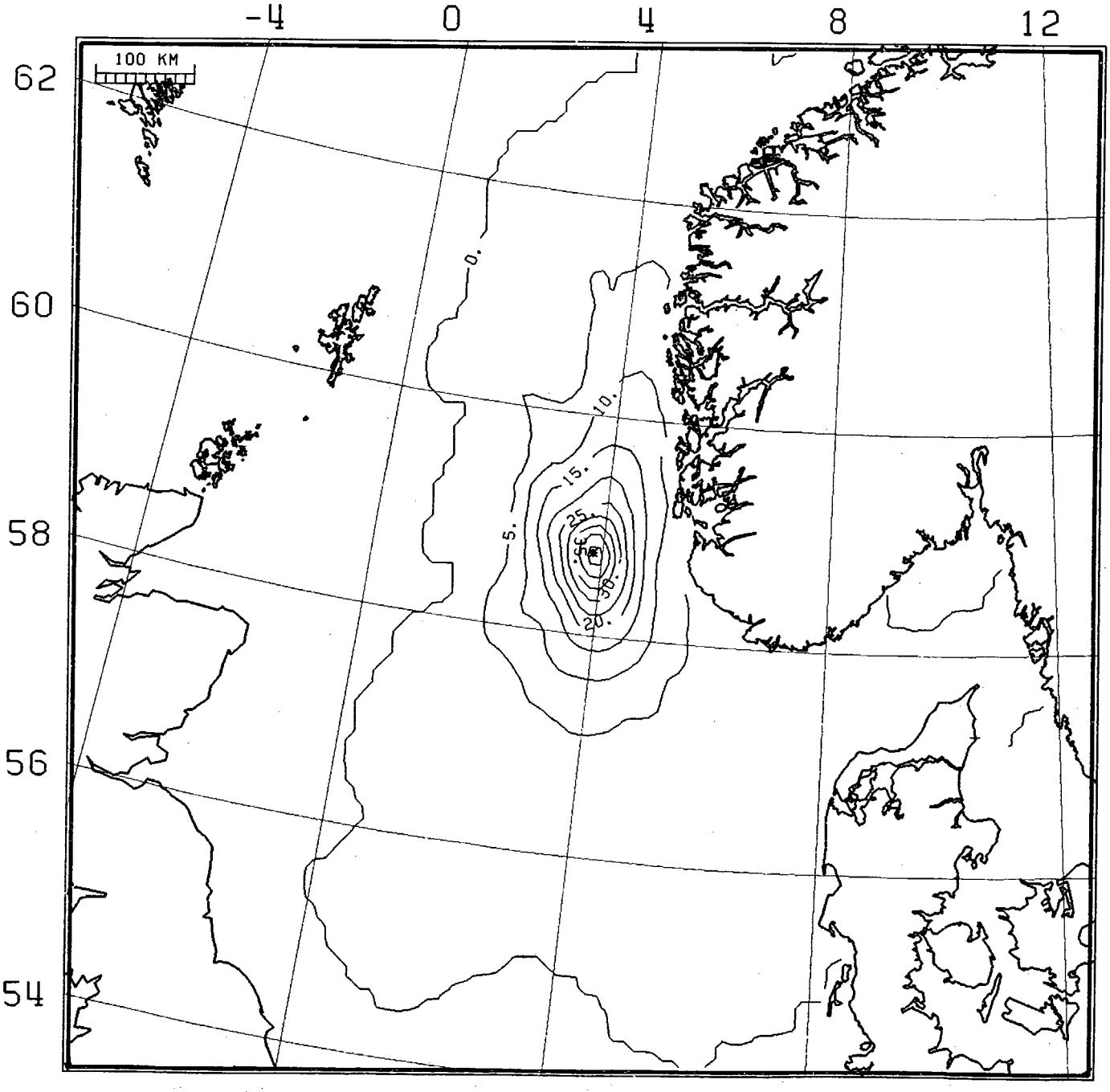
PERIOD : JUN, JUL, AUG 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

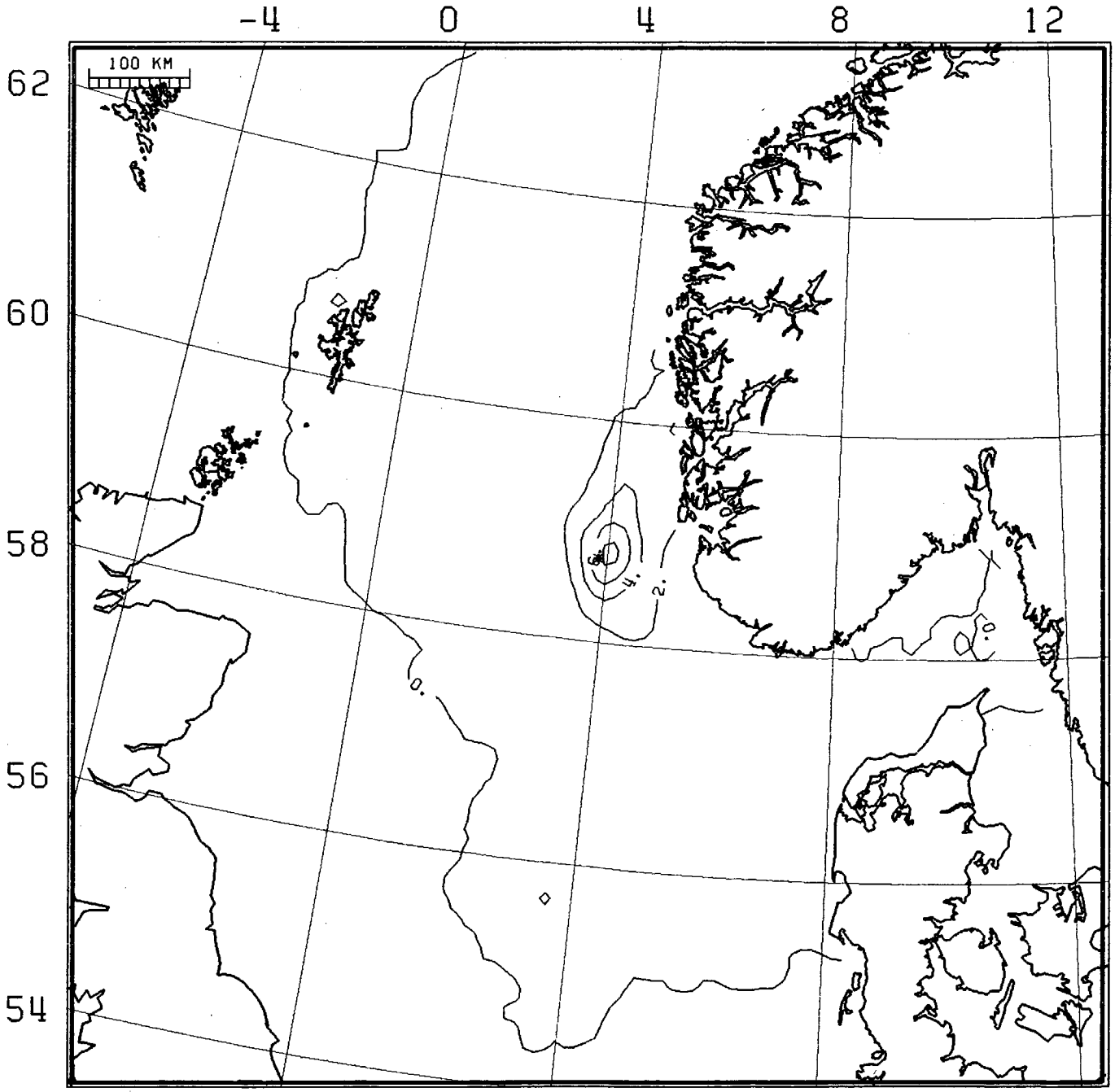
MEAN AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



AUTUMN

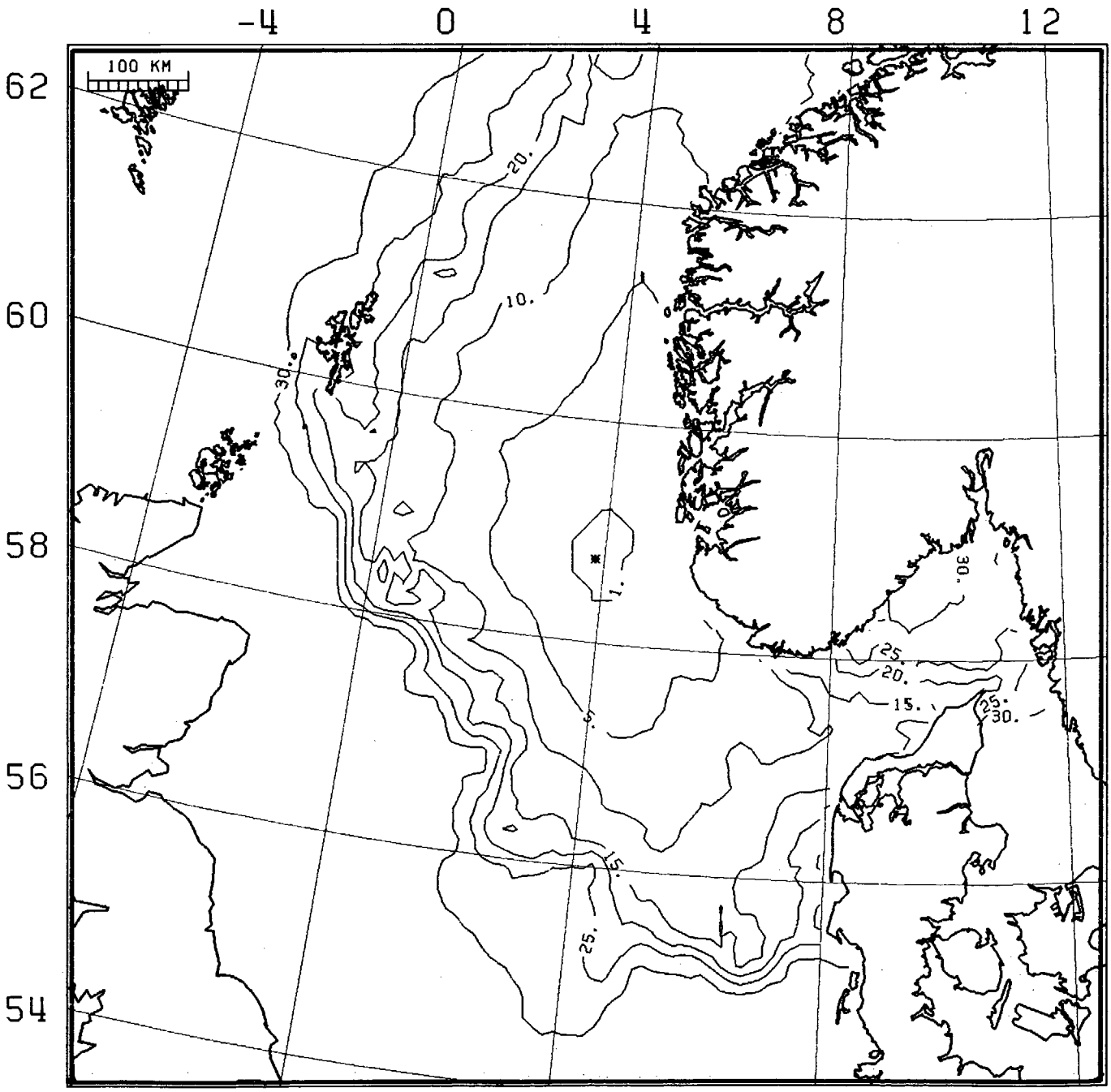
OIL SPILL POSITION:58°45'N 3°50'E
PERIOD : SEP,OCT,NOV 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

ARRIVAL FREQUENCY PER.10X10 KM AREA
UNIT: % OF TOTAL NUMBER OF SPILLS



OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : SEP, OCT, NOV 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MINIMUM DRIFT TIME
UNIT : DAYS



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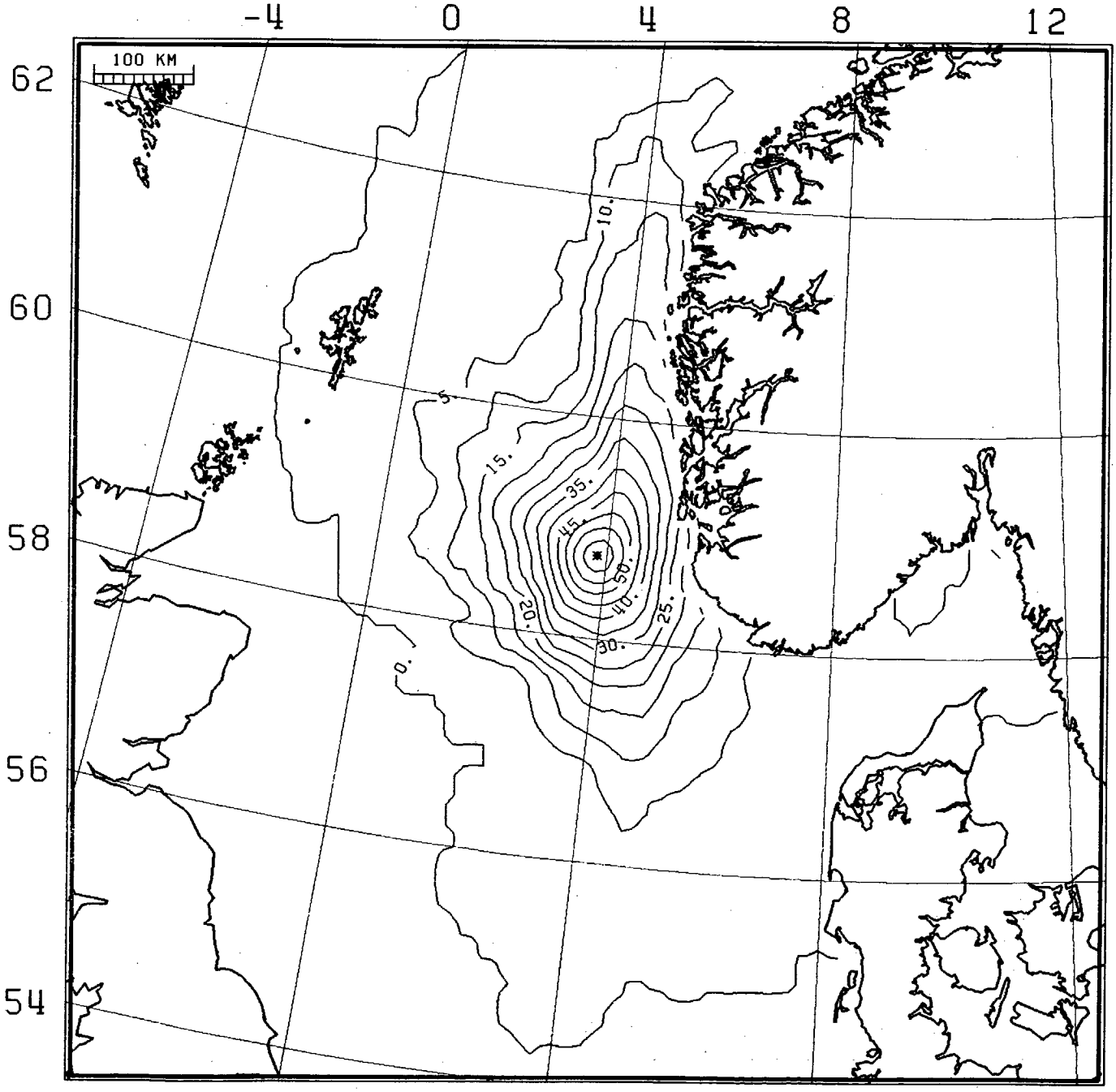
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MAXIMUM AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE



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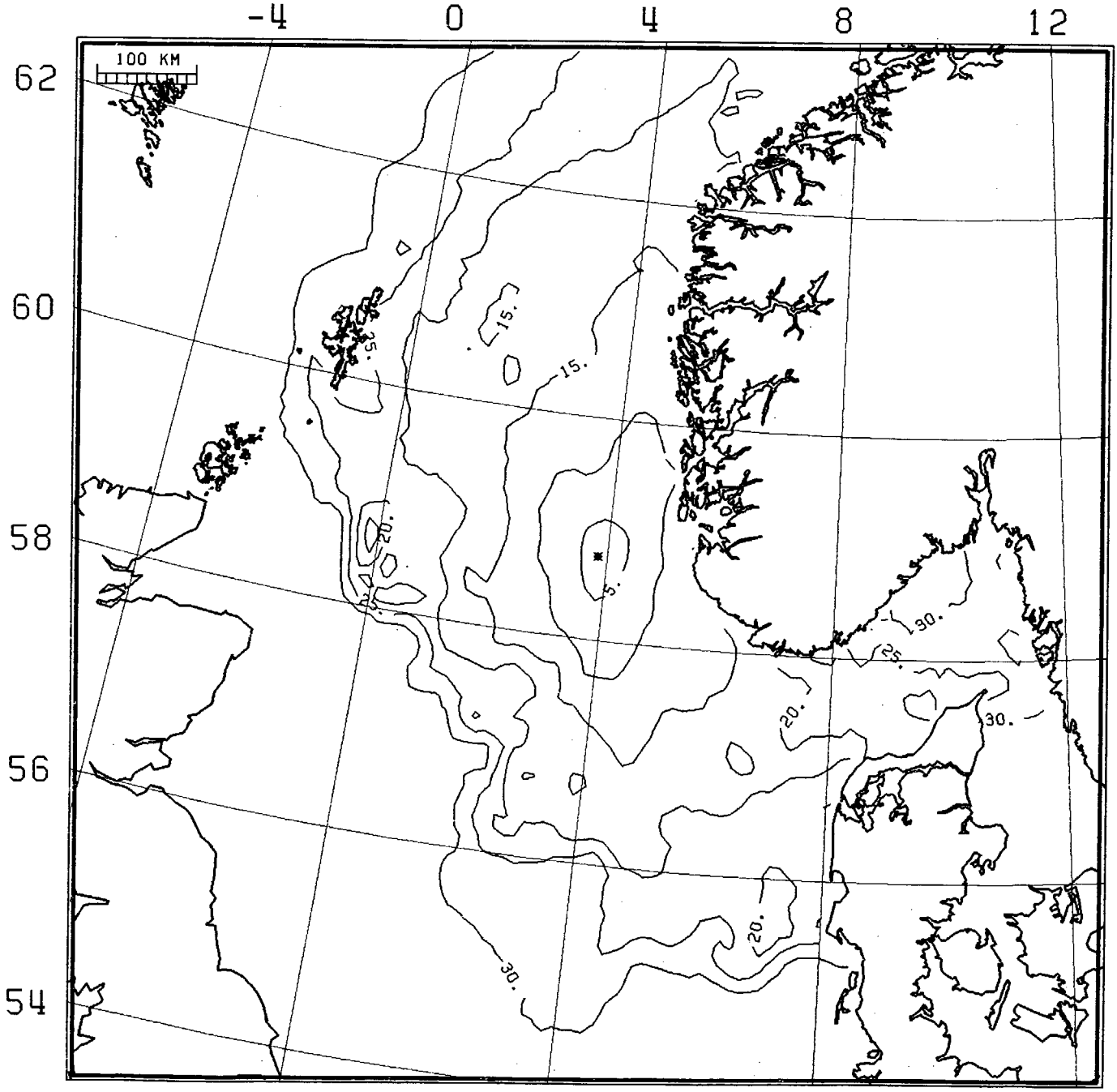
MEAN DRIFT TIME
UNIT : DAYS



OIL SPILL POSITION: 58°45'N 3°50'E
PERIOD : SEP, OCT, NOV 1955-1984
SPILLAGE RATE: 60 TONN/HOUR
DENSITY : 850 KG/M**3

MEAN AMOUNT OF OIL
UNIT : % OF SPILLAGE RATE