YSI data from the Neuse River from 2008-2013

Website: https://www.bco-dmo.org/dataset/767641
Data Type: Other Field Results
Version: 1
Version Date: 2019-05-13

Project

» Collaborative Research: Regulation of Phytoplankton Dynamics in Mid-Atlantic Estuaries Subject to Climatic Perturbations (climate_phyto_estuaries)

Contributors	Affiliation	Role
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Abstract

The Neuse River Estuary Water Quality Dataset is a compilation of the biological, chemical and physical water quality data that was collected along the length of the Neuse River Estuary, NC from March 14, 1985 to February 15, 1989 and from January 24, 1994 to the present. The primary purpose of this dataset was to provide long-term environmental information to supplement experimental, process-based research, including the Atlantic Coast Environmental Indicators Consortium (ACE-INC) project as well as other laboratory studies.

Table of Contents

Coverage

Spatial Extent: **N**:35.2106 **E**:-76.52602 **S**:34.94888 **W**:-77.1222

Temporal Extent: 2008-01-15 - 2013-12-09

Dataset Description

The Neuse River Estuary Water Quality Dataset is a compilation of the biological, chemical and physical water quality data that was collected along the length of the Neuse River Estuary, NC from March 14, 1985 to February 15, 1989 and from January 24, 1994 to the present. The primary purpose of this dataset was to provide long-term environmental information to supplement experimental, process-based research, including the Atlantic Coast Environmental Indicators Consortium (ACE-INC) project as well as other laboratory studies.

This dataset contains auxiliary YSI data related to the dataset Neuse River Estuary WQ, https://www.bco-dmo.org/dataset/767391.

Acquisition Description

Bi-weekly water sampling and in situ measurements were performed at fixed sampling stations. In situ measurements were performed throughout the water column in 0.5 meter depth increments. Parameters measured include: temperature, salinity, specific conductivity, dissolved oxygen (DO), pH, chlorophyll fluorescence, photosynthetically active radiation (PAR), turbidity, and barometric pressure.

Methods

Water sampling was conducted bi-weekly. When collection was split over two days, a single date was used based on the upstream or majority stations.

Stations were selected to cover the entire length of the Neuse River Estuary from Streets Ferry Bridge (Station 0) to the mouth of the estuary where it flows into Pamlico Sound. When possible, efforts were made to select locations with key stationary features (channel markers, buoys and land markers) to allow easy station identification in the field.

Surface water samples were collected by submerging 10 liter high-density polyethylene containers just below the water surface or by filling the containers with surface water collected from bucket casts. Bottom water samples were collected with a horizontal plastic Van Dorn sampler. Starting December 2007, all samples collected with diaphragm pump and a weighted, marked hose. All containers were kept in dark coolers at ambient temperature during transport to the laboratory. All filtration was done within a few hours of collection and when conditions permitted, on board the research vessel.

Prior to the 09/13/2000 sampling date, in situ measurements were performed at discrete depths using a Hydrolab Data Sonde 3 equipped with a multiprobe and SVR3 display logger. Beginning on the 09/13/2000 sampling date, in situ measurements were performed at discrete depths on the sunlit side of the research vessel using a Yellow Springs Instruments (YSI Incoporated, Ohio) multiparameter sonde (Model 6600 or 6600 EDS-S Extended Deployment System) equipped with a YSI conductivity/temperature probe (Model 6560), a YSI chlorophyll probe (Model 6025), a YSI pH probe (Model 6561 or 6566), a YSI pulsed dissolved oxygen probe (Model 6562), a self cleaning YSI turbidity probe (Model 6026 or 6136), and beginning on the 07/30/2003 sampling date, a flat Li-Cor sensor (UWQ-PAR 6067). The YSI sonde was coupled to a either a YSI 610 DM datalogger or a YSI 650 MDS Multi-parameter Display System datalogger. In situ measurements were performed at the surface (approximately 0.2 meters) and at the bottom of the water column (approximately 0.5 meters from the sediment layer). These data are included in the worksheet titled "NRE Dataset." In situ measurements were also performed throughout the water column in 0.5 meter depth increments. These data are included in the worksheet titled "NRE YSI Profiles." The data were stored on the datalogger and downloaded to Ecowin software upon return to the laboratory.

Distance (in river kilometers) was calculated using ESRI ArcGIS software. Distances were calculated using projected station locations (North Carolina State Plane 1983 meters projection). Distances from station 0 through 30 (upper river stations) were measured along the main channel of the river. Distances from stations 30 to 180 were measured as straight lines between stations

Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- appended the AMS station coordinate information

[table of contents | back to top]

Related Publications

Crosswell, J. R., Wetz, M. S., Hales, B., & Paerl, H. W. (2012). Air-water CO2fluxes in the microtidal Neuse River Estuary, North Carolina. Journal of Geophysical Research: Oceans, 117(C8), n/a–n/a. doi:10.1029/2012JC007925

Crosswell, J. R., Wetz, M. S., Hales, B., & Paerl, H. W. (2014). Extensive CO2 emissions from shallow coastal waters during passage of Hurricane Irene (August 2011) over the Mid-Atlantic Coast of the U.S.A. Limnology and Oceanography, 59(5), 1651–1665. doi:10.4319/lo.2014.59.5.1651

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Harding, L. W., Batiuk, R. A., Fisher, T. R., Gallegos, C. L., Malone, T. C., Miller, W. D., … Tango, P. (2013). Scientific Bases for Numerical Chlorophyll Criteria in Chesapeake Bay. Estuaries and Coasts, 37(1), 134–148. doi:10.1007/s12237-013-9656-6

Harding, L. W., Gallegos, C. L., Perry, E. S., Miller, W. D., Adolf, J. E., Mallonee, M. E., & Paerl, H. W. (2015). Long-Term Trends of Nutrients and Phytoplankton in Chesapeake Bay. Estuaries and Coasts, 39(3), 664–681. doi:10.1007/s12237-015-0023-7

Harding,, L. W., Mallonee, M. E., Perry, E. S., Miller, W. D., Adolf, J. E., Gallegos, C. L., & Paerl, H. W. (2016). Variable climatic conditions dominate recent phytoplankton dynamics in Chesapeake Bay. Scientific Reports, 6(1). doi:10.1038/srep23773

Havens, K., Paerl, H., Phlips, E., Zhu, M., Beaver, J., & Srifa, A. (2016). Extreme Weather Events and Climate Variability Provide a Lens to How Shallow Lakes May Respond to Climate Change. Water, 8(6), 229. doi:10.3390/w8060229

Hounshell, A. G., Peierls, B. L., Osburn, C. L., & Paerl, H. W. (2017). Stimulation of Phytoplankton Production by Anthropogenic Dissolved Organic Nitrogen in a Coastal Plain Estuary. Environmental Science & Technology, 51(22), 13104–13112. doi:10.1021/acs.est.7b03538

Kennish, M. J., & Paerl, H. W. (Eds.). (2010). Coastal Lagoons. doi:10.1201/EBK1420088304

Paerl, H. W., & Paul, V. J. (2012). Climate change: Links to global expansion of harmful cyanobacteria. Water Research, 46(5), 1349–1363. doi:10.1016/j.watres.2011.08.002

Paerl, H. W., Crosswell, J. R., Van Dam, B., Hall, N. S., Rossignol, K. L., Osburn, C. L., … Harding, L. W. (2018). Two decades of tropical cyclone impacts on North Carolina's estuarine carbon, nutrient and phytoplankton dynamics: implications for biogeochemical cycling and water quality in a stormier world. Biogeochemistry, 141(3), 307–332. doi:10.1007/s10533-018-0438-x

Paerl, H. W., Hall, N. S., Peierls, B. L., & Rossignol, K. L. (2014). Evolving Paradigms and Challenges in Estuarine and Coastal Eutrophication Dynamics in a Culturally and Climatically Stressed World. Estuaries and Coasts, 37(2), 243–258. doi:10.1007/s12237-014-9773-x

Paerl, H. W., Hall, N. S., Peierls, B. L., Rossignol, K. L., & Joyner, A. R. (2013). Hydrologic Variability and Its Control of Phytoplankton Community Structure and Function in Two Shallow, Coastal, Lagoonal Ecosystems: The Neuse and New River Estuaries, North Carolina, USA. Estuaries and Coasts, 37(S1), 31–45. doi:10.1007/s12237-013-9686-0

Paerl, H. W., Rossignol, K. L., Hall, S. N., Peierls, B. L., & Wetz, M. S. (2009). Phytoplankton Community Indicators of Short- and Long-term Ecological Change in the Anthropogenically and Climatically Impacted Neuse River Estuary, North Carolina, USA. Estuaries and Coasts, 33(2), 485–497. doi:10.1007/s12237-009-9137-0

Paerl, H.W. and B.L. Peierls. 2008. Ecological Responses of the Neuse River–Pamlico Sound Estuarine Continuum to a Period of Elevated Hurricane Activity: Impacts of Individual Storms and Longer Term Trends. American Fisheries Society Symposium 64:101-116.

Paerl, H.W., R.R. Christian, J.D. Bales, B.L. Peierls, N.S. Hall, A.R. Joyner, and S.R. Riggs. 2010. Assessing the response of the Pamlico Sound, North Carolina, USA to human and climatic disturbances: Management implications. Pp.17-42, In. M. Kennish and H. Paerl (Eds.) Coastal Lagoons: Critical Habitats of Environmental Change. CRC Marine Science Series, CRC Press, Boca Raton, FL.

Peierls, B. L., Hall, N. S., & Paerl, H. W. (2012). Non-monotonic Responses of Phytoplankton Biomass Accumulation to Hydrologic Variability: A Comparison of Two Coastal Plain North Carolina Estuaries. Estuaries and Coasts, 35(6), 1376–1392. doi:10.1007/s12237-012-9547-2

Thompson, P. A., O'Brien, T. D., Paerl, H. W., Peierls, B. L., Harrison, P. J., & Robb, M. (2015). Precipitation as a driver of phytoplankton ecology in coastal waters: A climatic perspective.

Estuarine, Coastal and Shelf Science, 162, 119–129. doi:10.1016/j.ecss.2015.04.004

Van Dam, B. R., Crosswell, J. R., Anderson, I. C., & Paerl, H. W. (2018). Watershed-Scale Drivers of Air-Water CO 2 Exchanges in Two Lagoonal North Carolina (USA) Estuaries. Journal of Geophysical Research: Biogeosciences, 123(1), 271–287. doi:10.1002/2017JG004243

Wetz, M. S., & Paerl, H. W. (2008). Estuarine Phytoplankton Responses to Hurricanes and Tropical Storms with Different Characteristics (Trajectory, Rainfall, Winds). Estuaries and Coasts, 31(2), 419–429. doi:10.1007/s12237-008-9034-y

Wetz, M. S., Hutchinson, E. A., Lunetta, R. S., Paerl, H. W., & Christopher Taylor, J. (2011). Severe droughts reduce estuarine primary productivity with cascading effects on higher trophic levels. Limnology and Oceanography, 56(2), 627–638. doi:10.4319/lo.2011.56.2.0627

[table of contents | back to top]

Parameters

Parameter	Description	Units
Zlevel1	Column used to determine surface or near bottom designation (closest reading to 0.5 m from bottom or last reading)	unitless
Zlevel2	Column used to determine surface or near bottom designation (closest reading to 0.5 m from bottom or last reading)	unitless
Date	Date of water sample collection; filtration; and in situ measurements.	unitless
Station	The name of the fixed sampling station.	unitless
Time	Exact time (hours:minutes:seconds) when the in situ measurements were made. This time is an approximate water sampling time.	unitless
Depth	Exact depth (meters) where the in situ measurements were made.	meters (m)
Temp	In situ water temperature	degrees Celsius
SpCond	In situ specific conductivity	milli Siemens per centimeter

Salinity	In situ salinity	parts per thousand
DOsat	In situ dissolved oxygen saturation	percent
DOconc	In situ dissolved oxygen concentration	milligrams per liter
pH	In situ pH.	unitless
Turbidity	In situ turbidity	NTU
Fluorescence	In situ chlorophyll fluorescence	relative fluorescence units
Chlorophyll	In situ chlorophyll concentration from fluorescence	micrograms per liter
PARdepth	Depth where PAR measurements were taken	meters (m)
PAR1	Photosynthetically active radiation	Einsteins/m2/s
PAR2	Photosynthetically active radiation	Einsteins/m2/s
BarPress	Surface barometric pressure	millimeters of mercury
ODO	Whether optical DO sensor used (Y or N)	unitless
DOsat_calc	Whether DO saturation value calculated in spreadsheet (Y or N)	unitless
DOconc_calc	Whether DO concentration value calculated in spreadsheet(Y or N)	unitless
Notes	notes	unitless
ISO_DateTime	Date and time combined into ISO8601 format	unitless
Station_Description	The physical location of the sampling station such as at or near a particular river marker; buoy; road or bridge. Lists other names that may also be used to refer to this station.	unitless
km0	The distance (in kilometers) of the sampling station from station 0.	kilometers (km)
Lat	North latitude of station in decimal degrees	decimal degrees

Lon	West longitude of station in decimal degrees	decimal degrees

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Yellow Springs Instruments (YSI Incoporated, Ohio) multiparameter sonde (Model 6600 or 6600 EDS-S Extended Deployment System)
Generic Instrument Name	YSI Sonde 6-Series
Dataset-specific Description	Beginning on the 09/13/2000 sampling date, in situ measurements were performed at discrete depths on the sunlit side of the research vessel using a Yellow Springs Instruments (YSI Incoporated, Ohio) multiparameter sonde (Model 6600 or 6600 EDS-S Extended Deployment System) equipped with a YSI conductivity/temperature probe (Model 6560), a YSI chlorophyll probe (Model 6025), a YSI pH probe (Model 6561 or 6566), a YSI pulsed dissolved oxygen probe (Model 6562), a self cleaning YSI turbidity probe (Model 6026 or 6136), and beginning on the 07/30/2003 sampling date, a flat Li-Cor sensor (UWQ-PAR 6067).
Generic Instrument Description	YSI 6-Series water quality sondes and sensors are instruments for environmental monitoring and long-term deployments. YSI datasondes accept multiple water quality sensors (i.e., they are multiparameter sondes). Sondes can measure temperature, conductivity, dissolved oxygen, depth, turbidity, and other water quality parameters. The 6-Series includes several models. More from YSI.

Project Information

Collaborative Research: Regulation of Phytoplankton Dynamics in Mid-Atlantic Estuaries Subject to Climatic Perturbations (climate_phyto_estuaries)

Website: http://paerllab.web.unc.edu/projects/modmon/

Coverage: The two largest estuaries in the United States, Chesapeake Bay (CB) and Albemarle-Pamlico Sound- Neuse River Estuary (APS-NRE).

NSF Award Abstract: Climatic perturbations by drought-flood cycles, tropical storms, and hurricanes are increasingly important in Mid-Atlantic estuaries, leading to ecosystem-scale responses of the plankton system with significant trophic implications. Recent observations support an emerging paradigm that climate dominates nutrient enrichment in these ecosystems, explaining seasonal and interannual variability of phytoplankton floral composition, biomass (chl-a), and primary production (PP). This project will evaluate this paradigm in the two largest estuaries in the United States, Chesapeake Bay (CB) and Albemarle-Pamlico Sound-Neuse River Estuary (APS-NRE) by quantifying responses to climatic perturbations. This project will: (1) resolve long-term trends of plankton biomass/production from high variability driven by climatic forcing, such as drought-flood cycles that generate significant departures from the norm; (2) quantify the role of episodic wind and precipitation events, such as those associated with frontal passages, tropical storms, and hurricanes, that evoke consequential spikes of biomass/production outside the resolution of traditional methods. The field program will focus on event-scale forcing of phytoplankton dynamics by collecting shipboard, aircraft remote sensing, and satellite (SeaWiFS, MODIS-A) data, analyzing extensive monitoring data for CB and APS-NRE to develop context, and quantifying effects of climatic perturbations on phytoplankton dynamics as departures from long-term averages. The rapid-response sampling will be paired with numerical simulations using coupled hydrodynamic biogeochemical models based on the Regional Ocean Modeling System (ROMS). This combination of observations and modeling will be used to explore mechanistic links and test empirical relationships obtained from field data. Intellectual Merit. Drought-flood cycles, tropical storms, and hurricanes are occurring at increasing severity and frequency, exerting significant pressures on land margin ecosystems. Research and monitoring in these ecosystems has focused singularly on eutrophication for nearly five decades. Recognition of climatic perturbations as the underlying cause of phytoplankton variability represents a significant departure from this singular focus. This project will combine

observations and modeling to significantly extend our knowledge of how climate regulates phytoplankton dynamics in estuaries. Progress in calibrating and validating hydrodynamic biogeochemical models with data collected in CB and APS-NRE by this project will lead to predictive capabilities thus far unattained, allowing us to evaluate the paradigm that climatic perturbations regulate phytoplankton dynamics in estuaries. Broader Impacts: Addressing the effects of climatic perturbations on phytoplankton dynamics in estuaries with a combination of data collection, analysis, and mechanistic modeling has societal benefits for scientists and resource managers. Applications in addition to ?basic? science include the consideration of climatic forcing in designing effective nutrient management strategies. Specific impacts include: (1) quantifying the effects of climatic perturbations on planktonic processes for important estuarine-coastal ecosystems; (2) extending empirically-based water quality criteria forward by enabling predictions of floral composition, chl-a, and PP in changing climate conditions; (3) combining observations and mechanistic models to support scenario analysis, allowing us to distinguish long-term trends from variability imposed by climate. This project will offer a graduate course in physical transport processes and plankton productivity that will benefit from this research, support two Ph.D. students, and train undergraduates in NSF REU and minority outreach programs at HPL-UMCES and IMS-UNC. The main products will be peer-reviewed publications and presentations at scientific meetings. The three PIs maintain active web sites that will be used to distribute results and data. NOTE: Dr. Harding was the original Lead PI. Dr. Michael R. Roman was named as substitute PI when Dr. Harding served as a Program Director in the NSF Biological Oceanography Program for two years, and through his move to UCLA thereafter. Dr. Harding is responsible for the data holdings on this project and for coordinating their submittal to BCO-DMO.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0825466

[table of contents | back to top]