

Geotechnical Properties and Processes of Sandy Beaches and their Impact on Beach Erosion

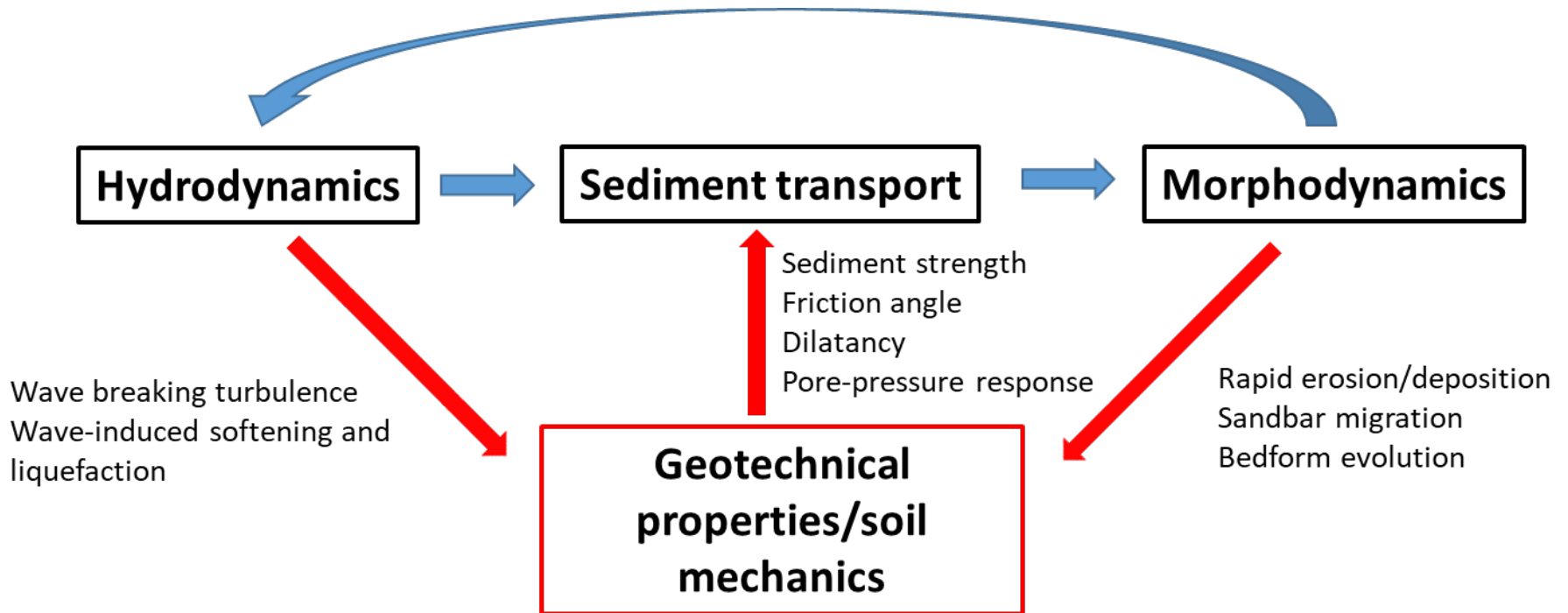
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<https://faculty.eng.ufl.edu/coastal-marine-geotechnics/>

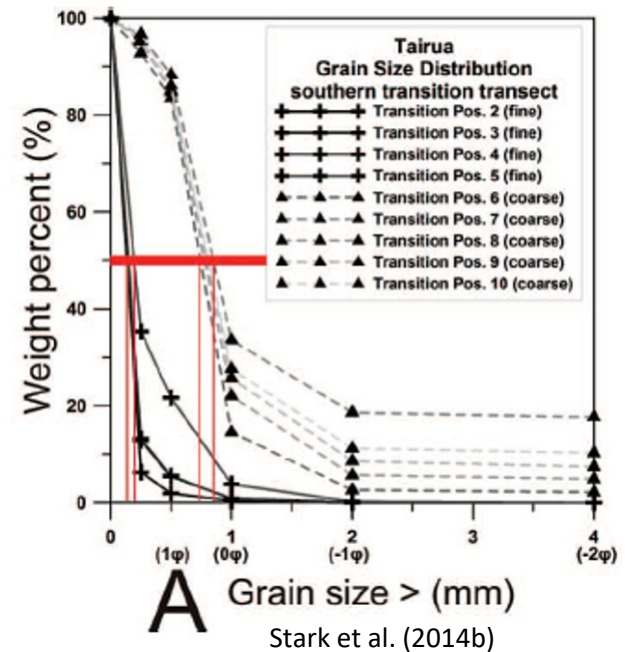
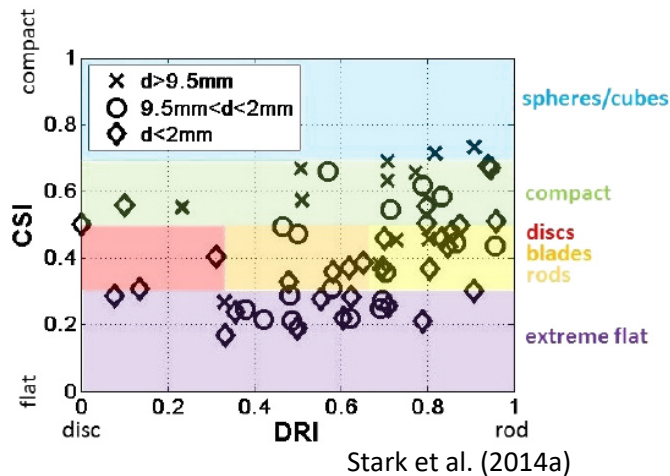
The role of geotechnical properties on beach dynamics and erosion



What are geotechnical properties we are interested in?

Textural properties

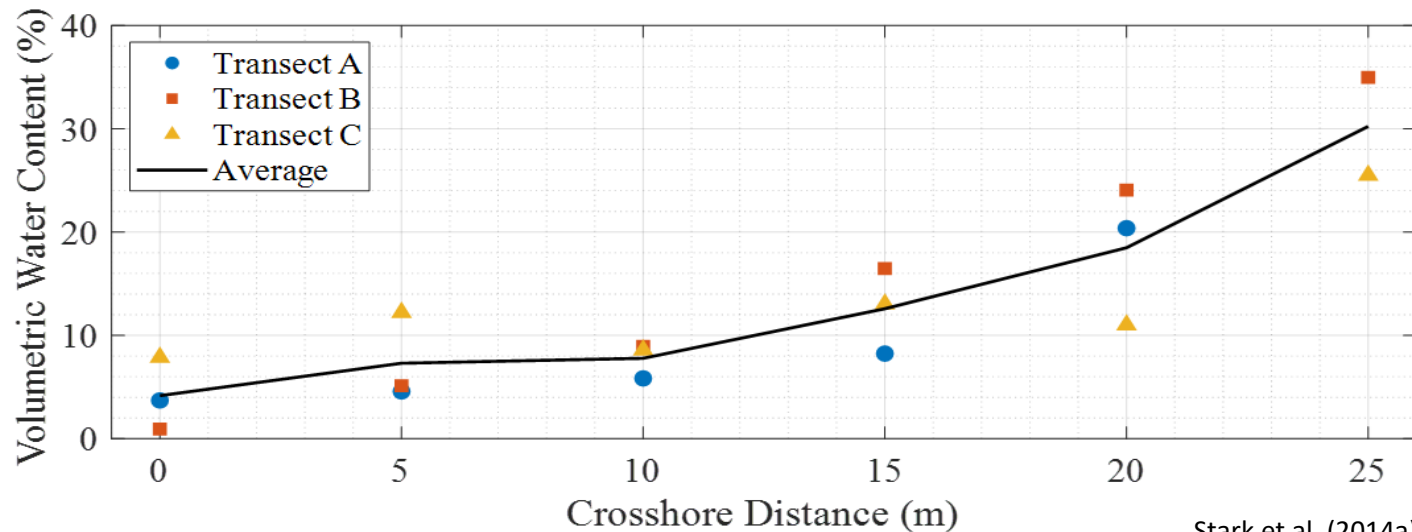
- Grain size
- Grain shape
- Bulk density
- Void ratio/porosity
- Moisture content/saturation



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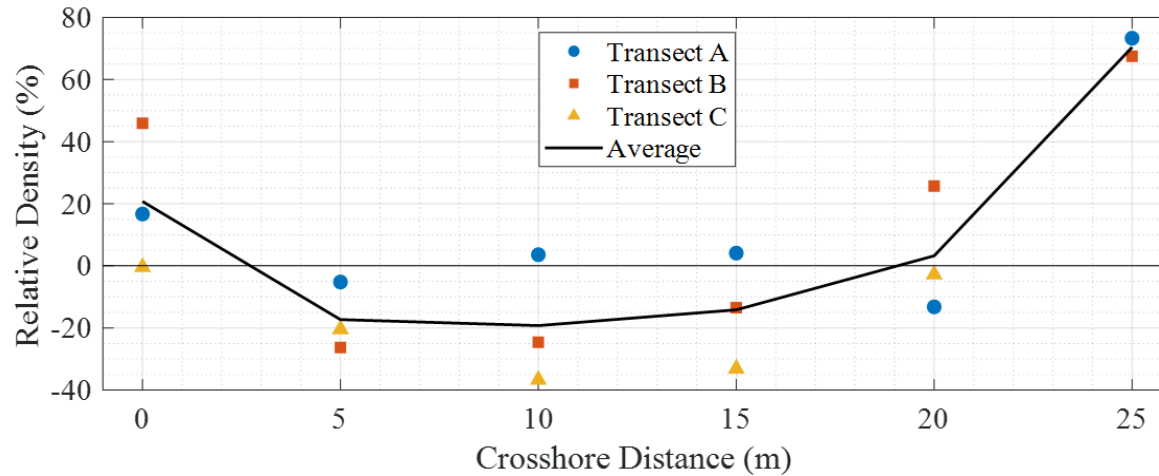


Stark et al. (2014a)

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Brilli (2023)

What are geotechnical properties we are interested in?

Strength properties

- Friction angle
- (Apparent) cohesion
- Bearing capacity

$$\text{Shear Strength} = \text{Cohesion} + \text{Normal stress} \tan(\text{Friction angle})$$

particle size distributions, particle shapes, packing

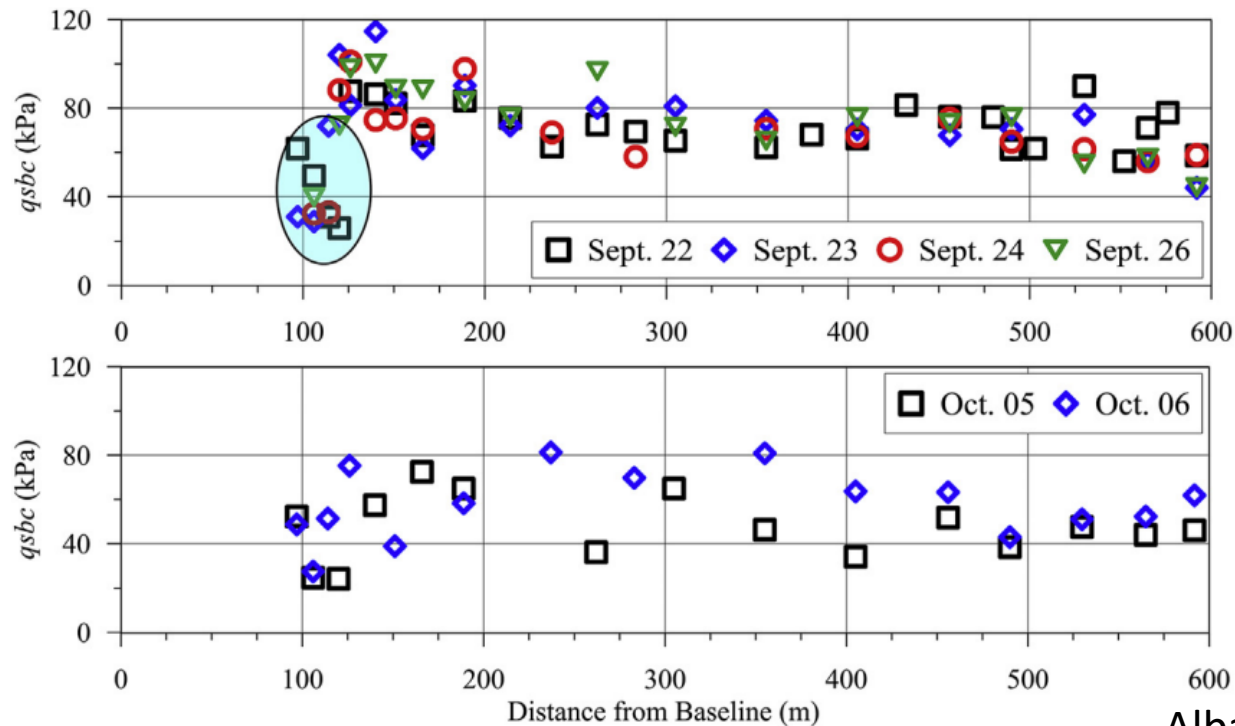
particle bonds through electrostatic forces, and others...
most importantly here, also through partial saturation

sediment depth and type of sediment

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Strength properties

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- Bearing capacity

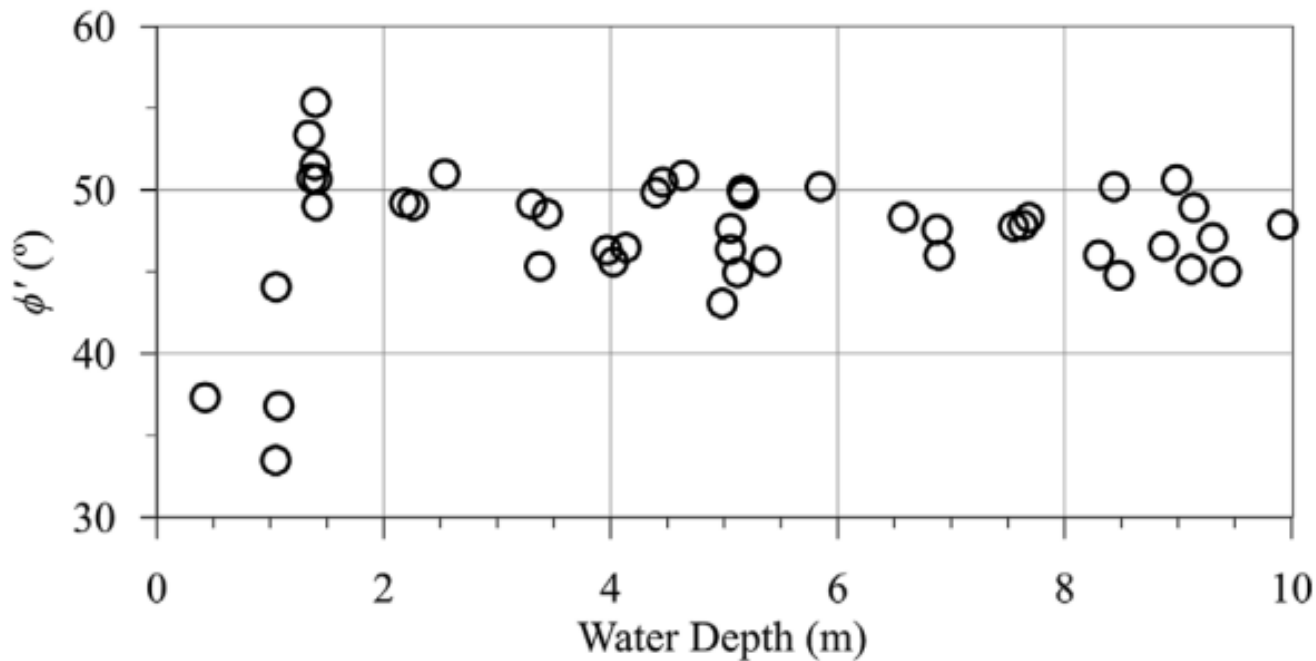


Albatal et al. (2019)

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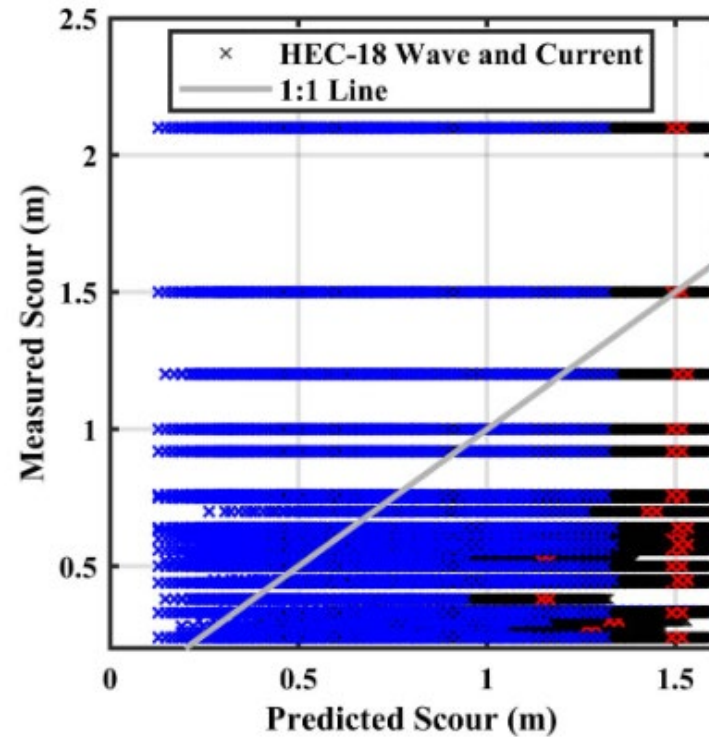
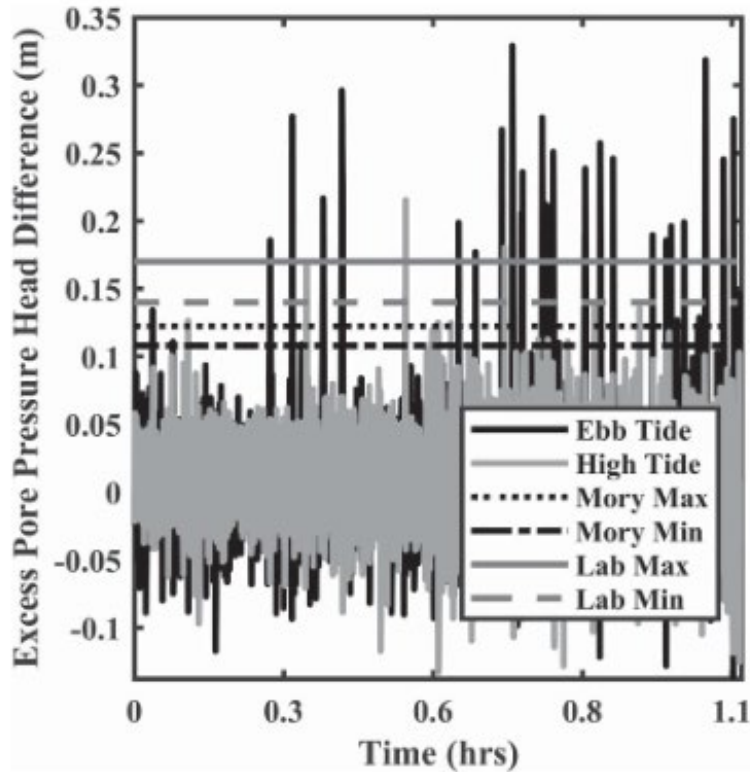


Albatal et al. (2019)

What are geotechnical properties we are interested in?

Pore pressure behavior

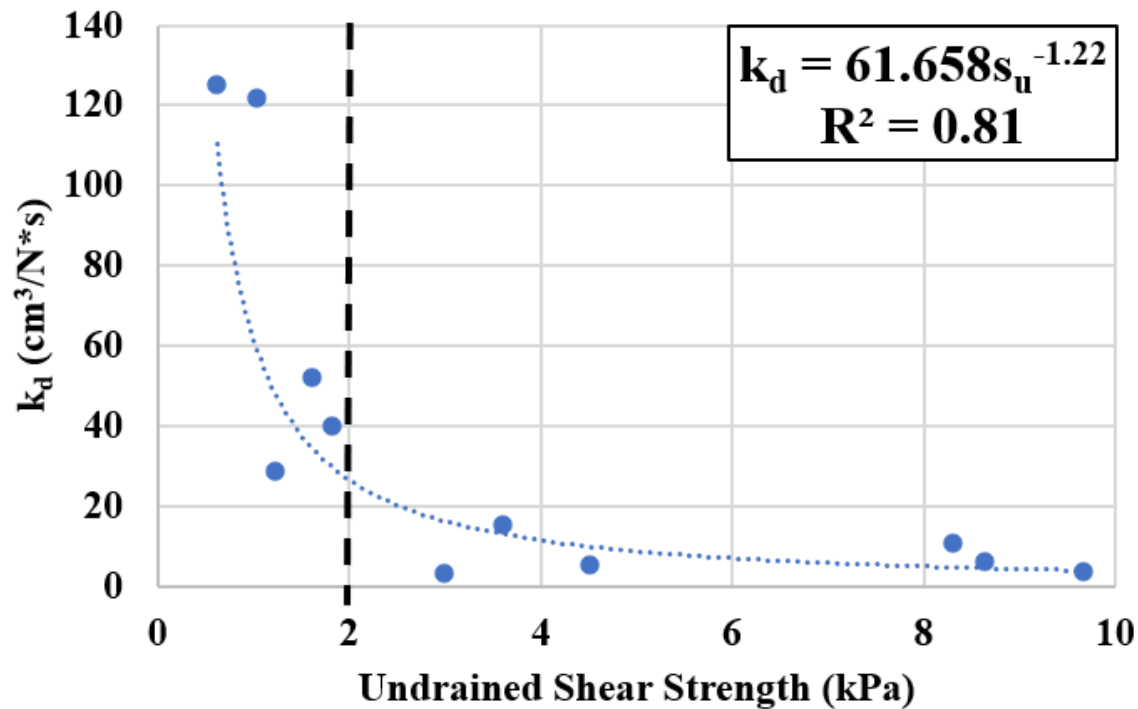
- Risk for momentary liquefaction



Florence et al. (2022)

Correlation to erodibility

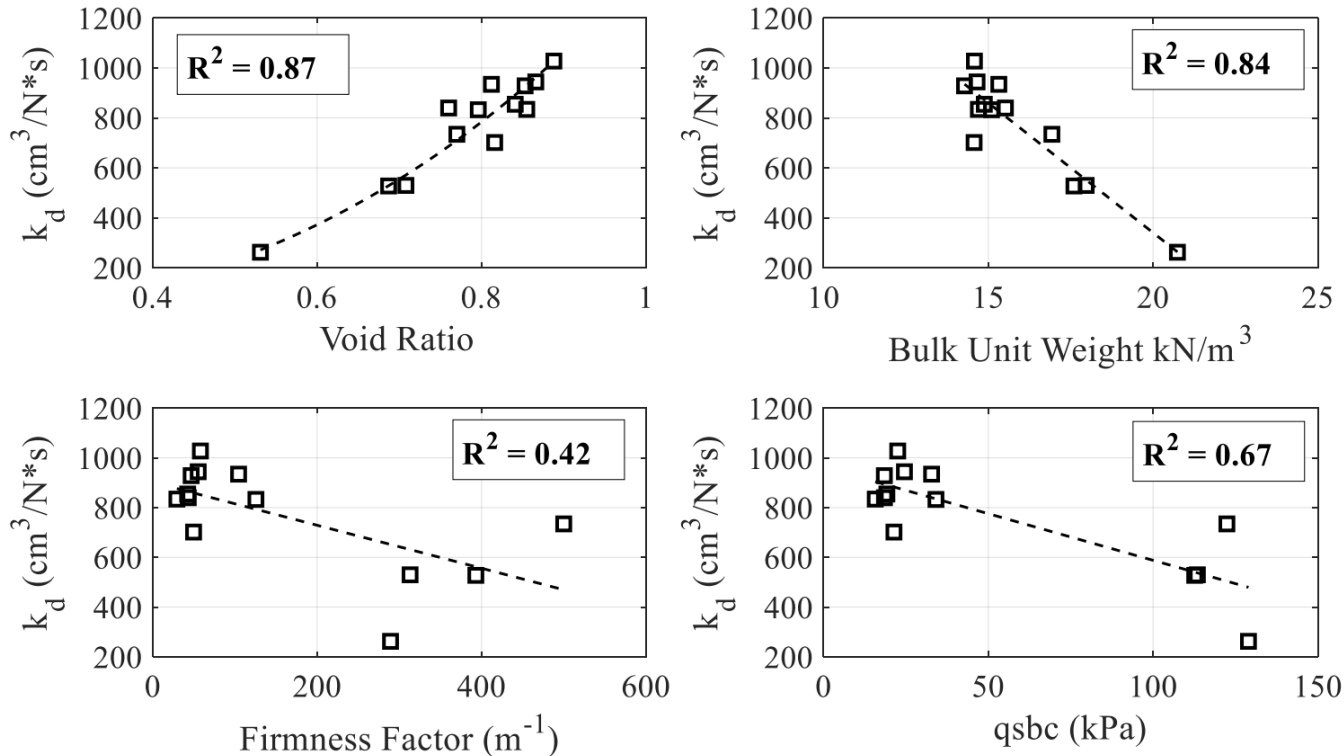
Geotechnical properties relate to erodibility parameters



Brilli et al. (in prep.)

Correlation to erodibility

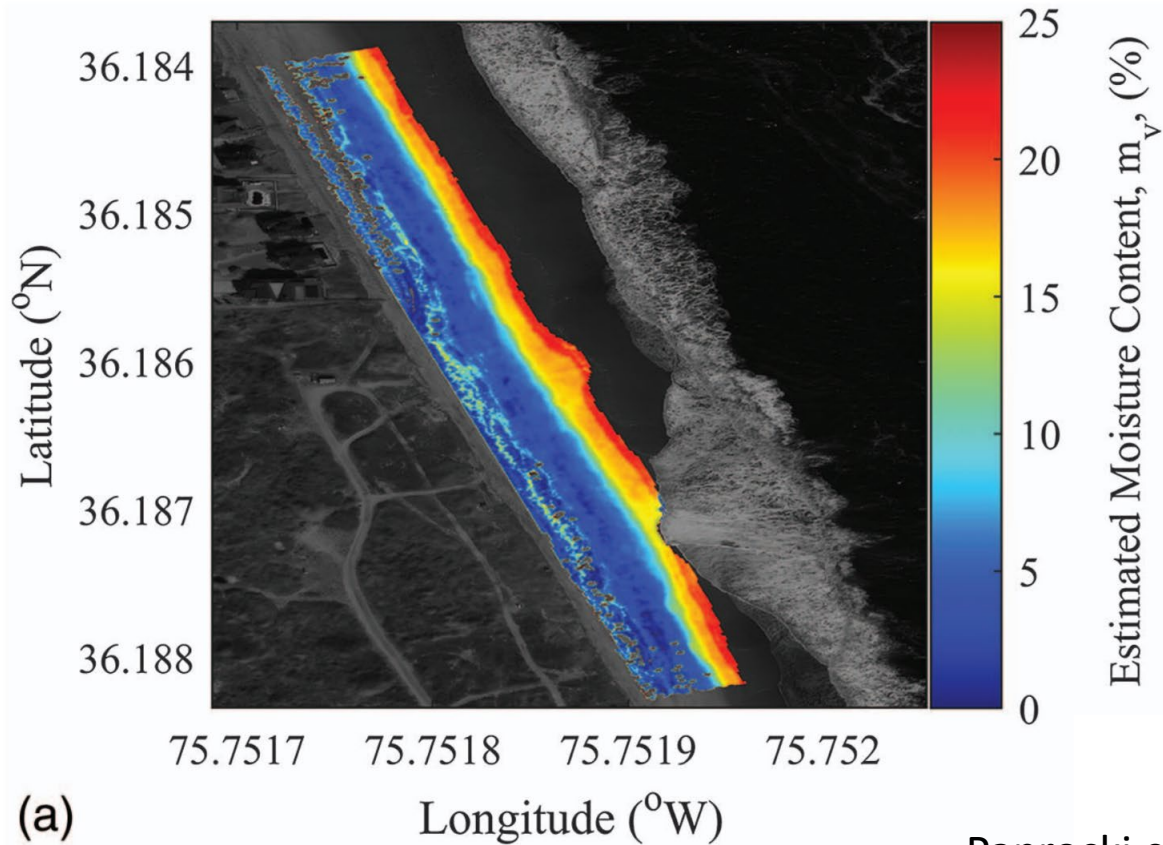
Geotechnical properties relate to erodibility parameters



Brilli et al. (2024)

Mapping

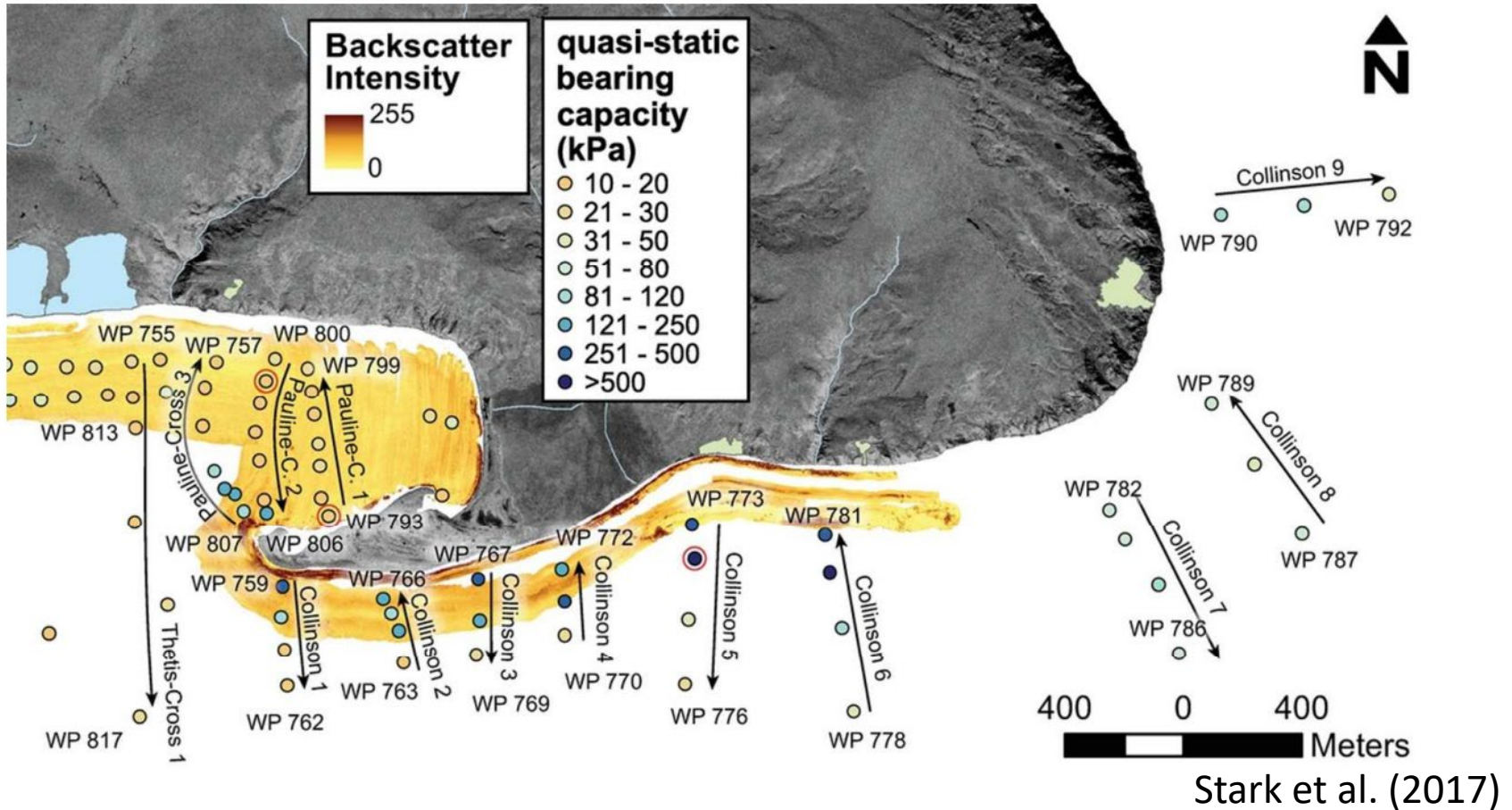
Mapping from correlation between geotechnical properties and satellite imagery



Paprocki et al. (2023)

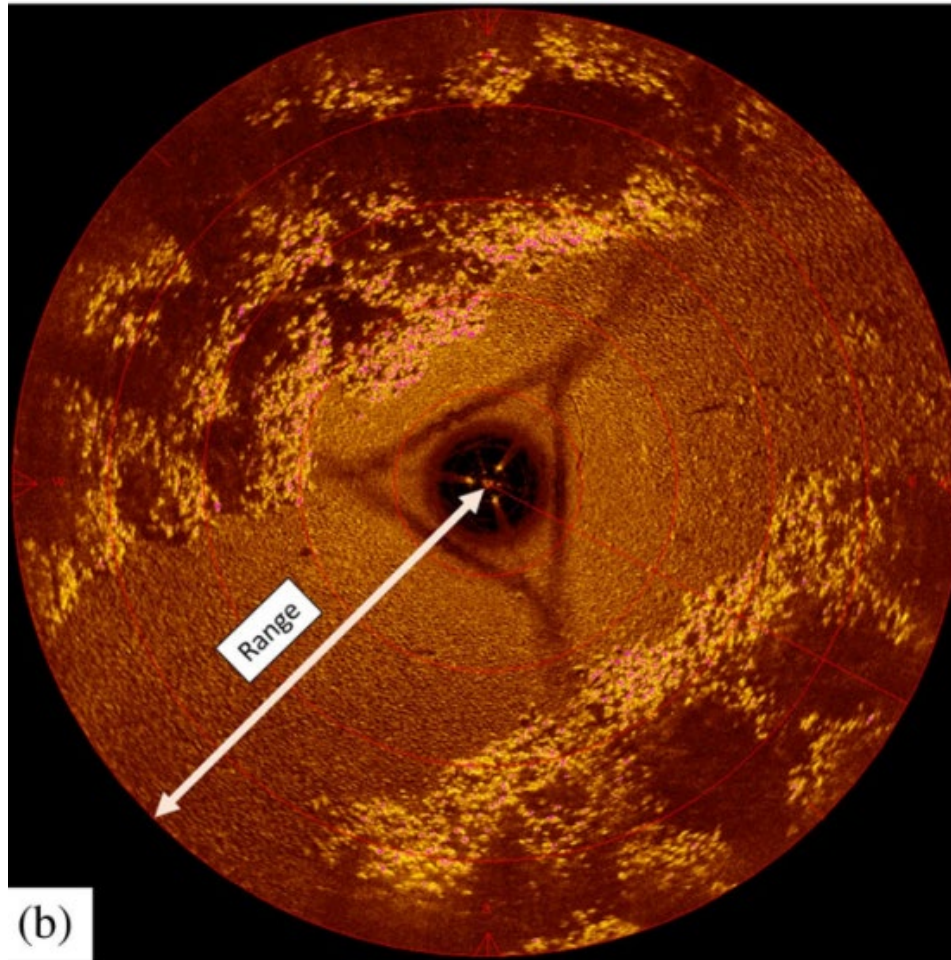
Mapping

Mapping from correlation between geotechnical properties and geoacoustic surveying



Mapping

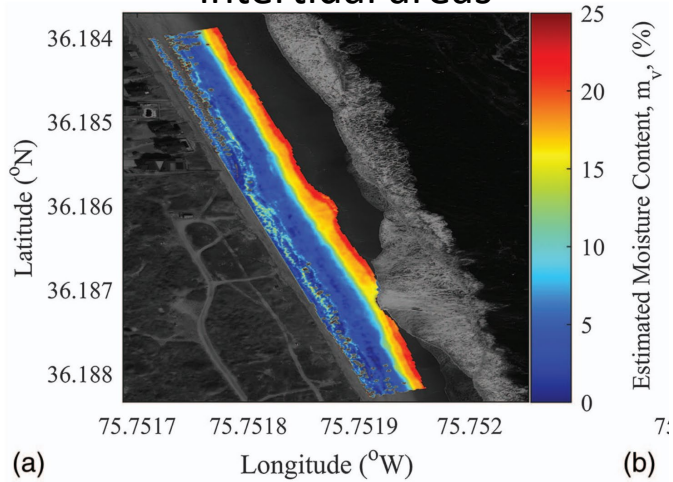
Mapping from correlation between geotechnical properties and geoacoustic surveying



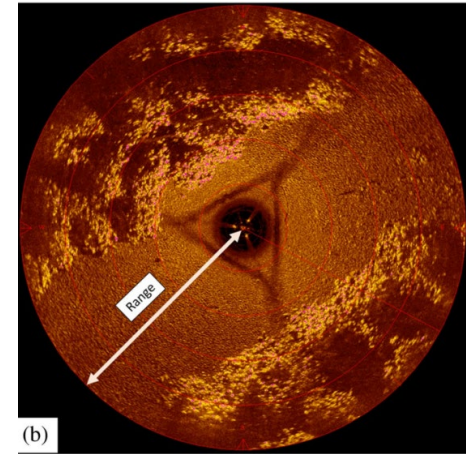
Smith et al. (2023)

Technical approach

Satellite-based remote sensing of intertidal areas



Geoacoustic surveying of subtidal areas



Geotechnical in-situ testing and sampling



Concluding remarks

- **Geotechnical properties of intertidal and nearshore sediments can reveal detailed information about sediment erodibility and recent sediment dynamics**
- **Novel in-situ testing methods enable time-and cost-efficient data collection**
- **Correlation between geotechnical testing and remotely sensed data enables mapping of geotechnical properties in general and to bathymetry and topography**
- **These information can offer detailed insights assisting with improved planning, erosion mitigation, engineering design, and management of coastal zones**



Thank you for your attention!

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