Characterization of NOM Removal via Coagulation using Fluorescence Spectroscopy

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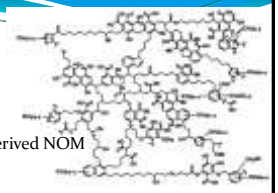
Outline

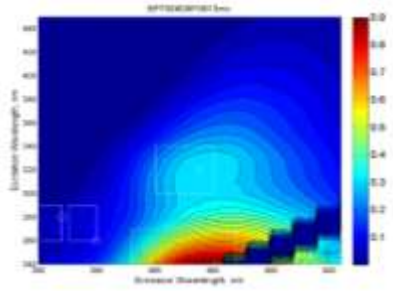
- Brief Background
  - What is NOM?
  - What is a DBP?
  - NOM Characterization with Fluorescence
- Project Objectives
- Experimental Methods
- Preliminary Results
- Future Work

Introduction

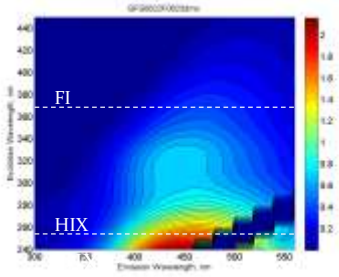


- Natural Organic Matter
  - Terrestrially or Microbially derived NOM
- Coagulation
- DBPs
  - Chlorine added to water as a form of disinfectant
  - NOM and Chlorine React -> Undesired chemical compound
  - Harmful to health – Carcinogenetic

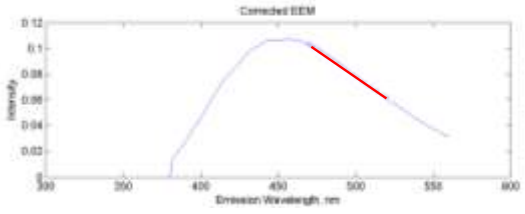
Fluorescence Spectroscopy - EEMs



FI and HIX Analyze Relative Intensities



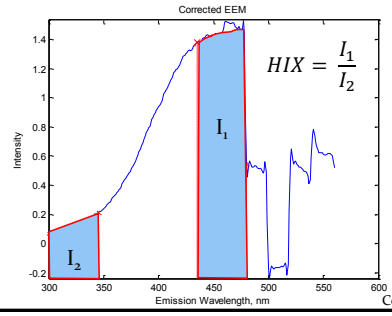
Fluorescence Index



- Lower FI (1.4) → more diversified aromatic NOM - suggesting terrestrial origin
- Steeper slope (1.9) → more homogenous less aromatic NOM - suggesting microbial origin

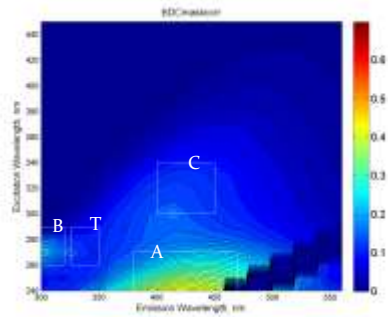
McKnight et. al., 2001

Humification Index



Cox et. al., 2000

Peak Picking



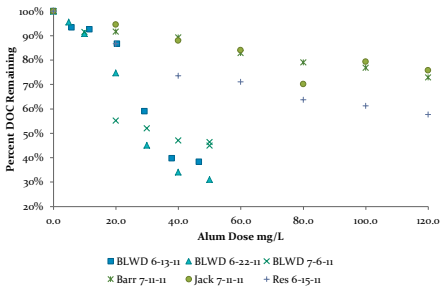
Project Objectives

- Use fluorescence spectroscopy to characterize the removal of NOM during coagulation
- Apply this analytical method to waters with a broad spectrum of NOM character
  - 5 Colorado Waters
  - 5 Water Sources Nationwide
- Compare the change in the C:N during the process of coagulation to the formation of HAN disinfection by-product formation

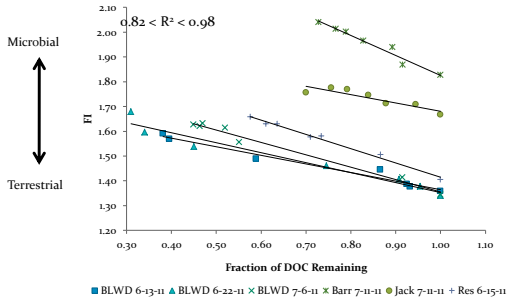
Experimental Methods

- Collect Water
- Initial Water Conditions:
  - Alkalinity and pH
- Jar tests
- Filter (0.7µm)
- Fluorescence and UV
  - Run UV for Inner Filter Corrections
  - Dilutions when UV_{254} above 0.2
- Measure DOC and TN
- Inorganic Nitrogen, DBPs, Metals Analysis

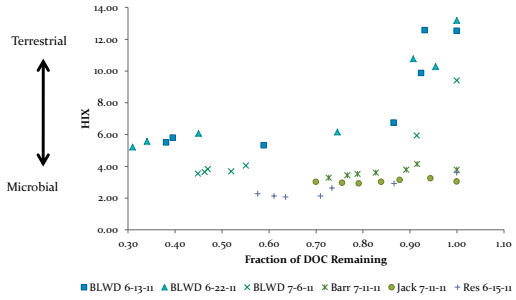
Dissolved Organic Carbon Removal



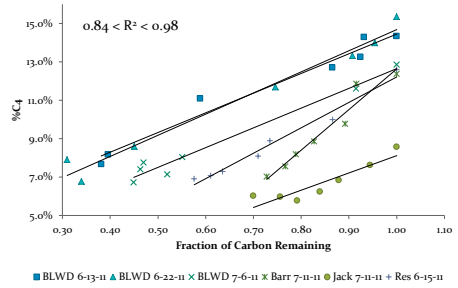
Fluorescence Index Results



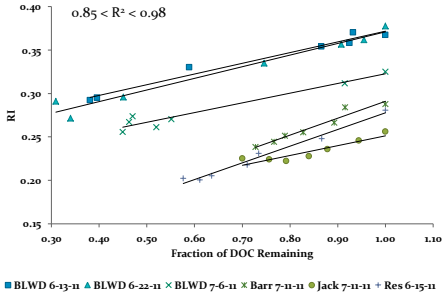
Humification Index Results



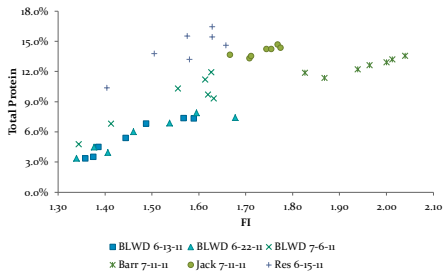
Reduced Quinone Results



Redox Index Results



Total Protein Results



Future Work

- Continue Water Collection
- Measure Inorganic Nitrogen levels
- Measure metals
- DBP Analysis
- Size Exclusion Chromatography Analysis
- Ultrafiltration

Questions?