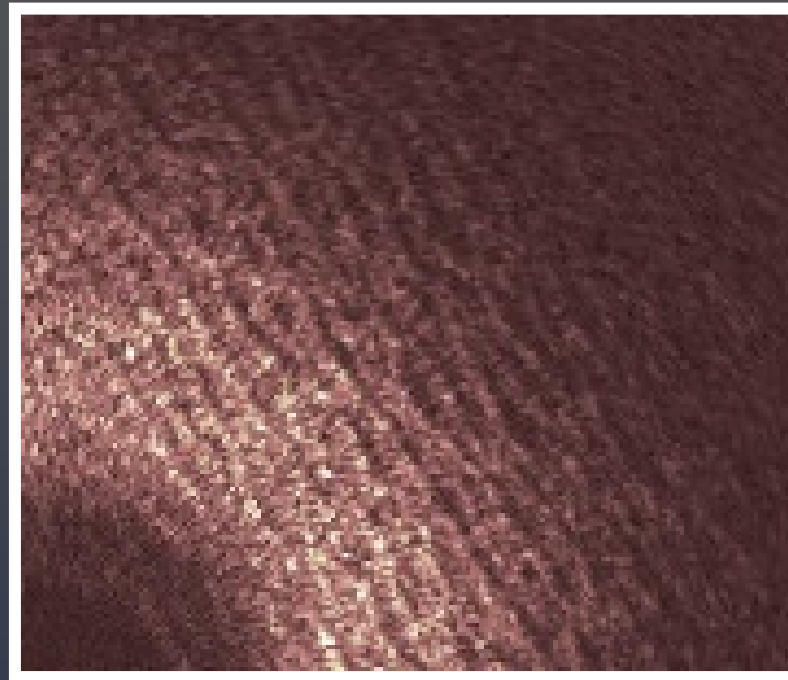


WAVE MEASUREMENT AND BEDFORM EVOLUTION ON A BARRIER SHOREFACE AND CAPE-ASSOCIATED SHOAL



Adam skarke

University of Delaware

College of Marine and earth Studies

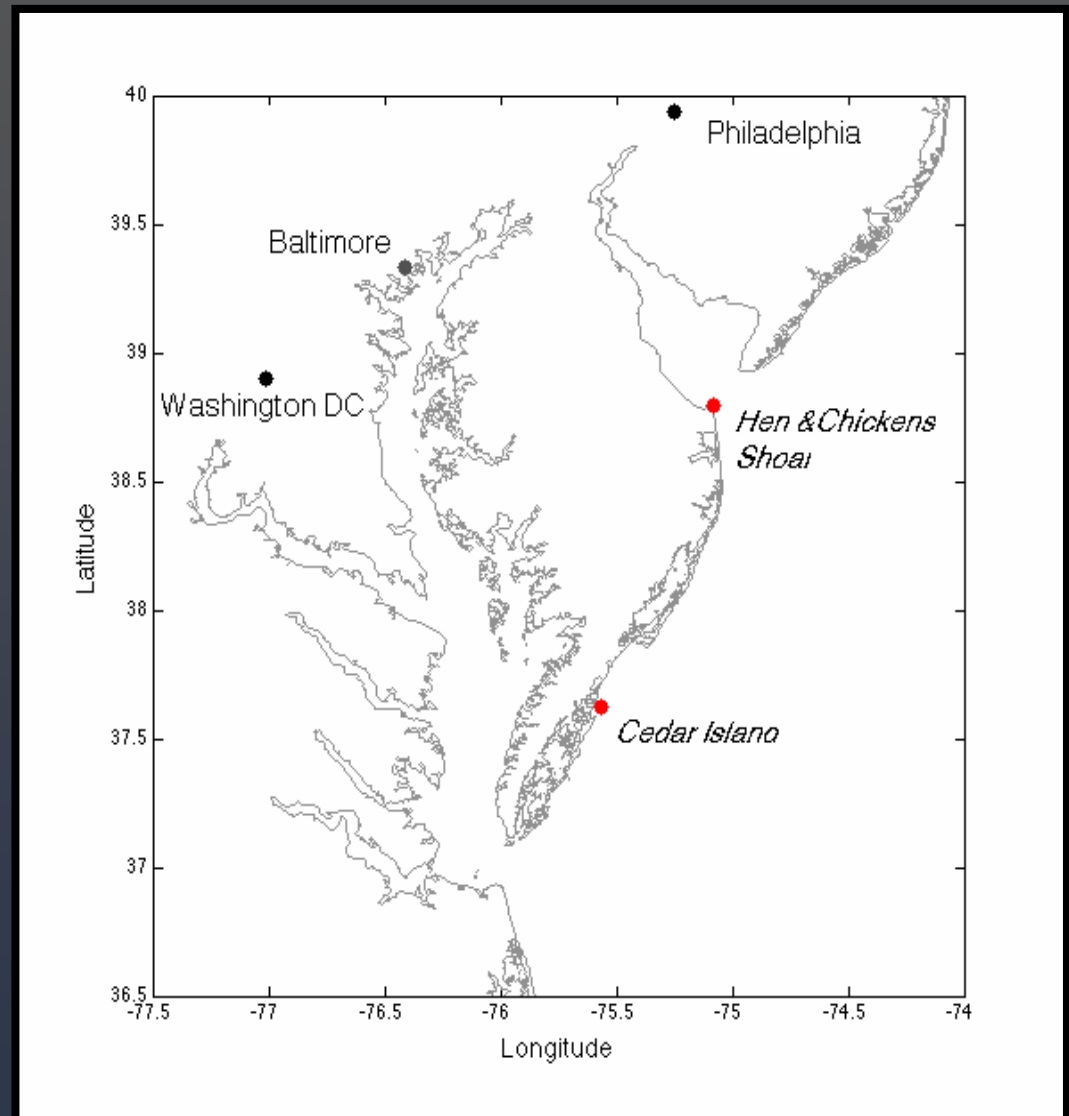
Coastal Sediments, Hydrodynamics, and Engineering Lab

Outline

- Field Locations
- Instrumentation
- Observations
- Ripple Models
- Summary
- Conclusions

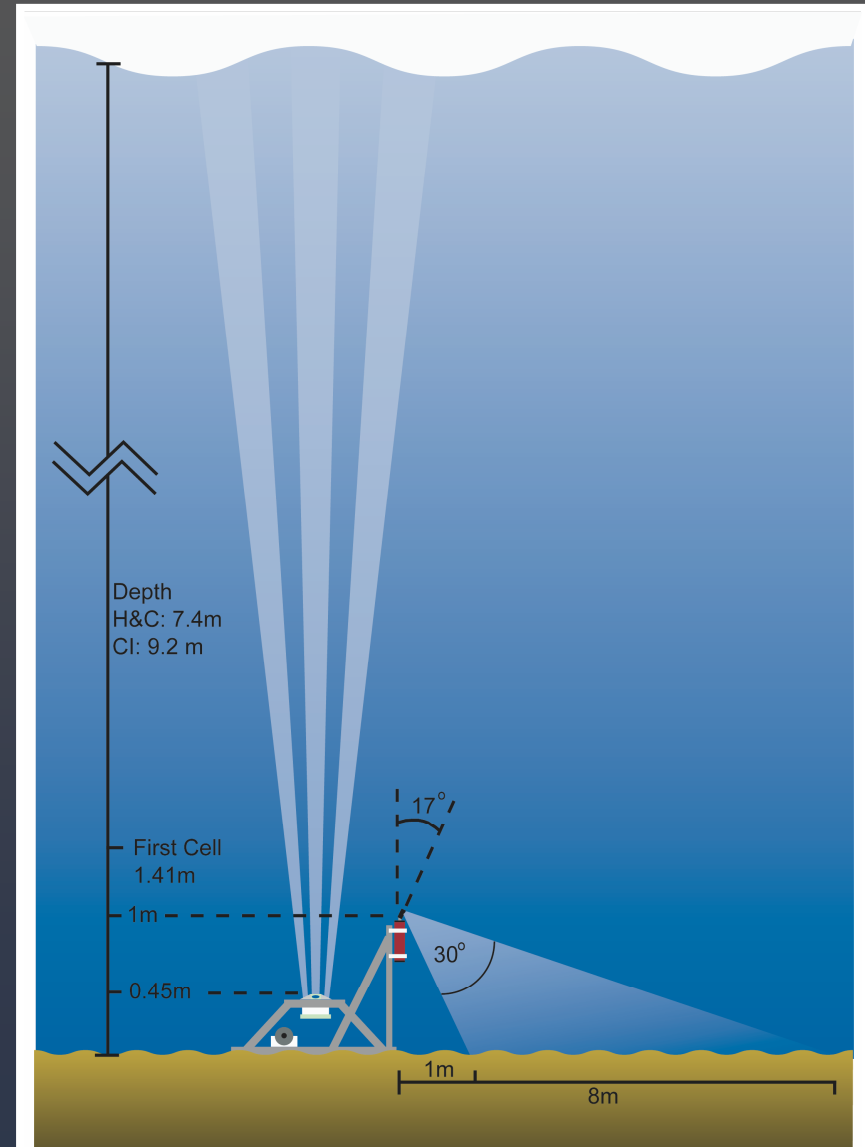
Field Locations

- Mid-Atlantic:
 - DelMarVa Peninsula
- Cedar Island, VA
 - Rapidly retreating barrier island
- Hen & Chickens Shoal, DE
 - Associated with prograding Spit (Cape Henlopen)

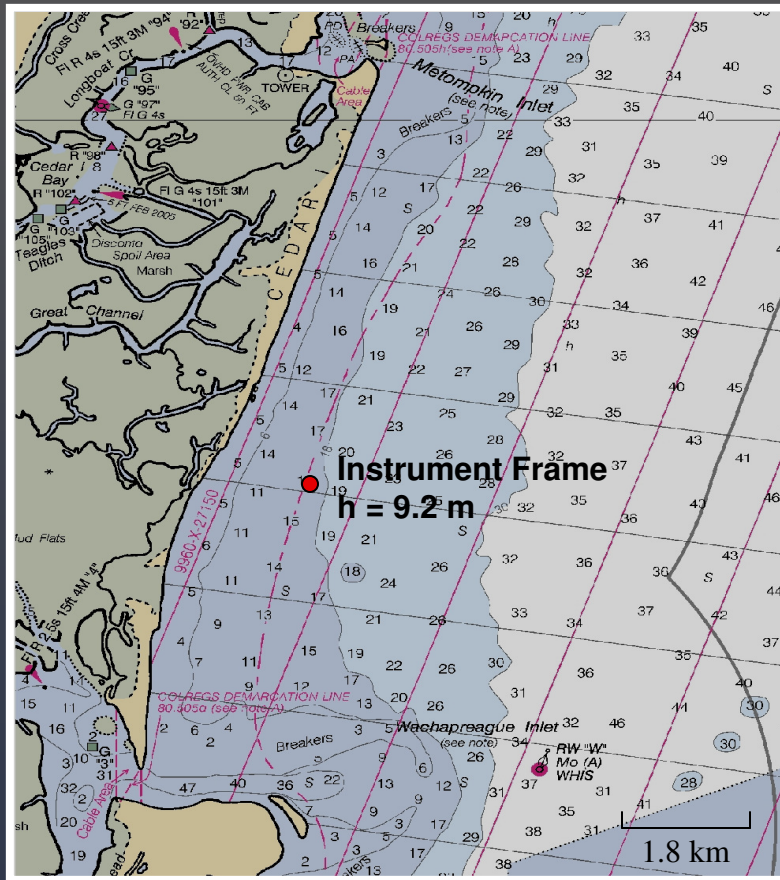


Instrumentation

- Upward looking 1 MHz Nortek acoustic wave and current profiler (AWAC) with AST
 - 0.45 m above bed
 - Sampling Interval:
 - Current: 600 s
 - Wave burst: 3600 s
- 2.25 MHz Imagenex tilt head rotary imaging sonar
 - 1 m above bed
 - Sampling Interval:
 - 3600 s (4 scans)



CEDAR ISLAND, VIRGINIA: TRANSGRESSIVE BARRIER SHOREFACE

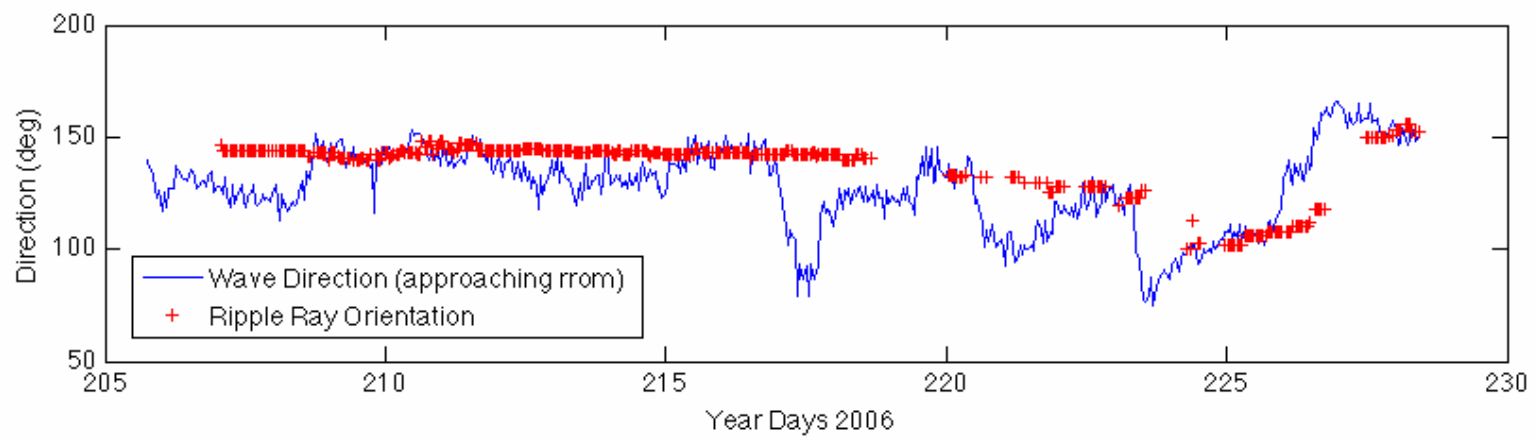
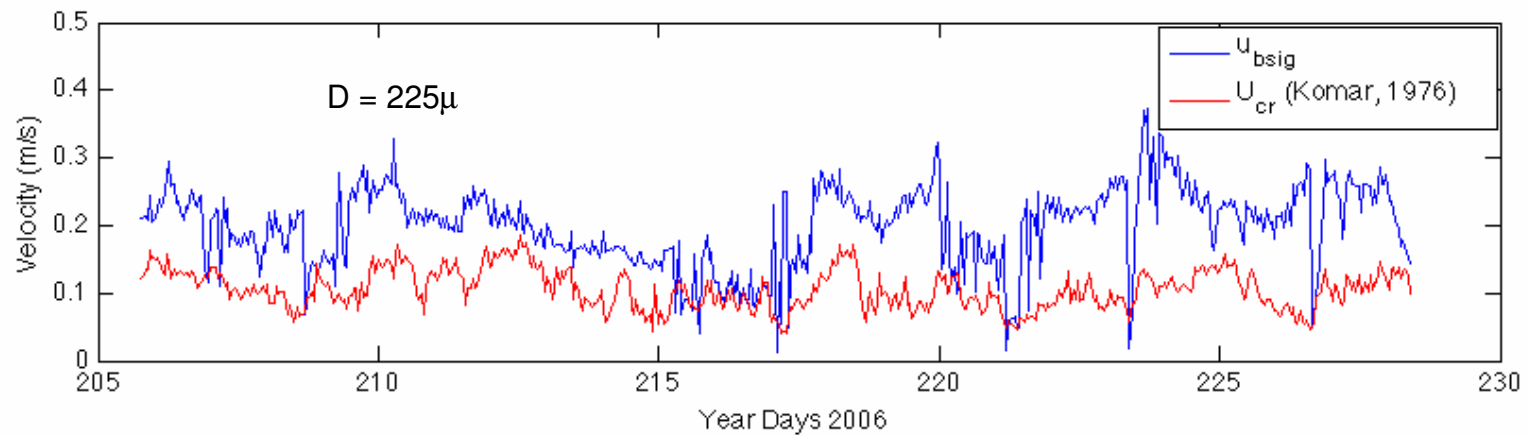


2003 N.O.A.A.

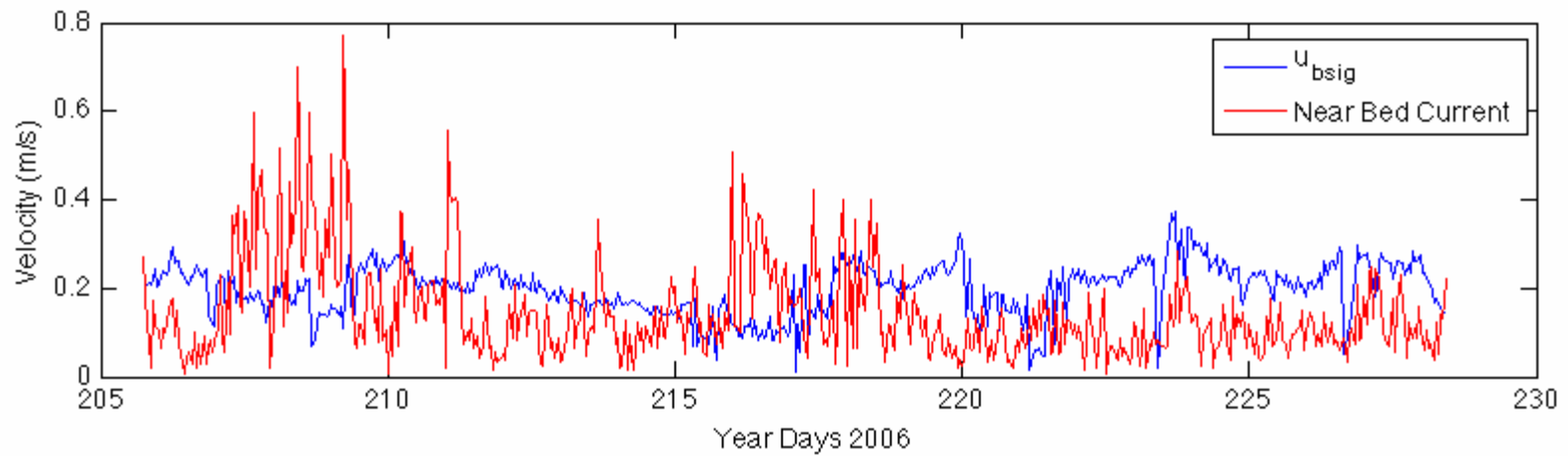


© 2008 DigitalGlobe

CEDAR ISLAND Deployment: July 24, 2006 - August 16, 2006



CEDAR ISLAND Deployment: July 24, 2006 -August 16, 2006



Cedar Island

Fair Weather Conditions



QuickTime™ and a
PNG decompressor
are needed to see this picture.

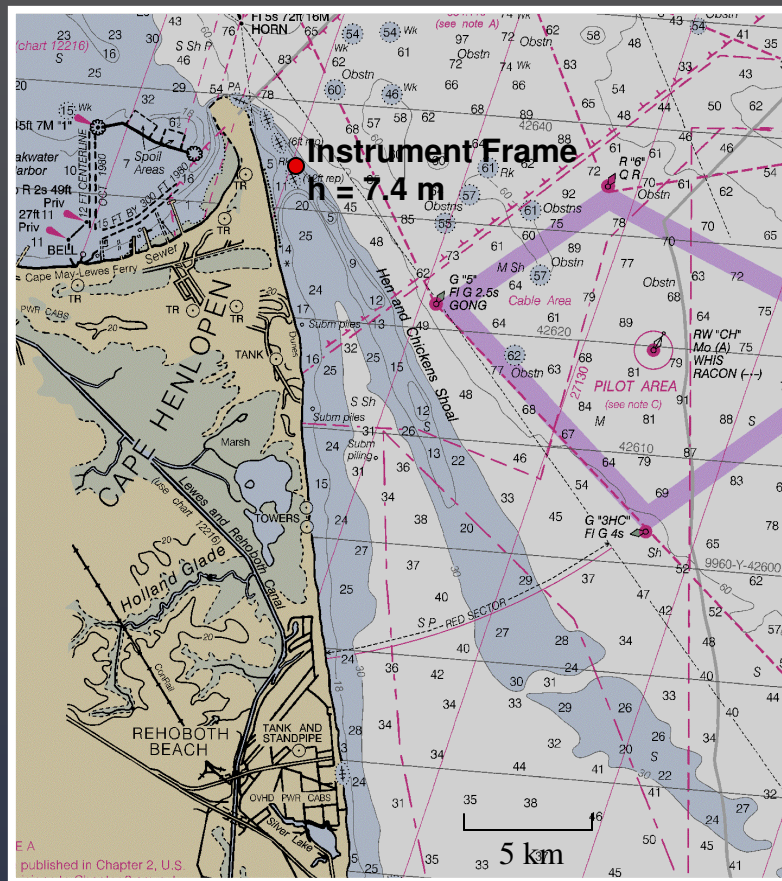


Current Vector



Wave Vector

Hen & Chickens Shoal, Delaware: Bay-Mouth Spit Associated Shoal

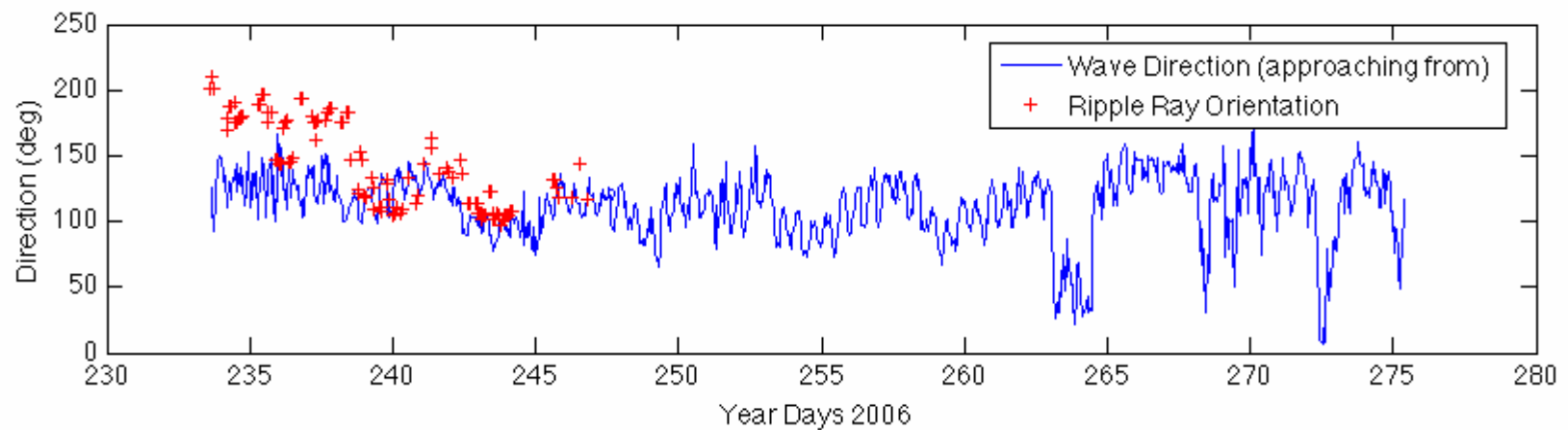
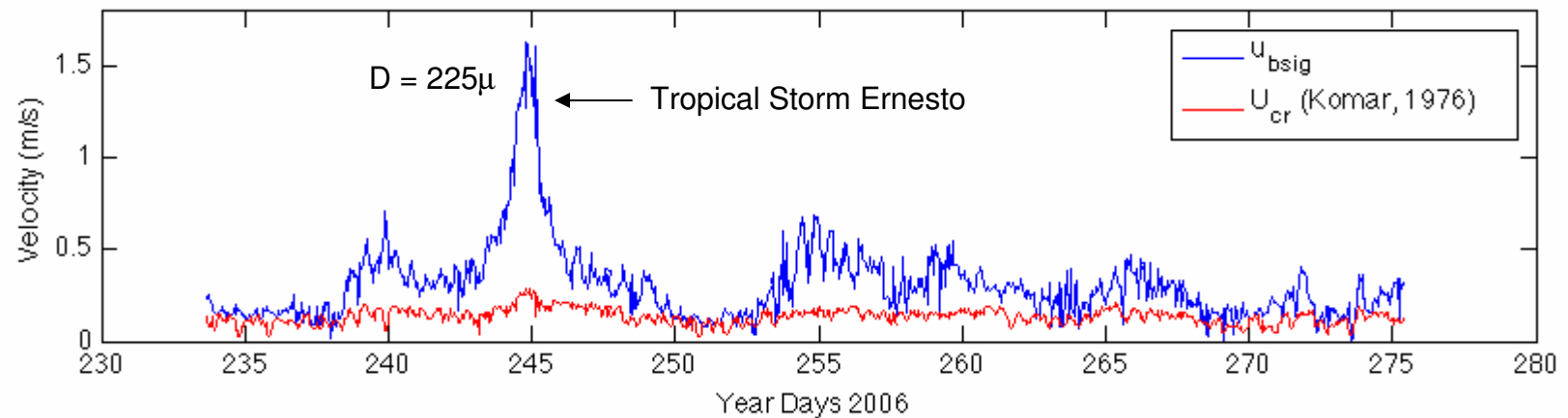


2003 N.O.A.A.

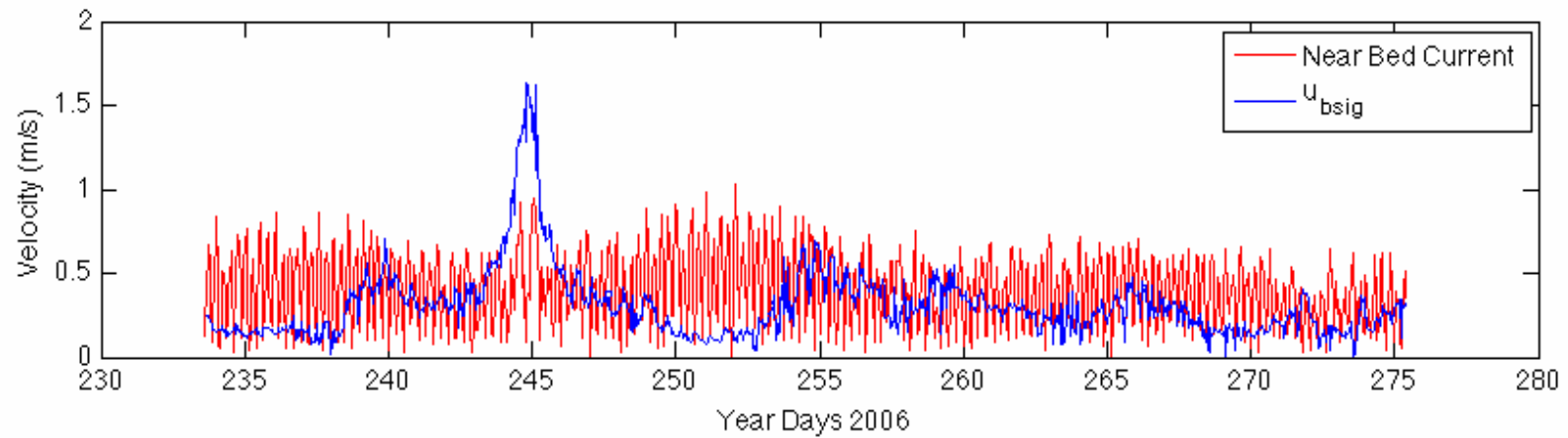


© 2008 DigitalGlobe

Hen and Chickens Shoal Deployment: August 22, 2006 -October 16, 2006



Hen and Chickens Shoal Deployment: August 22, 2006 -October 16, 2006



Hen and Chickens Shoal

Fair Weather Conditions



QuickTime™ and a
PNG decompressor
are needed to see this picture.



Current Vector



Wave Vector

Hen and Chickens Shoal Tropical Storm Conditions



QuickTime™ and a
PNG decompressor
are needed to see this picture.



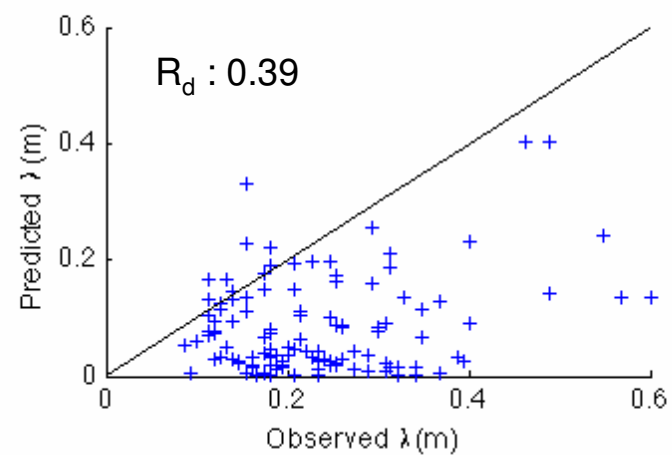
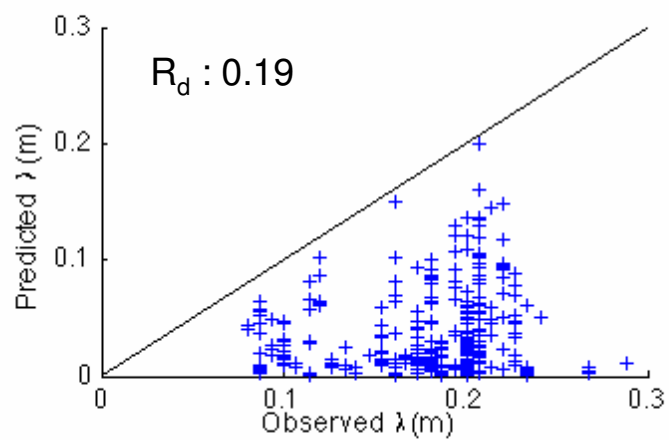
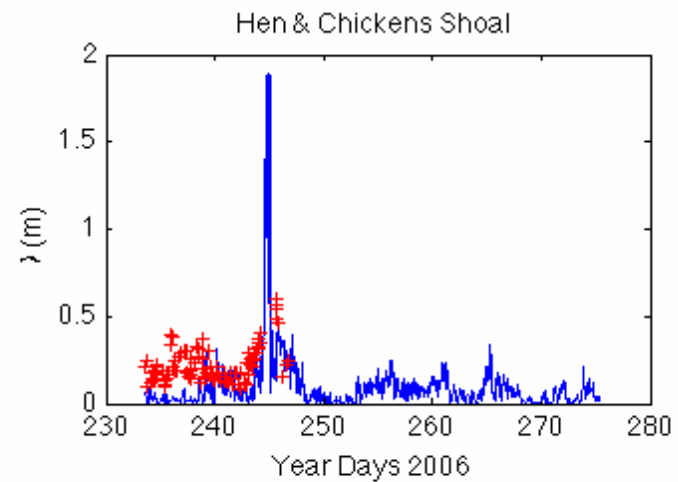
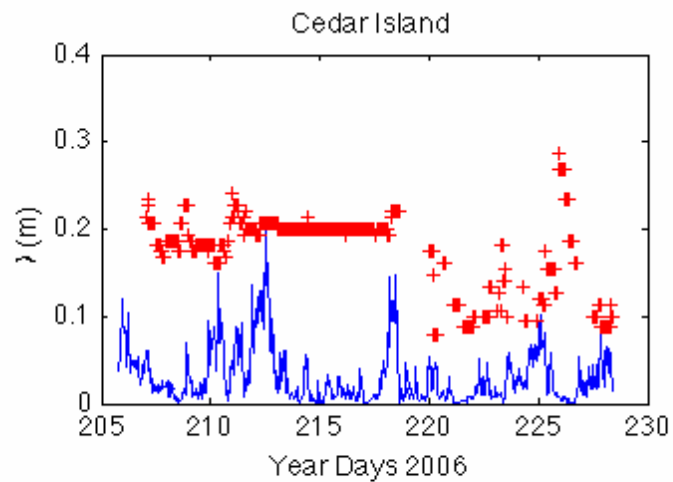
Current Vector



Wave Vector

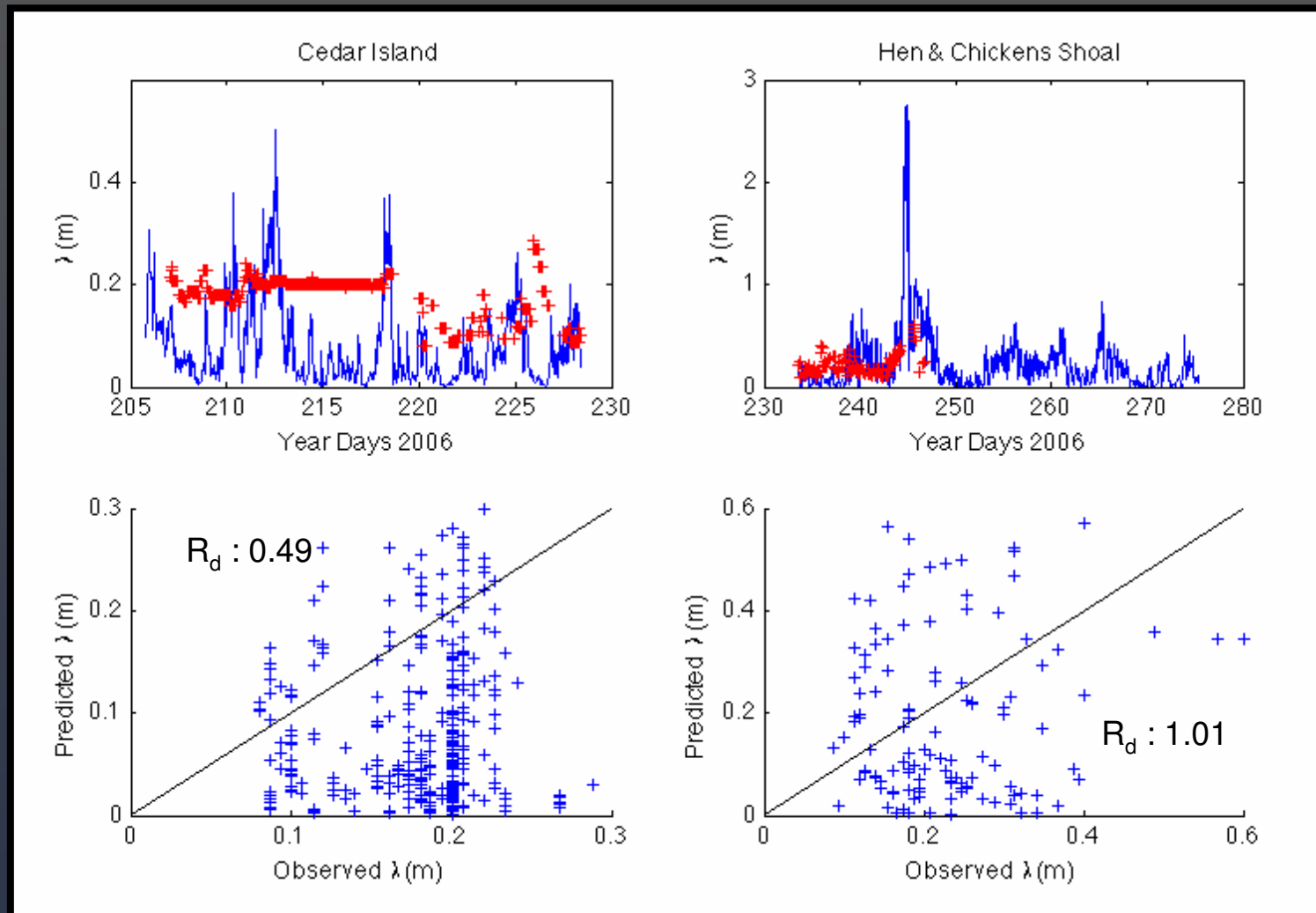
Ripple Model Comparison of λ

Nielsen (1981)



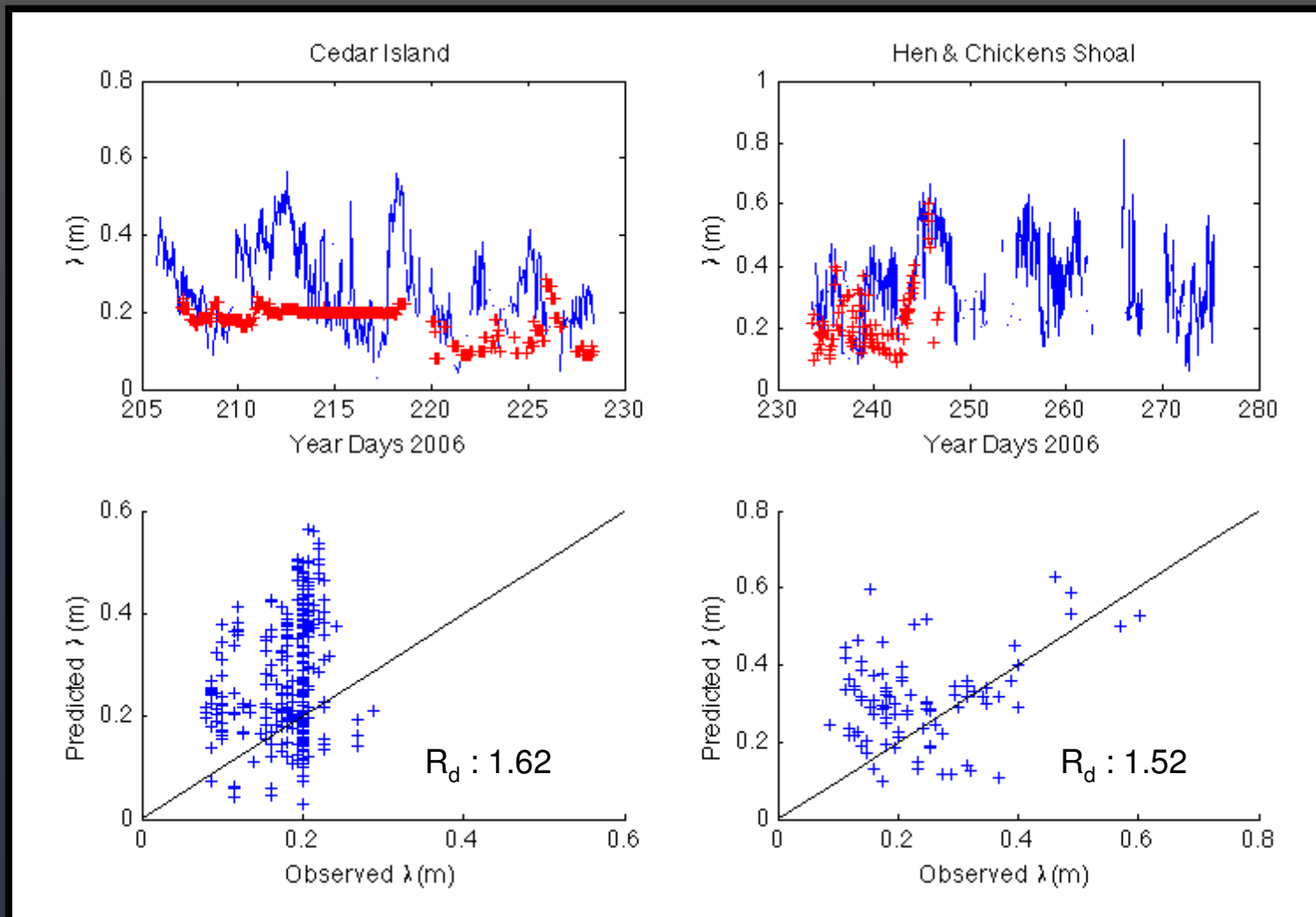
Ripple Model Comparison of λ

Grant & Madsen (1982)



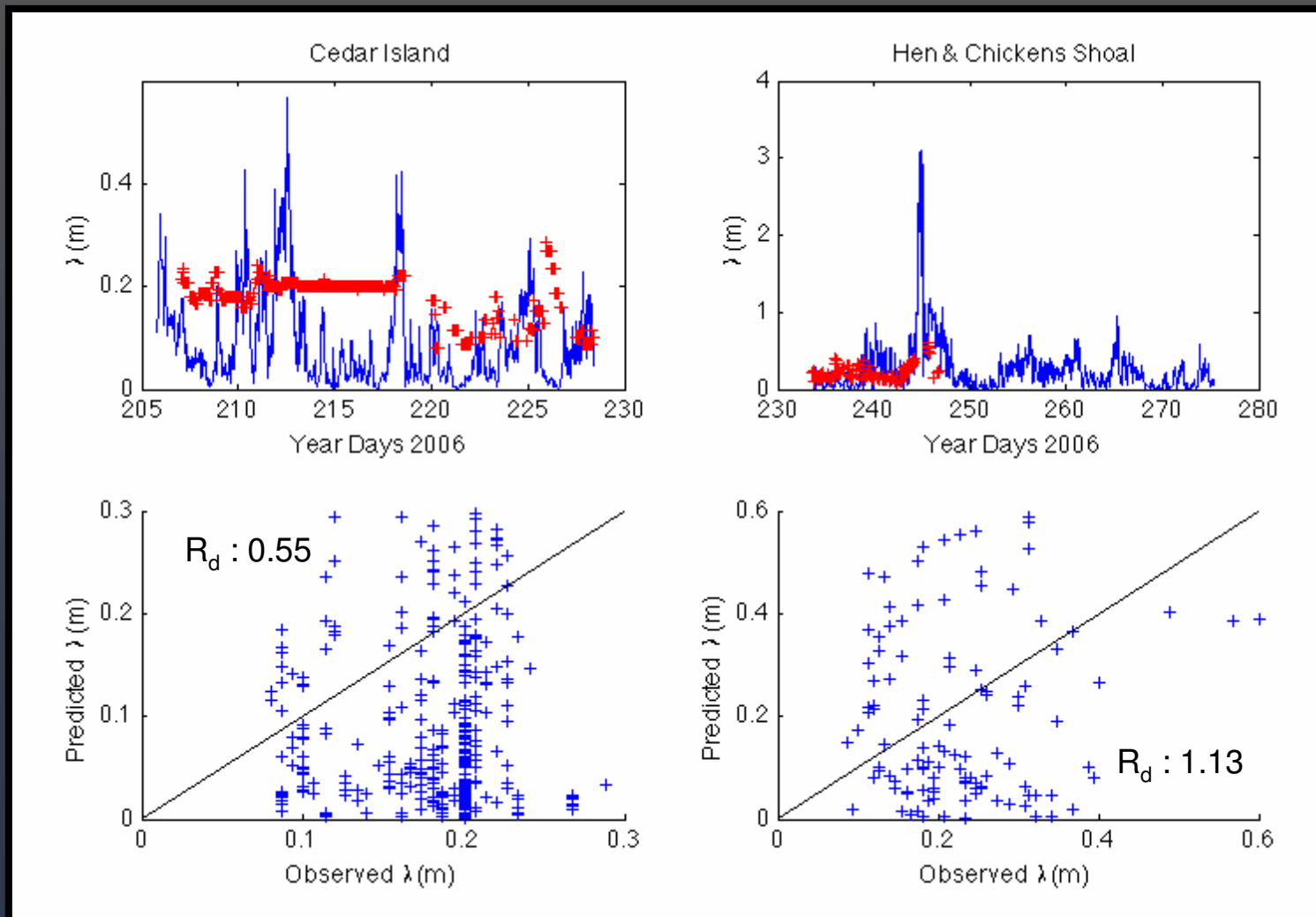
Ripple Model Comparison of λ

Wikramanayake (1993)



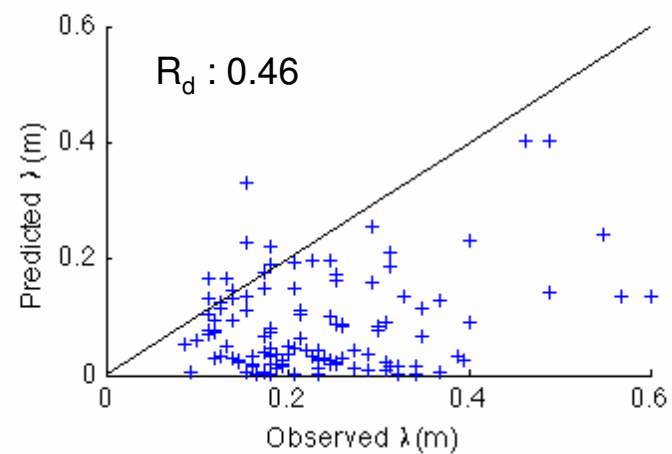
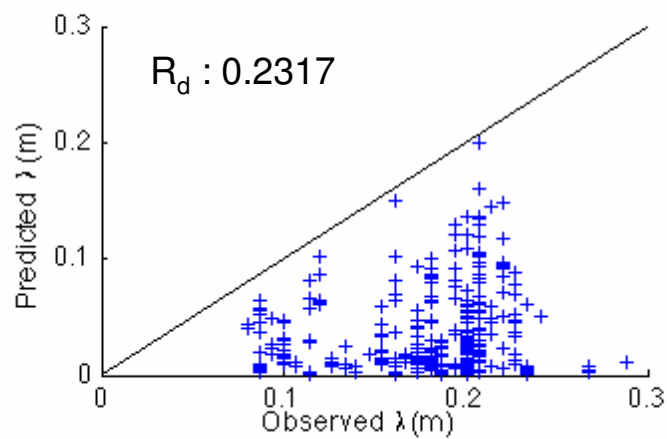
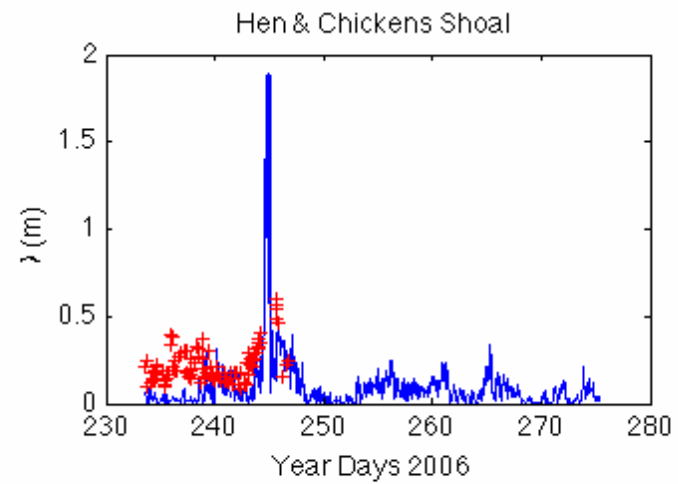
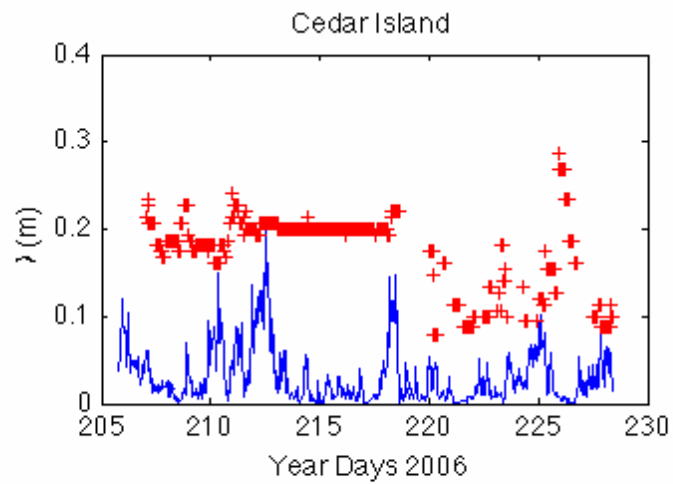
Ripple Model Comparison of λ

Li *et Al.* (1996)



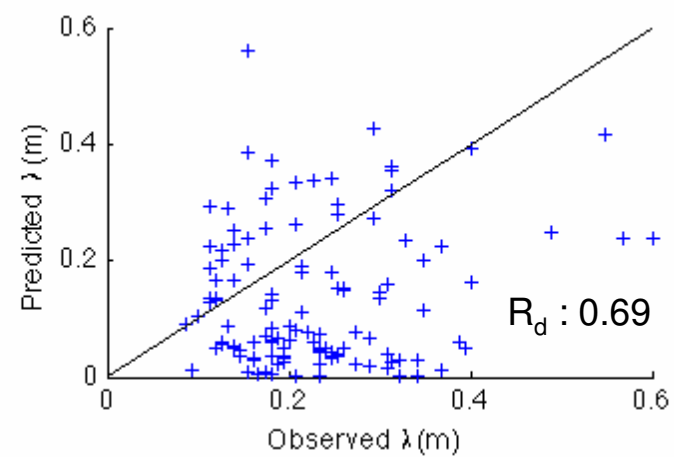
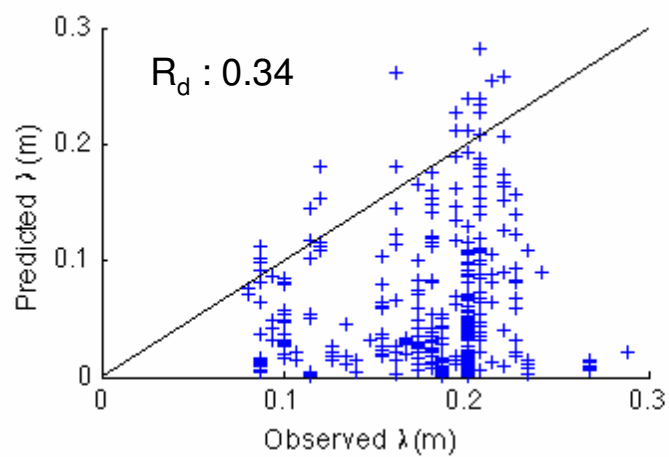
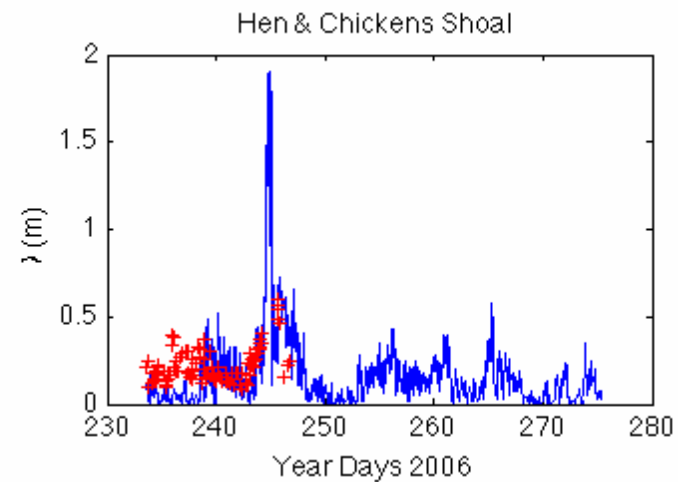
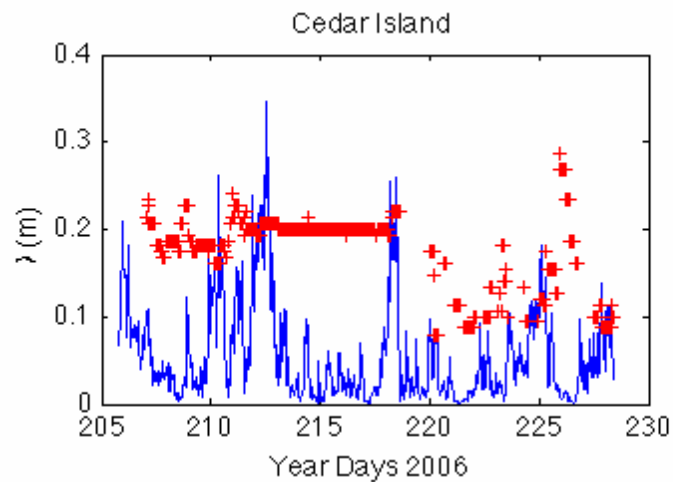
Ripple Model Comparison of λ

Tanaka & Dang (1996)



Ripple Model Comparison of λ

Khelifa & Ouellet (2000)



Ripple Model Results

| C e d a r I s l a n d | | | H e n & C h i c k e n s S h o a l | | |
|-----------------------|-----------------------------|----------------|-----------------------------------|-----------------------------|----------------|
| R a n k | A u t h o r | R _d | R a n k | A u t h o r | R _d |
| 1 | L i e t a l . | 0 .5 5 | 1 | G r a n t & M a d s e n | 1.0 1 |
| 2 | G r a n t & M a d s e n | 0 .4 9 | 2 | L i e t a l . | 1.13 |
| 3 | W i k r a m a n a y a k e | 1.6 0 | 3 | K h e l i f a & O u l l e t | 0 .69 |
| 4 | K h e l i f a & O u l l e t | 0 .3 4 | 4 | W i k r a m a n a y a k e | 1.5 2 |
| 5 | T a n a k a & D a n g | 0 .2 3 | 5 | T a n a k a & D a n g | 0 .46 |
| 6 | W i b e r g & H a r r i s | 0 .22 | 6 | W i b e r g & H a r r i s | 0 .4 3 |
| 7 | N i e l s e n | 0 .19 | 7 | N i e l s e n | 0 .4 0 |

- Models break into groups of validity
- Top: Li et al. And Grant & Madsen
 - Li et al. Is a modification of Grant & Madsen
- Models stronger on h & C Shoal by approximately a factor of 2

Conclusions

- Critical to consider combined flow hydrodynamic forcing in the observed coastal environments.
- the dominant hydrodynamic forcing mechanism transitions across temporal as well as Spatial scales of geomorphology.
 - Shoal scale (km) vs. ripple scale(cm) orientation and persistence
- temporal scales of forcing are insufficient to allow fully developed bedforms.
 - Instantaneous Hydrodynamic characteristics Likely insufficient to define bed morphology

Acknowledgements

- Nortek AS / Nortek USA
- VIMS Eastern Shore Lab
- University of Delaware College of Earth and Marine Studies

