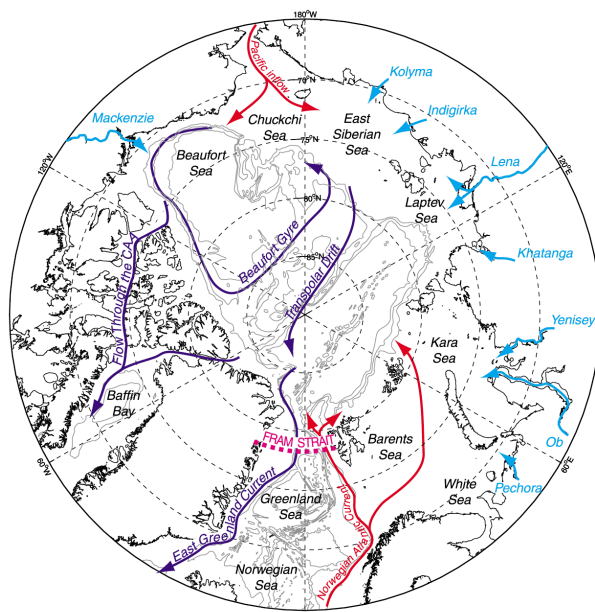


'TRACING THE COMPOSITION OF DOM IN THE ARCTIC OCEAN WITH FLUORESCENCE SPECTROSCOPY'

Rafael Gonçalves-Araujo
Colin A. Stedmon
Astrid Bracher

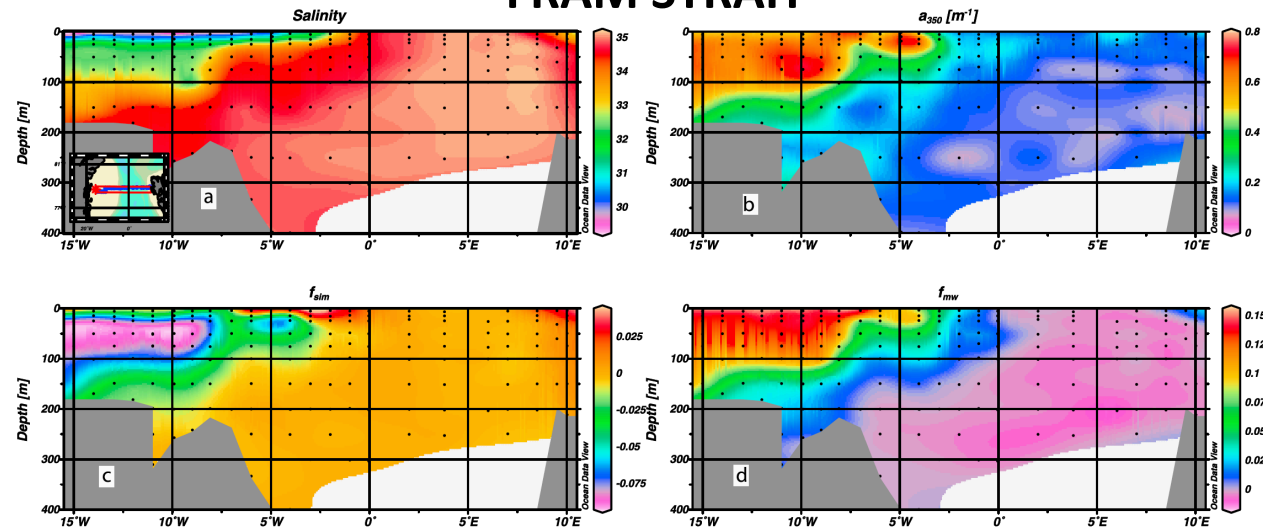
THE ARCTIC OCEAN

- Large DOM-pool
- Terrigenous material: more than 10% of global oceans (Benner et al 2004)
- Transpolar drift → Fram Strait (Rabe et al. 2013)



Dodd et al. 2012

FRAM STRAIT

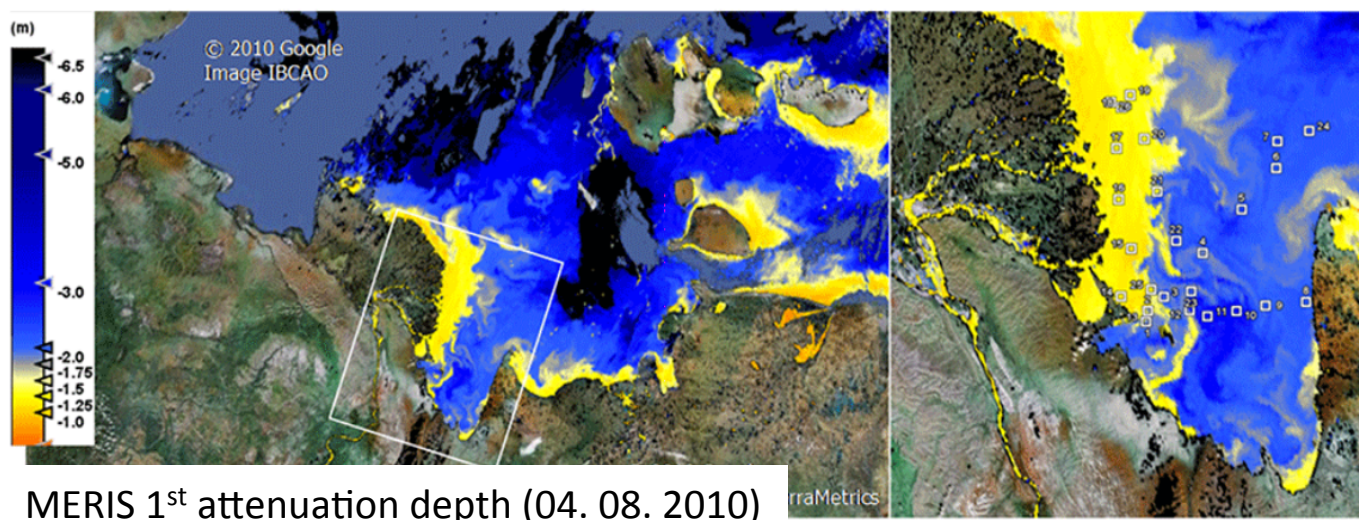


Granskog et al. (2012)

- Soils and peatlands → Rivers → Ocean (Opsahl et al 1999)

THE LENA RIVER AND DELTA REGION

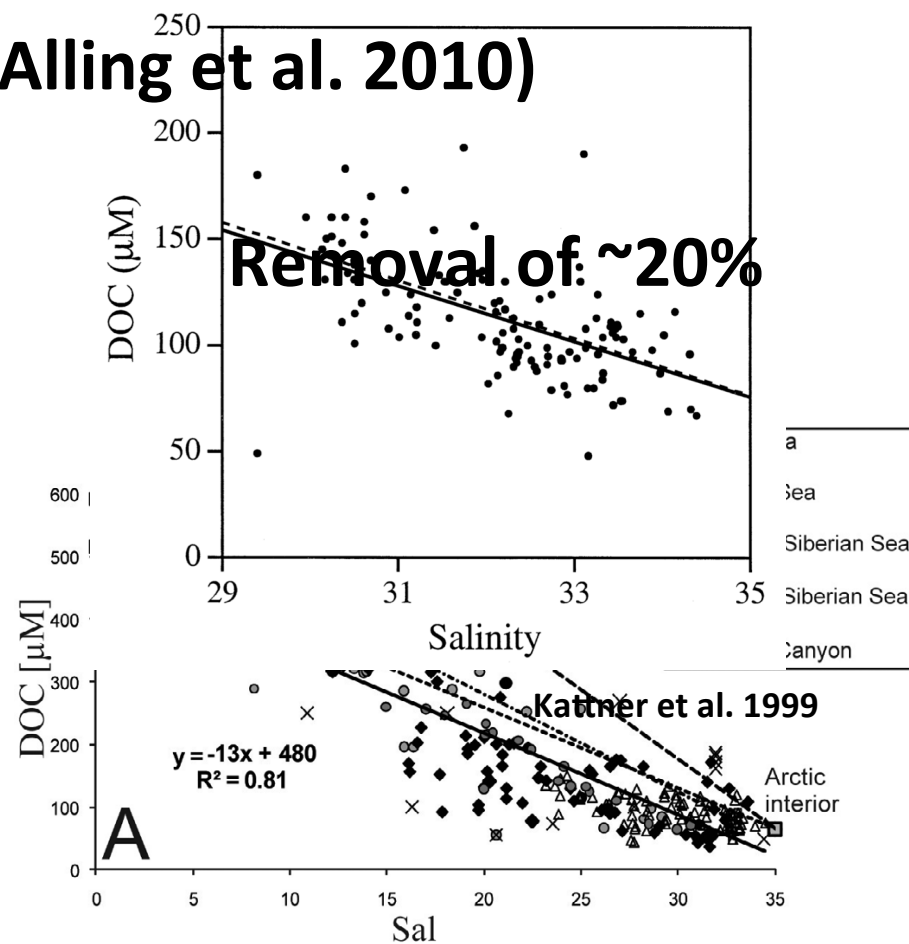
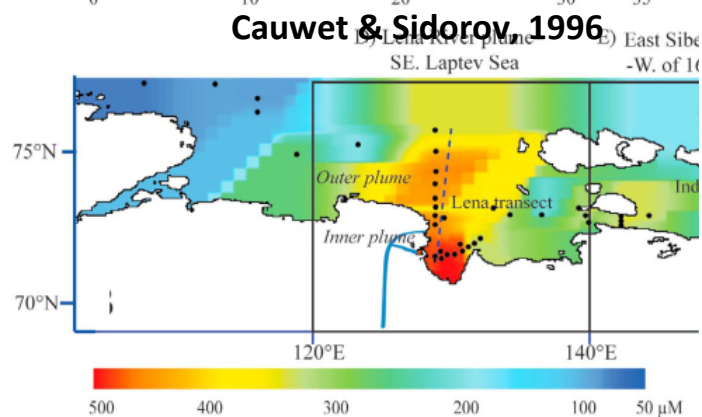
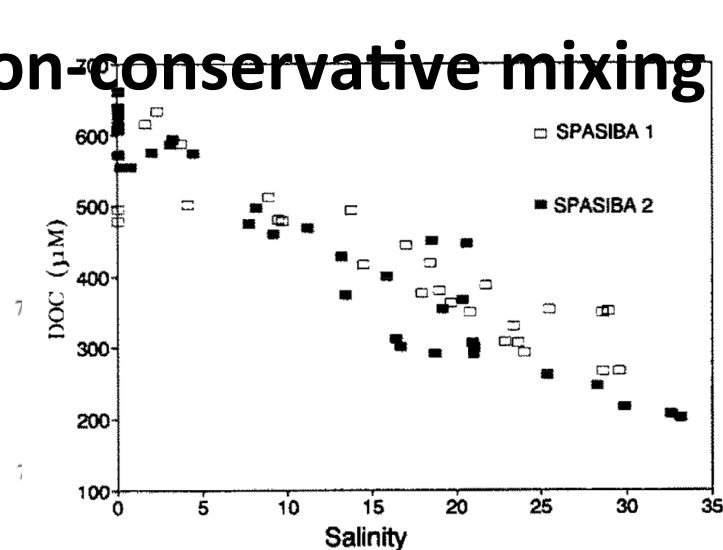
- **One of the largest rivers in the world**
 - ~20% total fresh water in the Arctic Ocean (Cauwet & Sidorov, 1996)
 - The greatest discharge of organic matter in the Arctic Ocean
 - Stedmon et al. (2011)
 - CDOM varies from ~ 12 to 36m^{-1} - dominance of humic signal
 - Walker et al. (2013)



Heim et al. (2014)

DOM IN THE LENA DELTA REGION

- Conservative mixing of DOM
- Non-conservative mixing (Alling et al. 2010)



OBJECTIVES

- to characterize the DOM by means of its optical properties
 - Lena Delta region
 - Fram Strait (preliminary results)

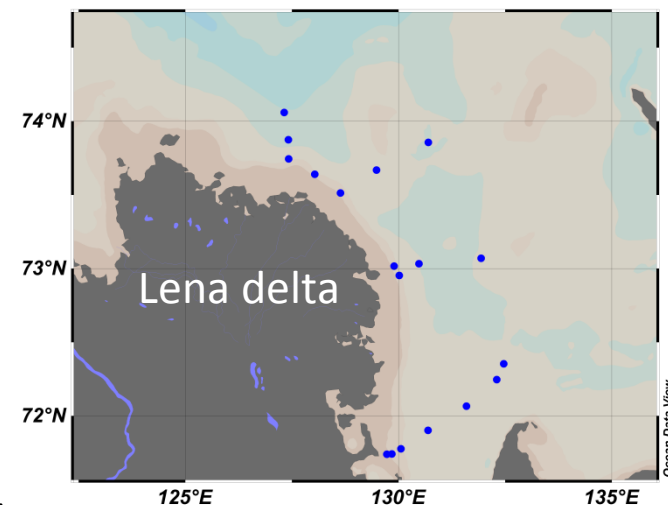
- to investigate the processes modulating the distribution and transformation of DOM within the Lena delta region

MATERIAL AND METHODS

• THE EXPEDITIONS

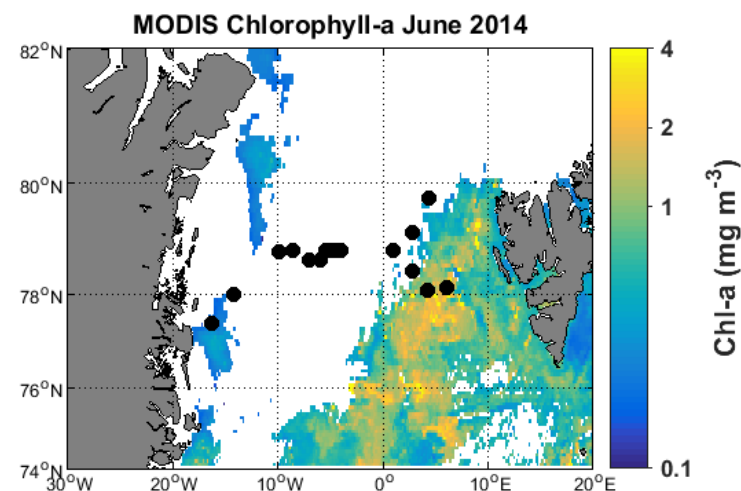
→ LENA DELTA

- 1-7 September 2013
- R/V “Dalniye Zelentsy”
- 4 transects → 18 Stn → 60 Samples



→ FRAM STRAIT

- 6 Jun – 2 Jul 2014
- R/V Polarstern
- 12 Stations → 66 samples



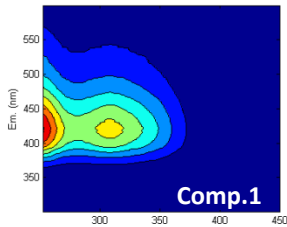
MATERIAL AND METHODS

- **DATA SET – DATA ANALYSIS**
 - CTD → UMLD, water column stratification (E)
 - DOC
 - Aqualog Fluorescence spectrometer
 - CDOM absorption @ 350nm
 - Excitation-Emission-Matrices (EEMs)
 - PARAFAC model
 - Stedmon & Bro, 2008; Murphy et al., 2013
 - Optical indices of DOM modification
 - S_{CDOM} , SUVA, FI, S_{ratio} , HIX and BIX

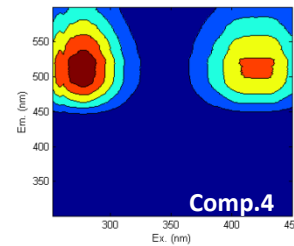
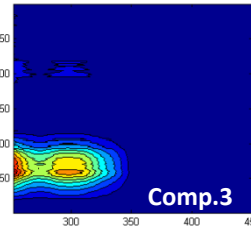
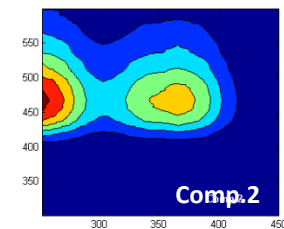
FDOM COMPONENTS

• LENA DELTA REGION

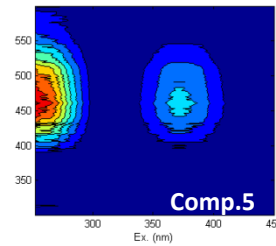
Walker et al., 2013



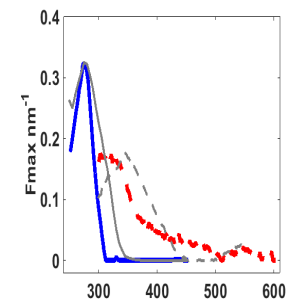
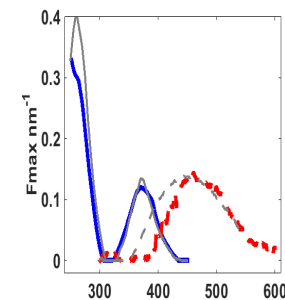
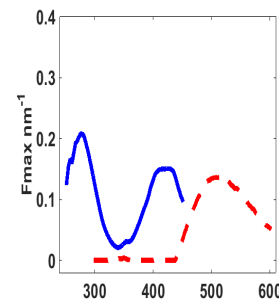
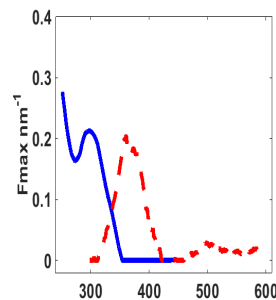
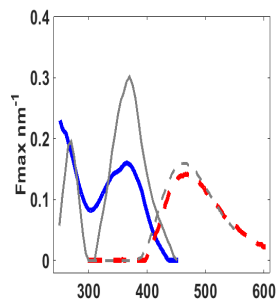
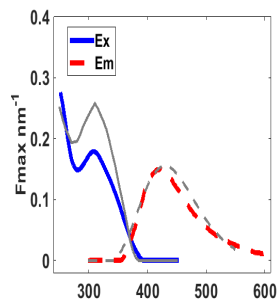
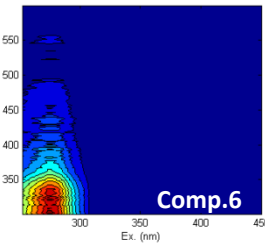
Walker et al., 2013



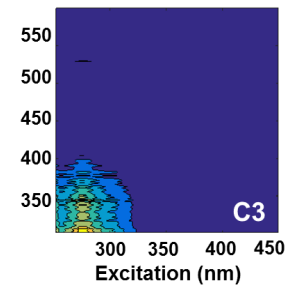
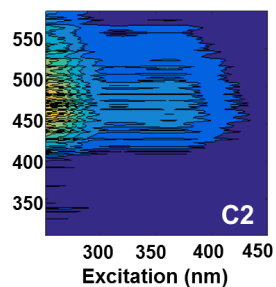
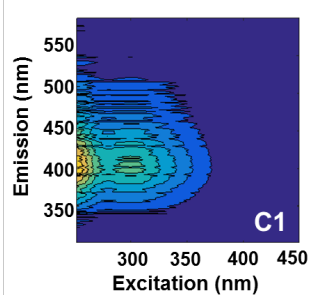
Walker et al., 2013



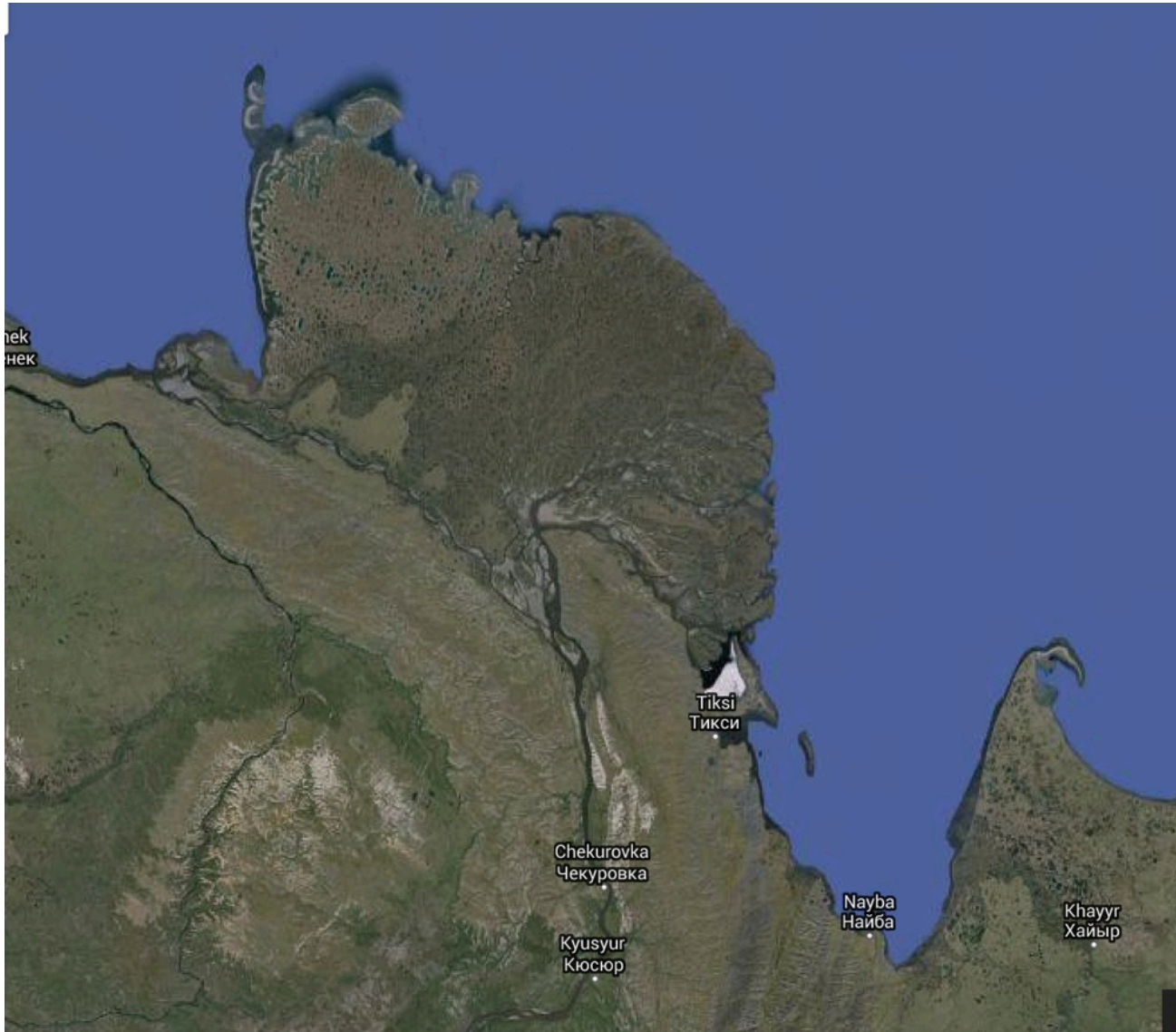
Walker et al., 2013



• FRAM STRAIT



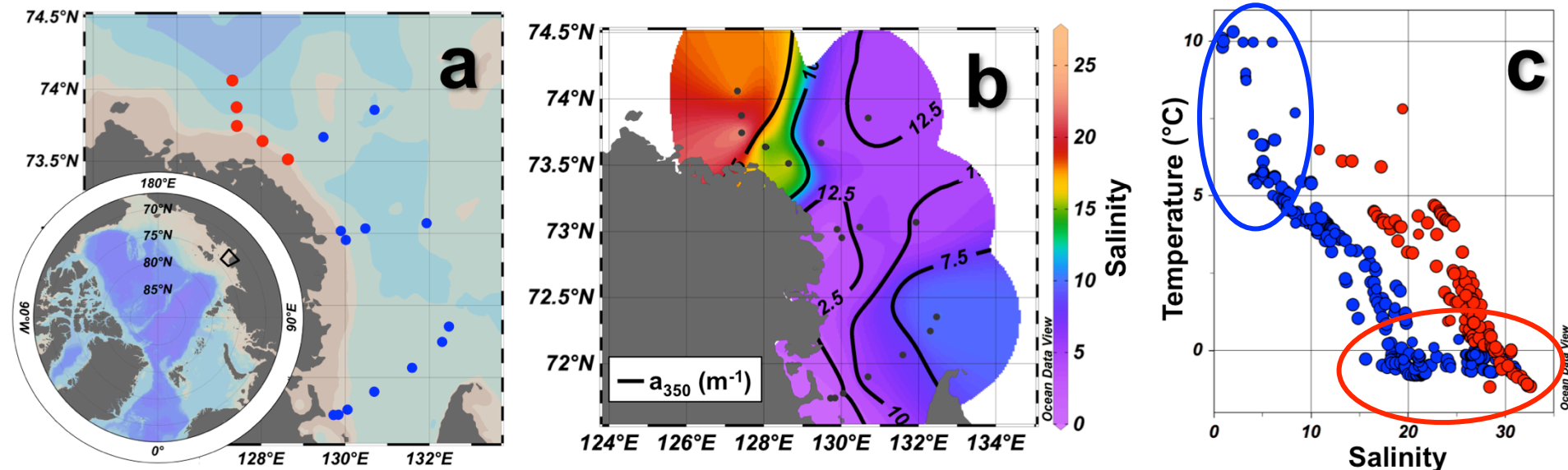
LENA DELTA REGION



Google maps

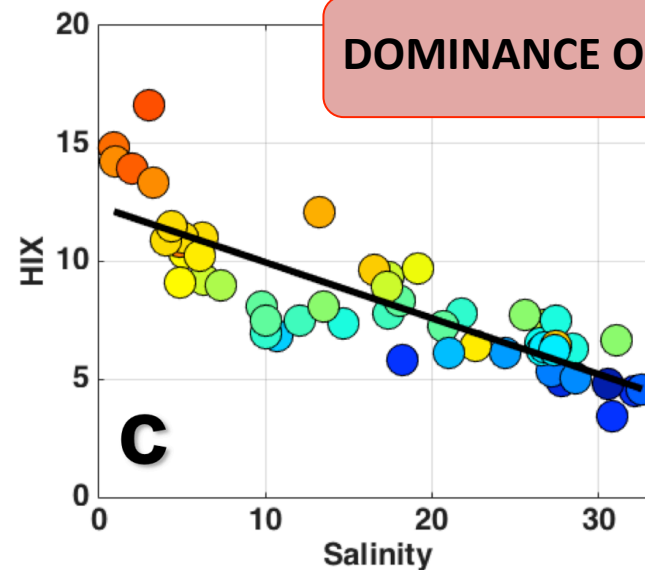
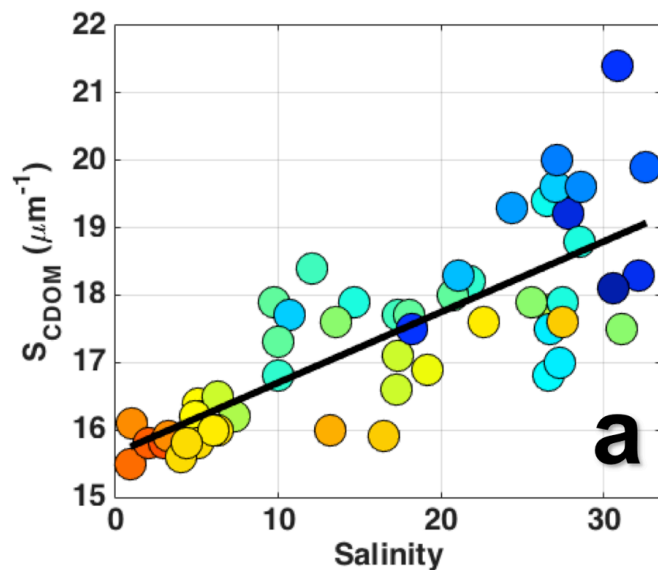
HYDROGRAPHY

• Hydrography and water column structure – Lena 2013

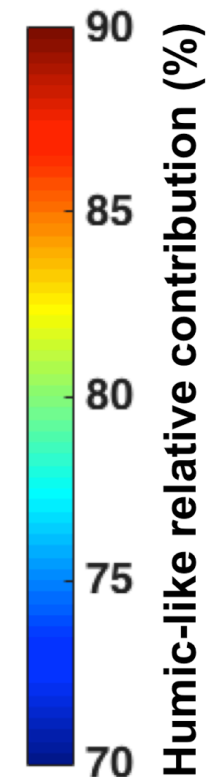
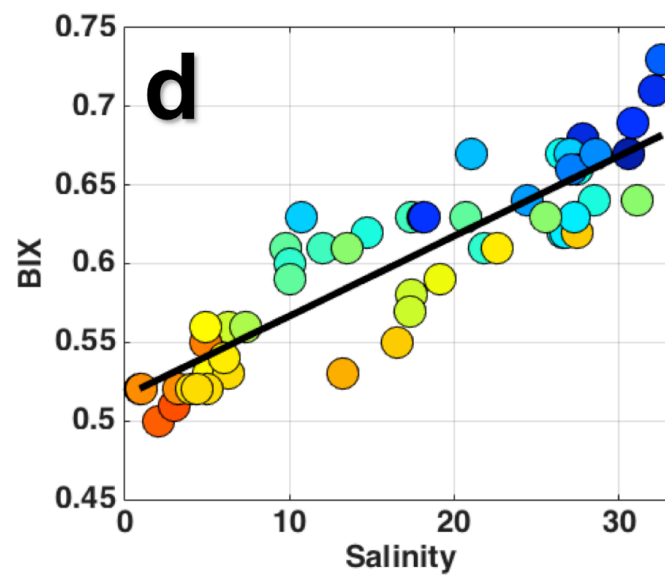
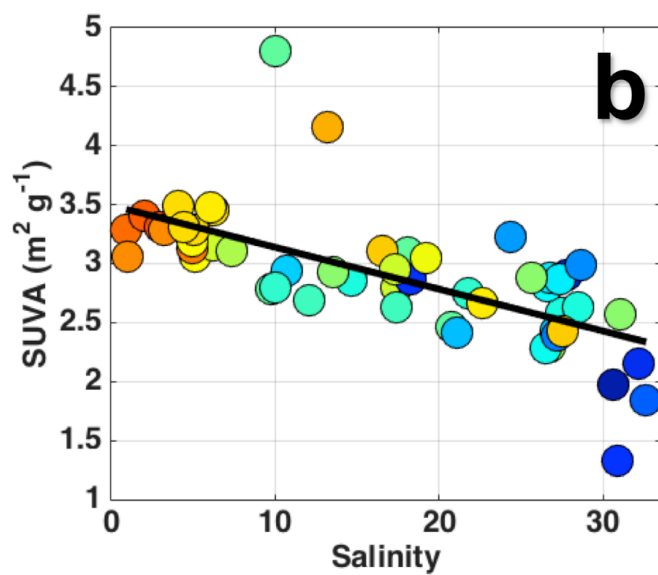


- Salinity range: 0.9 – 32.6
- Northward propagation of the Lena Plume (Sal < 10)
- Strong thermohaline gradients (especially vertical)
 - Shallow UML (< 10m)

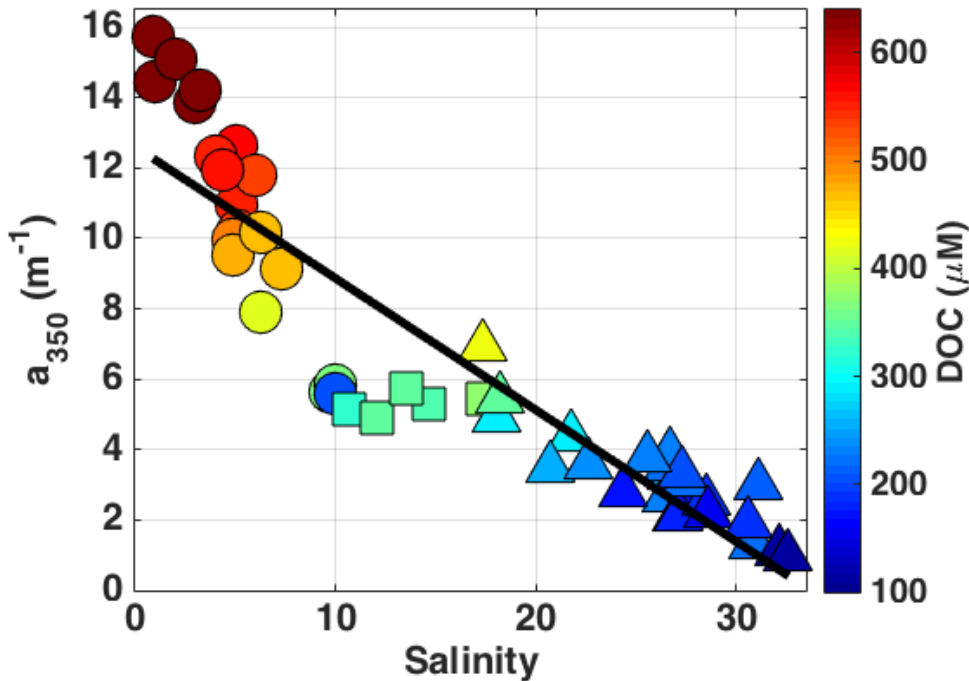
DOM TRANSFORMATION



DOMINANCE OF HUMIC-LIKE SIGNAL

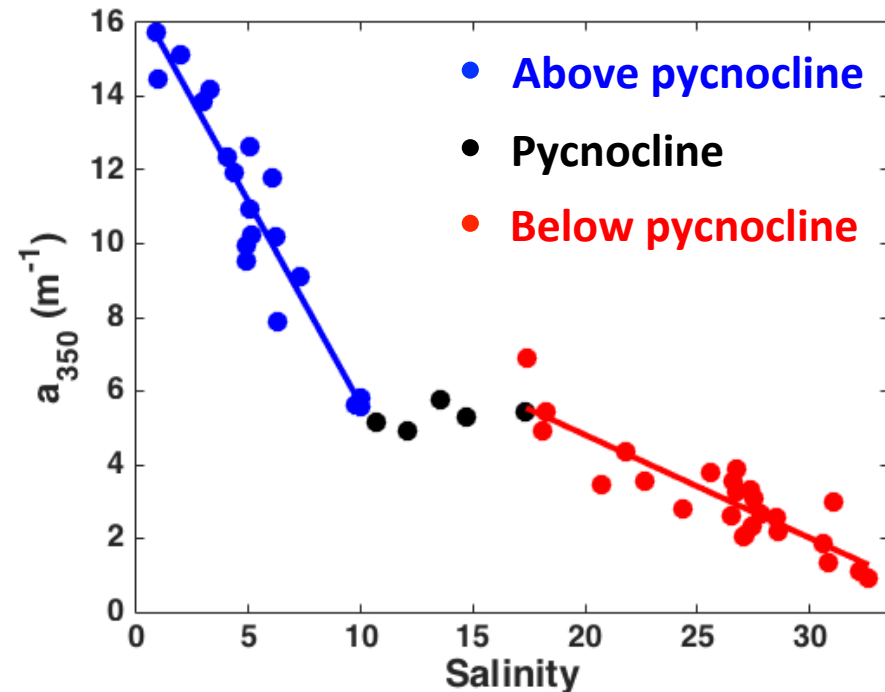


DOM MIXING

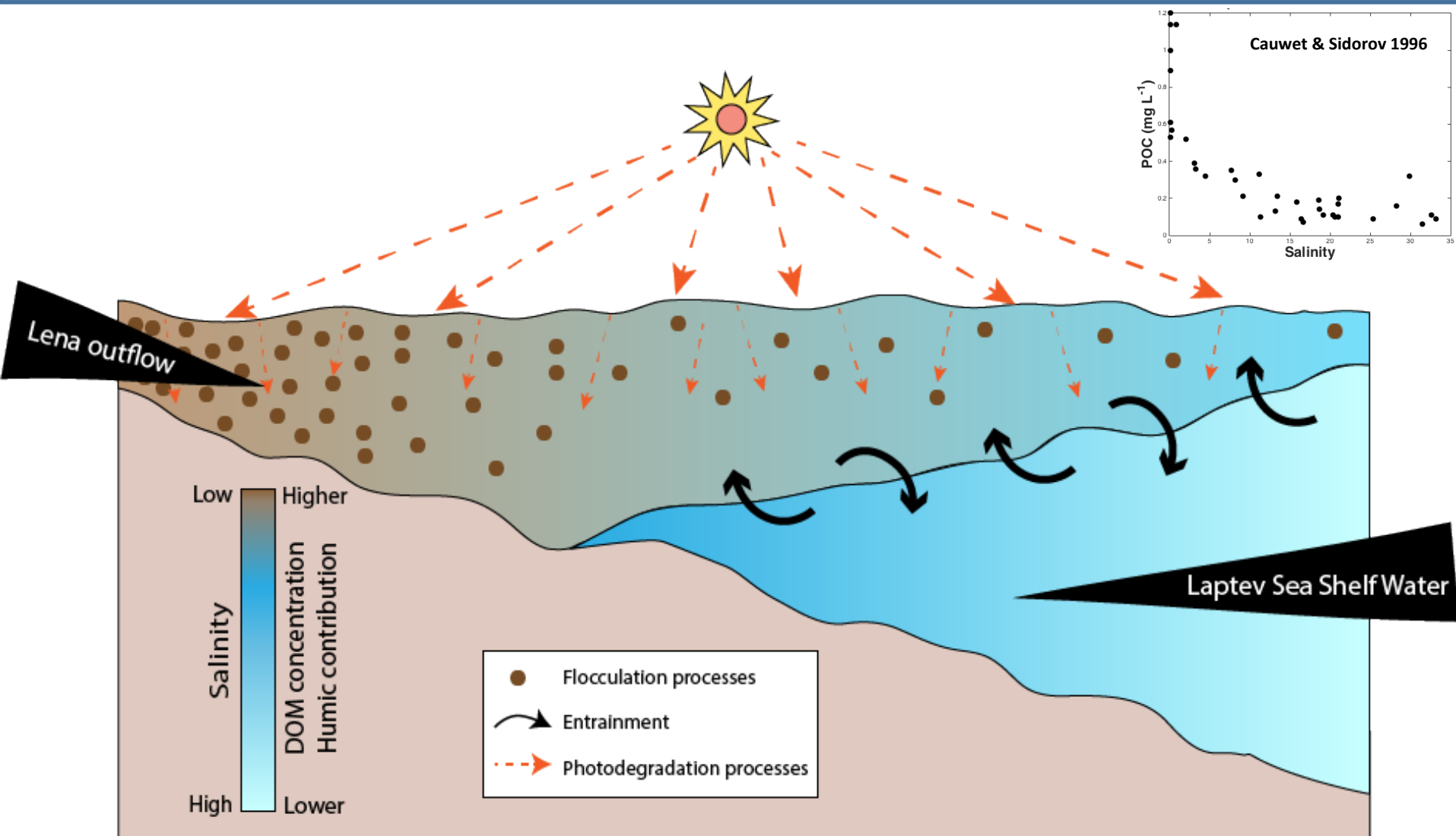


- Different mixing patterns
 - Above/Below pycnocline
- Indication of removal at the surface layer

- Decrease in DOM with salinity
 - Lena River \rightarrow major DOM source



DOM IN THE LENA DELTA



SUMMARY – LENA DELTA

- **6 fluorescent components characterized by PARAFAC model**
 - 4 humic-like
 - 1 marine-humic-like
 - 1 protein-like
- **Strongly humified region**
- **Reactivity of DOM varies with salinity**
- **Indication of removal at the surface layer**

MOVING FORWARD

- **What happens to DOM through the Arctic until it reaches the Atlantic basin via Fram Strait?**
 - a_{350} ranging from $\sim 0.5-0.8\text{m}^{-1}$
 - Dominance of humic-like signal (>70%)
- **Look at the optical indices of DOM**
 - Degree of reactivity
- **Relate with water masses fractions**

THANK YOU



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