

REGIONAL CLIMATOLOGY OF GREENLAND-ICELAND-NORWEGIAN SEAS 2013



New high-resolution regional ocean climatology in a key global climate change province

What are regional ocean climatologies?

Ocean climatology is a compendium of time-averaged fields of essential oceanographic variables, such as temperature, salinity, oxygen, etc, over the time of several decades or longer. The first edition of the well-acknowledged World Ocean Atlas (WOA) comprised such a compendium of objectively analyzed time-averaged fields on a regular one-degree geographical grid at 33 depth levels from the surface to 5500 meters.

In the early 1980's, one-degree spatial resolution was the limit that could be reached based upon existing computing power and availability of data. The spatial resolution of the ocean climatology from data was well ahead of capabilities of ocean numerical models and other practical applications. Fast forward to the present, and what seemed impossible 30 years ago is now commonplace, thanks to the skyrocketing increase of computing power and better modeling skills. A new edition of WOA (WOA13) has been recently upscaled to $1/4^{\circ} \times 1/4^{\circ}$ -degree resolution at 102 depth levels—far more detailed than the previous edition.

However, in contrast with numerical modeling, the grid resolution in ocean climatologies is restricted not by computing power, but by the availability of data. Only in a very few key ocean regions does data availability allow true high-resolution ocean climatologies to be possible, and thus, a new level of detail is now achievable in those regions. Therefore, NODC has recently begun a new project of developing high-resolution **Regional Ocean Climatologies (RC)**.

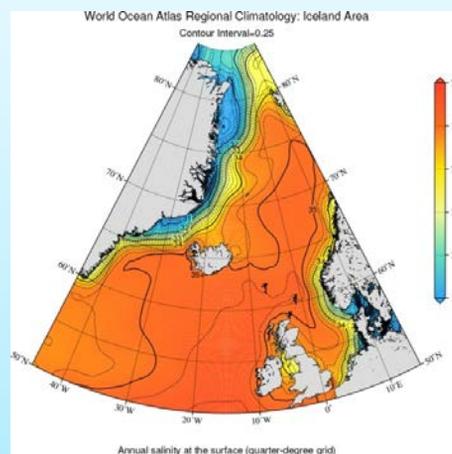


Figure 1. GINS surface salinity with $1/4^{\circ} \times 1/4^{\circ}$ -degree resolution.

To date, four RC were generated based on the World Ocean Database: The **Gulf of Mexico**, **East-Asian Seas**, **Arctic Ocean** and most recently—the **Greenland-Iceland-Norwegian Seas (GINS)**. The **GINS** regional climatology was published in October 2013 and is the first regional climatology providing one-tenth of degree grid resolution for both temperature and salinity for all twelve months.

Facts About GINS Regional Climatology

- The GINS are the gateways for water exchange between the North Atlantic Ocean and the Arctic. The ocean processes in this region play a key role in the entire high-latitude ocean climate formation and change. The magnitude of fisheries, oil and other material resources and climatic importance of GINS has spurred intensive observation and research programs in the region.
- The GINS climatology includes a set of high-resolution quality-controlled long-term annual, seasonal and monthly mean temperature and salinity fields on different depth levels.
- The GINS RC provides the first quality-controlled NODC regional ocean climatology with $1/10^\circ \times 1/10^\circ$ spatial resolution and monthly temporal resolution for both temperature and salinity.
- Higher spatial resolutions – here the $1/10^\circ \times 1/10^\circ$ resolution – provide major advantages in the areas where such resolutions are feasible and supported by data availability. The quality control on a higher-resolution grid reveals more outliers than an analysis on coarser resolution grids.
- The structure of the gridded fields is far better sustained, especially in regions with sharp gradients of the essential oceanographic parameters (temperature, salinity, etc.). They are better preserved in the generated climatological fields, which makes high-resolution climatologies more valuable for ocean modeling and other applications.

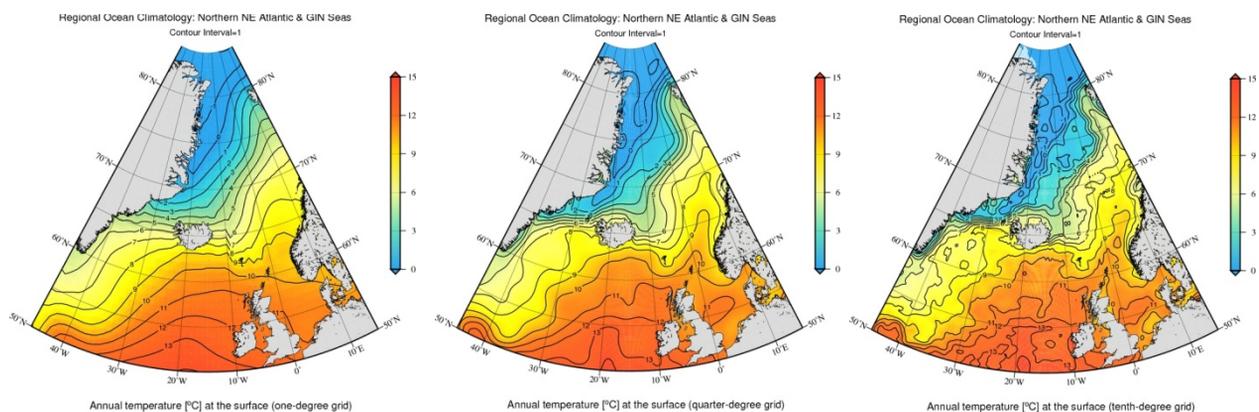


Figure 2. Annually mean surface temperature with three different resolutions: $1^\circ \times 1^\circ$ (left), $1/4^\circ \times 1/4^\circ$ (middle) and $1/10^\circ \times 1/10^\circ$ (right). The GINS RC is available for viewing and data downloading at the GINS RC web site: http://www.nodc.noaa.gov/OC5/regional_climate/gin-seas-climate/