Including Fine-Grained Sediment Processes Within Numerical Representations of a Partially-Mixed Estuary, the York River, Virginia, USA

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York River
- Partially mixed estuary
- Seasonal secondary turbidity maximum (STM)
- ETM near West Point
- Multidisciplinary Benthic Exchange Dynamics (MUBED) focus site, since 2006.

2-D Estuary
Idealized Model Configuration

Results

ETM
- Animation 1:
  o Typical estuarine circulation
  o ETM at the salt front
  o Higher SSC during flood tide.
- Sediment trapping
  o Deposition occurred seaward of the ETM
  o Lower bed stress
  o Velocities converge.
- Erosion throughout the rest of the estuary

Conclusions
- An idealized 2-dimensional estuarine model can represent the processes that create an ETM.
- Suspension of fine-grained sediment in the salt front.
- Sediment trapping in the salt front.
- Higher suspended sediment during the flood tide.
- Sediment-induced stratification reduces suspended sediment concentrations.
- Observational data is useful to guide the processes necessary to incorporate into numerical models.

Future Work
Expand the capabilities of the model to better compare with observations.
- Three-dimensional model of York River estuary
  - Incorporates bed consolidation and swelling.
  - Observational data drives the salinity, winds and river discharge.
- Track sediment resuspension
  - Use Beryllium-7 as a tracer (Fig. 11)

References


HPC
- Aggregation and breakup of flocculated particles with a size class based population model
  - FLOOMD (Verney et al., 2013)

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