Regional 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 in a selected region of the World Ocean. Regional climatologies are most valuable in the ocean regions that are critical for practical applications, such as fisheries, climate change monitoring, etc., with sufficient data coverage to justify the effort of creating high-resolution and high-quality climatological fields of the essential variables.

Only in a very few key ocean regions does data availability allow true high-resolution ocean climatologies to be possible, providing a new level of detail and understanding of ocean climate state and long-term variability. Coincidently, such regions are also most important from the long-term climate change perspective. Therefore, NCEI has recently begun a new project of developing high-resolution ocean Regional Climatologies (RC).

To date, four RCs were created and published using the data in the World Ocean Database: The Gulf of Mexico, East-Asian Seas, Arctic Ocean and most recently the Greenland-Iceland-Norwegian Seas (GINS). Additionally, the International Nordic Seas Atlas, which resulted from a US-Norway-Russia cooperative effort led by NCEI, was published by NOAA as the 5th NCEI RC project. The newest NCEI RC project is the Northwest Atlantic (NWA) Regional Climatology, which is now under construction and scheduled for publication in 2015. Figure 1 shows a snapshot of the NCEI Regional Climatology website showing the portal to all five RCs.

The NWA RC is even more advanced, with both mean and six decadal climatological temperature and salinity fields reconstructed in one of the most important U.S. and Canada coastal zones on one-tenth of degree grid, at 87 depth levels from 1955 to 2012.
Advantages of Regional Climatologies

The advantages of regional climatologies are many, and a clear demonstration can be done by comparing the low- to high-resolution climatologies in any of the completed regions.

Figure 2 shows three fields of sea surface temperature from the GINS RC.

Higher spatial resolutions—here the 1/10°x1/10° 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.

The most recent NCEI regional climatology project—the Northwest Atlantic Regional Climatology—is a part of the NOAA-wide project Sustaining Marine Ecosystems in a Changing Climate (SMECC) and will be a part of the proposed NOAA Climate Science Strategy plan complying with the first of the three Priority Activities: To conduct climate vulnerability analyses in each region for all Large Marine Ecosystems regions.” The first step in assessing climate vulnerability is to gain a better understanding of the state and trend of the ocean climate in key regions.