

JOINT EVENT

5th World Conference on **Climate Change**

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16th Annual Meeting onOctober 04-06, 2018
London, UK**Environmental Toxicology and Biological Systems****Recent shifts in continental shelf/slope oceanographic processes in the Northeastern United States****Glen Gawarkiewicz**

Woods Hole Oceanographic Institution, USA

Statement of the Problem: The continental shelf and slope region of the Northeastern United States is rapidly warming (. Record warming of the continental shelf occurred in 2012 due to a northward shift in the atmospheric jet stream during winter and a corresponding reduction in heat loss from the ocean in winter. Warming of the continental shelf occurs from both atmospheric effects as well as ocean advection. How have oceanographic processes changed over the past ten years?

Methodology & Theoretical Orientation: A recent ocean observatory, the Ocean Observatories Initiative, Pioneer Array, is providing new data and insights into continental shelf and slope processes of New England. It has been in operation since 2014. In addition, a cooperative research program, the Commercial Fisheries Research Foundation/Woods Hole Oceanographic Institution, Shelf Research Fleet is providing vertical profiles of temperature and salinity across the continental shelf south of New England since November 2014.

Findings: Data from both the Pioneer Array and Shelf Research Fleet show that there have been significant exchange events at the shelfbreak (edge of continental shelf) in which waters of Gulf Stream origin are carried considerable distances across the continental shelf. A particularly dramatic event in December 2016/January 2017 resulted in a warm temperature anomaly of over 5°C, lasting over a month across most of the continental shelf. Several other significant ring intrusion events have been observed since 2014.

Conclusion & Significance: The ring intrusion event led to significant ecological effects, including the presence of warm water species over the continental shelf in January 2017. Further work is necessary to understand Gulf Stream motions and their impact on the continental shelf south of New England (Andres 2016).

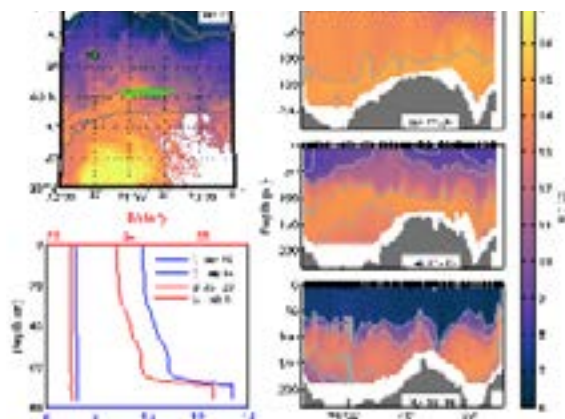


Figure 1: A map of sea surface temperature from January 2017 (upper left panel). Along slope sections of temperature from a glider of the Pioneer Array appear in the three panels to the right from January, February, and March 2017. The lower left panel shows temperature and salinity profiles from January and February 2017. The temperature of over 10 Degrees C was a 5 degree C warm anomaly compared to a recent climatology.

Recent Publications

1. Gawarkiewicz G, R Todd, W Zhang, J Partida, A Gangopadhyay, et al. (2018) Recent changes in shelf break exchange processes as revealed by the OOI pioneer array. *Oceanography* 31:60–70.
2. Andres M (2016) On the recent destabilization of the Gulf Stream path downstream of Cape Hatteras. *Geophysical Research Letters* 43:9836–9842.

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3. Chen K, Y Kwon and G Gawarkiewicz (2016) Interannual variability of winter spring temperature in the Middle Atlantic Bight: relative contributions of atmospheric and oceanic processes. *Journal of Geophysical Research* 121:4209–4227.
4. Pershing A, M Alexander, C Hernandez, L Kerr, A LeBris, et al. (2015) Slow adaptation in the face of ocean warming leads to collapse of Gulf of Maine cod fishery. *Science* 350:809–812.
5. Chen K, G Gawarkiewicz, S Lentz and J Bane (2014) Diagnosing the warming of the northeastern U.S. coastal ocean in 2012: a linkage between the atmospheric jet stream variability and ocean response. *Journal of Geophysical Research* 119:218–227.

Biography

Glen Gawarkiewicz is a Physical Oceanographer at the Woods Hole Oceanographic Institution. His research focuses on shelfbreak processes and the exchange of water masses between the continental shelf and the deep ocean. He has been involved in the planning and scientific direction for the Ocean Observatories Initiative, Pioneer Array. He works closely with the Commercial Fisheries Research Foundation of Rhode Island on collaborative research.

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