Hurricanes Accelerate Dissolved Organic Carbon Cycling in Coastal Ecosystems



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Hurricane Harvey



-August 26-30, 2017

- Category 4(>130 mph)
- 93 km³ of rainwater over 5 days







R/V Trident



- five trips (T1-T5), 10 stations (S1-S10)
- surface water
- 0.2 µm filtration

Methods and approach

- dissolved organic carbon (DOC)
- dissolved lignin phenols (TDLP₉)
- dissolved enantiomeric amino acids (THAA)
- UV-VIS absorbance properties
- bacterial community composition and function

land (vascular) plants



lignin-tracer for terrigenous OC





Evolution of DOC distribution and sources



Terrigenous DOC export flux



Freshwater load to Galveston Bay $14-17 \times 10^9 \text{ m}^3$

tDOC flux = freshwater DOC × freshwater export flux

Determination of freshwater endmember DOC

Method 1: measured river DOC concentrations during the first sampling cruise Method 2: extrapolated DOC at salinity 0 using DOC/salinity relationship

The input of tDOC to Galveston Bay for the entire storm event was 87 ± 18 Gg (95% was delivered within the first week), which is equivalent to the average annual tDOC load to Galveston Bay.

tDOC source and degradation mechanism



Citation: Lu C-J, Benner R, Fichot CG, Fukuda H, Yamashita Y and Ogawa H (2016) Sources and Transformations of Dissolved Lignin Phenols and Chromophoric Dissolved Organic Matter in Otsuchi Bay, Japan.

tDOC removal



 α, β – model parameters

Freshwater endmember

-measured values in river water during first cruise Seawater endmember -DOC assumed to be 80 μM

-lignin = 0

TDLP₉-C_{sample} – fitted concentration at $f_R = 1$ TDLP₉-C_{river} – concentration of river endmember t – water residence time in years

High decay constant (~3 times) → highly labile tDOC and/or efficient removal process

Linking mineralization of tDOC to microbial community structure



Sept. 9

Sept. 16

Sept. 28

Sept. 6

Summary

