EXAMPLES OF ENVIRONMENTAL DATA

for

AQUACULTURE RESEARCH SUPPORT

April 1981

School of Oceanography
Oregon State University
Corvallis, Oregon 97331

ORESU-0-81-003

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Contract NA79AA-D-00106 with Oregon State University

INTRODUCTION

Aquaculture research is a major part of the NOAA Sea Grant program at Oregon State University. Both aquaculture research and its subsequent application by public and private agencies are thought to be strongly dependent on environmental factors. While it is not now clear exactly what the dependency is, user estimates have been taken as a first guess and translated into graphical displays that ultimately may be valuable in analyzing past, and forecasting future, trends in aquaculture results. This report summarizes initial work with physical data and may prove useful as the basis for more elaborate studies when assessment techniques for environmental effects on aquaculture become more precise.

USER REQUIREMENTS

Research personnel at OSU and operators of private Oregon aquaculture concerns have indicated that information about coastal upwelling, wind-driven currents and estuary conditions would be of primary assistance to their work.

These requirements were translated into two displays:

- local estuary and near-shore conditions, on a daily time scale
- continental shelf conditions, on a relatively coarse space scale and a monthly time scale

FORMATS

The local format presents:

- the square of the N-S wind component (V, with sign) averaged over a day, m^2/sec^2
- the max-min values of sea temperature during a day, °C
- the total precipitation in each day, mm
- the max-min values of estuary salinity in each day, $^\circ/_{oo}$

All parameters are plotted on one sheet for a 3 month season (spring, summer,

autumn, winter) at Newport, OR over the time period 1968 through 1980.

V^2 (with sign) is related through the Coriolis effect to nearshore upwelling/downwelling, and also shows predominant wind stress (current) effects in our area. Max-min. sea temperatures should also reflect upwelling and should check with the V^2 indication. Total precipitation affects estuary runoff and should reduce the daily salinity range, as can be checked in the salinity max-min values.

The area format presents:

- sea level, monthly average, cm
- the Bakun upwelling index,* monthly average, m^3/sec/100m of coastline (roughly proportional to V^2 with sign)
- sea surface temperature, monthly average, °C

All parameters are plotted for an ocean location or Marsden Square on one sheet for a decade. The envelope lines indicate monthly extremes obtained from the entire record length. Sea level should be related to the integral of N-S wind stress (hence, N-S wind-driven currents and upwelling). Sea surface temperature data cross-check the Bakun index (upwelling) indication, and are useful to biologists in their own right.

DATA SOURCES

Fig. 1 shows locations of stations used. Data for the plots were obtained from the following sources:

- local (Yaquina Bay, Newport, OR)

  wind - Aerovane sensor and strip chart recorder on the berm near south jetty of Yaquina Bay (knots).

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*BAKUN, A., 1975. Daily and Weekly Upwelling Indices, West Coast of North America, 1967-73. U.S. Dep. Comm., NOAA Tech. Rep. NMFS SSRF-693, 114 p.

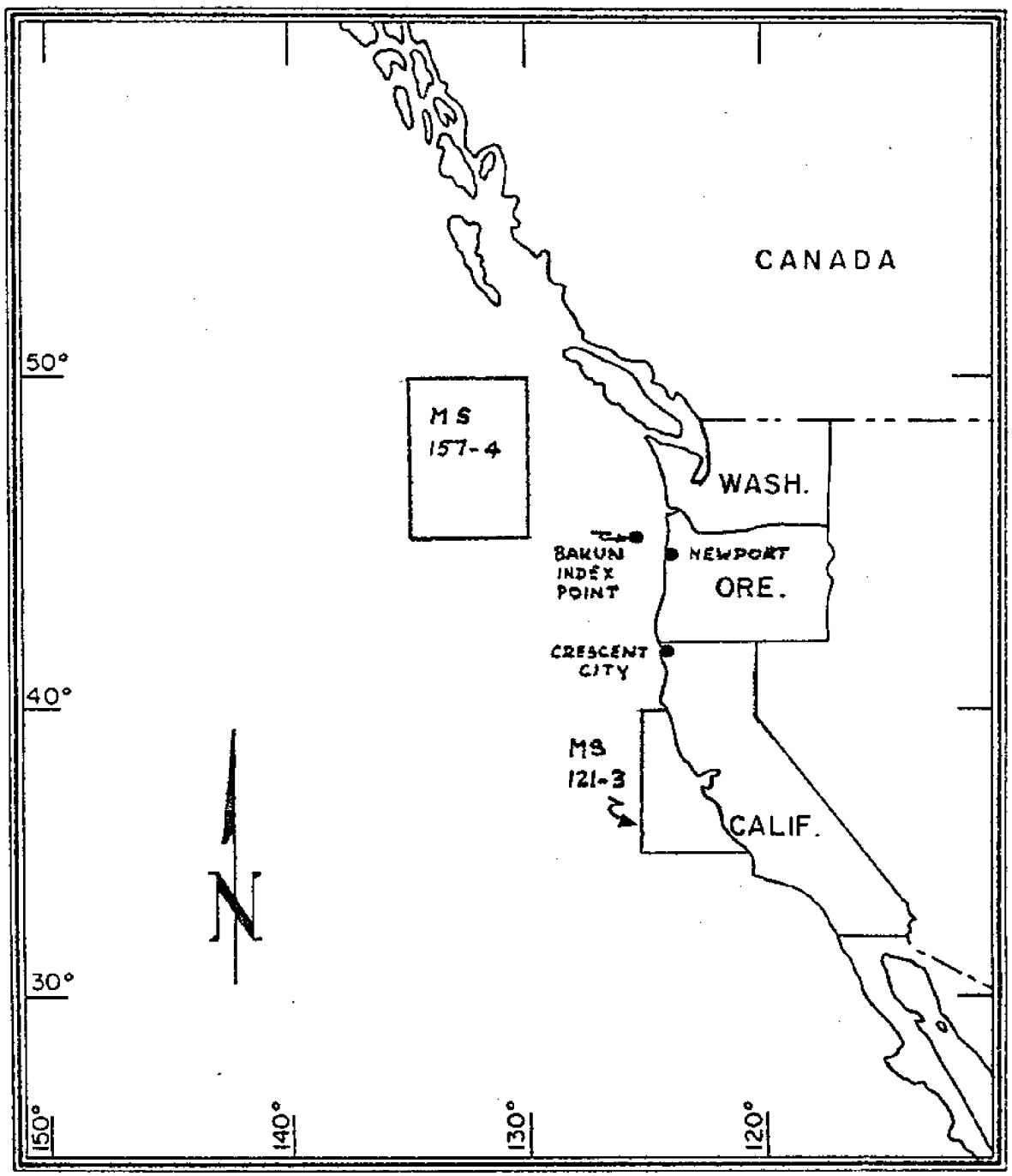
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Fig. 1

sea temperature - thermistor sensor at OSU Marine Science Center main building sensing temperature of water pumped from -13 ft. MLLW in Yaquina Bay (°C)

precipitation - NWS climatological station, Newport, OR (inches)

salinity - hydrometer-type sensor at OSU Marine Science Center sensing salinity of water pumped from -13 ft. MLLW in Yaquina Bay (°/₀₀)

- area

sea level - NOS tide guage at Crescent City (1933-1969) and at main dock of OSU Marine Science Center (1970-1979);

Bakun index - courtesy Andrew Bakun, Pacific Environmental Group, Southwest Fisheries Center, NMFS, Monterey, CA.

sea surface temperature - Marsden square compilations of ship ship reports courtesy FNWC, Monterey, CA (°C)

PROMINENT FEATURES

The local seasonal plots show the inverse relationship between precipitation and minimum salinity, especially during the winter months. Heavy precipitation is usually accompanied by strong southerly winds (large negative V^2).

An instance of seasonal warming of water temperature occurs during Jan-Mar 1969 and seasonal cooling during Oct-Dec 1969. Strong upwelling (positive V^2) during late July 1979 causes the water to cool dramatically. Then, as upwelling ceases in mid-August, the water warms rapidly during the next ten days.

The local decadal plot (1970-79) shows low salinity during the winter months when most precipitation occurs. However, note the unusually low precipitation during the winter of 76-77 and higher than normal salinities. There

is little difference in monthly averages of max. and min. water temperatures even though the range of daily values may exceed 5°C

The area decadal plots indicate the manner in which values for a particular month (darker line) compare with the all-time max. or min. for that month (lighter envelope lines). For instance, water temperatures for both Marsden Squares during 1957-58 were much warmer than normal, and equalled the record maximum for a few months.

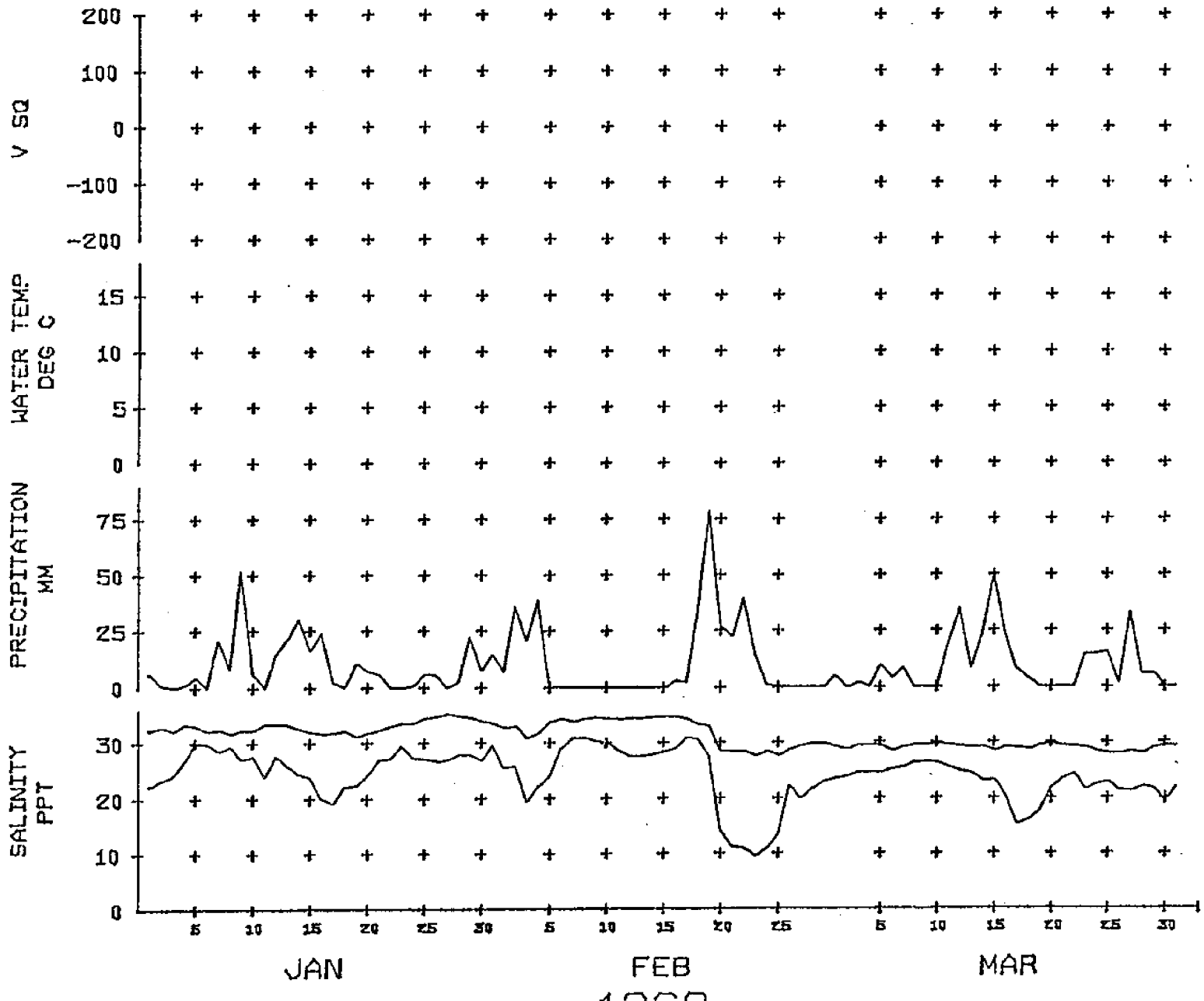
ACKNOWLEDGEMENTS

The compilations shown in this report were produced by Clayton Creech, School of Oceanography, Oregon State University.

We acknowledge the courtesy of Andrew Bakun and D.R. McLain in making available the area data reported herein from the computer tapes held by the NOAA/NMFS Pacific Environmental Group, Monterey, CA. Dr. Adriana Huyer, and Henry Pittock, OSU School of Oceanography made available to us their Crescent City, CA and Newport, OR sea level data.

PLOTS

- local (Newport, OR) by season and decade
- area (off Washington, Oregon, N. Calif.) by decade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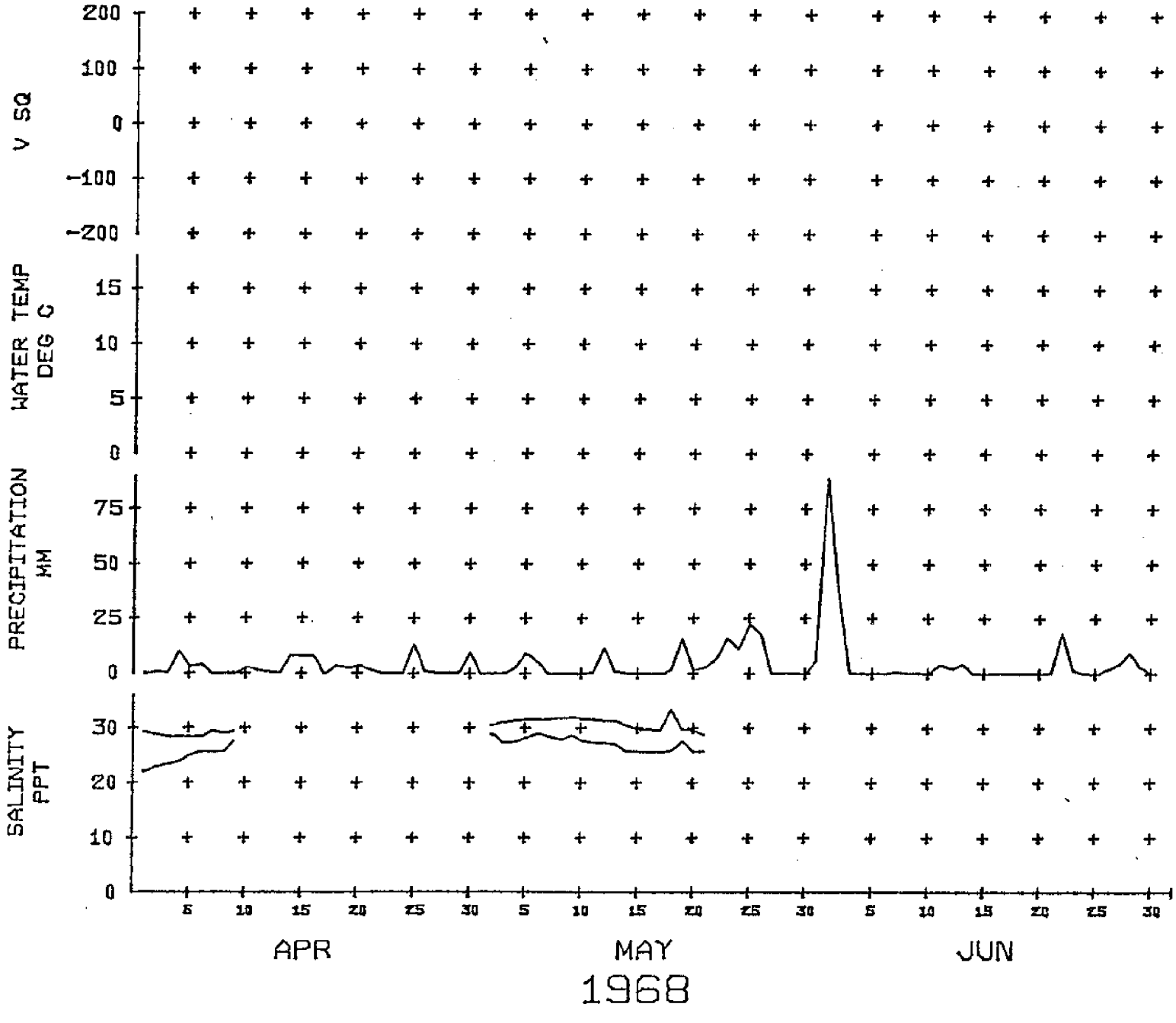
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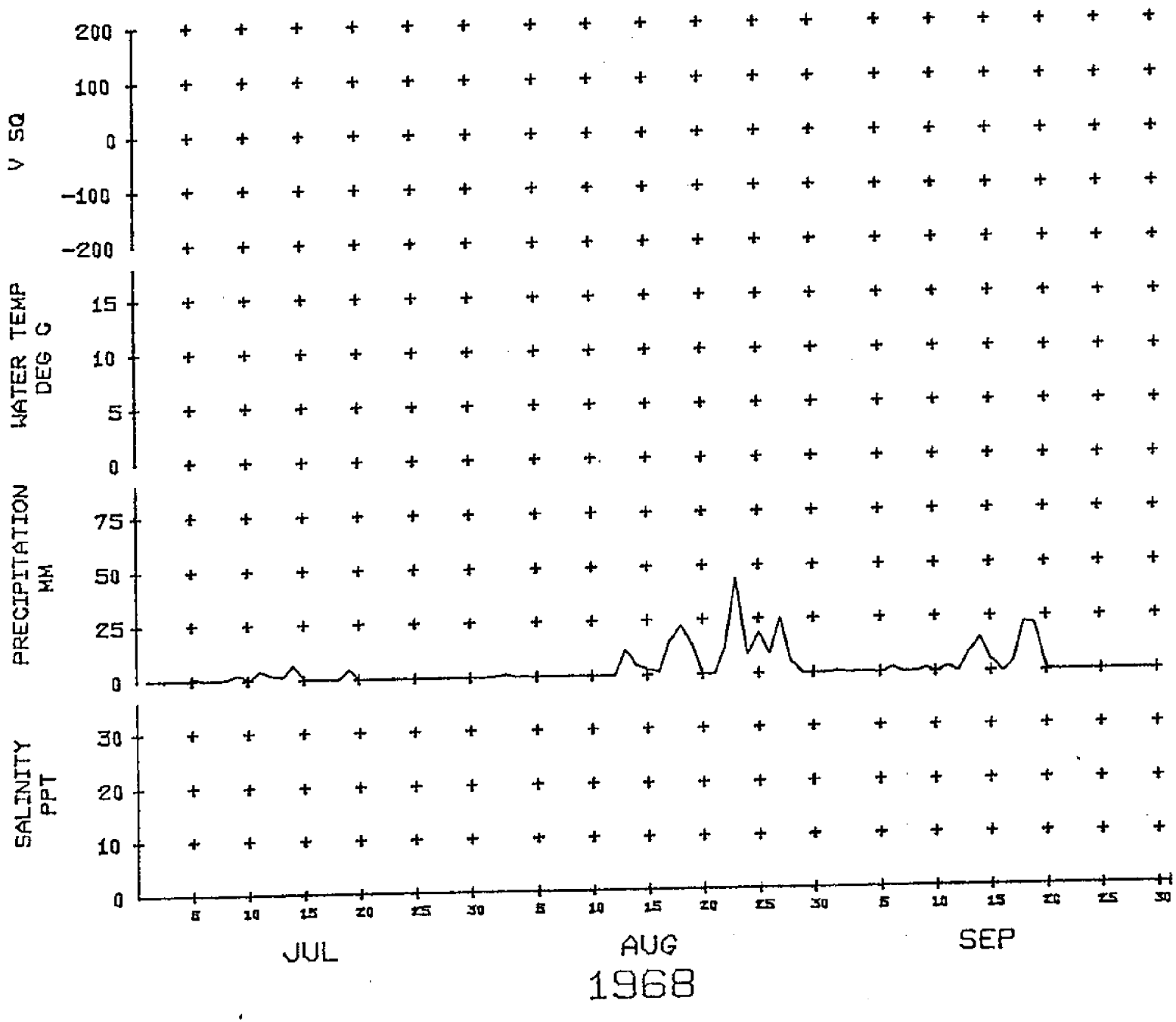
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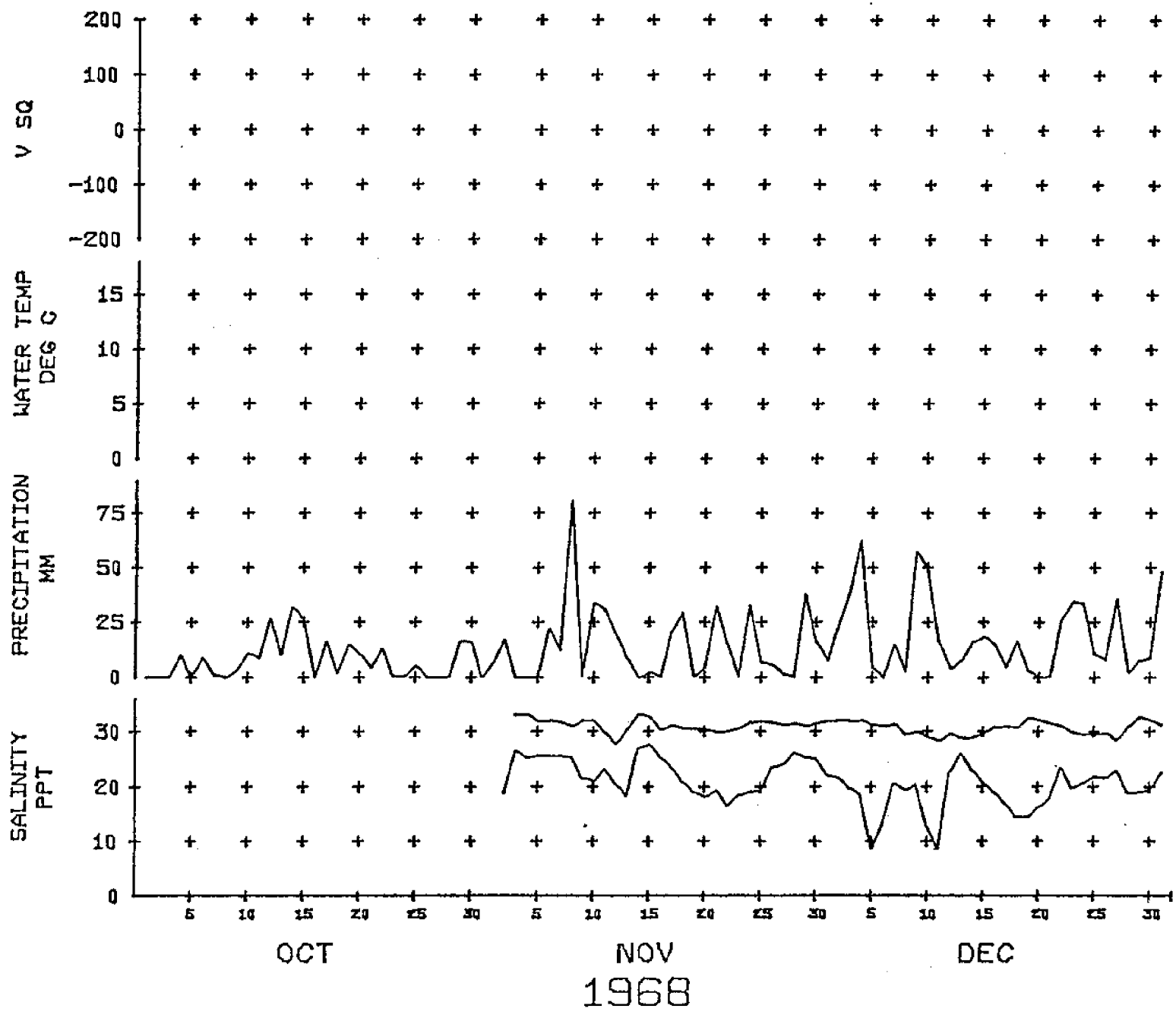
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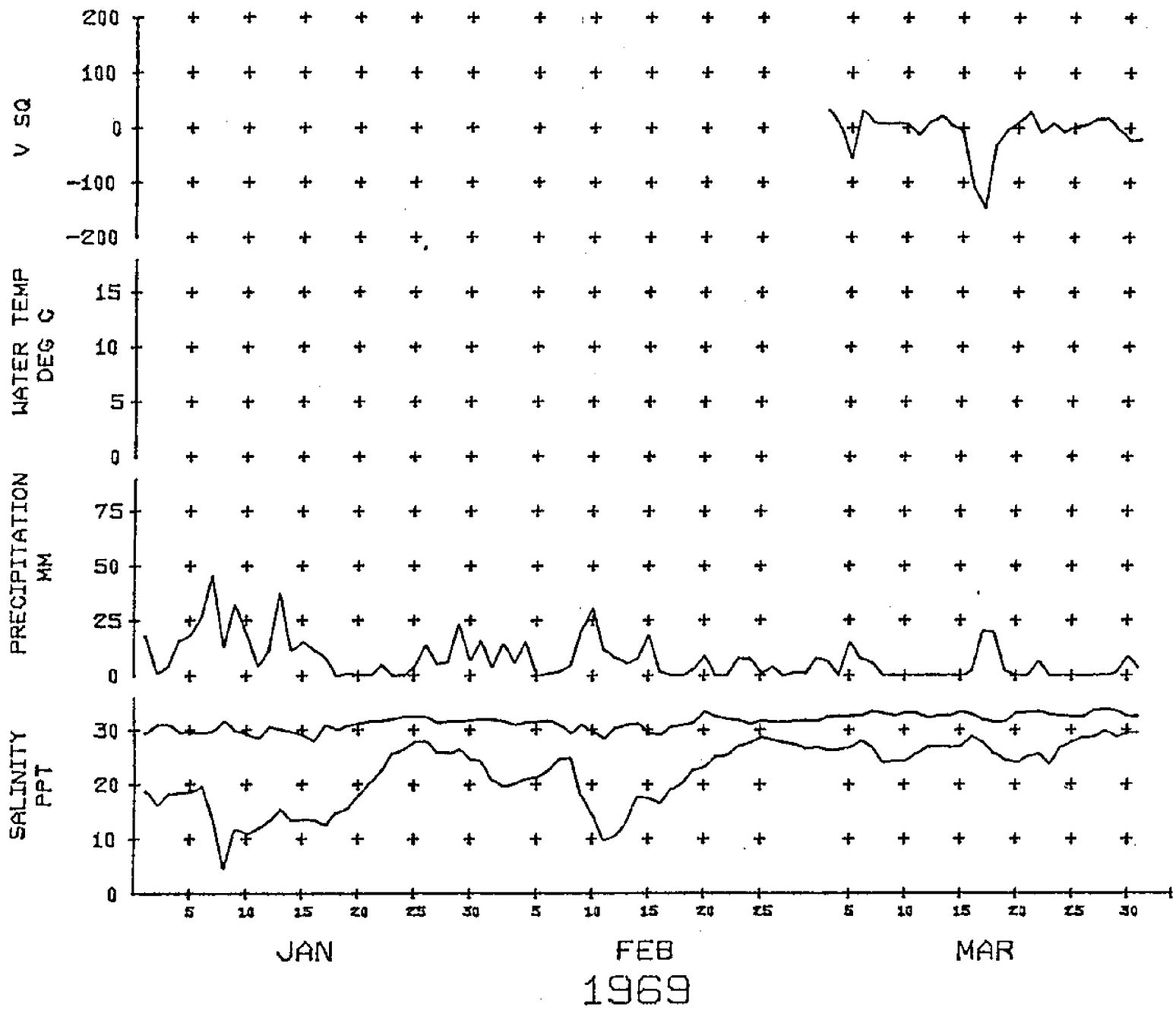
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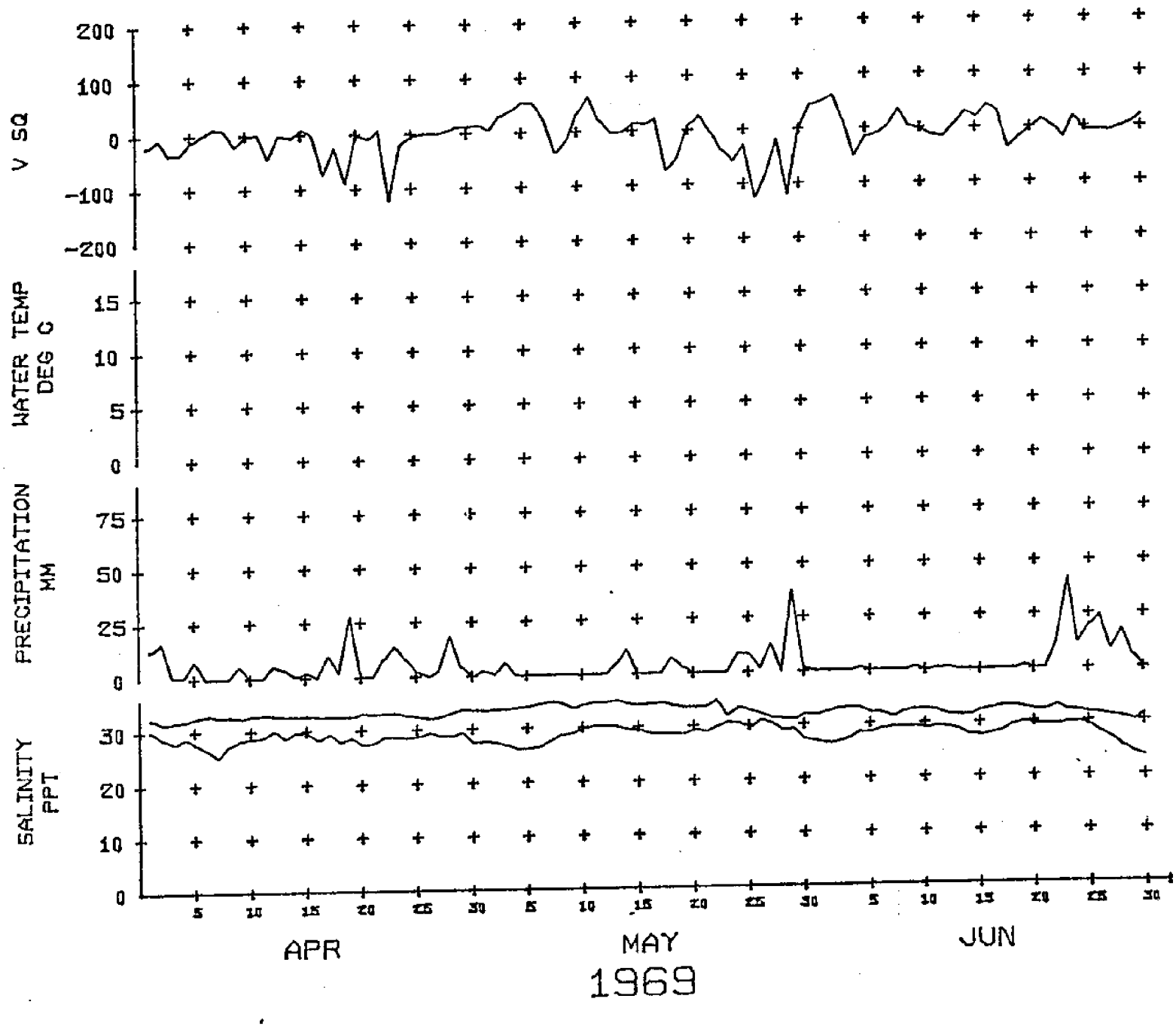
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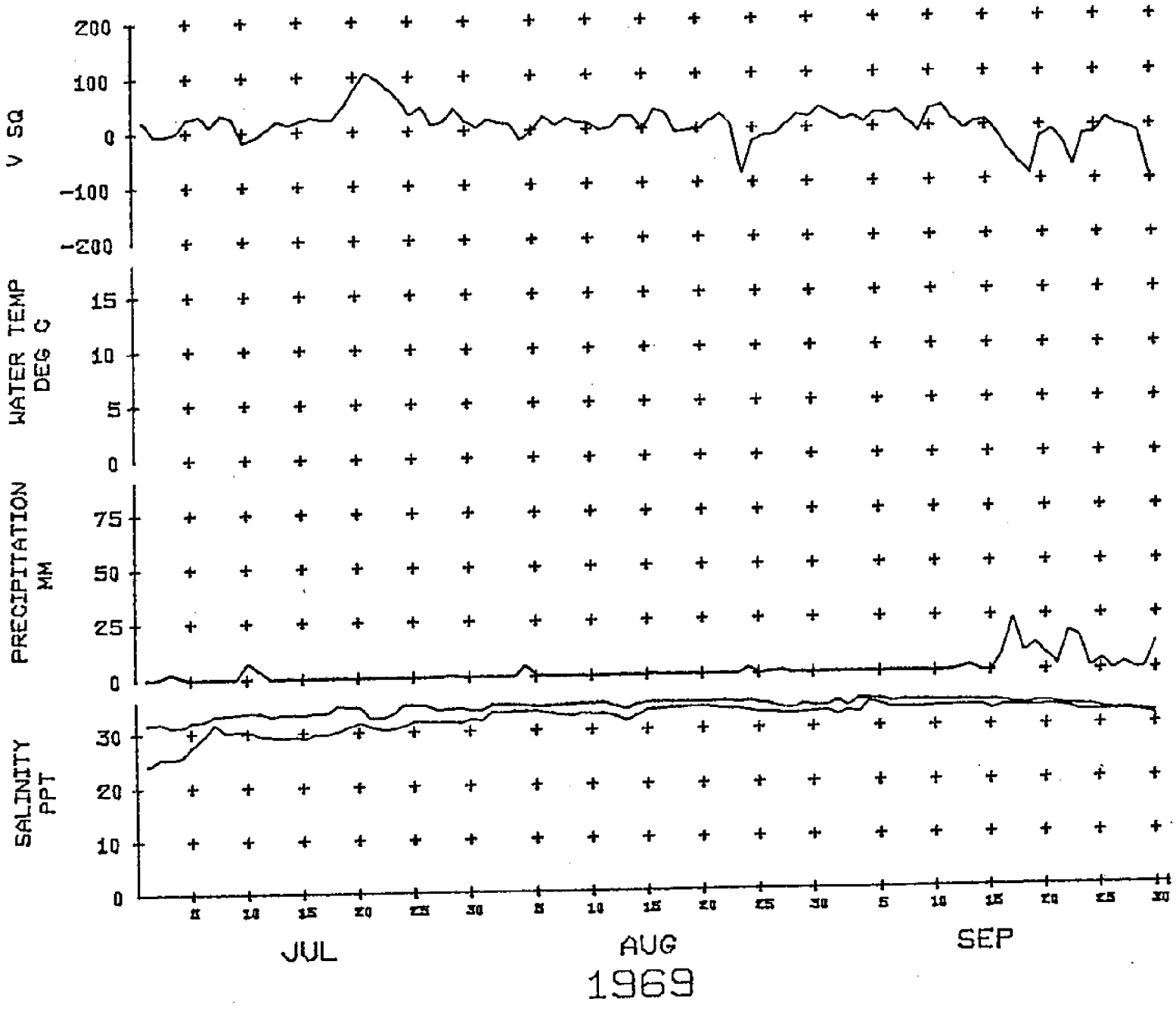
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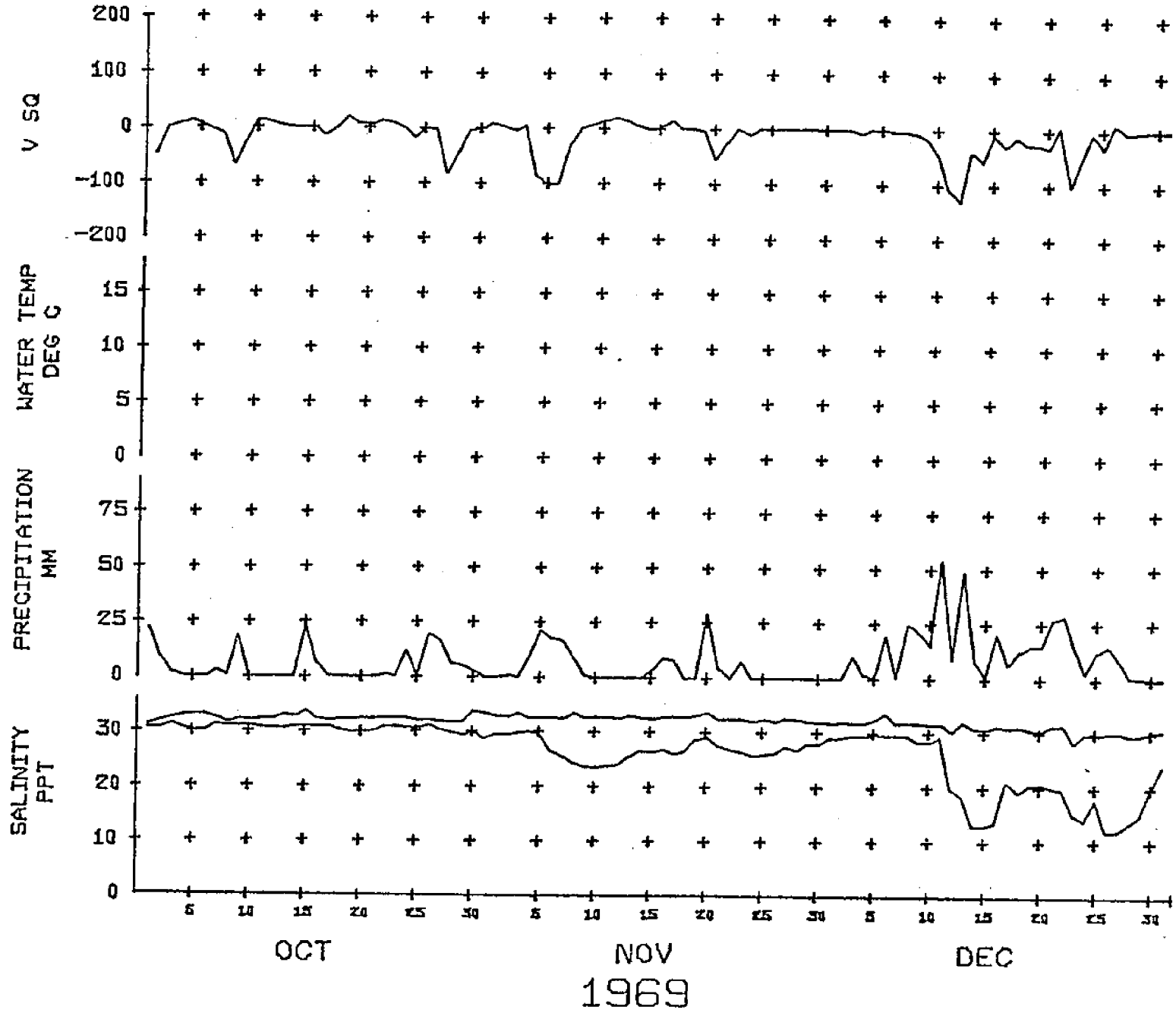
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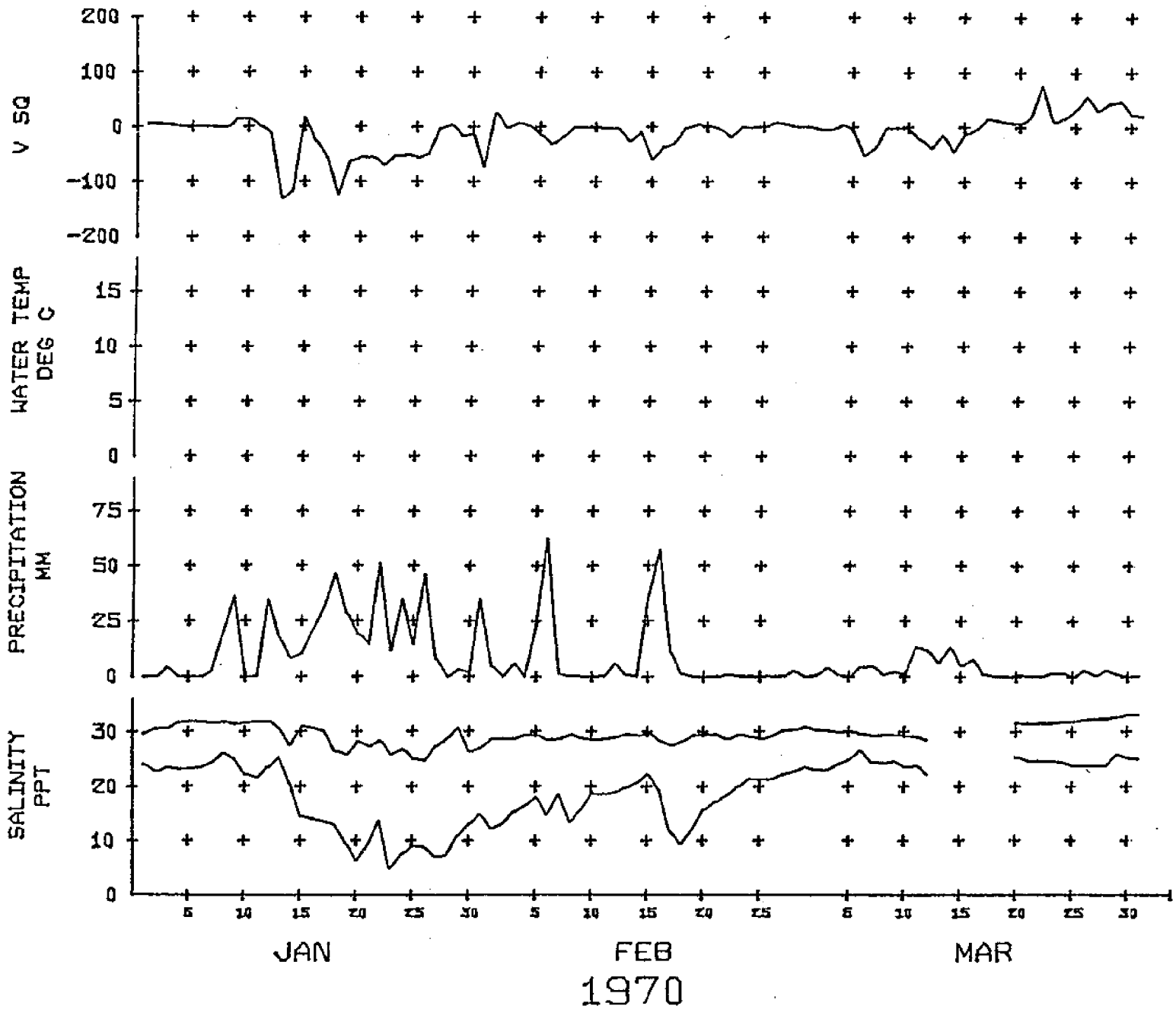
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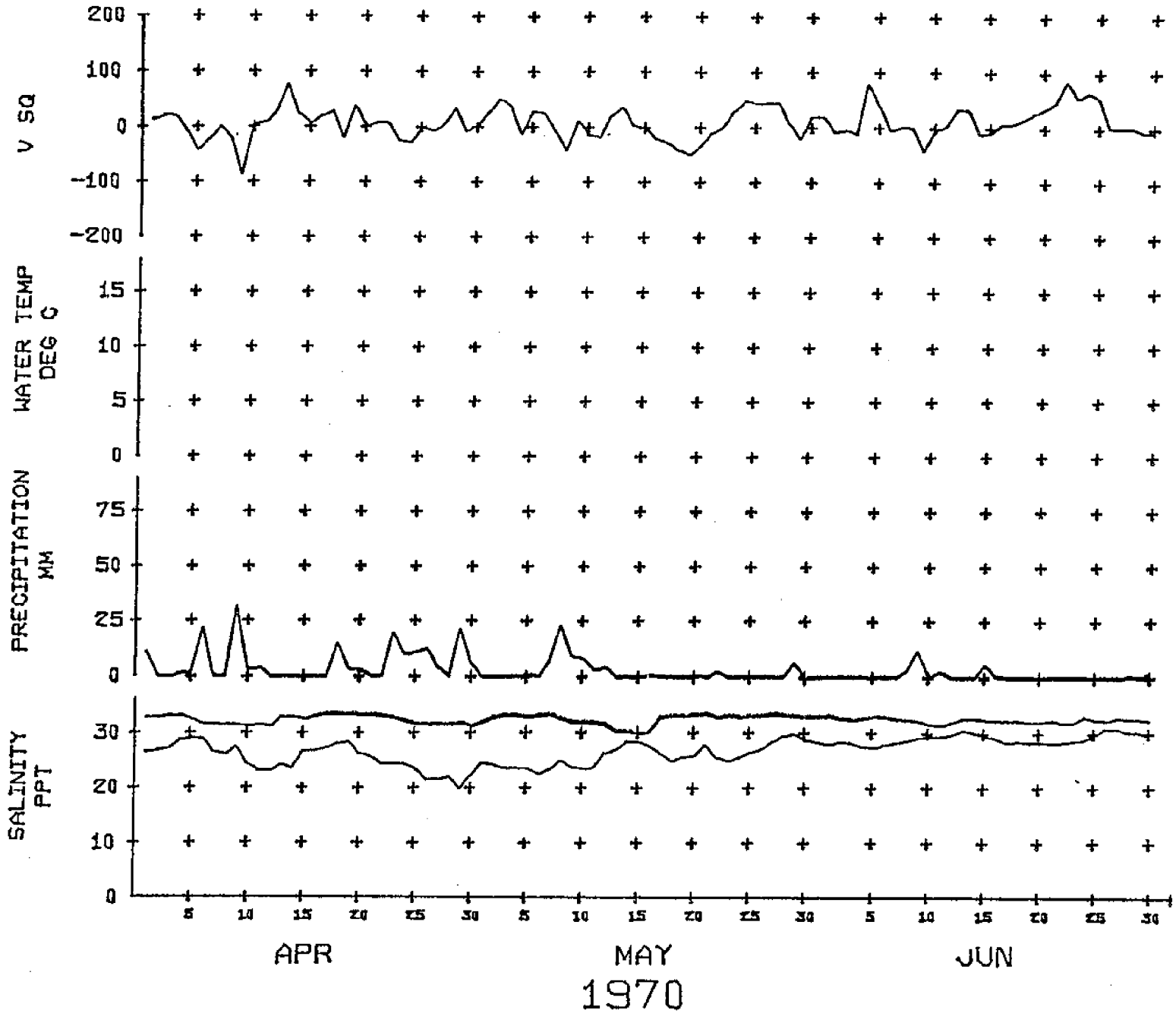
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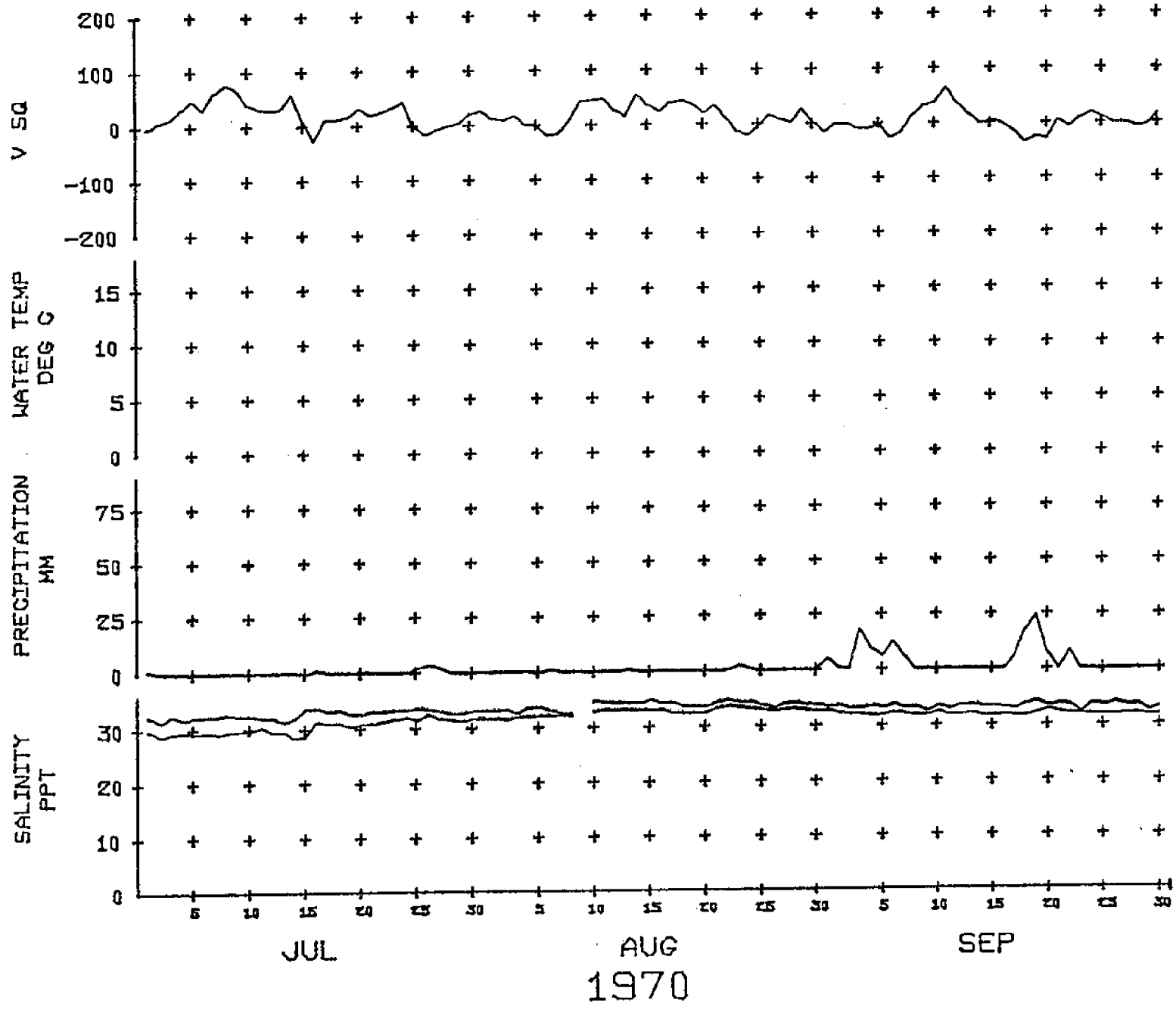
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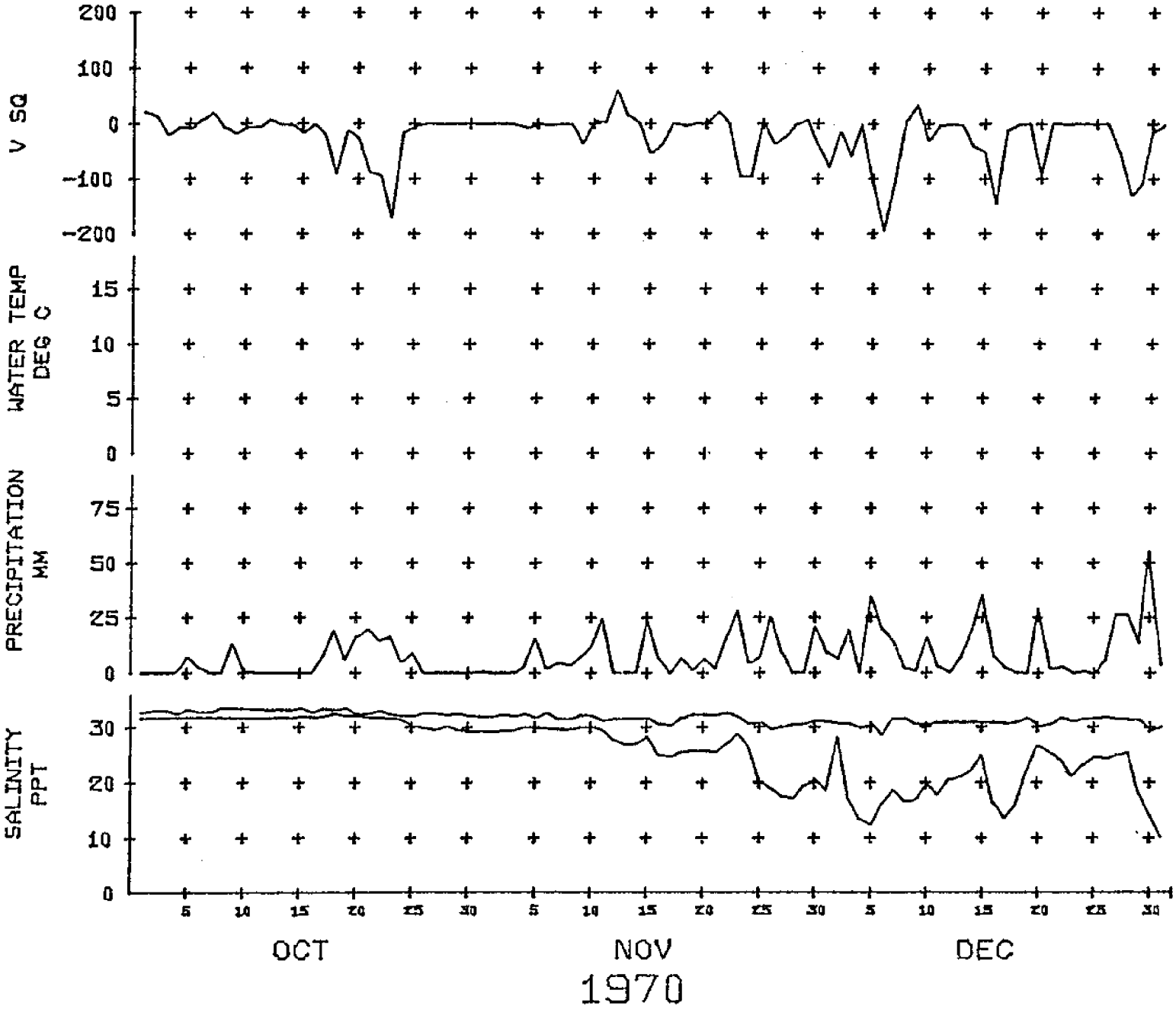
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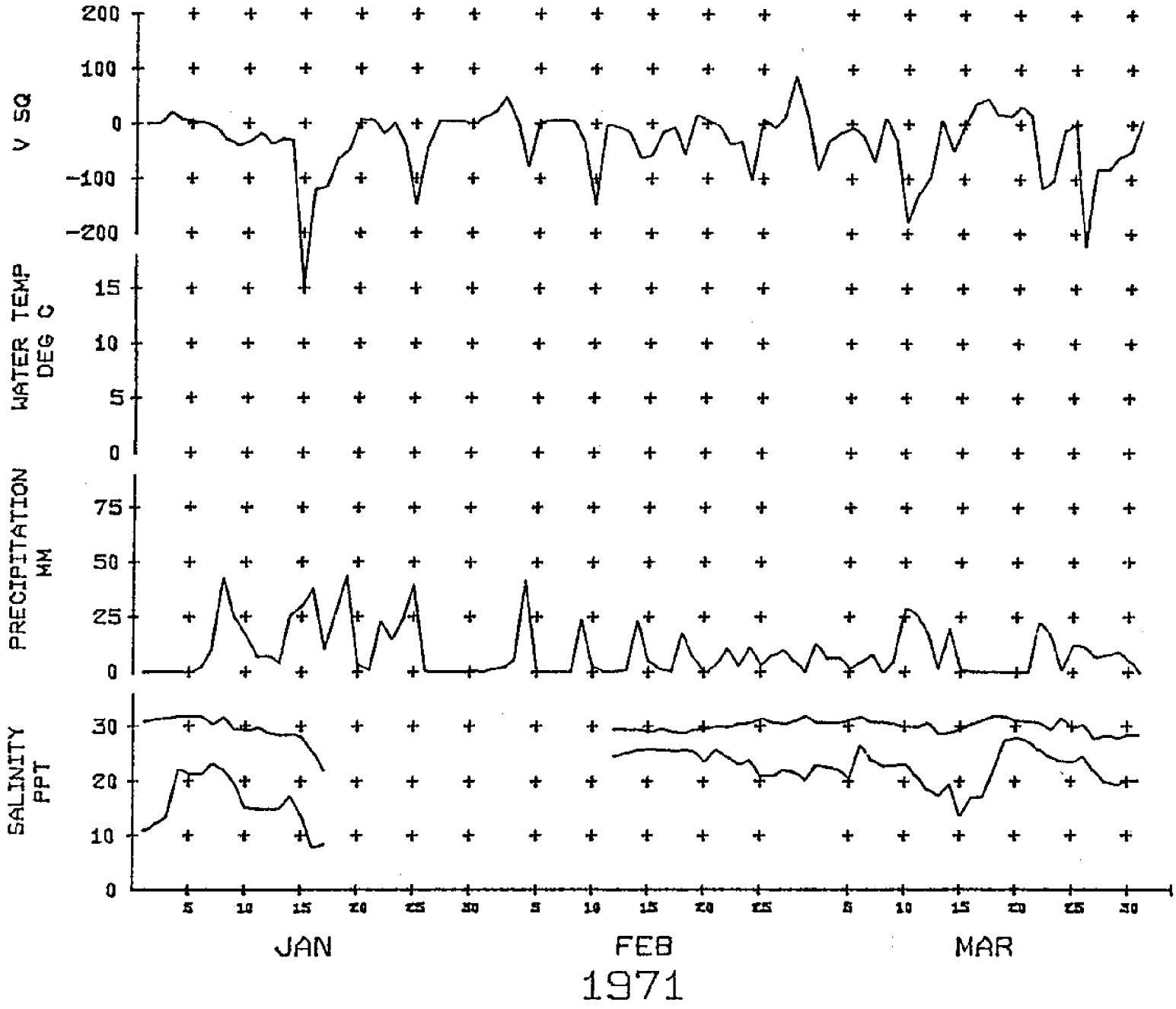
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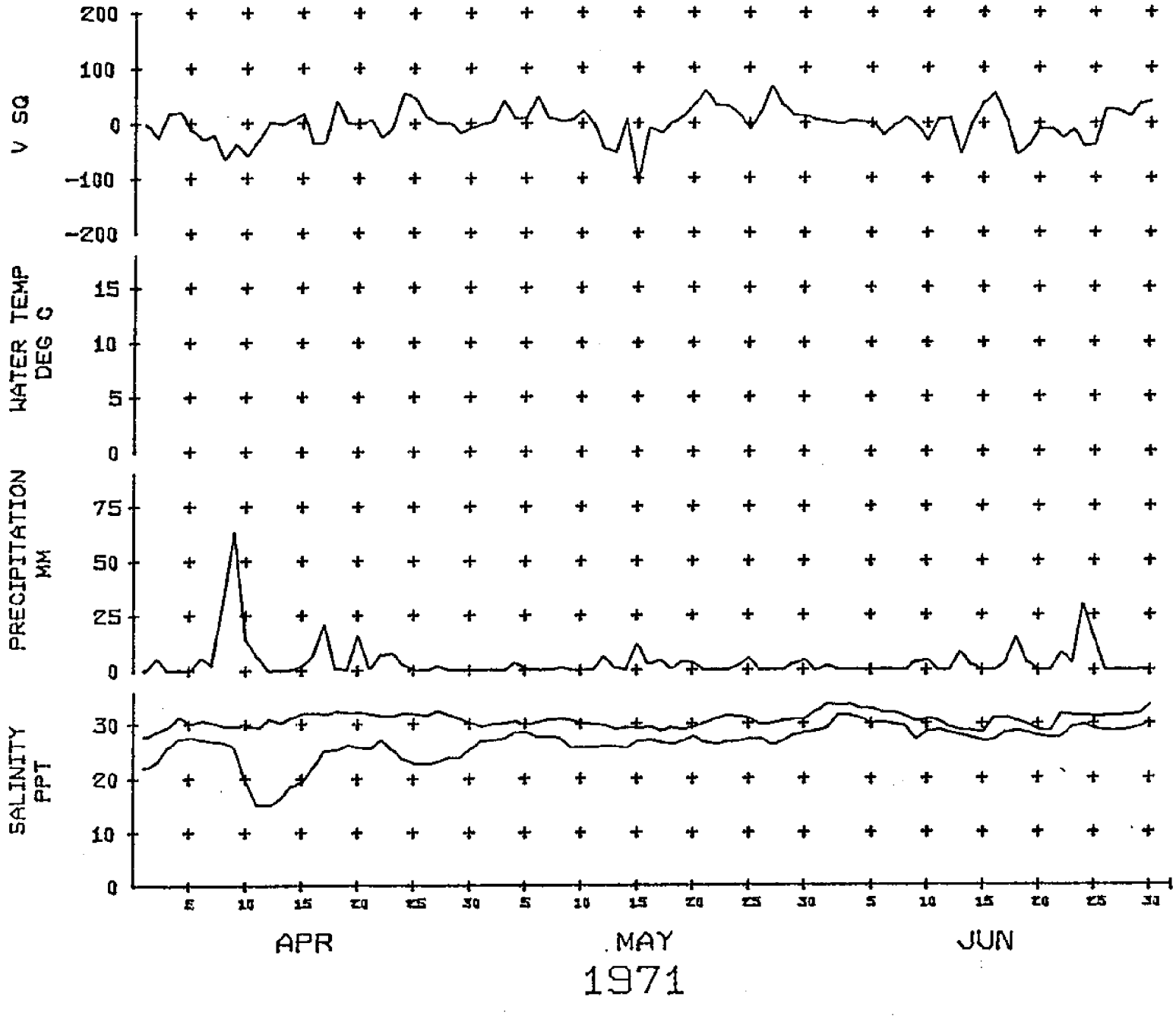
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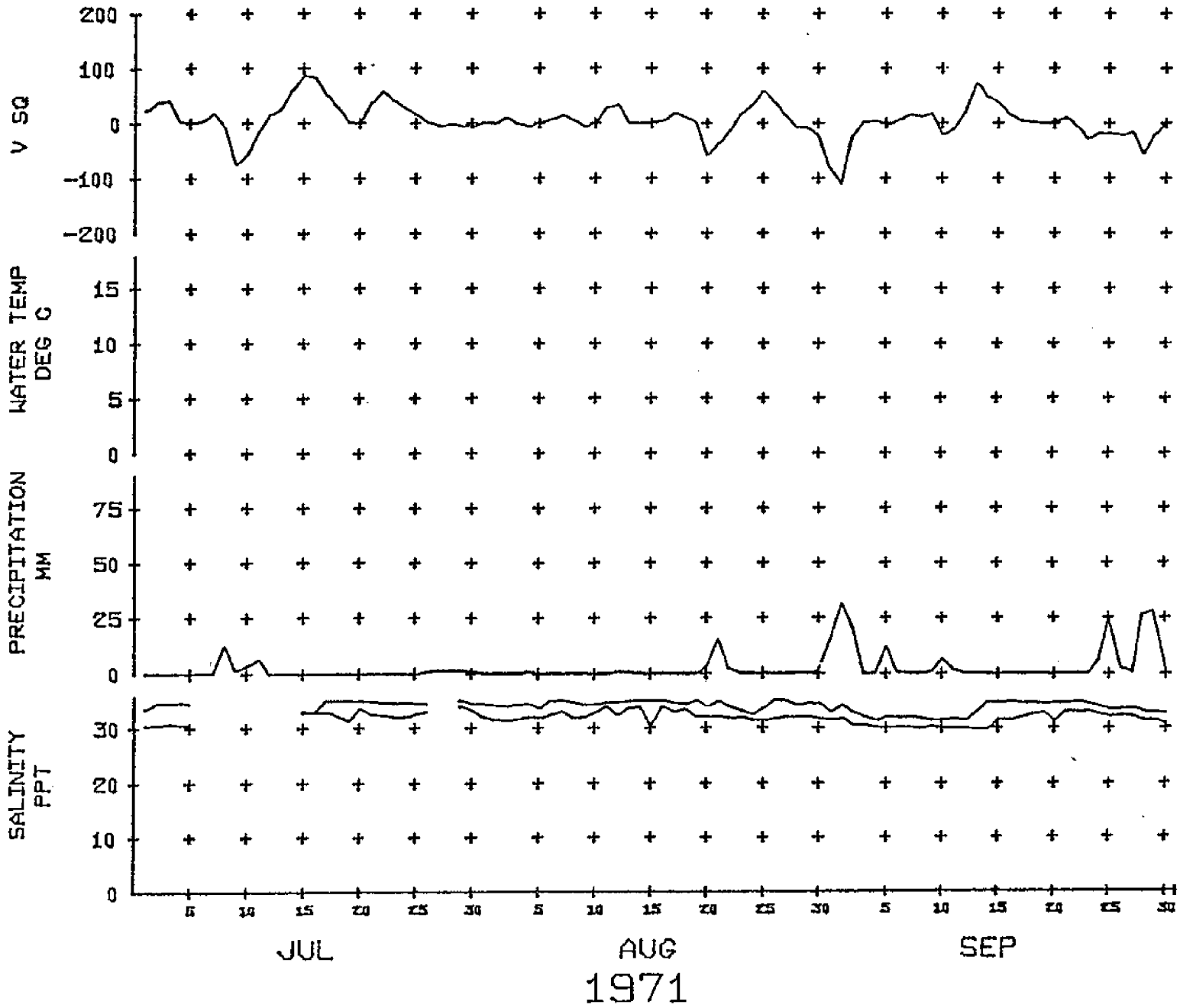
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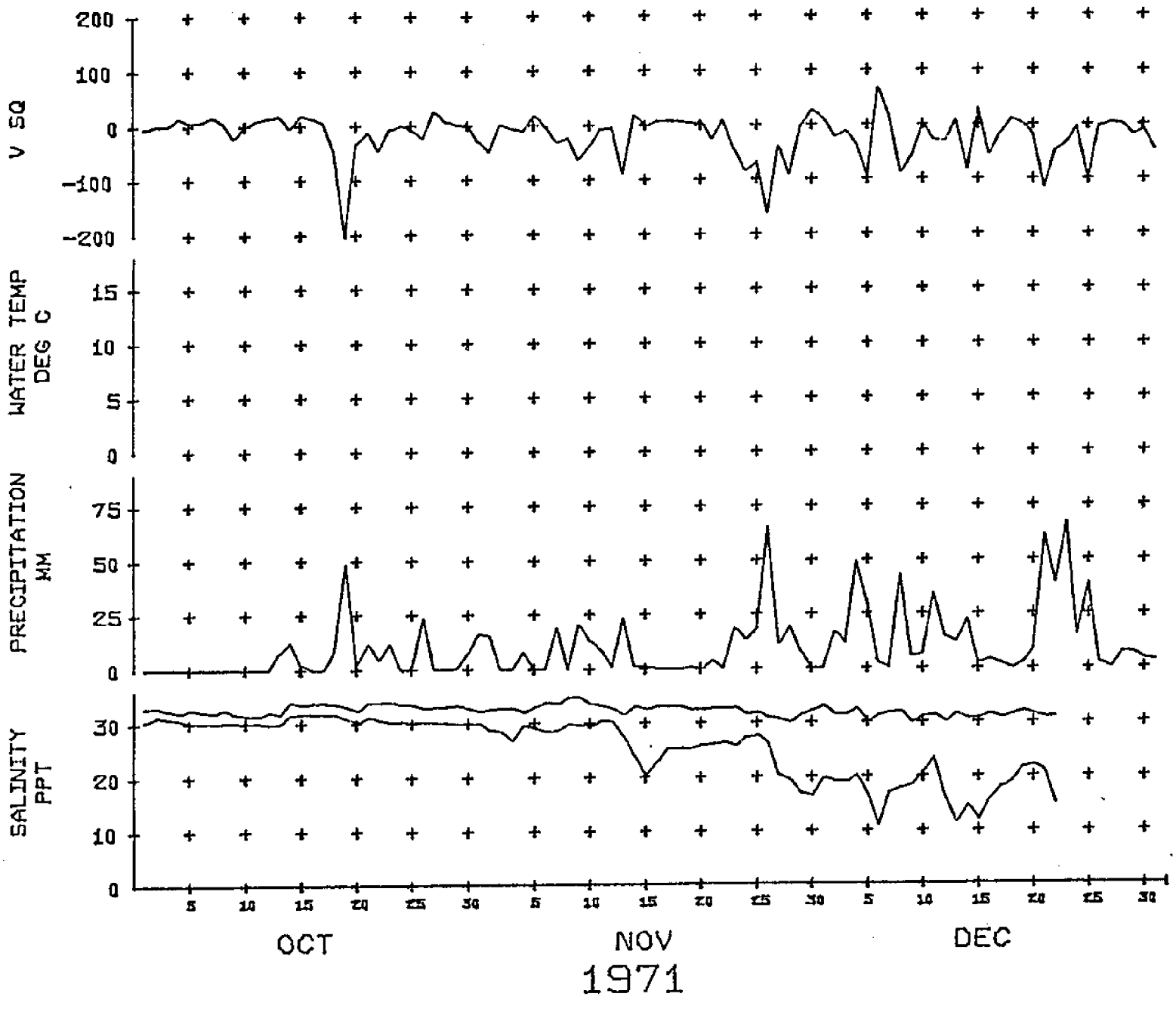
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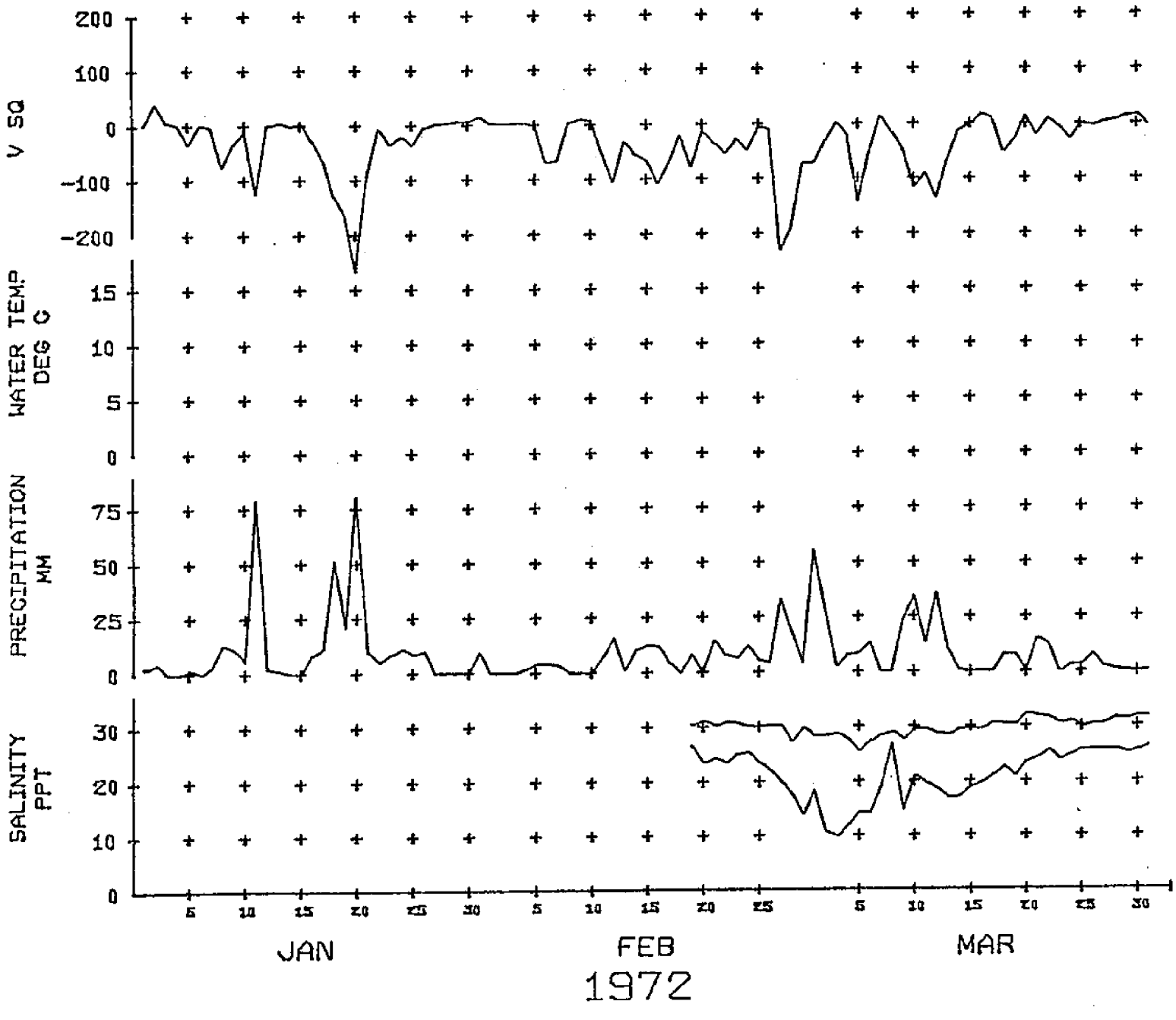
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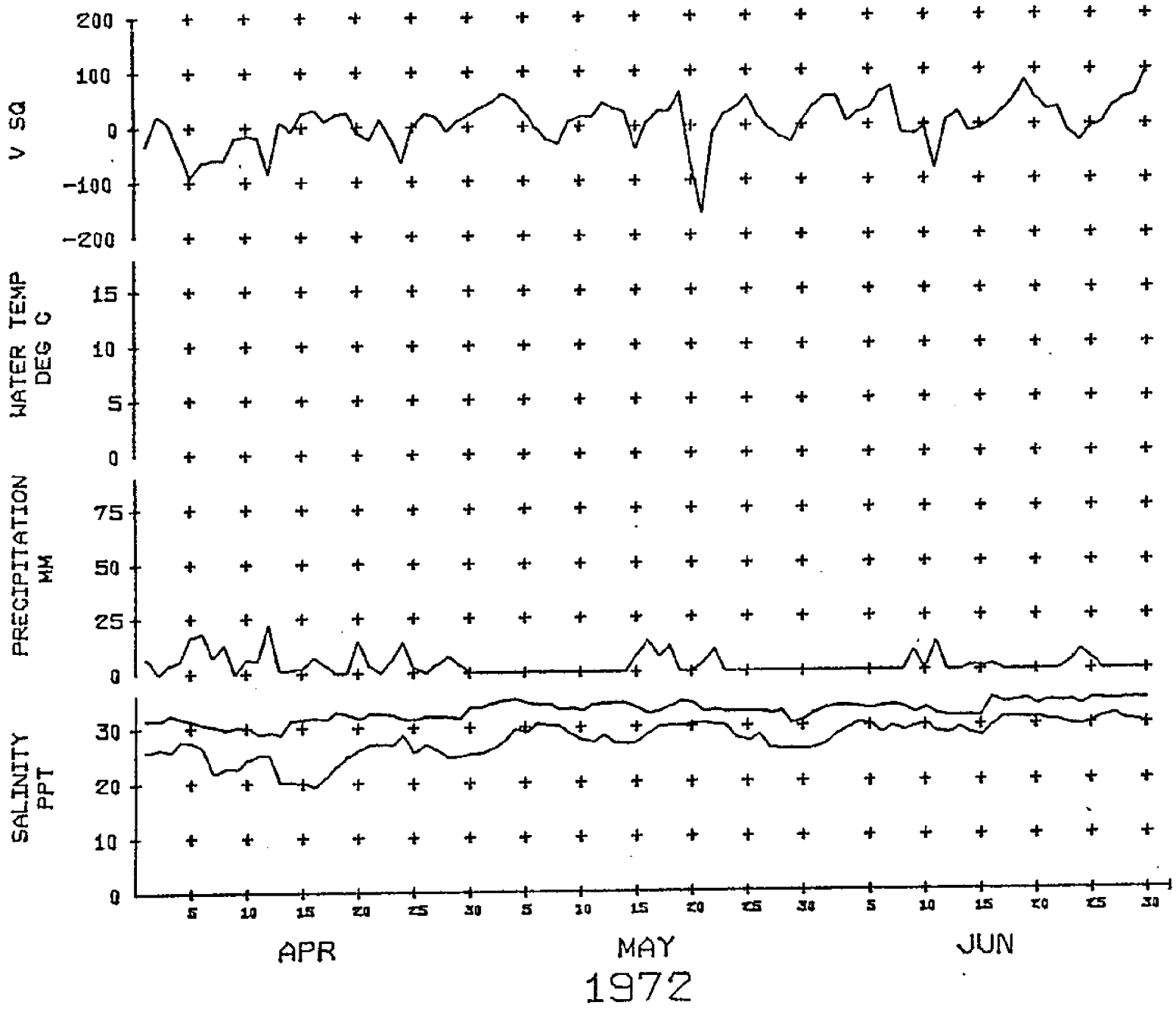
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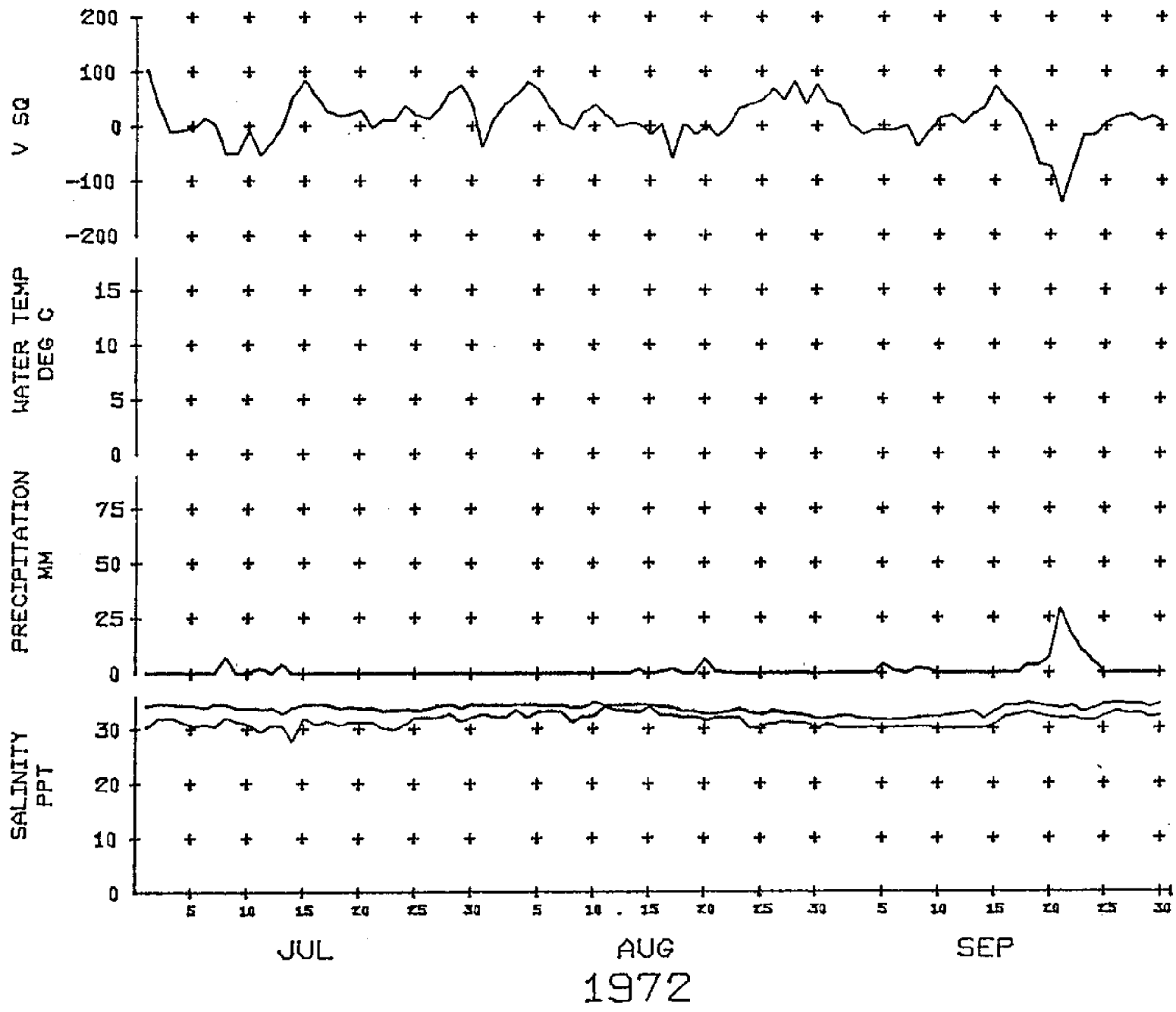
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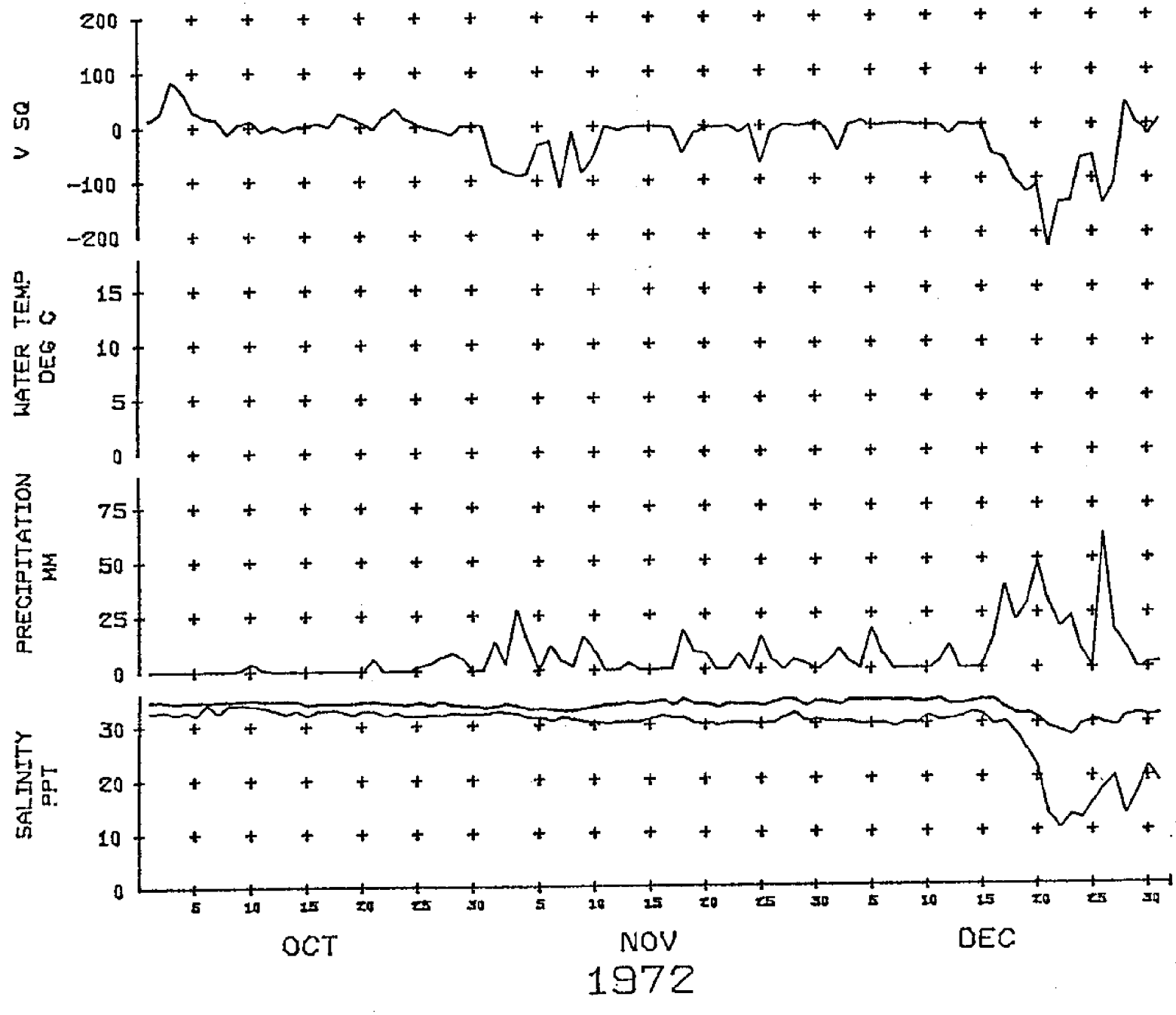
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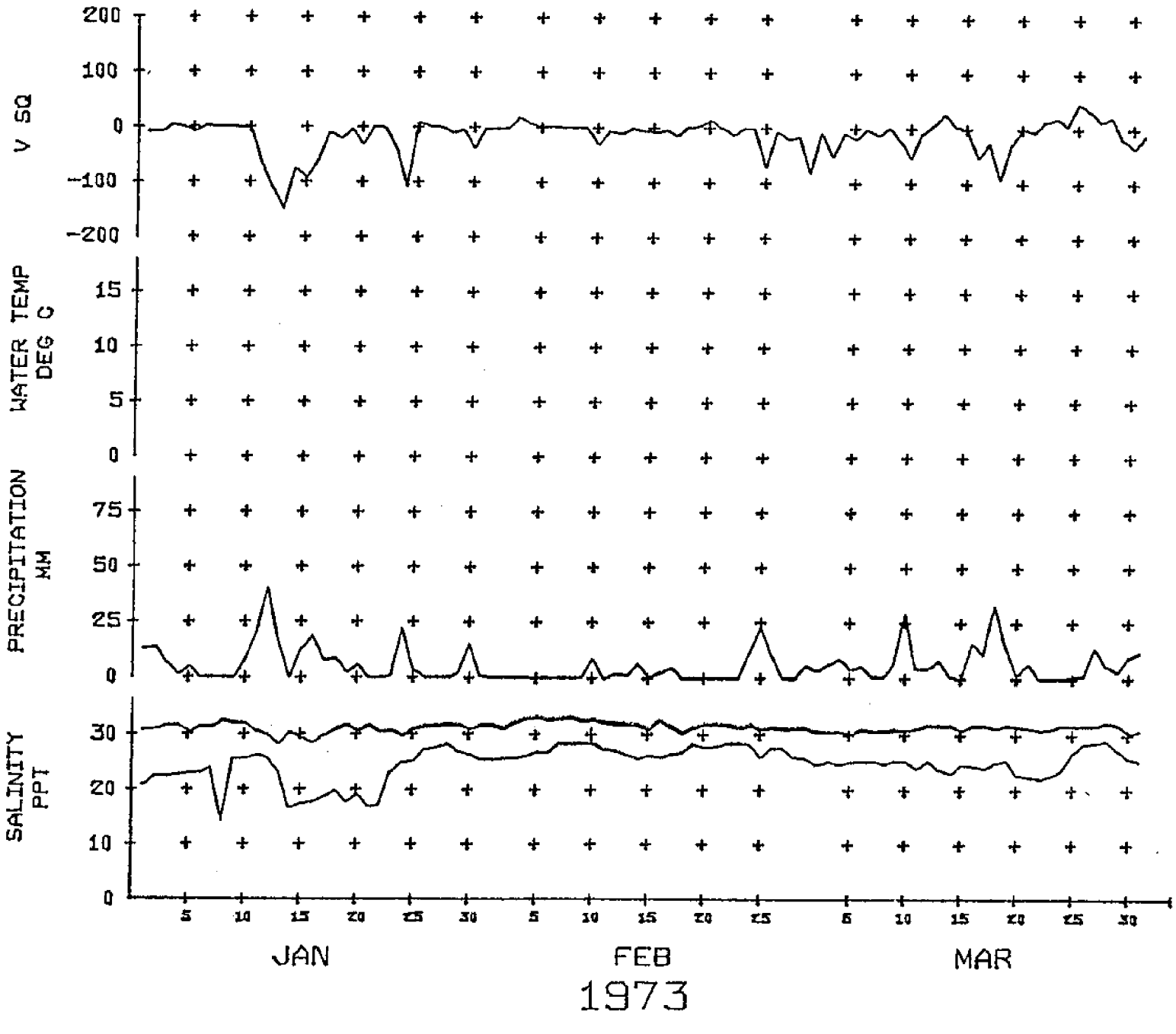
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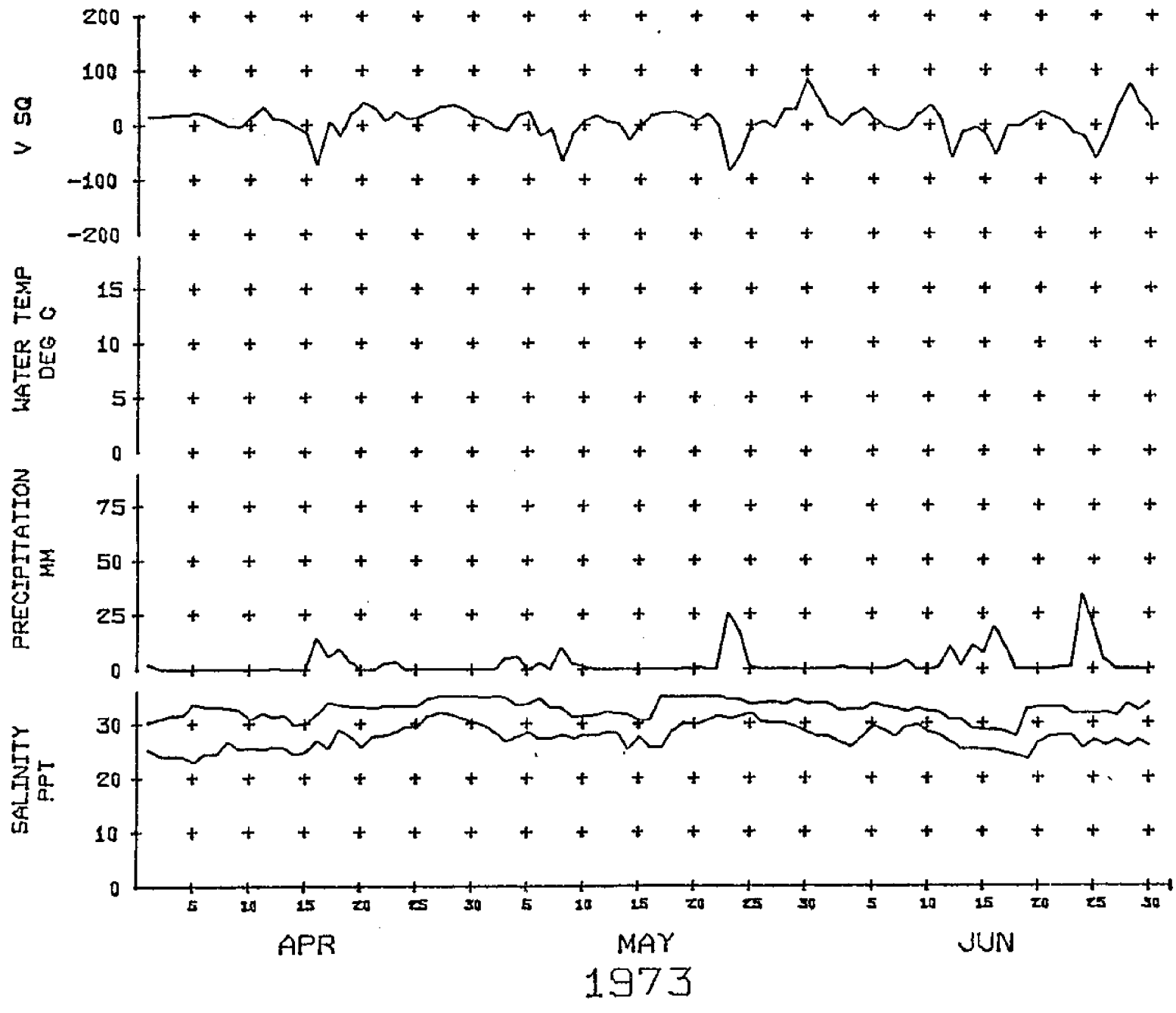
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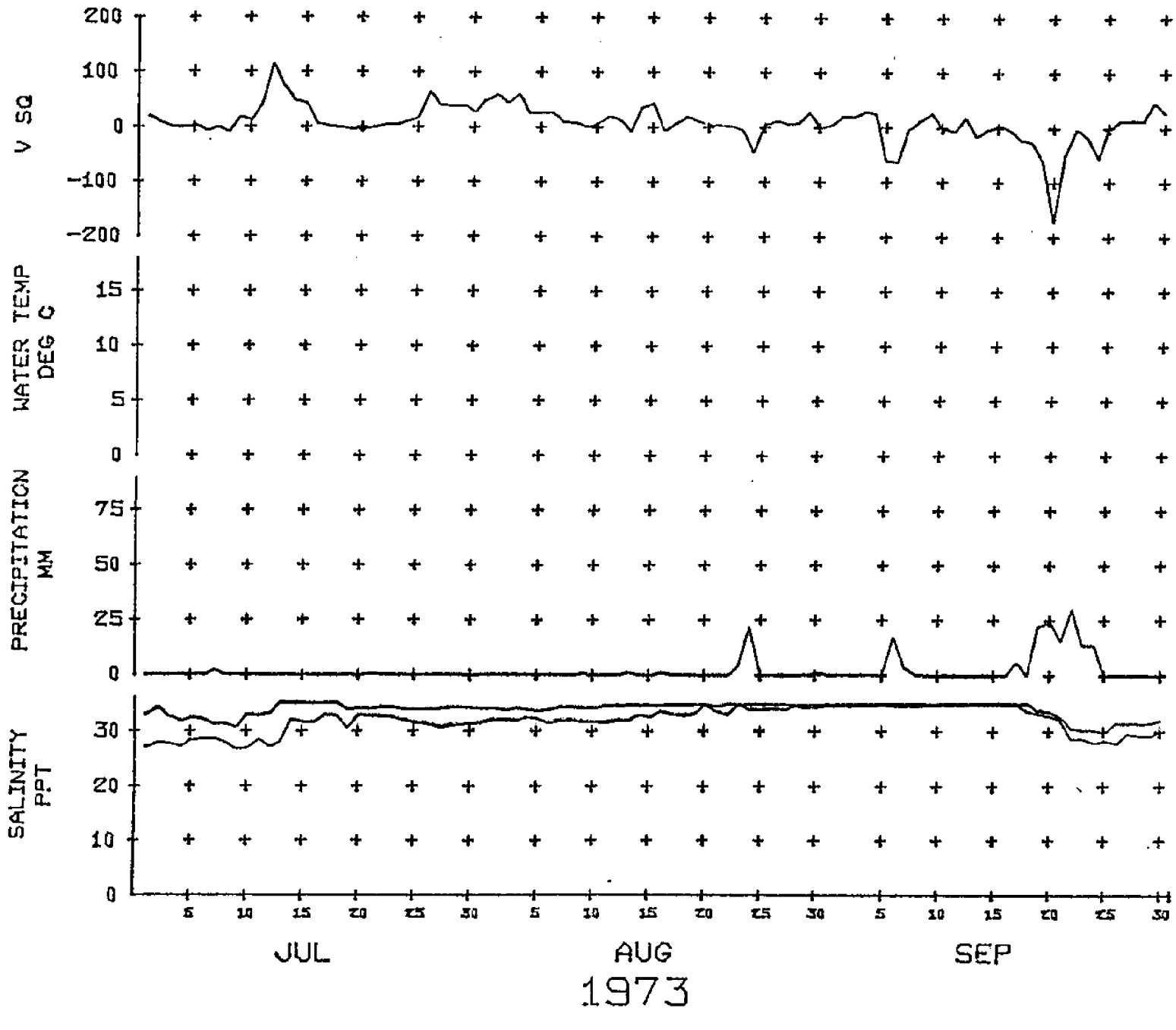
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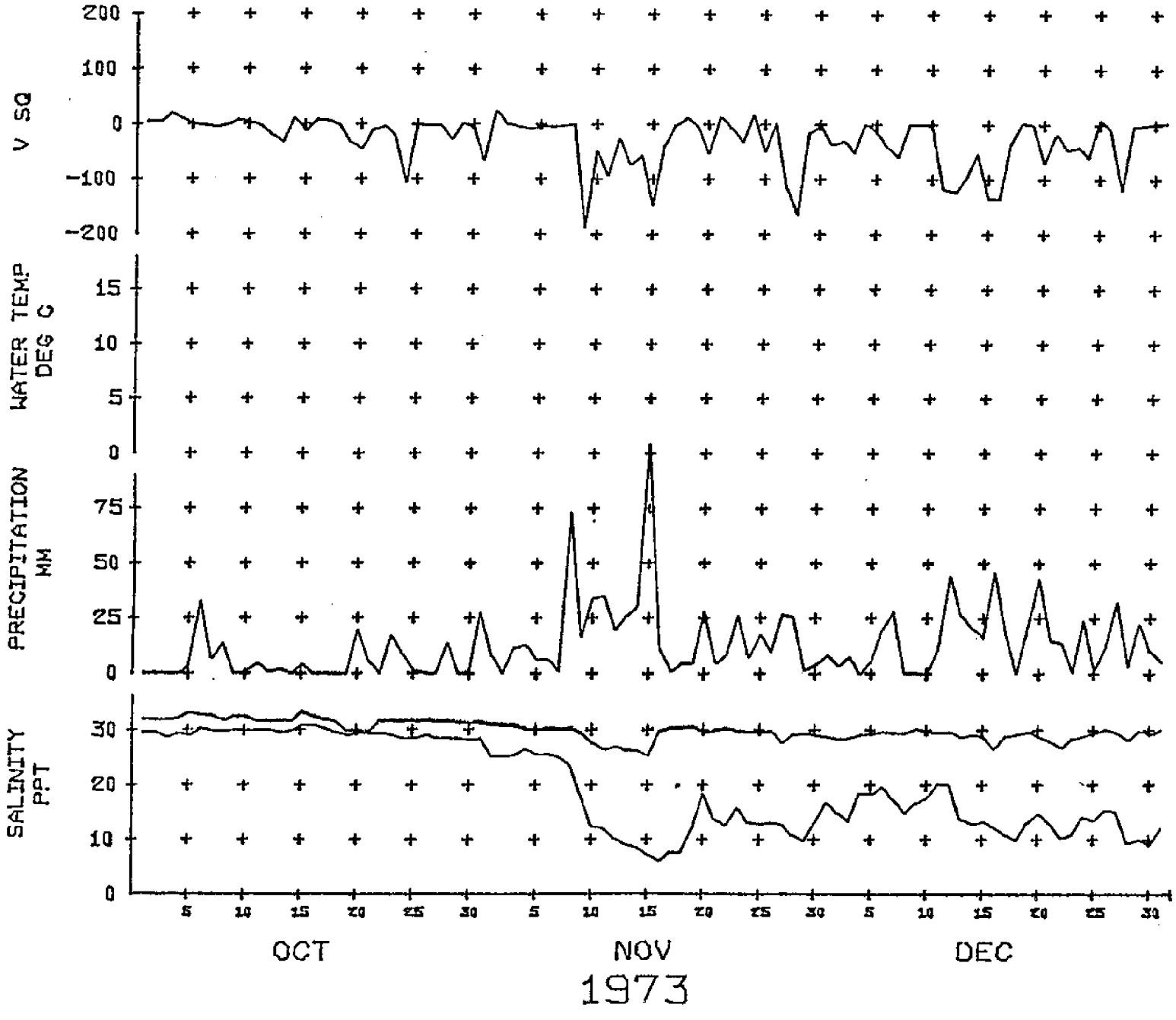
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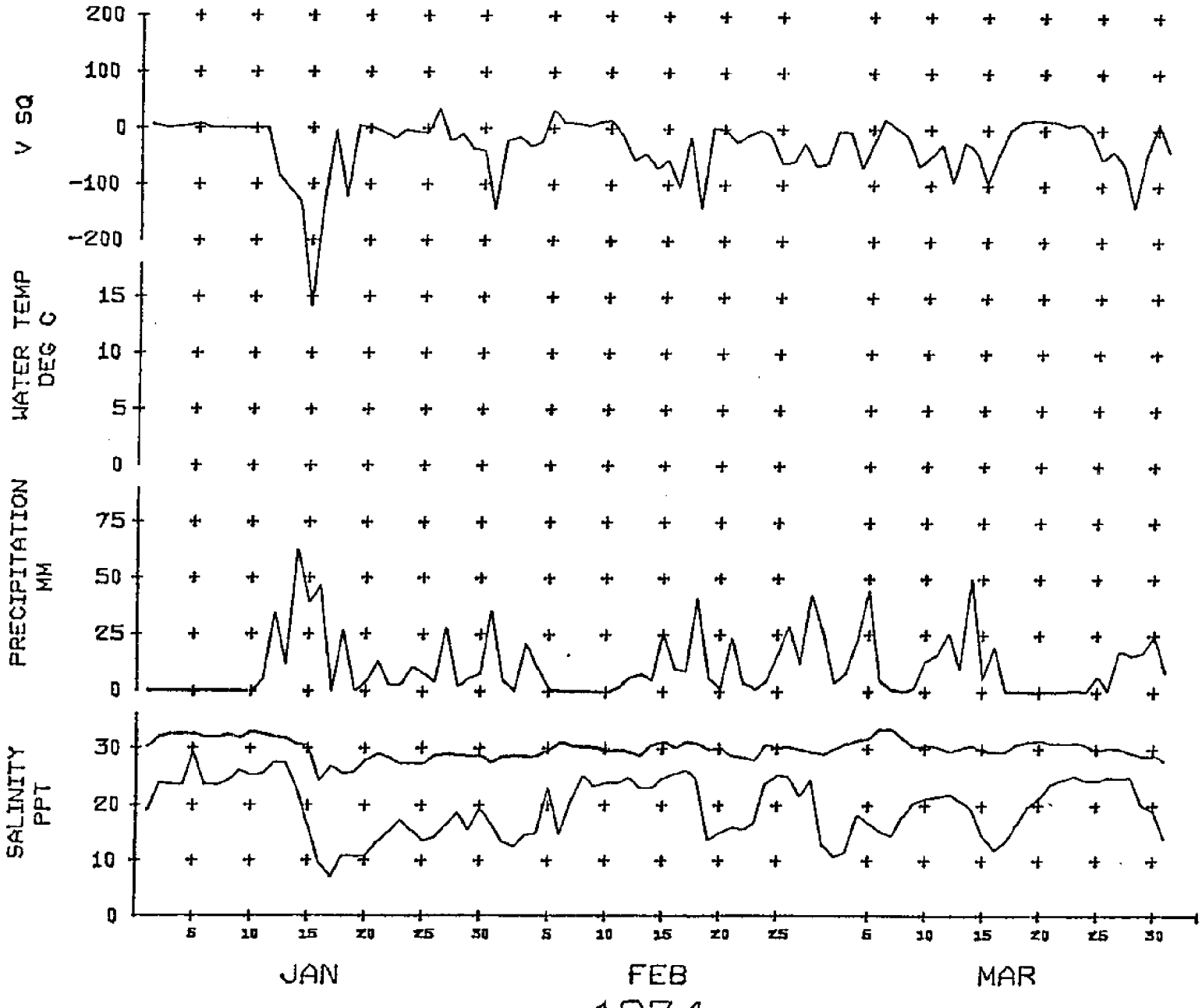
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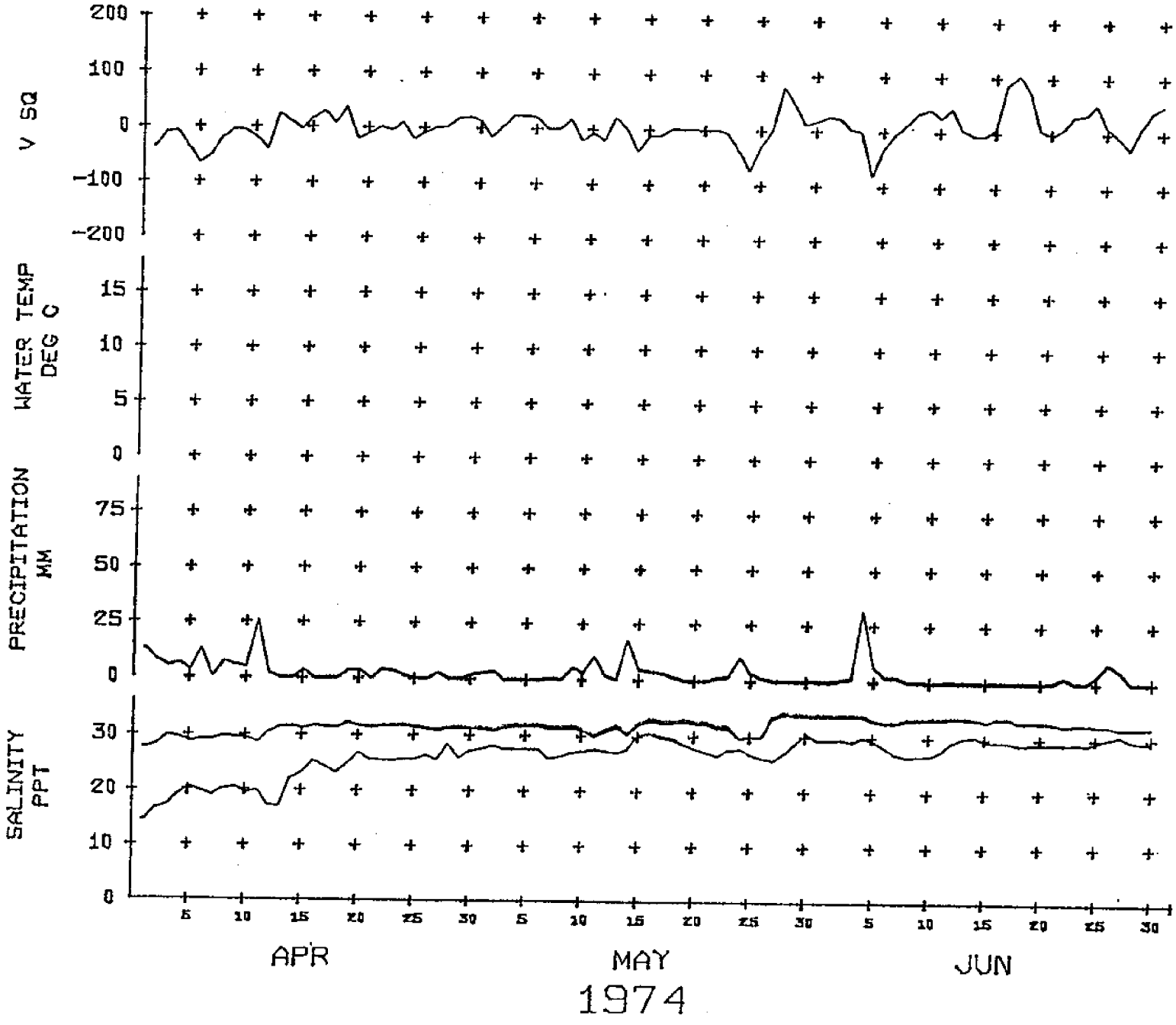
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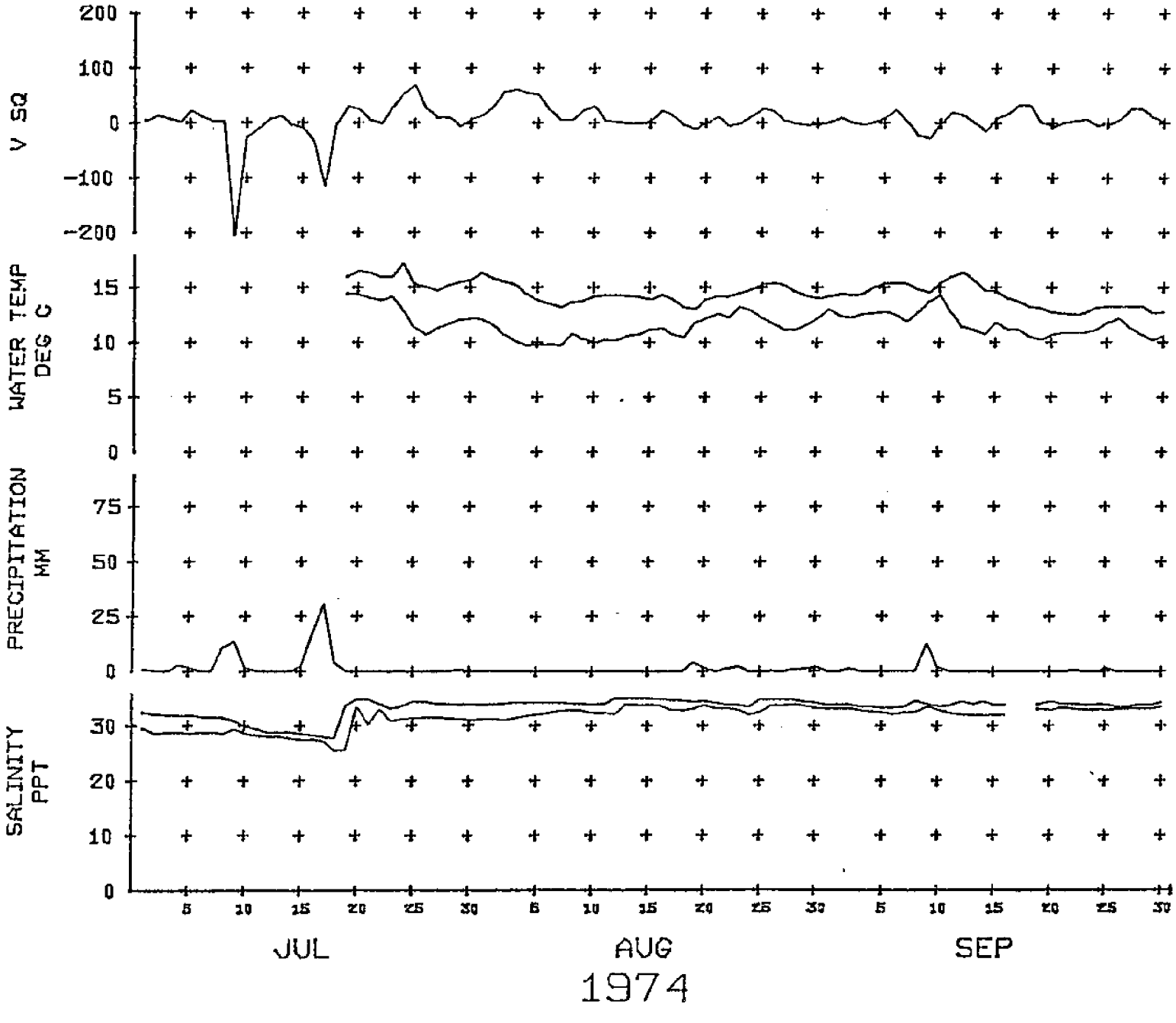
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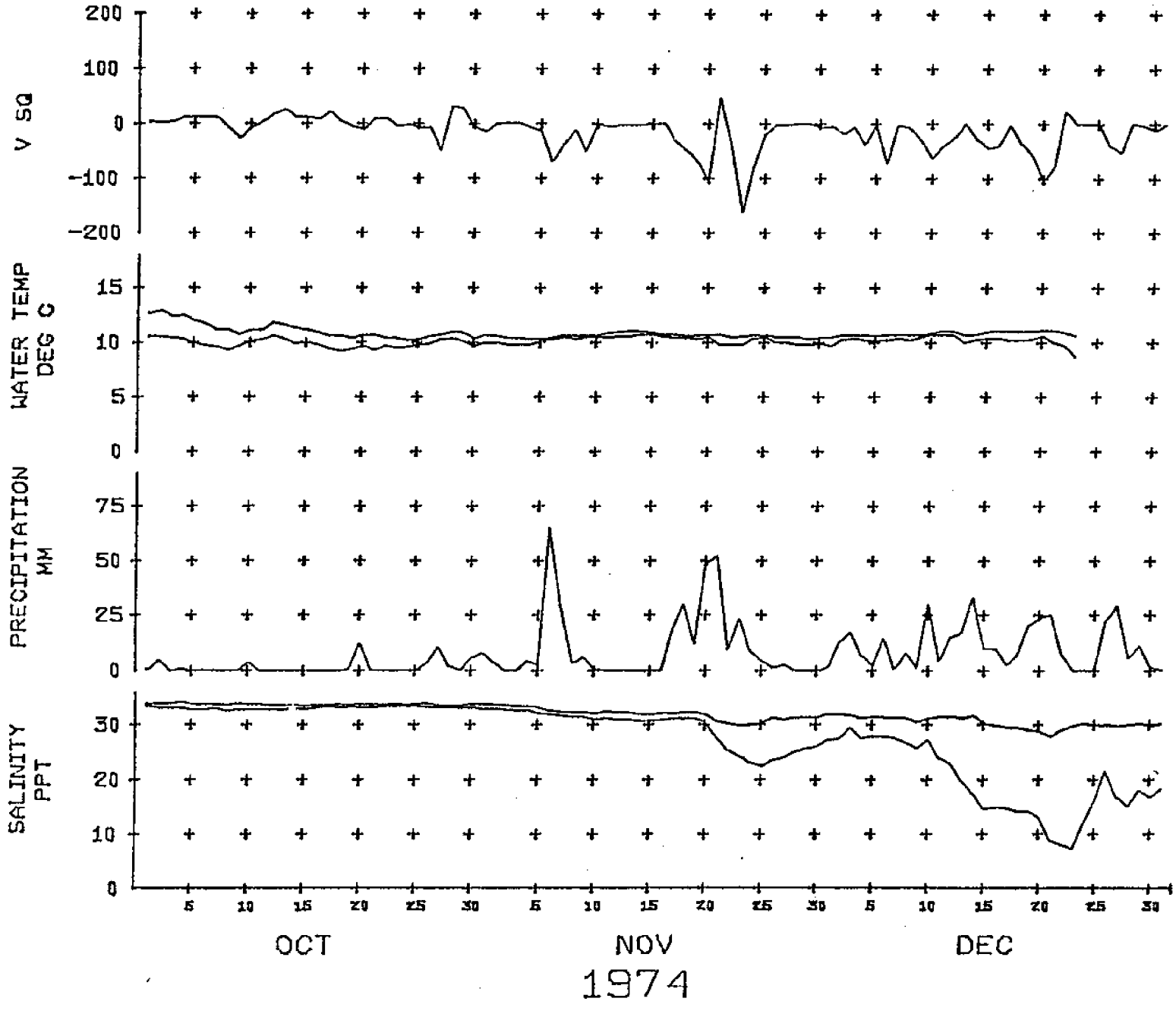
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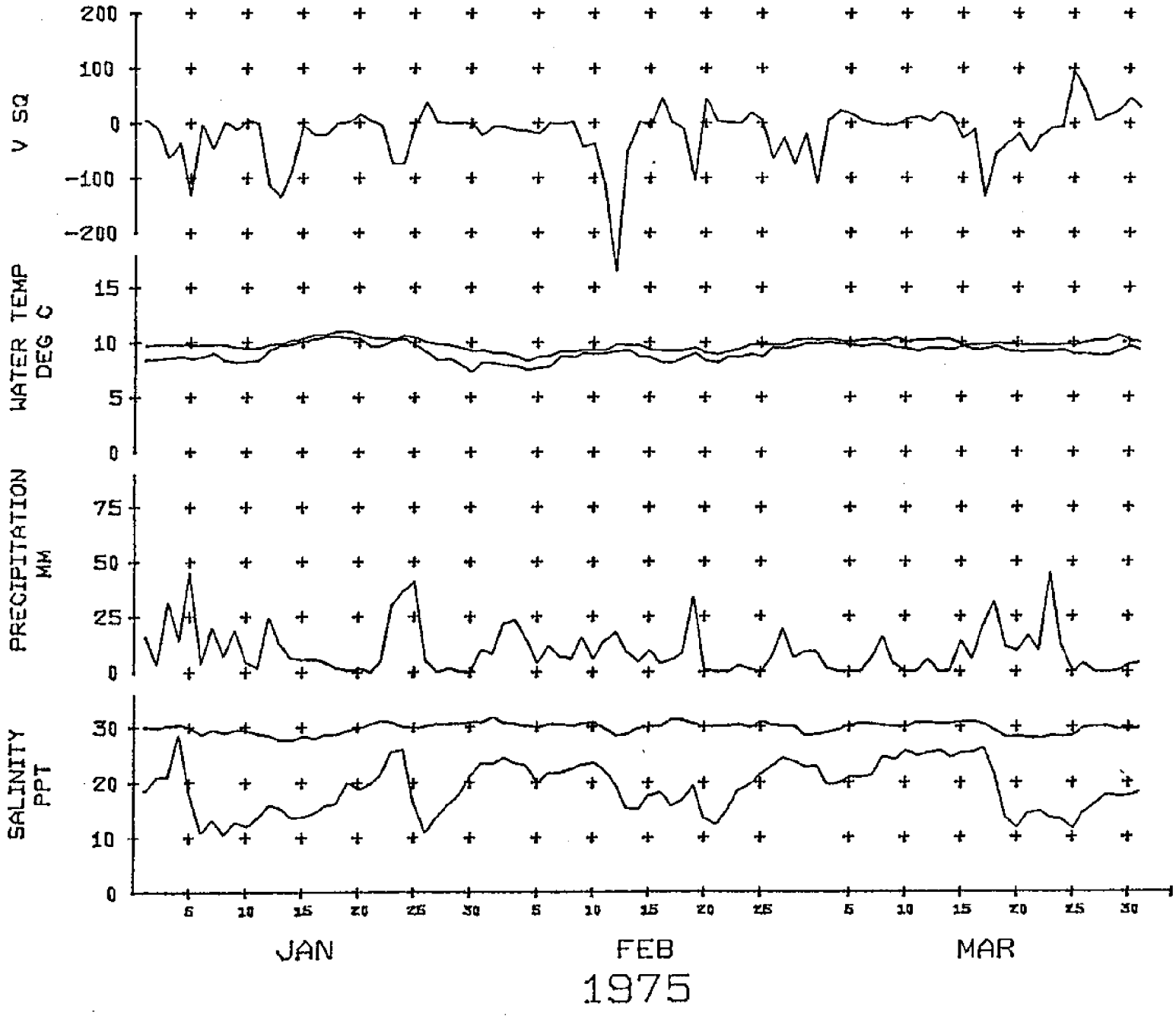
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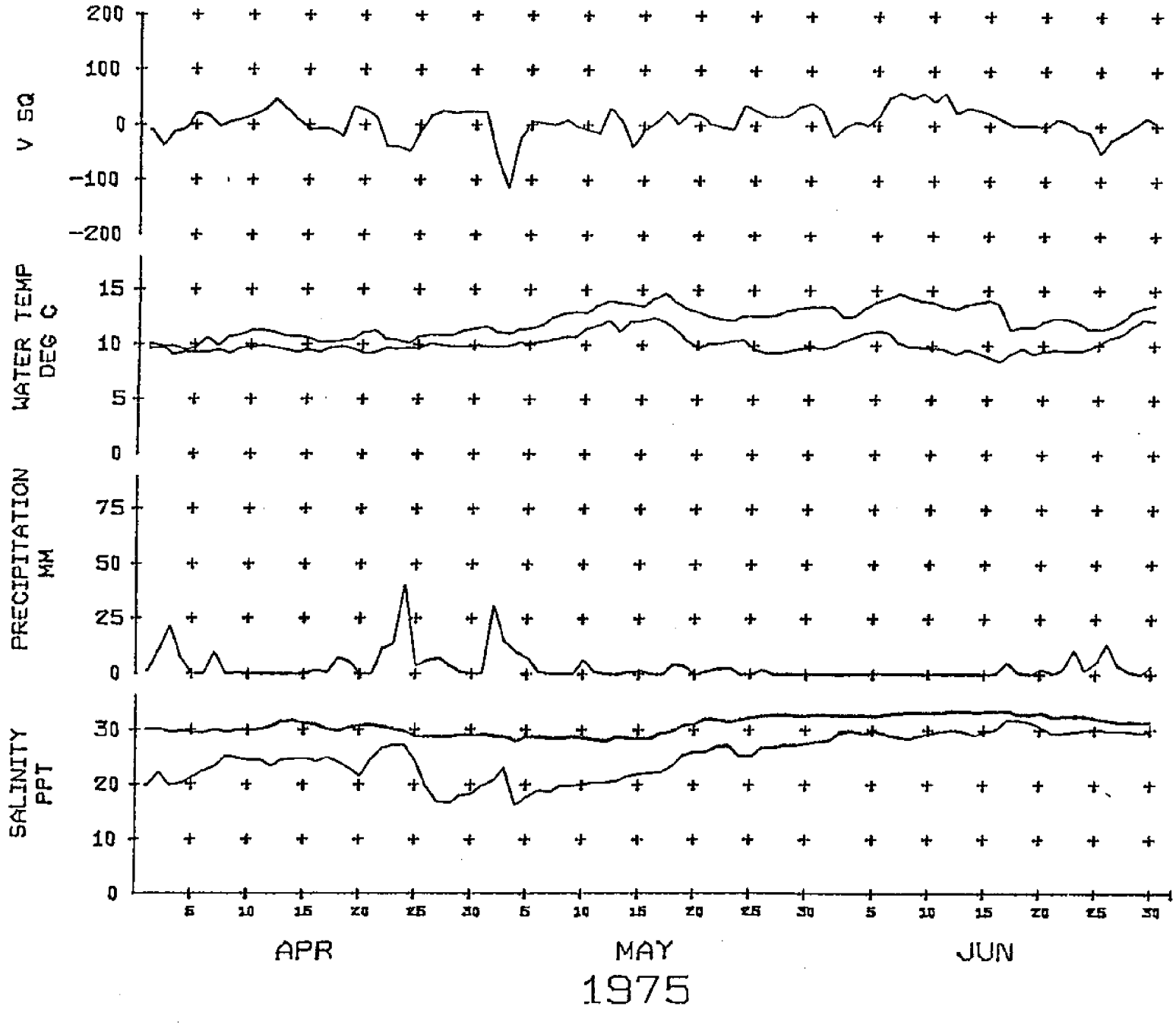
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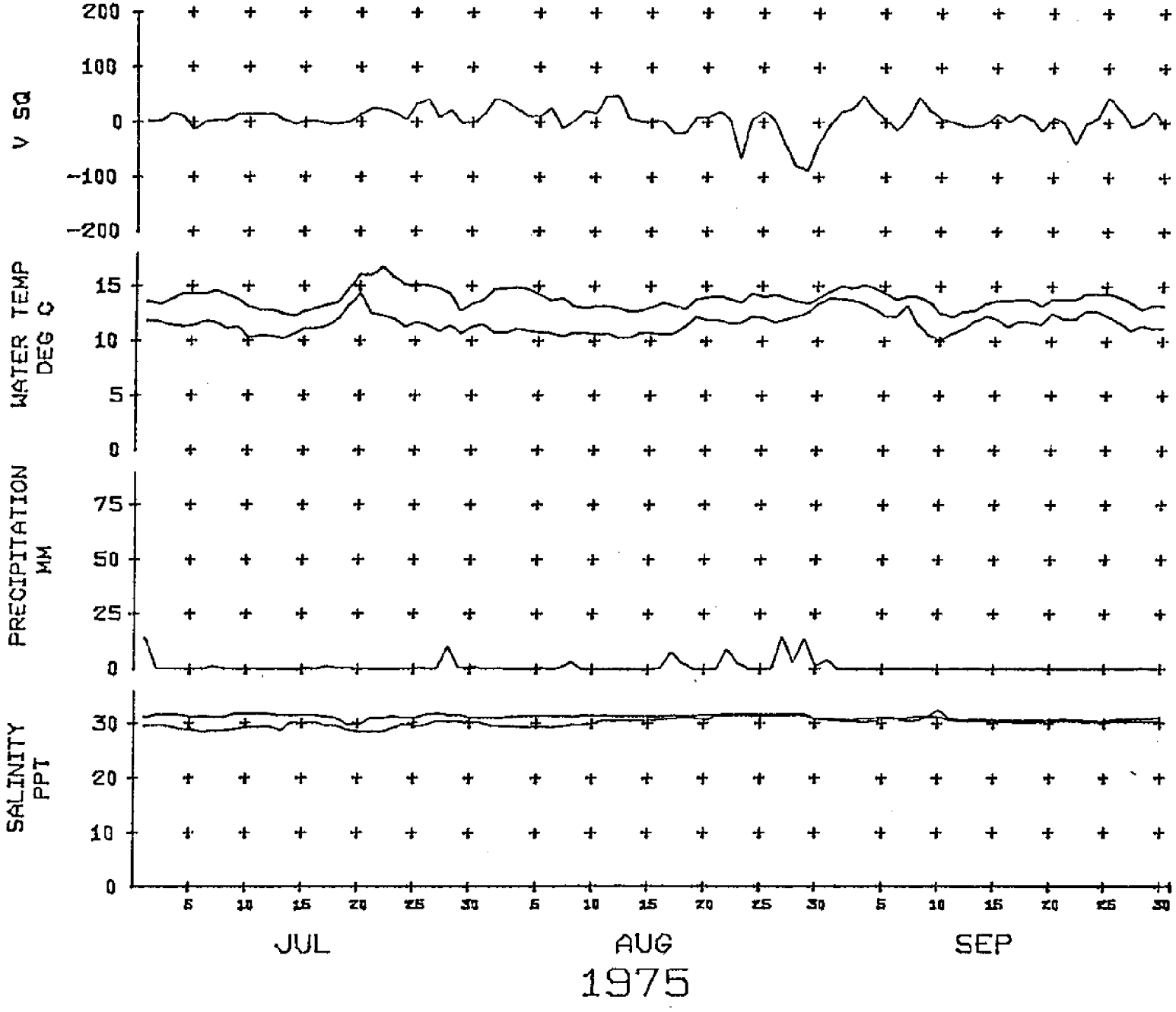
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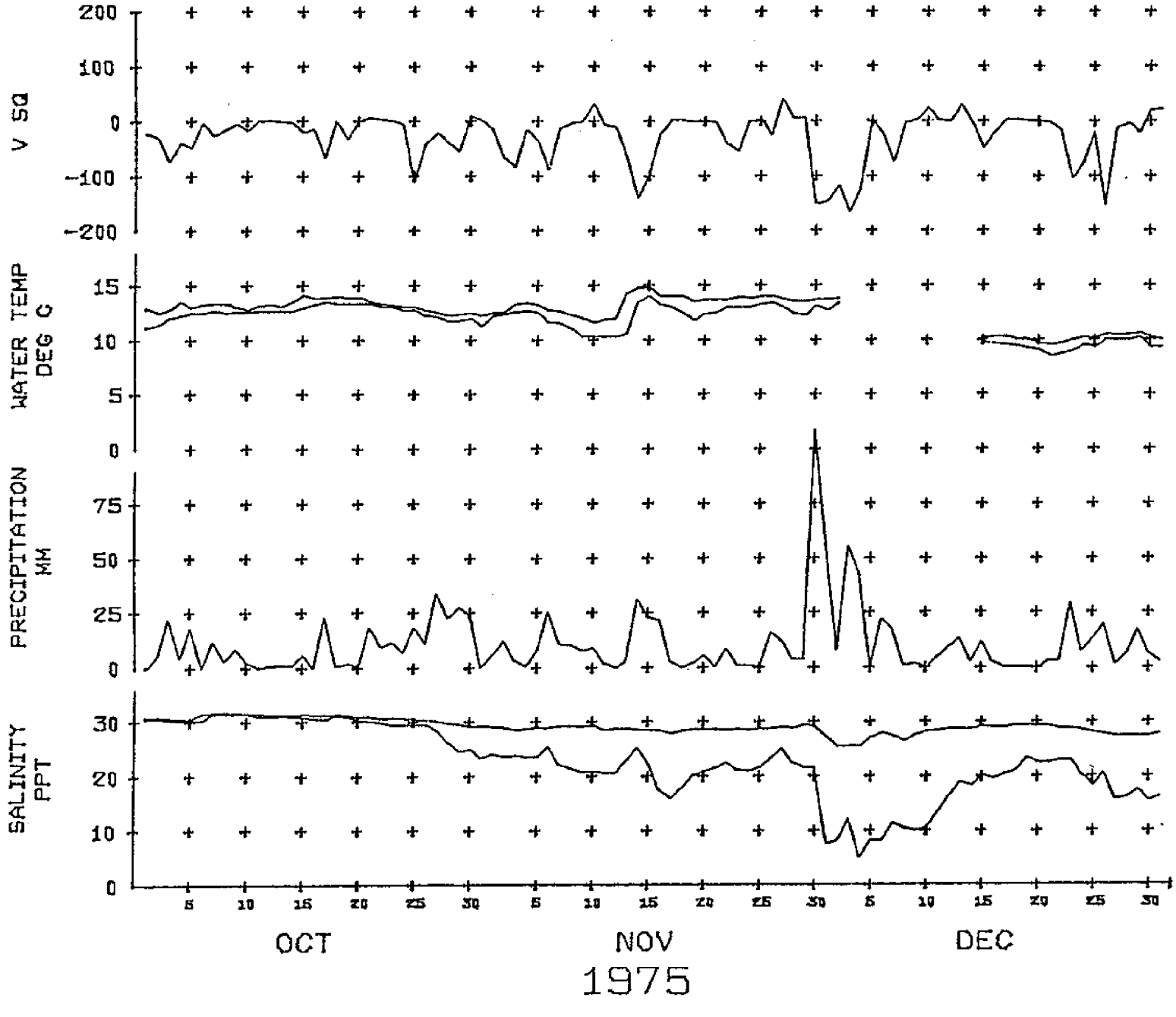
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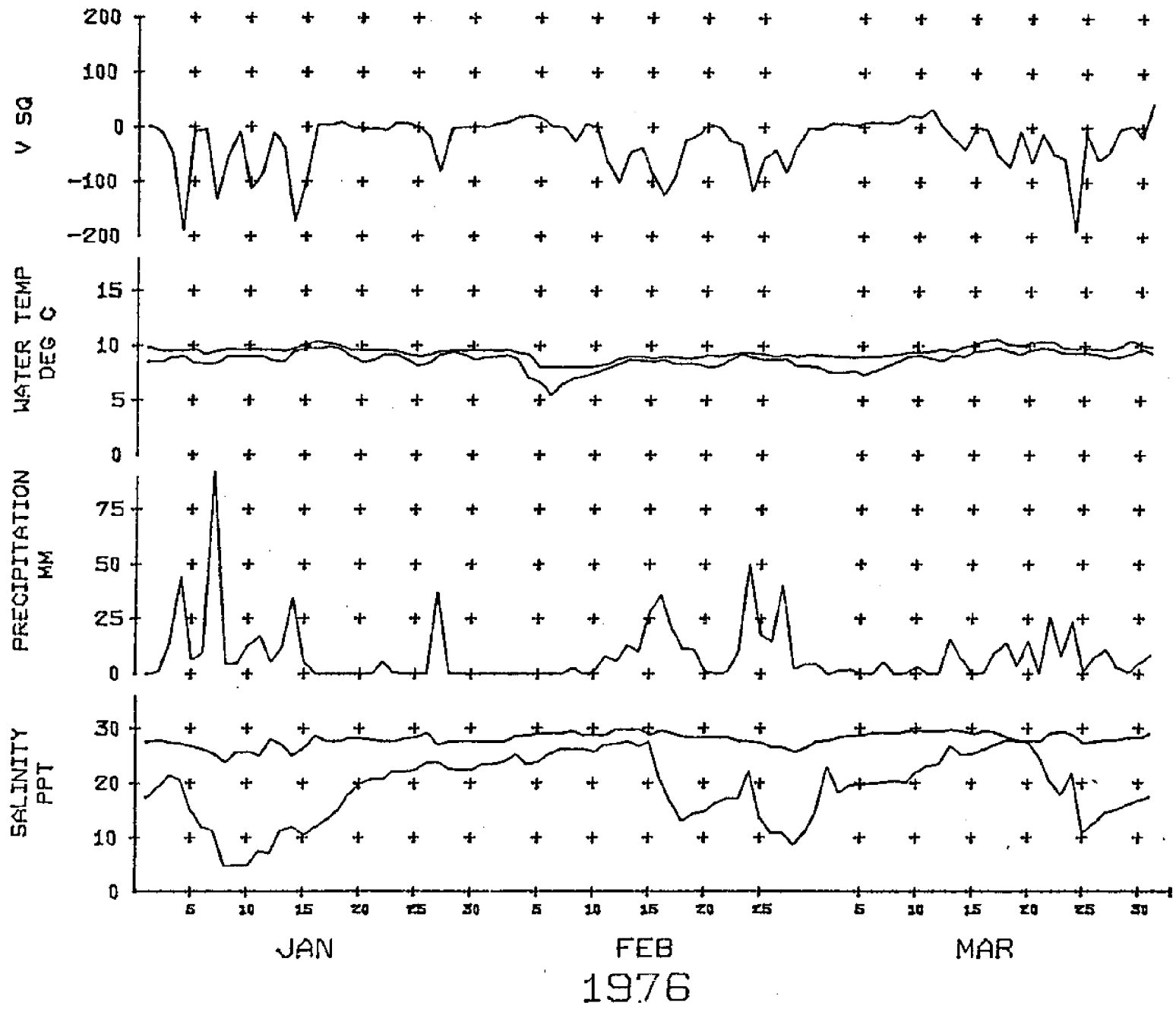
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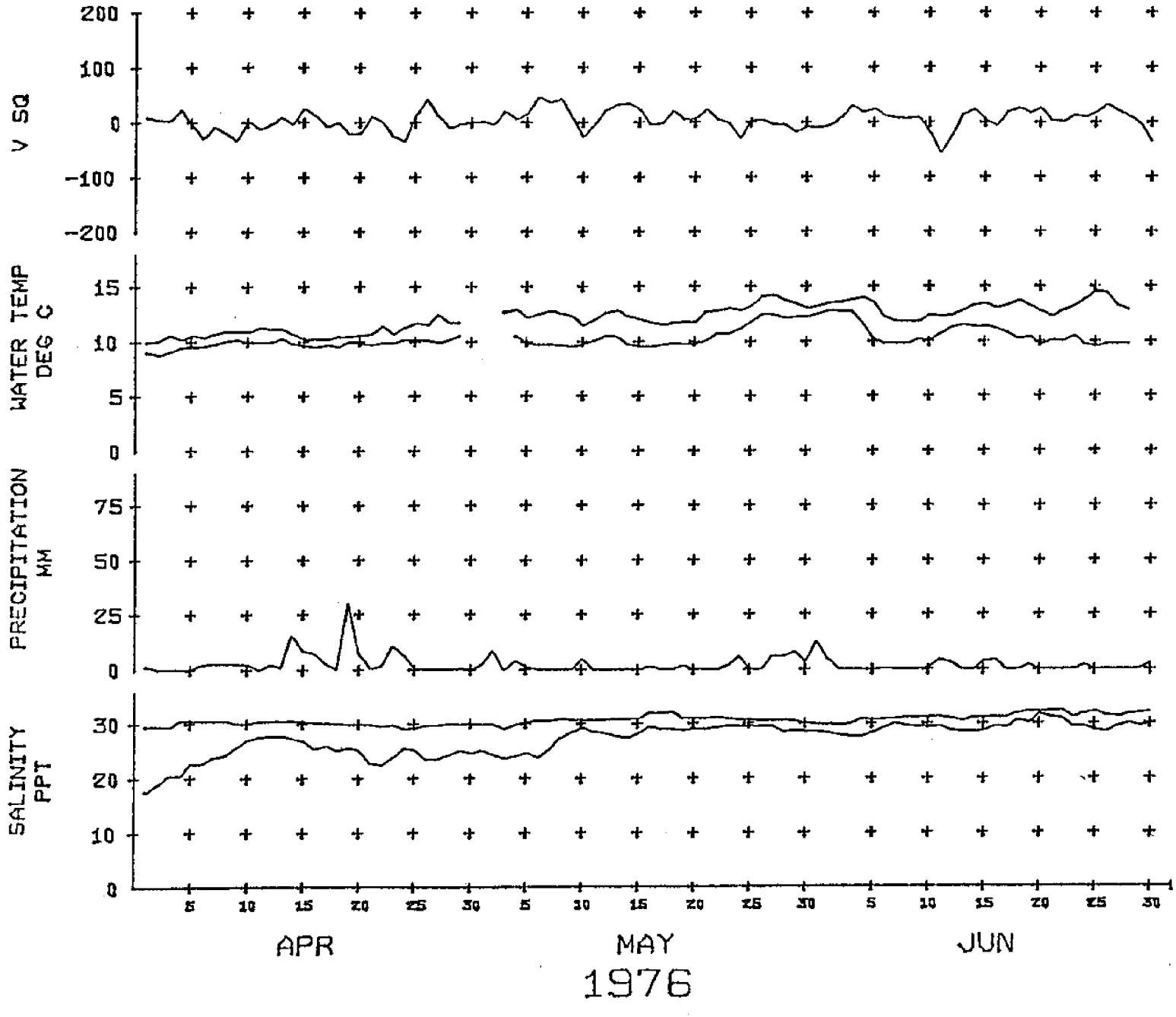
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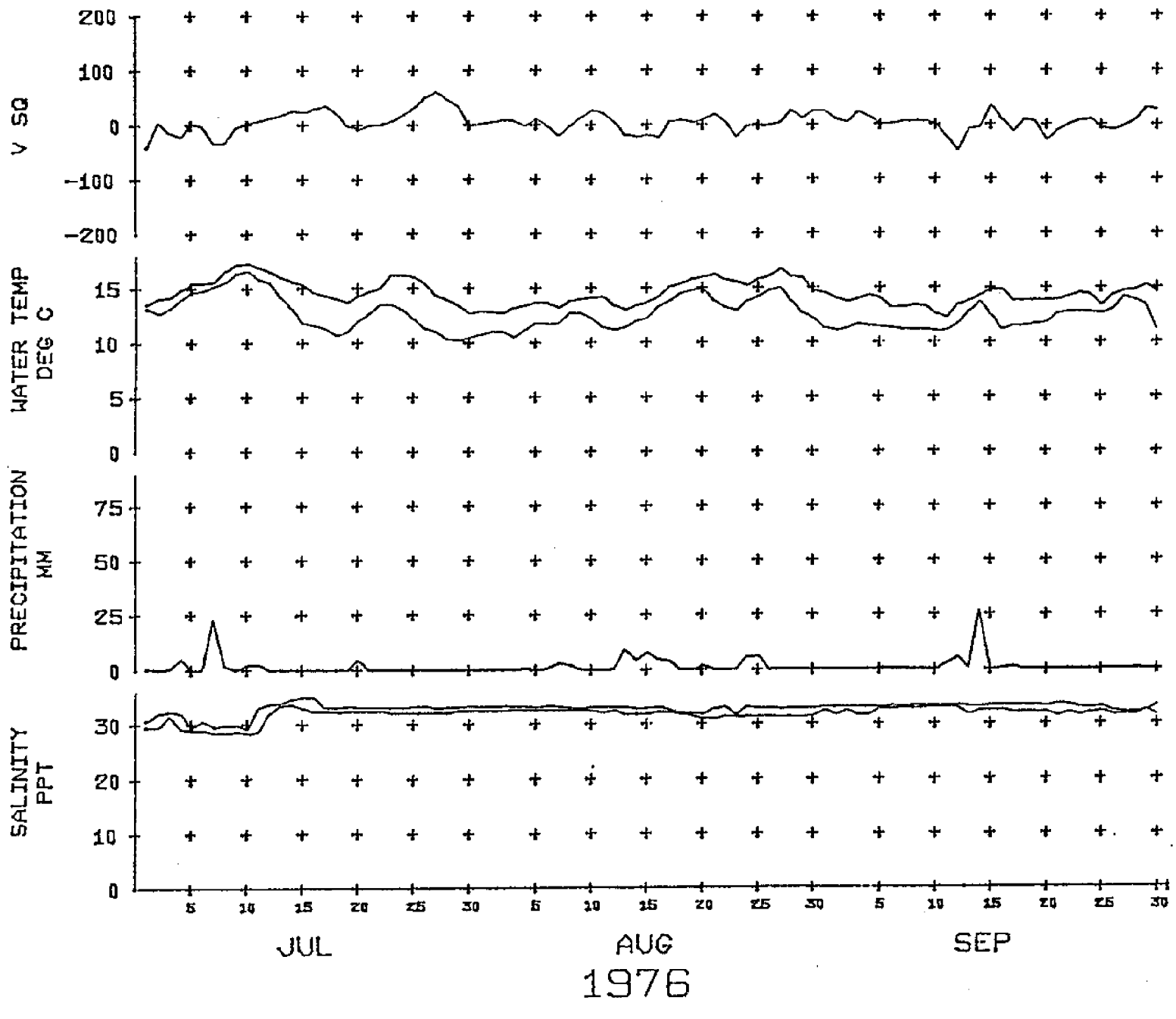
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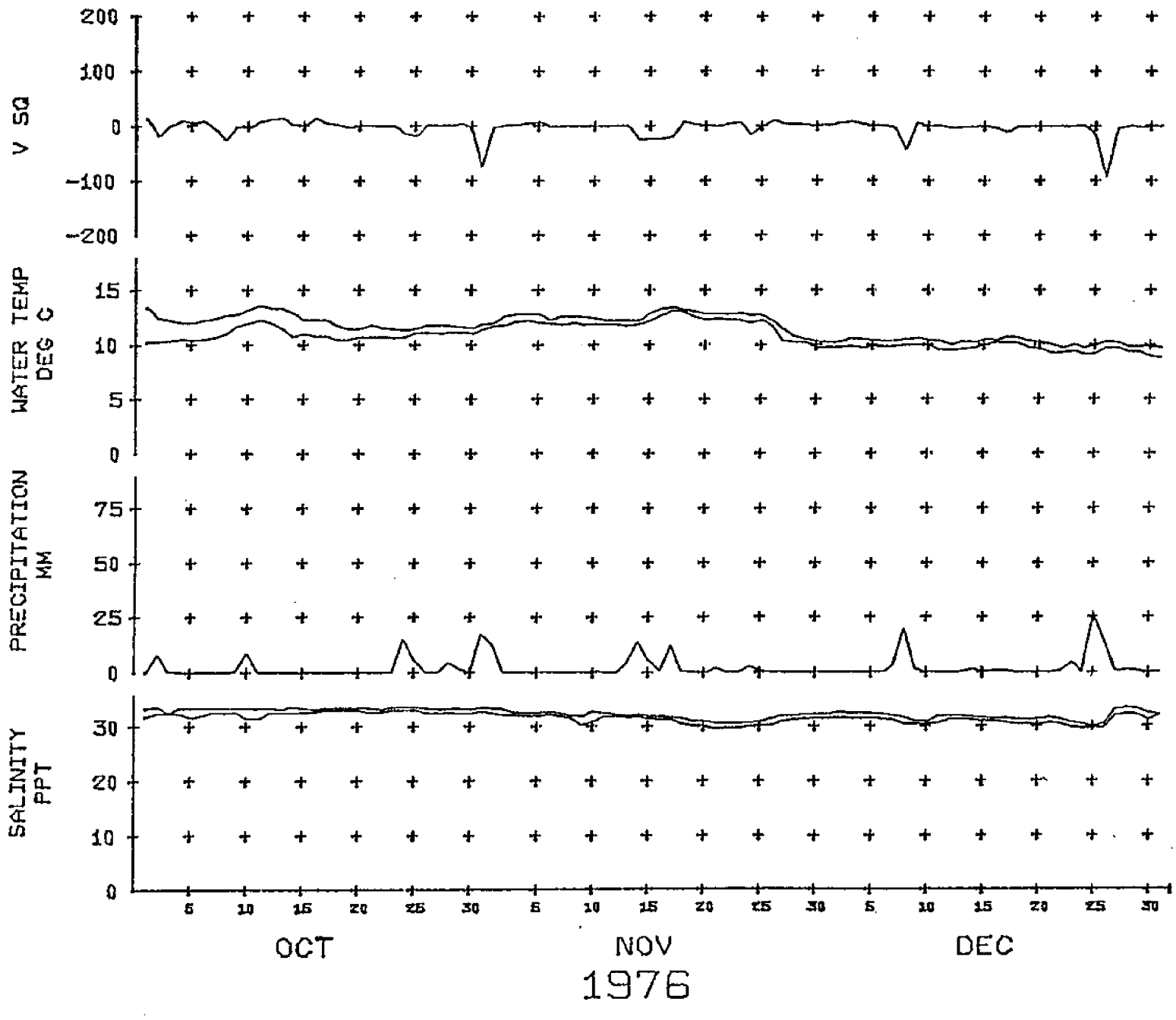
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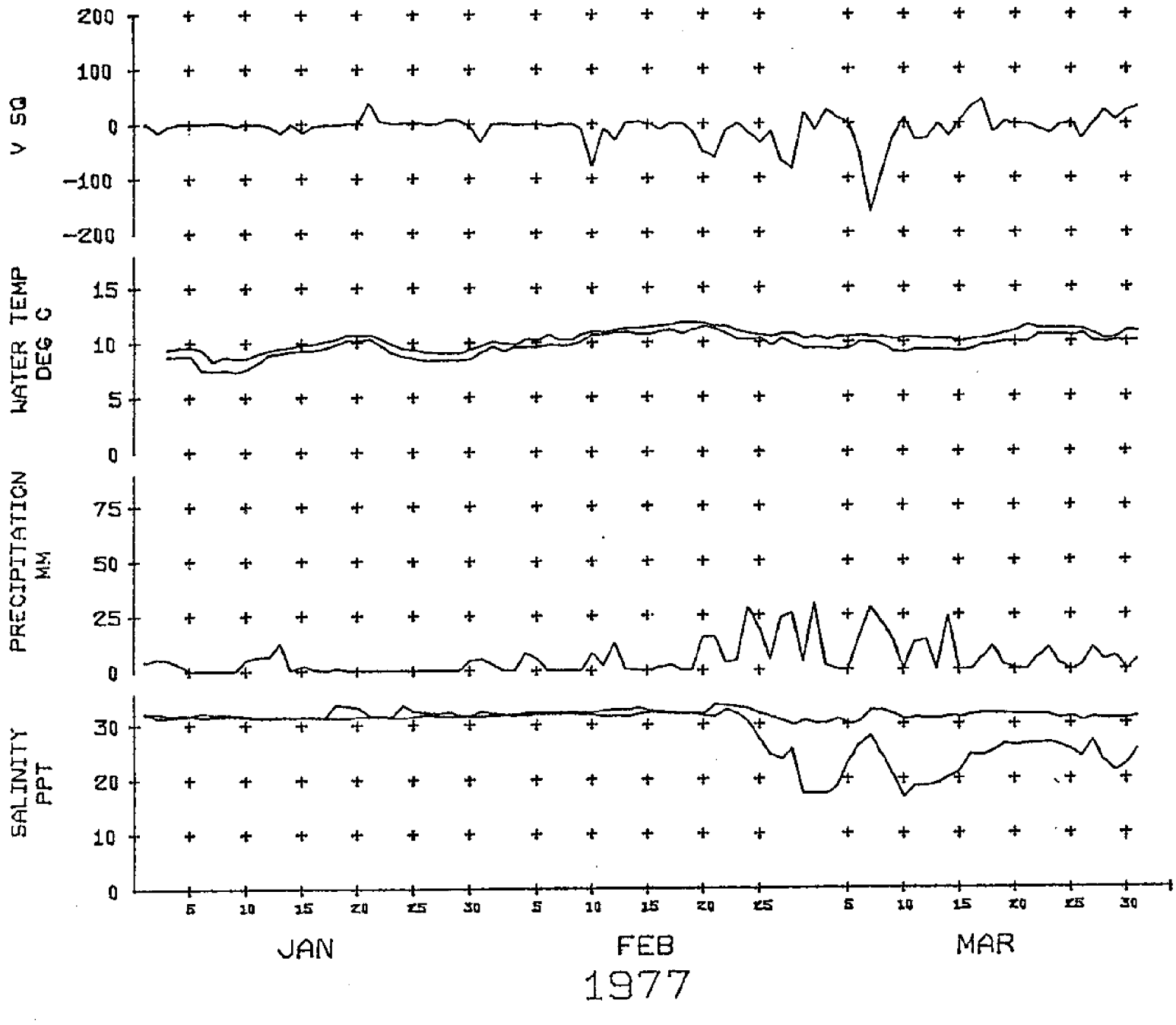
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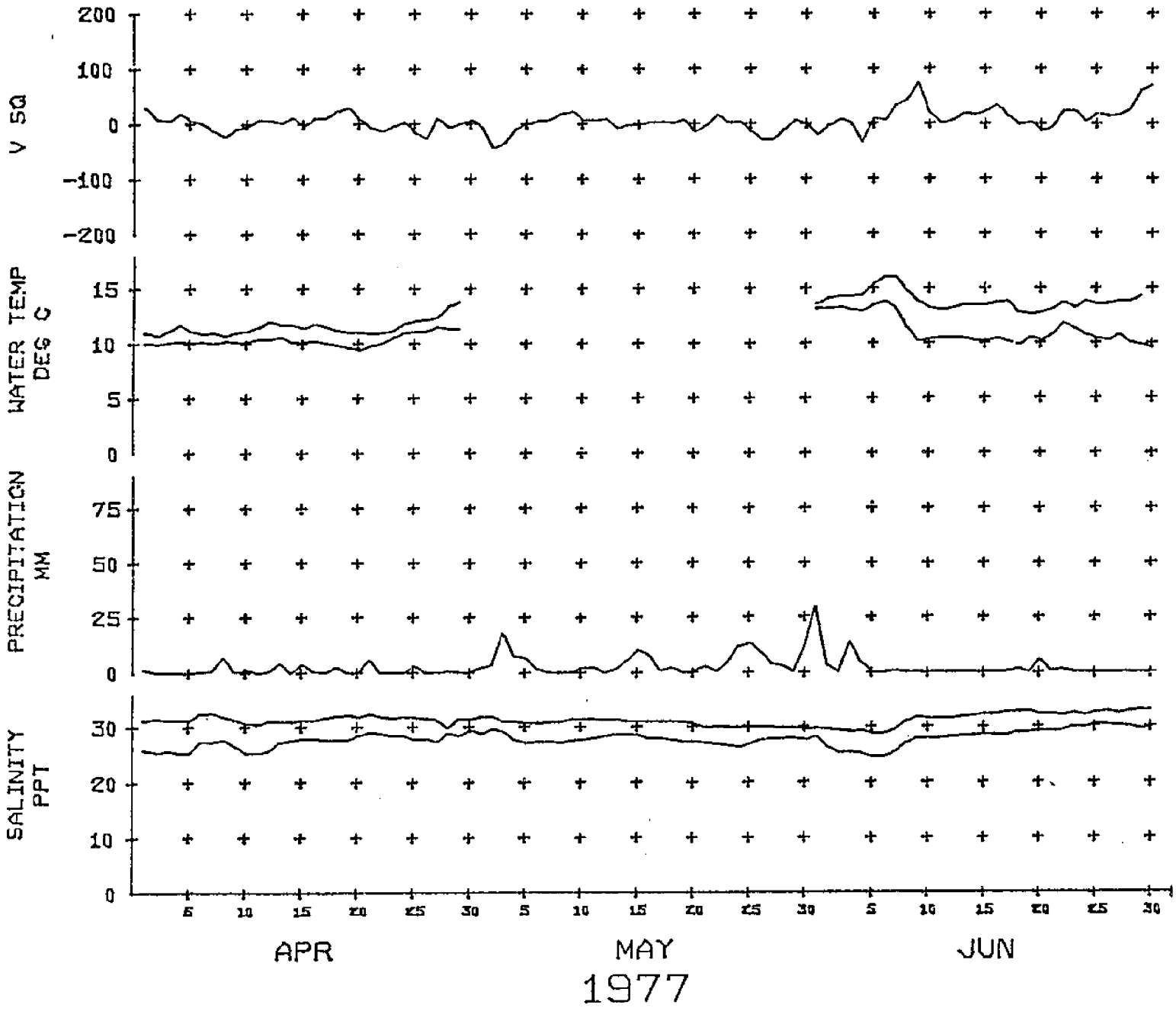
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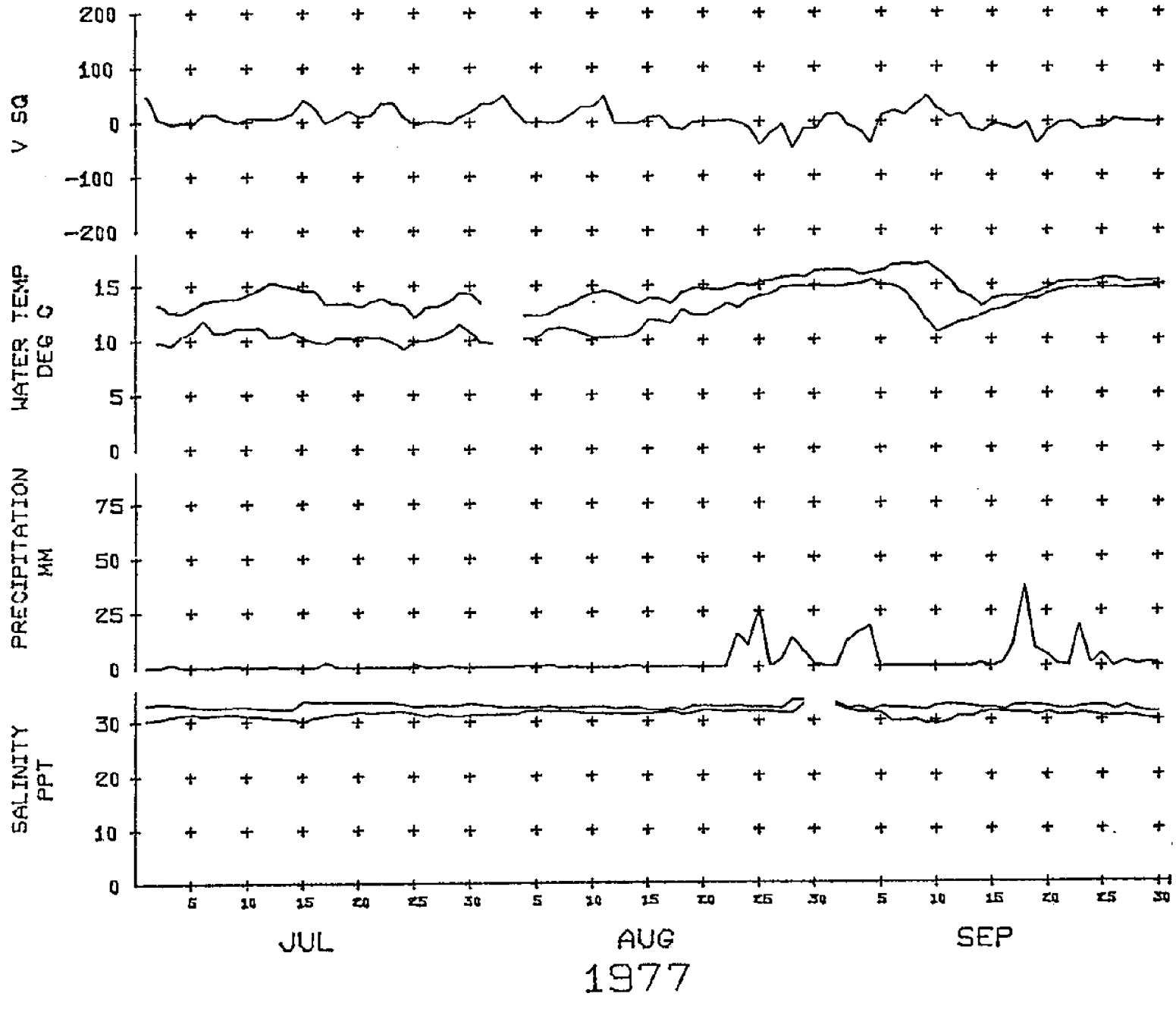
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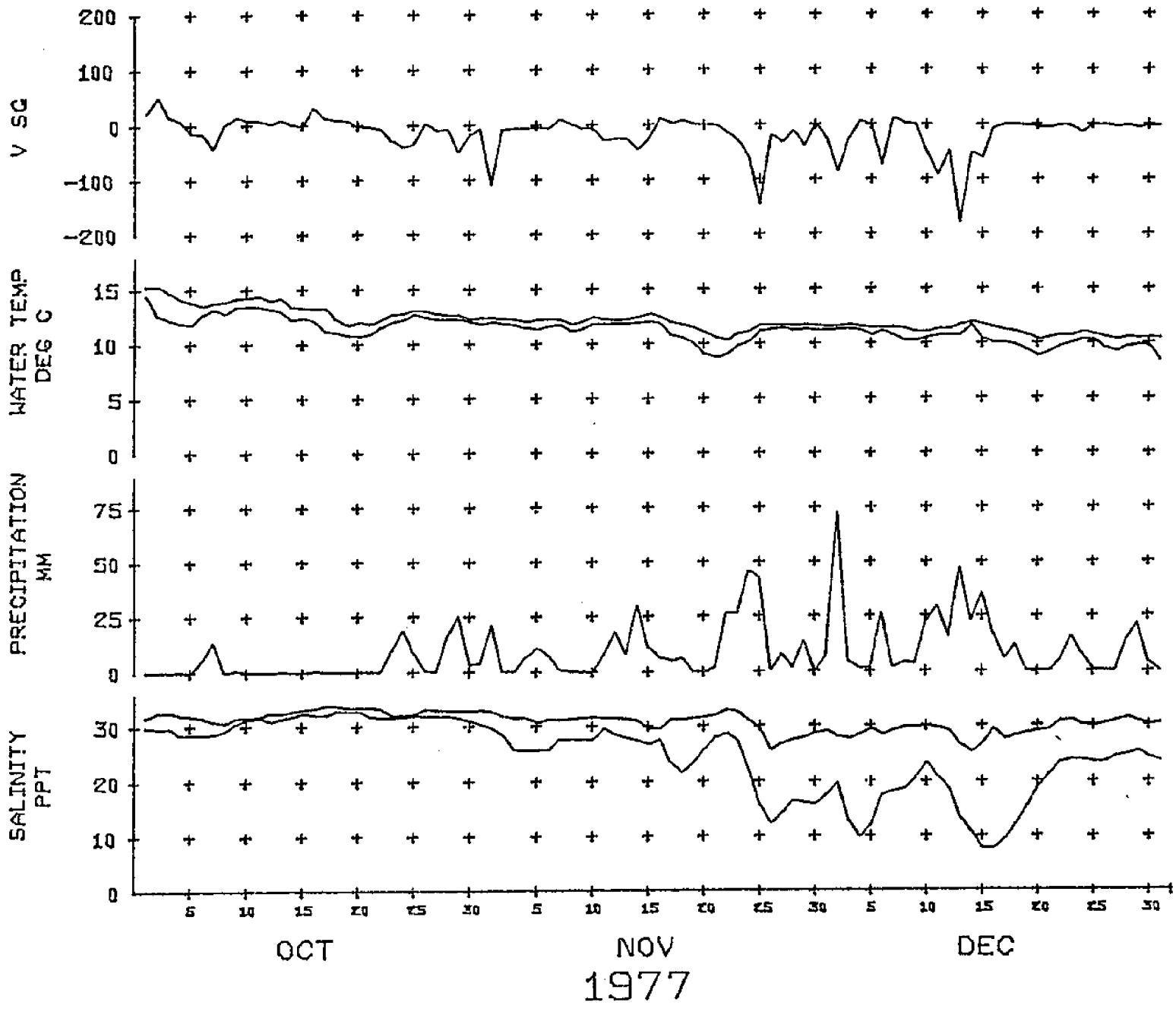
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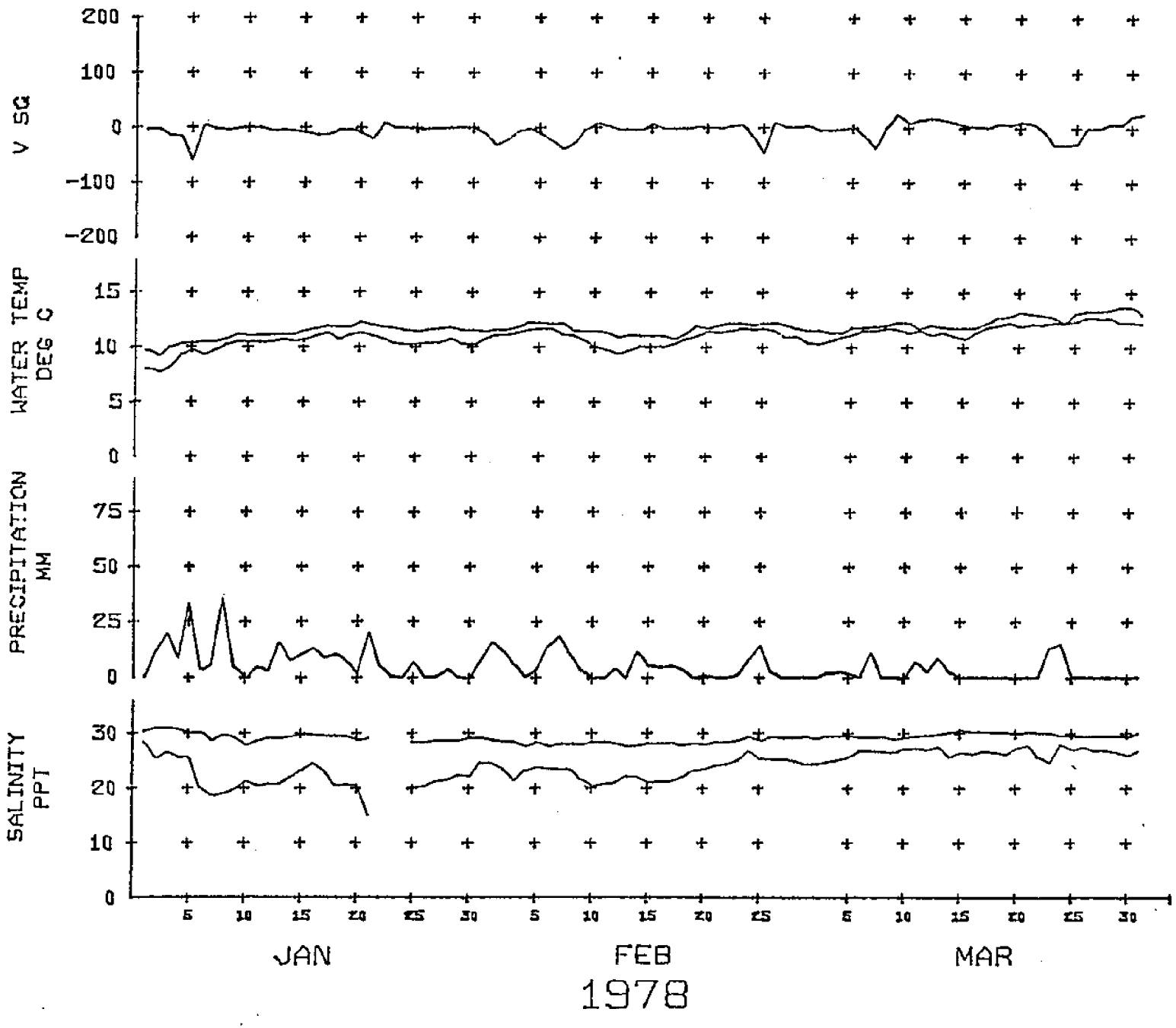
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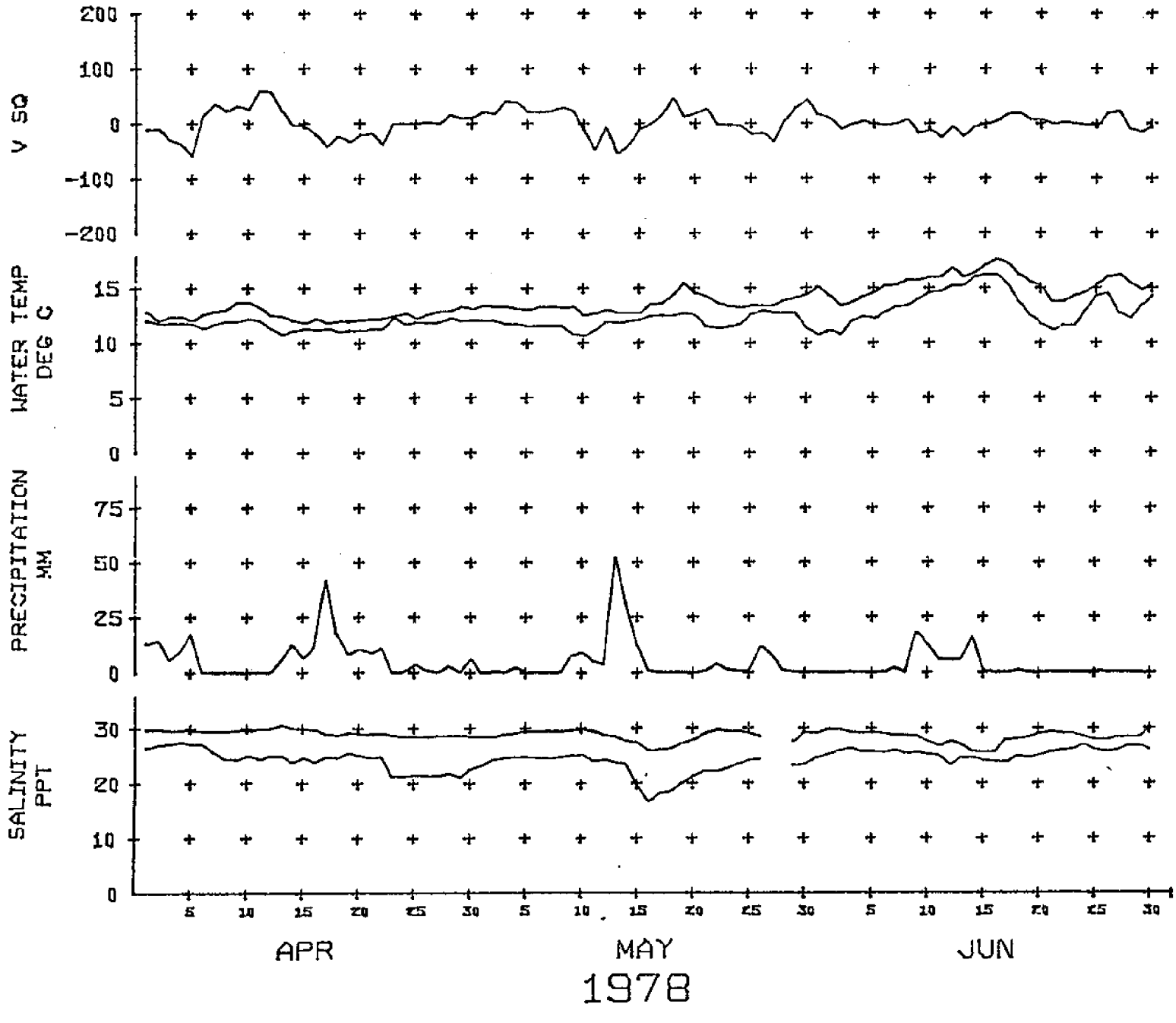
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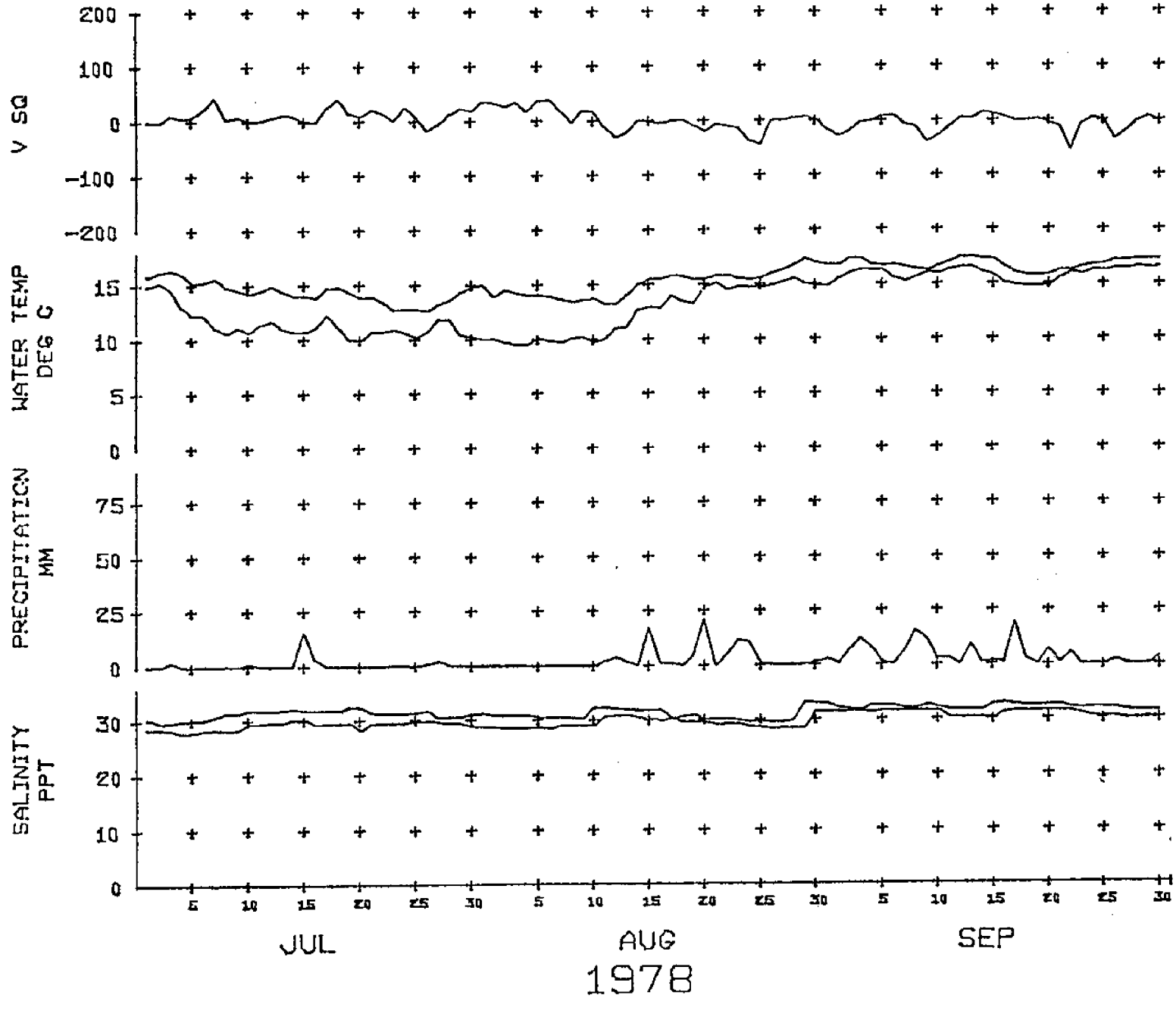
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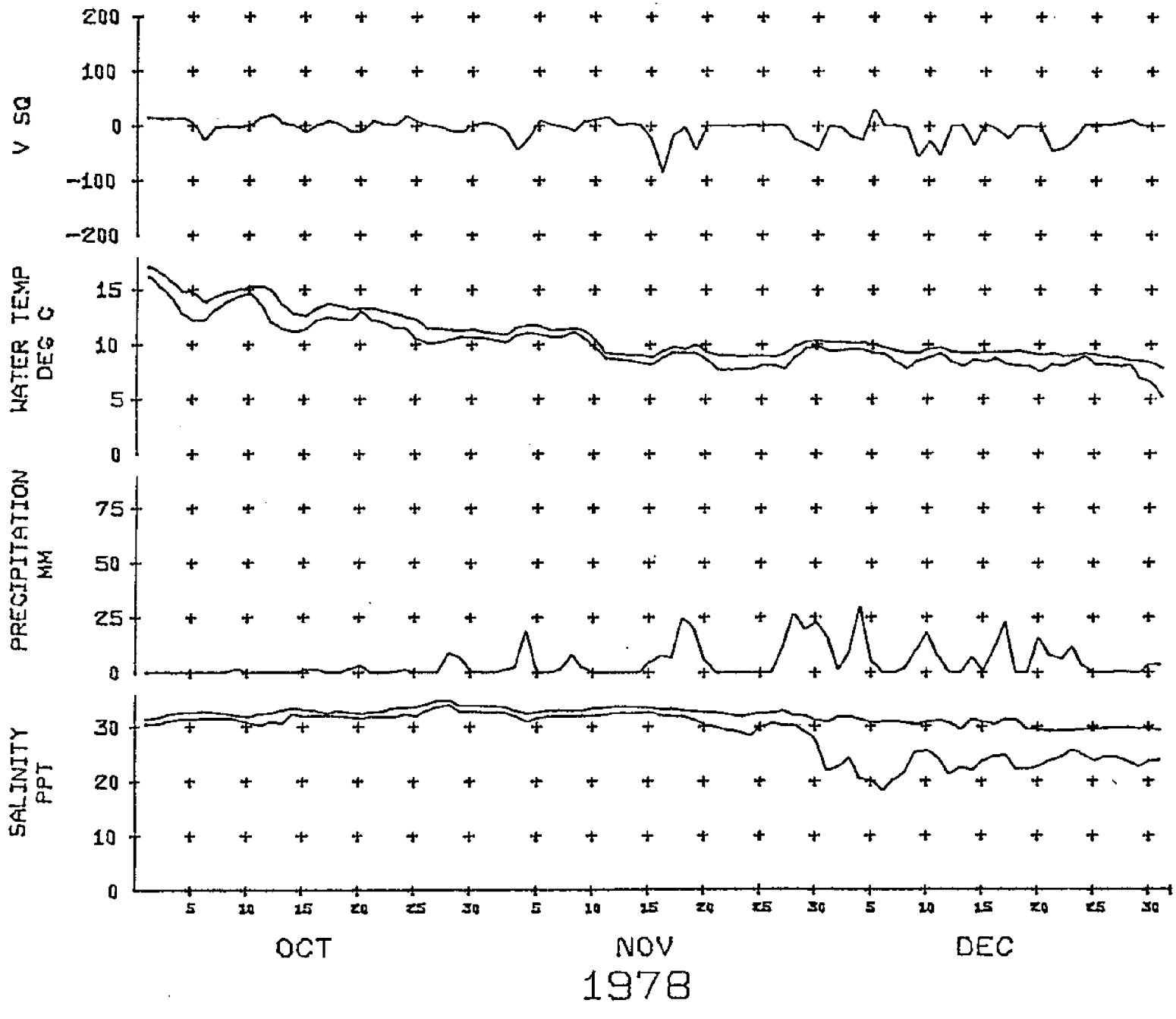
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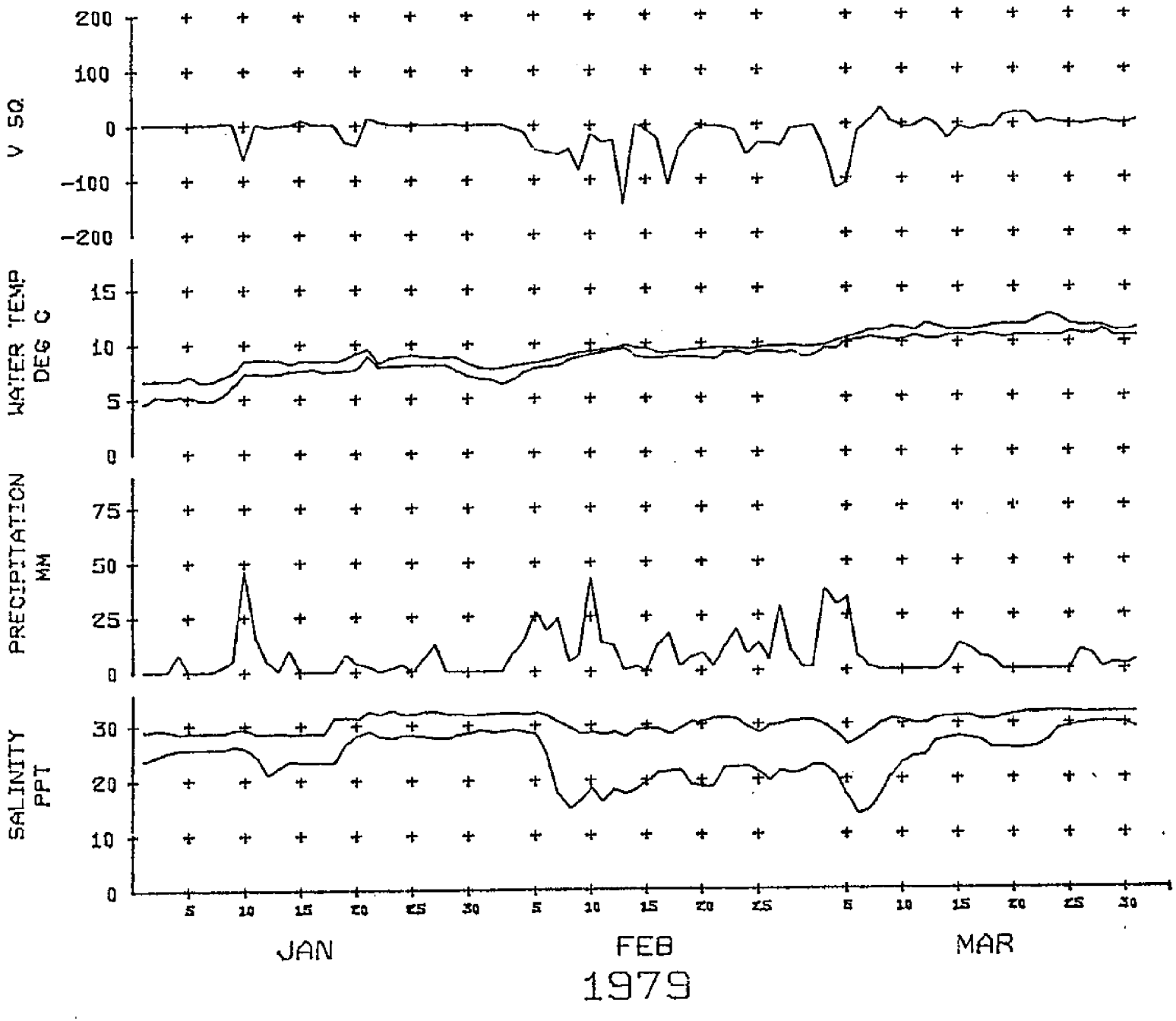
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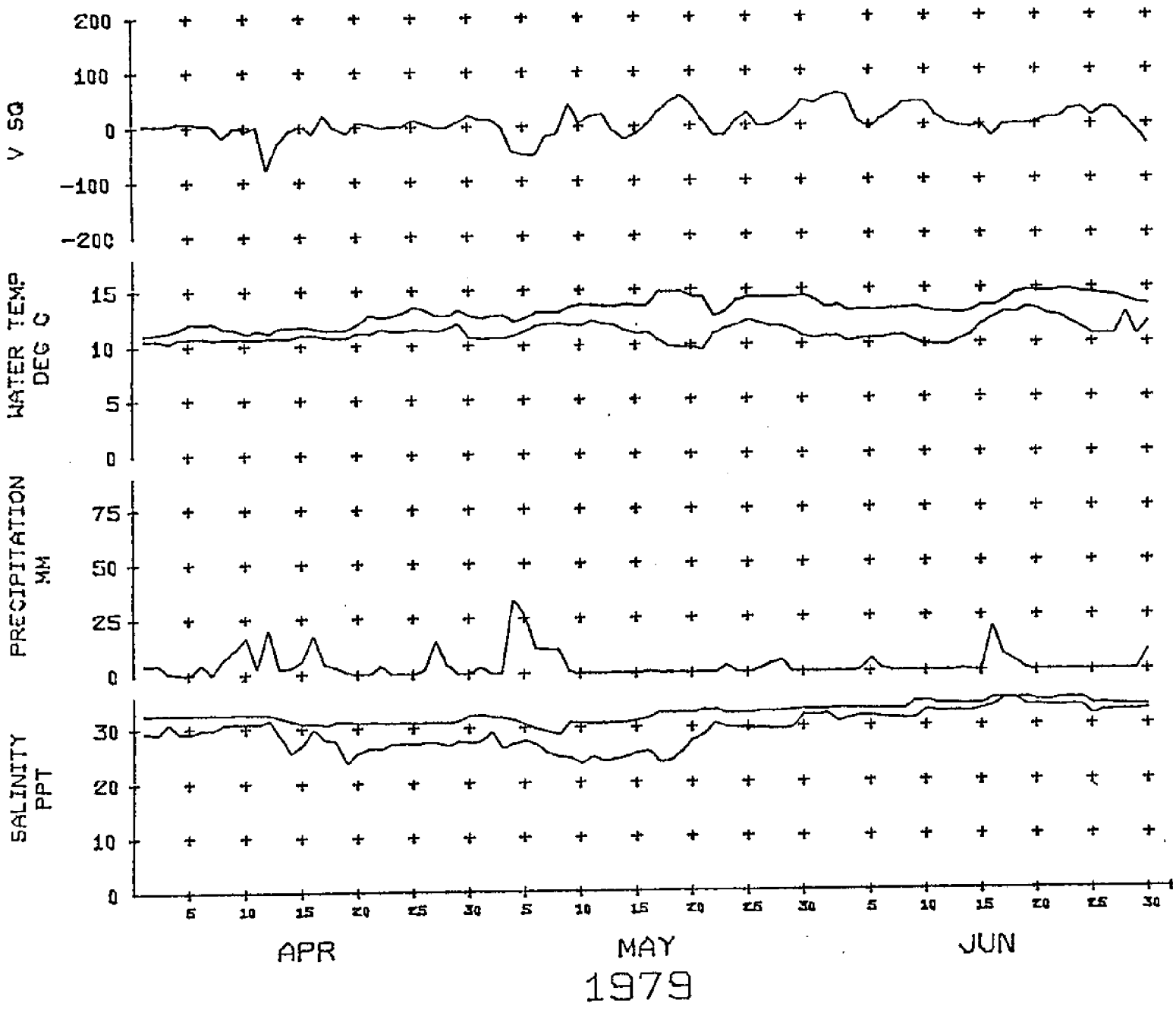
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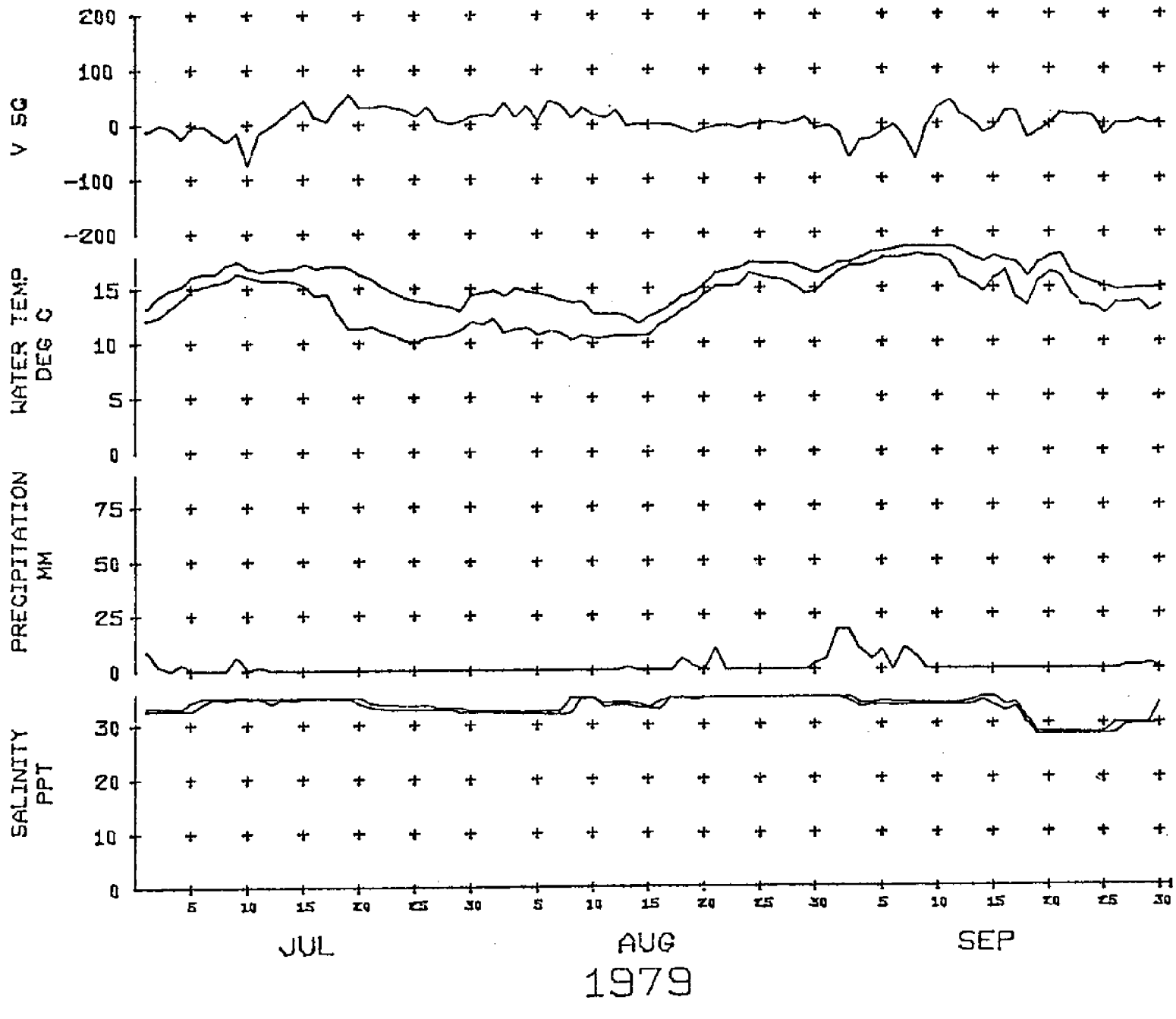
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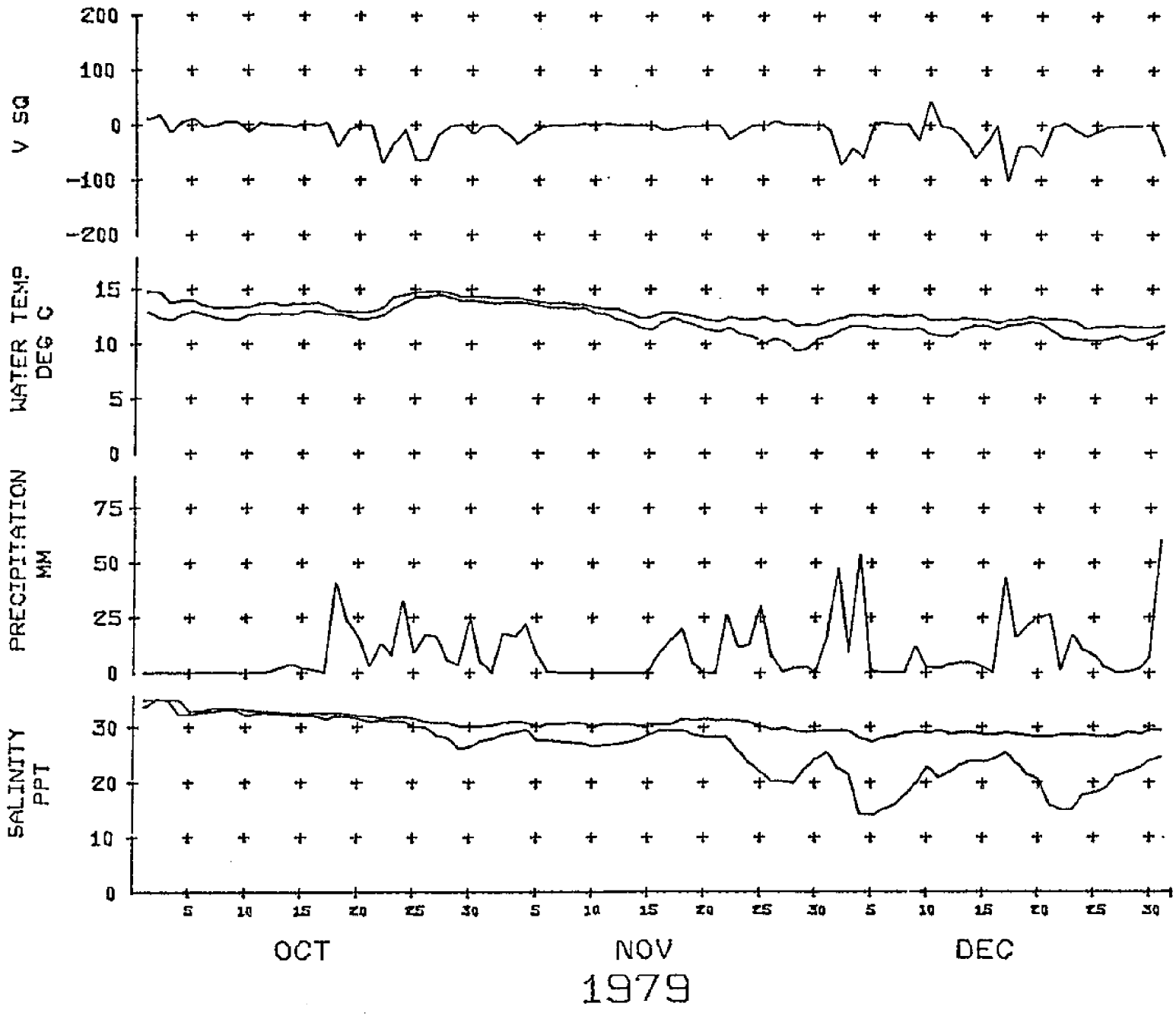
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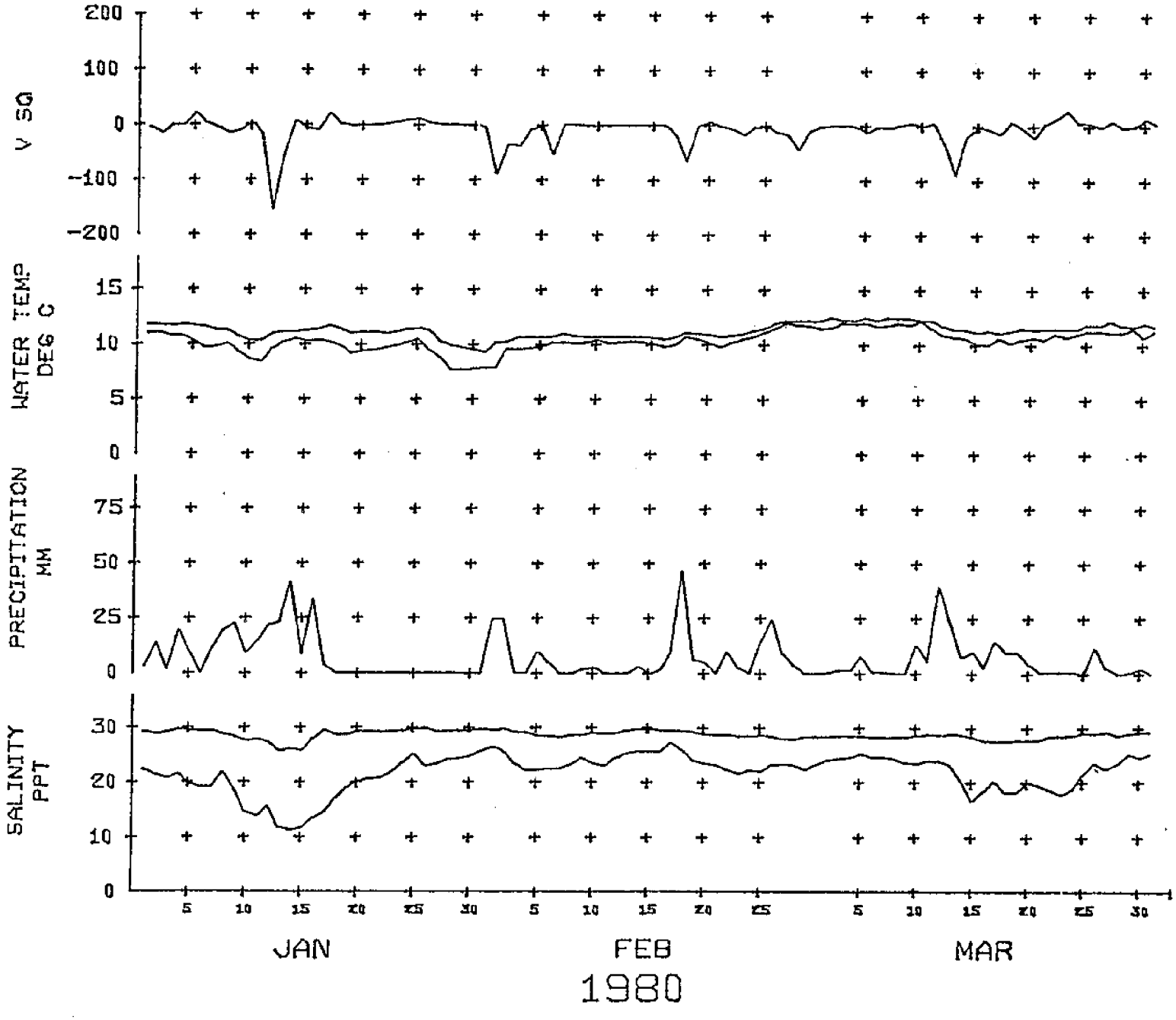
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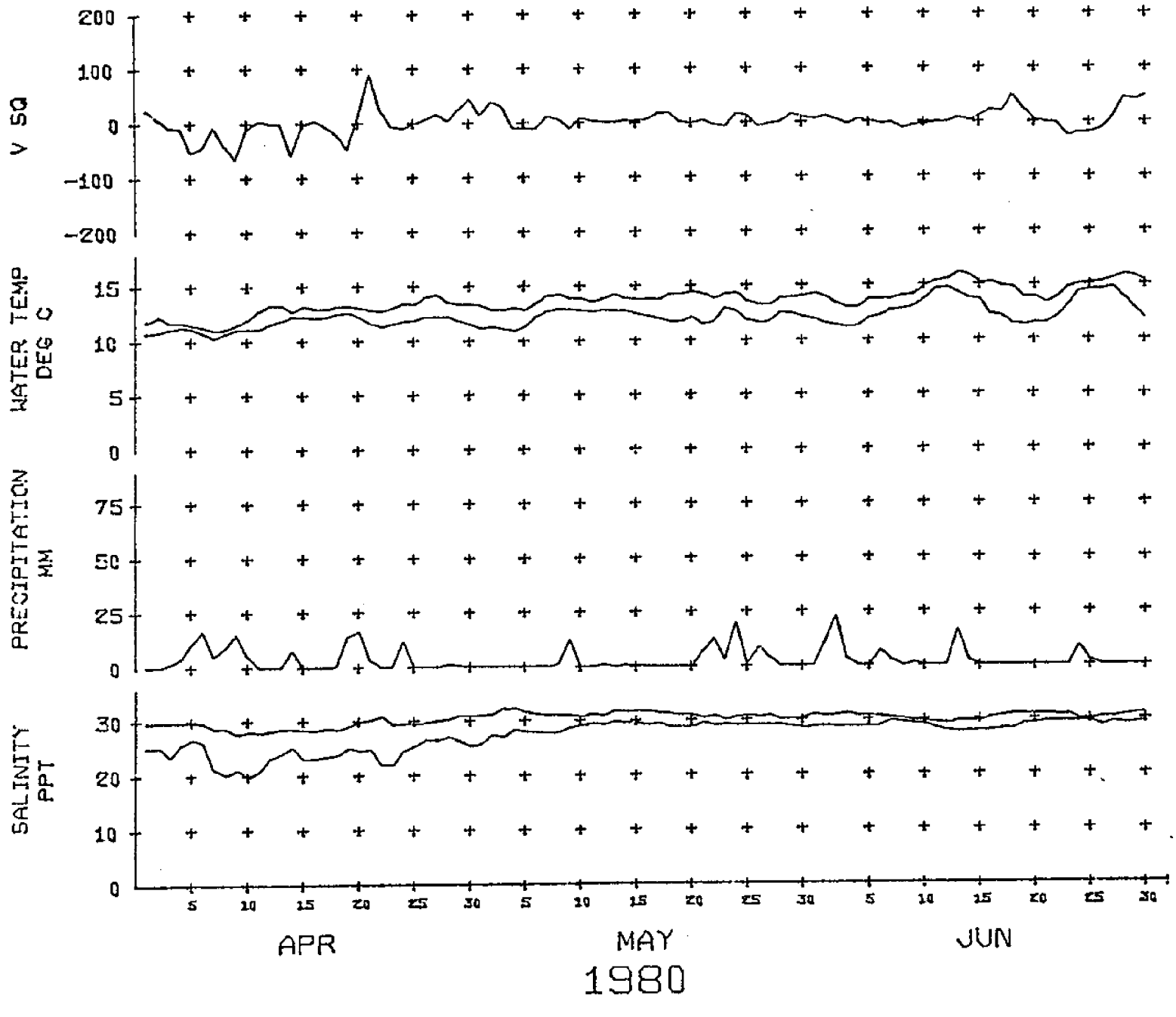
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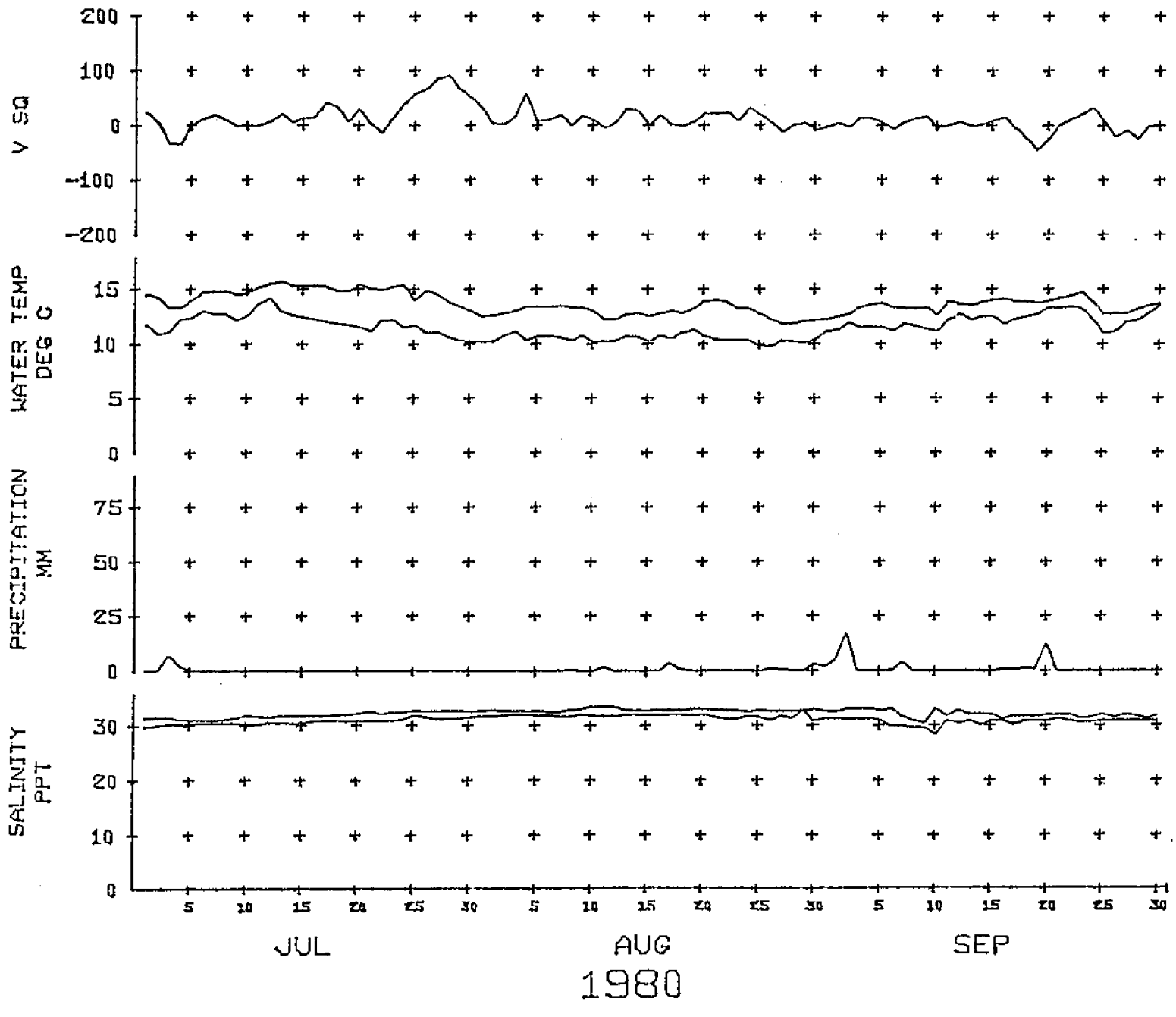
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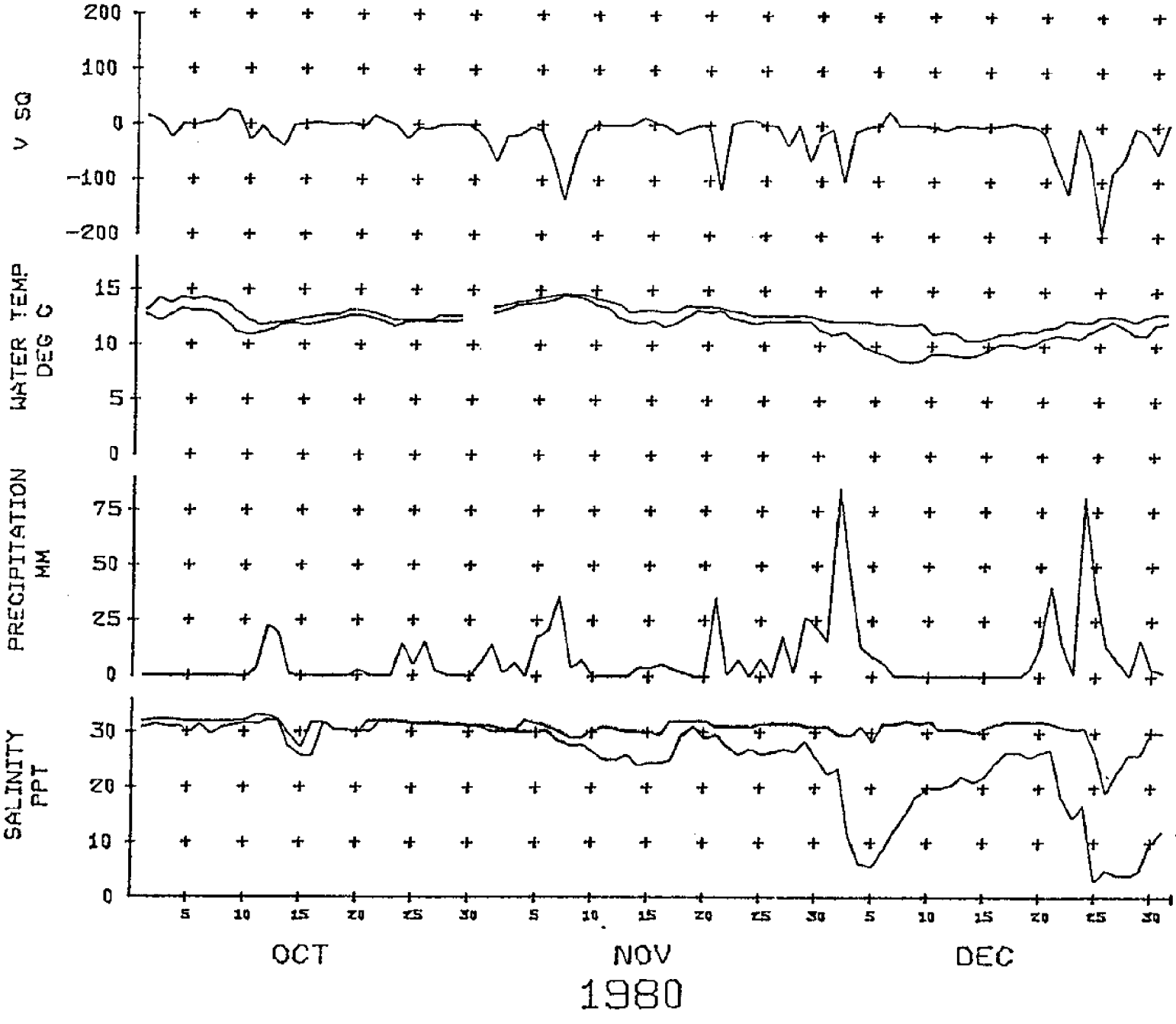
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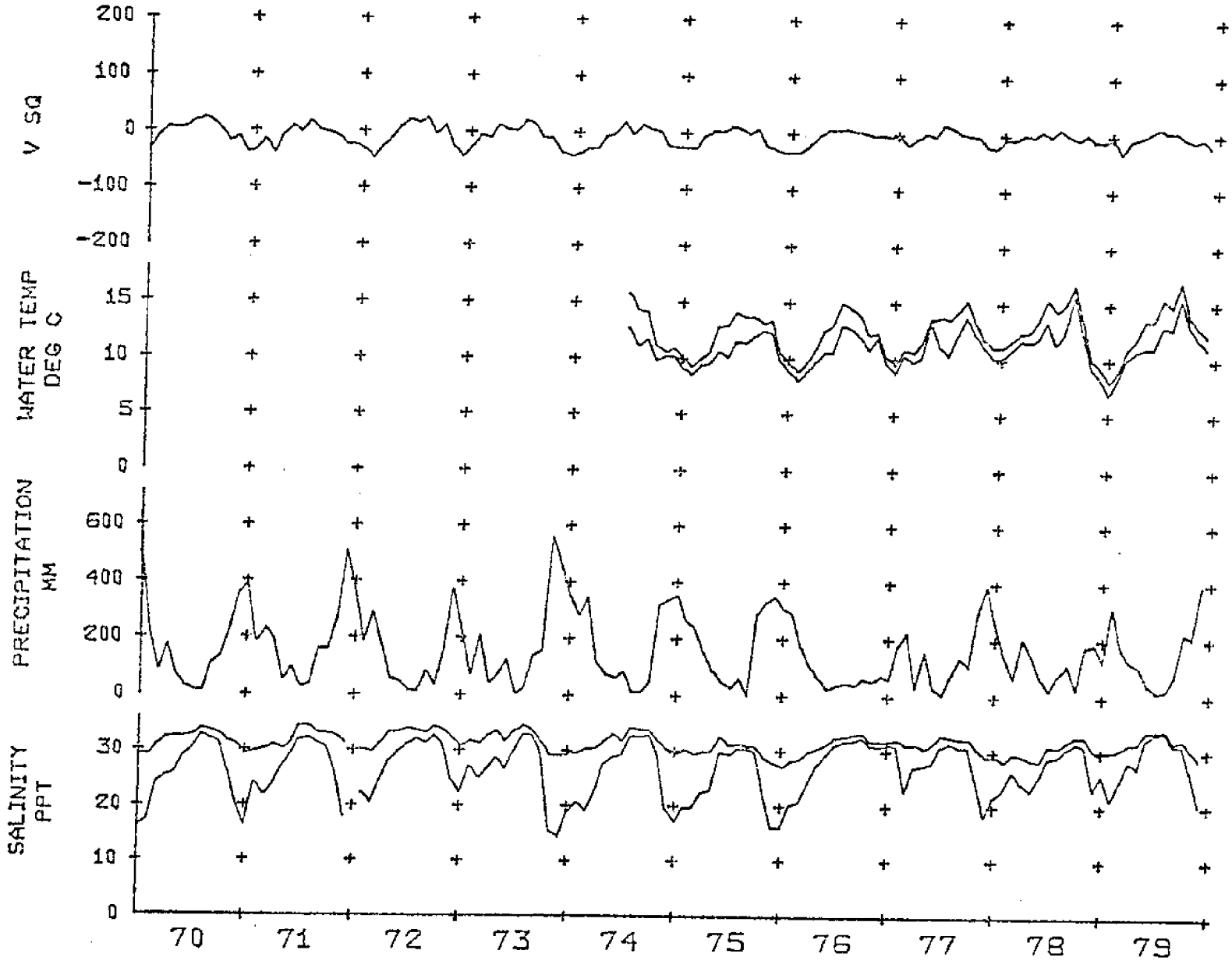
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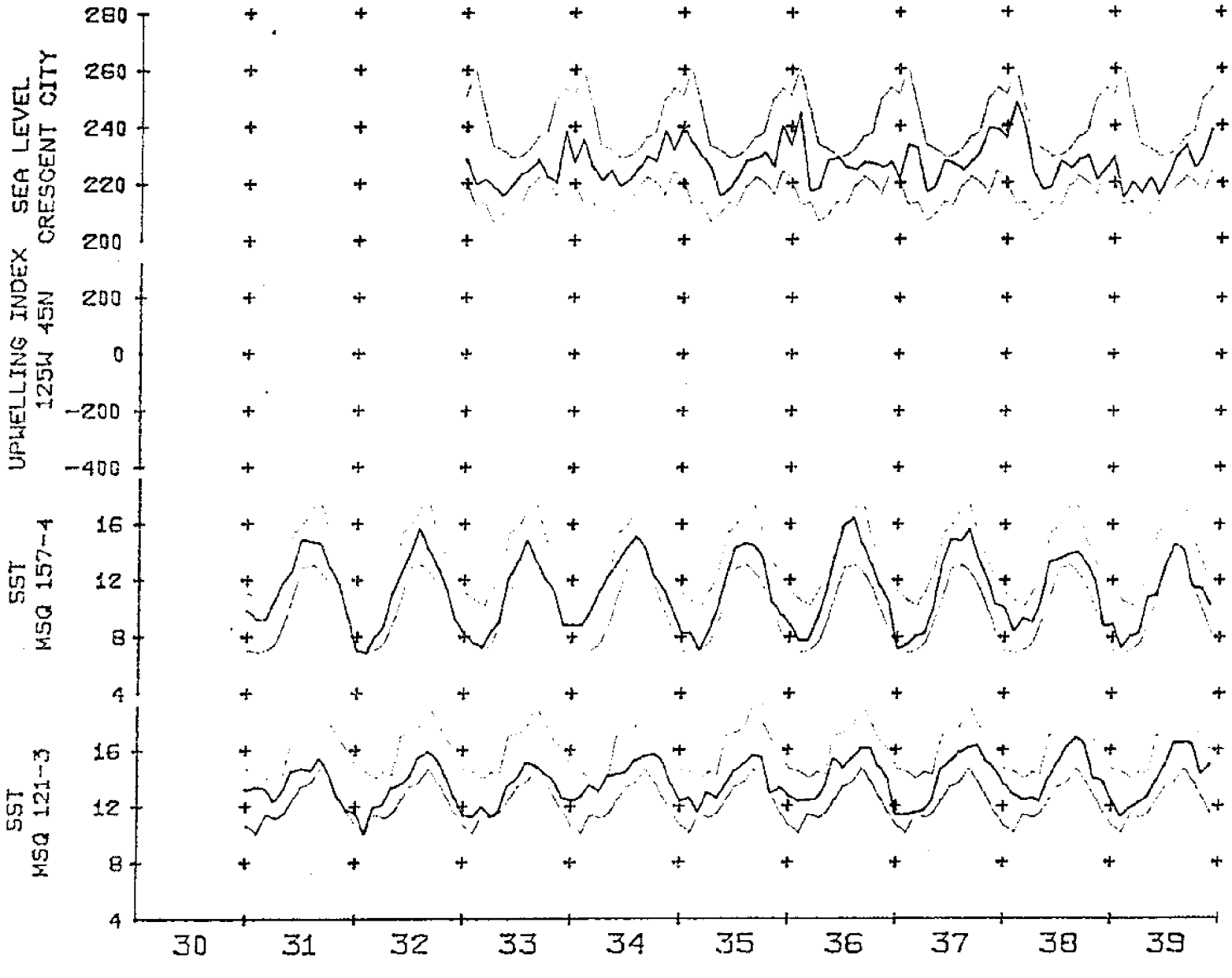
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16
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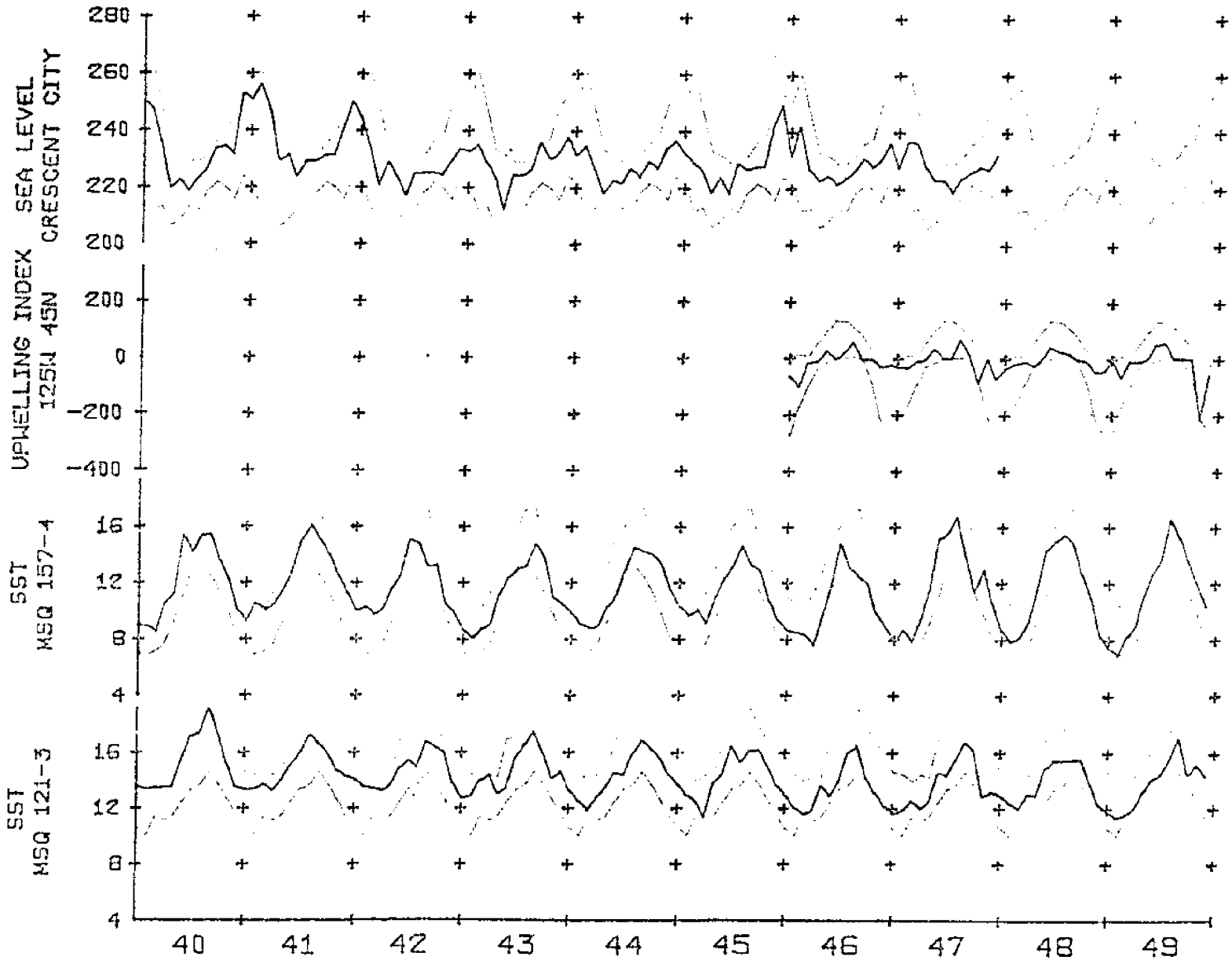
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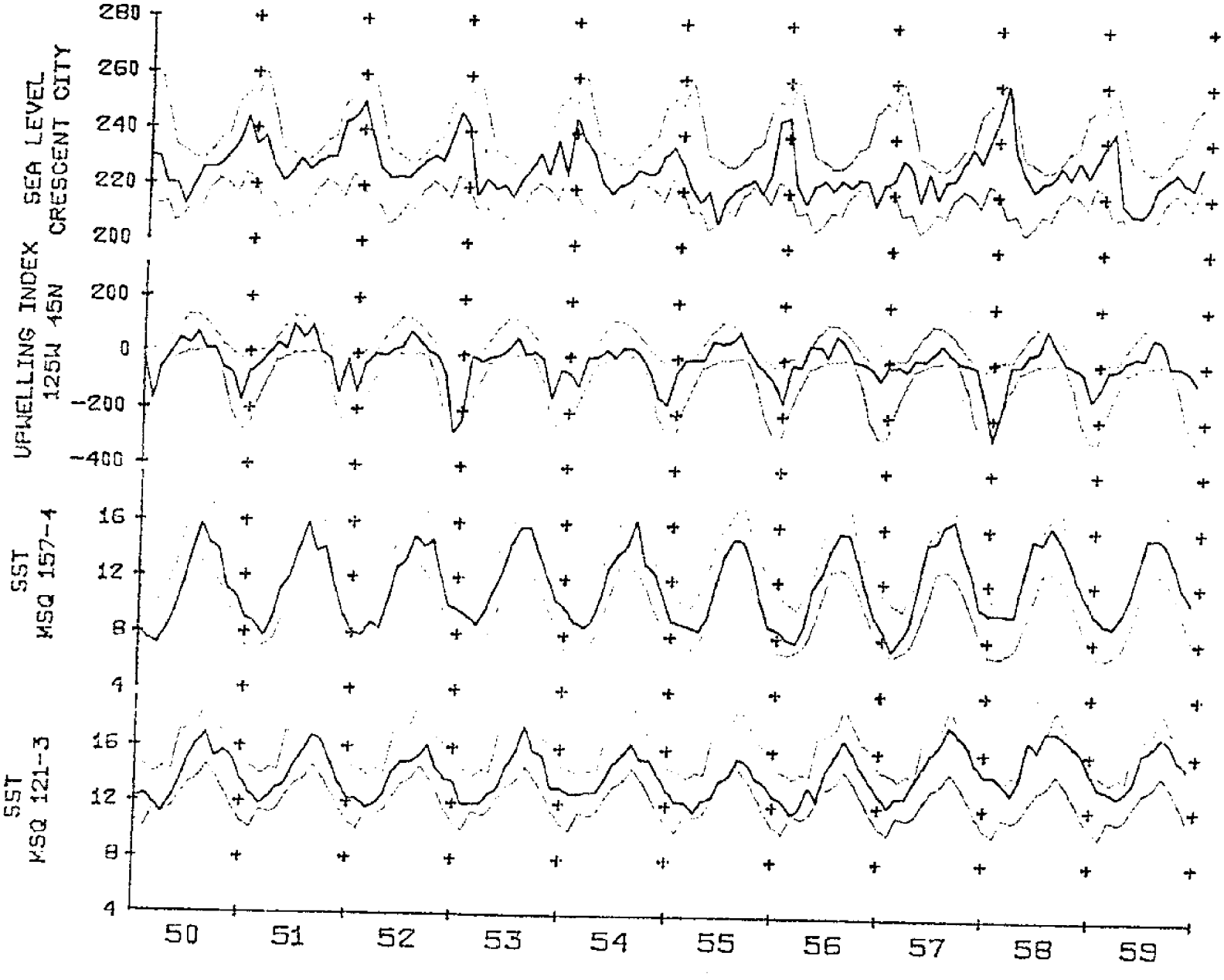
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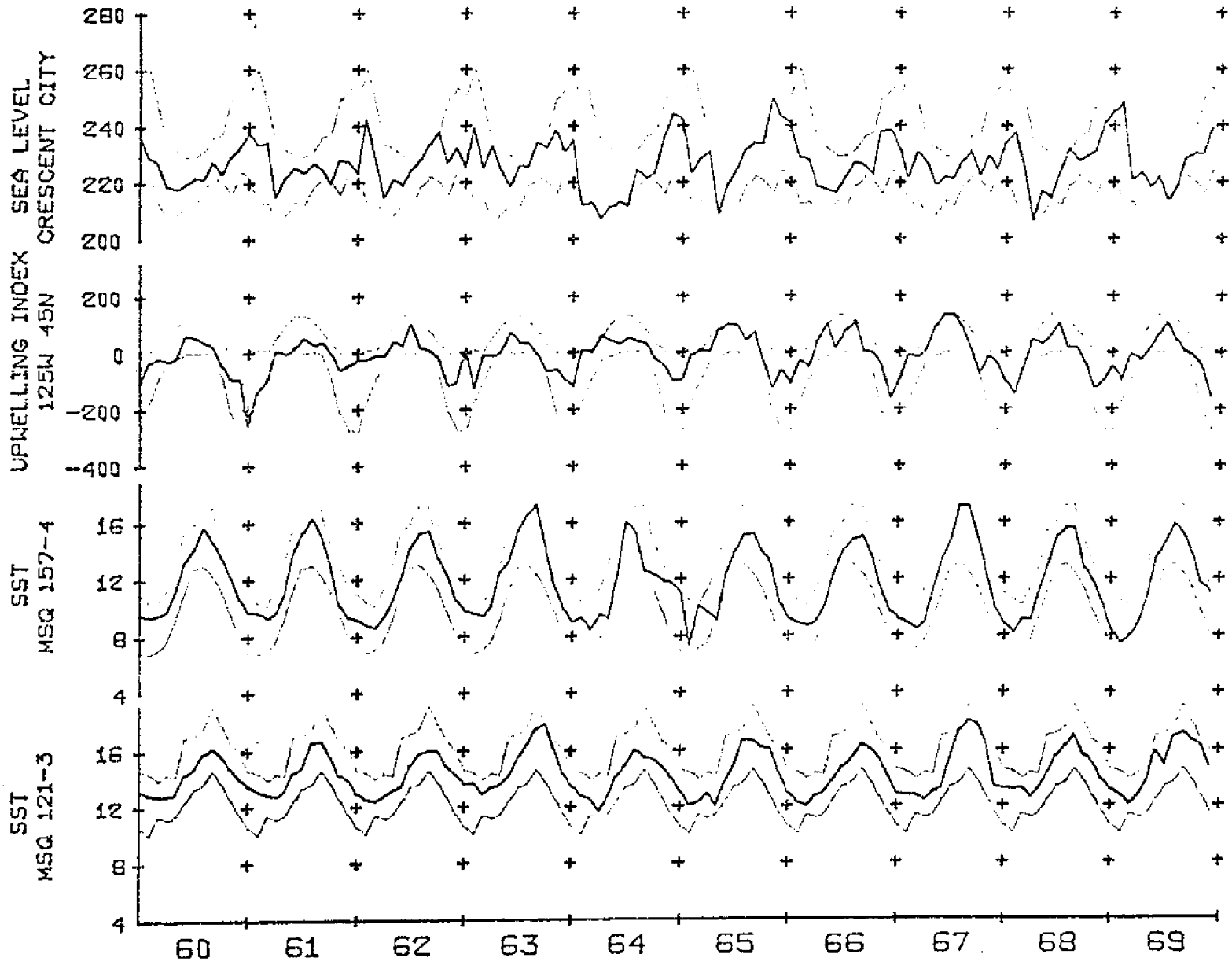
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UPWELLING INDEX
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-400
SST
MSQ 157-4
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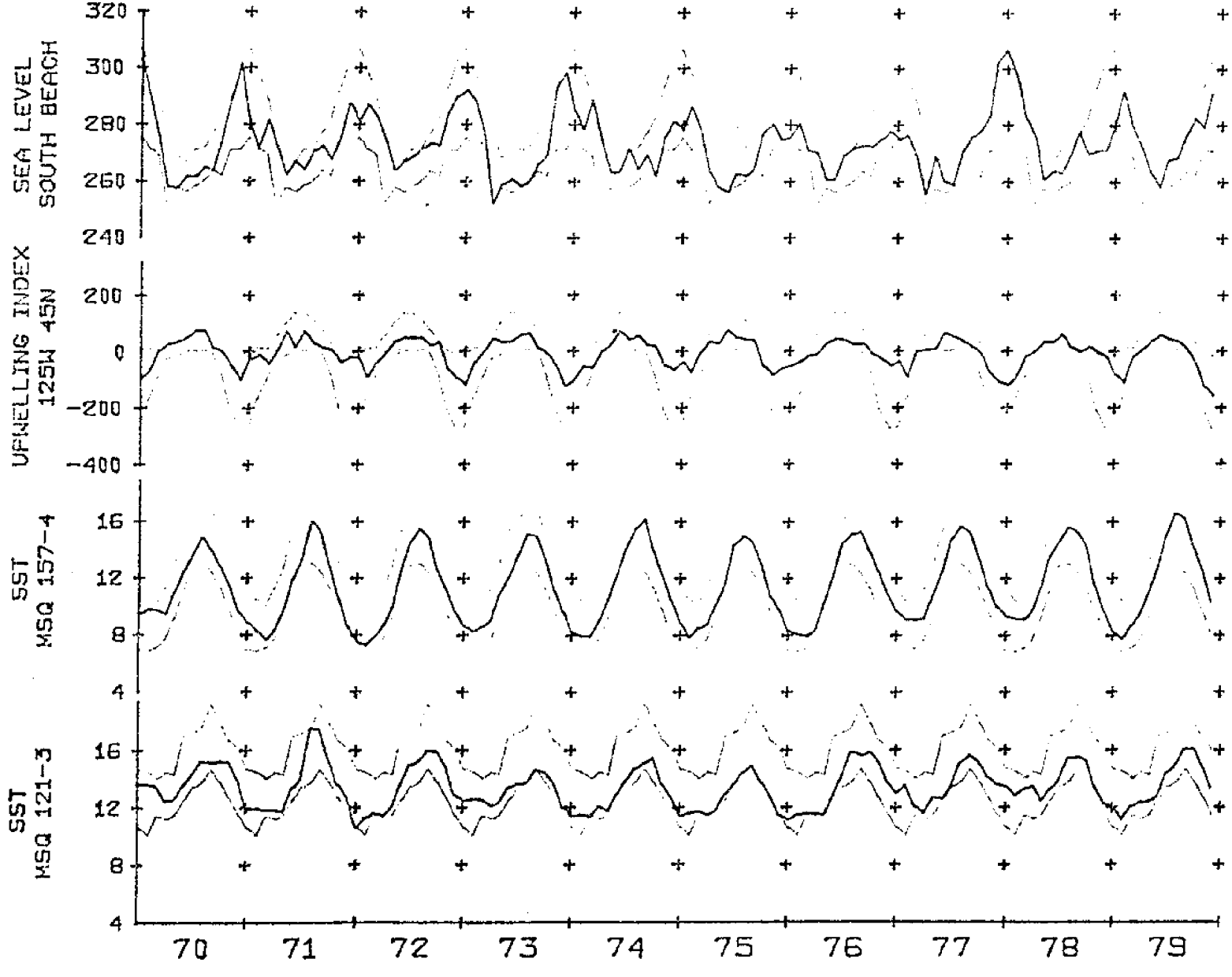
SEA LEVEL
SOUTH BEACH
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300
280
260
240
UPWELLING INDEX
125W 45N
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4
SST
MSQ 121-3
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8
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