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AEROSPACE SCIENCES DIVISION
FIFTH WEATHER WING
LANGLEY AIR FORCE BASE, VIRGINIA 23665

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20. **ABSTRACT**
    This technical note contains sea-surface isotherm charts divided into geographical sections for the Atlantic, Pacific, and Indian Oceans as well as North American lakes and Hudson Bay. Each section is further divided into 12 monthly sets of charts, each set containing a maximum, mean, and minimum temperature chart (except for the Canadian lakes and Hudson Bay section, which only has a mean value). Also included is a table on approximate survival times of humans immersed in the sea with ordinary clothing.
BLOCK 19

Sibuyan Sea
Arabian Sea
Coral Sea
Bering Sea
Solomon Sea
Bismarck Sea
Arafura Sea
Tasman Sea
Sea of Japan
North Sea
Baltic Sea
Persian Gulf
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Hudson Bay
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Bay of Biscay
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Gulf of Sidra
Gulf of Sidra
Gulf of Tonkin
Gulf of Alaska
Gulf of Bengal
Gulf of Guinea
Lake Michigan
Lake Superior
Lake Huron
Lake Erie
Lake Ontario
Great Salt Lake
Great Slave Lake
Great Bear Lake
Lake Winnipeg
Sea Surface Temperature
Water Survival
Atlantic Ocean
Pacific Ocean
Indian Ocean
5TH WEATHER WING
TECHNICAL NOTE 83-001

WORLD-WIDE SEA-SURFACE TEMPERATURES

APRIL 1983

AEROSPACE SCIENCES DIVISION
5TH WEATHER WING
LANGLEY AIR FORCE BASE, VIRGINIA
The sea-surface isotherm charts in this publication came from the following sources:

   a. Vol I: North Atlantic Ocean (NAVAIR 50-1C-528) (Revised 1974)
   b. Vol II: North Pacific Ocean (NAVAIR 50-1C-529) (Revised 1977)
   c. Vol III: Indian Ocean (NAVAIR 50-1C-530) (Revised 1976)
   d. Vol IV: South Atlantic Ocean (NAVAIR 50-1C-531) (Revised 1978)
   e. Vol V: South Pacific Ocean (NAVAIR 50-1C-532) (Revised 1979)

II. Summary of Synoptic Meteorological Observations for Great Lakes Area (National Climatic Center), January 1975

III. Utah State University Climatology Department

IV. United States Air Force Environmental Technical Applications Center (MAC)

These charts are grouped into the following geographical sections:

I. North Atlantic Ocean
II. North Pacific Ocean
III. Indian Ocean
IV. South Atlantic Ocean
V. South Pacific Ocean
VI. Great Lakes and Great Salt Lake
VII. Canadian Lakes and Bays

Each geographical section consists of 12 monthly sets of temperature charts. Each monthly set contains 3 charts, except for the Canadian Lakes and Bays section. The first chart of each month is the maximum temperature chart. The maximum temperature is that value in which 1 percent of the temperatures recorded for that location were greater than the given value. The second chart is the mean temperature chart. The last chart is the minimum temperature chart. Its value is that value in which 1 percent of the temperatures recorded for that location were less than the given value. For the Canadian Lakes and Bays section, only mean temperature charts are provided.
INTRODUCTION

This technical note was prepared with all the data currently available to AWS. The majority of the data (that for the oceans) came from the five Navy publications listed in the forward. The USAF Environmental Technical Applications Center, through various sources, obtained the rest of the data in this publication. We were unable to obtain data on non-North American lakes, such as the Caspian Sea and the Aral Sea, USSR. Data on Lake Victoria, Africa, was available, but the temperature of the lake will always be high enough not to present any hazard due to its equatorial location.

OCEANIC CHARTS

Sea-surface temperature is recorded with a fairly high frequency in marine observations. The various methods of recording (bucket versus intake, etc.) have been combined for these charts. In data sparse regions, satellite data were used for guidance. In addition, all data associated with oceanographic hydrocast and bathythermograph samples (expendable and otherwise) were included. The various methods of recording, however, tend to decrease the reliability of the individual values. Gradients and relative values are considered to be reliable.

The 1% and 99% isopleths give estimates of the extremes that may be encountered at any location. Use the extreme values, especially the minimum values, in all your sea-surface temperature determinations - the actual temperature can be anywhere between the extremes. In rare occasions, the actual values could exceed the extremes. These isopleth analyses of the sea-surface temperatures are based on all available data subjectively adjusted where bias was evident.

LAKES AND HUDSON BAY CHARTS

Some of the lakes are small enough to have only one temperature for the entire lake (that is, no isopleths). The Great Lakes and Hudson Bay, however, are large enough to contain isopleths, even though the gradients could be small. The isopleths for these bodies of water were subjectively determined and interpolated from various data sources.

An important fact to remember about water temperatures (and lake temperatures in particular) is that land heats and cools faster than water. This effect can be seen in the Great Lakes. During the summer, the land heats faster than the water, causing water temperature gradients to increase toward land (i.e., the coolest part of a lake in summer is that part farthest from the surrounding land). During the winter, the reverse is true - temperature gradients decrease towards land and the warmest part of the lake is that part farthest from the shore.


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APPROXIMATE SURVIVAL TIMES AND TEMPERATURE CONVERSIONS

Approximate Survival Times

<table>
<thead>
<tr>
<th>Water Temperature (°C)</th>
<th>Exhaustion or Unconsciousness</th>
<th>Expected Survival Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0</td>
<td>&lt;15 min</td>
<td>&lt;15 - 45 min</td>
</tr>
<tr>
<td>0 - 5</td>
<td>15 - 30 min</td>
<td>30 - 90 min</td>
</tr>
<tr>
<td>5 - 10</td>
<td>30 - 60 min</td>
<td>1 - 3 hrs</td>
</tr>
<tr>
<td>10 - 15</td>
<td>1 - 2 hrs</td>
<td>1 - 6 hrs</td>
</tr>
<tr>
<td>15 - 20</td>
<td>2 - 7 hrs</td>
<td>2 - 40 hrs</td>
</tr>
<tr>
<td>20 - 25</td>
<td>3 - 12 hrs</td>
<td>3 - Indef hrs</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>Indef</td>
<td>Indef</td>
</tr>
</tbody>
</table>

Water temperature can be used to estimate the approximate time a person in ordinary clothes and life preserver may be expected to survive in the water. (Source: US Navy Marine Climatic Atlas of the World Vol. III, Indian Ocean)

Temperature Conversions (°C to °F)

<table>
<thead>
<tr>
<th>°C</th>
<th>°F</th>
<th>°C</th>
<th>°F</th>
<th>°C</th>
<th>°F</th>
<th>°C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>-12</td>
<td>10.4</td>
<td>10</td>
<td>50.0</td>
<td>21</td>
<td>69.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-11</td>
<td>12.2</td>
<td>11</td>
<td>51.8</td>
<td>22</td>
<td>71.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>14.0</td>
<td>12</td>
<td>53.6</td>
<td>23</td>
<td>73.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 9</td>
<td>15.8</td>
<td>13</td>
<td>55.4</td>
<td>24</td>
<td>75.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 8</td>
<td>17.6</td>
<td>14</td>
<td>57.2</td>
<td>25</td>
<td>77.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 7</td>
<td>19.4</td>
<td>15</td>
<td>59.0</td>
<td>26</td>
<td>78.8</td>
<td></td>
<td></td>
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<tr>
<td>- 6</td>
<td>21.2</td>
<td>16</td>
<td>60.8</td>
<td>27</td>
<td>80.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 5</td>
<td>23.0</td>
<td>17</td>
<td>62.6</td>
<td>28</td>
<td>82.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 4</td>
<td>24.8</td>
<td>18</td>
<td>64.4</td>
<td>29</td>
<td>84.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 3</td>
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<td>19</td>
<td>66.2</td>
<td>30</td>
<td>86.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2</td>
<td>28.4</td>
<td>20</td>
<td>68.0</td>
<td>31</td>
<td>87.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NORTH ATLANTIC
TEMPERATURE CHARTS
APRIL

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
JULY

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
OCTOBER

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
NORTH PACIFIC
TEMPERATURE CHARTS
JANUARY

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
FEBRUARY

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
FEBRUARY

SEA SURFACE TEMPERATURE

MEAN SEA SURFACE TEMPERATURE
(°C)
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
APRIL

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE.)
MAY

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE )
JUNE

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
JULY

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
JULY

SEA SURFACE TEMPERATURE

MEAN SEA SURFACE TEMPERATURE
(°C)
OCTOBER

SEA SURFACE TEMPERATURE

MEAN SEA SURFACE TEMPERATURE
(°C)
NOVEMBER

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
NOVEMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
DECEMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
INDIAN OCEAN
TEMPERATURE CHARTS
SOUTH ATLANTIC TEMPERATURE CHARTS
FEBRUARY

SEA SURFACE TEMPERATURE

MEAN SEA SURFACE TEMPERATURE (°C)
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C)
(1% of the temperatures were equal to or
less than the given value)
APRIL

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C)
(1% OF THE TEMPERATURES WERE EQUAL TO OR LESS THAN THE GIVEN VALUE)
MAY

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C)
(1% OF THE TEMPERATURES WERE GREATER
THAN THE GIVEN VALUE)
MINIMUM (1%) SEA SURFACE TEMPERATURE(°C)
(1% OF THE TEMPERATURES WERE EQUAL TO
OR LESS THAN THE GIVEN VALUE)
JUNE

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C)
(1% of the temperatures were greater
than the given value)
SEPTEMBER

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C)
(1% OF THE TEMPERATURES WERE GREATER THAN
THE GIVEN VALUE)
SEPTEMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C)
(1% of the temperatures were equal to or less than the given value)
MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C)
(1% OF THE TEMPERATURES WERE GREATER THAN THE GIVEN VALUE.)
SOUTH PACIFIC
TEMPERATURE CHARTS
JANUARY

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
JANUARY

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
MAY

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
SEPTMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
NOVEMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
DECEMBER

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
GREAT LAKES
and
GREAT SALT LAKE
TEMPERATURE CHARTS
MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% of the observations were greater than the given value.)
MARCH

SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)

GREAT LAKES

ICE

GREAT SALT LAKE

12°
MARCH

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)

GREAT LAKES

ICE

GREAT SALT LAKE

O

4°
Sea surface temperature

May

Maximum (99%) sea surface temperature (°C) (1% of the observations were greater than the given value.)

Great Lakes

Salt Lake

24°
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% of the observations were less than the given value.)
SEA SURFACE TEMPERATURE

MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)

GREAT LAKES

JUNE
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)
MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)
MAXIMUM (99%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE GREATER THAN THE GIVEN VALUE)

GREAT LAKES

SEPTEMBER

SALT LAKE
NOVEMBER

SEA SURFACE TEMPERATURE

MINIMUM (1%) SEA SURFACE TEMPERATURE (°C) (1% OF THE OBSERVATIONS WERE LESS THAN THE GIVEN VALUE)

GREAT LAKES

GREAT SALT LAKE
CANADIAN
LAKES and BAYS
TEMPERATURE CHARTS