Role of dissolved organic matter in estuarine primary production: A modeling study

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**Abstract**

Nutrient inputs can have cascading impacts on coastal ecosystems. A well-developed approach to analyze nutrient dynamics is the nutrient-phytoplankton-zooplankton (NPZ) model. Recently, the approach was modified by adding a benthic compartment to the NPZ model, which enabled the use of an oceanic model in coastal ecosystems. This new model was called a NPC (nutrient, phytolplankton, consumer) model. The current project builds upon the NPC model by adding a dissolved organic nitrogen (DON) component. High levels of DON can occur in estuaries, especially in areas of high salinity and hypersalinity, in contrast high levels of dissolved inorganic nitrogen (DIN) occur with decreasing salinity. This implies that a nitrogen form is a source, not consumed, in high salinity estuaries. Thus, the model compares four bays along the south Texas coast with different DON and DIN inputs that will act as the drivers of primary production, and thus secondary production.

**2. Methods**

(1) Nutrient input values for calibration

* WRTDS (Weighted Regressions on Time Discharge and Season)
  + Inputs: discharge and concentrations
  + Data requirements: >200 samples, 20 year period of sample collection
  + Used in: Paerl et al. 2018
  + References: Hirsch et al. 2010
  + R program

1. Data Format:
   * Discharge from USGS from major rivers
     + Keep in Ft3/S
     + 2 Columns Date Discharge
   * Nutrient data from TCEQ
     + In Mg/L N
     + Must be in CSV
     + 3 Columns Date Remark Concentration
     + Download is by segment need to have just one station
2. Model Settings:
   * Colorado = Default settings
     + Able to use station 12284 only
   * Guadalupe = Had to lower model limits
     + Took mean of all nutrient stations
     + minNumObs = 57, minNumUncen =13 (Organic)
       - The surface you are using extends 12 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
     + minNumObs = 40, minNumUncen =11, (Inorganic)
       - The surface you are using extends 16 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
   * Lavaca = Default
     + Mean of all nutrient stations in segment
     + The surface you are using extends 14 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
     + The surface you are using extends 8.9 years prior to the start,and 13 years past the end of the data of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
   * Nuecues = Had to lower model limits
     + Mean of all nutrient stations in segment
     + minNumObs = 46, minNumUncen =9, (Organic)
     + The surface you are using extends 9.1 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
     + minNumObs = 70, minNumUncen =13 (Inorganic)
     + The surface you are using extends 3.5 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
   * Tres = Had to lower model limits
     + Means of all nutrient stations in segment
     + minNumObs = 92, minNumUncen =37
     + The surface you are using extends 6.4 years prior to the start of the water quality data set.The surface is only reliable within the time period of the water quality data set.Extensions of a year or more should not be used to characterize trends. However, the factthat there are such extensions, does not harm the reliability of the surface or the trendresults within the period for which there are water quality data
     + minNumObs = 86, minNumUncen =36,