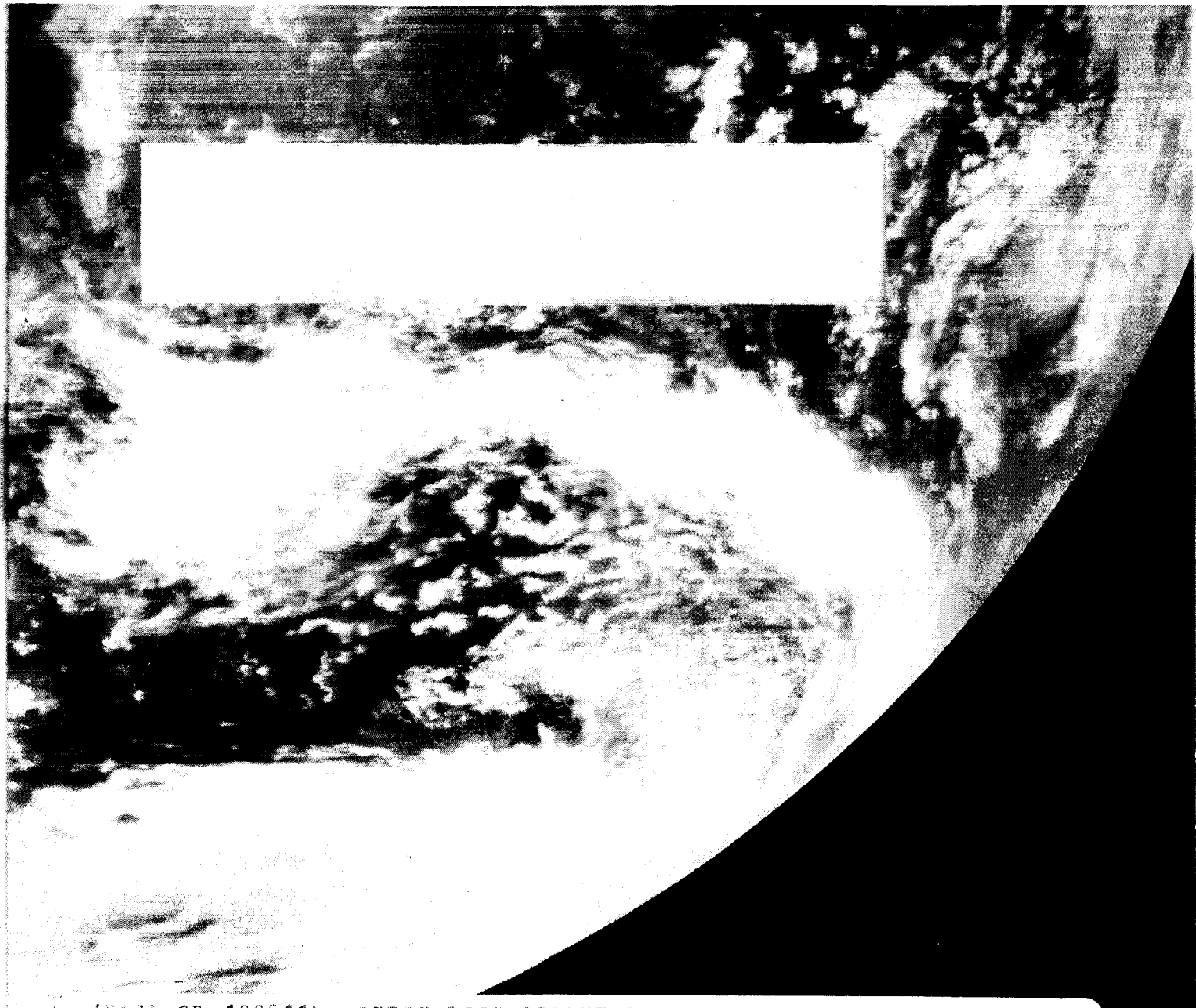

A REPORT

from the space science and engineering center
the university of wisconsin-madison
madison, wisconsin

An Interim Report to the

National Aeronautics and Space Administration

QUICK LOOK ATLANTIC OCEAN RAIN MAPS FOR GALE

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NAG5-742

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March 1987

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In support of GALE the Rain Studies Group at the University of Wisconsin - Madison has made a set of quick look maps of Atlantic Ocean rainfall. The maps are based entirely on information extracted from geostationary satellite images. This report briefly describes the maps and the process by which they were made. It also points out the major shortcomings of such a product and invites comments from users.

For convenience the maps are presented in rectangular format. However, the area for which rain information actually is available is a trapezoid oriented northeast - southwest. Long-dashed lines mark the northwest and southeast sides of this trapezoid. A dotted line marks the southeast coast of the United States.

Each map covers one day. The days, which all are drawn from the Intensive Observing Periods, are listed in the table; they total fifteen. For this quick look mapping of rainfall, only images in the SSEC real time archive were processed. Out of a possible 360 infrared images, 320, or 90%, were available. The missing images are indicated in the table. Although in every case more than half of each day was covered, for a few - such as 18 January - the gaps were rather wide. Owing to a software error, four good images were left out of the processed group. Nominally, days begin with the 00 GMT satellite image and end with the 23 GMT image.

Rainfall is contoured in units of millimeters. With one exception the increment between contours is 10 mm. The exception is the lowest contour, which marks values of 1 mm. This contour is dashed.

Rainfall was estimated by the technique of Arkin (1983; also see Arkin and Meisner, 1987). This technique assumes that rainfall is linearly related to fractional cloud cover. Cloud cover is determined from a geostationary infrared image. Ordinarily, the area, or box, for the measurement of cloud cover is 2½ deg in latitude and longitude and the interval between infrared images is 3 h. In the present case a box is 1 deg in latitude and longitude and the image interval is 1 h. 235 K is the threshold temperature for cloud.

Fractional cloud covers (f) are averaged for the period of the estimate (in the present case, one day), then are related to rainfall (R) as

$$R = a \cdot \bar{f}$$

The coefficient a has a value of 72 mm d^{-1}.

Fields of rainfalls, consisting of one estimate for each box, were contoured by means of a standard microcomputer plot package. The coefficient we have used for these maps was derived for tropical marine regimes. Arkin (personal communication, 1986) expects that its use in the present context will overestimate actual rainfall. Furthermore, in the mean the overestimate is likely to increase with latitude. It is likely, too, that the estimates contain random error of a larger magnitude than that of Arkin's estimates of tropical rainfall. Therefore, users should regard these maps as tentative products. Their main two uses may be in locating each day's rain centers and in showing broad gradients over offshore parts of the GALE domain.

The Rain Studies Group plans to evaluate these estimates by means of coastal rain gauge and radar observations. Any bias which we uncover will be removed. If random errors are modest, estimates

may be made for 6 or 12 h periods. By incorporating additional satellite information we also will attempt to improve the estimates and extend them to other intensive days. Users of these quick look maps are encouraged to send criticisms and comments to the authors.

Acknowledgements: Mrs. Delores Wade and the staff of the McIDAS facility created the GALE-rain GOES archive and performed initial data processing. Maps were made through the efforts of Gail Dengel, David Santek and Gary Krueger.

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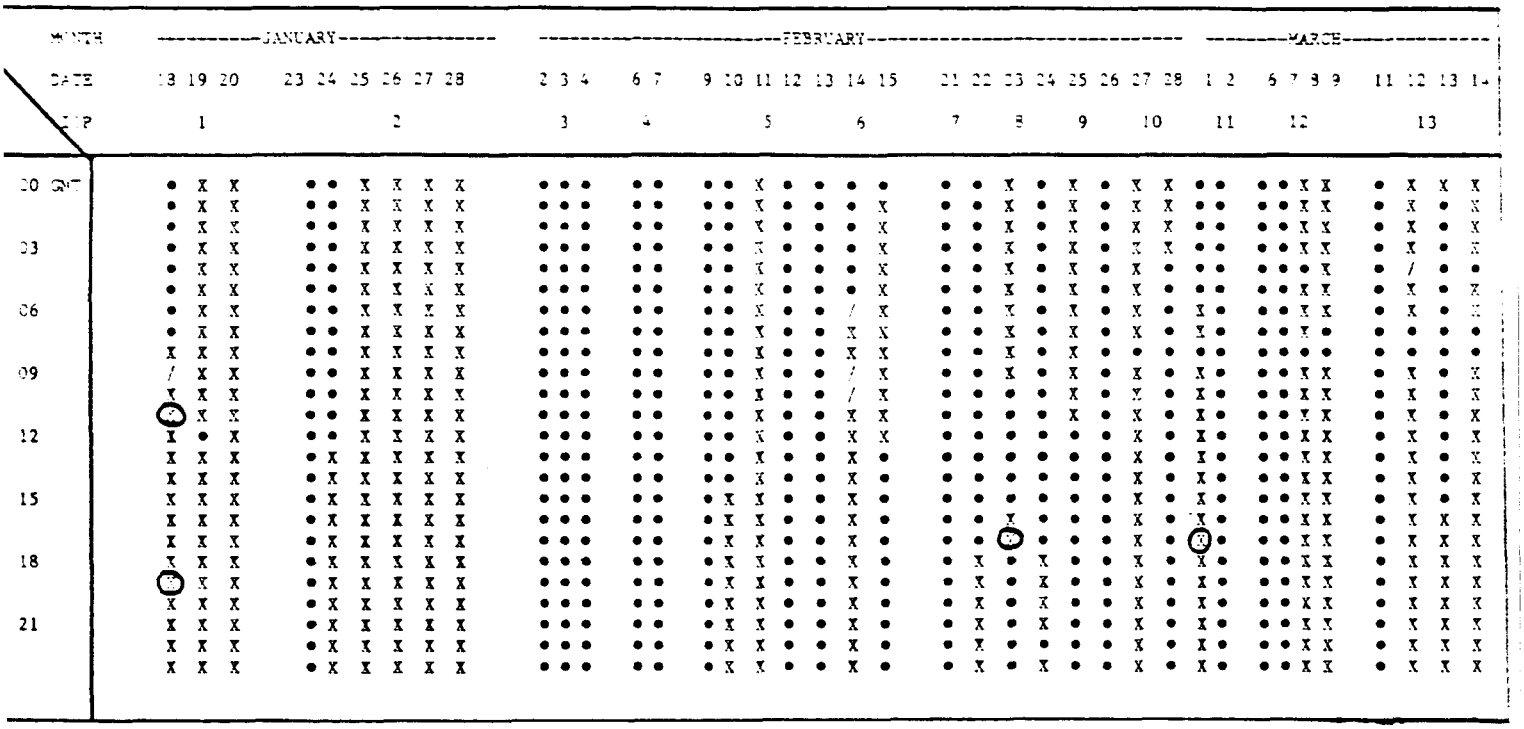
G A L E

Real-Time Archive of GOES-6 Images on Computer-Compatible Tape



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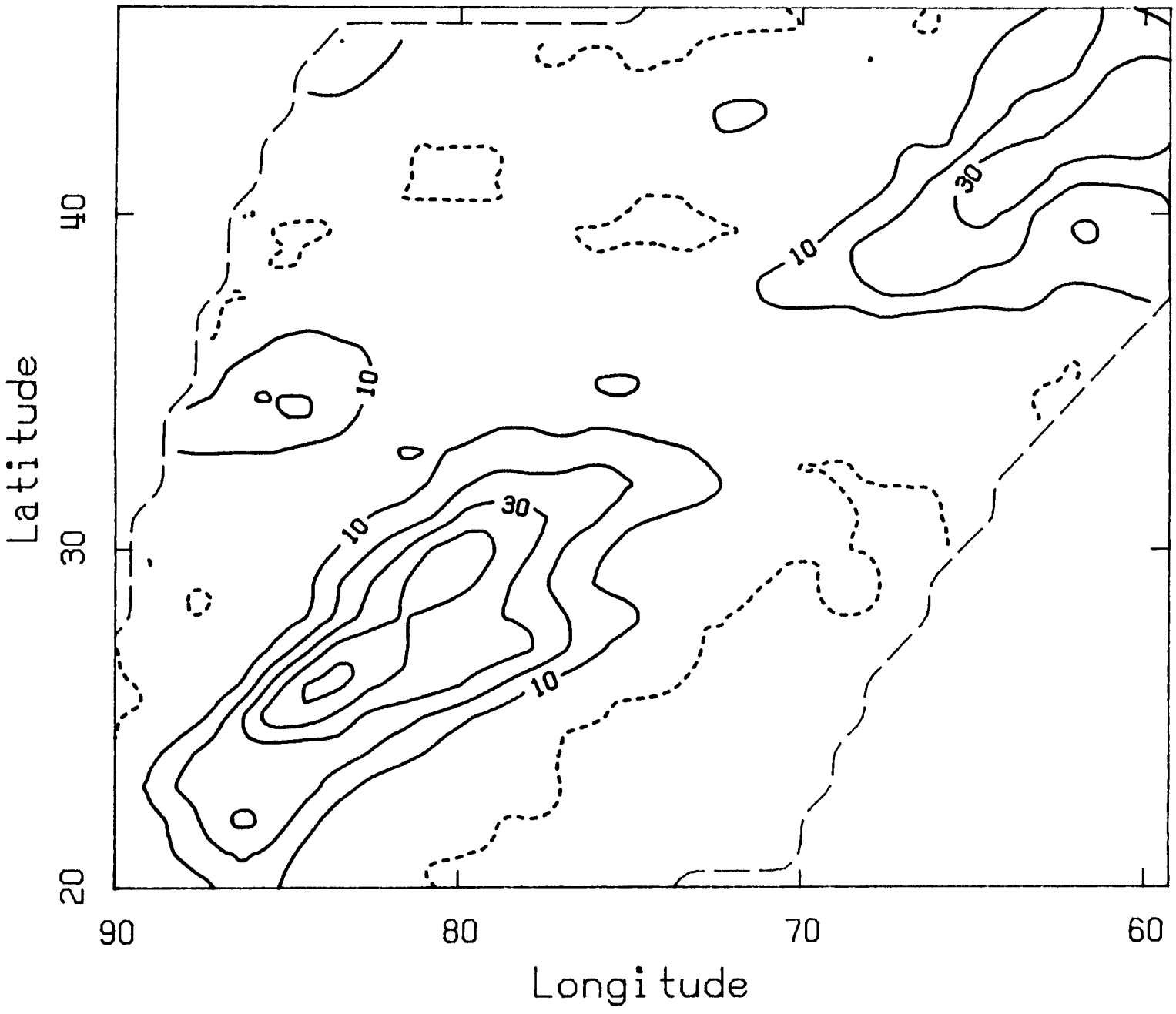
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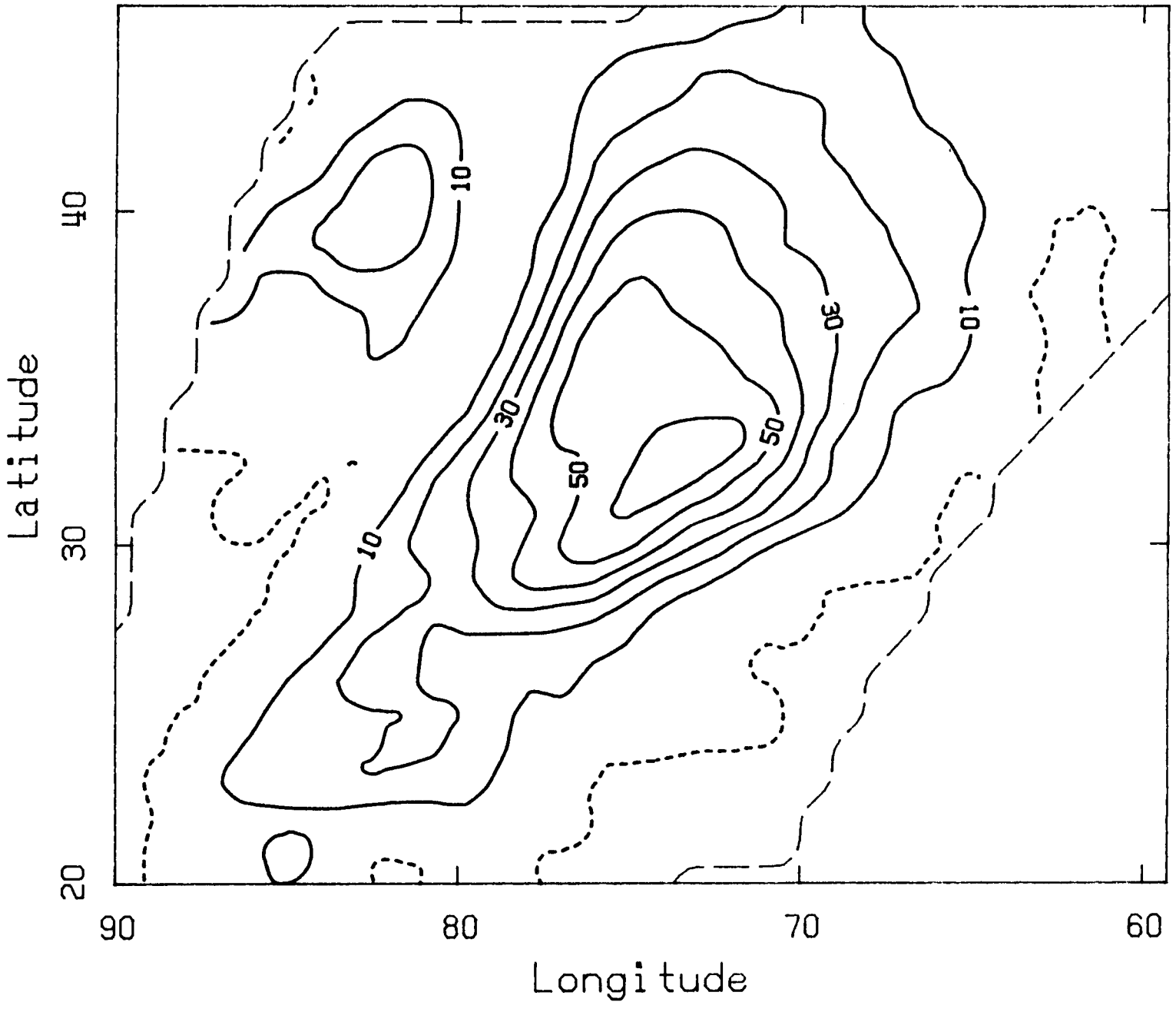
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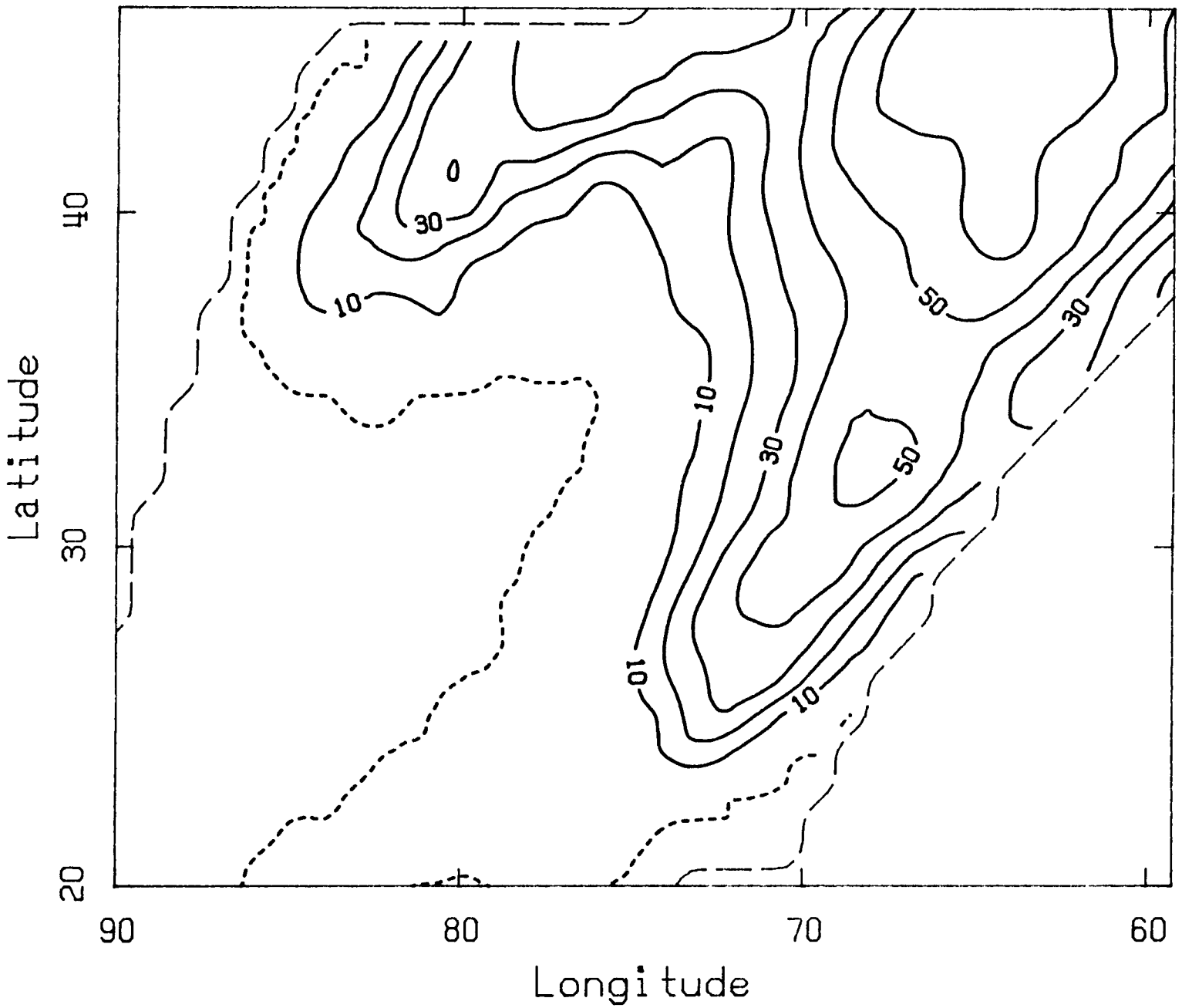
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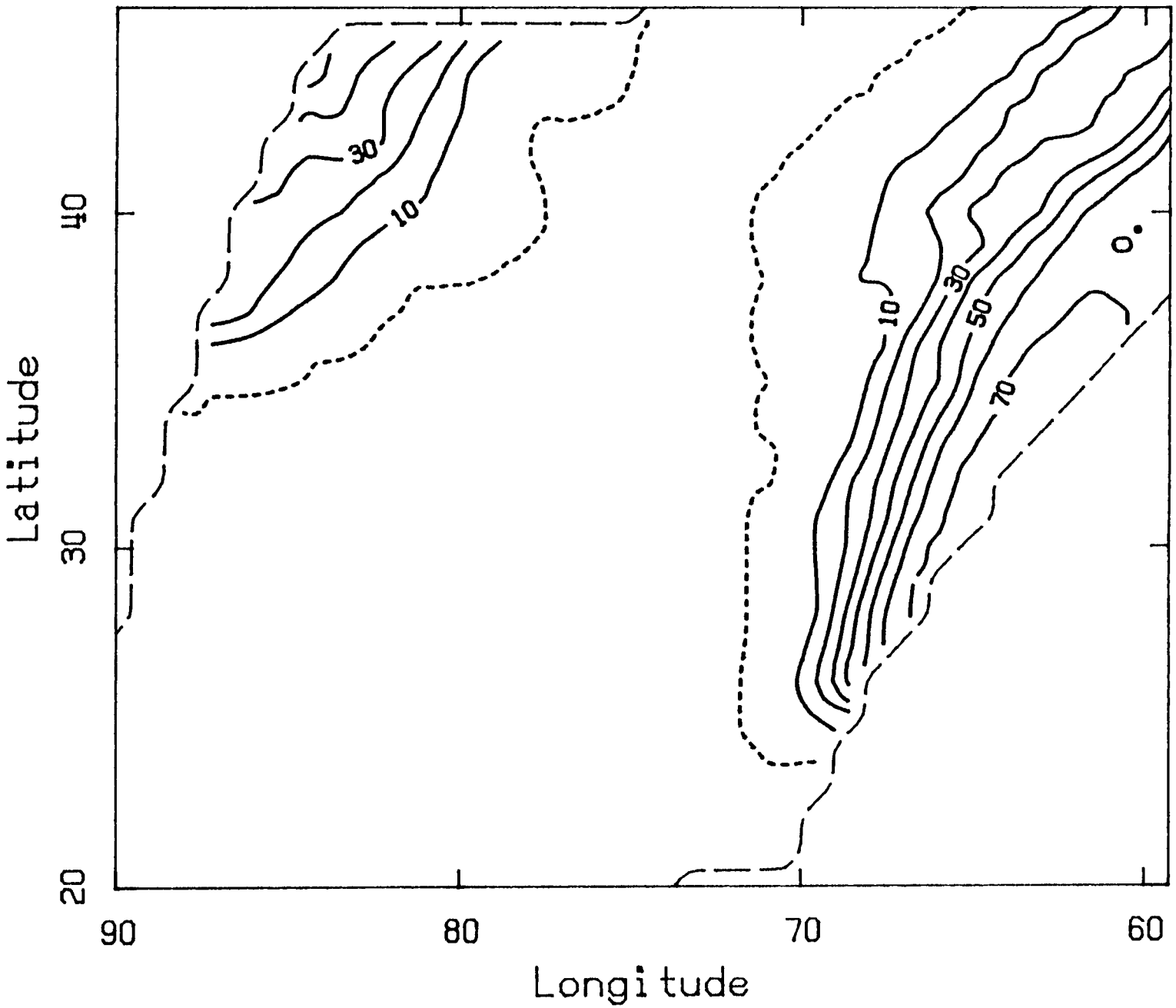
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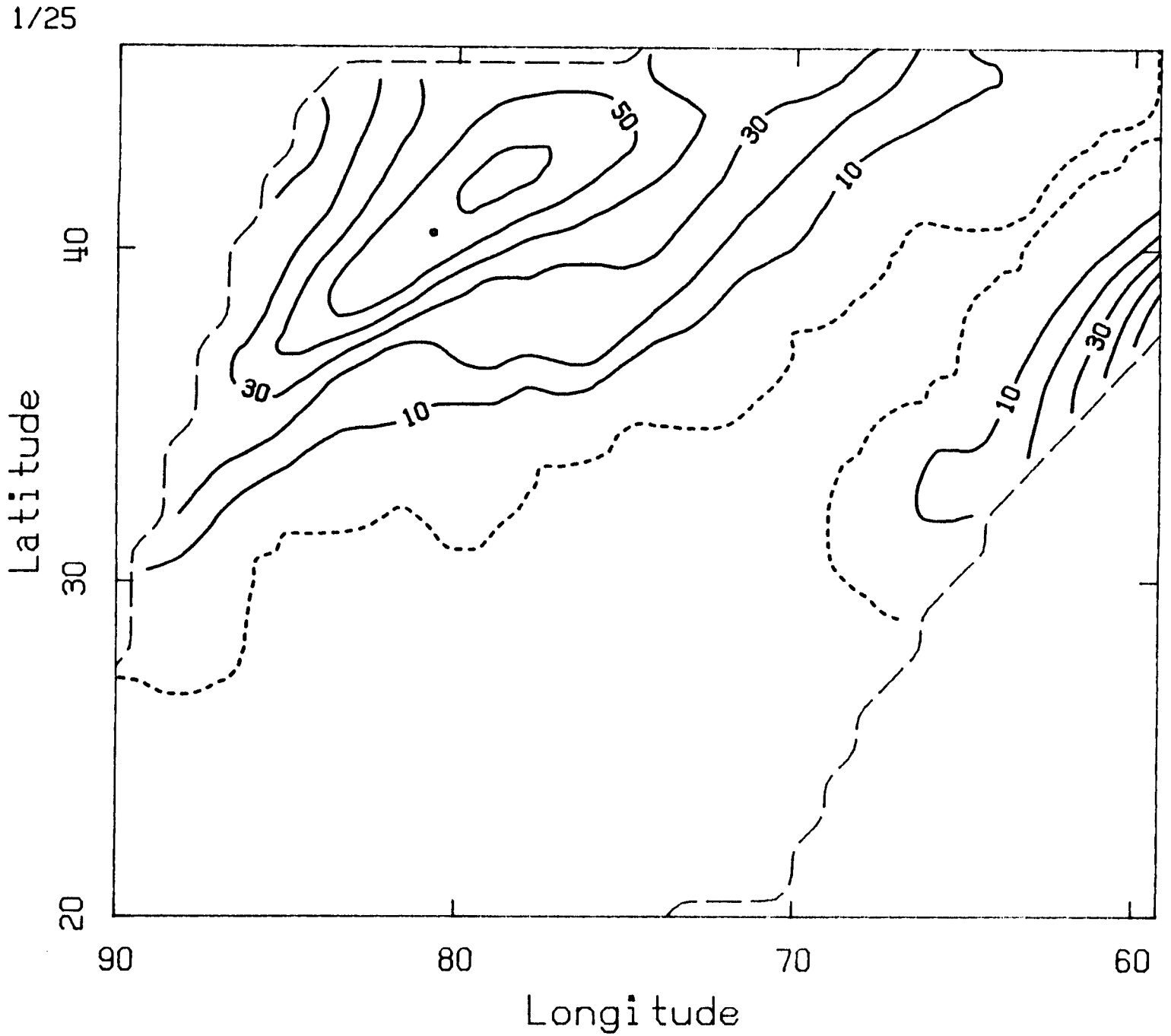
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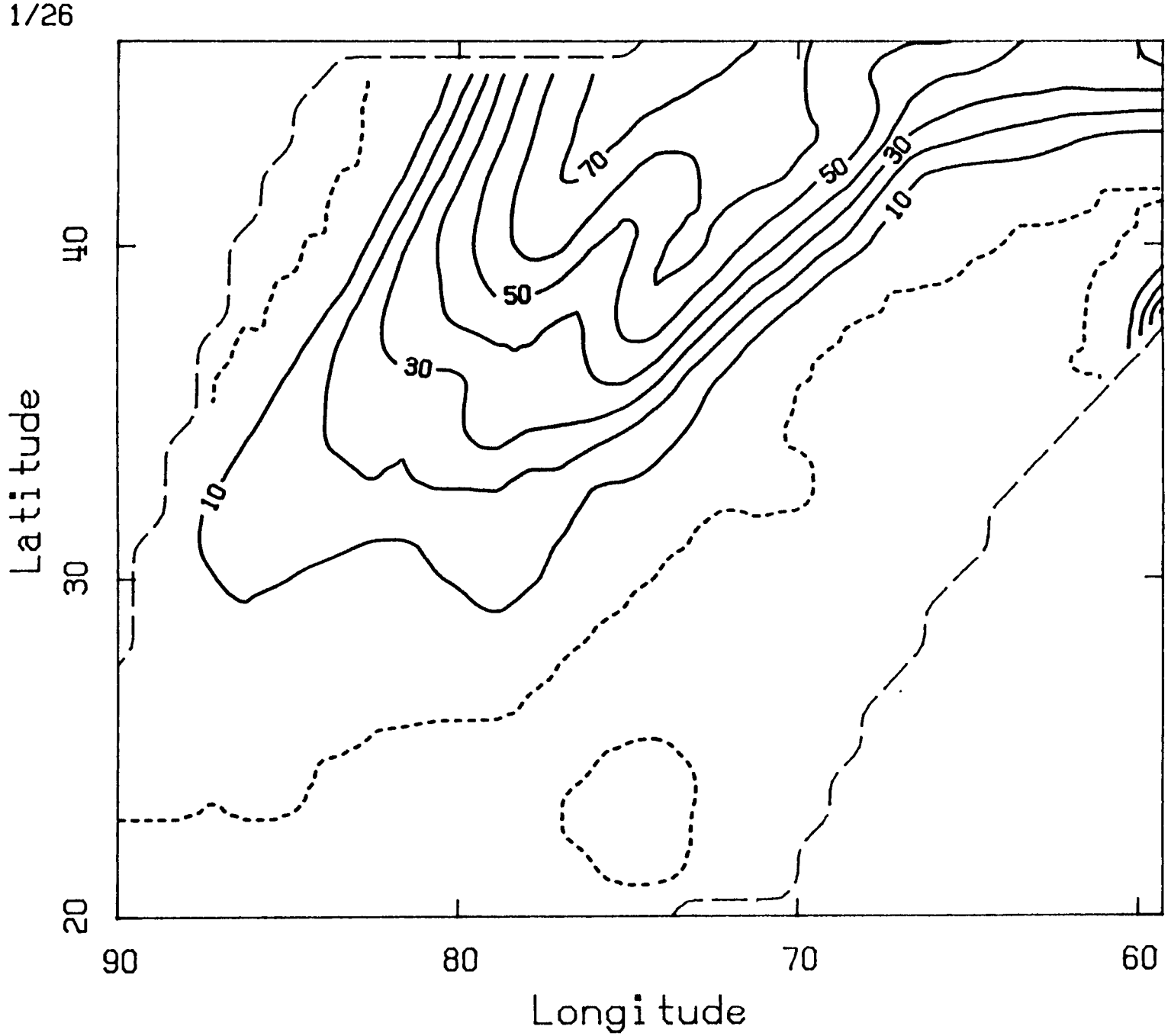
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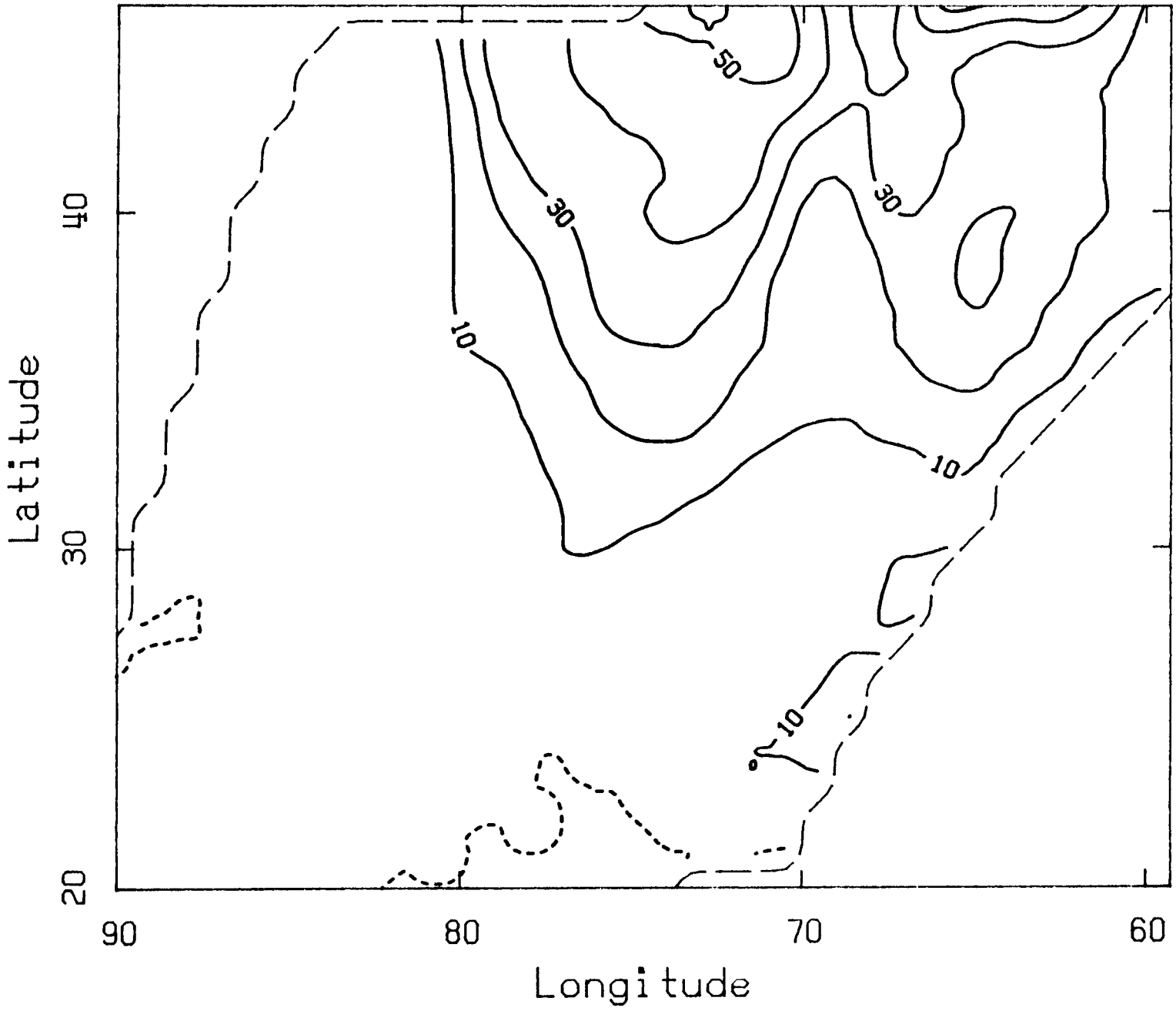
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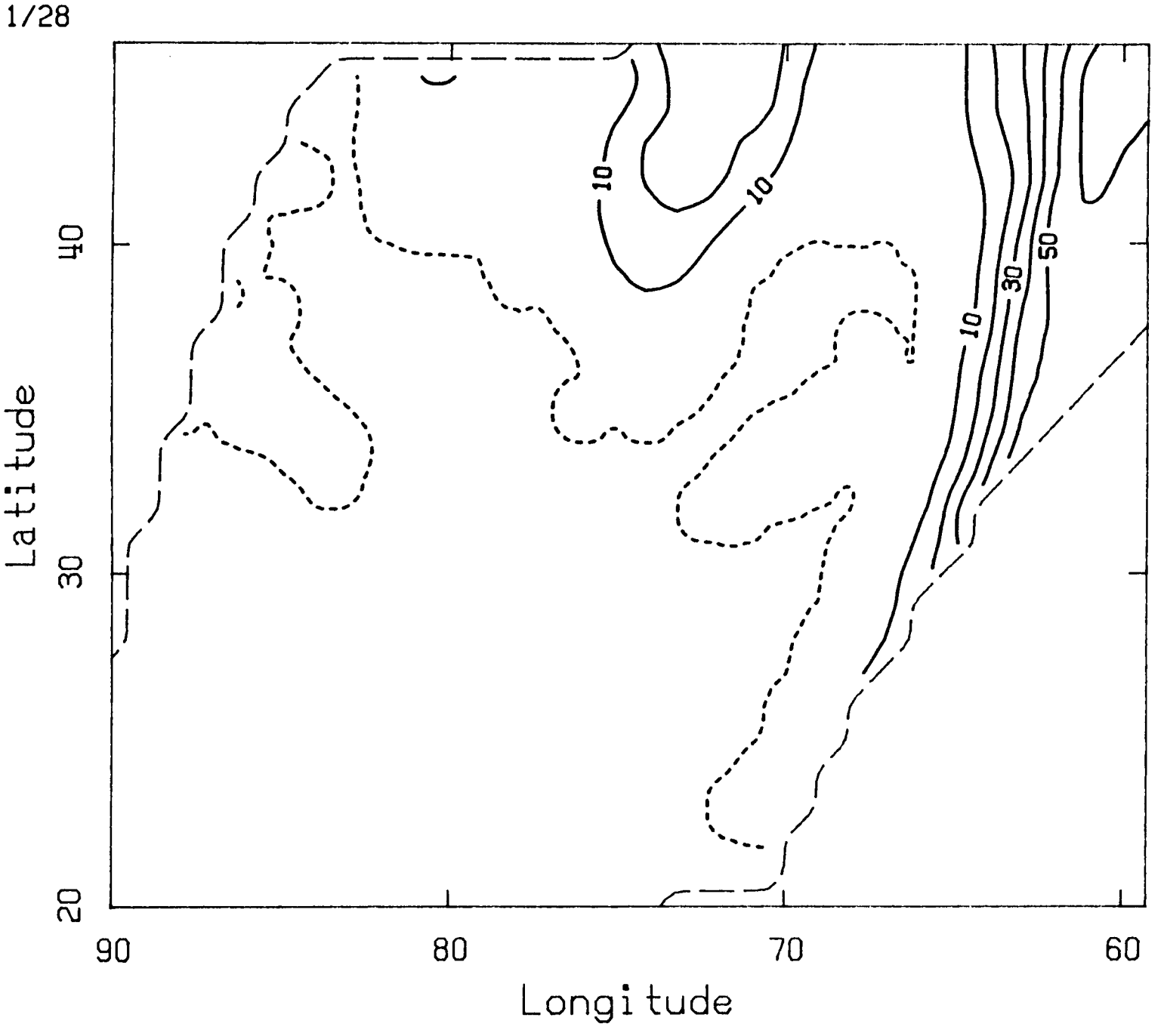
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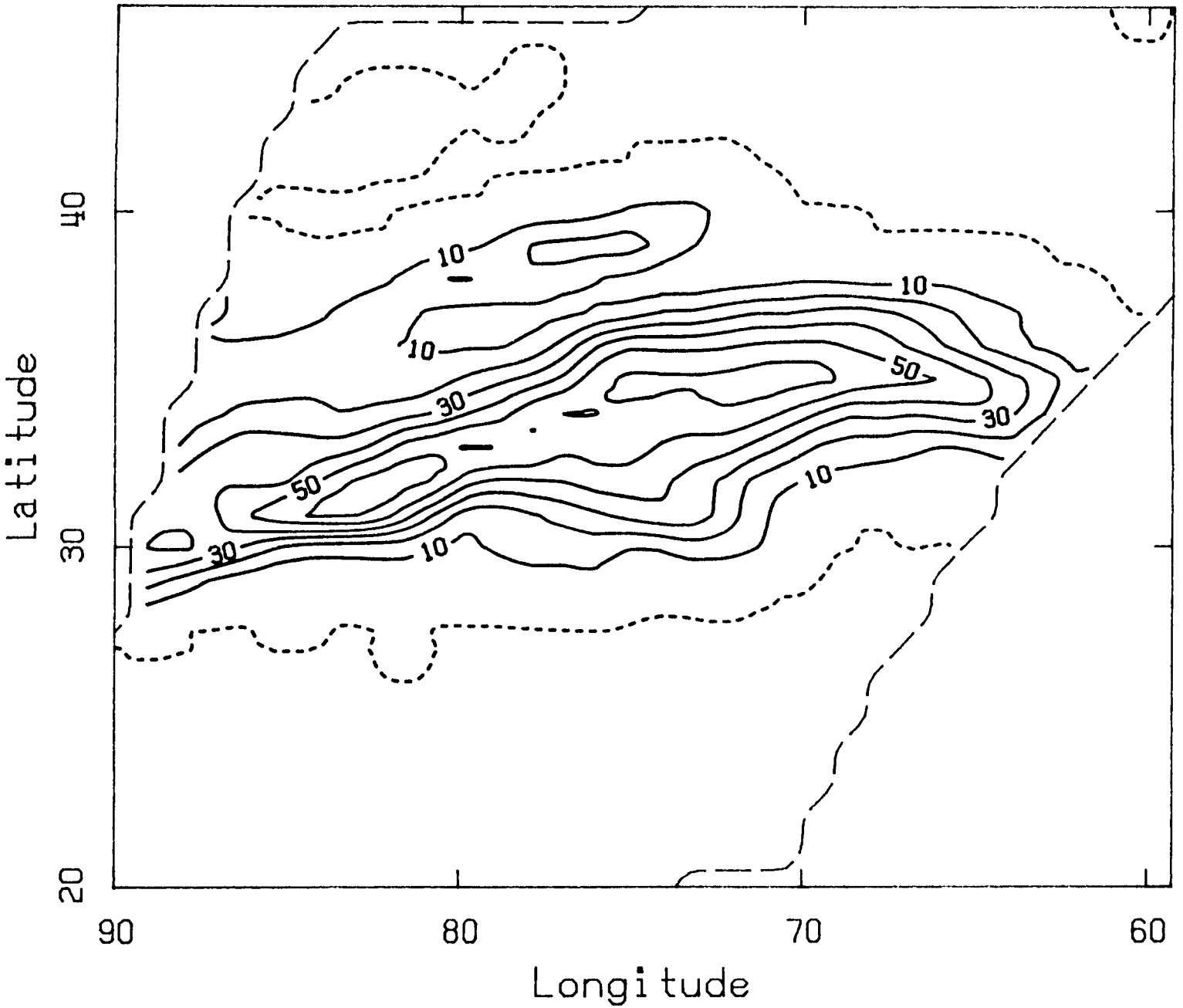
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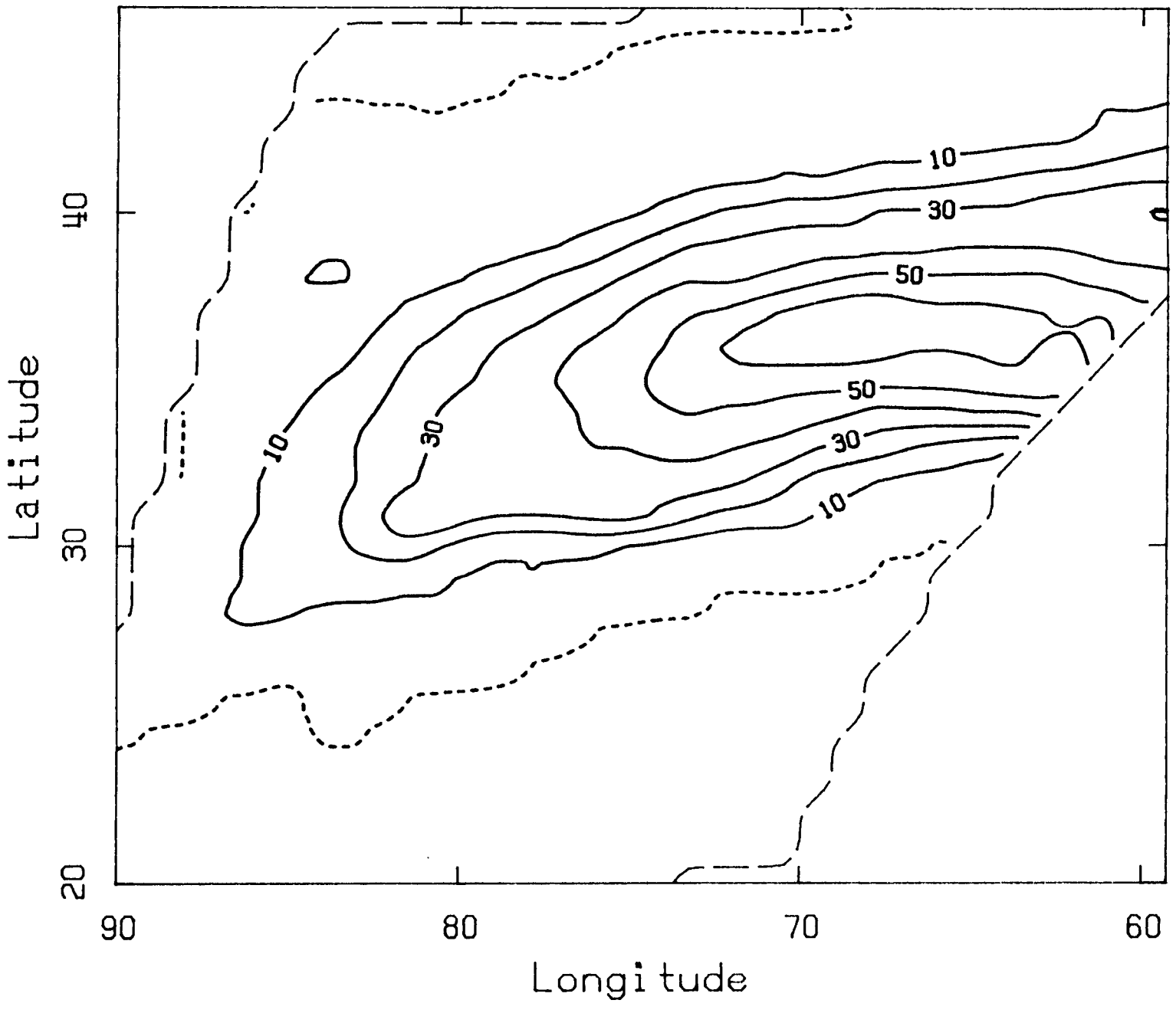
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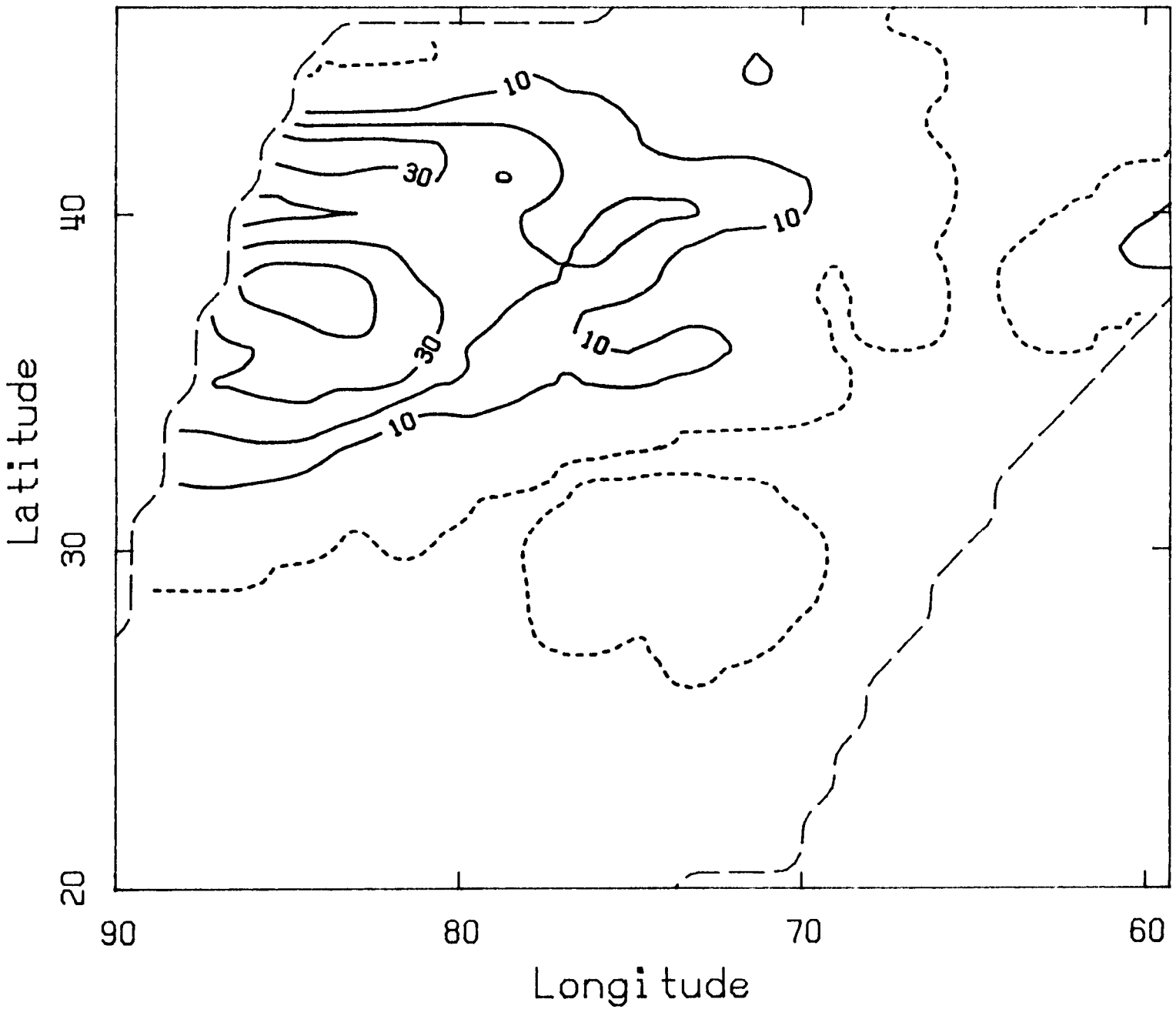
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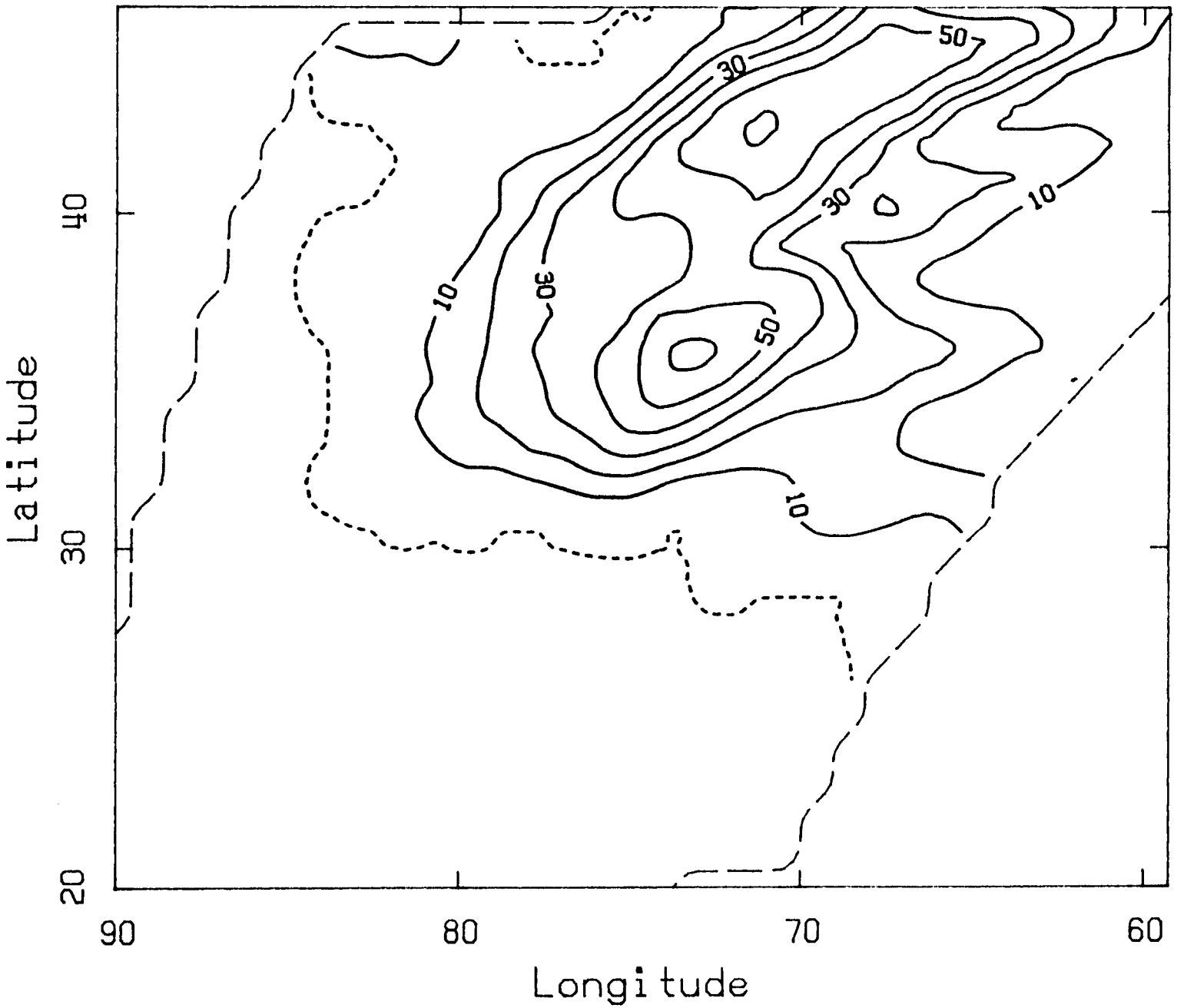
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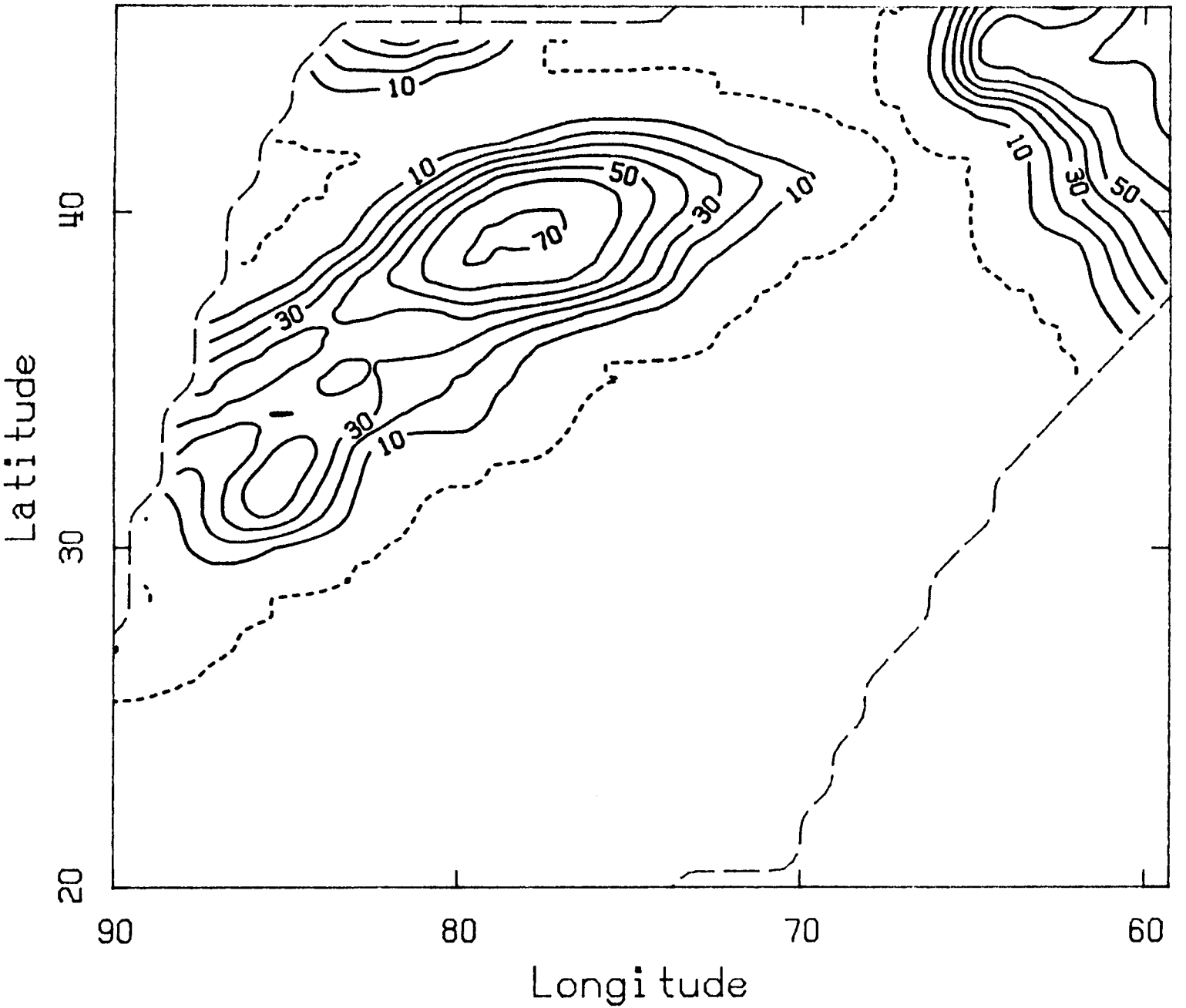
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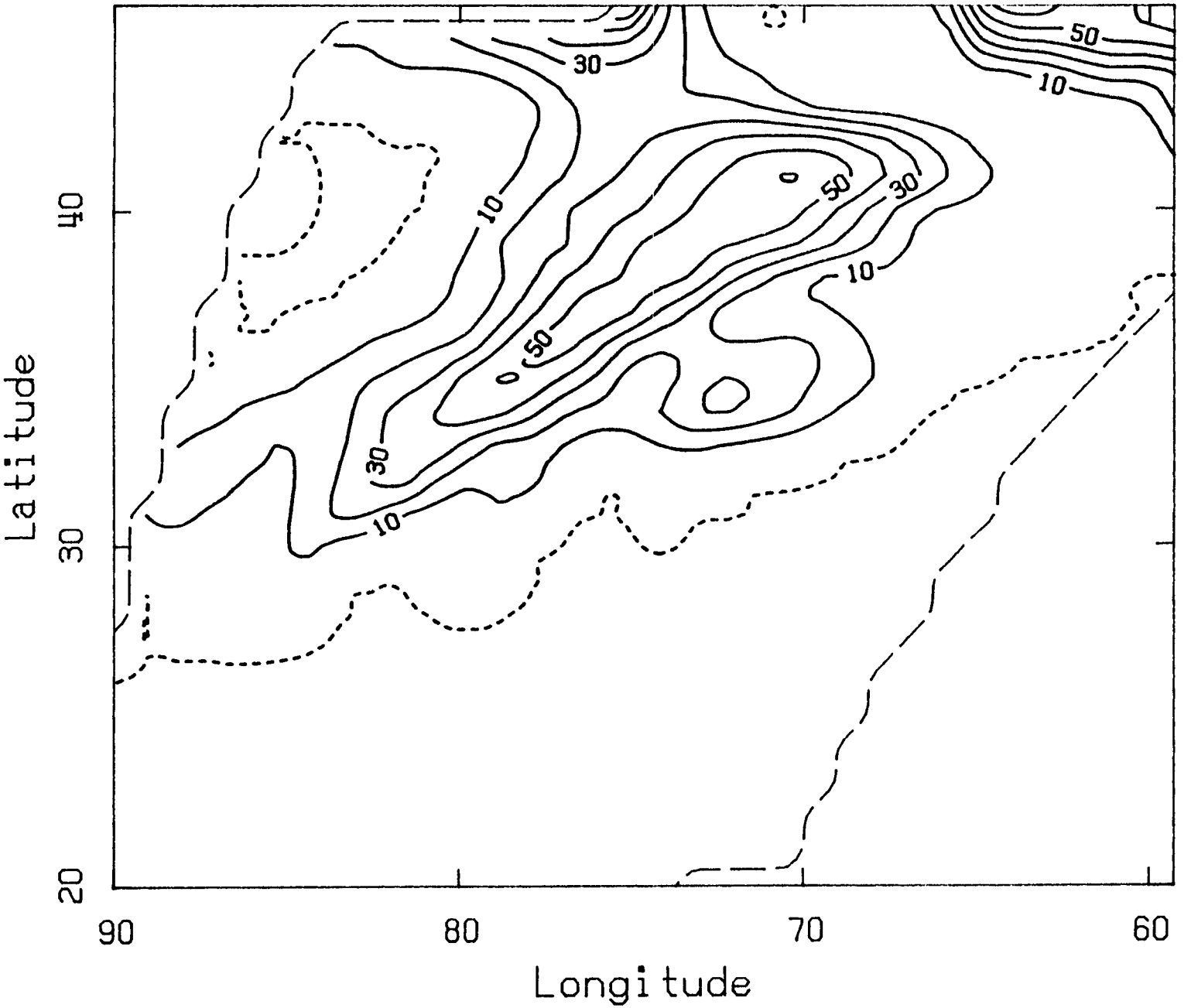
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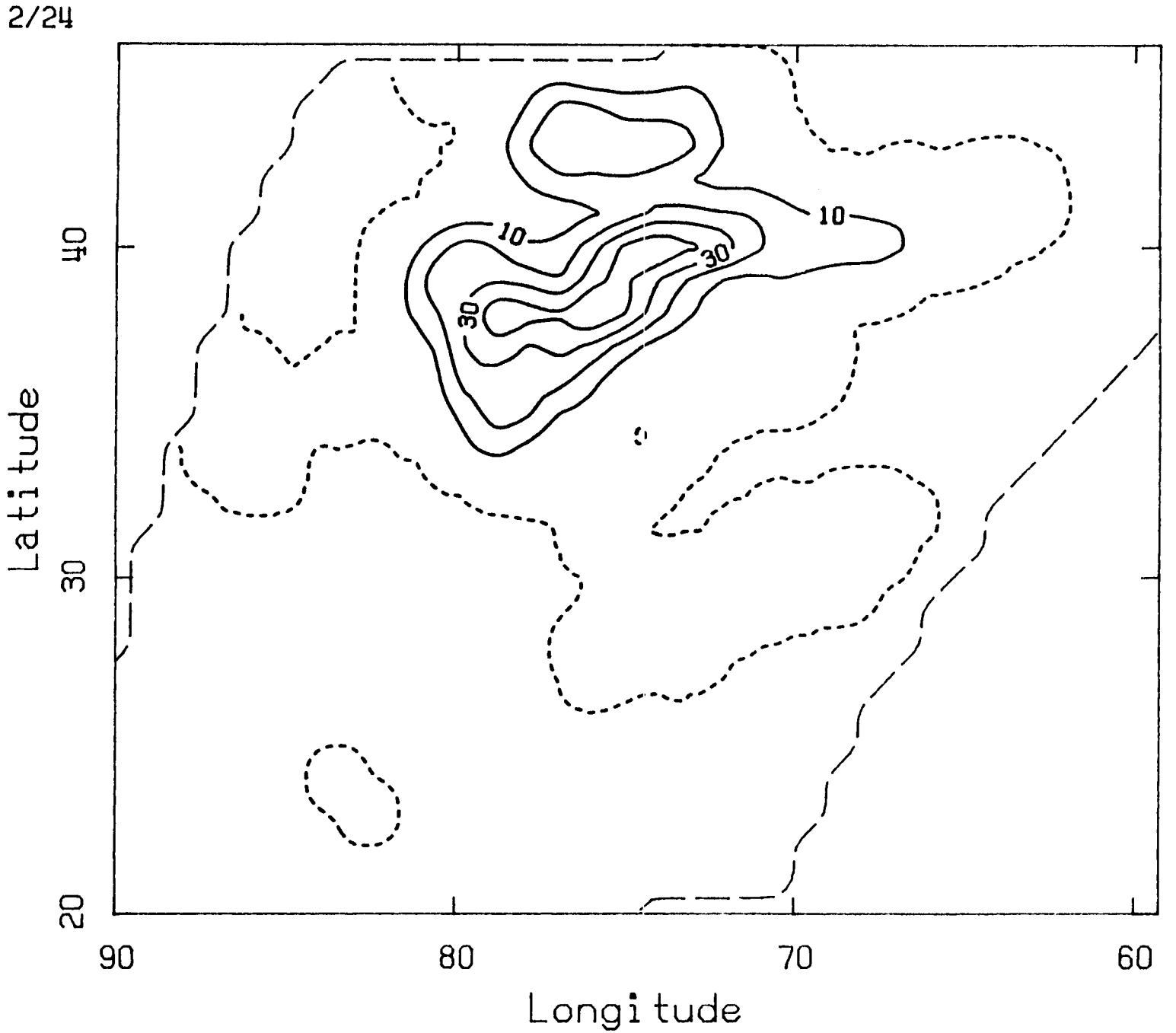
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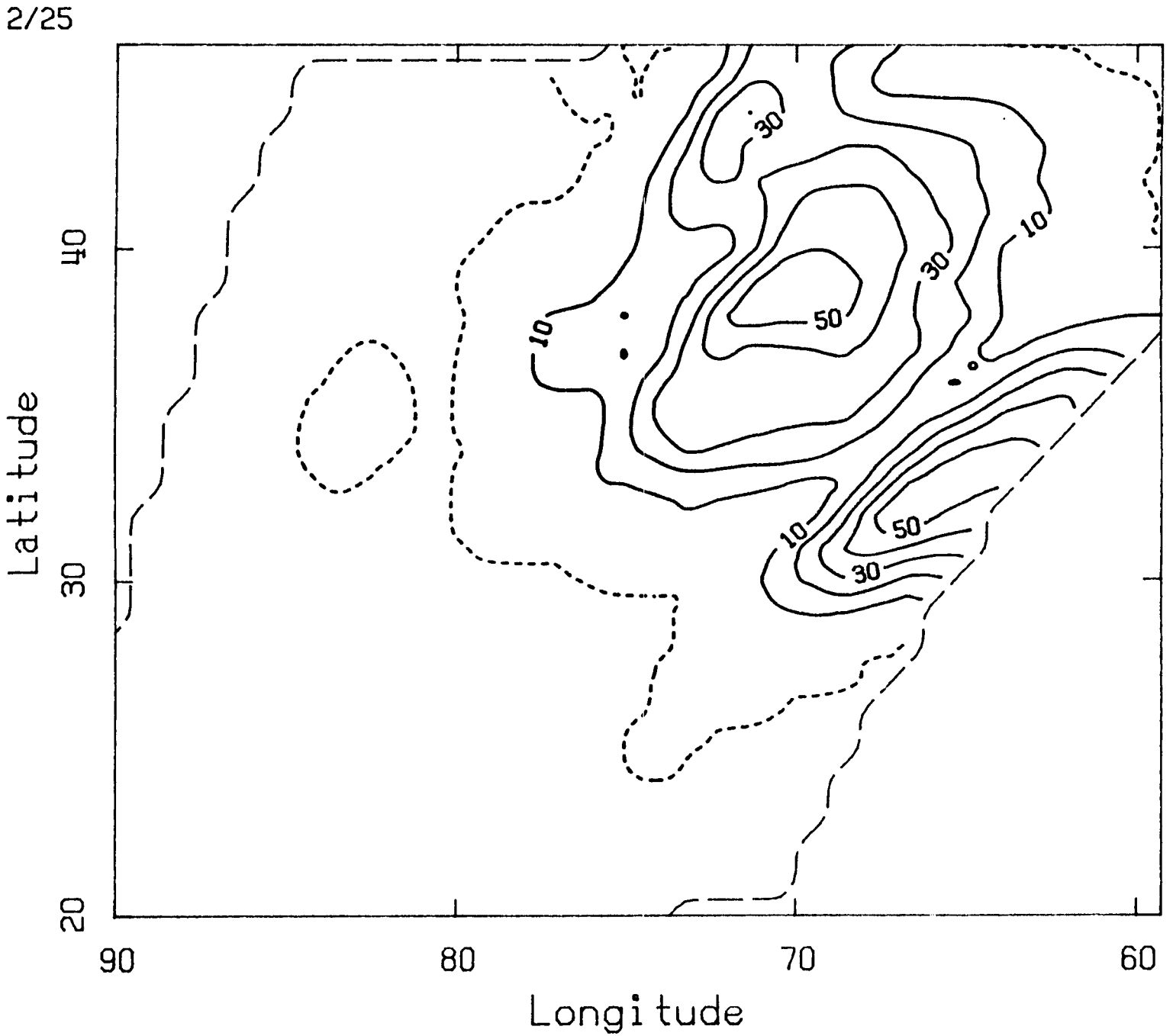
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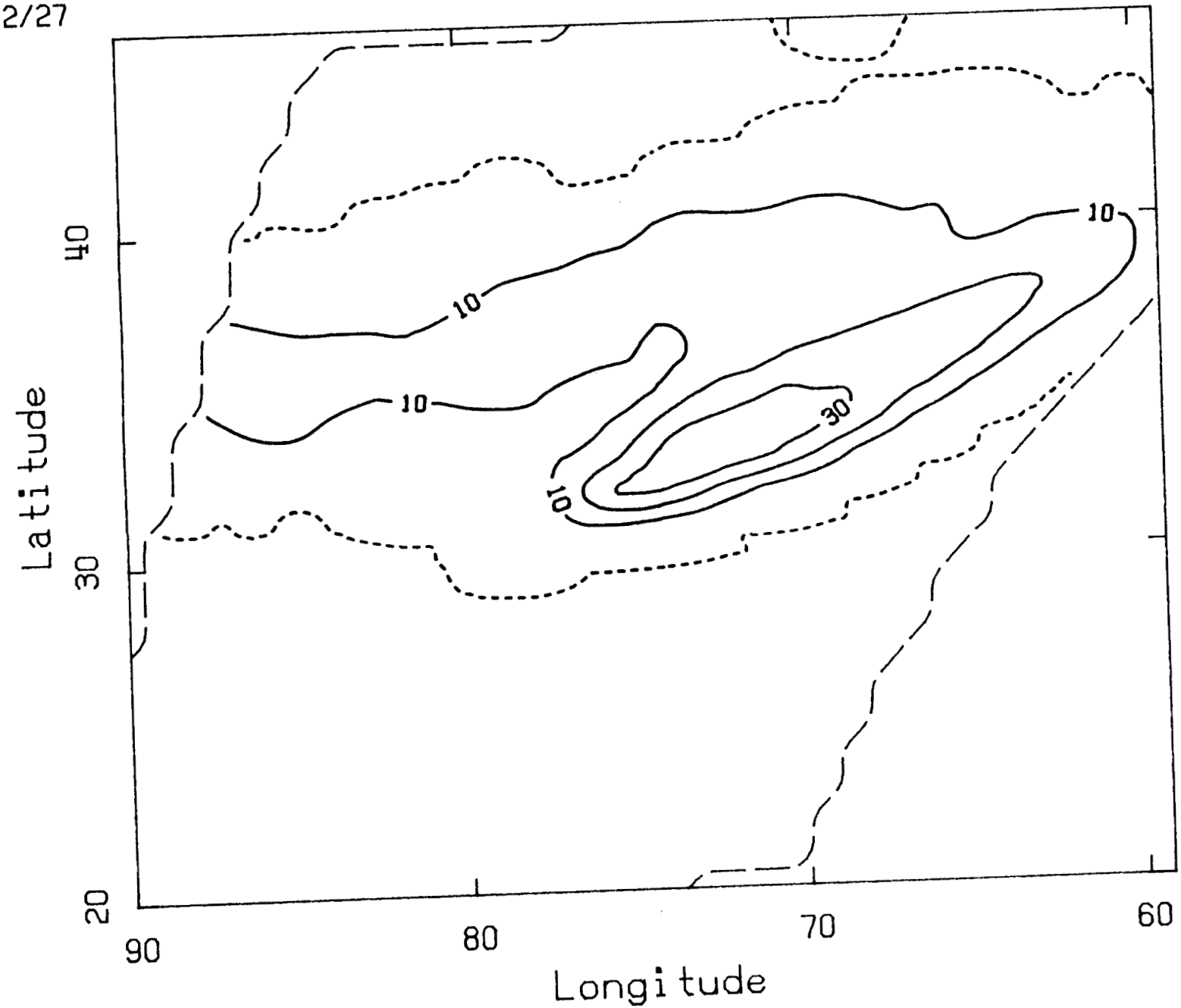
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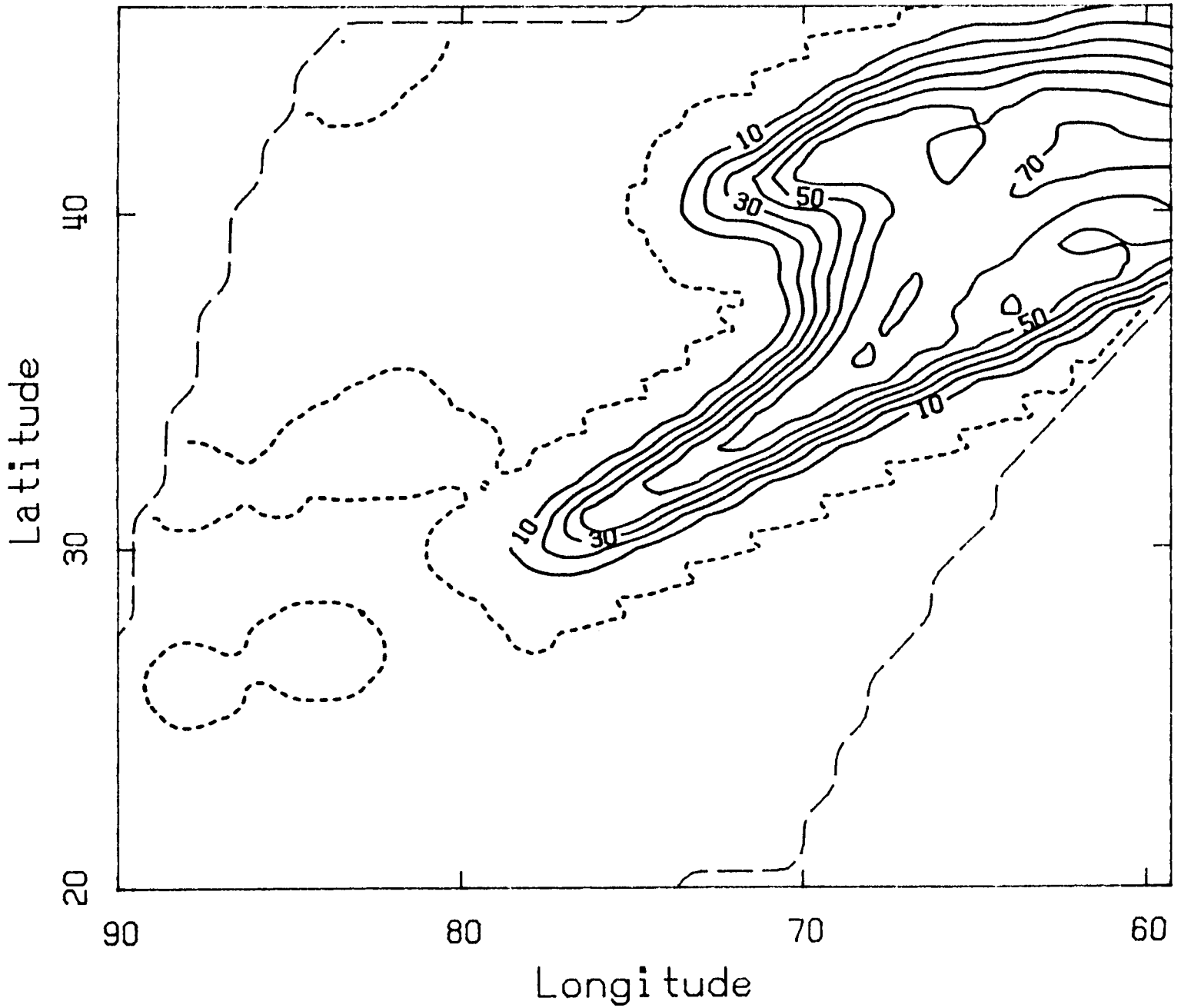
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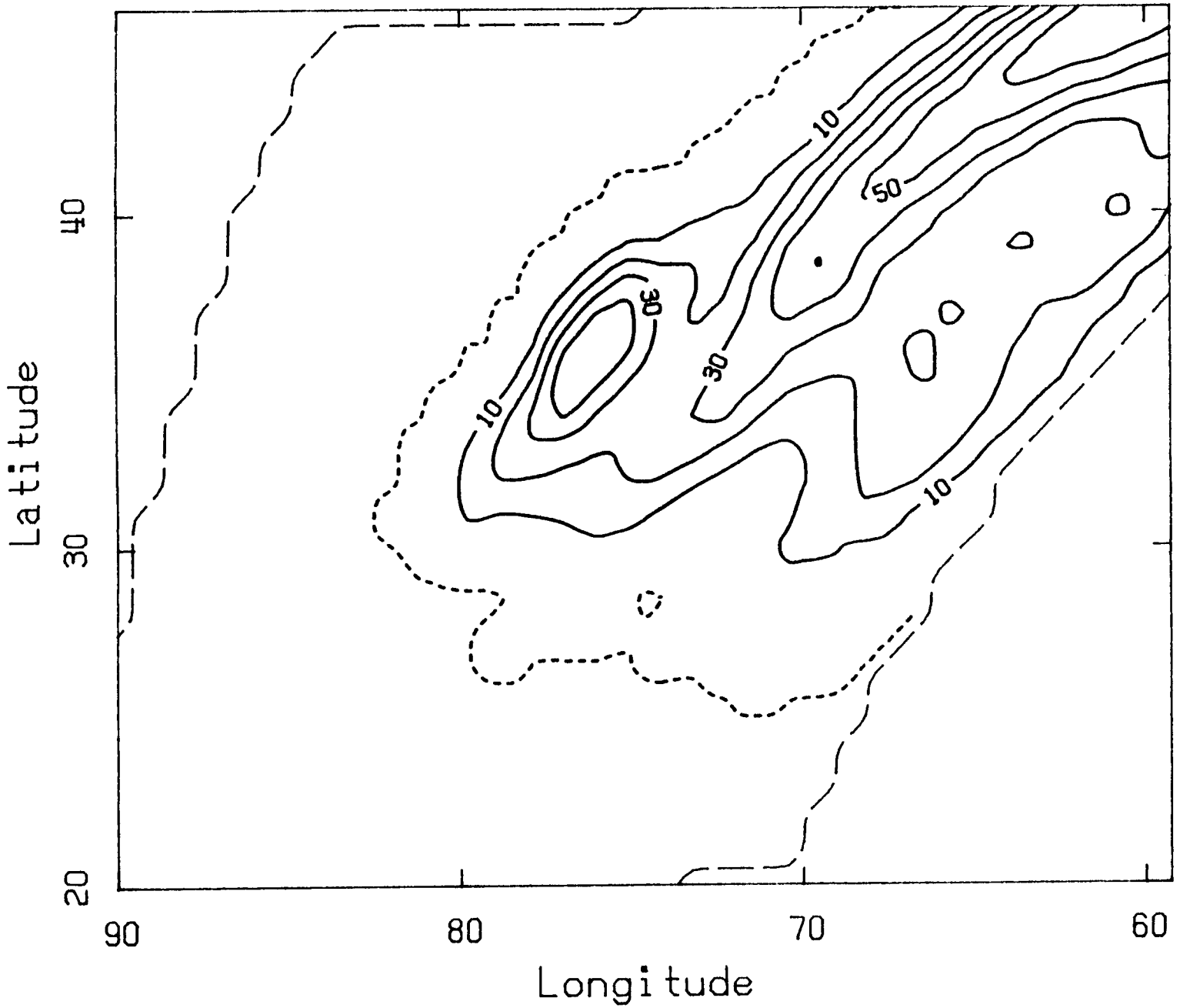

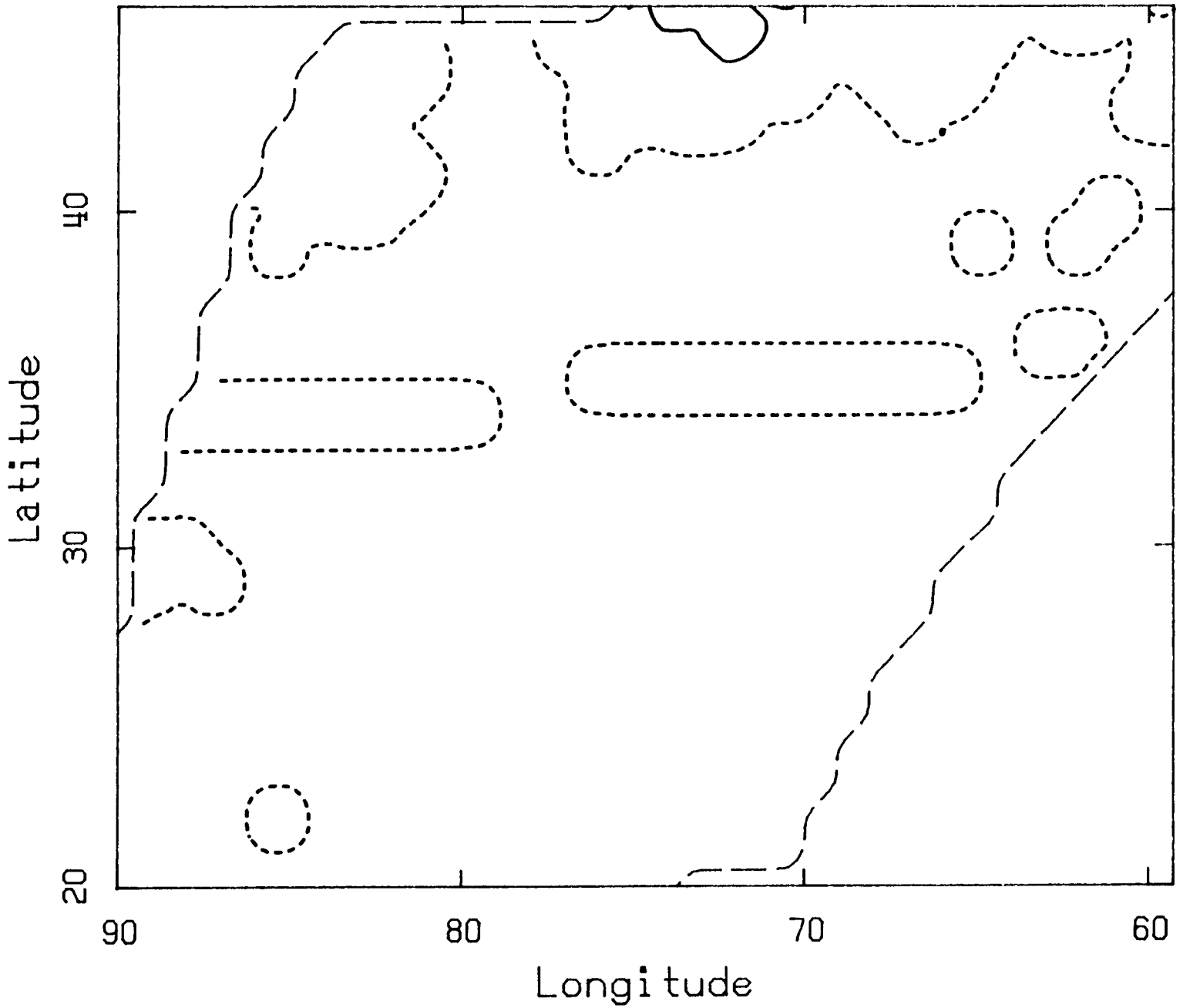
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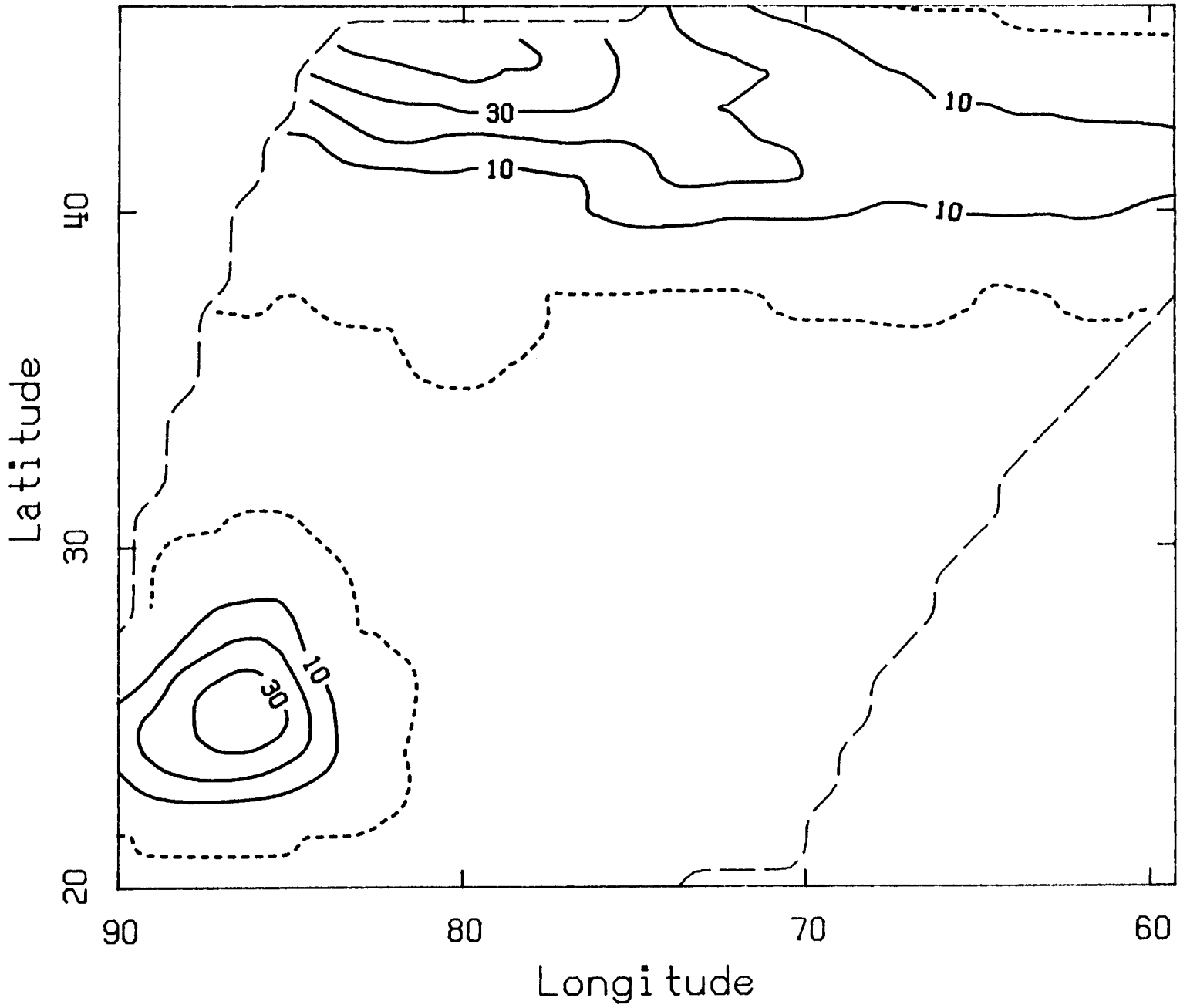
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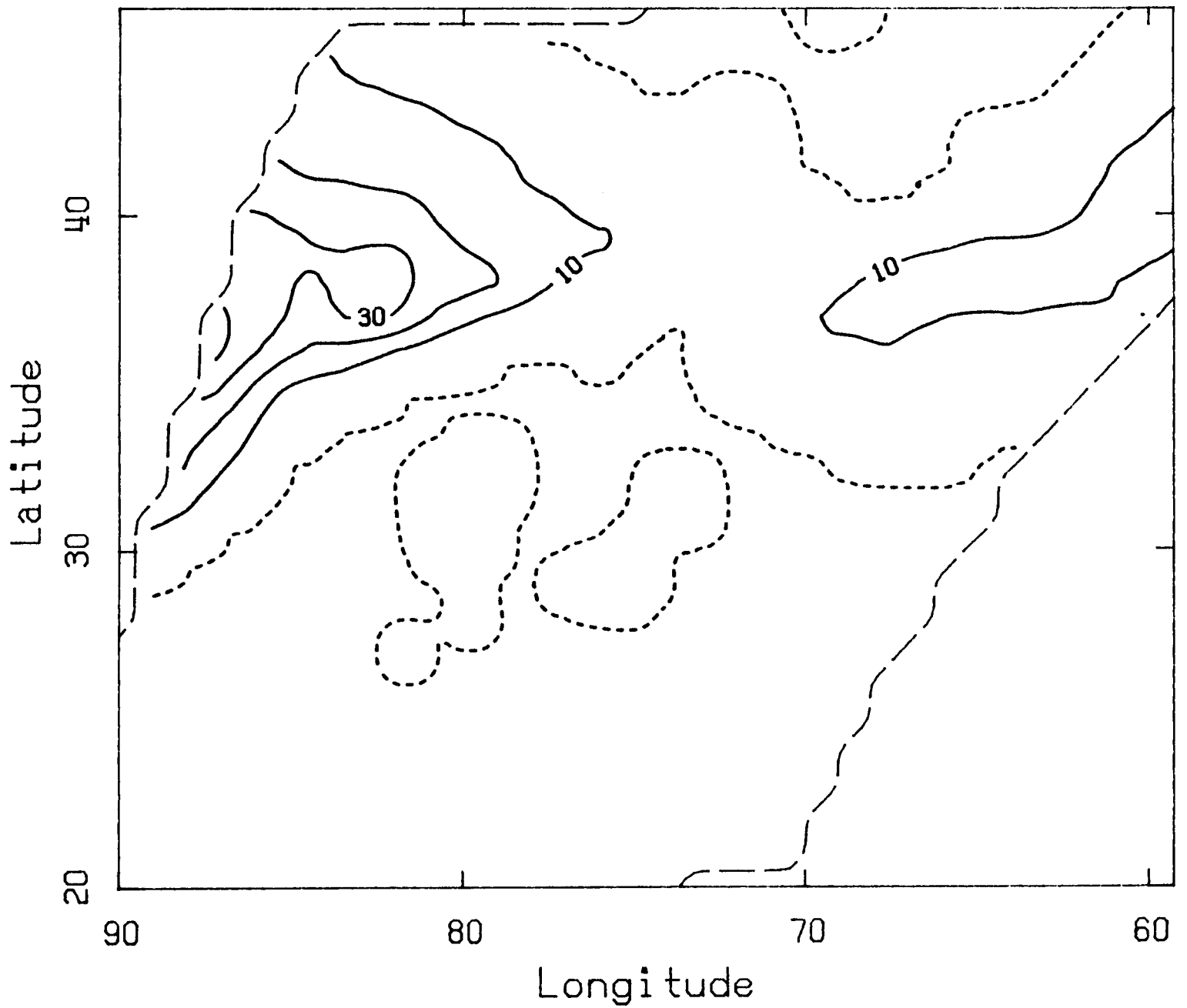
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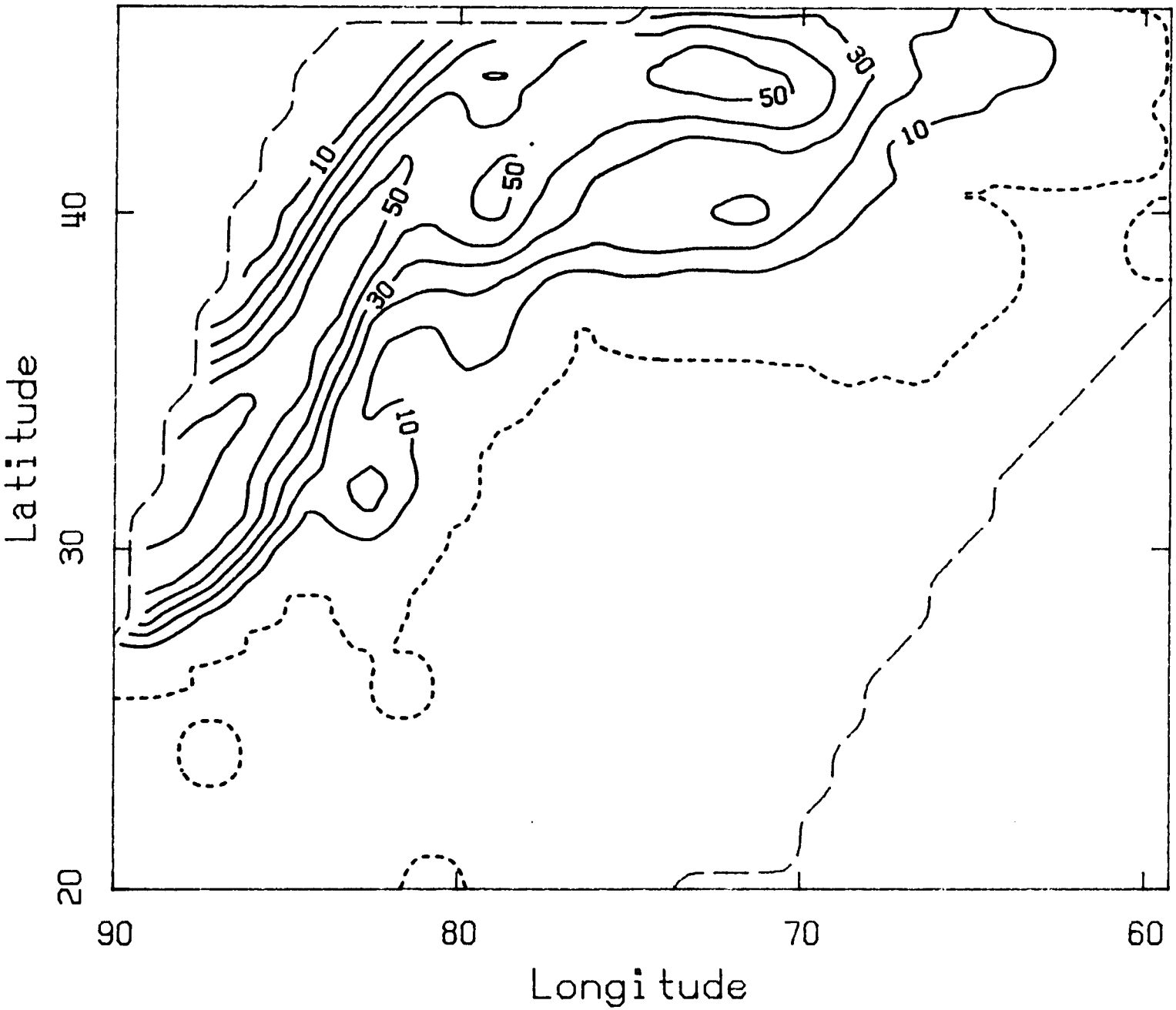
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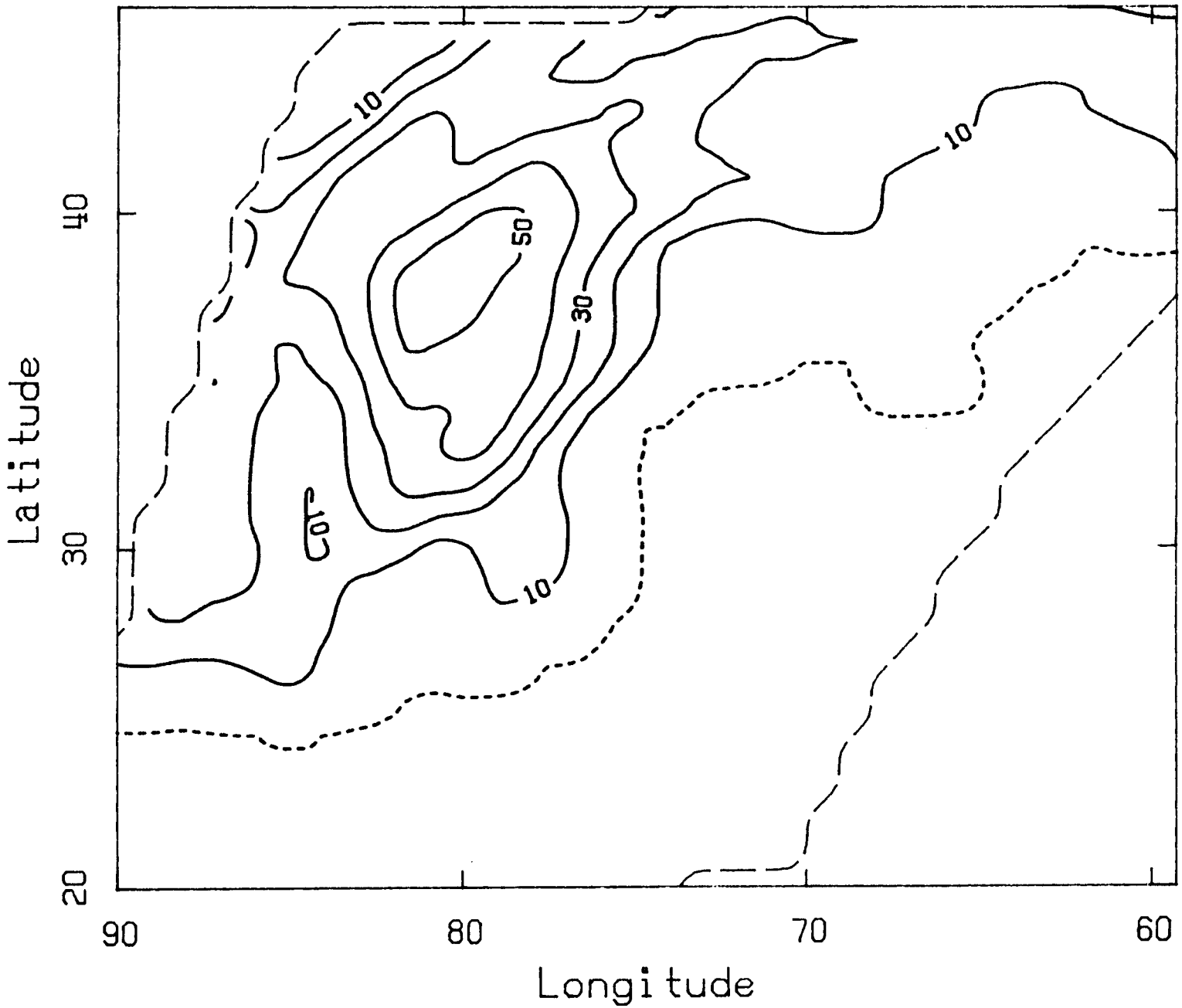
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