Outrunning Sea-Level Rise: A Study of Seasonal Sediment Accretion Rates in Salt Marshes of Savannah, GA

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Salt Marsh Importance

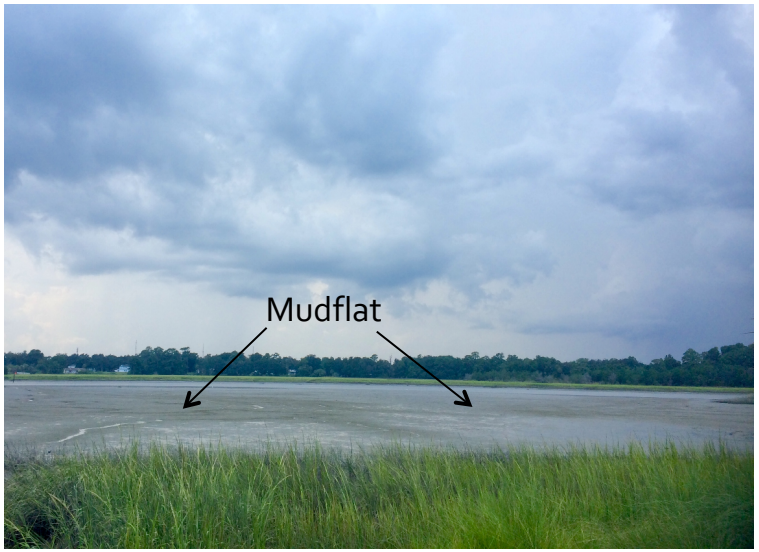
- Southeastern United States
- Provide habitats
- Highly productive
- Nursery grounds
- Buffer

How a Marsh Survives/Evolves

- Surface elevation of the marsh relative to sea level

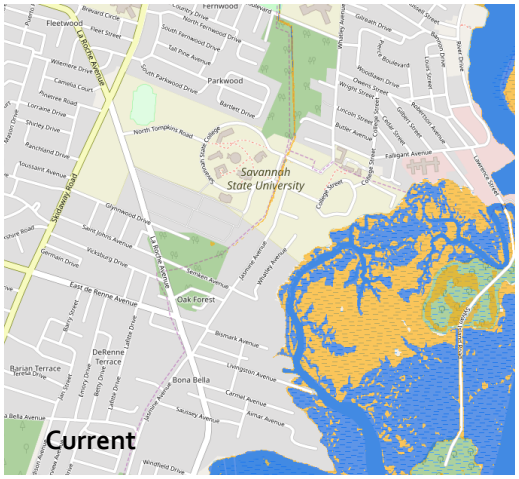
- Sediment Accretion
  - Above Mean SL
- Tidal Cycles
  - Reduce Coastal Erosion
  - Baffling
- Organic Matter

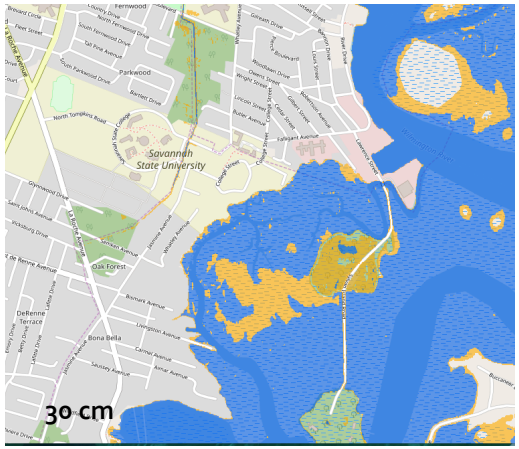
Determining Elevation – Main Factors



- How Long
- How Often
- Productivity

- Or Else…..
  - Mud Flats

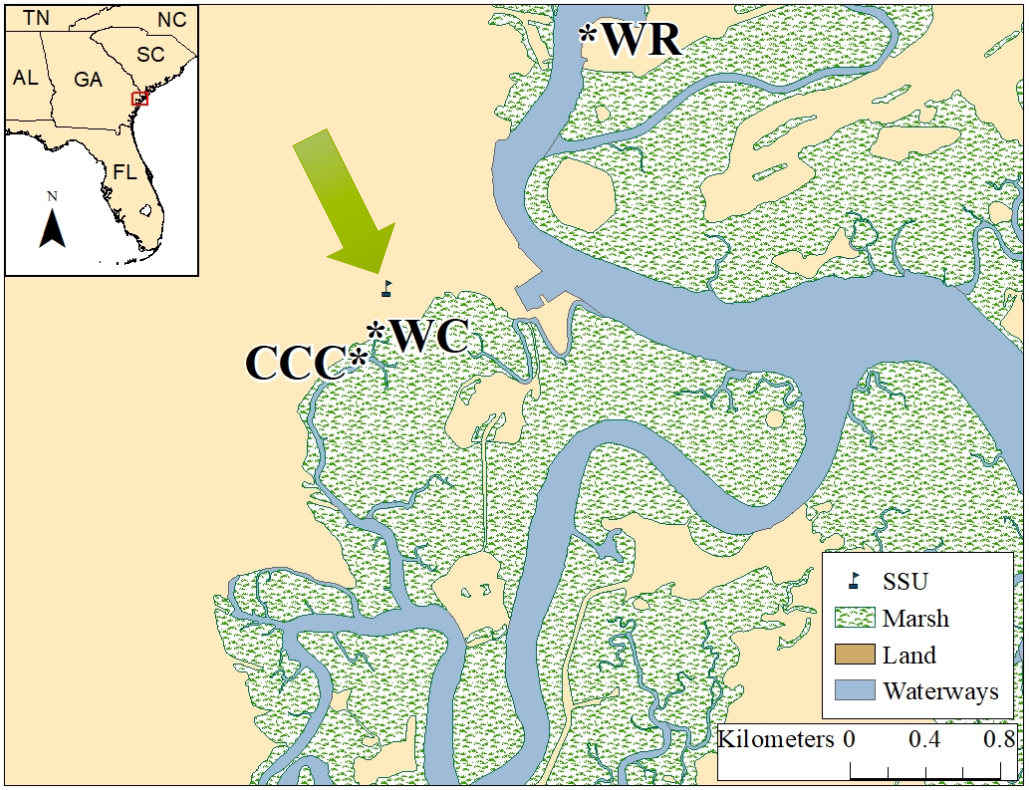




Sea-Level Rise (SLR)

- Global Warming
- 30-90 cm by 2100
- Total Marsh Submergence
- Habitat Migration

Purpose of Our Study

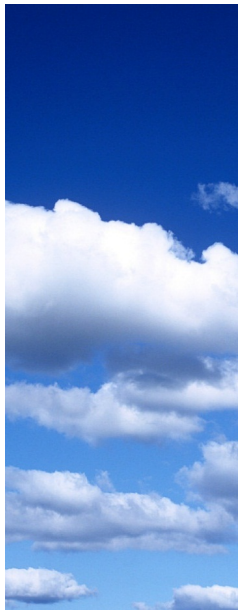


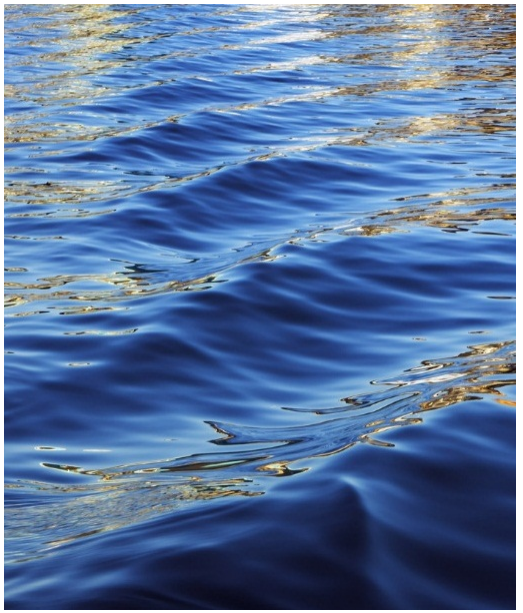
- Wilmington River (WR)
  - Country Club Creek (CCC)
- Williamson Creek (WC)

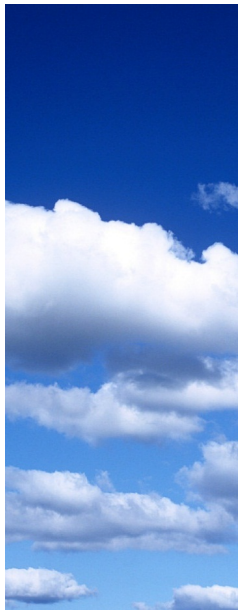
Methodology

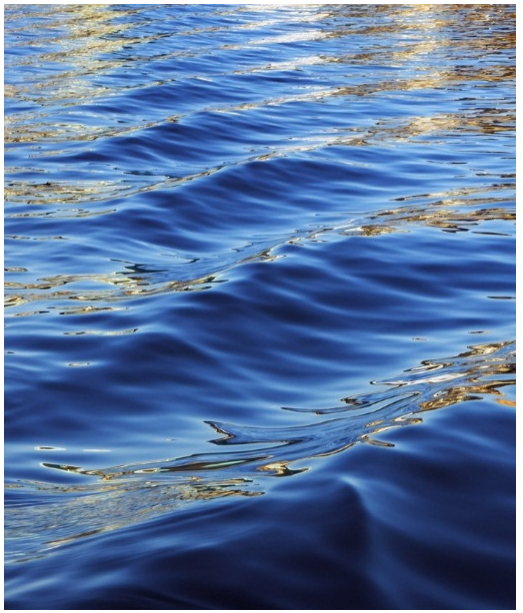
- **Wilmington River (WR)**
- **Country Club Creek (CCC)**
- **Williamson Creek (WC)**

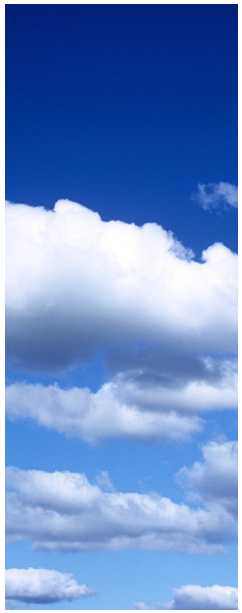
- **Accretion Samples**
- **Water Samples**

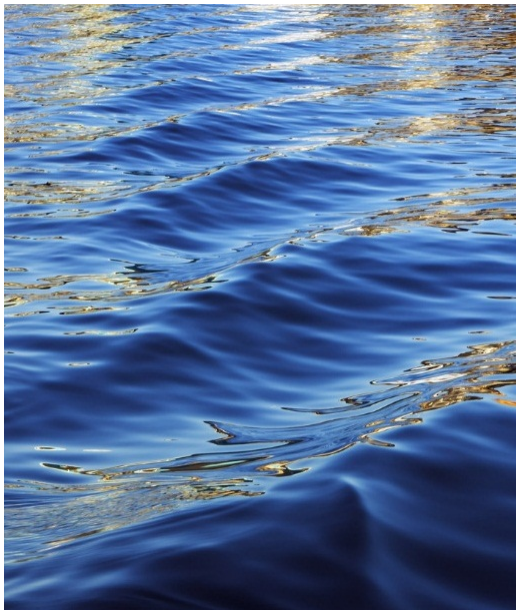


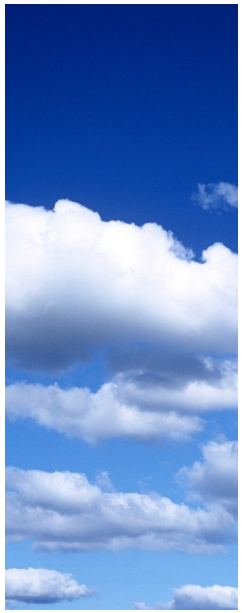


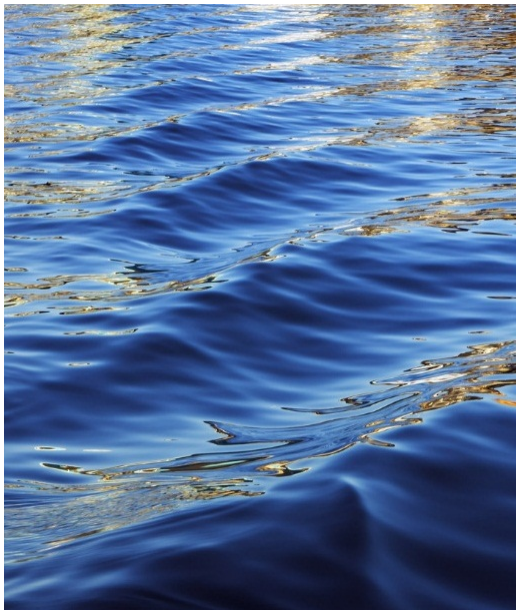


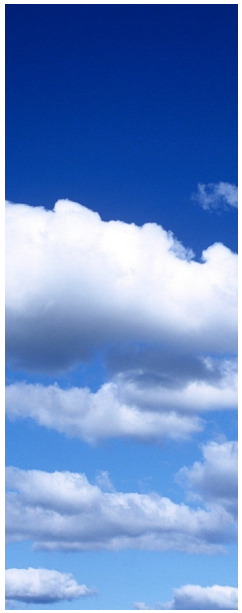


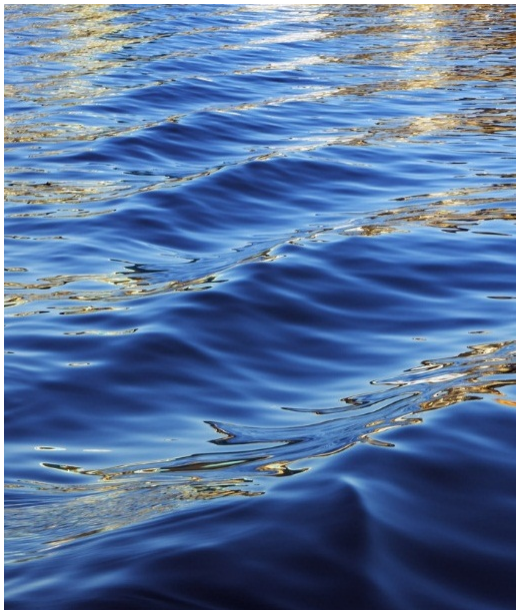


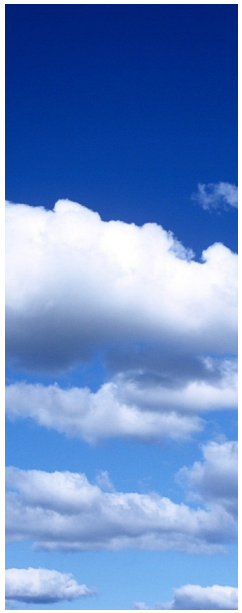


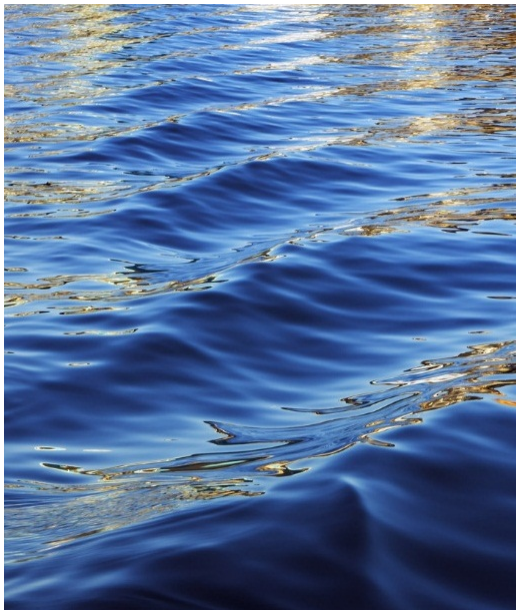


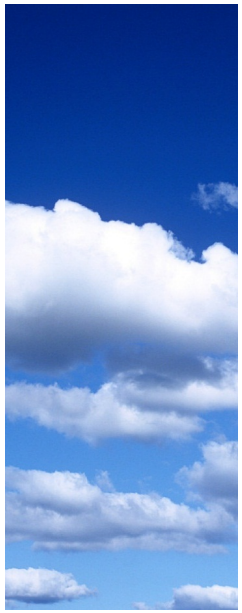


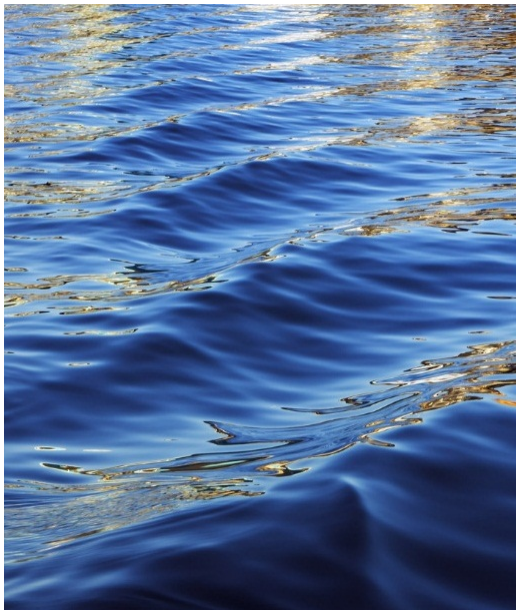


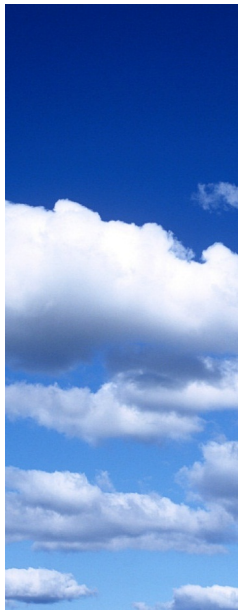


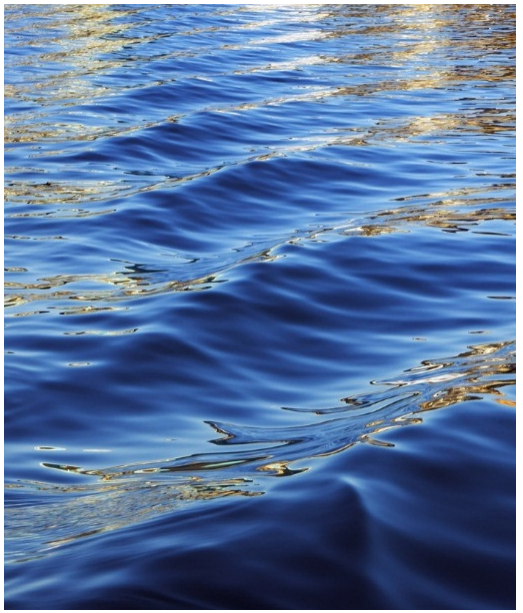






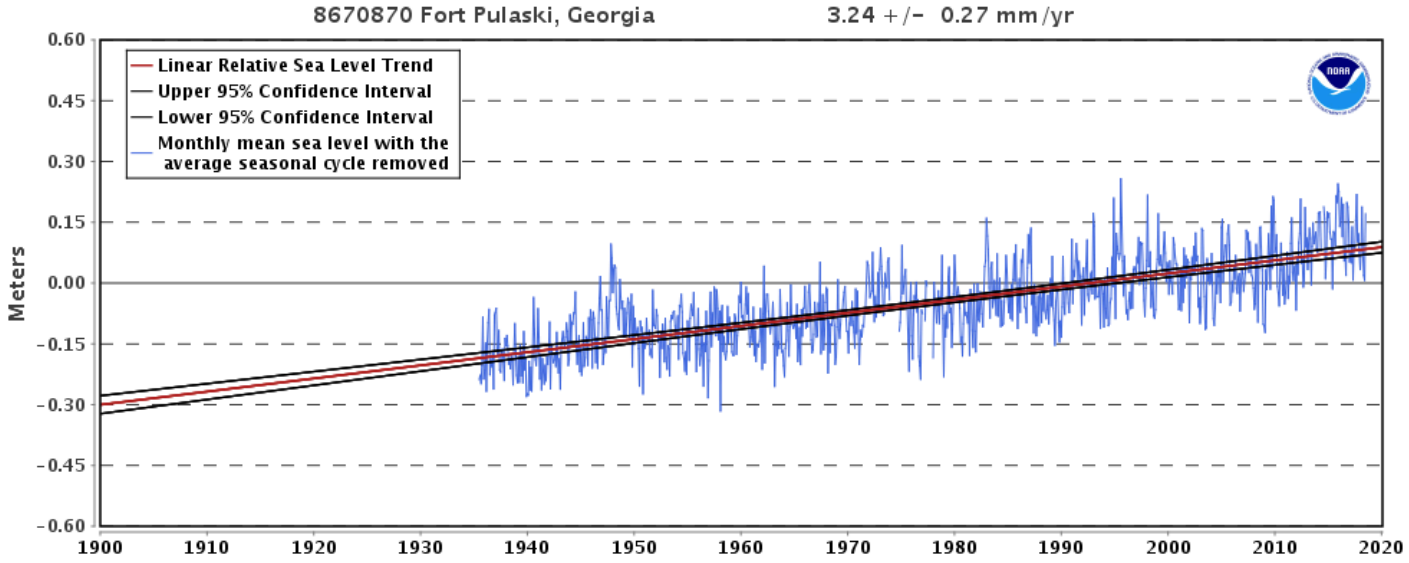


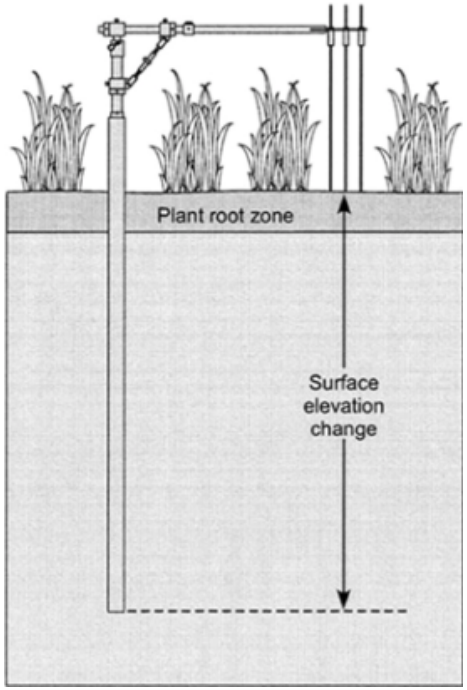




Ft. Pulaski Tide Gauge

- Summer 2016: ~20 x Faster
- Winter 2018: ~ 10 x Faster





- Wait a Minute….
- Student-Budget SET
- New Plan of Action

Feldspar Marker Horizon

Thank You

- Our fellow students from Marine Sediments Class
- Kristina Schwarz – Summer 2016 Intern

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MARINE SCIENCE
http://savannahstate.edu/marinescience

Literature Cited

Alexander, C.R., J.Y.S. Hodgson, and J.A. Brandes. 2017. Sedimentary processes and products in a mesotidal salt marsh environment: insights from Groves Creek, Georgia. Geo-Marine Letters 37(4):345-359.

Burkholder, P.R. 1956. Studies of the nutritive value of Spartina grass growing in the marsh areas of Coastal Georgia. Bulletin of the Torrey Botanical Club. 83(5):327-334.

Christiansen, T., P.L. Wiberg, and T.G. Milligan. 2000. Flow and sediment transport on a tidal salt marsh surface. Estuarine, Coastal and Shelf Science 50:315-331.

Craft, C., J. Clough, J. Ehman, S. Joye, R. Park, S. Pennings, H. Guo, and M. Machmuller. 2009. Forecasting the effects of accelerated sea-level rise on tidal marsh ecosystem services. Frontiers in Ecology and the Environment 7:73-78.

Donnelly, J.P., and M.D. Bertness. 2001. Rapid shoreward encroachment of salt marsh cordgrass in response to accelerated sea-level rise. Proceedings of the National Academy of Sciences of the United States of America 98(25):14218-14223.

Edwards, J.M., and R.W. Frey. 1977. Substrate characteristics within a Holocene salt marsh, Sapelo Island, Georgia. Senckenbergiana Maritima 9:215-259.

Kirwan, M.L., G.R. Guntenspergen, A. D'Alpaos, J.T. Morris, S.M. Mudd, and S. Temmerman. 2010. Limits on the adaptability of coastal marshes to rising sea level. Geophysical Research Letters 37(23).

Kirwan, M.L., and A.B. Murray. 2007. A coupled geomorphic and ecological model of tidal marsh evolution. Proceedings of the National Academy of Sciences of the United States of America 104(15):6118-6122.

Niering, W.A., and R.S. Warren. 1980. Vegetation patterns and processes in New England salt marshes. BioScience 30(5):301-307.

National Oceanographic and Atmospheric Administration (NOAA). 2018. NOAA tides and currents, sea level trends. https://tidesandcurrents.noaa.gov/sltrends/

Schile, L.M., J.C. Callaway, J.T. Morris, D. Stralberg, V.T. Parker, and M. Kelly. 2014. Modeling tidal marsh distribution with sea-level rise: evaluating the role of vegetation, sediment, and upland habitat in marsh resiliency. PLoS ONE 9(2): e88760. https://doi.org/10.1371/journal.pone.0088760.

Stumpf, R.P. 1983. The process of sedimentation on the surface of a salt marsh. Estuarine 17:495-508.

Thorne, K.M., K.J. Buffington, D.L. Elliott-Fisk, and J.Y. Takekawa. 2015. Tidal marsh susceptibility to sea-level rise: importance of local-scale models. Journal of Fish and Wildlife Management 6(2):290-304.

Ward, L.G., M.S. Kearney, and J.C. Stevenson. 1998. Variations in sedimentary environments and accretionary patterns in estuarine marshes undergoing rapid submergence, Chesapeake Bay. Marine Geology 151:111-134.