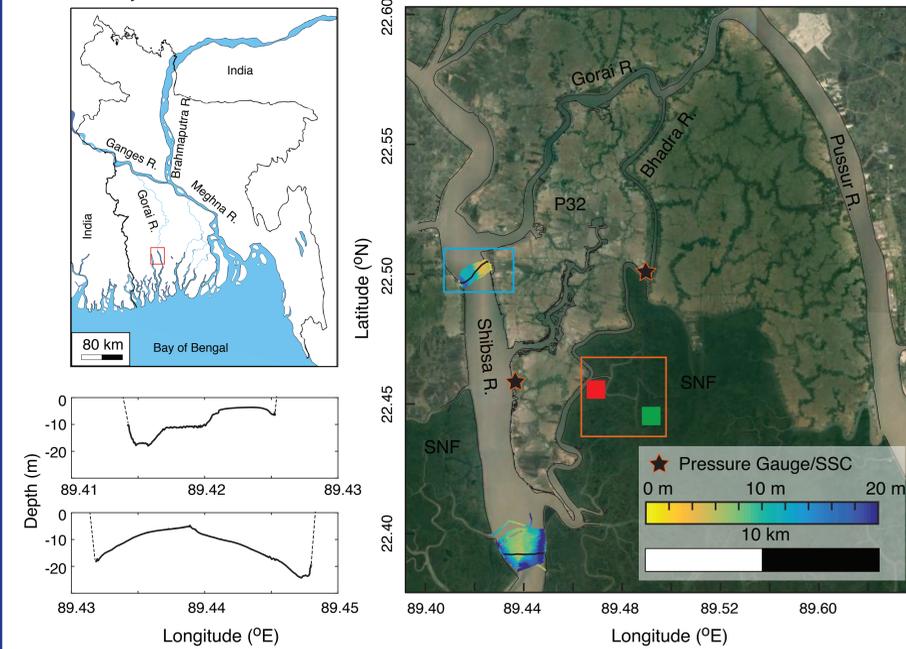


## I. Motivation

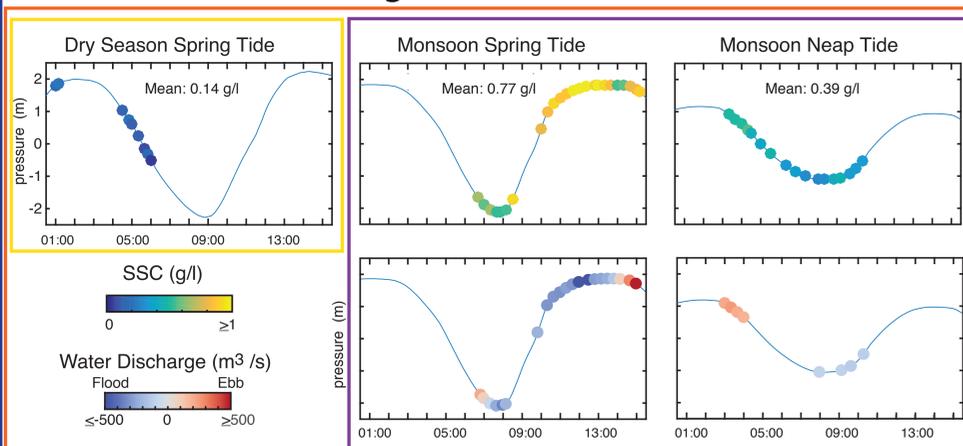
The Sundarbans National Forest (SNF) is a critical cultural, ecologic, and economic resource to the country of Bangladesh. Despite widespread land use changes in the surrounding region, sedimentation within the SNF has managed to keep pace with local rates of sea level rise (e.g., Rogers et al., 2013). This study explores some of the controls on sedimentation, with the goal of investigating their vulnerability to future change. Specifically, we examine the depth and frequency of platform inundation, suspended sediment concentration (SSC), sediment grain size, and the volume of water exchanged, and how these factors vary across time scales ranging from spring-neap tidal cycles to monsoon-dry season cycles. Understanding why the source of local sediment (i.e., the primary tidal channel) behaves differently from the channels delivery that sediment to the platform presents an important knowledge gap that future research will examine in detail.

## II. Study Area



- Cross-channel transect on Shibsia River and in SNF
- SSC from casts and time-series observations
- Inundation from piezometer and tidal channel pressure
- Deposition rates from sediment tiles and elevation tables

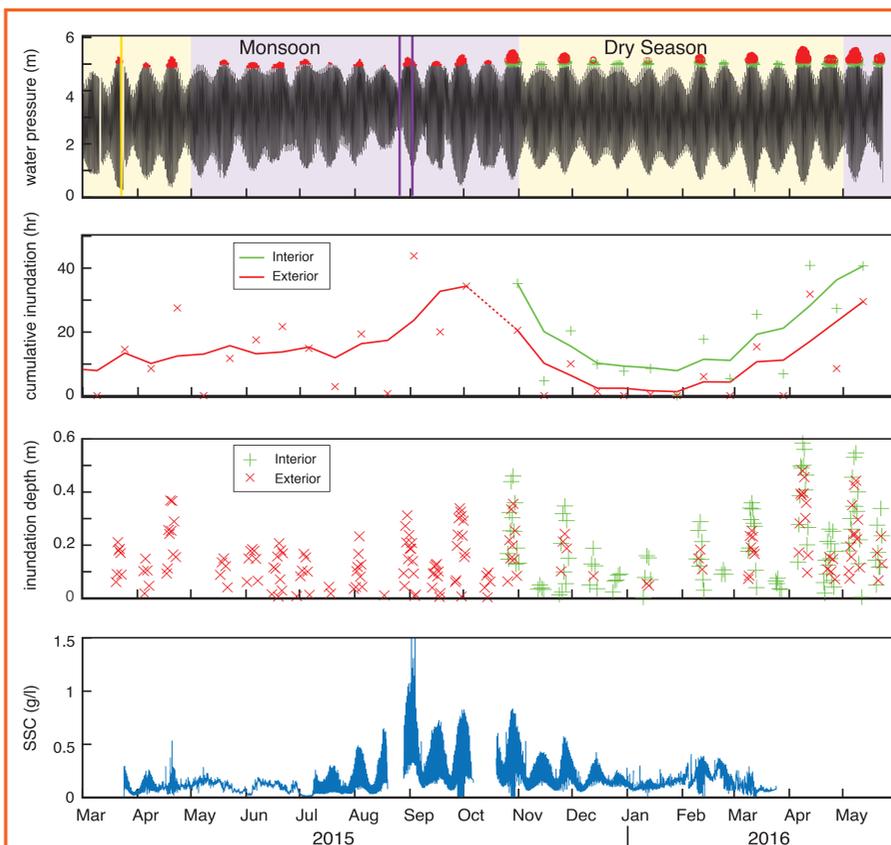
## III. Sundarbans Discharge and SSC



Measurements of SSC (top) and water discharge (bottom) from within the SNF during dry season spring tides, and monsoon spring and neap tides.

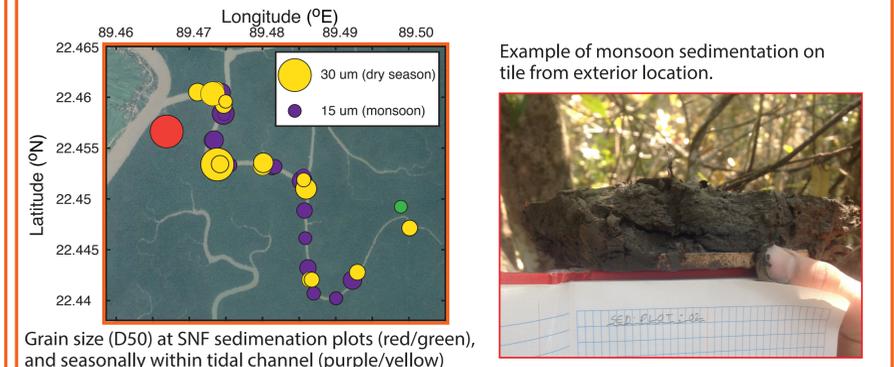
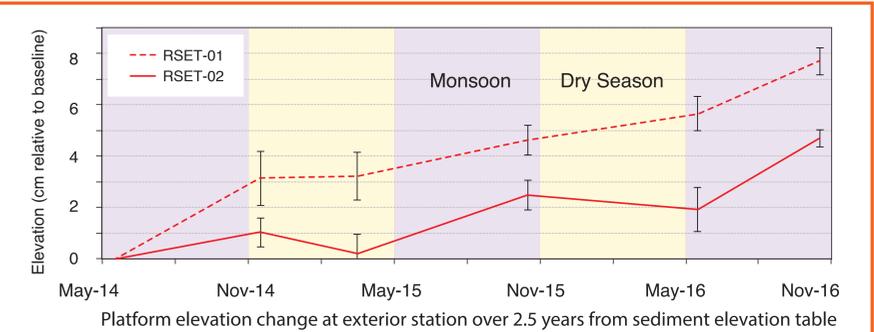
- Maximum SSC during dry season <0.2 g/l (spring tide)
- Minimum SSC during monsoon season >0.1 g/l (neap tide)
- Discharge varies by a factor of ~2 between neap and spring tides
- Monsoon SSC scales with discharge

## V. Platform Inundation and Sedimentation



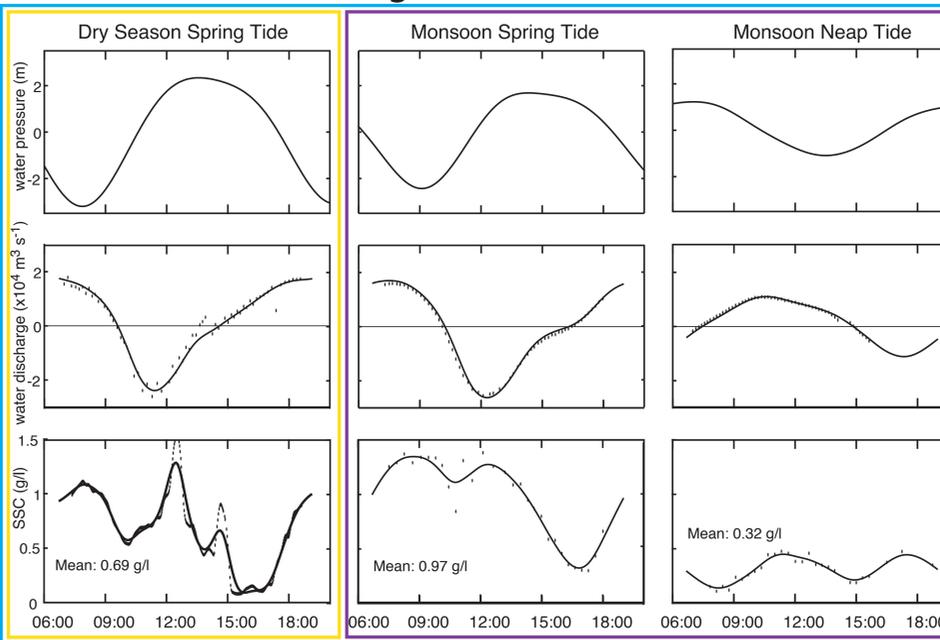
Tidal range and periods of inundation at the exterior (red) and interior (green) locations, total inundation for a given spring-neap tidal cycle, maximum daily inundation depth, and SSC

- Inundation occurs more frequently during monsoon
- Monsoon inundation depth is greater than dry season
- SSC maximum coincides with peak inundation



- Deposition (1-3 cm) occurs primarily during monsoon
- Grain size fines away from main channel
- No obvious seasonal change in grain size

## IV. Shibsia River Discharge and SSC



Shibsia R. tidal range, water discharge, and SSC during dry season spring tides and monsoon spring and neap tides

- Water discharge is similar for spring (or neap) tides across seasons
- Maximum SSC for a given tidal range is similar across seasons
- SSC minimum follows slack high water on every tide, any season
- Average SSC is greatest during monsoon spring tides (0.97 g/l)
- Dry season spring tide SSC > monsoon neap tide SSC

## VI. Conclusions

- SSC in primary channel controlled largely by tidal variability
- SSC in secondary channel demonstrates importance of seasonal variability relative to tidal range
- Variables controlling sedimentation show similar patterns of seasonal change
- Magnitude of seasonal variability is also similar
  - Monsoon SSC 2-3x greater than dry season
  - Platform floods 2x more frequently during monsoon
  - Maximum flood depth is 2x deeper during monsoon
- Sedimentation occurs primarily during monsoon
- Interior station features finer grains and enhanced inundation, resulting in deposition rate  $\approx$  exterior station
- Understanding relative importance of specific sedimentation controls will require higher-frequency observations of deposition

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