Pacific Northwest
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Fe-OM associations may act as a mechanism for DOC mobilization in coastal upland forest

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April 23, 2024

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U.S. DEPARTMENT OF ENERGY BATTELLE

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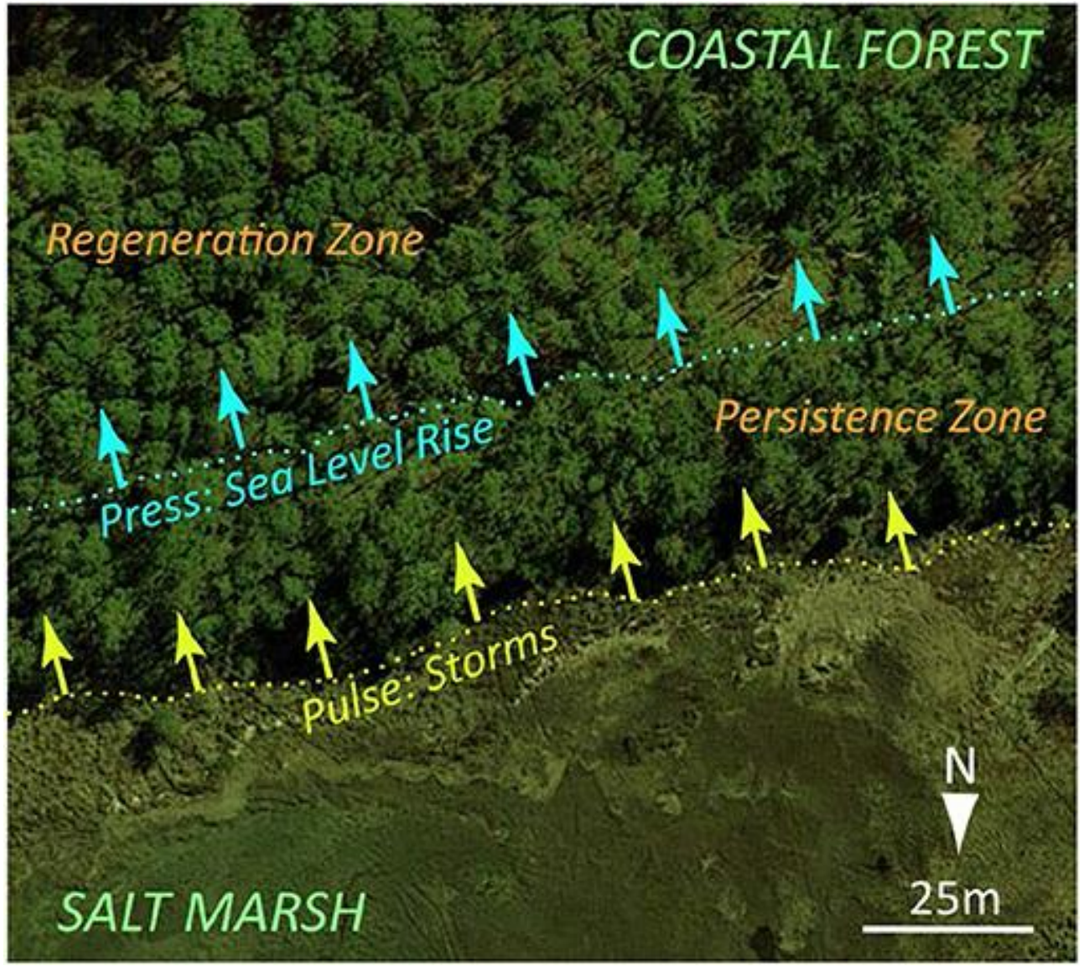
Saltwater: Bane of Coastal Forest

- Climate change is linked to an **increase** in…
  - Frequency and intensity of storms
  - Annual precipitation and temperature
  - **Sea levels**
- Inundation of seawater can threaten upland forests

How will this impact biogeochemical processes?



S. Fagherazzi, S. Anisfeld, L. Blum, E. Long, R. Feagin, A. Fernandes, W. Kearney, and K. Williams, "Frontiers | Sea Level Rise and the Dynamics of the Marsh-Upland Boundary," Frontiers, (2019).

Ionic Strength may impact OM release through exchange of ions

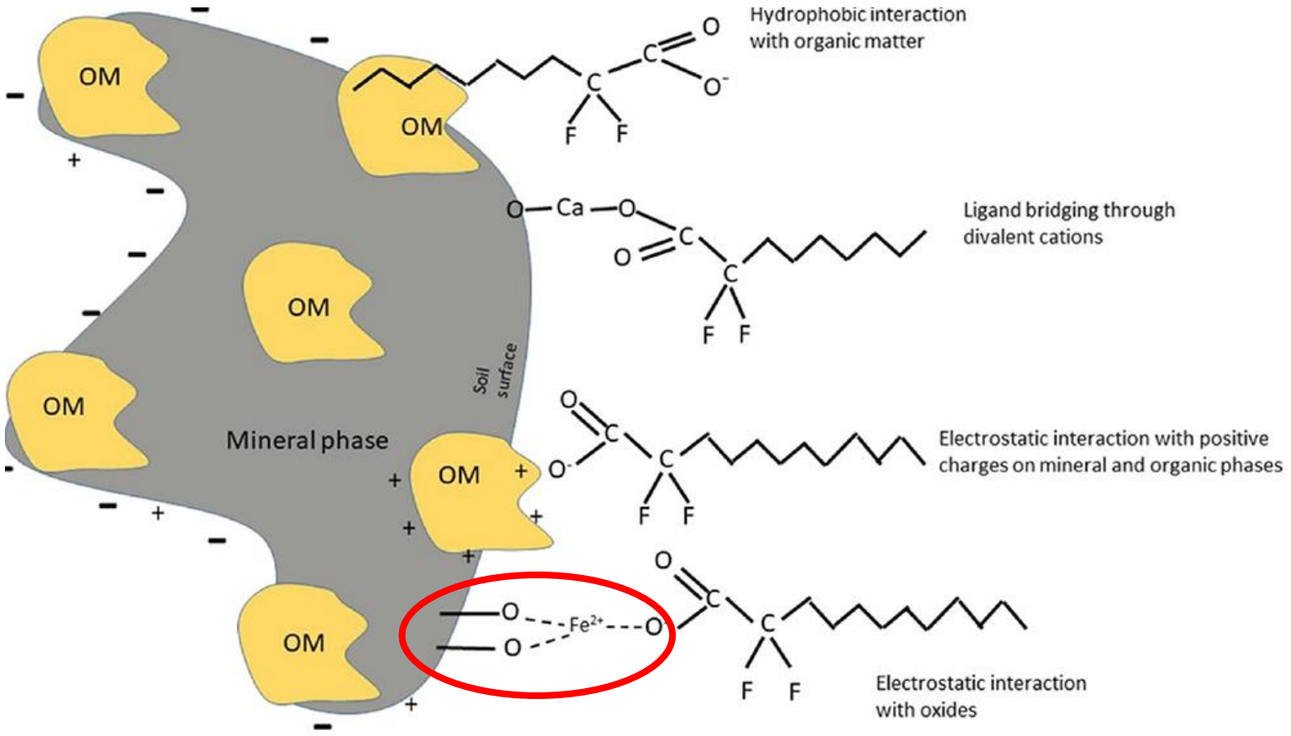
Low IS water

High IS water

Ionic Strength

(Tomaszewski et al., 2021)

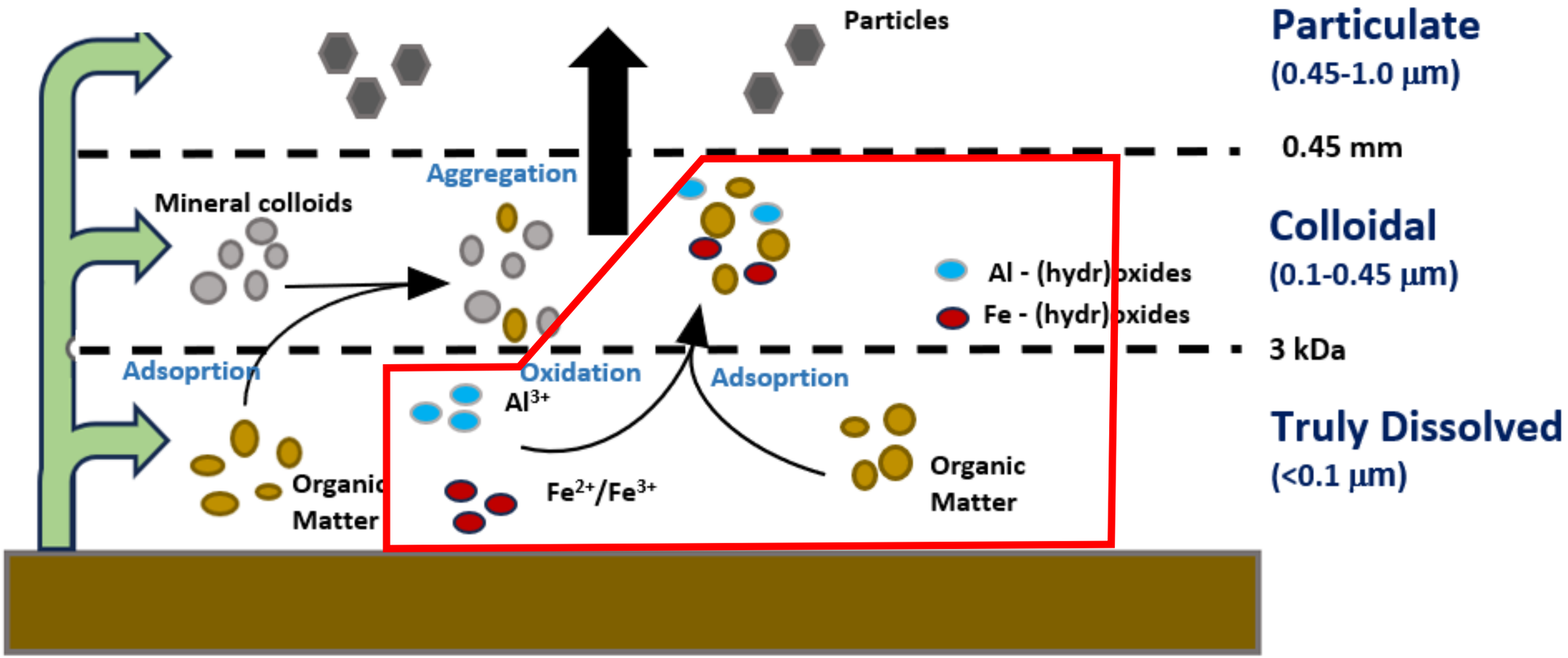
Mineral-Organic Matter (e.g. Fe-OM) interactions may also drive OM release



Mineral-OM Interactions

(Bolan et al., 2021)

Is Bigger Better when it comes to particle size and DOC mobilization?



Big Question

After saltwater inundation, does Fe-OM interactions provide a mechanism for colloidal OC mobilization?

Hypotheses

1. Changes in ionic strength with subsequent DI washes will result in differences in DOC mobilization
2. Oxygenated systems will release more DOC due to OM adsorption to Fe(III).
3. Fe(III) will be associated with **aromatic DOM** across all size fractions.

Experimental Design

Sampling
Prepared in triplicate

5 washes
1 /w 25% Artificial seawater (ASW)
4 /w DI water

3 Size Fractions (μm)
<0.1
0.1-0.45
0.45-1.0

2 Treatments
Oxic
Anoxic

Soil
5 g field moist soil
72 hr anoxic treatment

1.

Wash added
35 mL of 25% ASW
Anoxic samples were in glove box

2.

3.

Shaker Table
Shaken for 24 hrs
270 RPM

4.

O_2%
Used a Firesting GO2 probe
Set to room temp (20°C)

Centrifugation
Fractions are centrifuged at prescribed time and speed

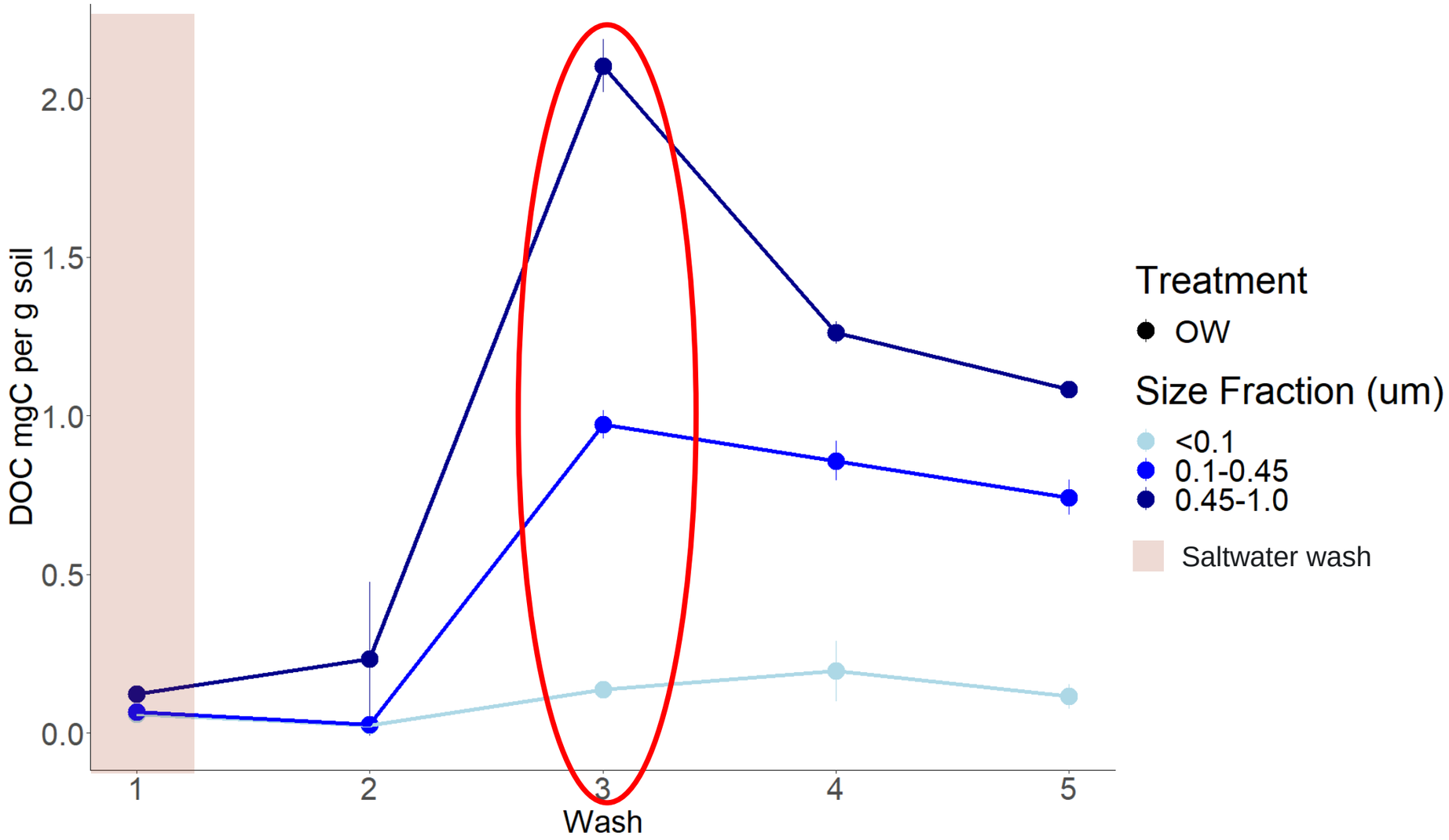
5.

Wash added
Step 2 is repeated but with DI water
4x times

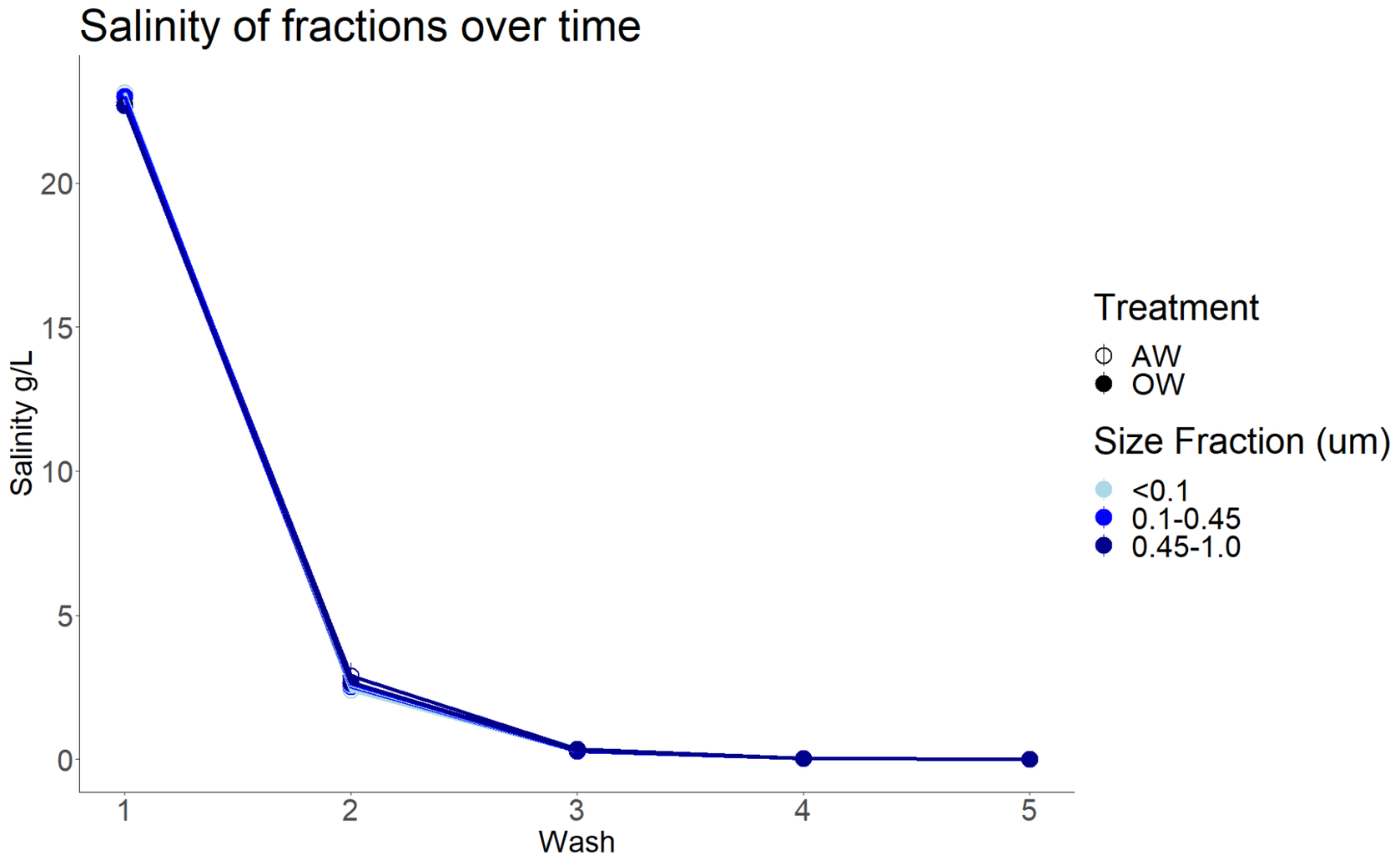
6.

CDOM
ICP-MS
Fe Assay
TOC

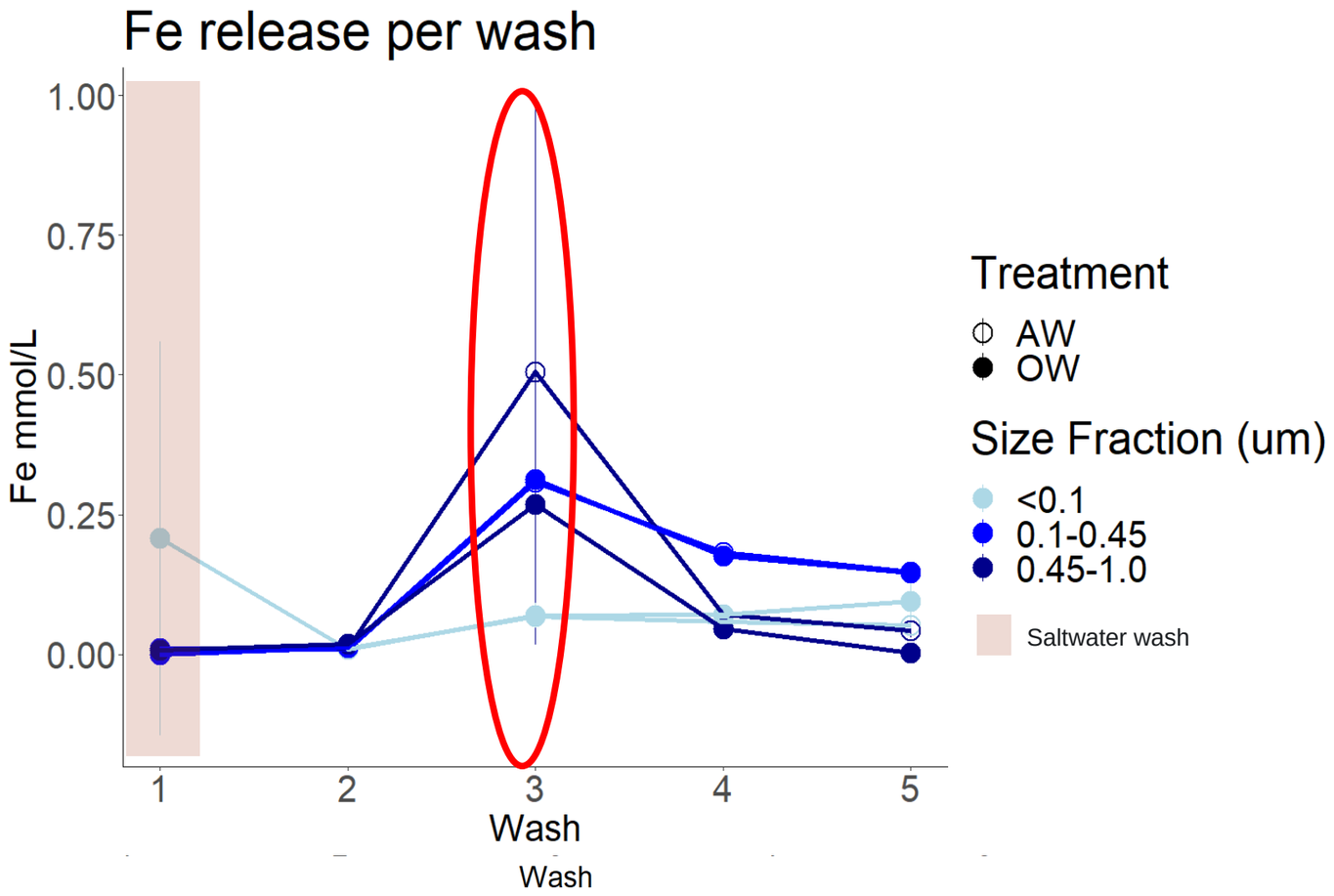
Organic Carbon release was greatest in wash 3 and in the 0.45-1.0 µm fraction



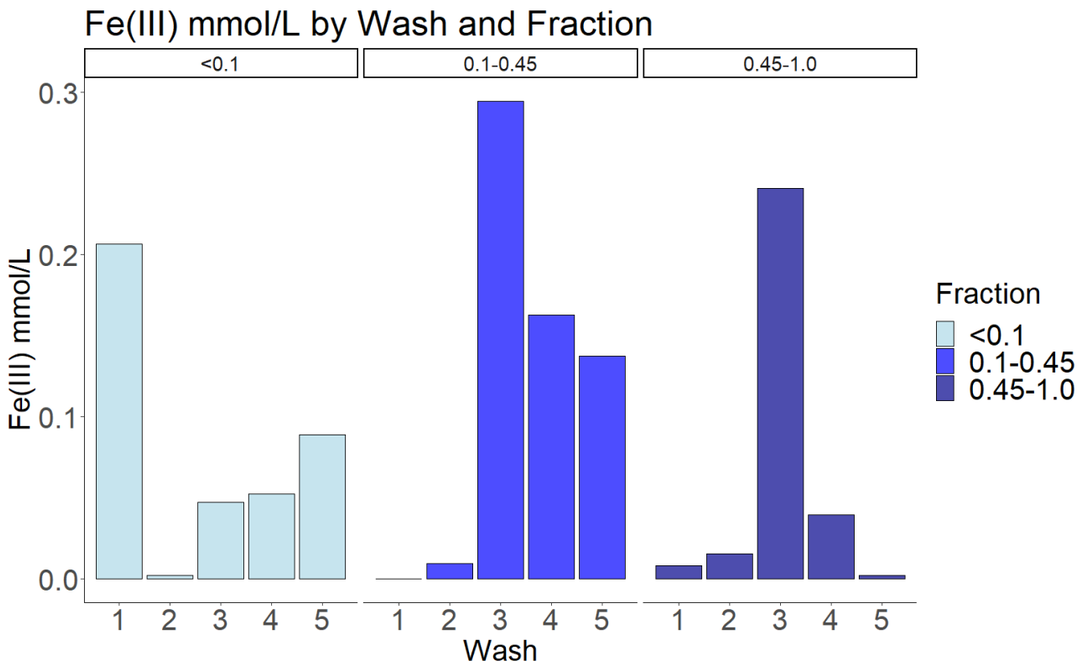
Ionic strength is not responsible for all the variation

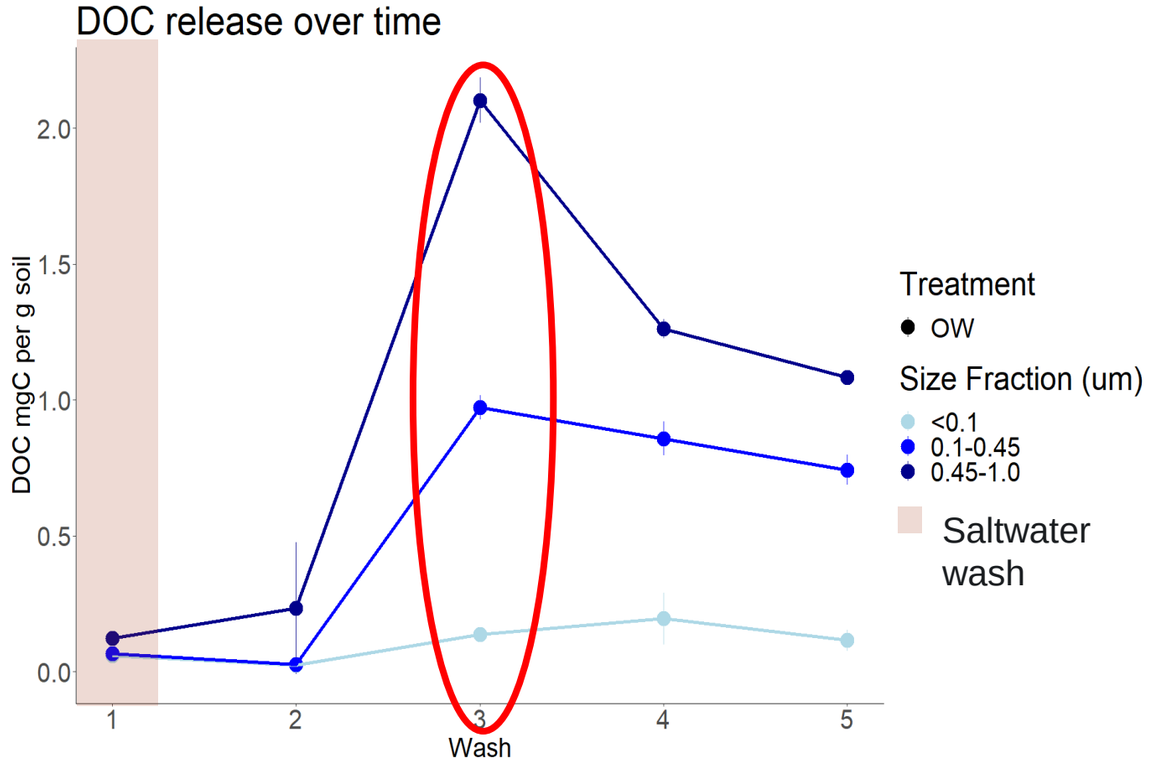


No major differences in DOC release or Fe between aerobic and anerobic treatments



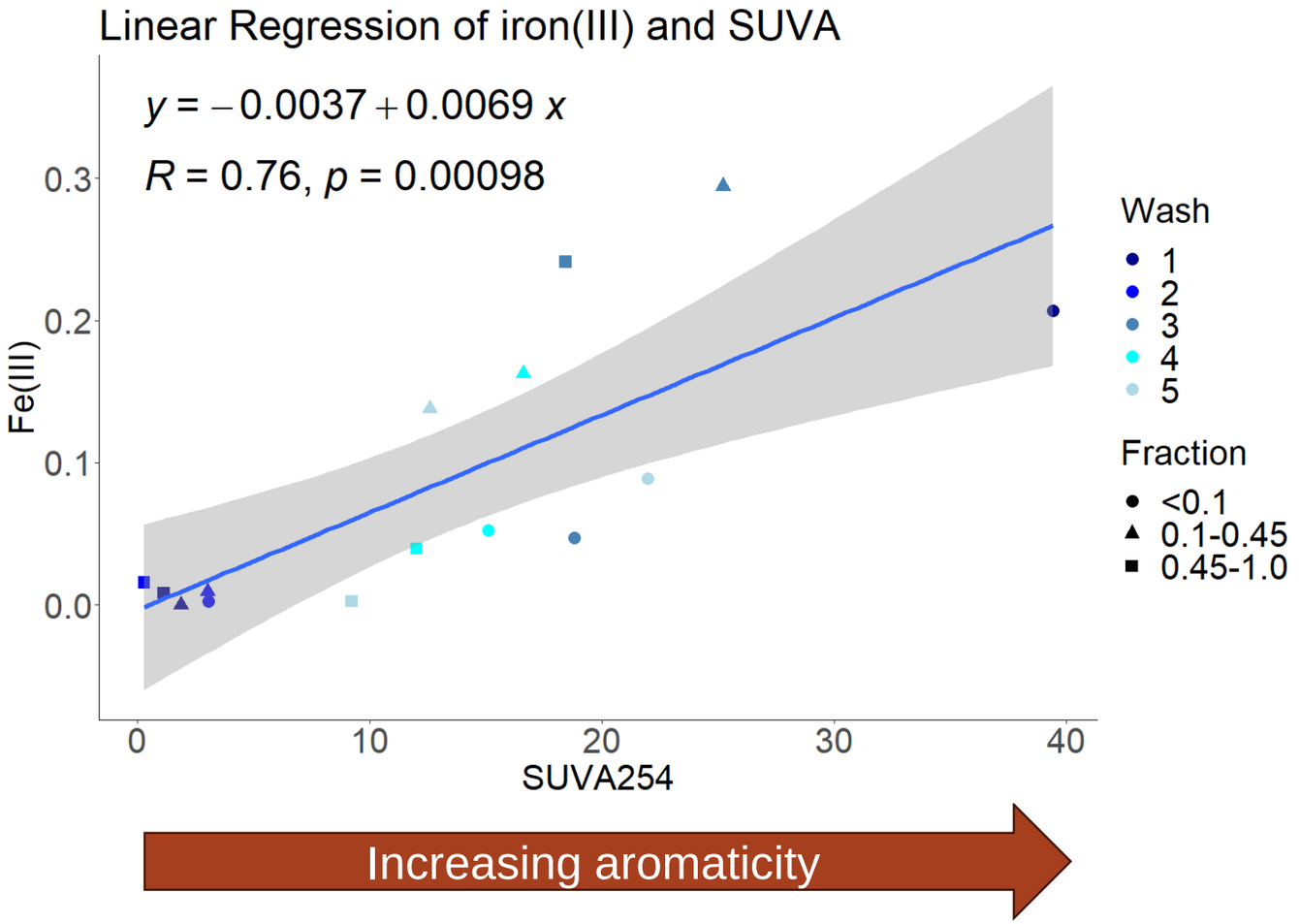
Fe(III) and DOC are releasing at the same time





The increase in aromatic DOM may be related to shifts in Fe redox states

There is a significant relationship between Fe(III) and the aromaticity of DOM across all size fractions



Conclusions

1. Changes in ionic strength with subsequent DI washes will result in differences in DOC mobilization ✓
2. Oxygenated systems will release more DOC due to OM adsorption to Fe(III). ✗
3. Fe(III) will be associated with **aromatic DOM** across all size fractions. ✓

Fe-OM interactions offer a mechanism for DOC mobilization in coastal upland forest

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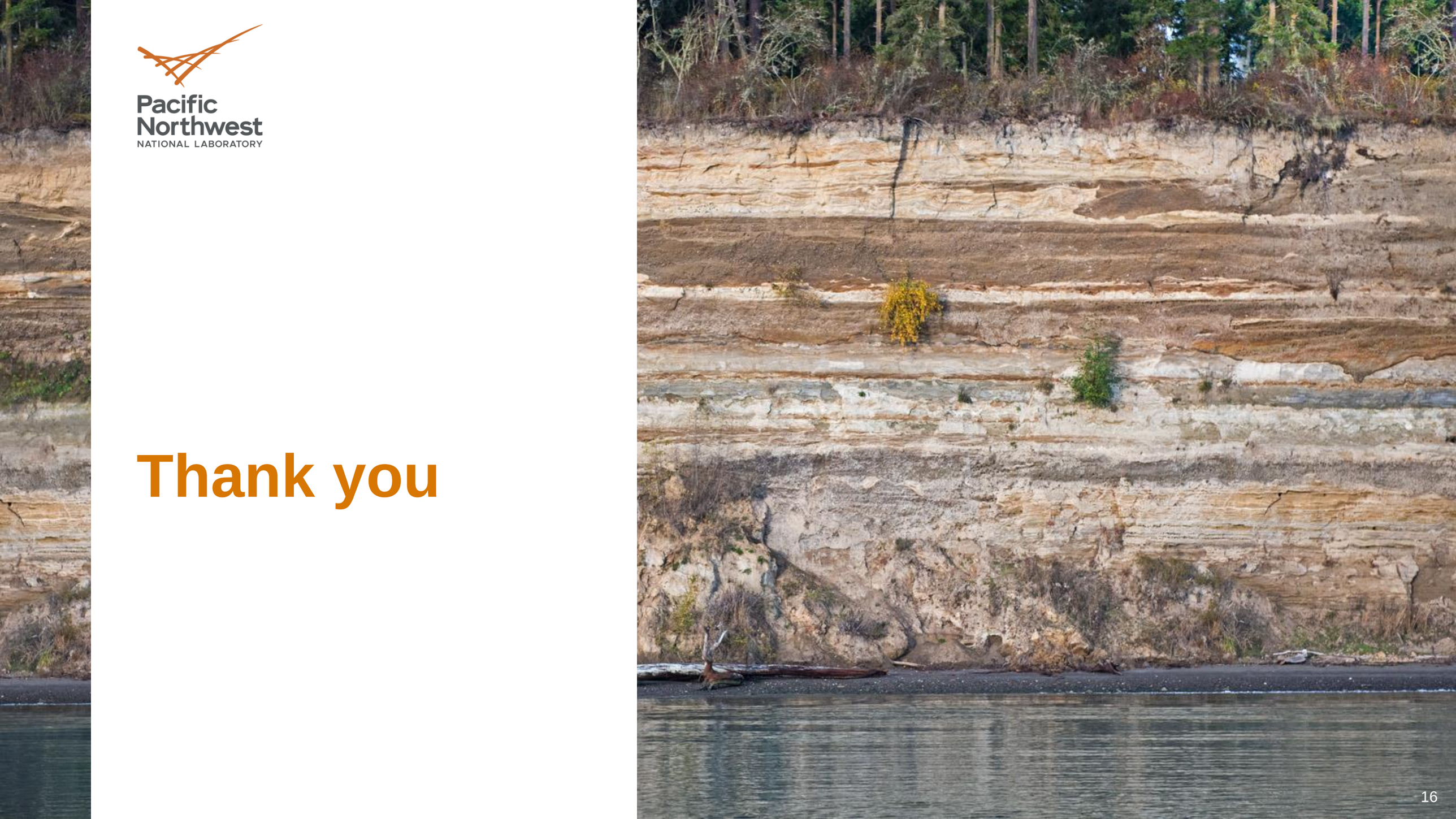
Thank you



Acknowledgements

- Allison Myers-Pigg – Mentor
- Nick Ward – Co mentor
- Kaizad Patel – Collaborator
- Edward O’Loughlin – Collaborator
- Alan Roebuck - Collaborator
- Nicole C. Castilleja Bentley – SULI Coordinator

This work was supported in part by the U.S Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Science Undergraduate Laboratory Internship Program (SULI).