

The Oceanographic Research in the Southern Region of the Hawaiian Islands—VI

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Abstract

The oceanographic observations were carried out in the southern region of the Hawaiian Islands in May, 1983. The general features of the water masses are described by the temperature-salinity curves at each stations obtained in oceanographic survey. The salinity maximum water is found at a depth of about 150 m and the salinity minimum at a depth of about 400 m-500 m. The temperature-salinity curves indicates the Eastern North Pacific Central Water.

1. Introduction

Since 1977, the Keiten Maru (G. T. 860 ton) of Kagoshima University occupied the oceanographic researches in connection with the tuna-fishing condition in the southern region of the Hawaiian Islands. The oceanographic observations were carried out in the region along 20° N between 165° W and 167°-30' W in May, 9th-19th, 1983. In this report, the oceanographic information described by using data obtained the records of S. T. D. measurement. The observation stations are shown in Fig. 1. The depth-temperature-salinity data at each station are tabulated in Table 1.

2. Results and Discussion

The representative temperature-salinity curves are shown in Fig. 2. The Eastern North Pacific Central Water and the Pacific Equatorial Water defined by Sverdrup et al. (1942) are indicated by dotted bands. The surface water is a depth of about 50 m and the numerical values of the temperature and the salinity are about 25.0°C and 34.80 ‰, respectively. The water of the salinity maximum is found at a depth of about 150 m and the salinity minimum at a depth of about 400 m-500 m; the former corresponds to the subsurface saline water and the latter to the subarctic intermediate water.

The subsurface saline water found in the northeast region of the Hawaiian Islands around 29°N, 148°W (1977, Henmi) spreads to the south and enters this region.

The mean values of the temperature and the salinity of the subsurface saline water are about 21.2°C and 34.24 ‰, respectively. On the other hand, the subarctic intermediate water of low salinity sinks at the subarctic convergence and extends toward

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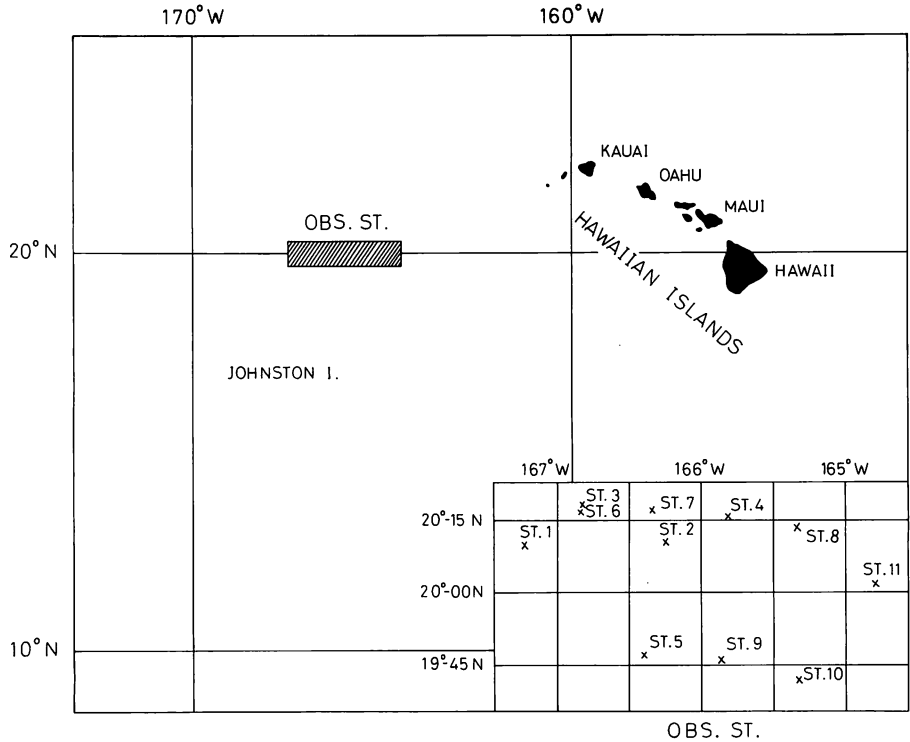


Fig. 1. Map showing the oceanographic stations of S. T. D. observation in the southwestern region of the Hawaiian Islands

the south, which has been mixed with waters of the tropical region. The mean values of the temperature and the salinity of this water are about 8.1°C and 34.14‰, respectively.

The values of the salinity maximum and minimum are almost the same to that of the EC-water and EI-water (1981, Yuwaki and Henmi). The temperature-salinity curves have a quite similar form to the first group in the southern region of the Hawaiian Islands, where the North Equatorial Current flows. (1981, Yuwaki and Henmi) The water between 200 m-300 m is a mixture of the EC-water and the EI-water. The temperature-salinity curves below at a depth of about 250 m coincide with that of the Eastern North Pacific Central Water.

3. Conclusions

The oceanographic research in the southwestern region of the Hawaiian Islands was carried out in May, 1983. The water mass consist of the surface water, the subsurface

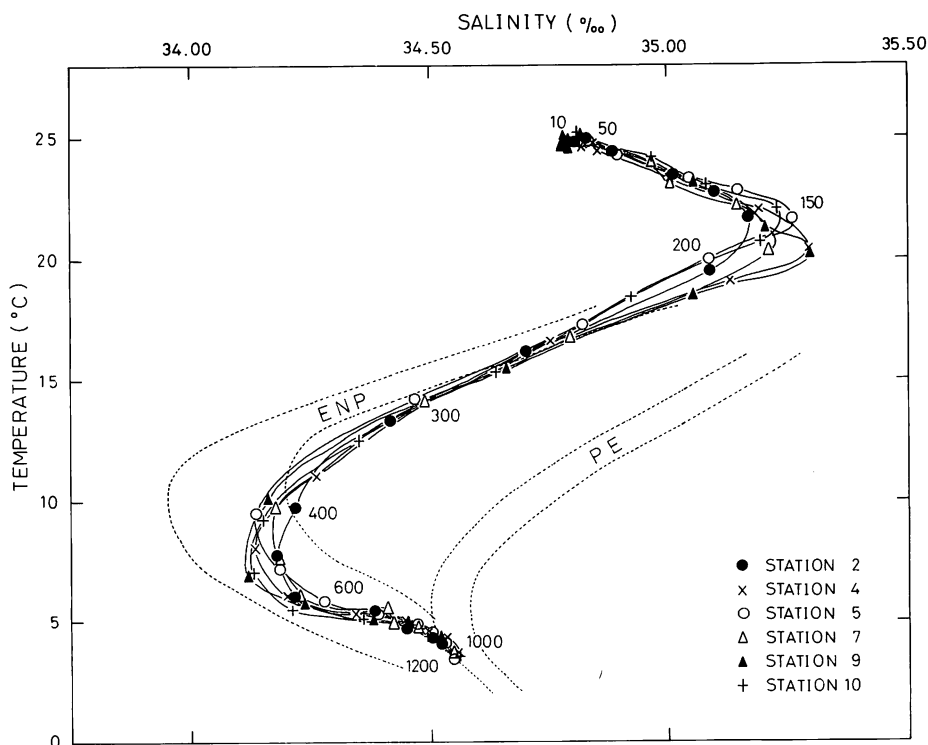


Fig. 2. The representative temperature-salinity curves in the southwestern region of the Hawaiian Islands. Observing depth are entered. (m) E.N.P. Eastern North Pacific Central Water. P.E., Pacific Equatorial Water.

saline water and the subarctic intermediate water. The temperature-salinity curves have an inverted form of the letter 'S' characterized by a salinity maximum at a depth of about 150 m and a salinity minimum at a depth of about 400 m-500 m. The water below at a depth of about 250 m coincide with the Eastern North Pacific Central Water.

References

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Table 1. The depth-temperature-salinity data at each stations.

| Depth | Station 1 Lat. 20°-10'1N Long. 167°-12'8W May 9, 1983 | | Station 2 Lat. 20°-10'8N Long. 166°-14'2W May 10, 1983 | | Station 3 Lat. 20°-18'4N Long. 166°-49'6W May 11, 1983 | |
|-------|--|-----------------|---|-----------------|---|-----------------|
| | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) |
| 0 | 25.34 | 34.760 | 25.07 | 34.836 | 25.14 | 34.789 |
| 10 | 25.33 | 34.760 | 25.06 | 34.838 | 25.13 | 34.795 |
| 20 | 25.33 | 34.759 | 25.06 | 34.838 | 25.13 | 34.794 |
| 30 | 25.33 | 34.762 | 25.04 | 34.833 | 25.13 | 34.795 |
| 50 | 24.79 | 34.903 | 24.86 | 34.820 | 25.13 | 34.798 |
| 75 | 23.72 | 35.145 | 24.48 | 34.893 | 24.94 | 34.811 |
| 100 | 22.00 | 35.195 | 23.55 | 35.017 | 24.13 | 34.919 |
| 125 | 21.33 | 35.324 | 22.75 | 35.104 | 23.39 | 35.082 |
| 150 | 20.61 | 35.261 | 21.71 | 35.172 | 22.40 | 35.172 |
| 200 | 17.81 | 34.910 | 19.54 | 35.094 | 19.22 | 34.973 |
| 250 | 14.29 | 34.499 | 16.24 | 34.703 | 15.40 | 34.561 |
| 300 | 12.25 | 34.327 | 13.28 | 34.417 | 12.87 | 34.366 |
| 400 | 9.20 | 34.185 | 9.66 | 34.217 | 9.61 | 34.187 |
| 500 | 7.13 | 34.119 | 7.68 | 34.178 | 7.66 | 34.254 |
| 600 | 5.80 | 34.229 | 6.04 | 34.214 | 5.99 | 34.216 |
| 700 | 5.26 | 34.378 | 5.37 | 34.385 | 5.45 | 34.399 |
| 800 | 4.90 | 34.457 | 4.70 | 34.452 | 4.81 | 34.474 |
| 900 | 4.48 | 34.493 | 4.28 | 34.504 | 4.40 | 34.501 |
| 1000 | 4.08 | 34.529 | 4.02 | 34.522 | 4.04 | 34.522 |
| 1200 | 3.49 | 34.558 | — | — | 3.51 | 34.552 |

| Depth | Station 4 Lat. 20°-16'0N Long. 165°-48'6W May 12, 1983 | | Station 5 Lat. 19°-47'3N Long. 166°-22'9W May 13, 1983 | | Station 6 Lat. 20°-17'3N Long. 166°-50'0W May 14, 1983 | |
|-------|---|-----------------|---|-----------------|---|-----------------|
| | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) |
| 0 | 24.78 | 34.841 | 24.93 | 34.834 | 25.28 | 34.790 |
| 10 | 24.79 | 34.842 | 24.93 | 34.836 | 25.27 | 34.793 |
| 20 | 24.79 | 34.843 | 24.92 | 34.836 | 25.27 | 34.796 |
| 30 | 24.79 | 34.845 | 24.91 | 34.834 | 25.27 | 34.799 |
| 50 | 24.63 | 34.820 | 24.77 | 34.829 | 25.18 | 34.789 |
| 75 | 24.60 | 34.819 | 24.26 | 34.902 | 24.72 | 34.846 |
| 100 | 24.44 | 34.855 | 23.34 | 35.043 | 23.70 | 34.924 |
| 125 | 23.35 | 35.074 | 22.78 | 35.152 | 22.44 | 35.161 |
| 150 | 21.99 | 35.194 | 21.75 | 35.269 | 21.01 | 35.195 |
| 200 | 20.36 | 35.297 | 20.05 | 35.092 | 18.70 | 34.808 |
| 250 | 19.14 | 35.134 | 17.28 | 34.825 | 16.49 | 34.737 |
| 300 | 16.57 | 34.755 | 14.19 | 34.470 | 13.58 | 34.419 |
| 400 | 10.99 | 34.256 | 9.46 | 34.136 | 8.89 | 34.166 |
| 500 | 8.04 | 34.133 | 7.20 | 34.185 | 7.21 | 34.239 |
| 600 | 6.00 | 34.196 | 5.84 | 34.276 | 5.78 | 34.260 |
| 700 | 5.20 | 34.339 | 5.27 | 34.392 | 5.35 | 34.356 |
| 800 | 4.89 | 34.443 | 4.78 | 34.470 | 5.02 | 34.444 |
| 900 | 4.51 | 34.491 | 4.44 | 34.505 | 4.59 | 34.483 |
| 1000 | 4.15 | 34.532 | 4.11 | 34.528 | 4.12 | 34.519 |
| 1200 | 3.62 | 34.554 | 3.52 | 34.555 | 3.55 | 34.551 |

| Depth | Station 7 Lat. 20°-17'7N Long. 166°-19'7W May 15, 1983 | | Station 8 Lat. 20°-14'4N Long. 165°-20'0W May 16, 1983 | | Station 9 Lat. 19°-46'2N Long. 165°-51'5W May 17, 1983 | |
|-------|---|-----------------|---|-----------------|---|-----------------|
| | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) |
| 0 | 25.07 | 34.831 | 25.15 | 34.829 | 25.12 | 34.816 |
| 10 | 25.05 | 34.831 | 25.07 | 34.818 | 25.06 | 34.820 |
| 20 | 25.04 | 34.833 | 24.92 | 34.822 | 24.94 | 34.789 |
| 30 | 25.01 | 34.834 | 24.91 | 34.824 | 24.84 | 34.798 |
| 50 | 24.97 | 34.832 | 24.82 | 34.811 | 24.75 | 34.790 |
| 75 | 24.78 | 34.815 | 24.62 | 34.813 | 24.62 | 34.784 |
| 100 | 23.85 | 34.974 | 23.78 | 34.969 | 24.55 | 34.795 |
| 125 | 23.13 | 35.095 | 22.52 | 35.124 | 23.17 | 35.057 |
| 150 | 22.08 | 35.149 | 21.54 | 35.311 | 21.18 | 35.210 |
| 200 | 20.19 | 35.215 | 19.30 | 35.071 | 20.21 | 35.303 |
| 250 | 16.85 | 34.800 | 16.02 | 34.678 | 18.43 | 35.059 |
| 300 | 14.02 | 34.491 | 13.37 | 34.420 | 15.38 | 34.663 |
| 400 | 9.72 | 34.174 | 10.09 | 34.208 | 10.05 | 34.160 |
| 500 | 7.62 | 34.184 | 7.11 | 34.106 | 6.93 | 34.118 |
| 600 | 6.05 | 34.226 | 5.76 | 34.179 | 5.68 | 34.236 |
| 700 | 5.45 | 34.361 | 5.03 | 34.300 | 5.05 | 34.382 |
| 800 | 4.94 | 34.422 | 4.70 | 34.414 | 4.78 | 34.449 |
| 900 | 4.64 | 34.473 | 4.48 | 34.486 | 4.44 | 34.496 |
| 1000 | 4.30 | 34.503 | 4.04 | 34.514 | 4.11 | 34.523 |
| 1200 | 3.64 | 34.540 | 3.48 | 34.550 | 3.56 | 34.551 |

| Depth | Station 10 Lat. 19°-42'1N Long. 165°-18'2W May 18, 1983 | | Station 11 Lat. 20°-02'1N Long. 164°-46'8W May 19, 1983 | |
|-------|--|-----------------|--|-----------------|
| | Temp. (°C) | Salinity (‰) | Temp. (°C) | Salinity (‰) |
| 0 | 25.23 | 34.818 | 25.11 | 35.050 |
| 10 | 25.20 | 34.820 | 25.11 | 35.048 |
| 20 | 25.15 | 34.817 | 24.65 | 35.021 |
| 30 | 24.97 | 34.829 | 24.17 | 35.079 |
| 50 | 24.78 | 34.820 | 22.85 | 35.159 |
| 75 | 24.06 | 34.971 | 21.29 | 35.192 |
| 100 | 23.01 | 35.087 | 20.35 | 35.199 |
| 125 | 22.01 | 35.232 | 19.80 | 35.185 |
| 150 | 20.68 | 35.197 | 18.42 | 34.690 |
| 200 | 18.35 | 34.926 | 14.11 | 34.507 |
| 250 | 15.29 | 34.639 | 11.40 | 34.259 |
| 300 | 12.45 | 34.351 | 9.92 | 34.179 |
| 400 | 9.16 | 34.146 | 7.54 | 34.122 |
| 500 | 7.05 | 34.128 | 6.07 | 34.204 |
| 600 | 5.43 | 34.207 | 5.35 | 34.295 |
| 700 | 4.87 | 34.355 | 4.83 | 34.413 |
| 800 | 4.56 | 34.465 | 4.51 | 34.485 |
| 900 | 4.29 | 34.494 | 4.17 | 34.513 |
| 1000 | 3.95 | 34.525 | 3.86 | 34.533 |
| 1200 | 3.46 | 34.556 | 3.36 | 34.561 |