

Investigating the Overlap between the Mid-Atlantic Bight Cold Pool and Leased Off-Shore Wind Sites

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Overview

- The Cold Pool is a stratified coastal ocean feature that forms from increasing spring temperatures and breaks down from mixing events; it spans from Massachusetts to North Carolina.
- The Cold Pool has one of the largest differences in coastal bottom and surface water temperatures in the world.
- The Cold Pool supports East Coast fisheries and can help reduce storm strength.

Monthly Averaged Cold Pool Temperatures

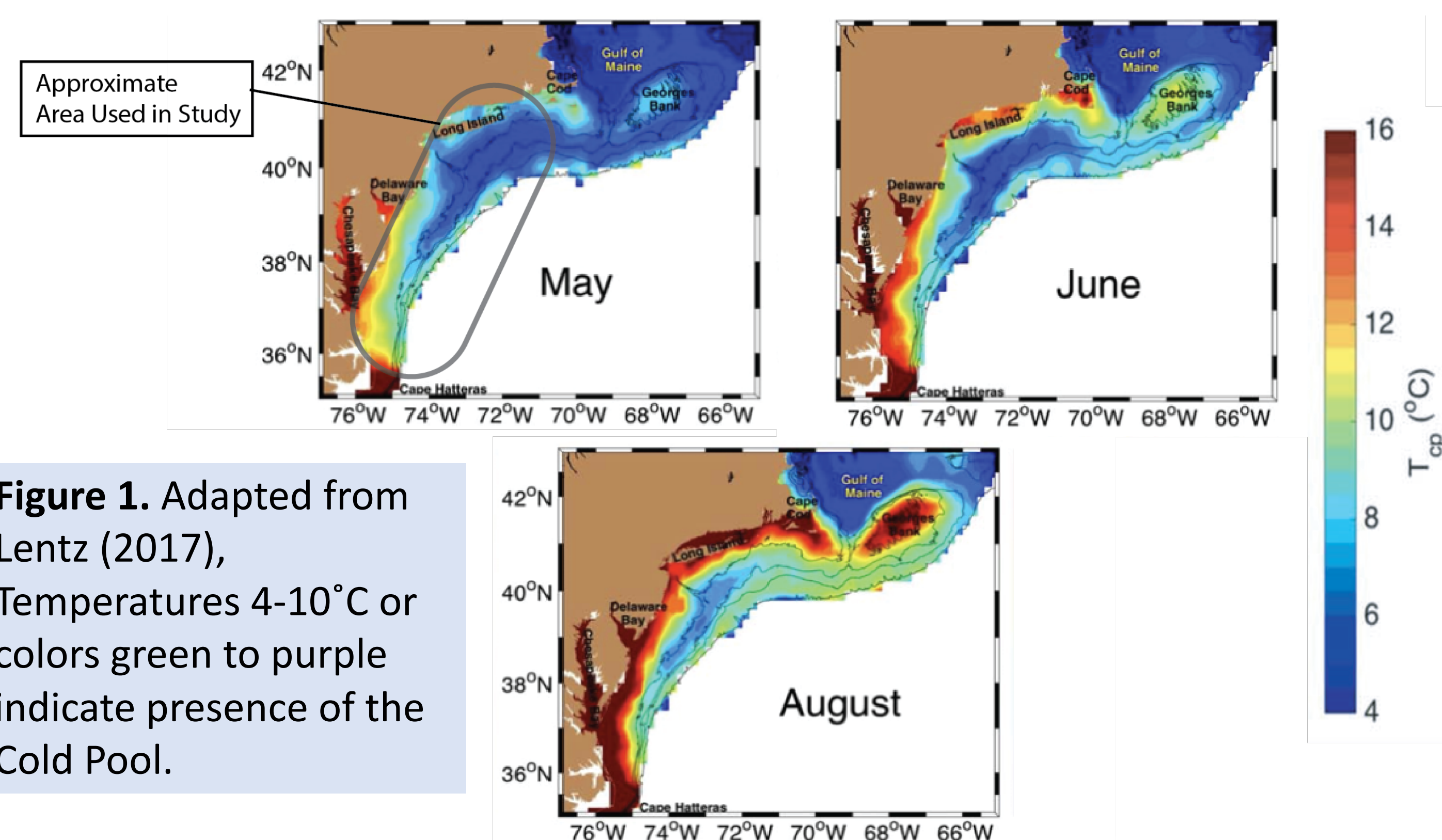


Figure 1. Adapted from Lentz (2017), Temperatures 4-10°C or colors green to purple indicate presence of the Cold Pool.

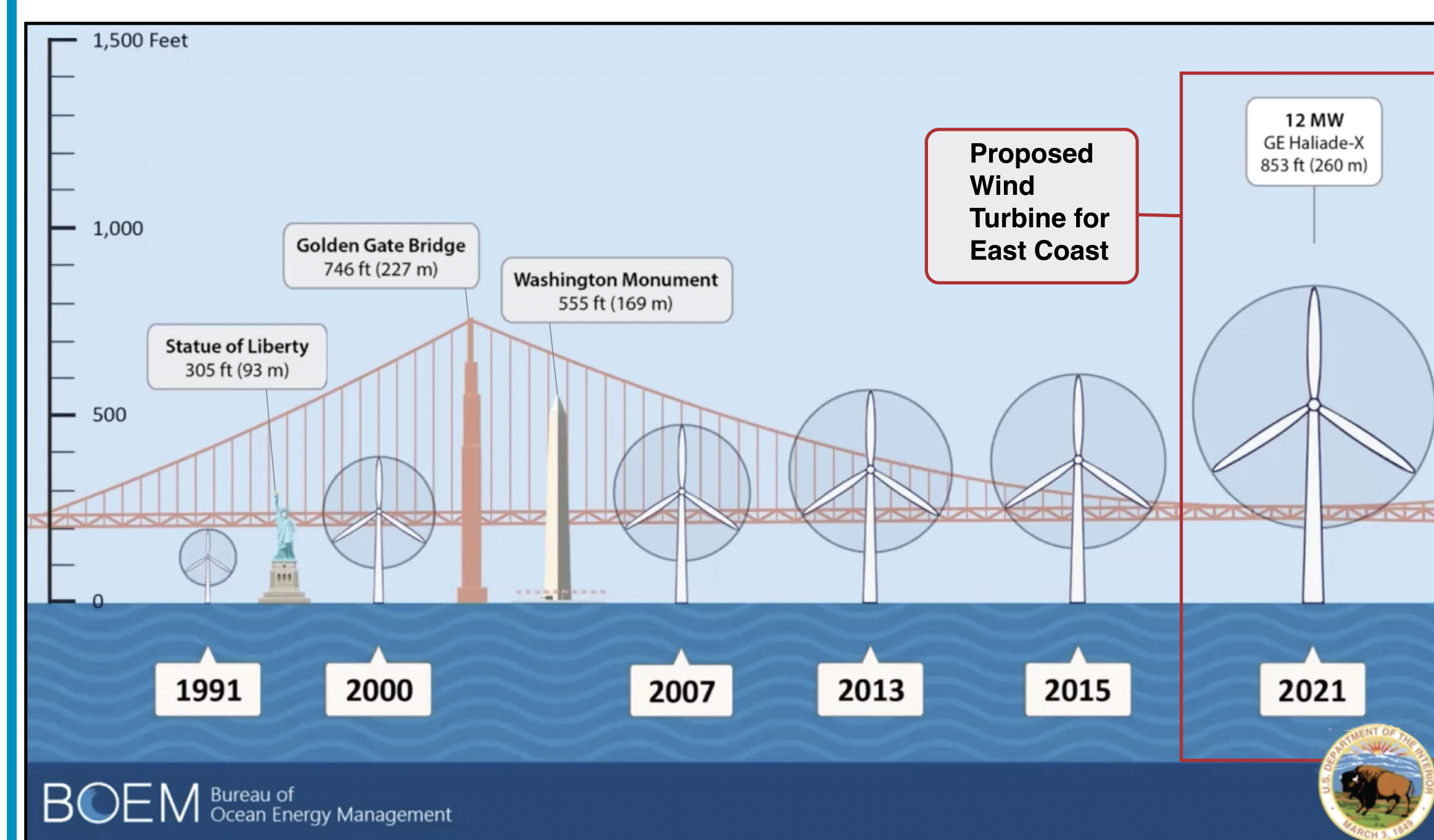


Figure 2. Adapted from Cluck (2022), size of existing and proposed wind turbines.

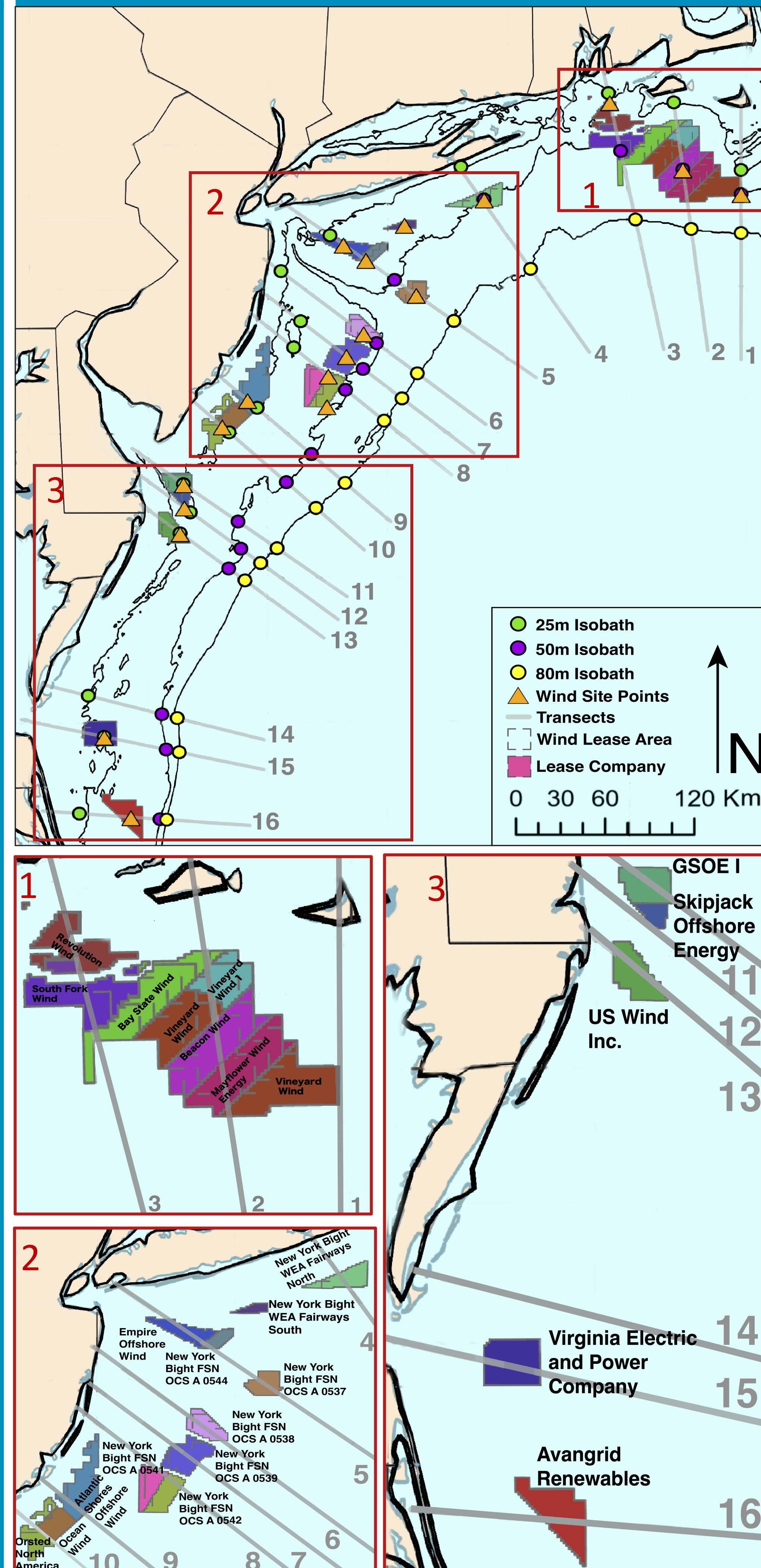


Figure 3. The study area is depicted with the 25, 50 and 80m isobaths shown in black. Transects are labeled and Selected points within each wind lease site are shown with orange triangles. Figures 3.1, 3.2 and 3.3 depict company names of leased areas.

Methods

*Data was acquired from the Regional Ocean Modeling System-based Circulation model (ROMS) for the Mid Atlantic Bight (MAB) known as Doppio.

- Doppio has a 7km horizontal grid with 40 vertical levels.
- Temperature and Salinity monthly averages of daily simulations from 2007 to 2020 were collected.
- Using python the levels were translated to bathymetry

*Data for selected points along the 25, 50 and 80m for 16 transects and within MAB wind lease sights were chosen from the Doppio model and integrated into python.

*Dt/Dz was calculated and bottom temperature was pulled out.

- The mean monthly Dt/Dz and bottom temperature were calculated from 2007-2020

Results

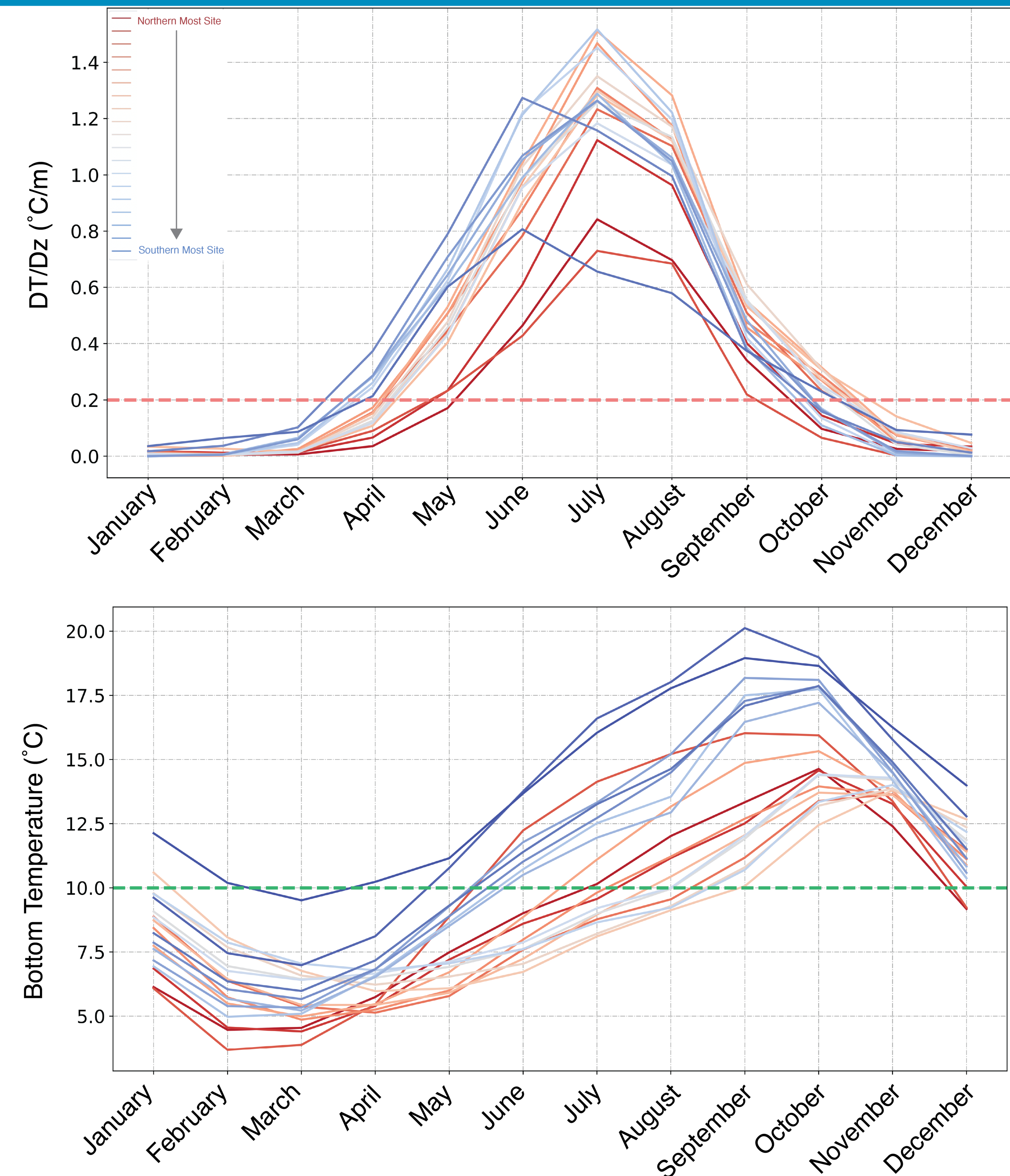


Figure 4. Monthly averaged bottom temperature and Dt/Dz values from 2007-2020 are shown for each selected point within wind lease areas (shown as an orange triangle in figure 3). The Cold Pool exists when the bottom temperature is below the dashed green line (10°C) and above the dashed red line (0.2°C/m).

Findings

- The Cold Pool exists in 18 of 19 selected points within the wind lease areas (Fig. 4).
- The Cold Pool exists for longer in sites farther offshore (Fig. 4)
- Stratification above 0.2°C/m begins earlier in southern sites.
- In nearshore sites, stratification of the water column (dT/dz °C/m) continues through the fall, even after the bottom temperature warms above 10°C (Fig. 4).
- Our finding of the continued stratification past August is significant because it highlights that stratification in near shore sites continues despite warming bottom temperatures. Stratification, regardless of warming bottom temperatures, is important to fishery habitats.

Big Picture:

- Studies in Europe have shown Offshore Wind to increase water column mixing.
- Will there be similar effects in the U.S?

Acknowledgements

- Data is available at López, A. G., J. L. Wilkin, and J. C. Levin (2020), Doppio-a ROMS (v3.6)-based circulation model for the Mid-Atlantic Bight and Gulf of Maine: Configuration and comparison to integrated coastal observing network observations, *Geosci. Model Dev.*, 13(8), 3709–3729, doi:10.5194/gmd-13-3709-2020.
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