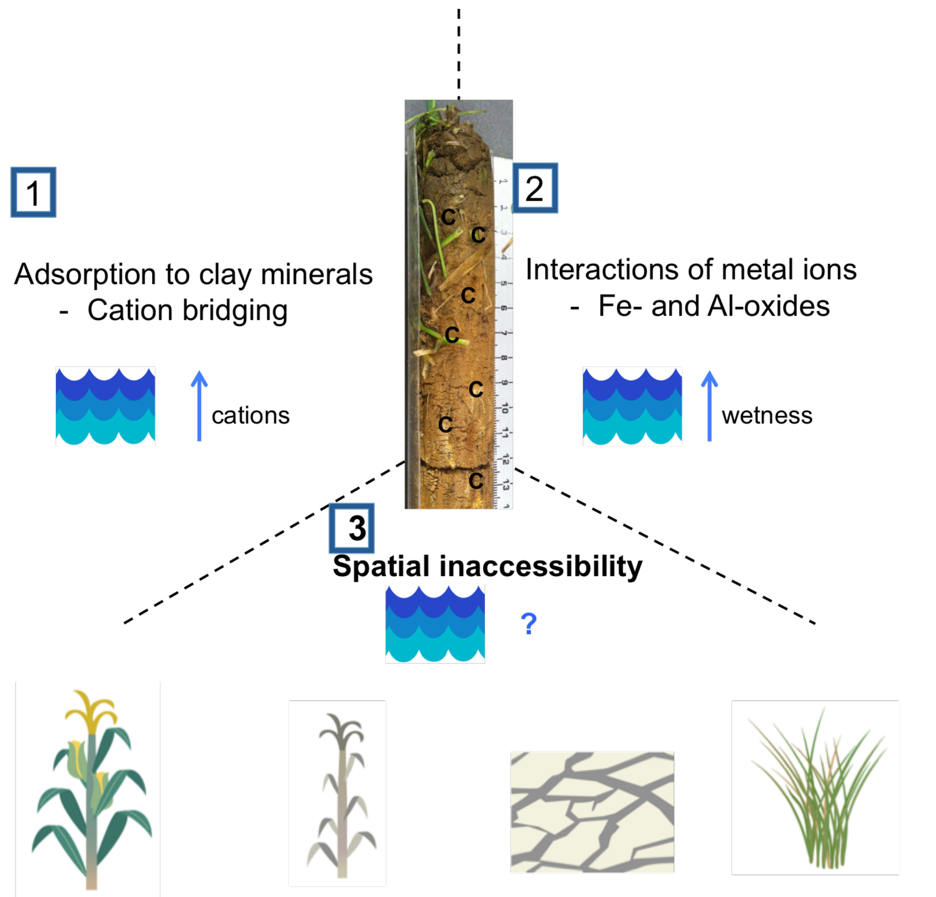
Farming carbon: the link between saltwater intrusion and carbon storage in coastal agricultural fields

Elizabeth de la Reguera[1], Dr. Margaret Palmer[1,2], Dr. Keryn Gedan[3], Dr. Kate Tully[1]

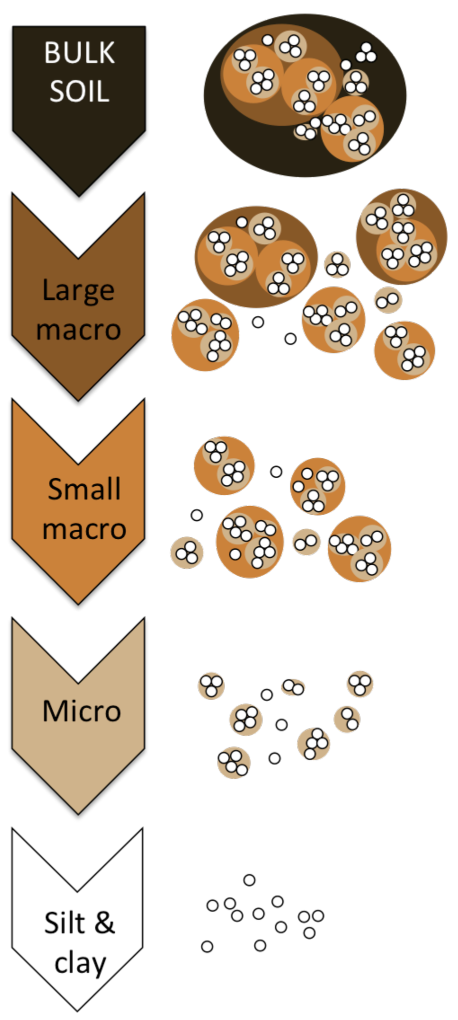
[1]University of Maryland College Park, [2]Socio-Environmental Synthesis Center, [3]George Washington University

VISUAL ABSTRACT



INTRODUCTION

Coastal ecosystems, especially low-lying regions of the Mid-Atlantic United States, are on the forefront of climate change and rising sea levels, which are projected to increase over the next century.[1] A major consequence of sea-level rise is saltwater intrusion (SWI), the landward movement of sea salts. While past research has focused on the effects of SWI on freshwater wetlands[2,3] and forested uplands[4,5], little to no work has examined the effects on upland agricultural systems[6]. My research will focus on spatial inaccessibility of carbon to microbes due to occlusion by aggregation through levels of physical protection. ***The objective of my work is to understand how much carbon is stabilized in salt-affected farm fields and the stability of that carbon via physical protection in aggregates.***



METHODS

Soil was collected down to ~140 cm along a SWI gradient from a salt-intruded farm field in Somerset County, MD in March 2018 (Figure 1). Soil was segmented based on horizons, which were identified in the field. A sub-sample of 100 g of soil was fractionated based on aggregate size[7] (Figure 2). Oven dried aggregates were analyzed for percent carbon using dry combustion.

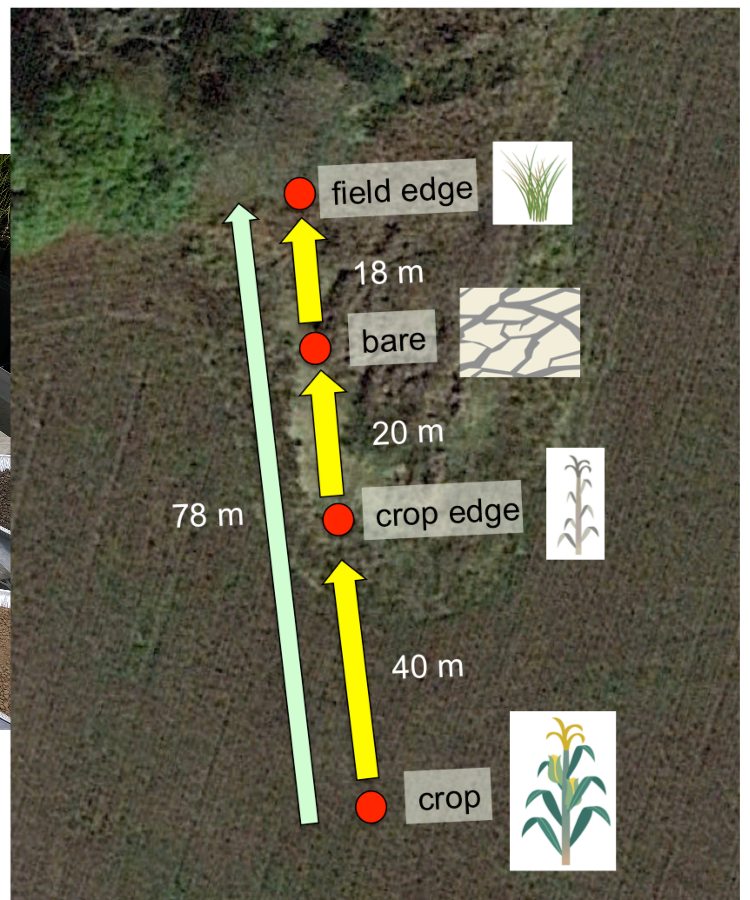


Figure 1. Transect on farm field

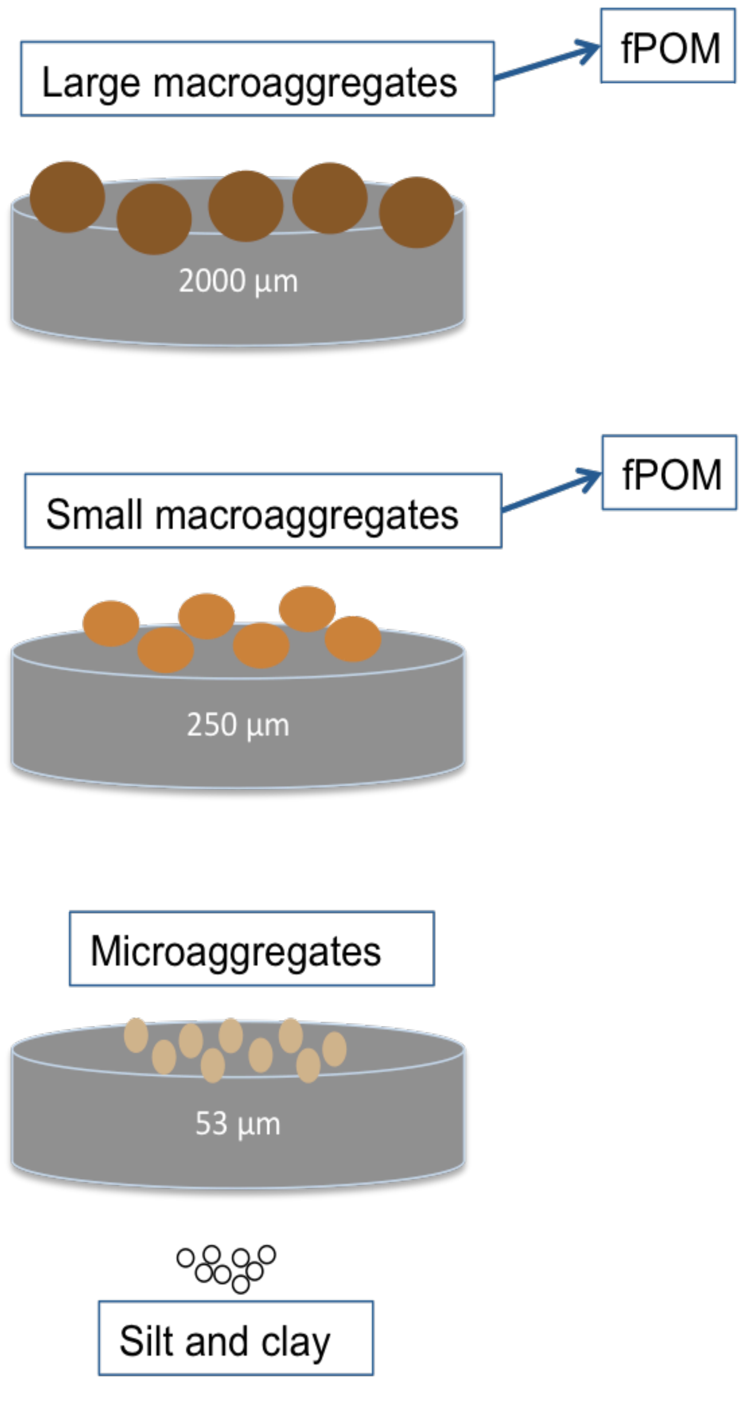


Figure 2. Aggregate sieving procedure by Six et al. (2000)

RESULTS

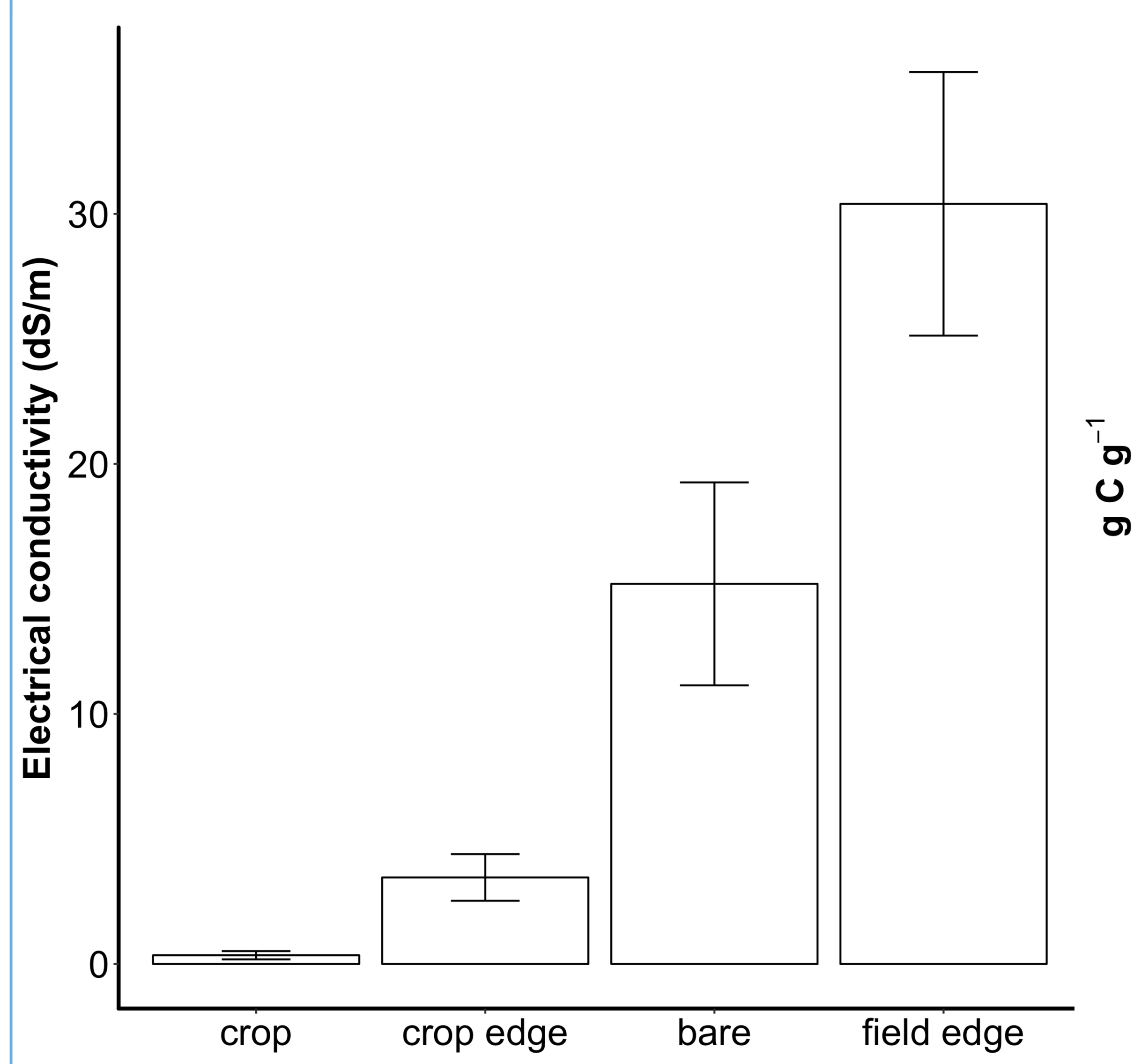


Figure 3. Electrical conductivity along intrusion gradient. (1 dS/m ≈ 1ppt @ 25°C)

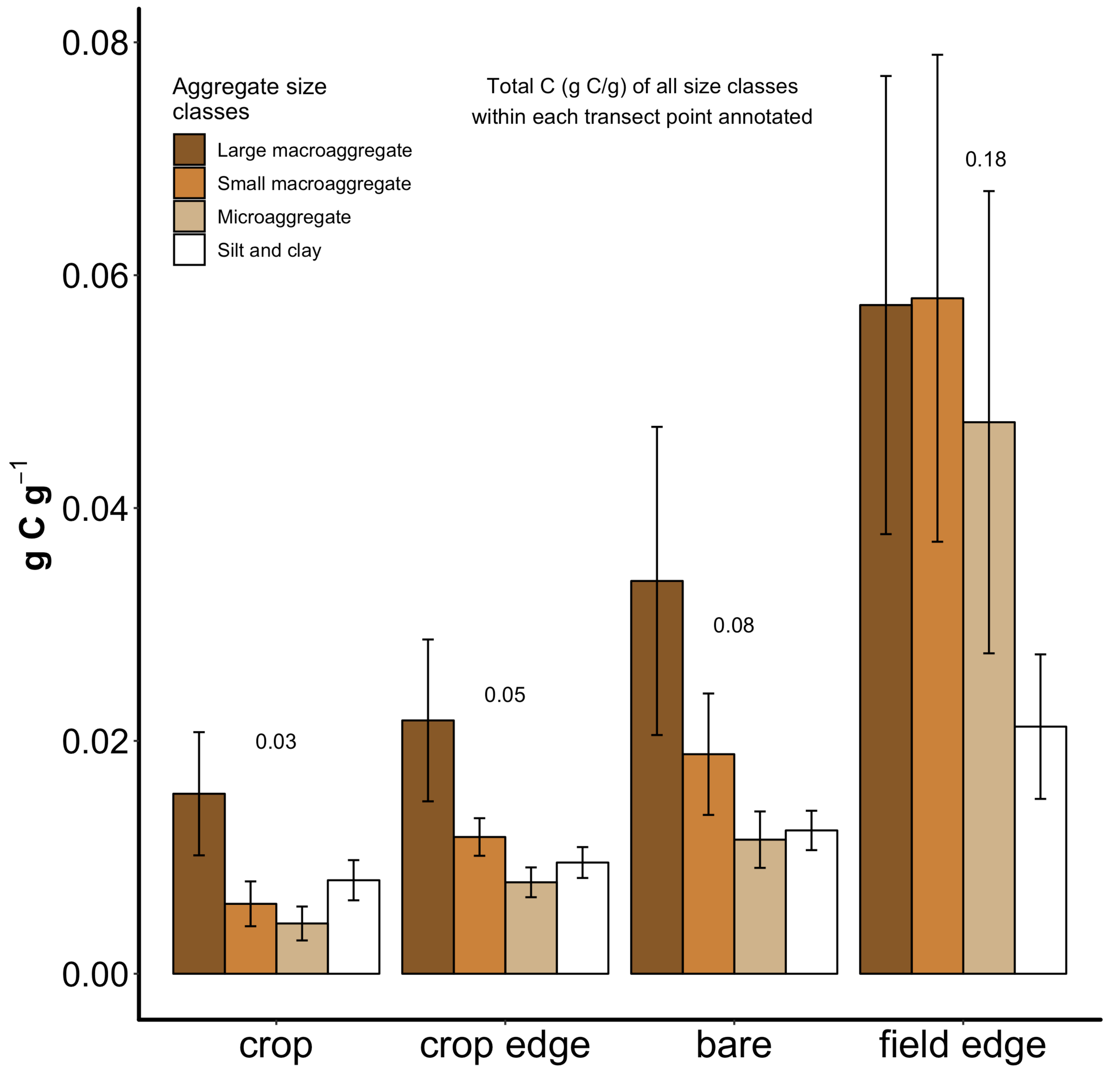


Figure 4. Aggregate-associated carbon within each size class along intrusion gradient.

INTERPETATION

- Six times more carbon in the field edge than in the crop zone.
- More carbon stored in large macroaggregates across all zones.
- The field edge will continue to move inland.
- Potential for farms to become blue carbon ecosystems (C markets).
- We are analyzing data on 5 additional salt-intruded farm fields.

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