

**RESIST:** Response of **Ecologically**mediated **S**hallow Intertidal Shores and their Transitions to extreme hydrodynamic forcing



### **Species-dependent variation in geotechnical properties** and erodibility of salt marsh sediments

Evans BR, Brooks H, Carr S, Chirol C, Christie EK, Kirkham MK, Möller I, Royse K,

Shears OM, Spencer K, Spencer T

https://youtu.be/4ZoPBfm2aBY



NERC

SCIENCE OF THE

ENVIRONMEN





British **Geological Survey** ATURAL ENVIRONMENT RESEARCH COUNCI



**Trinity College Dublin** Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin









www.nerc-resist.uk 😇 🔍 www.thesaltmarshexperiment.com



#### Hypothesis:

Halophytes modify sub-surface structure  $\rightarrow$  alter response to hydrodynamic forcing  $\rightarrow$  modulate erosion

Approach

Use insights to better map salt marsh vulnerability to erosion













# 2020 Geosciences Union, Sharing Geoscience Online May European

et al.

Evans

#### Findings 1: Field



Shear strength of underlying sediments in the root zone (measured by shear vane) varies with species





Sites: WS = Warton Sands (sandy) TF = Tillingham Farm (muddy)

#### Surface Cover Types: BARE = Bare Ground PUC = Puccinellia, SAL = Salicornia SPA = Spartina

- Effect of species appears greater at WS than TF
- PUC associated with the highest shear strengths
- BARE has lowest shear strengths

All treatments separable (p<0.05) except TF\_BARE:TF\_SAL, TF\_BARE:TF\_SPA, TF\_SAL:TF\_SPA and TF\_PUC:WS\_BARE





#### Findings 2: Lab

Undisturbed samples analysed in the geotechnical laboratories (British Geological Survey) Presence of roots emulates an increase in cohesion, with PUC having the strongest influence Coarser sediments (WS) have higher friction angles and lower cohesion than fine sediments Presence of SPA in fine sediments emulates a higher friction angle

## RESIST

#### Shear Box test



Triaxial test





#### Upscaling:

2020

Mapping of vegetation cover type using multispectral UAV data Inference of patterns of vegetation-induced modification of geotechnical characteristics





#### **Conclusions and Further Work:**

Different halophyte species have different root network morphologies

Vegetation presence and type modify the geotechnical characteristics of marsh sediments in the lab and field

The "vegetation effect" appears to be stronger in coarser sediments

Multispectral UAV data useful for mapping salt marsh vegetation

Further work needed to understand how the differences in geotechnical parameters translate into different vulnerabilities to erosion (D1202 | EGU2020-510)

Further work needed to gain mechanistic understanding of vegetation effect On subsurface structure and properties – inc. geochemistry





() BY

<u>\_\_\_\_</u>

