Importing GenCade with SBAS Toolbox

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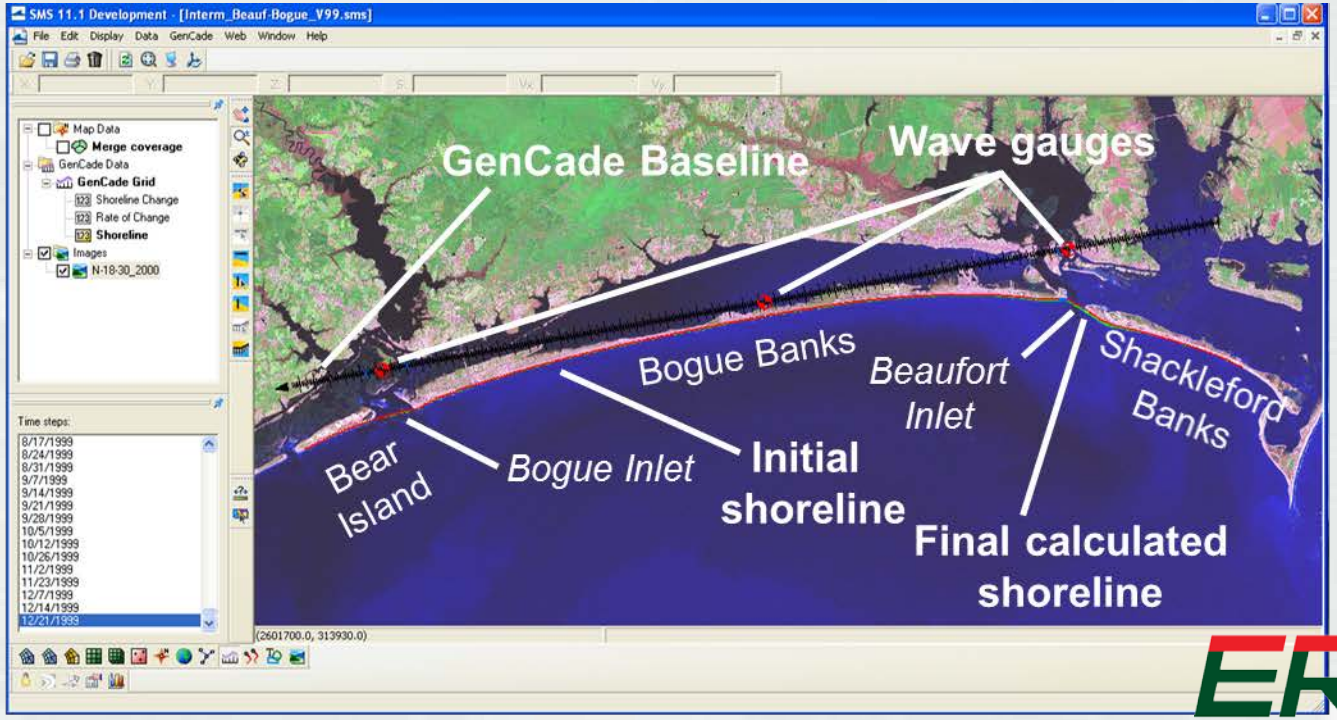
Outline

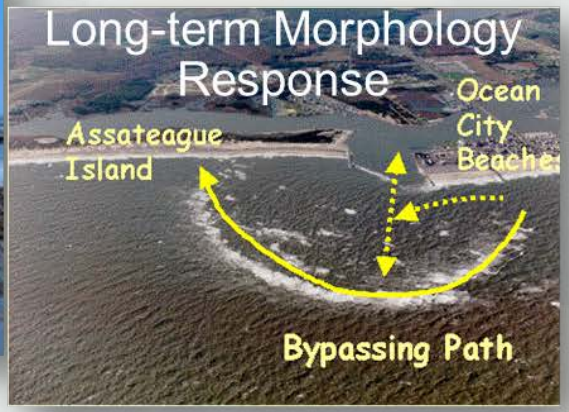
- Introduction to GenCade
- GenCade Method
- Background Information and Introduction to Onslow Bay, NC
- GenCade Results
- Developing a Sediment Budget with GenCade and SBAS
- Summary and Conclusions

GenCade

- Integrated GENESIS and Cascade models for shoreline change and regional sediment calculation
- Connects inlets, navigation channels, ebb and flood shoals, and beaches in engineering activities in a regional framework
- Decision-making support for planning, operation, and engineering
- In SMS 11.1; PC, user-friendly interface for engineers & scientists



GenCade



Why GenCade?

- Sediment storage and transfer (bypassing, back-passing)
- Navigation channel maintenance
- Multiple interacting inlet dredging & placements on beaches
- Cumulative impacts
- Sources & sinks (shoal dredging and beach nourishment)
- Compatibility with data and previous calculations

Overview of Onslow Bay

- Cape Lookout to Cape Fear
- More than 185 km of shoreline
- 11 inlets
- Developed and undeveloped barrier islands
- Few coastal structures

Problem Statement

Main goal – Improve understanding of the Onslow Bay regional sediment system

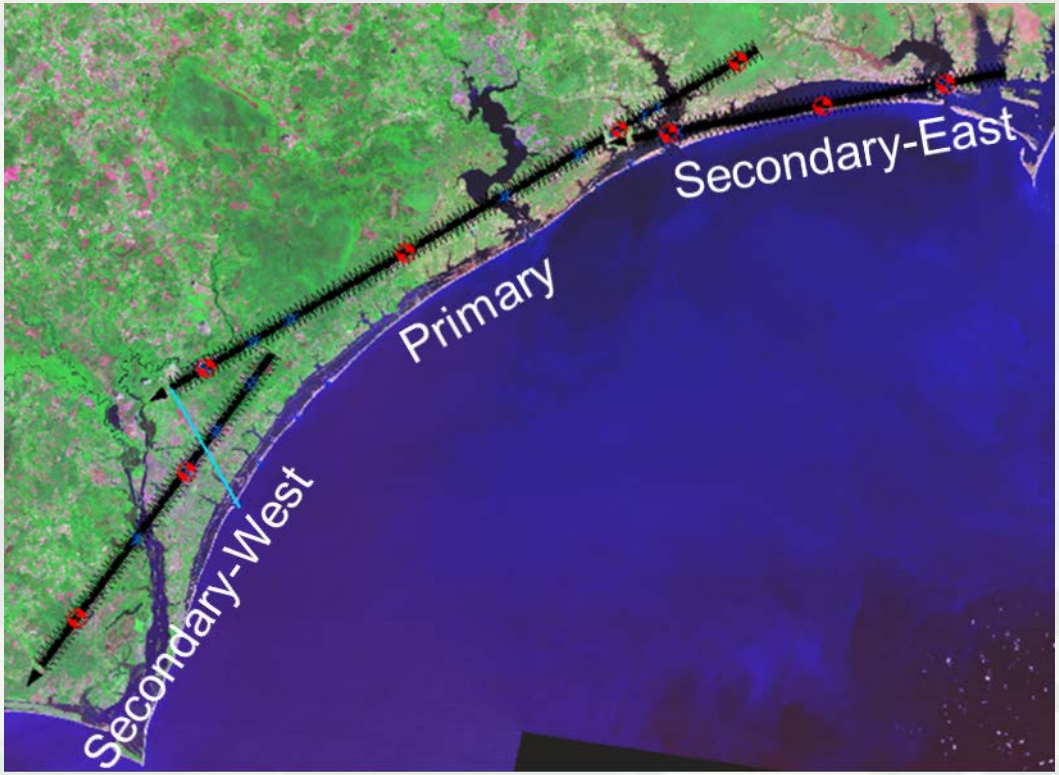
Initial Task

- use a numerical model to calculate shoreline change and longshore sand transport in Onslow Bay

Final Tasks

- develop a sediment budget based on the numerical modeling results
- develop a tool to connect GenCade results to the Sediment Budget Analysis System (SBAS) automatically

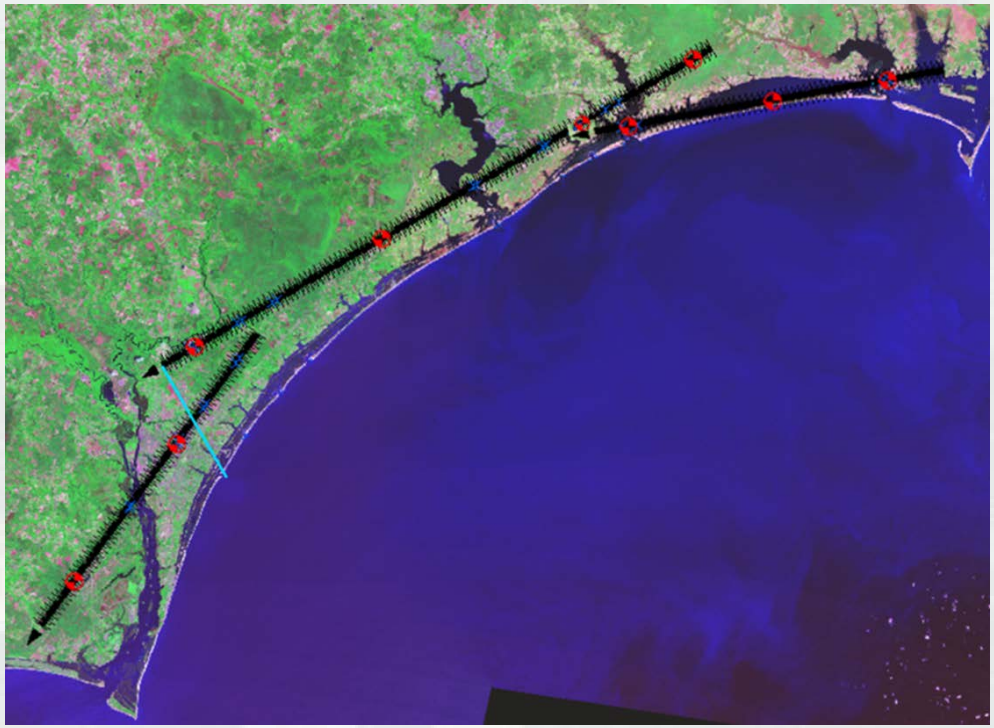
GenCade Calibration



Three separate GenCade models

- Primary
  - 8 inlets
  - 4 wave gauges
- Secondary-East
  - 2 inlets
  - 3 wave gauges
- Secondary-West
  - 4 inlets
  - 2 wave gauges

GenCade Calibration

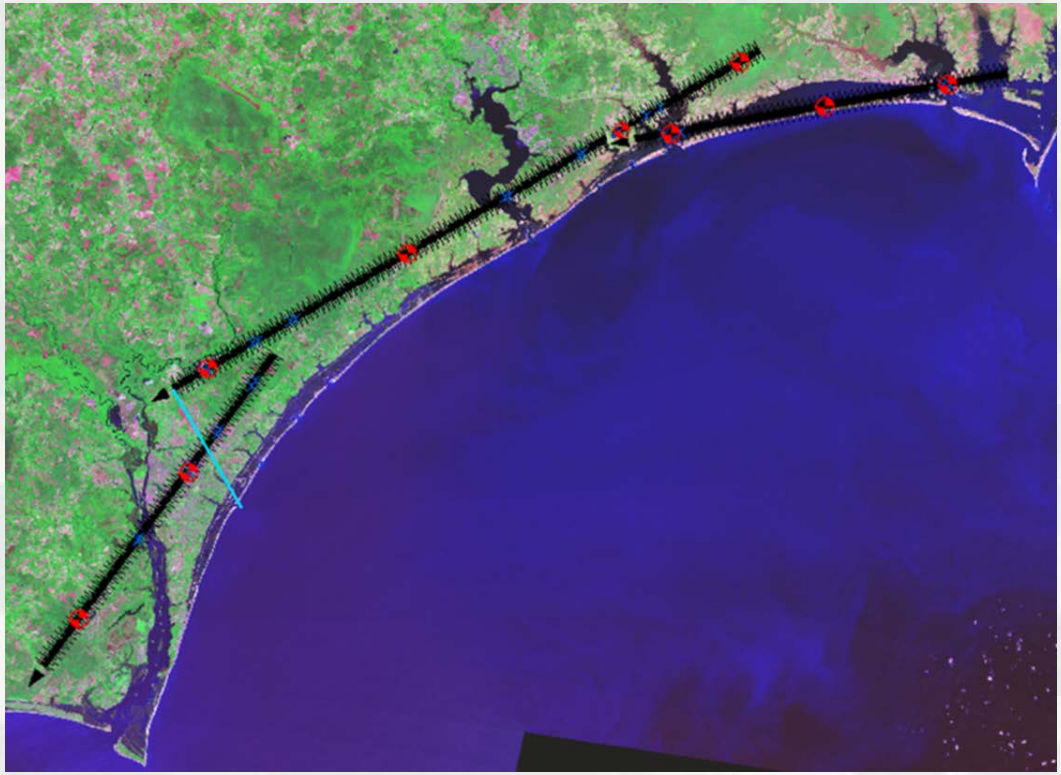


GenCade Input

- 1997 and 2004 shorelines
- Waves (WIS 63274, 63276, 63279, 63292, 63298, 63304)
- Masonboro Inlet jetties
- Carolina Beach seawall
- Fort Fisher revetment
- Beaufort Inlet terminal groin

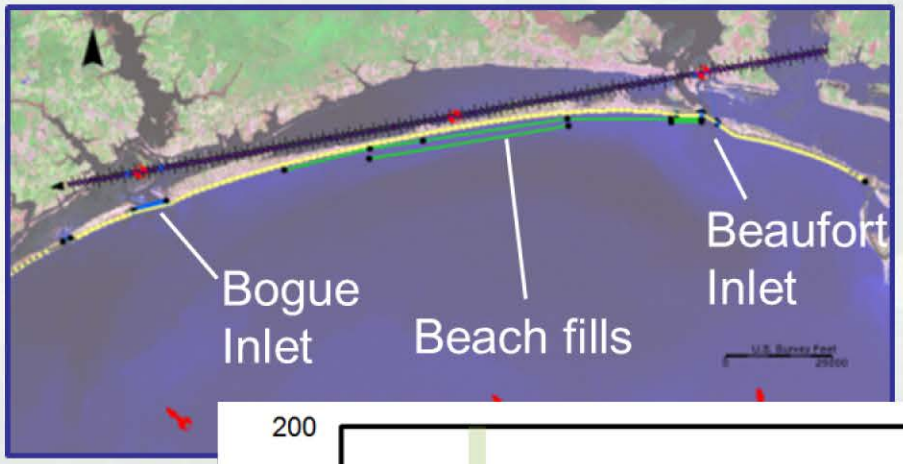
- Beach fills on Bogue Banks, Figure Eight Island, Masonboro Island, Wrightsville Beach, Carolina Beach, and Kure Beach
- Beaufort Inlet, New River Inlet, Rich Inlet, Masonboro Inlet, Carolina Beach Inlet dredging events

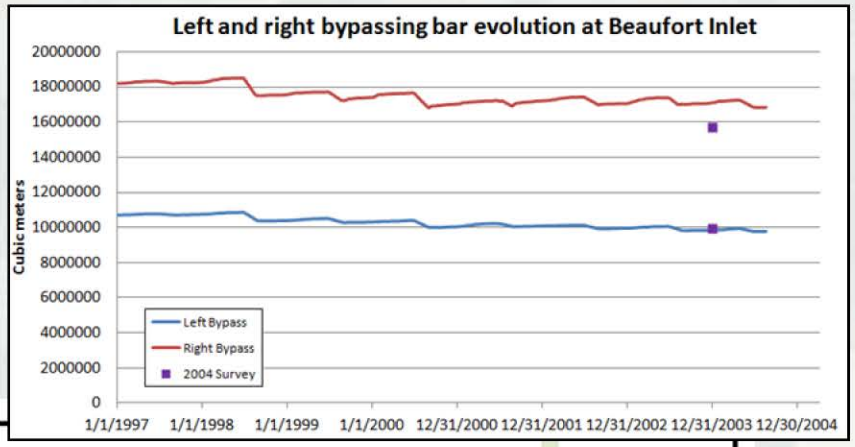
GenCade Calibration

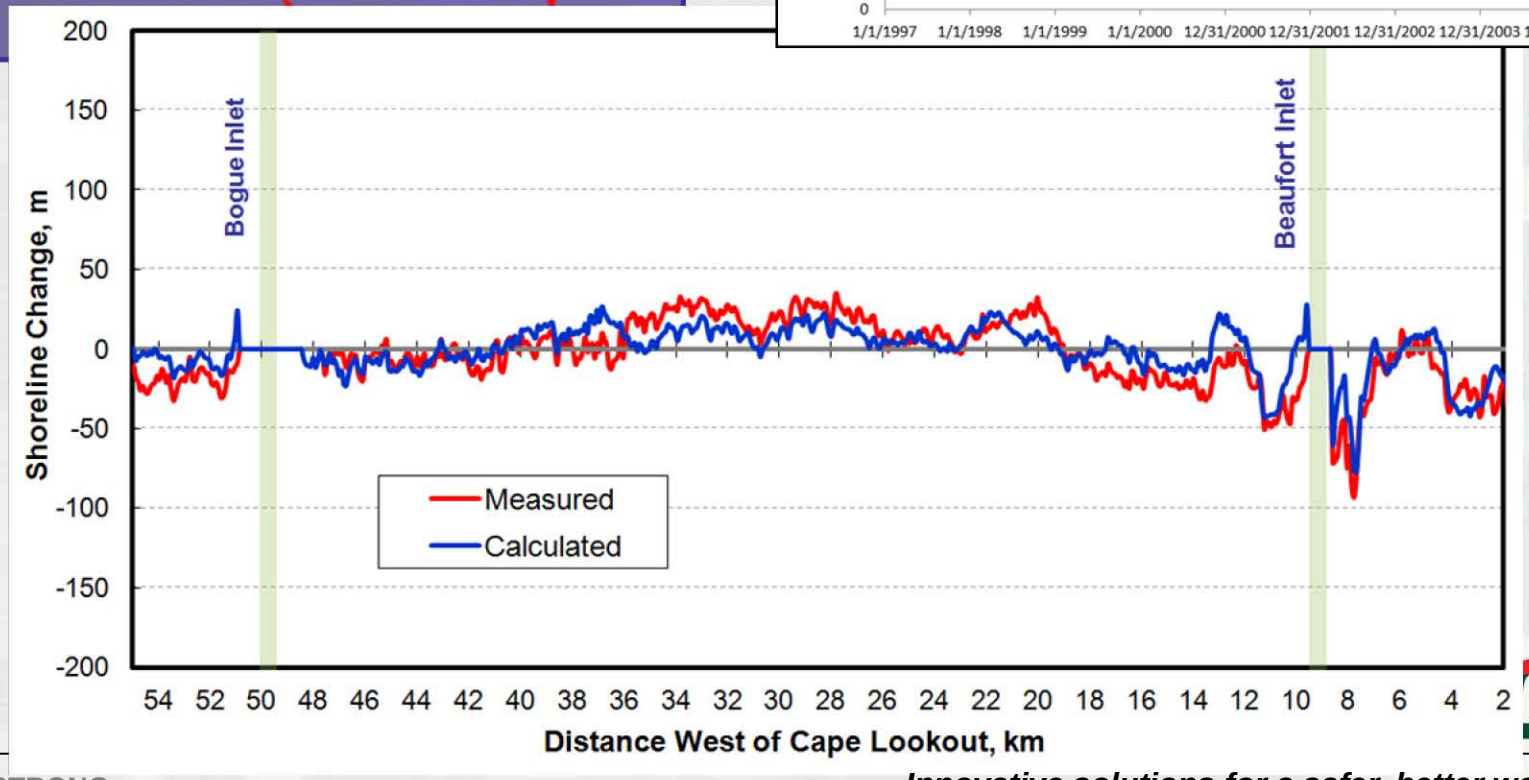


Parameter	Value
Start Date	1/1/1997 0:00
End Date	8/27/2004 0:00
Time Step	0.5 hr
Recording Time Step	168 hr
Effective Grain Size, mm	0.17
Average Berm Height, m	1.4
Average Depth of Closure, m	8.1
Lateral Boundary Conditions	Moving
K1	0.6
K2	0.4
ISMOOTH (smoothing window)	100
Cell spacing, m	91

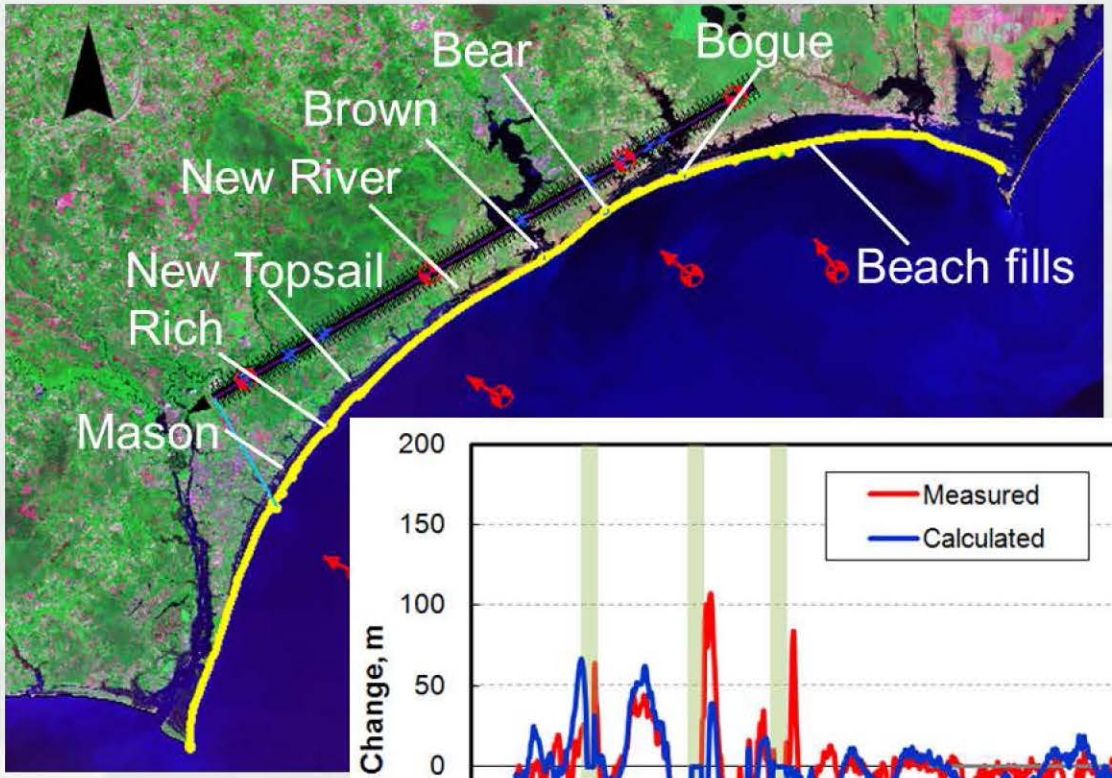
GenCade Results: Secondary-East

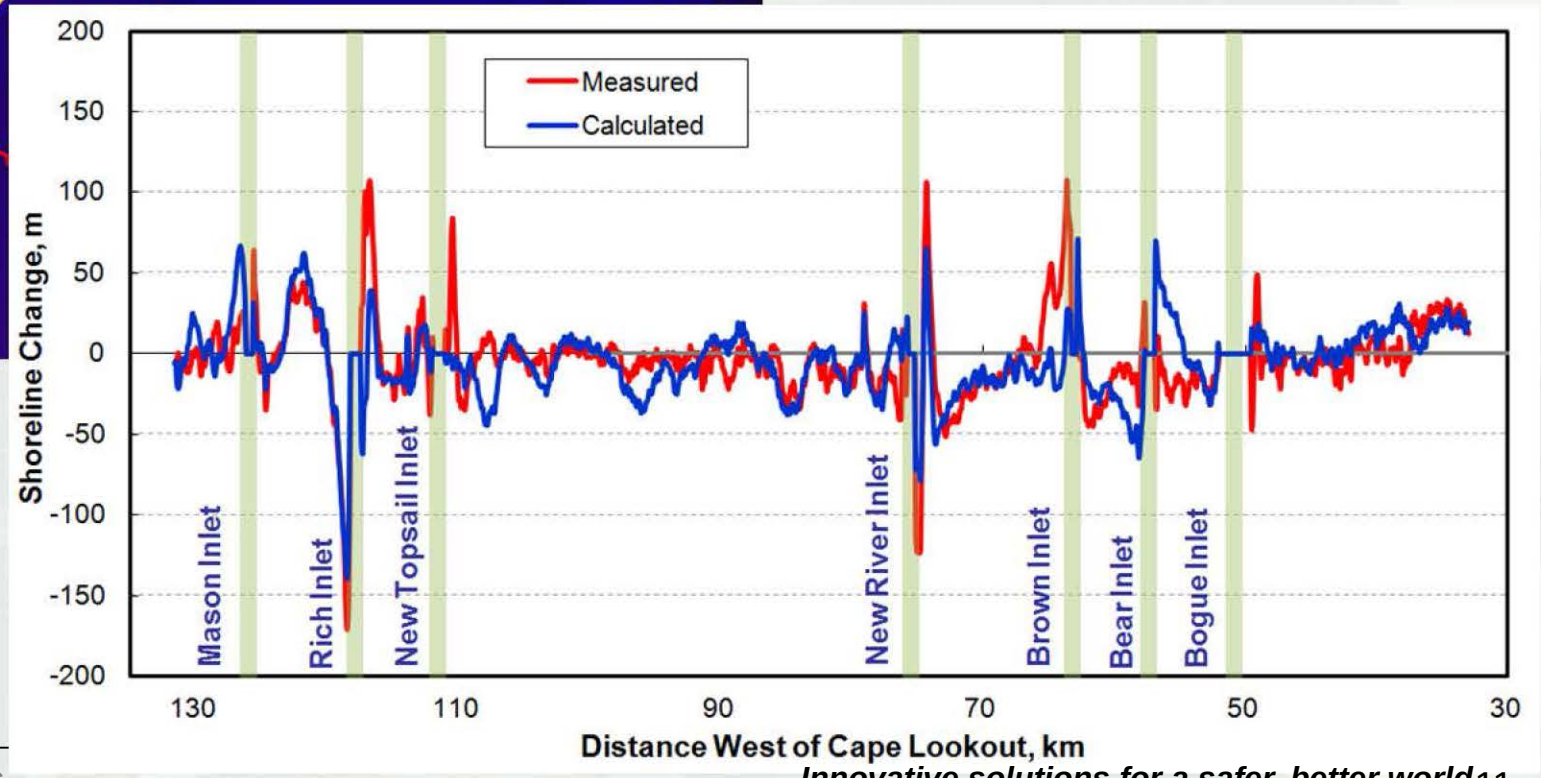




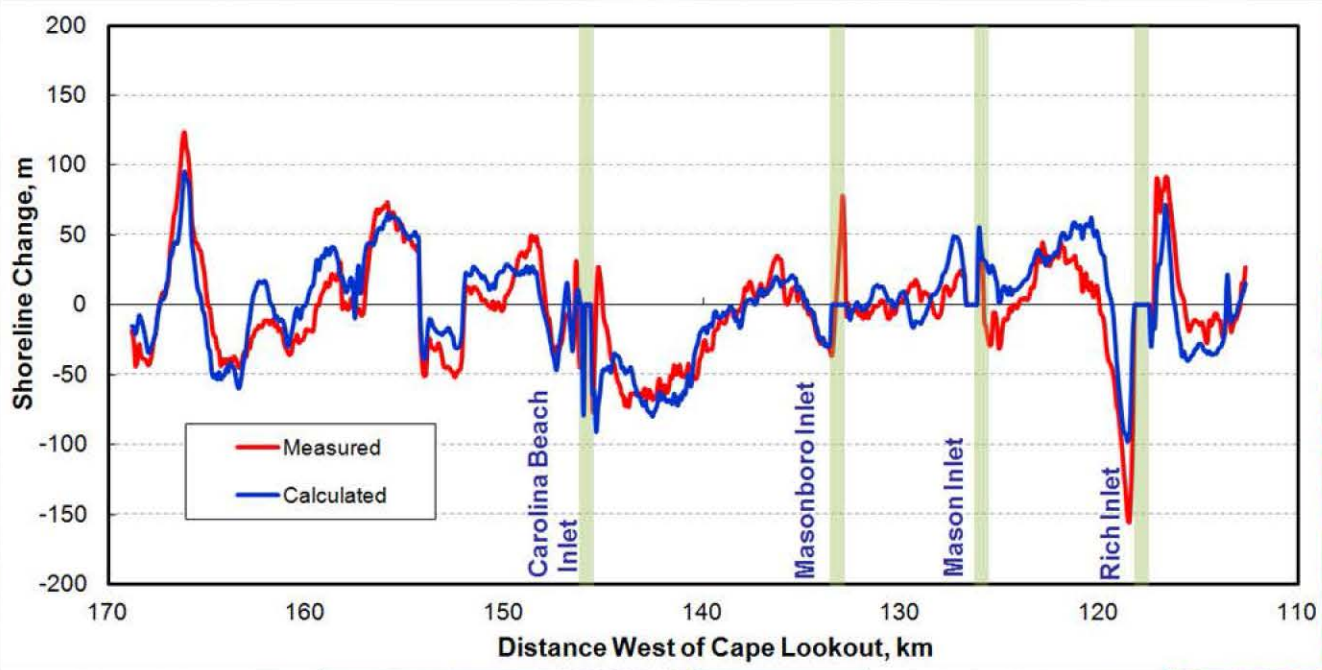


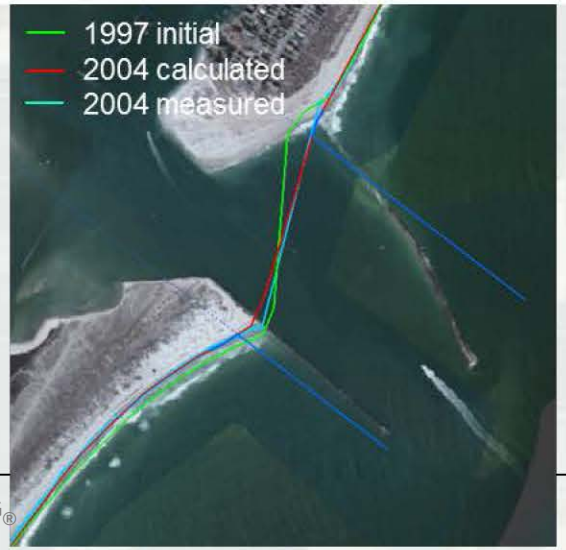
GenCade Results: Primary

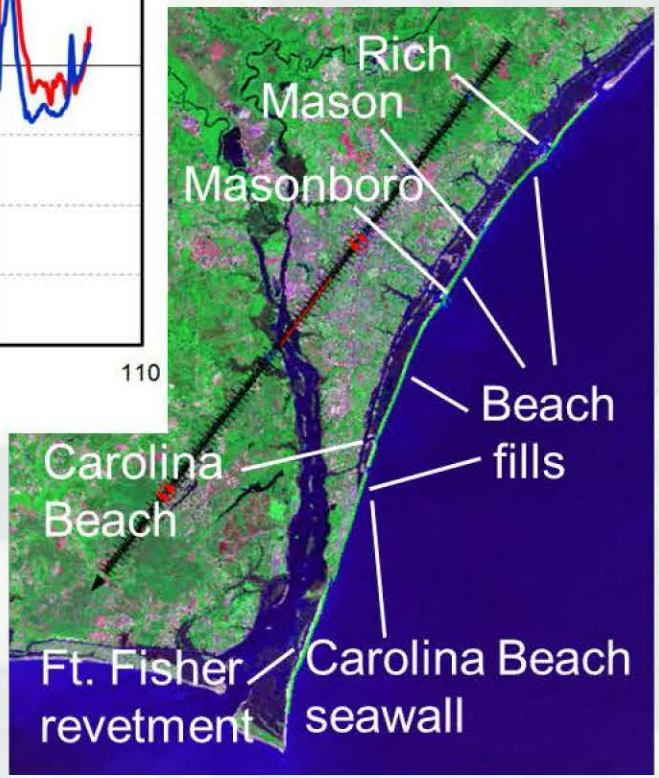




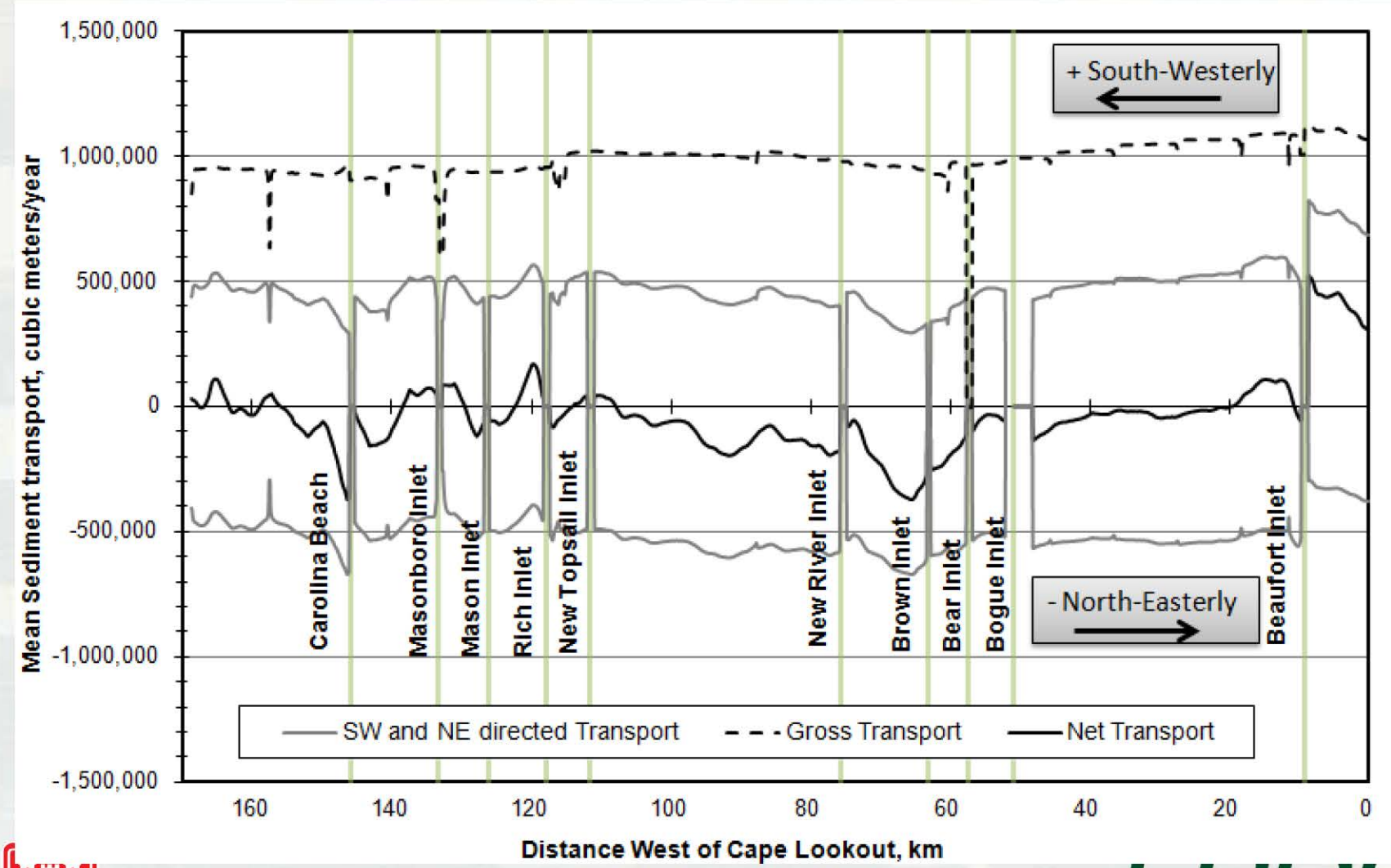
GenCade Results: Secondary-West



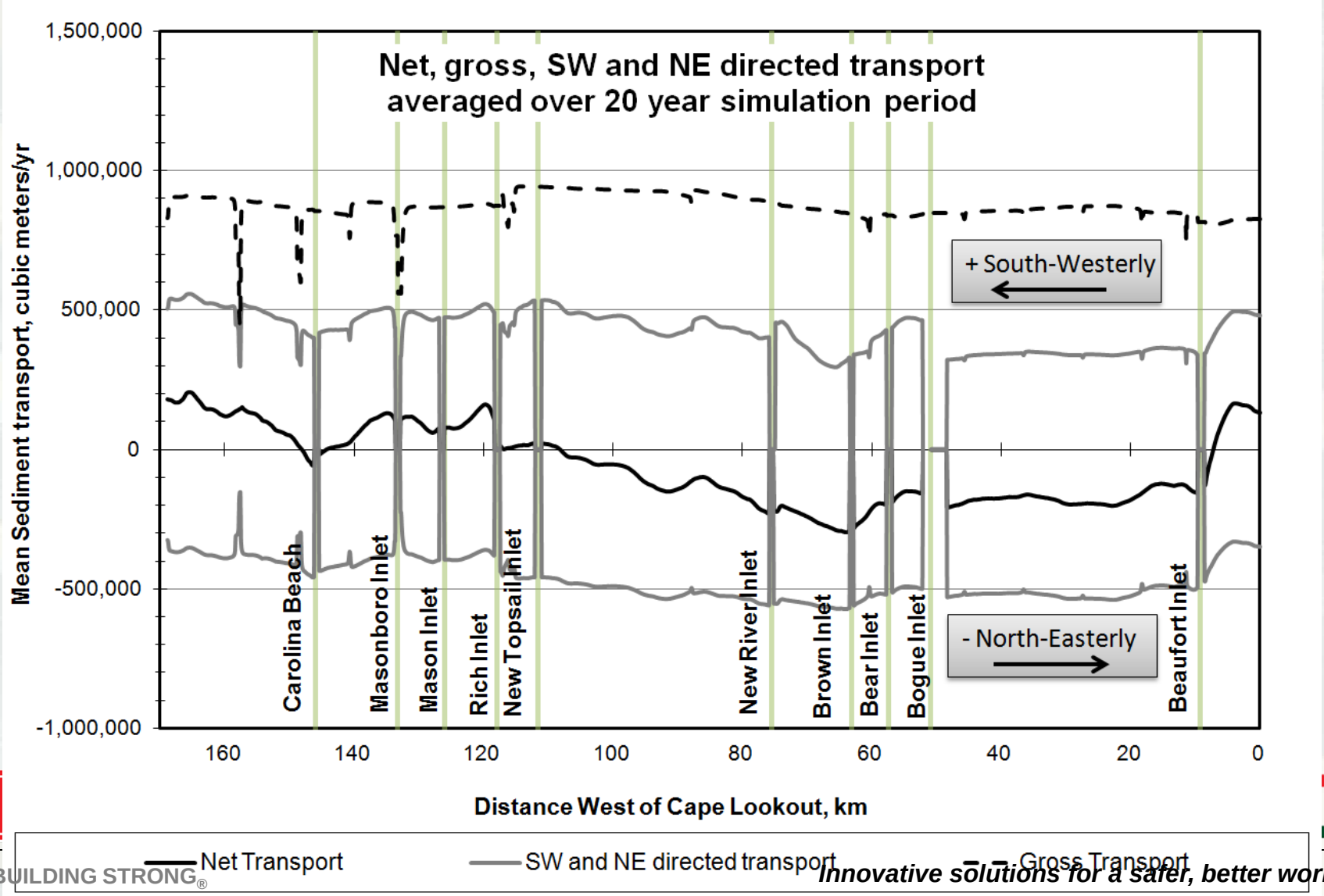




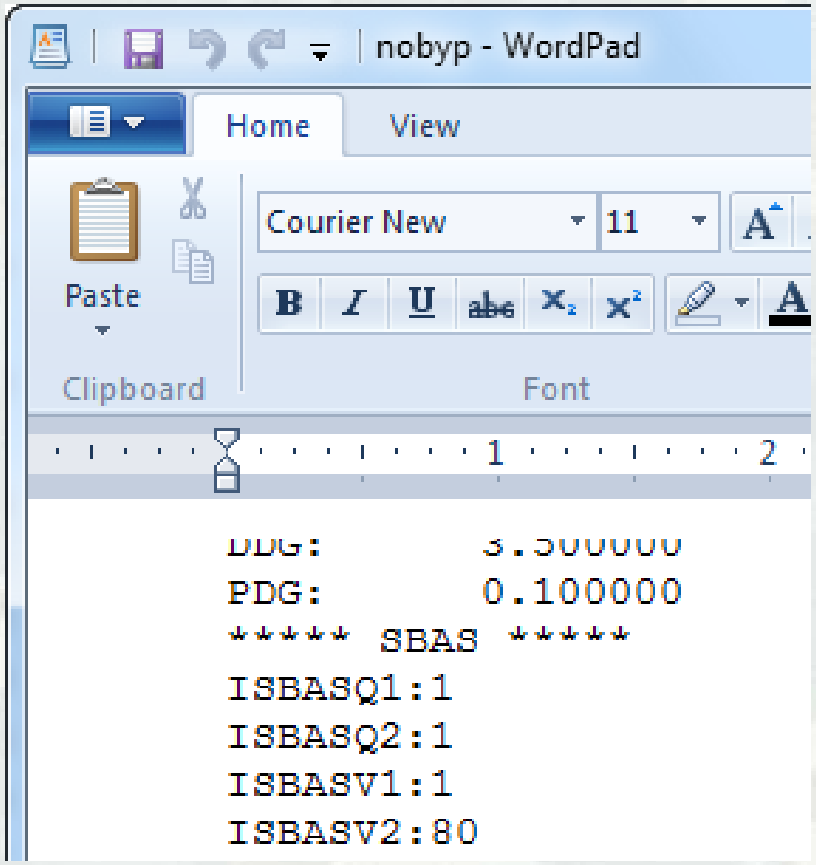
GenCade Results: Longshore Transport



GenCade Results: Longshore Transport (20 years)



Advanced Cards

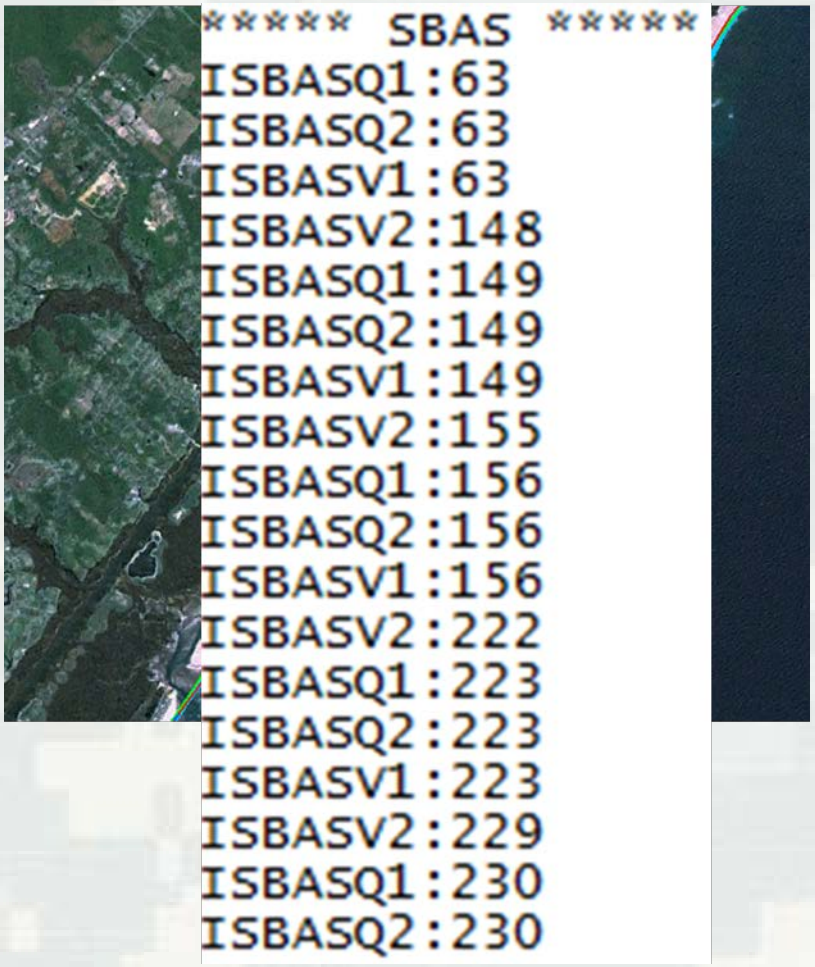


Sediment Budget: Producing output from GenCade

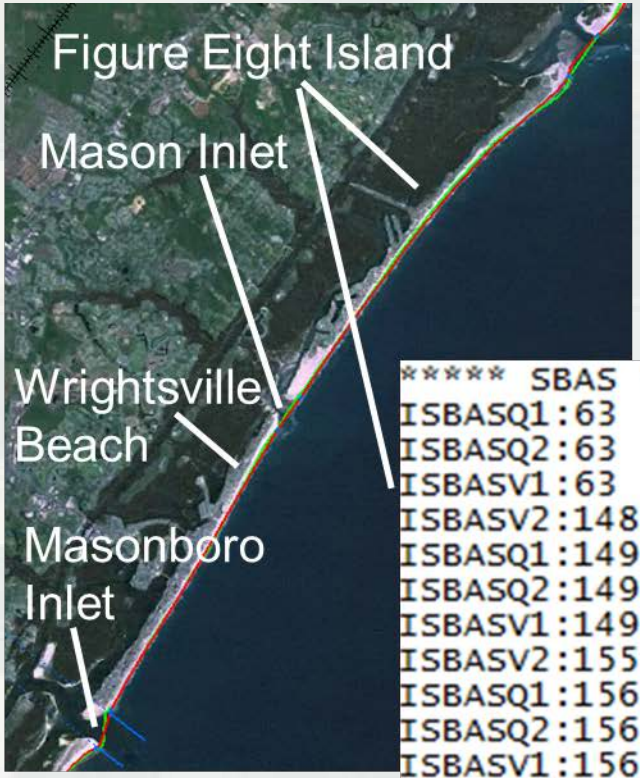
Typical outputs

- Shoreline change
- Longshore transport
- Inlet shoal volumes

New input file created to output volume change for specific cells and longshore transport rates between cells



Sediment Budget: Producing output from GenCade




```
***** SBAS *****
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ISBASQ2:63
ISBASV1:63
ISBASV2:148
ISBASQ1:149
ISBASQ2:149
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ISBASV2:155
ISBASQ1:156
ISBASQ2:156
ISBASV1:156
ISBASV2:222
ISBASQ1:223
ISBASQ2:223
ISBASV1:223
ISBASV2:229
ISBASQ1:230
ISBASQ2:230
```
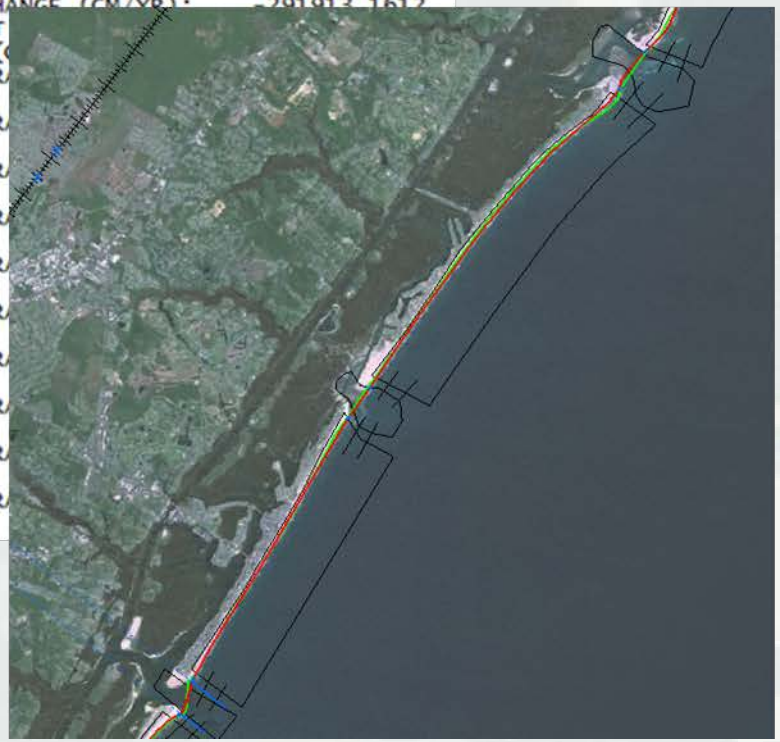

```
*************************************************************
*                          SBAS OUTPUT                      *
*************************************************************

 SBAS CELL            1  VOLUME CHANGE (CM/YR):     209398.5782
                         PLACEMENT (CM/YR):         116497.5174
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            2  VOLUME CHANGE (CM/YR):     0.0000E+000
                         PLACEMENT (CM/YR):         0.0000E+000
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            3  VOLUME CHANGE (CM/YR):     71521.8133
                         PLACEMENT (CM/YR):         217076.2381
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            4  VOLUME CHANGE (CM/YR):     -291913.1612
                         PLACEMENT (CM/YR):         0.0000E+000
                         REMOVAL (CM/YR):           327990.9759
 SBAS FLUX ARROW              1  TRANSPORT FLUX TO RIGHT (CM/YR):
  362863.0875
 SBAS FLUX ARROW              1  TRANSPORT FLUX TO LEFT (CM/YR):
 -332898.6535
 SBAS FLUX ARROW              2  TRANSPORT FLUX TO RIGHT (CM/YR):
  436323.8119
 SBAS FLUX ARROW              2  TRANSPORT FLUX TO LEFT (CM/YR):
 -499260.4387
 SBAS FLUX ARROW              3  TRANSPORT FLUX TO RIGHT (CM/YR):
  436323.8119
 SBAS FLUX ARROW              3  TRANSPORT FLUX TO LEFT (CM/YR):
 -499260.4387
 SBAS FLUX ARROW              4  TRANSPORT FLUX TO RIGHT (CM/YR):
 342132.9471
 SBAS FLUX ARROW              4  TRANSPORT FLUX TO LEFT (CM/YR):
 -259515.1491
 SBAS FLUX ARROW              5  TRANSPORT FLUX TO RIGHT (CM/YR):
 436456.8445
 SBAS FLUX ARROW              5  TRANSPORT FLUX TO LEFT (CM/YR):
 -389916.8611
```

Sediment Budget: Using GenCade results in SBAS

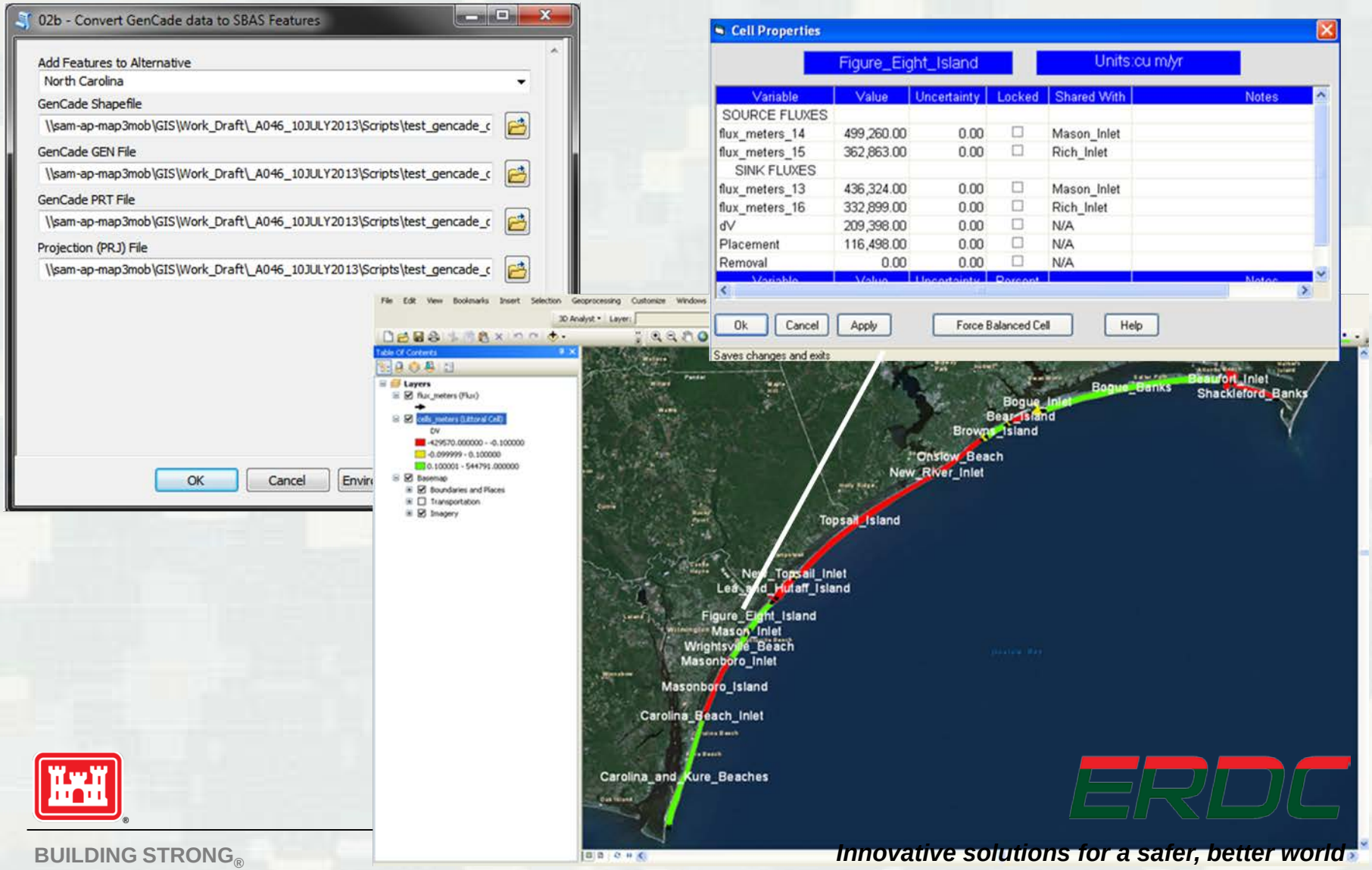
```
*****************************************************************
*                          SBAS OUTPUT                          *
*****************************************************************

 SBAS CELL            1  VOLUME CHANGE (CM/YR):     209398.5782
                         PLACEMENT (CM/YR):         116497.5174
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            2  VOLUME CHANGE (CM/YR):     0.0000E+000
                         PLACEMENT (CM/YR):         0.0000E+000
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            3  VOLUME CHANGE (CM/YR):     71521.8133
                         PLACEMENT (CM/YR):         217076.2381
                         REMOVAL (CM/YR):           0.0000E+000
 SBAS CELL            4  VOLUME CHA
                         PLACEMENT
                         REMOVAL (
 SBAS FLUX ARROW              1  TR
  362863.0875
 SBAS FLUX ARROW              1  TR
 -332898.6535
 SBAS FLUX ARROW              2  TR
  436323.8119
 SBAS FLUX ARROW              2  TR
 -499260.4387
 SBAS FLUX ARROW              3  TR
  436323.8119
 SBAS FLUX ARROW              3  TR
 -499260.4387
 SBAS FLUX ARROW              4  TR
 342132.9471
 SBAS FLUX ARROW              4  TR
 -259515.1491
 SBAS FLUX ARROW              5  TR
 436456.8445
 SBAS FLUX ARROW              5  TR
 -389916.8611
```



Two pieces of information needed for input into SBAS

- SBAS output from GenCade
- Shapefile of SBAS cells (from SMS)

Sediment Budget: Using GenCade results in SBAS



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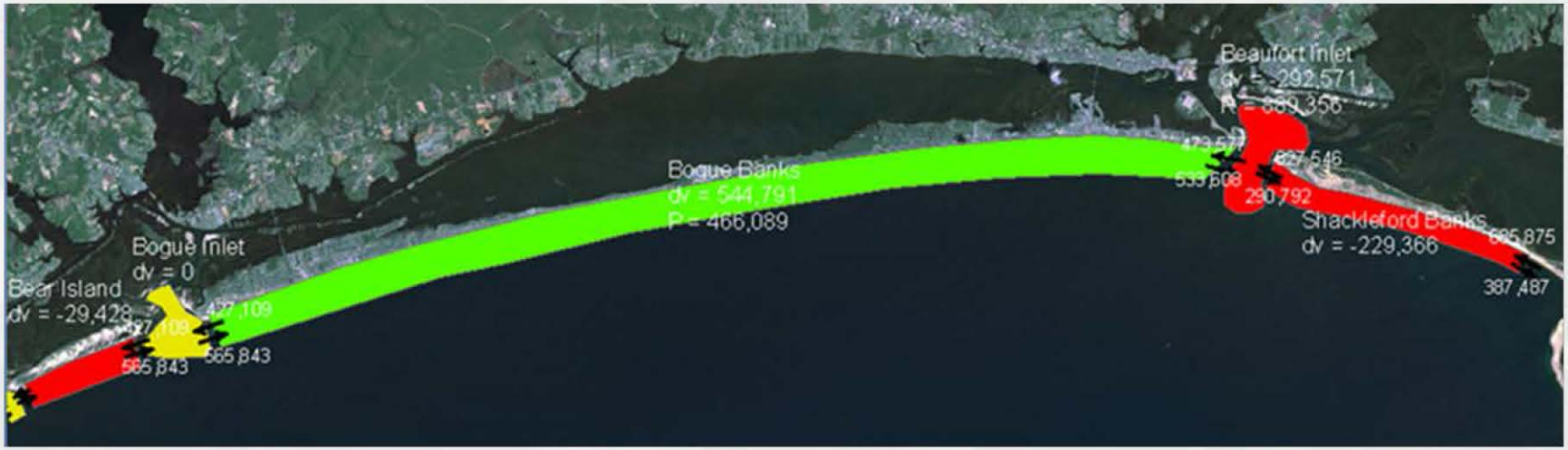
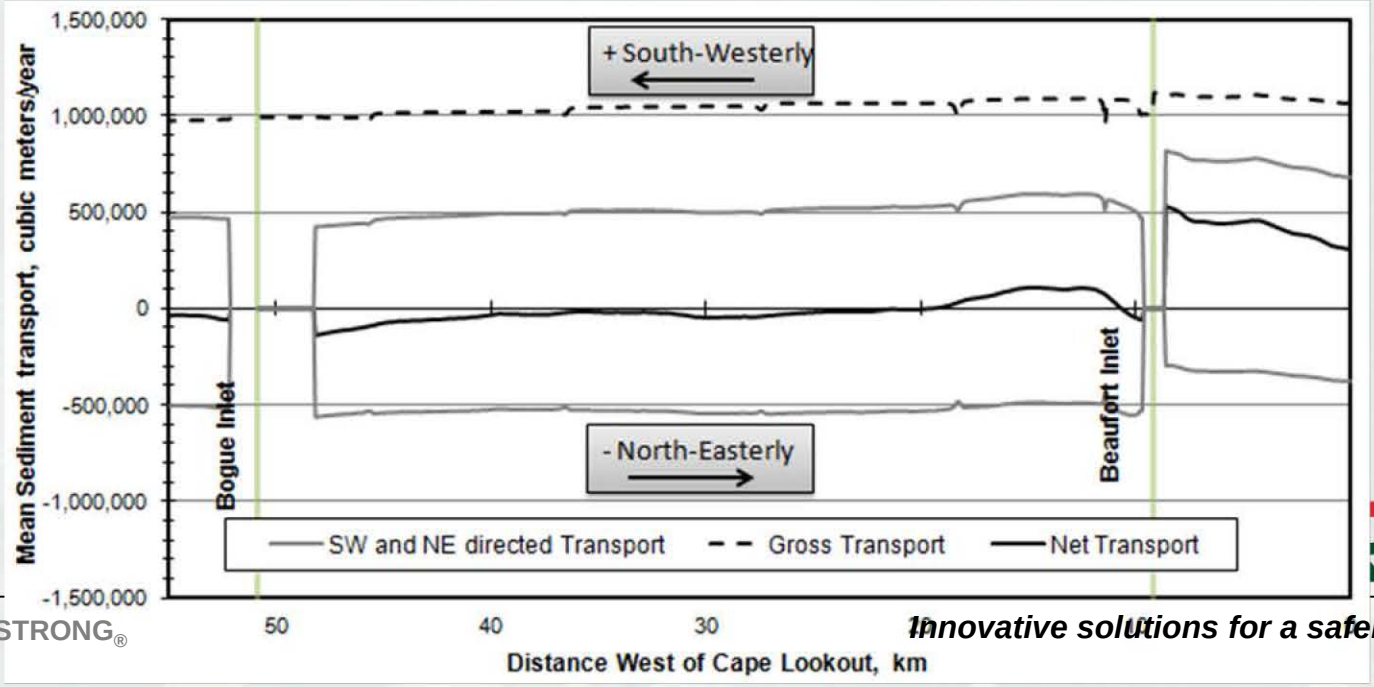
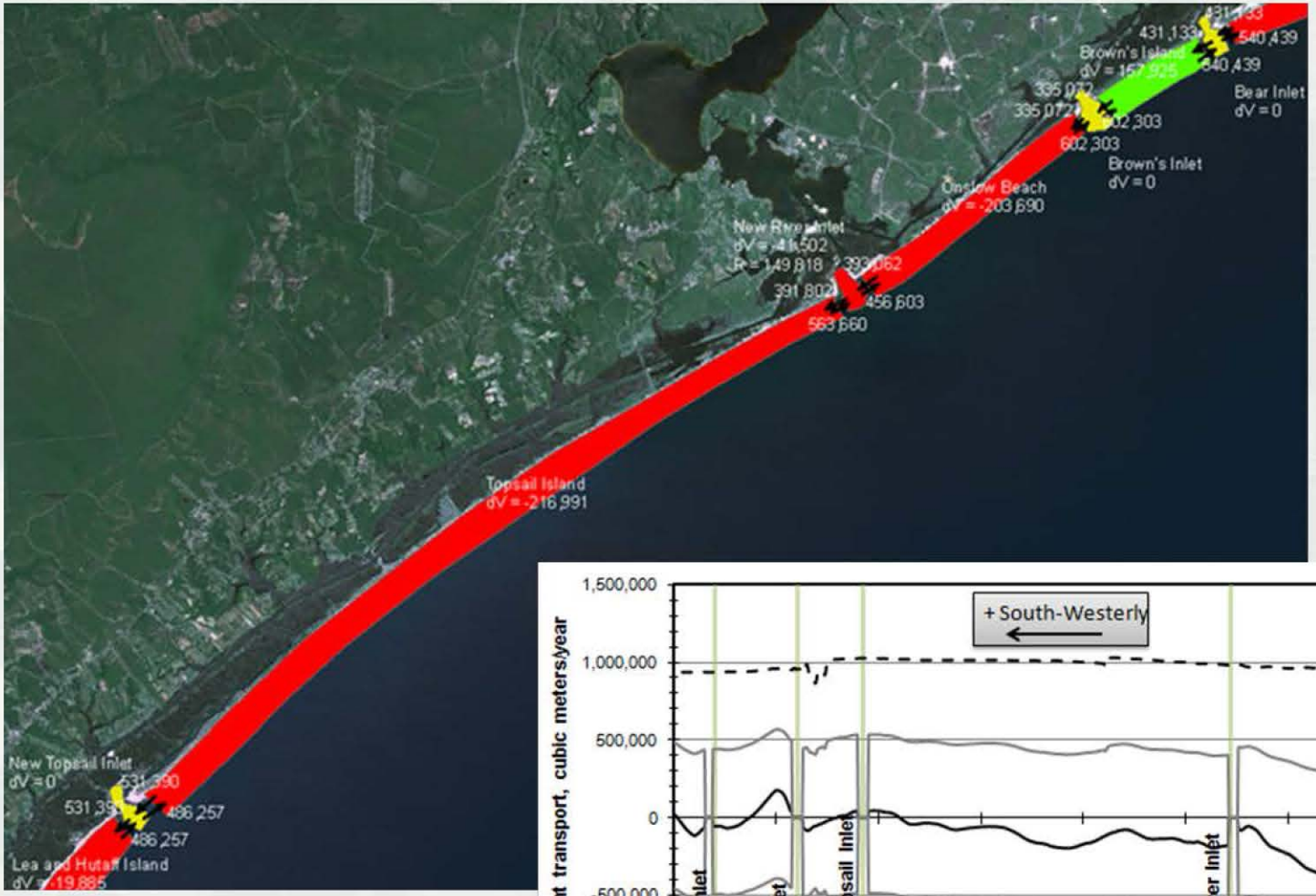
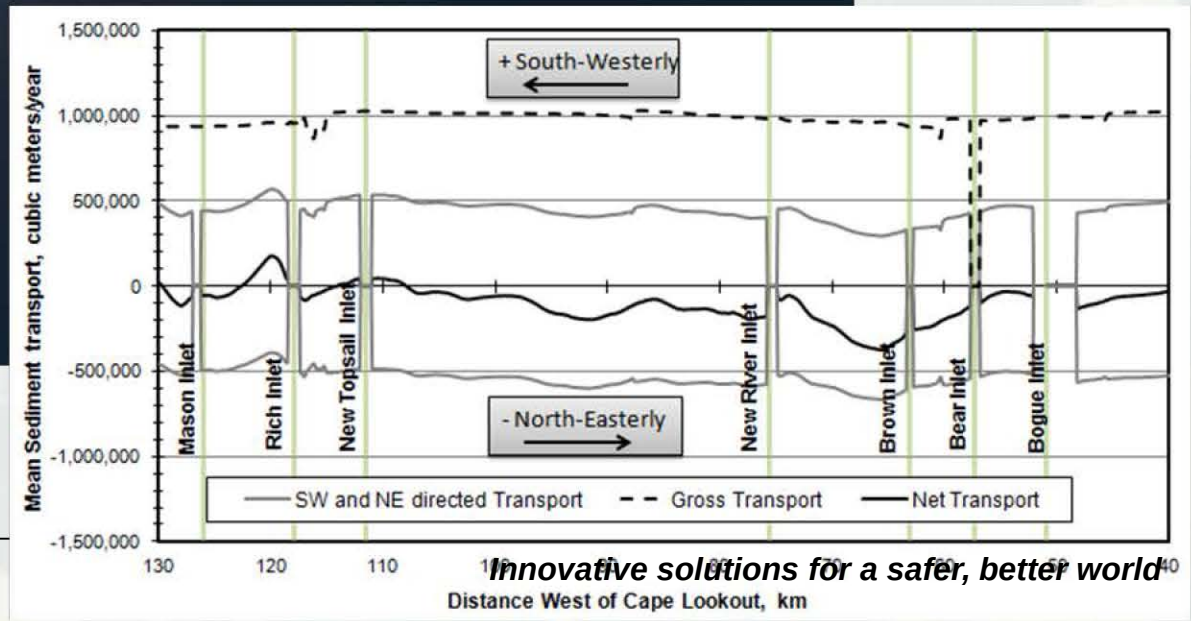
Sediment Budget in SBAS



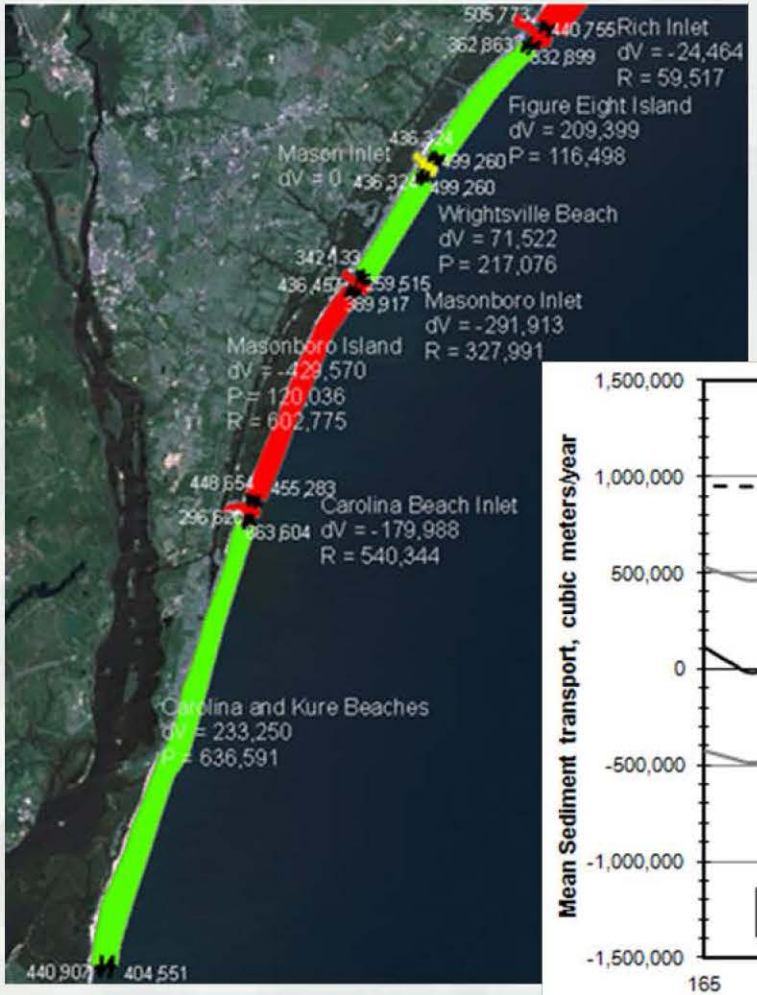


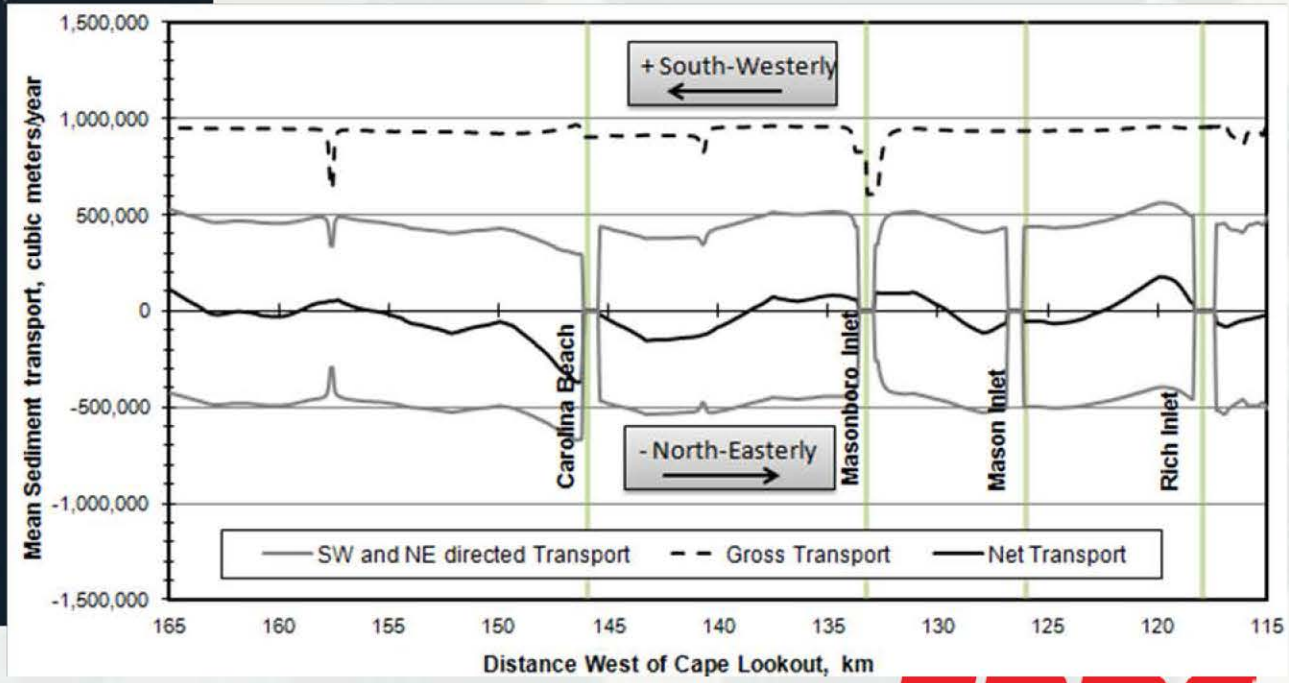
Sediment Budget in SBAS



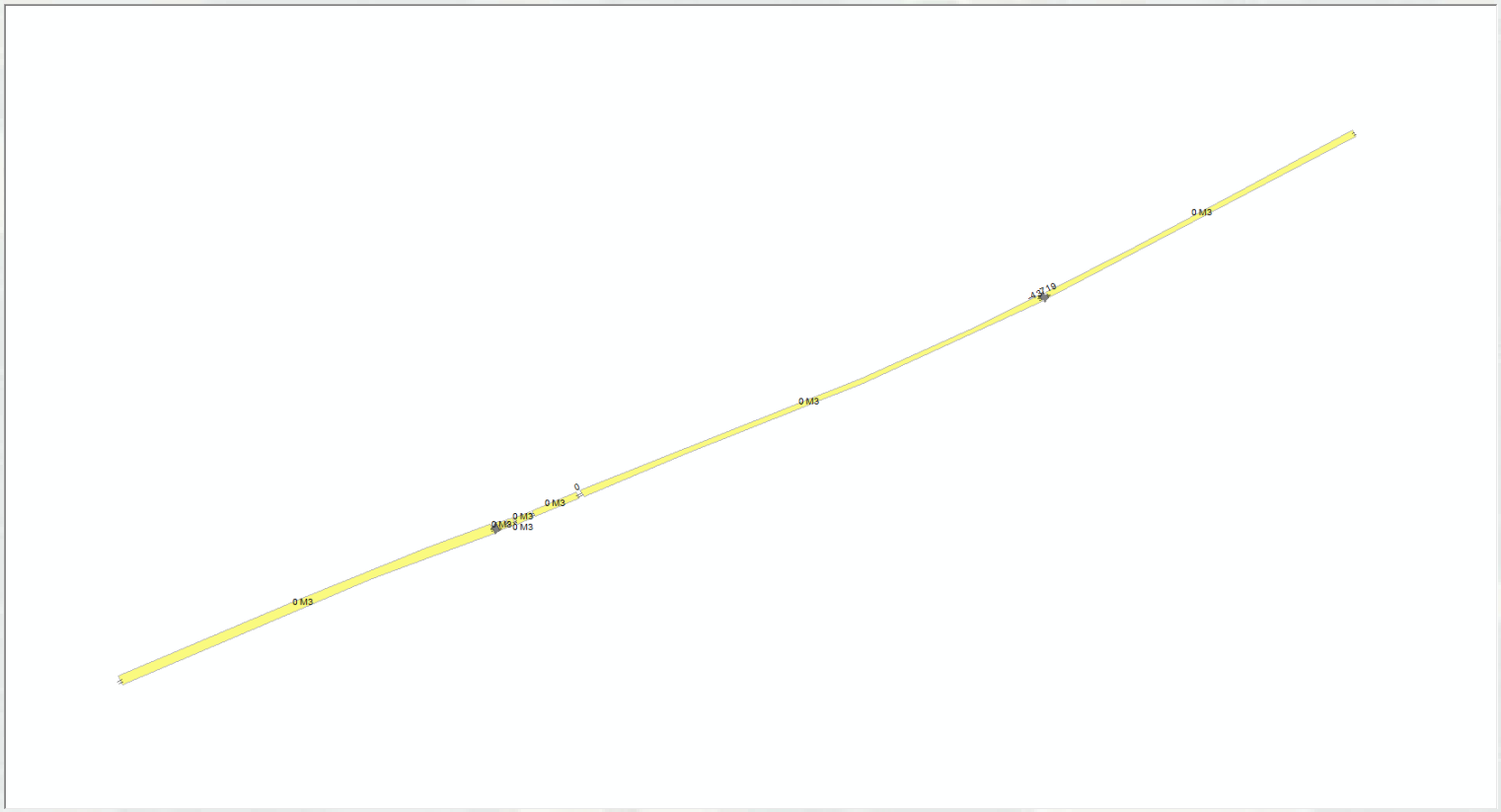


Sediment Budget in SBAS





Imported GenCade Results



Summary and Conclusions

- Shoreline change and longshore transport calculated by GenCade were similar to measured values
- GenCade modeling was conducted to improve the understanding of Onslow Bay as a regional sediment system and provide information for a sediment budget
- GenCade can be applied to produce a sediment budget in SBAS