Integrating engineering, geology, and nearshore processes: utilizing high resolution survey techniques and numerical modeling to support evolving dredge disposal practices, Ocean Beach, San Francisco, California

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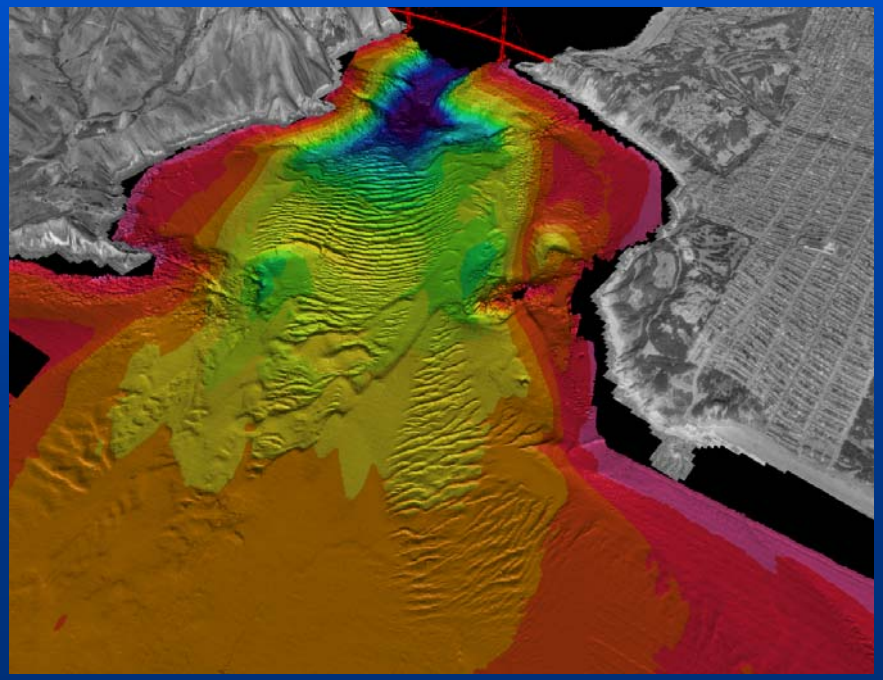

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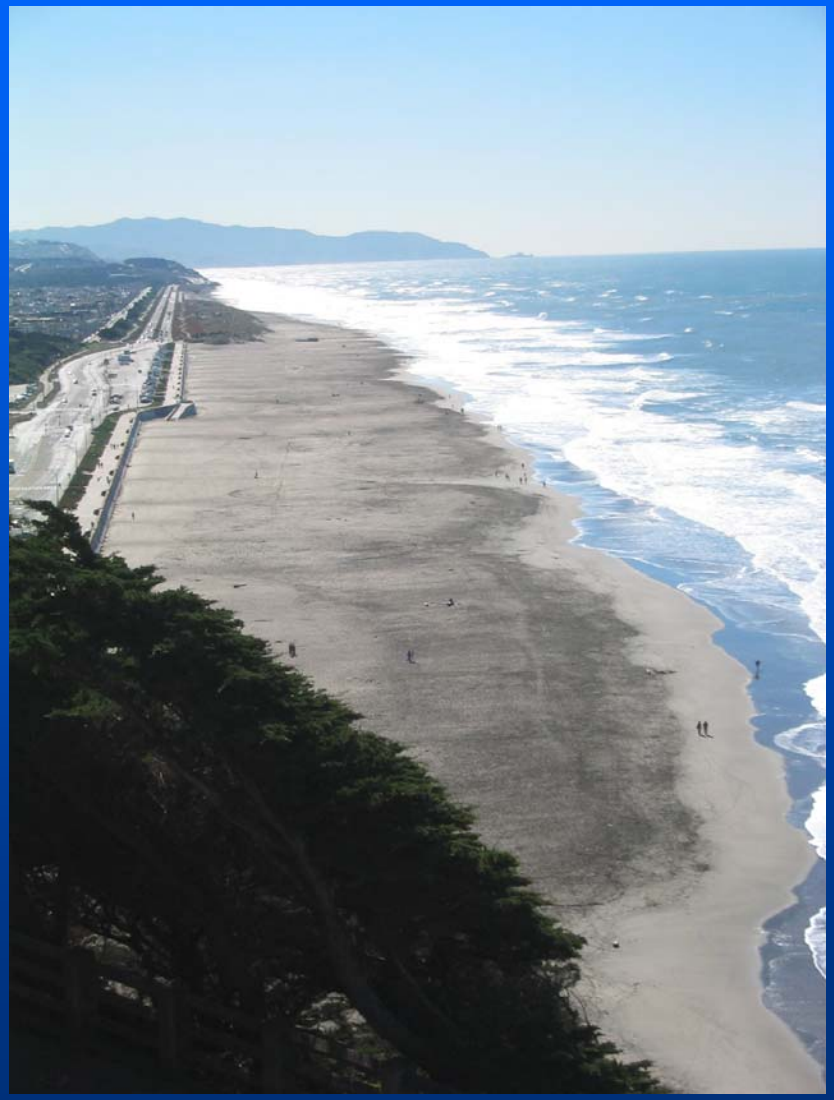
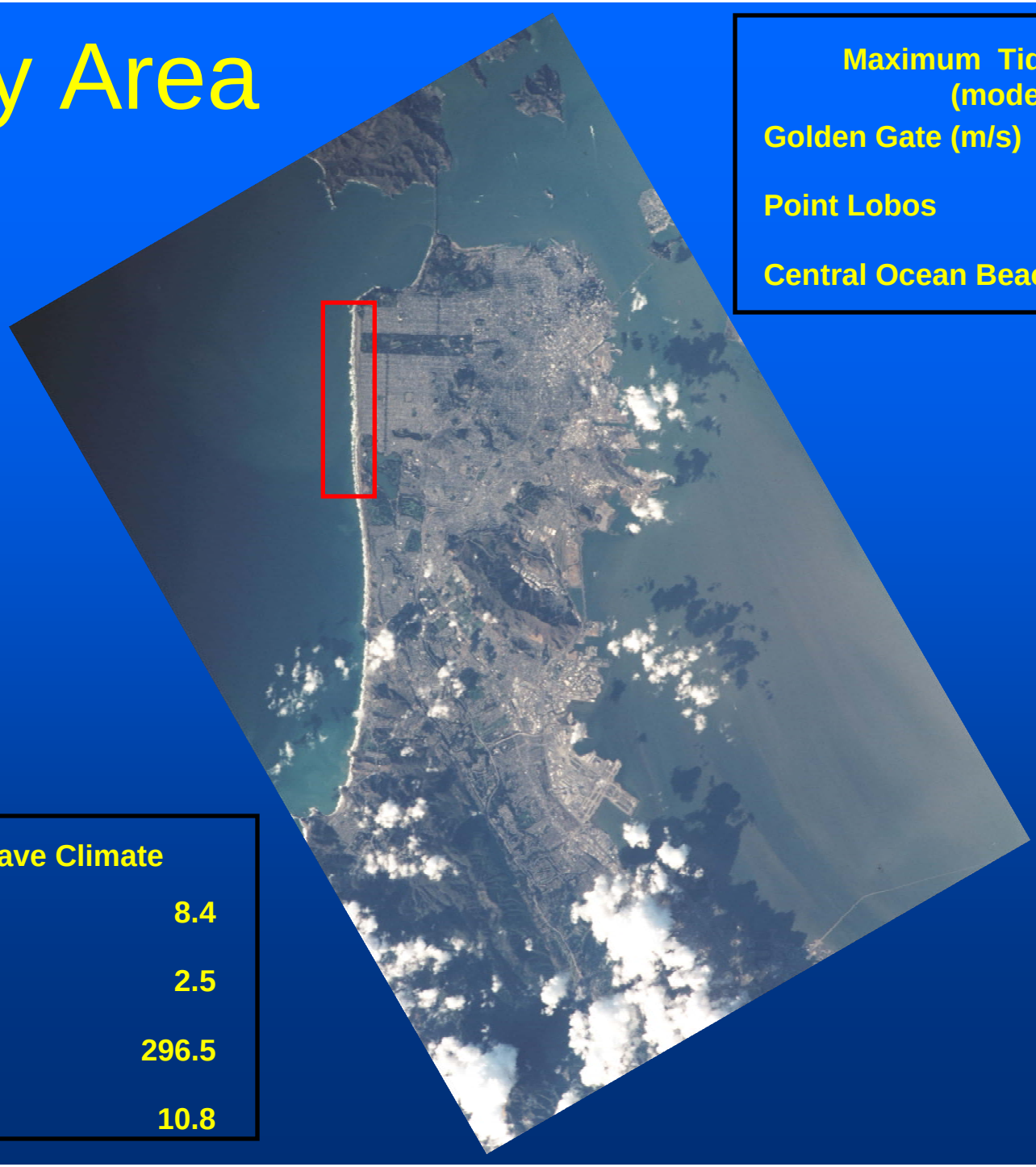
Project Summary

- 2-year coastal processes study
- USGS Support: Mendenhall Post-doctoral Fellowship, Coastal Evolution Modeling
- Collaborating Agencies: National Park Service, City of San Francisco, U.S. Army Corps of Engineers (San Francisco District), California Boating and Waterways, extensive student involvement from UC Santa Cruz, San Francisco State and Cal State Monterey Bay



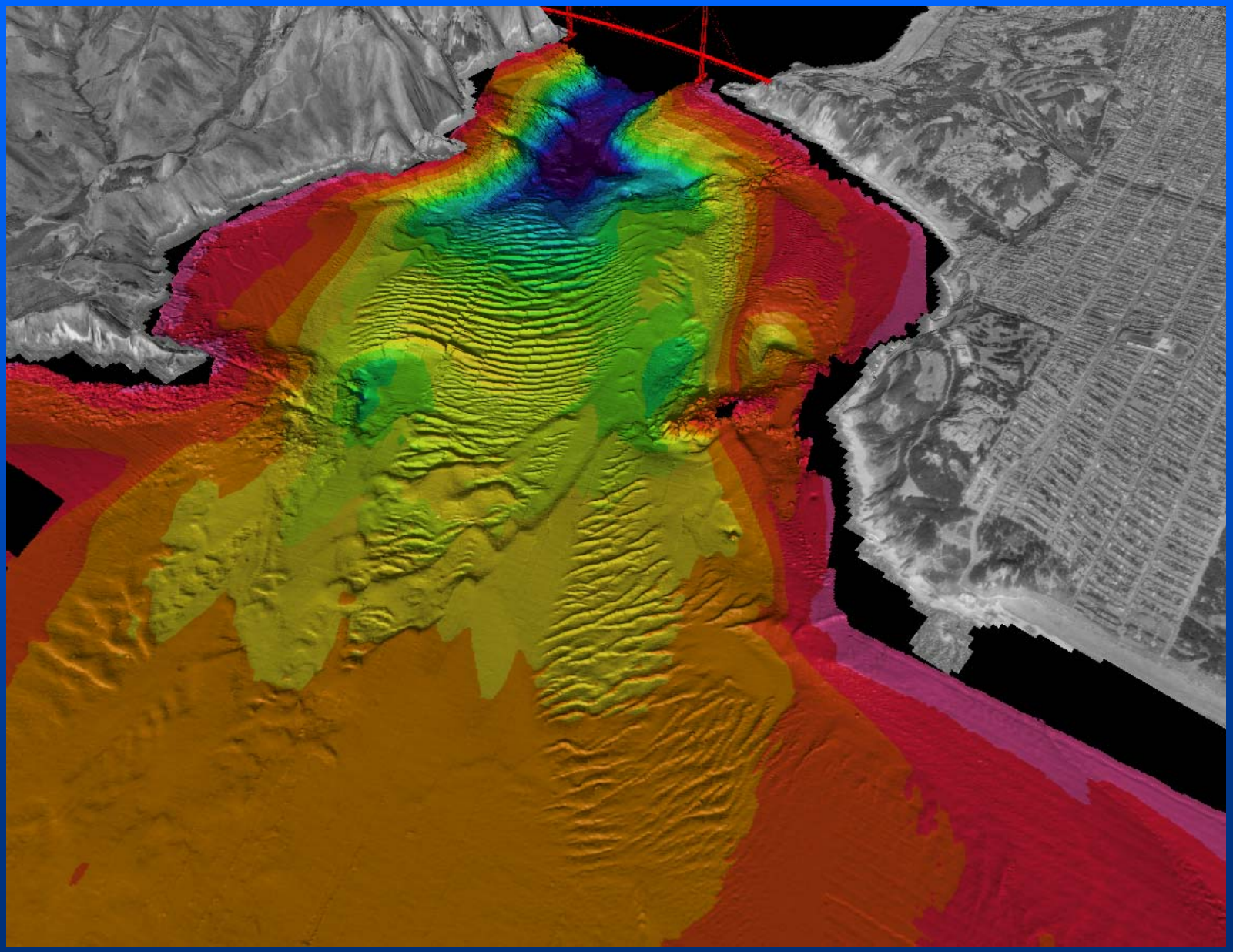
Study Area



Maximum Tidal Currents (modeled)	
Golden Gate (m/s)	2.5
Point Lobos	1.5
Central Ocean Beach	1.0

Offshore Wave Climate	
max Hs (m)	8.4
avg Hs (m)	2.5
avg deg (naut)	296.5
avg Tp (s)	10.8

Multibeam



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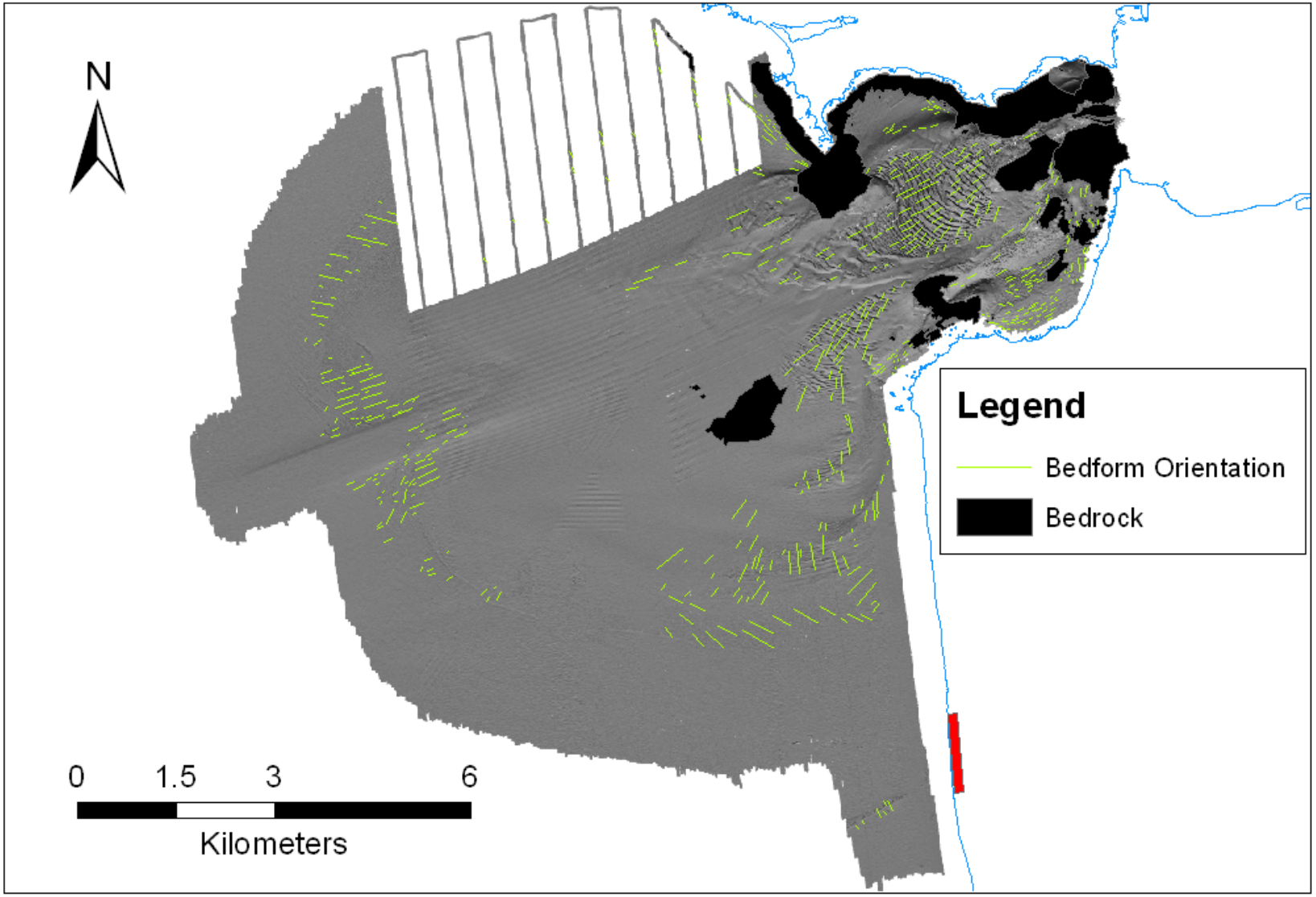

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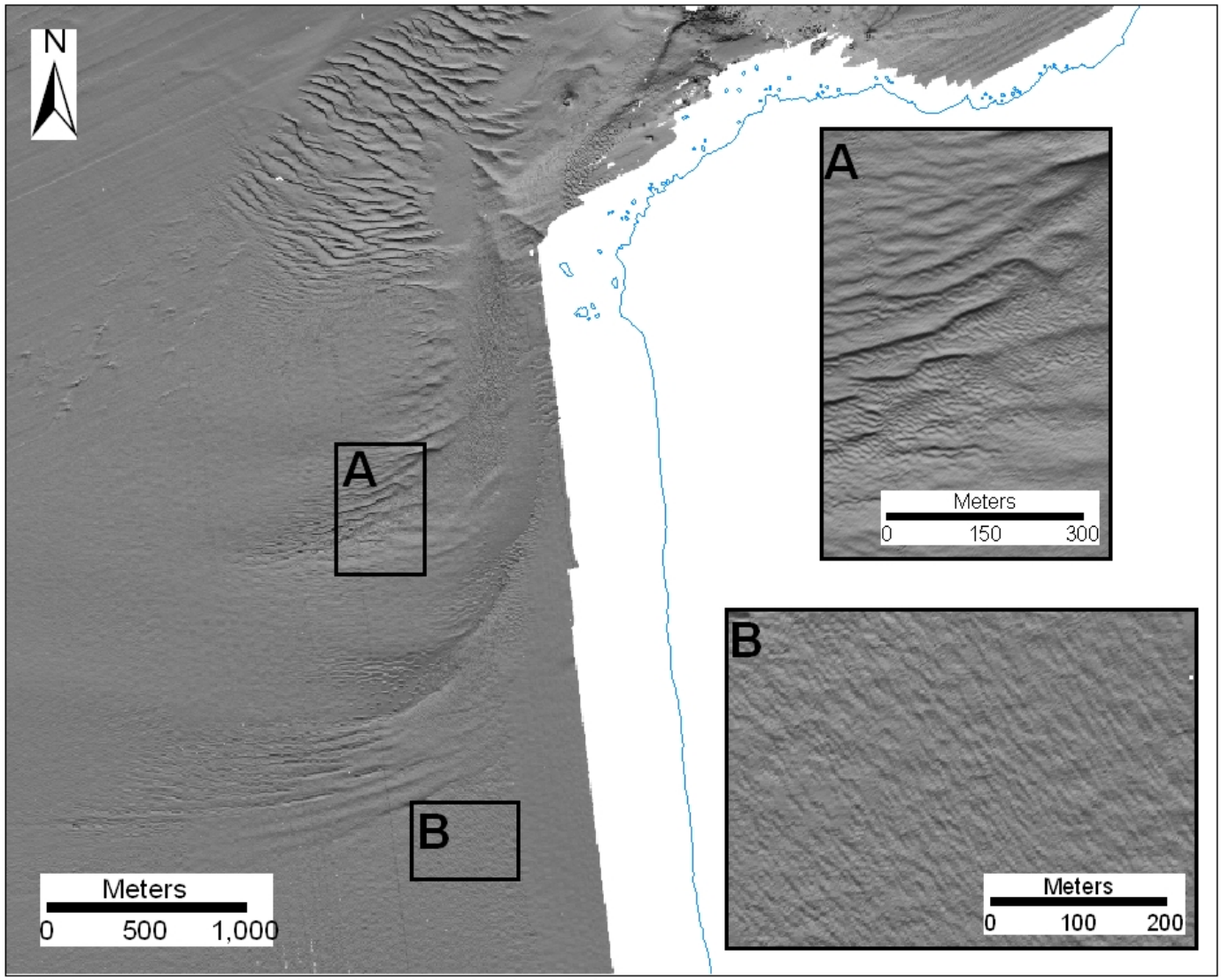
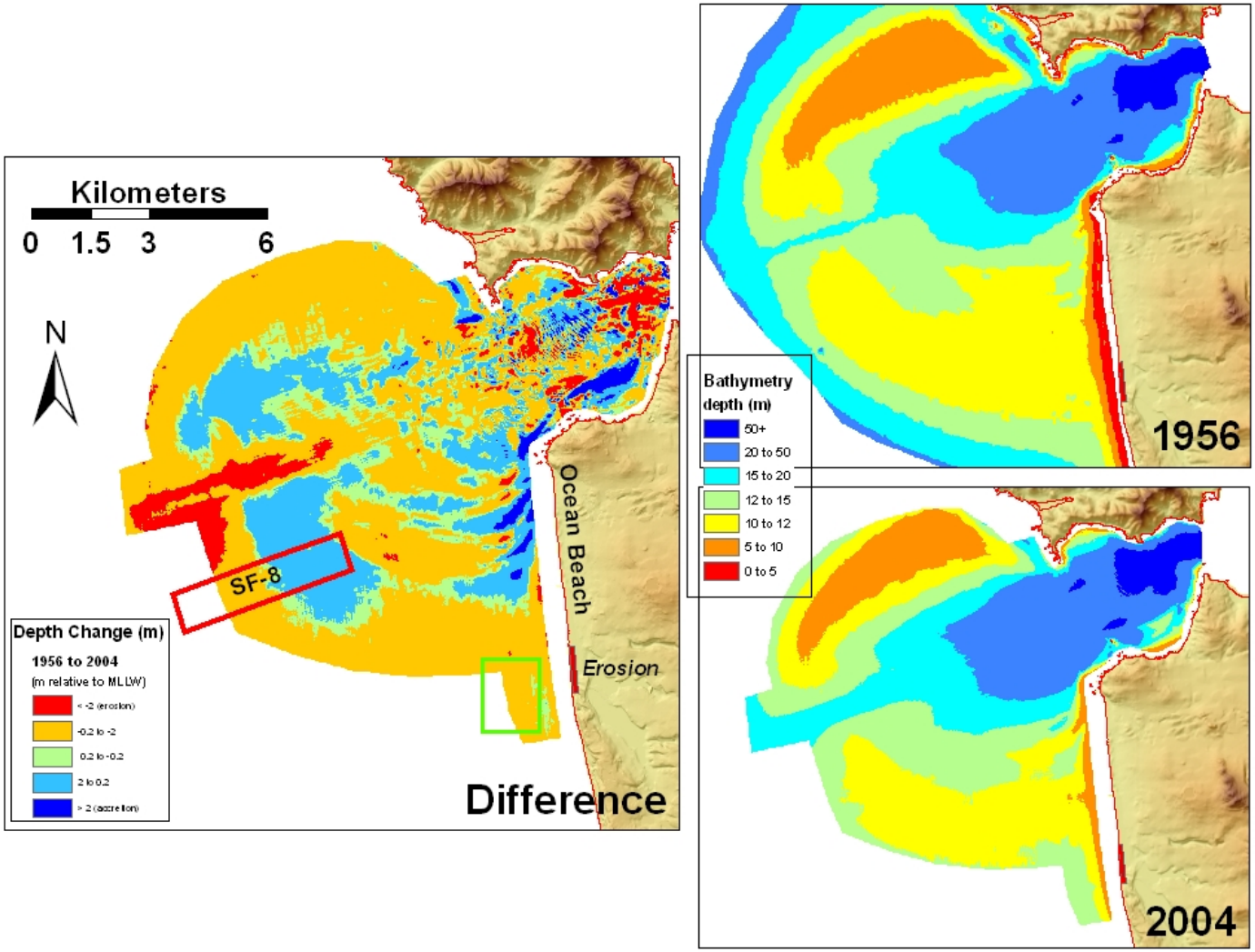


Depth Change



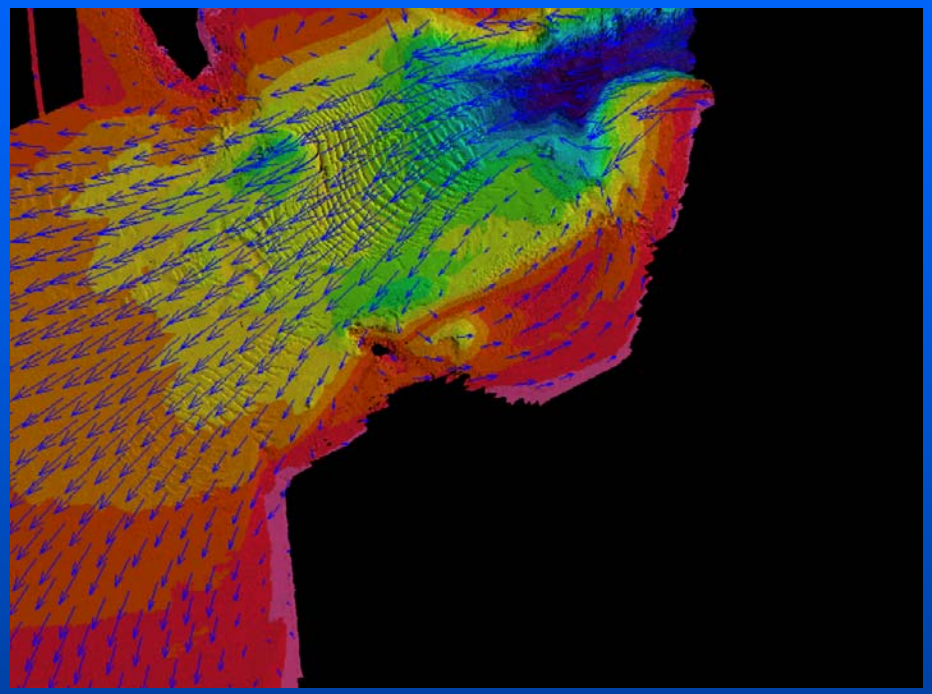
Modeling

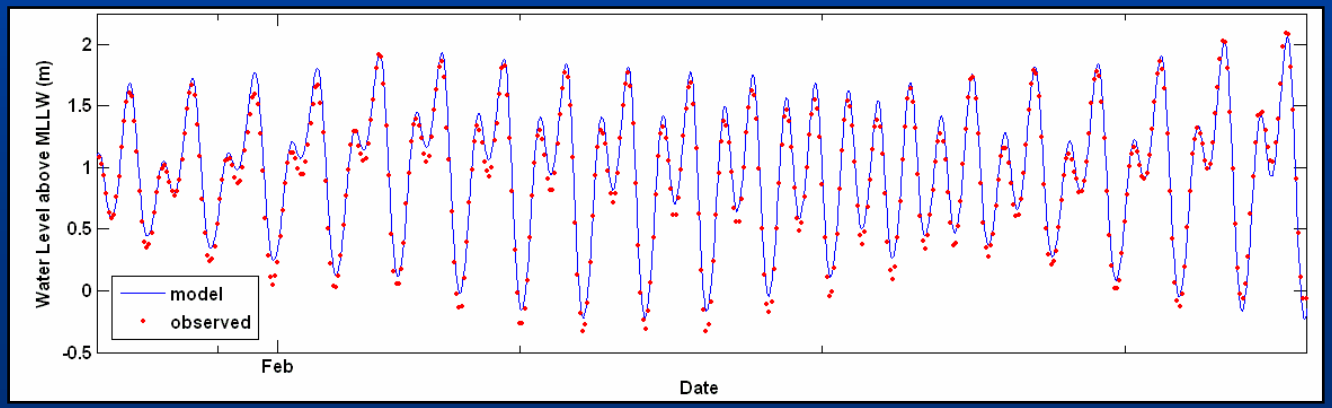
Delft3D and NearCoM

3 spatial scales: estuary, shelf, beach

Major findings: good agreement between in situ measurements, bedform morphology and model results, complicated 2D flow patterns explain local morphology

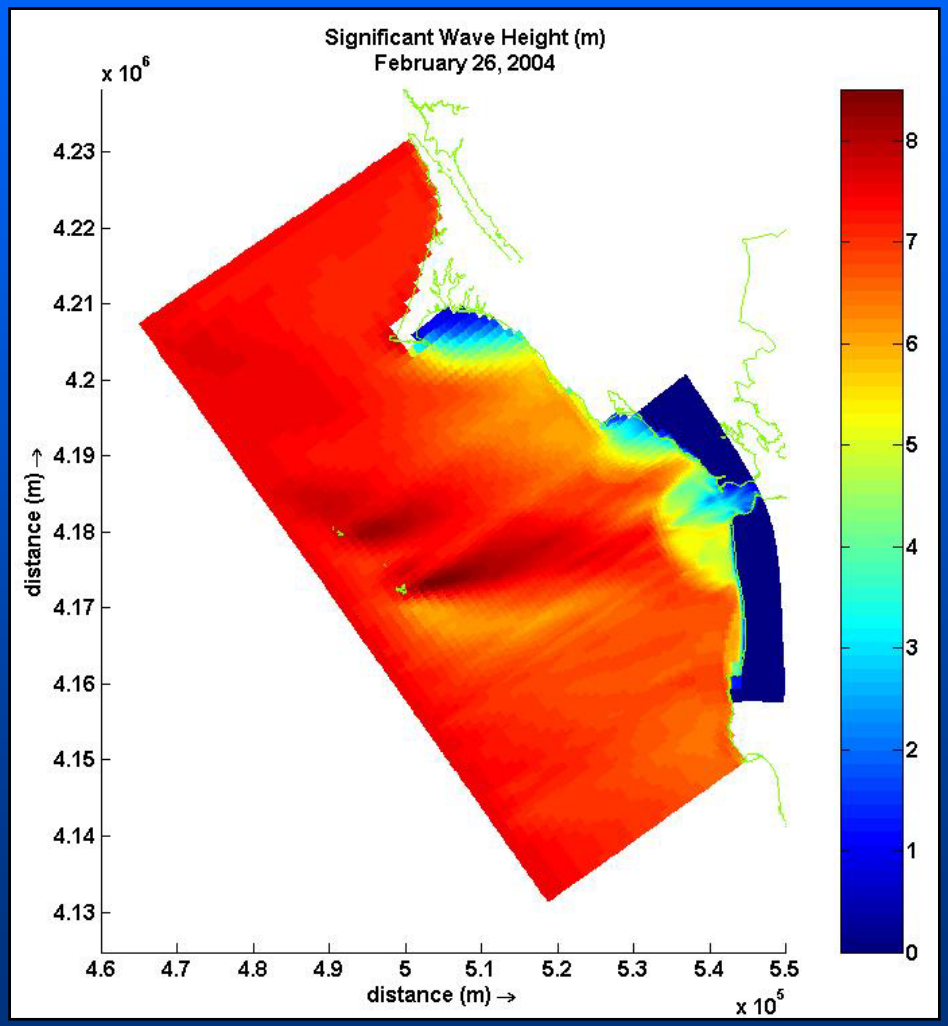
Future work: further model validation, dredge disposal modeling



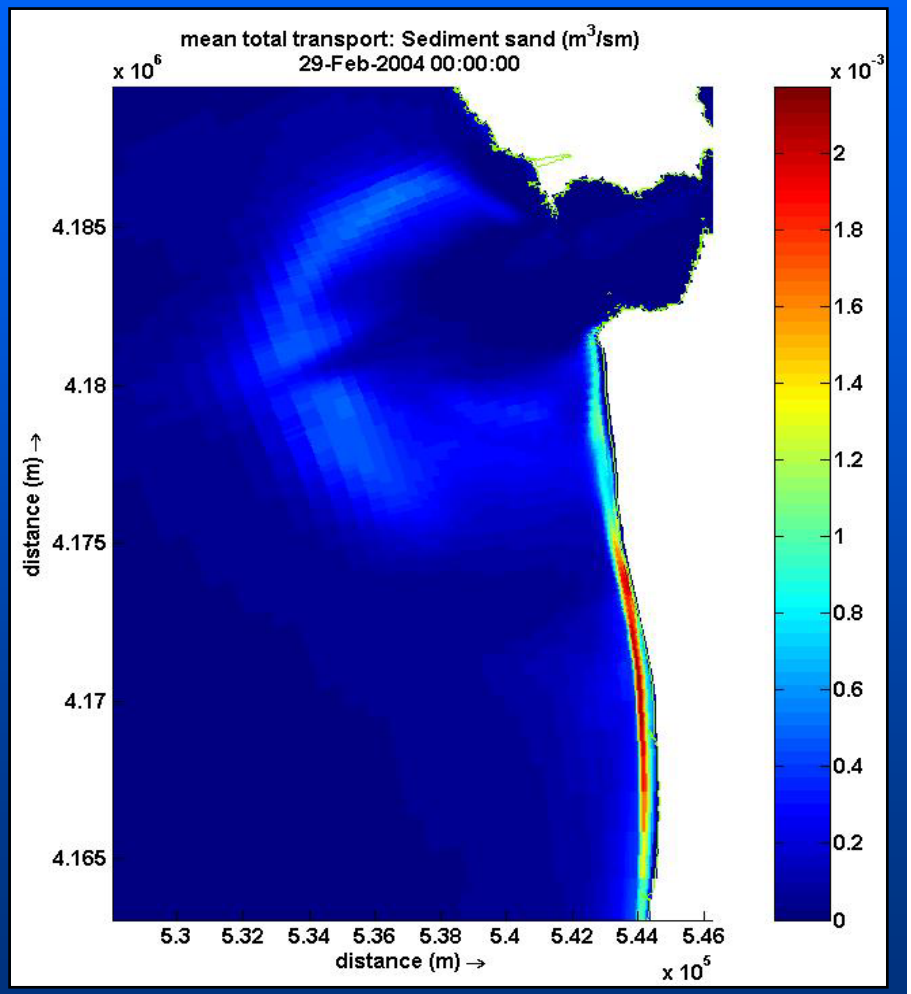


Modeling Extreme Events

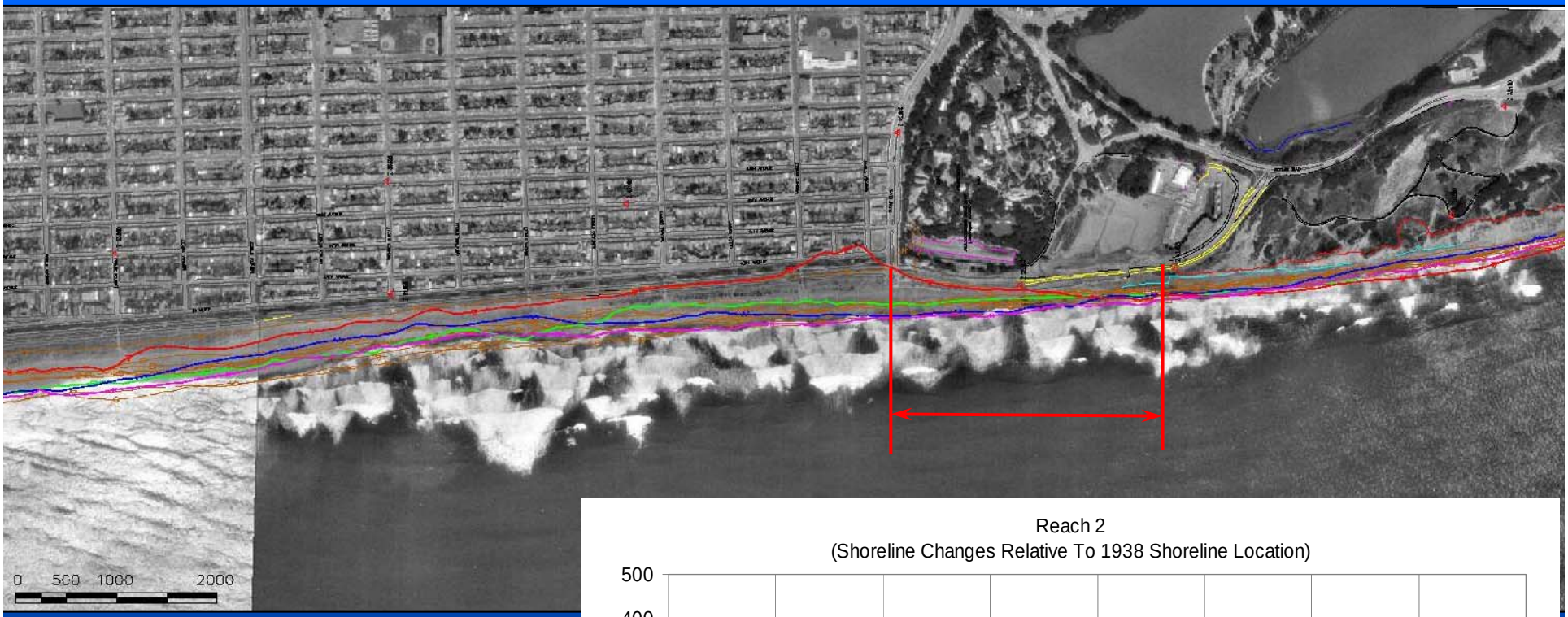
Storm Wave Patterns



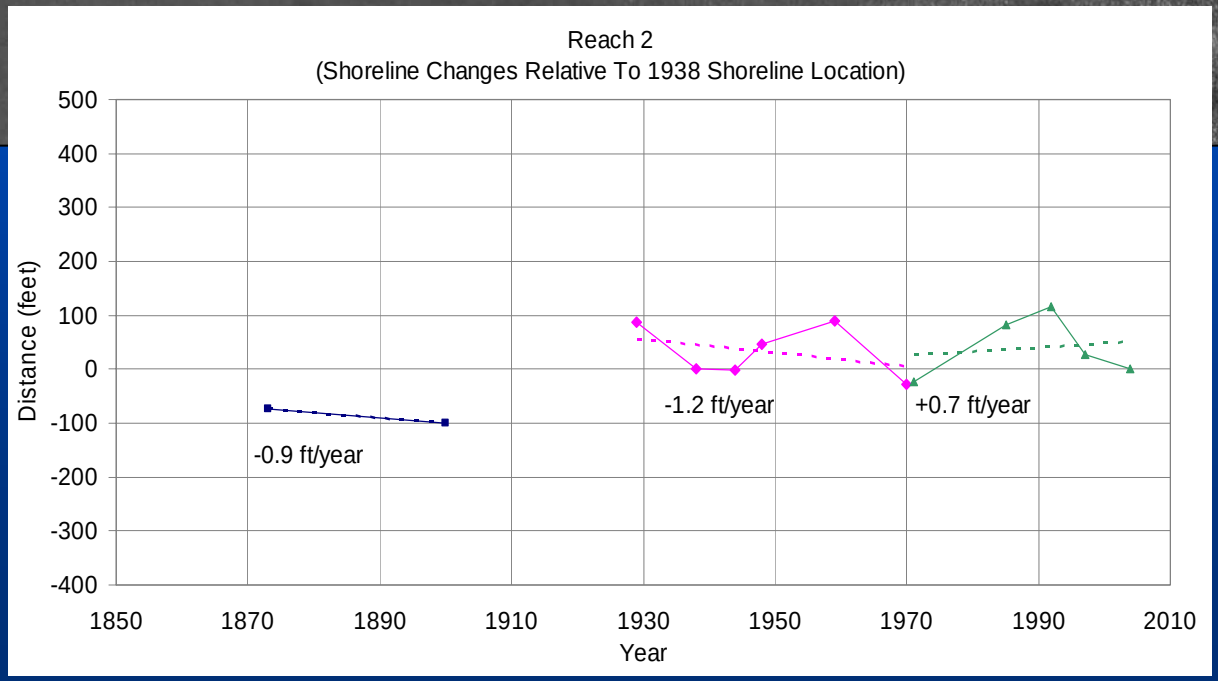
Storm Sediment Transport



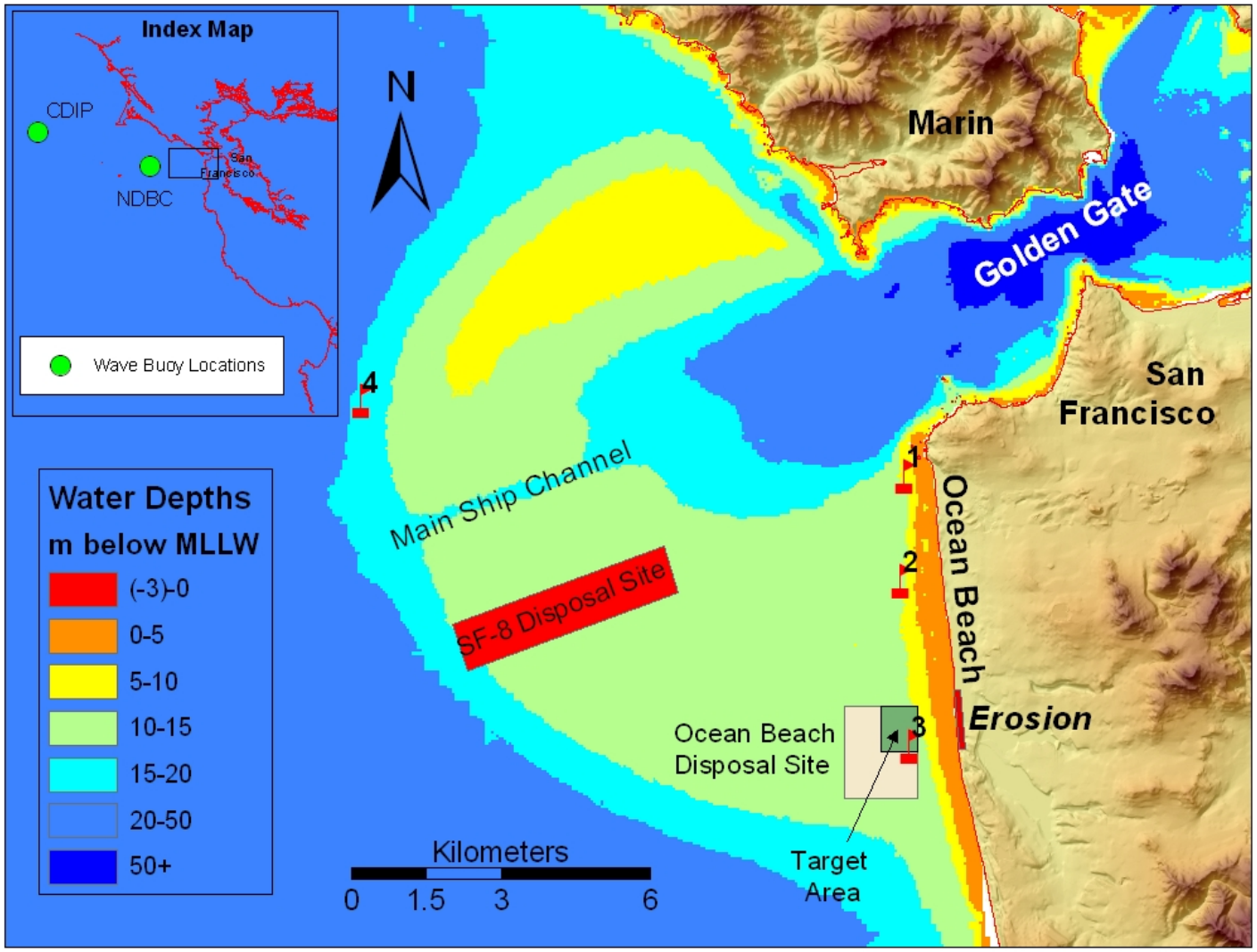
Shoreline Changes at Ocean Beach



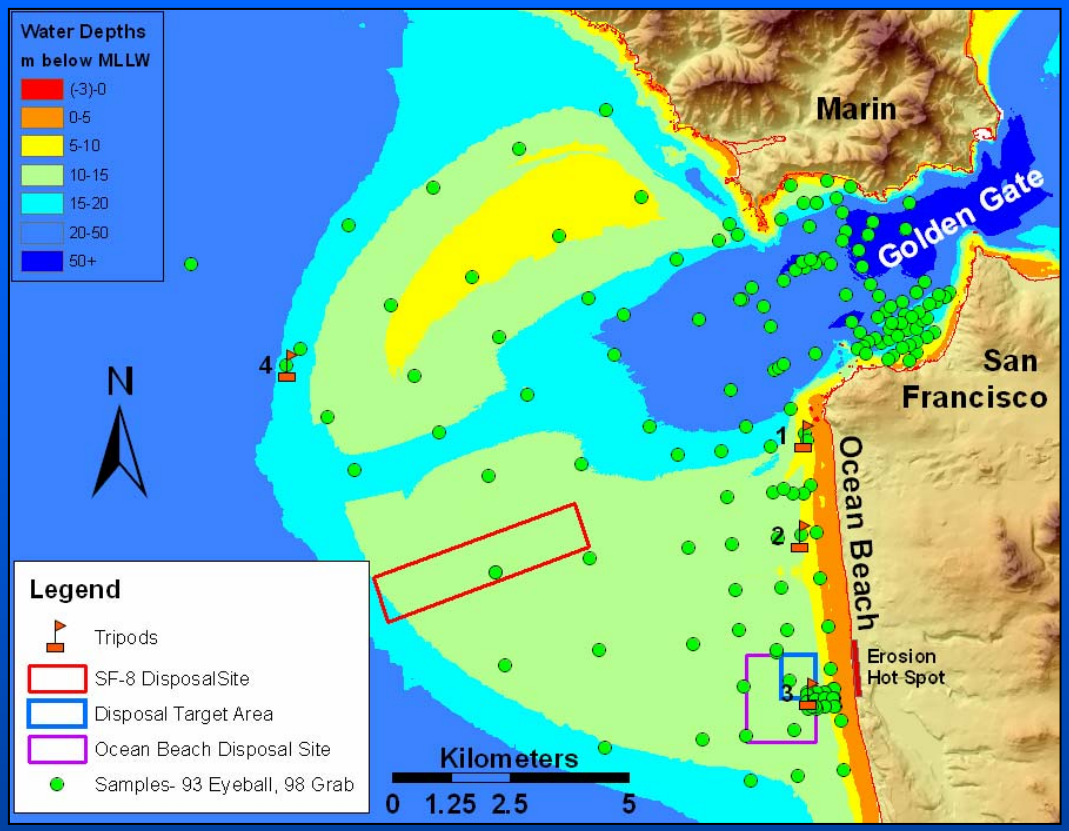
1873 shoreline
1938 shoreline
1985 shoreline
1992 shoreline

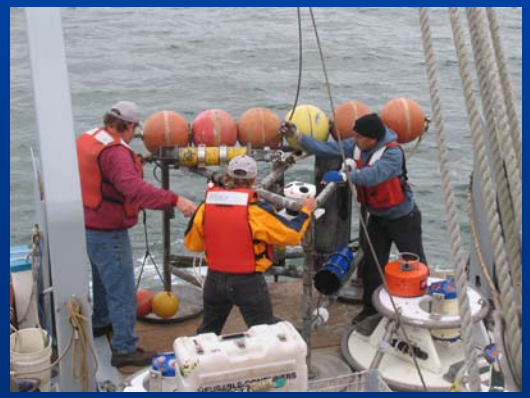


June 2005 Disposal Plan



Summer 2005 Field Work

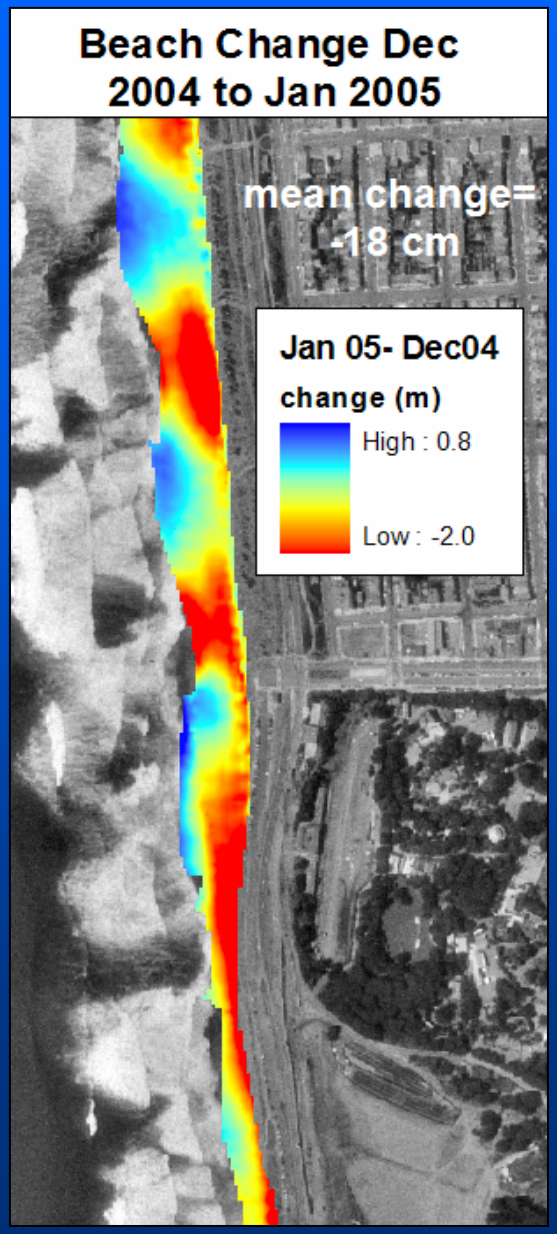




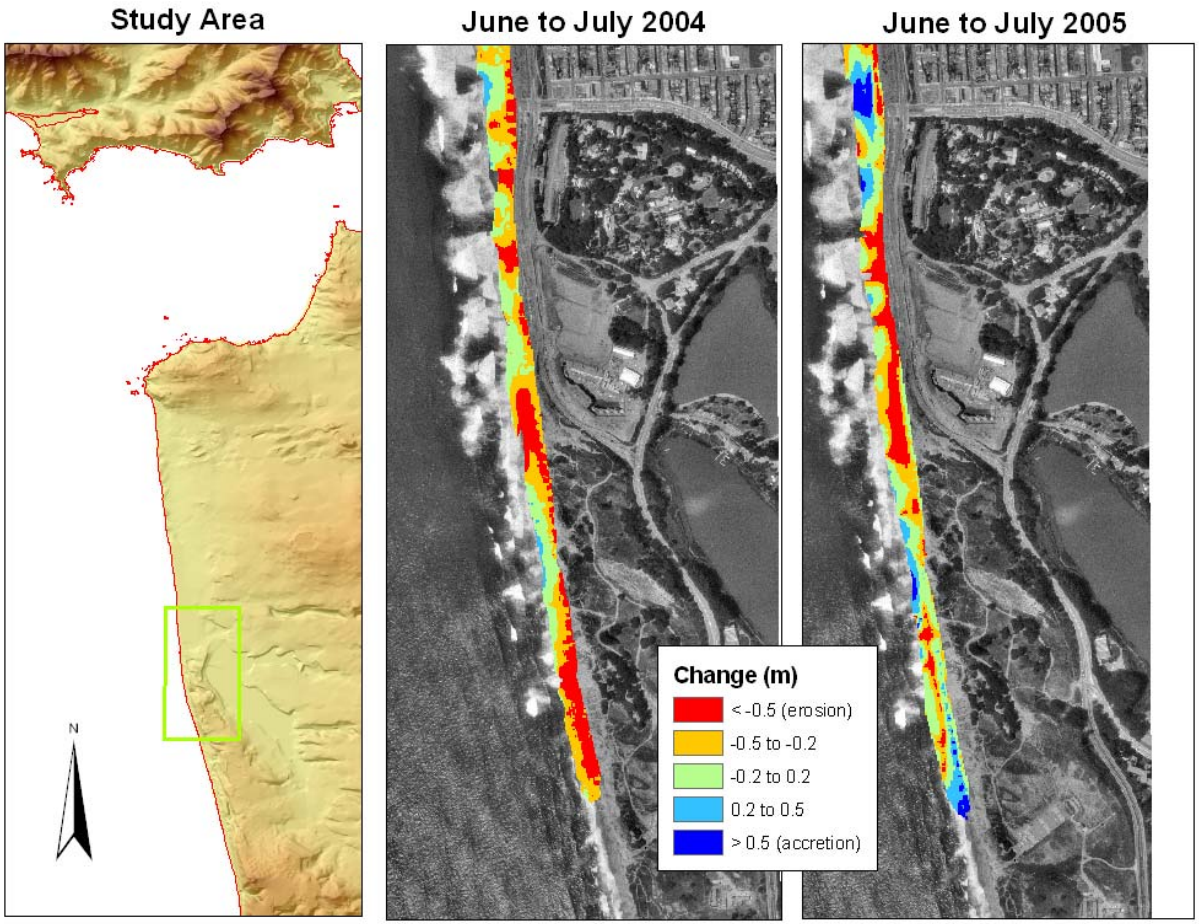
Topographic Surveys

Surveys completed: 16

Major findings: strong seasonal response, quasi-systematic erosion-accretion pattern, strong spatial variation



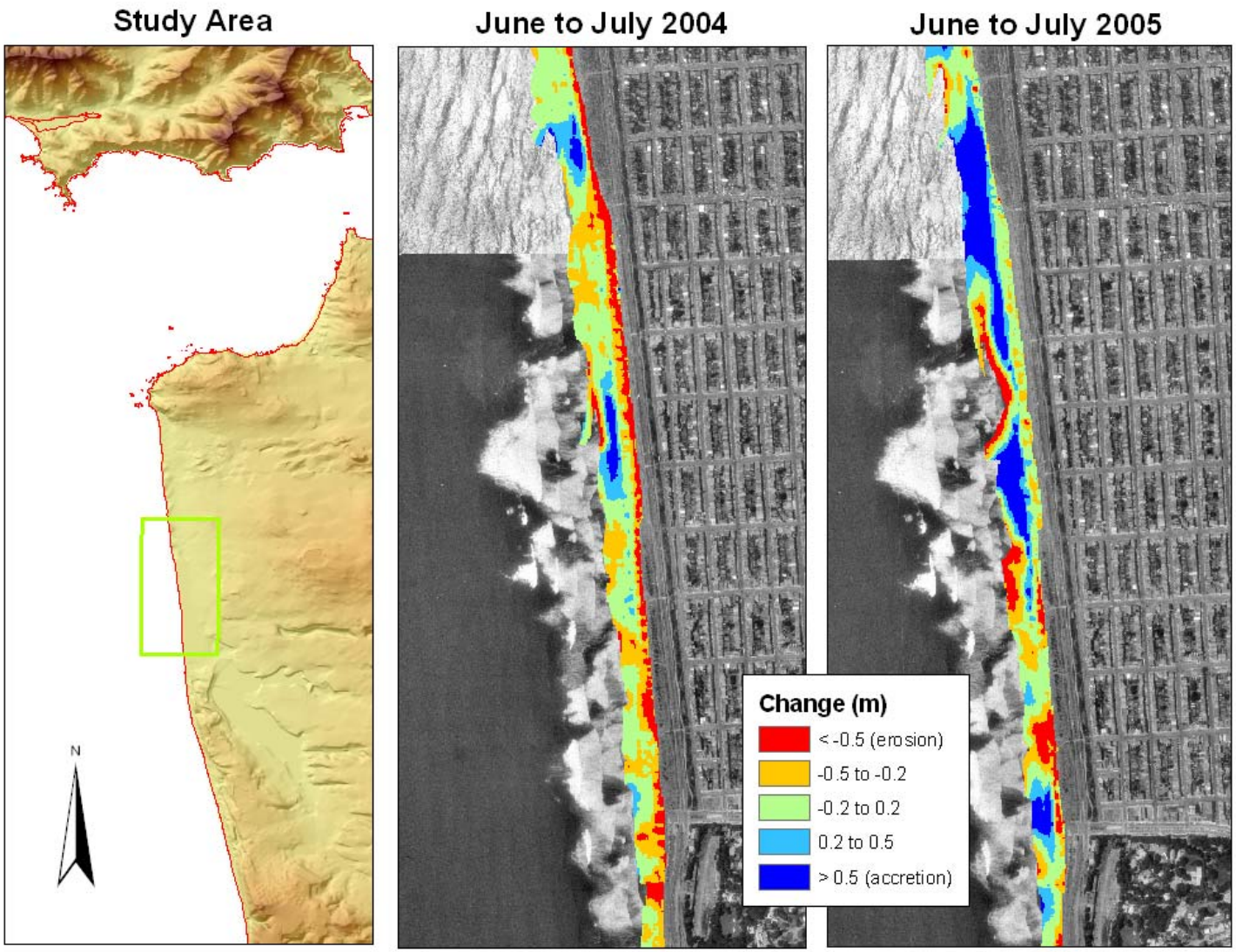
Recent Beach Change



Change (cm)

	Last Year	This Year
May-June	18	4
June-July	-18	12
July-August	NA	24

Recent Beach Change



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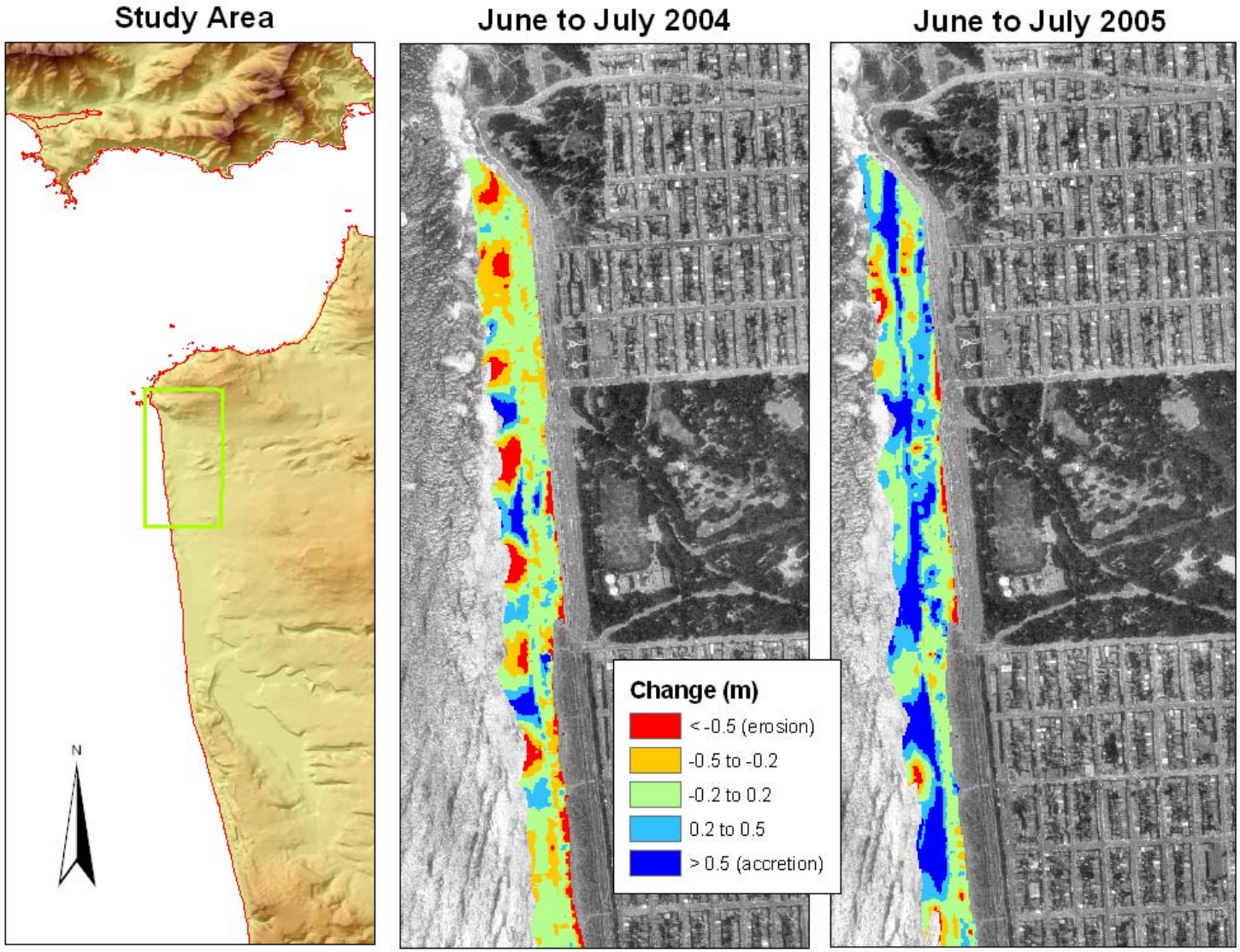
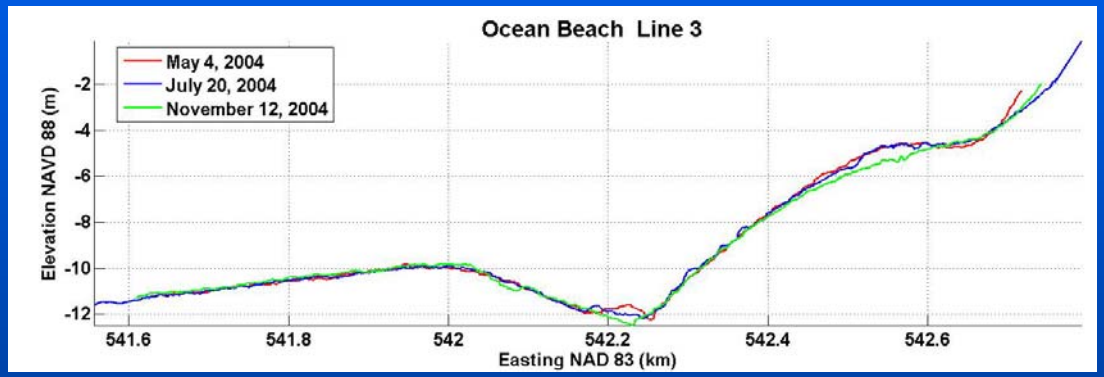
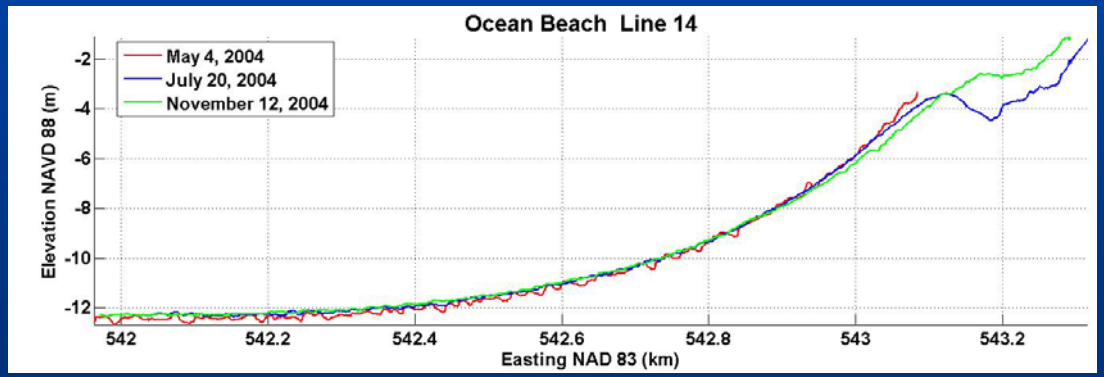


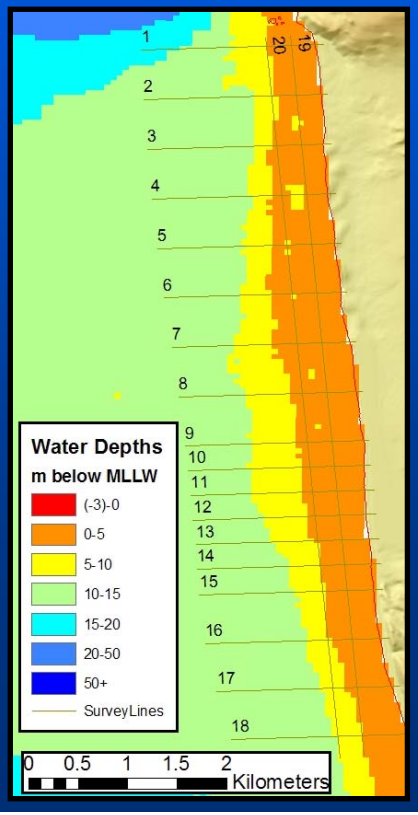
Nearshore Surveys

Surveys completed: 5

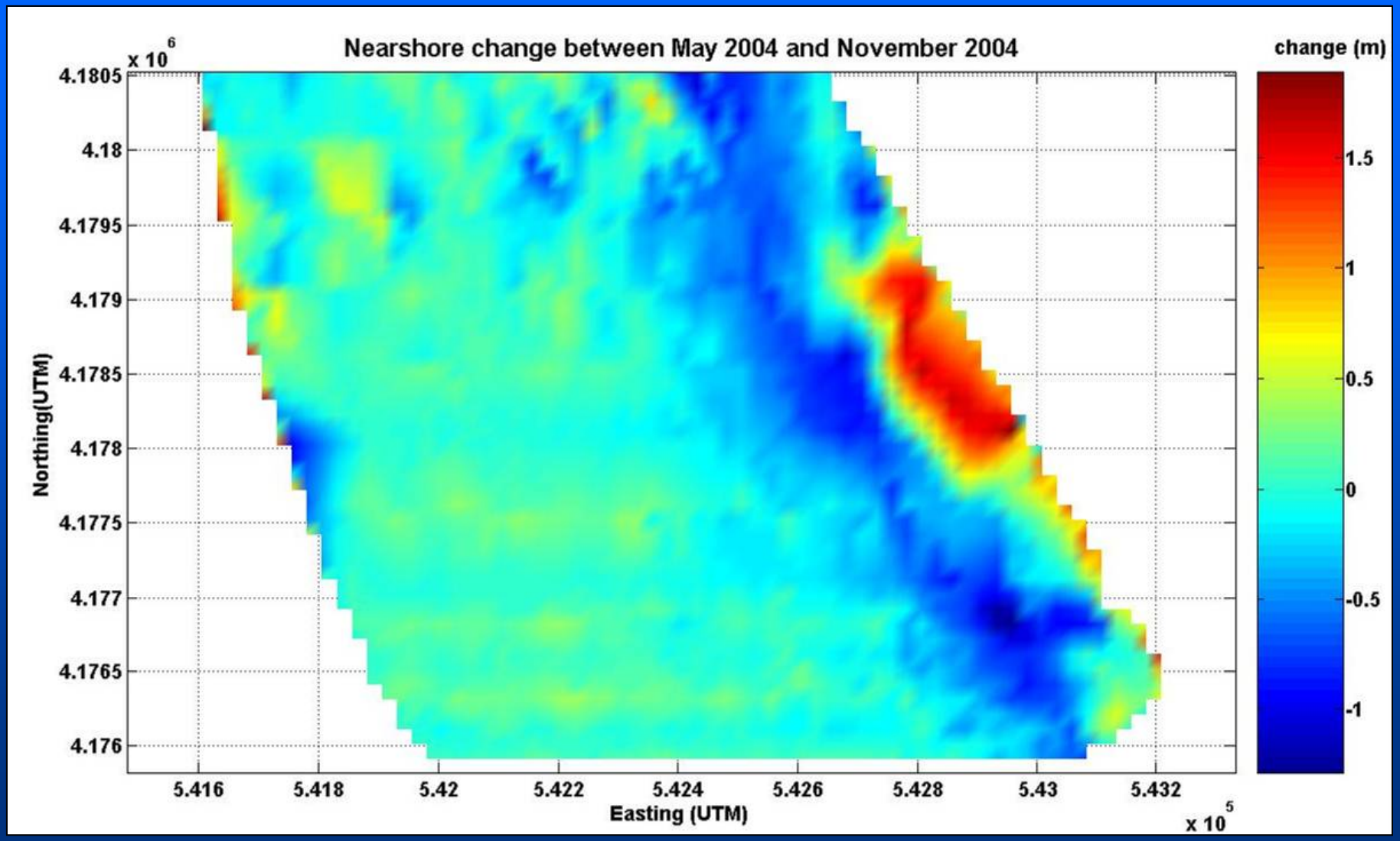
Major findings: strong seasonal response, extreme alongshore spatial variation of cross-shore profile







Seasonal Change



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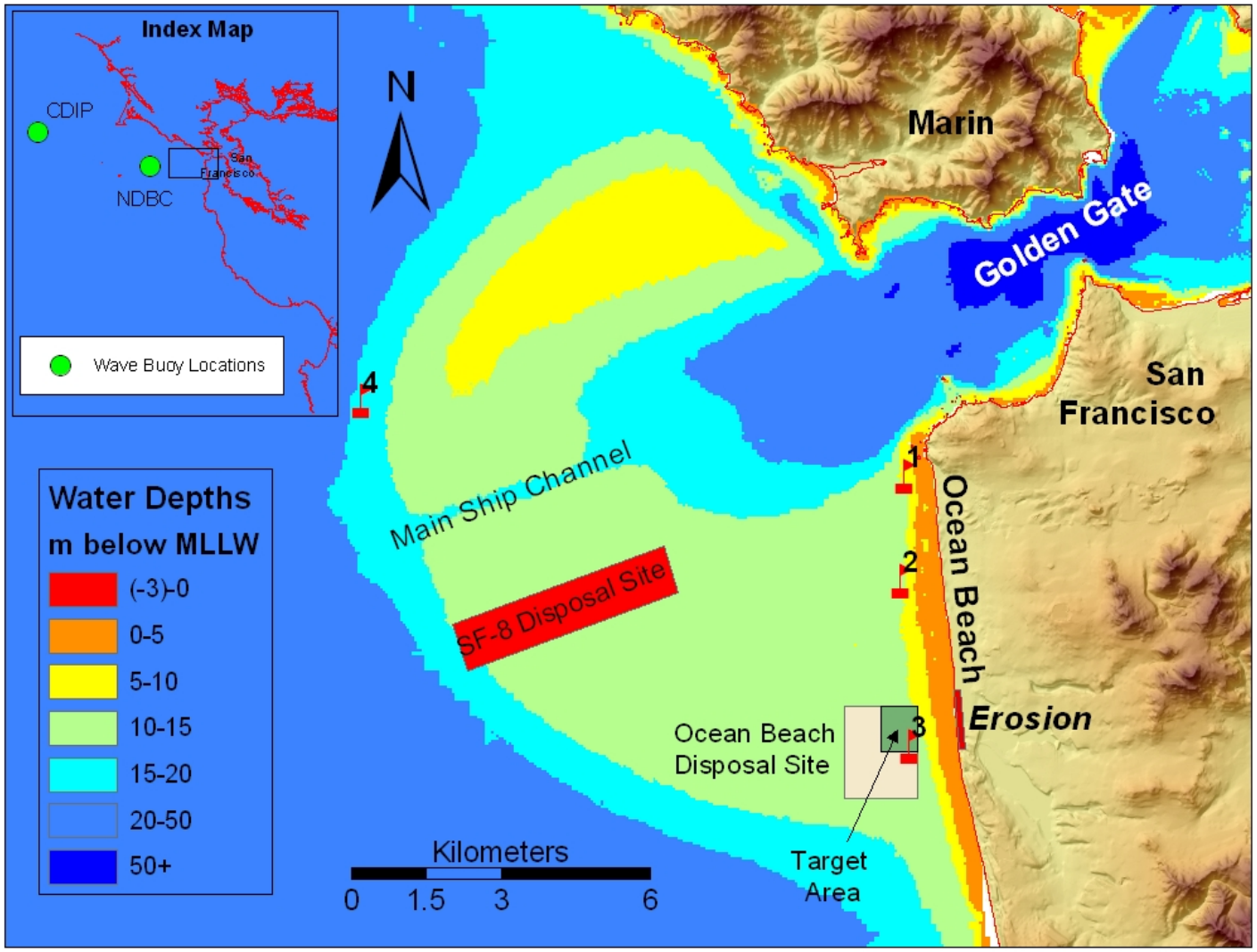
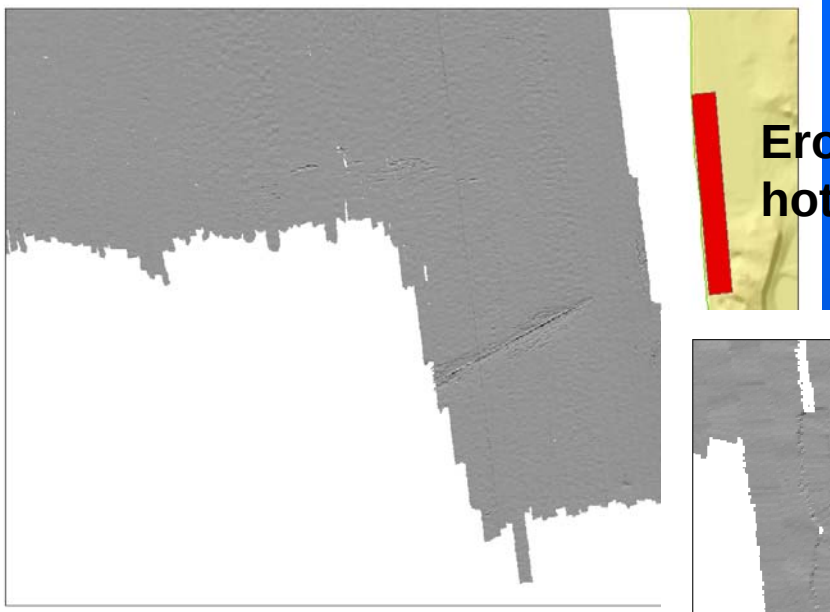
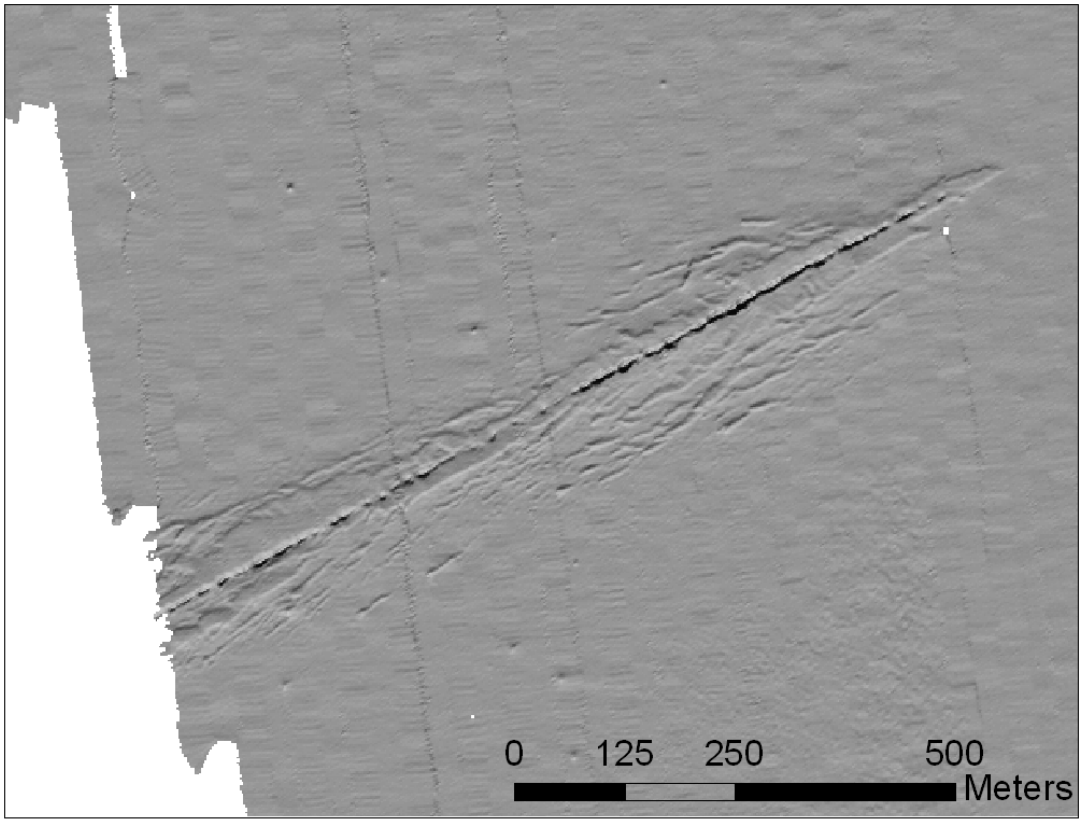


Disposal Area

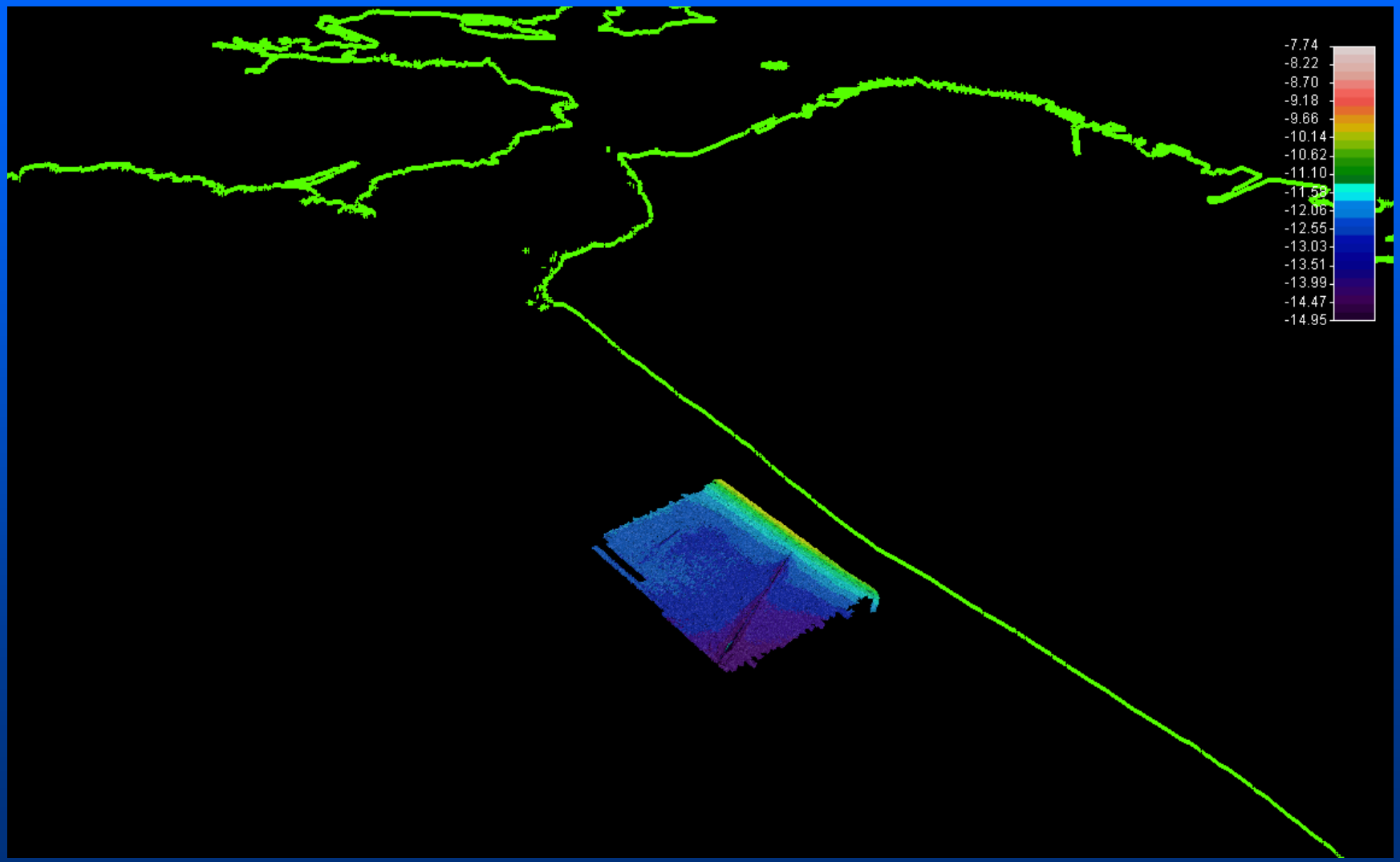


Erosion hot spot

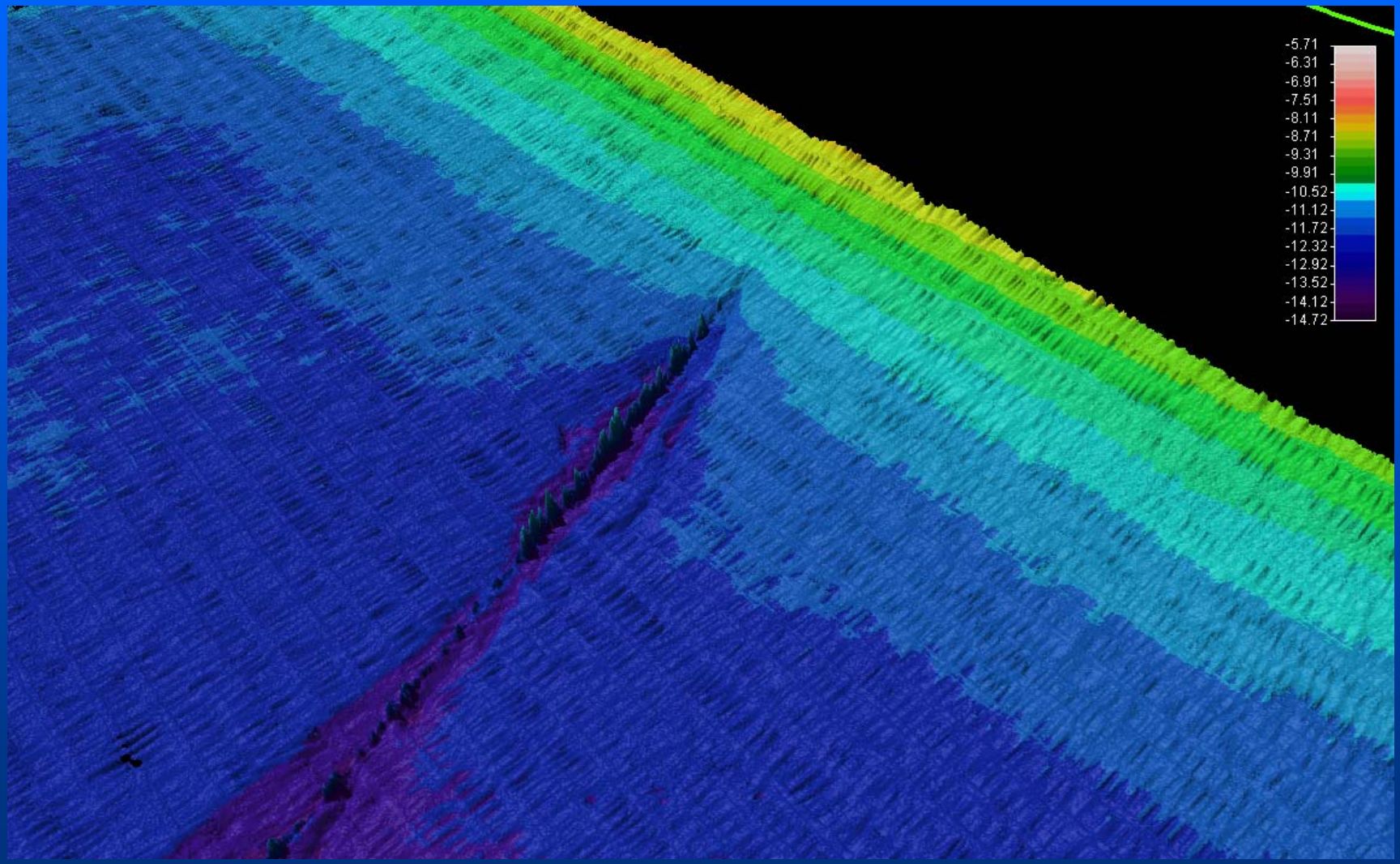
Intense pipe scour



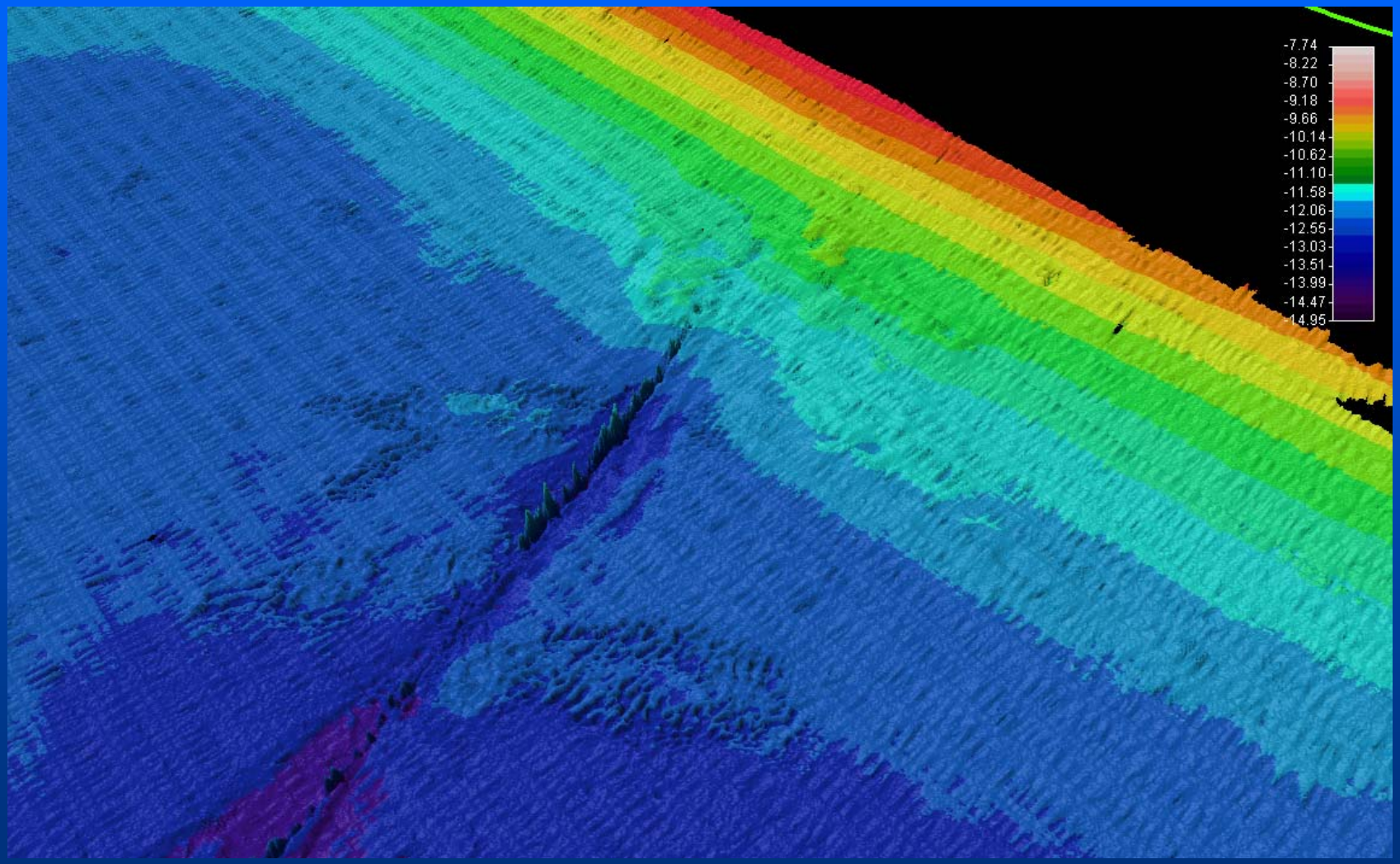
Dredge Disposal Site



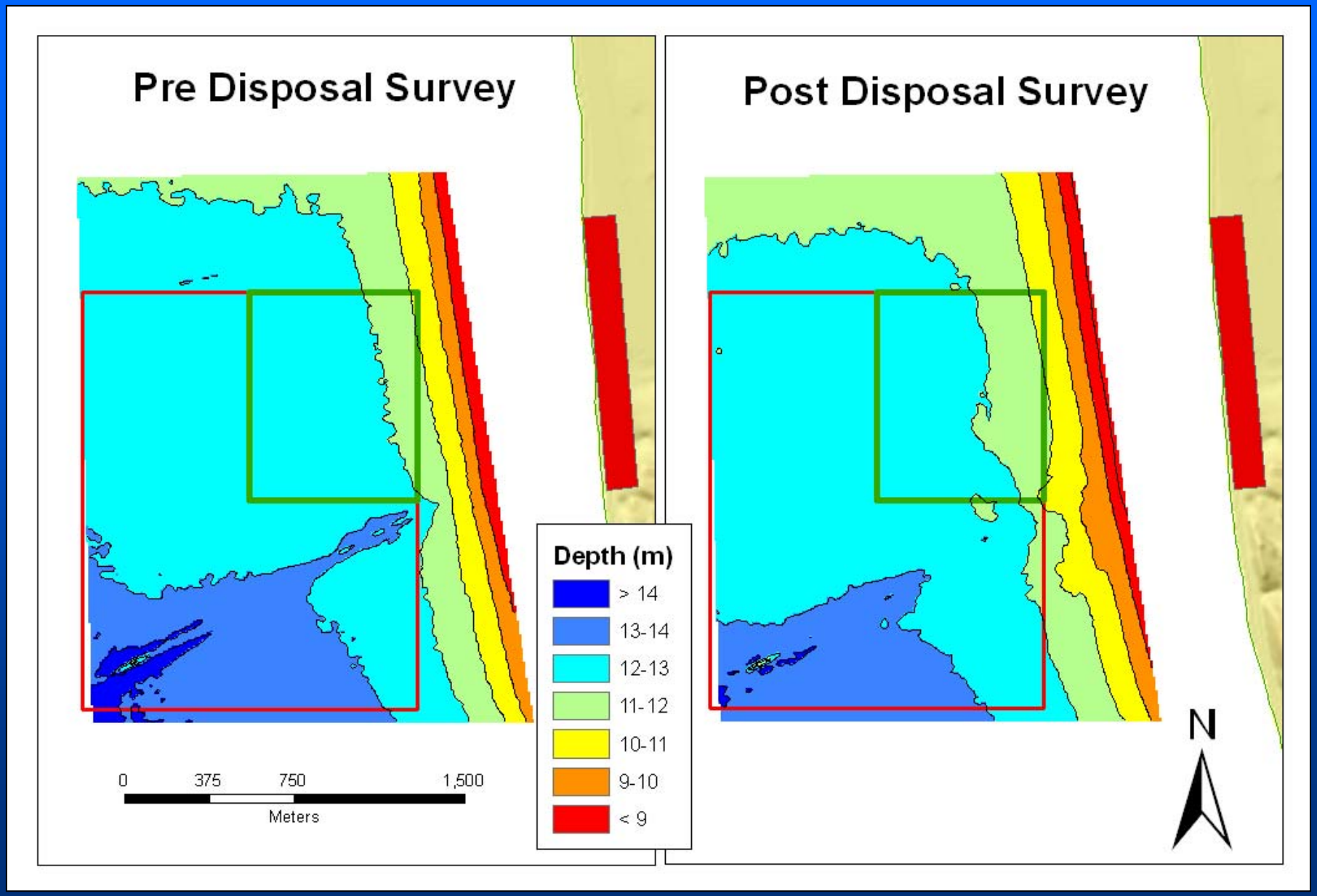
Pre Disposal



Post Disposal



Disposal Area



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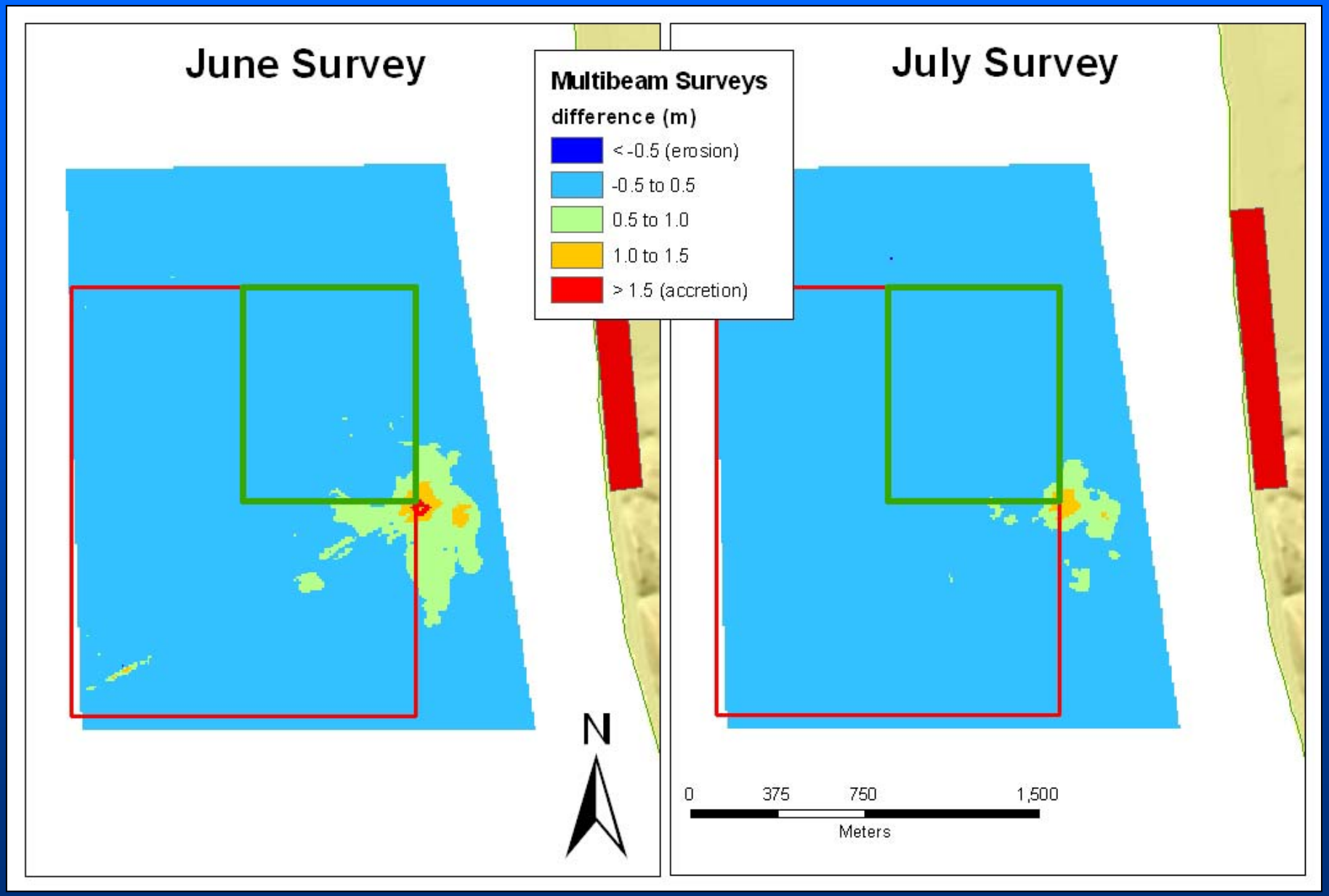

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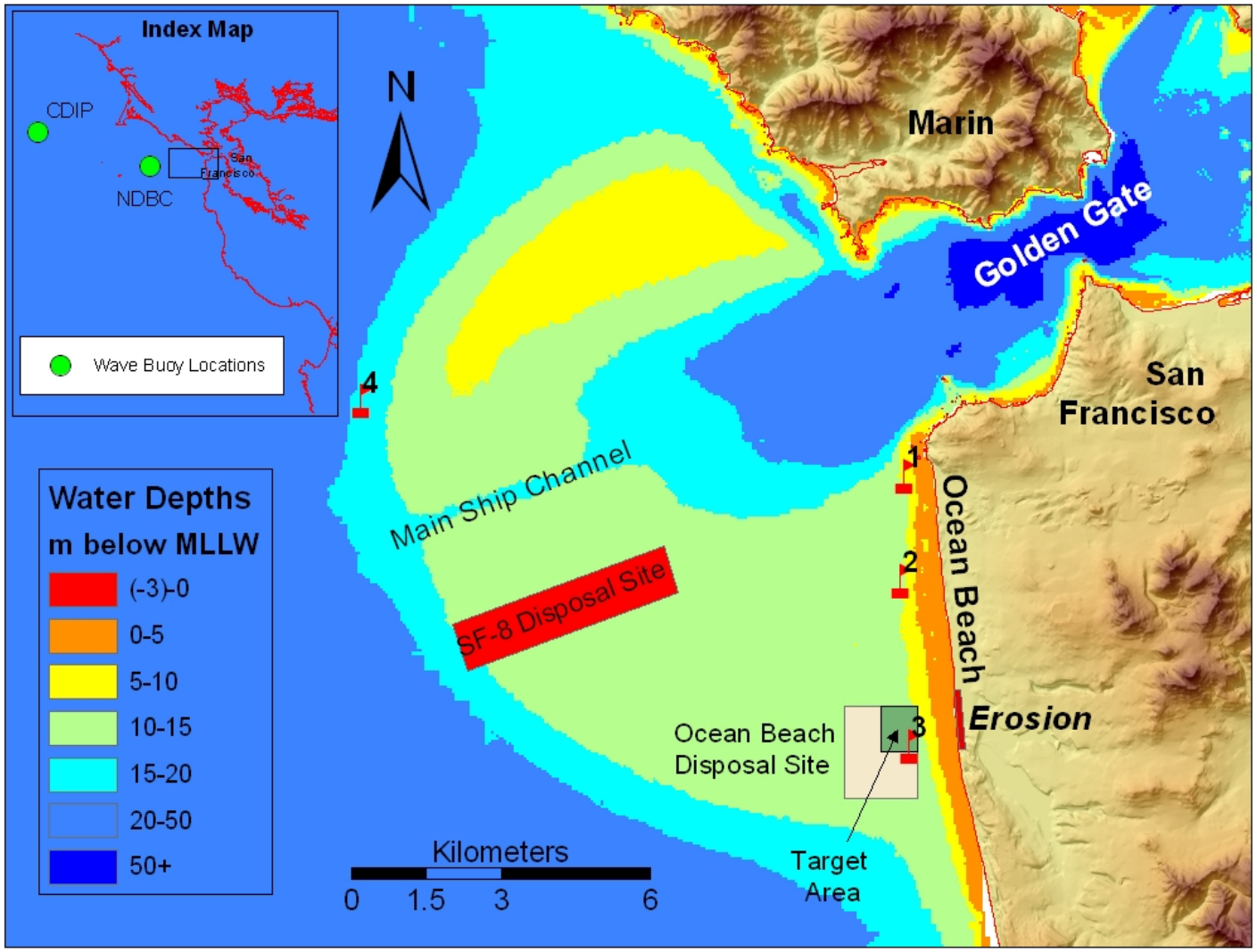
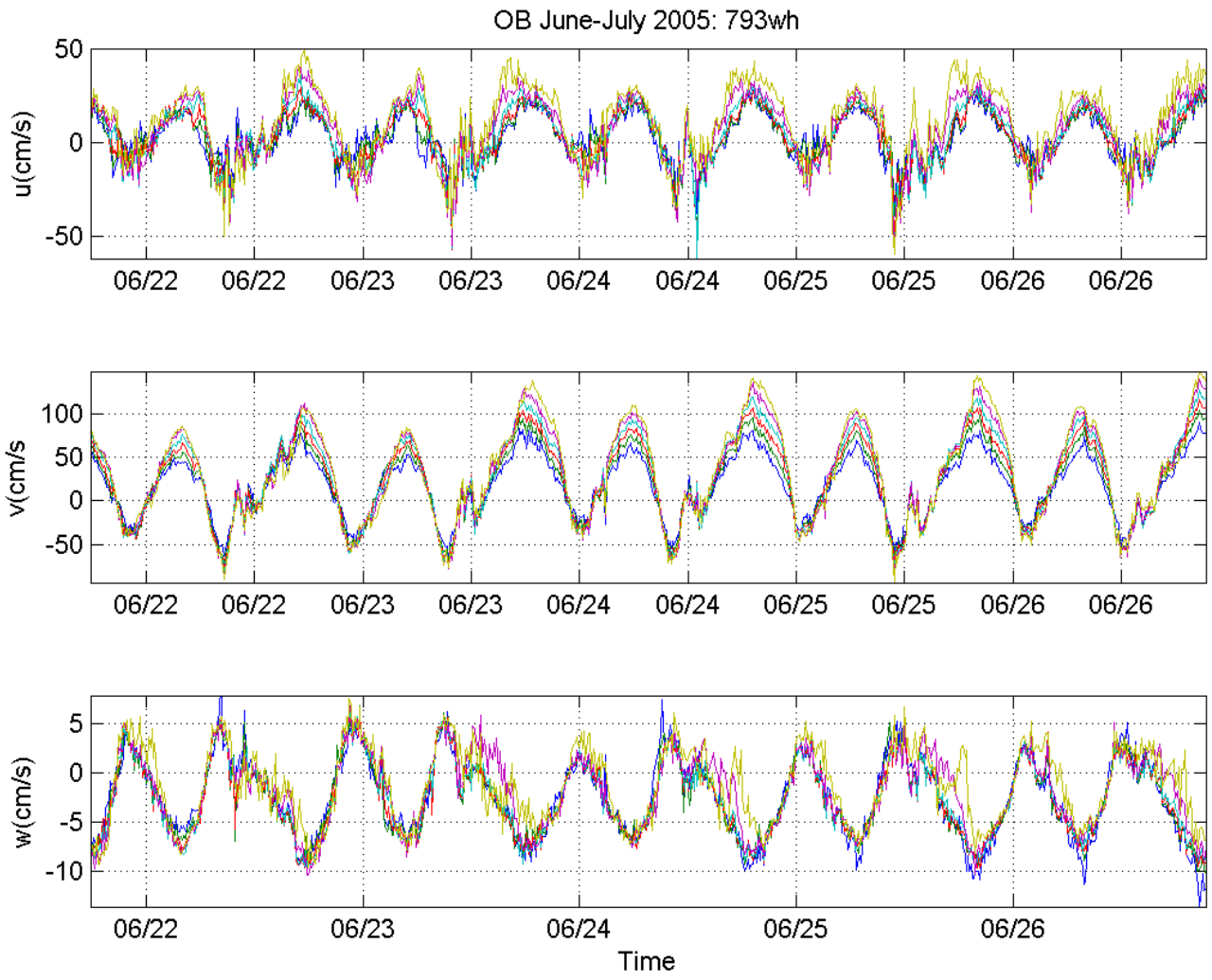


Instruments



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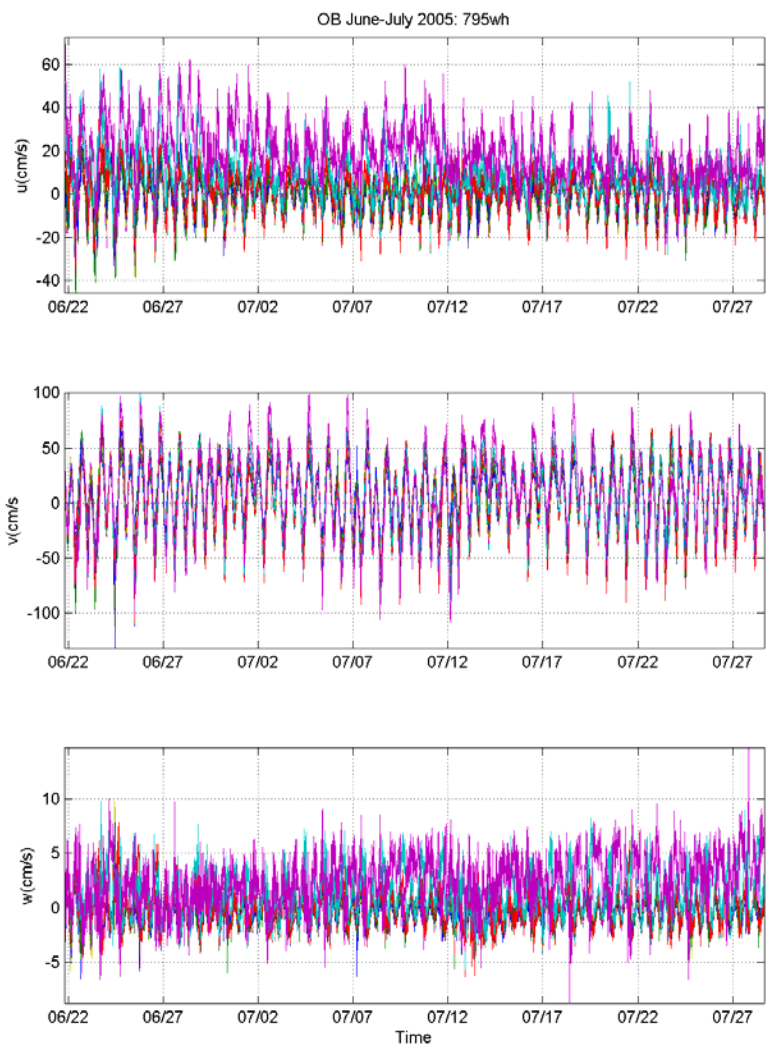

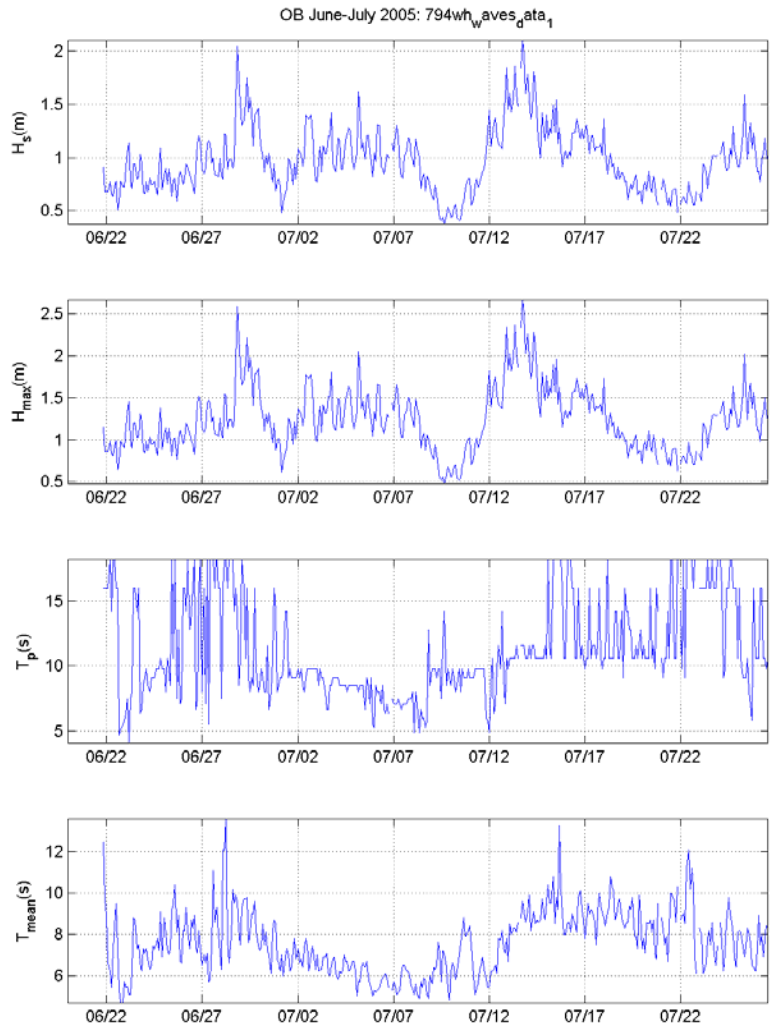

Summary

- More time required to evaluate true performance
- Placing dredge more proximal to littoral zone would have more immediate effect
- Continued integration of science, engineering and policy essential

Future Directions

- Modeling of new dredge disposal
- Model validation with open coast in situ measurements in key locations
- Continue monitoring
- Winter instrument deployment

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