

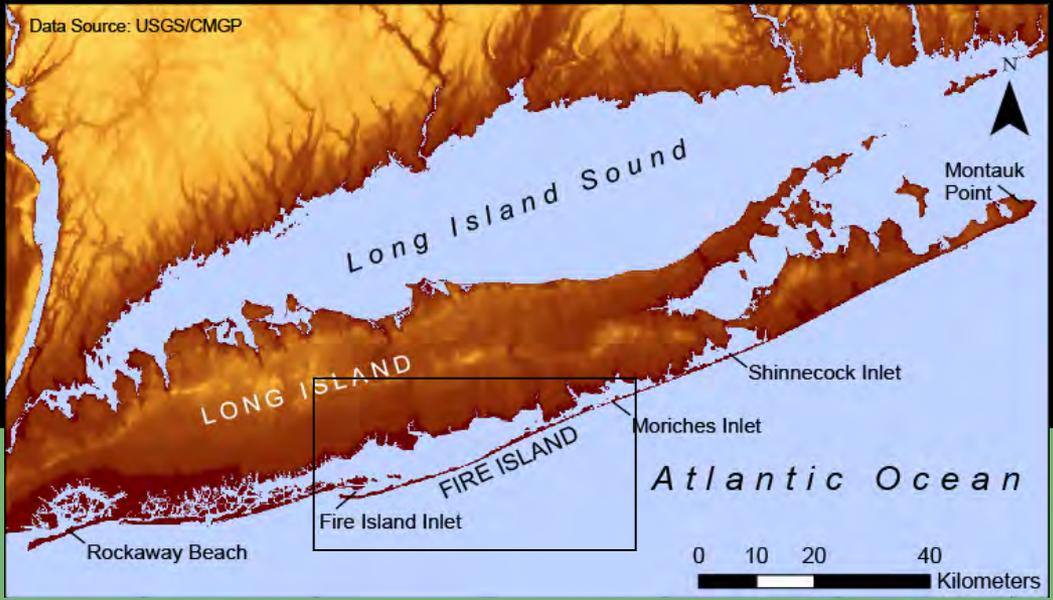
Inner Shelf Morphologic Controls on Patterns of Shoreline Change, Fire Island, New York

Cheryl Hapke, U.S. Geological Survey

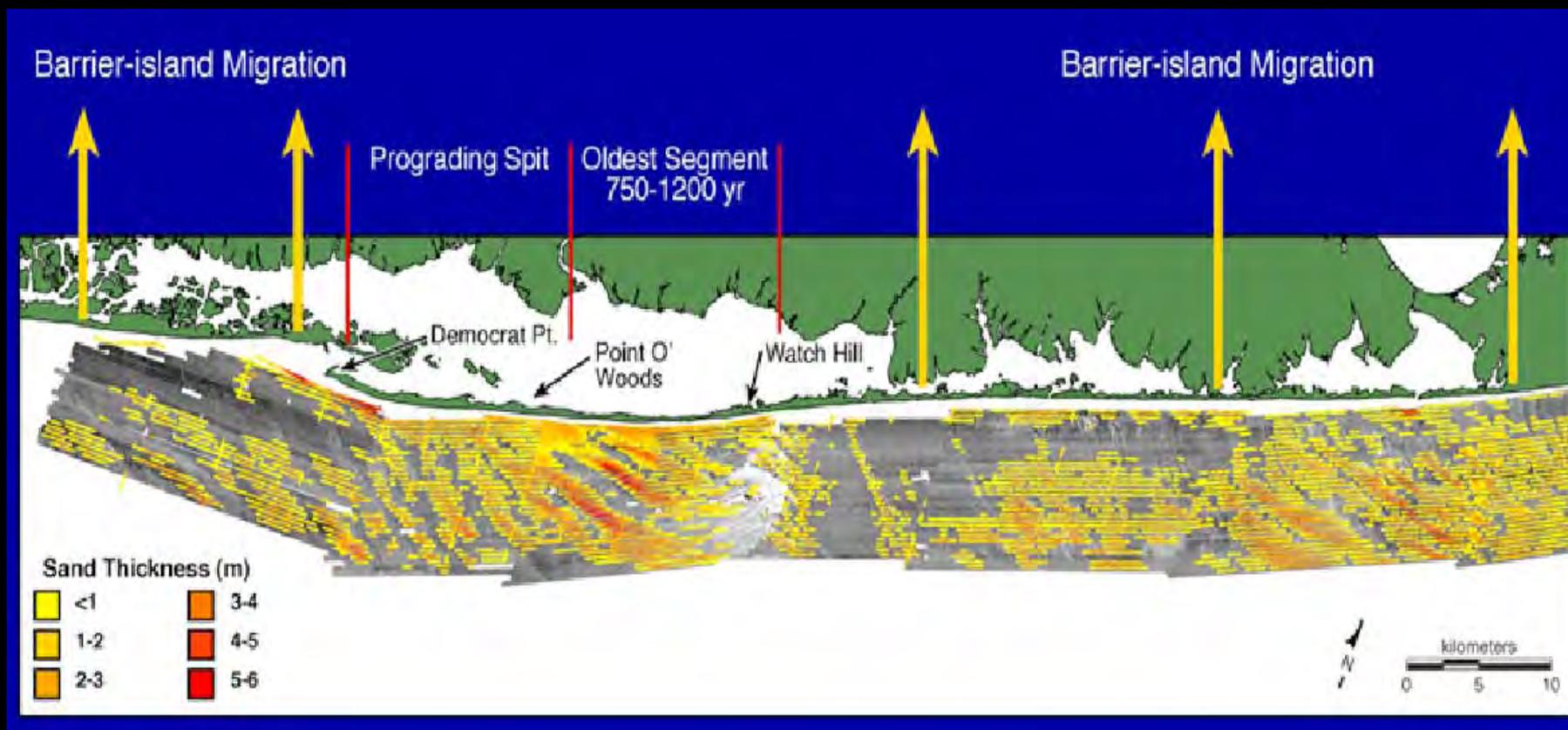
Coastal Carolina University: Paul Gayes
Clay McCoy

University of Rhode Island: Erika Lentz
U.S. Geological Survey: Bill Schwab



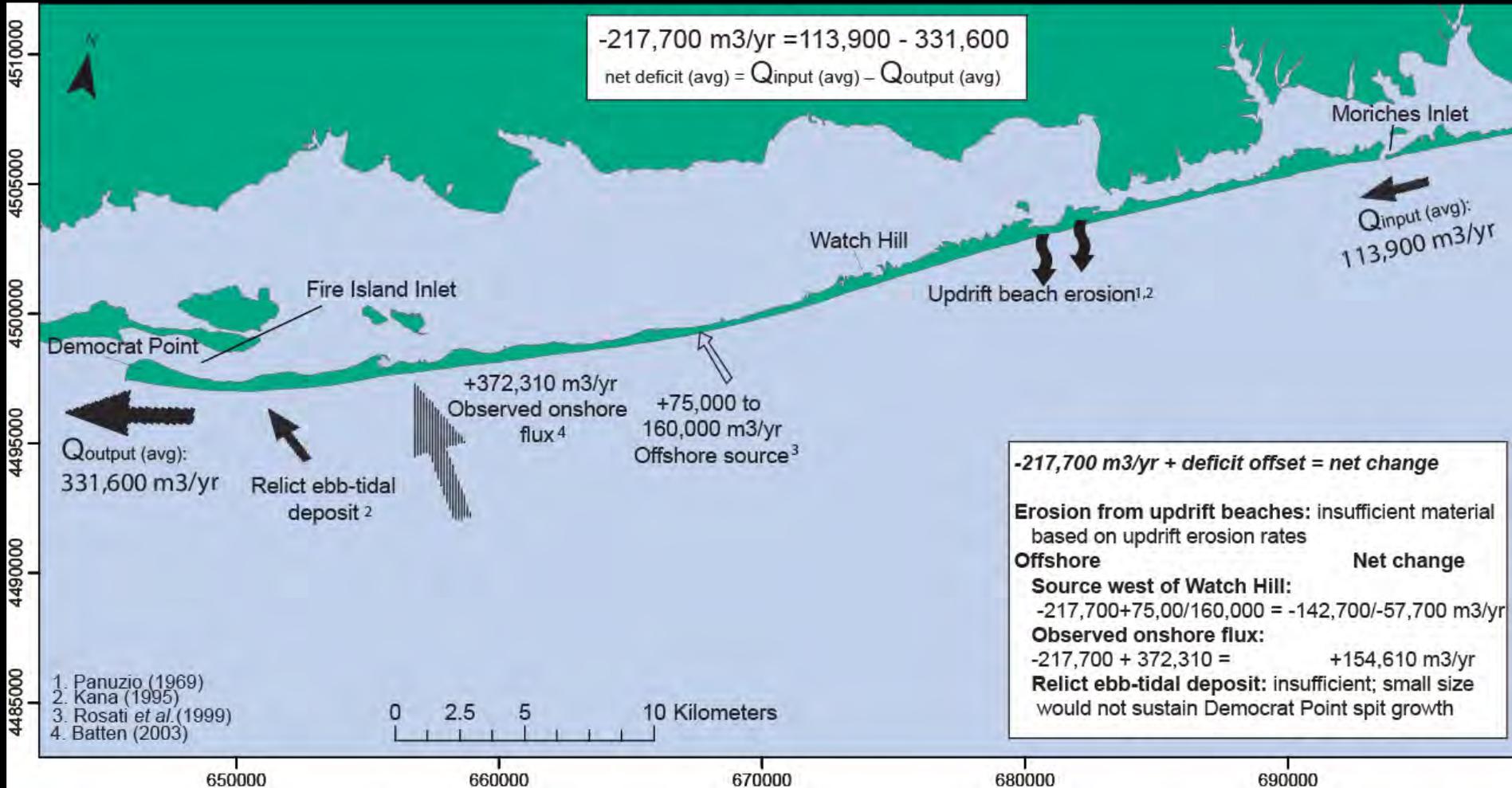


Geologic Framework and Island Evolution



From Schwab et al. 2000: <http://pubs.usgs.gov/of/1999/of99-559/>

Sediment Budget



Sediment Budget

Reference	Years	Input m ³ /yr	Output m ³ /yr	Deficit m ³ /yr	Source of material east - west
Panuzio (1969)	1931-1933; 1873-1909	267,600	458,700	191,100	Beach nourishment from tidal delta
Kana (1995)	1955-1979	45,000	360,000	315,000	Relict ebb tidal delta
Rosati et al. (1999)	1979-1995	29,000	167,000	147,000	None; deficit is within the range of uncertainty

What is the long-term behavior of the shoreline?

Is there evidence that offshore ridges are connected to the shoreface?

Is there evidence that the ridges influence the behavior of the beach?

- Focusing wave energy, esp. during large storm events
- Sediment source or conduit along western F.I.?

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Date	Shoreline	Shoreline Source
1933 (Feb-Mar)	HWL	?? (ACNYMP)
1969 (Mar)	HWL	Orthophotograph (Hapke et al.)
1979 (Dec)	HWL	Orthophotograph (ACNYMP)
1983 (Apr)	HWL	Orthophotograph (ACNYMP)
1988 (Mar)	HWL	Orthophotograph (ACNYMP)
1993 (Sept)	HWL	USGS, field survey
1994 (Sept)	HWL	USGS, field survey
1995 (Sept)	HWL	USGS, field survey
1996 (Sept)	HWL	USGS, field survey
1997 (Sept)	HWL	USGS, field survey
1998 (Sept)	HWL	USGS, field survey
1999 (Sept)	HWL	Leatherman, field survey
2001 (Sept)	HWL	Leatherman, field survey
2002 (Oct)	MHW	Lidar (Hapke et al)
2005 (Apr)	MHW	Lidar (Hapke et al)
2006 (Oct)	HWL	NPS field survey
2007 (Apr)	MHW	Lidar (Hapke et al)

Great South Bay

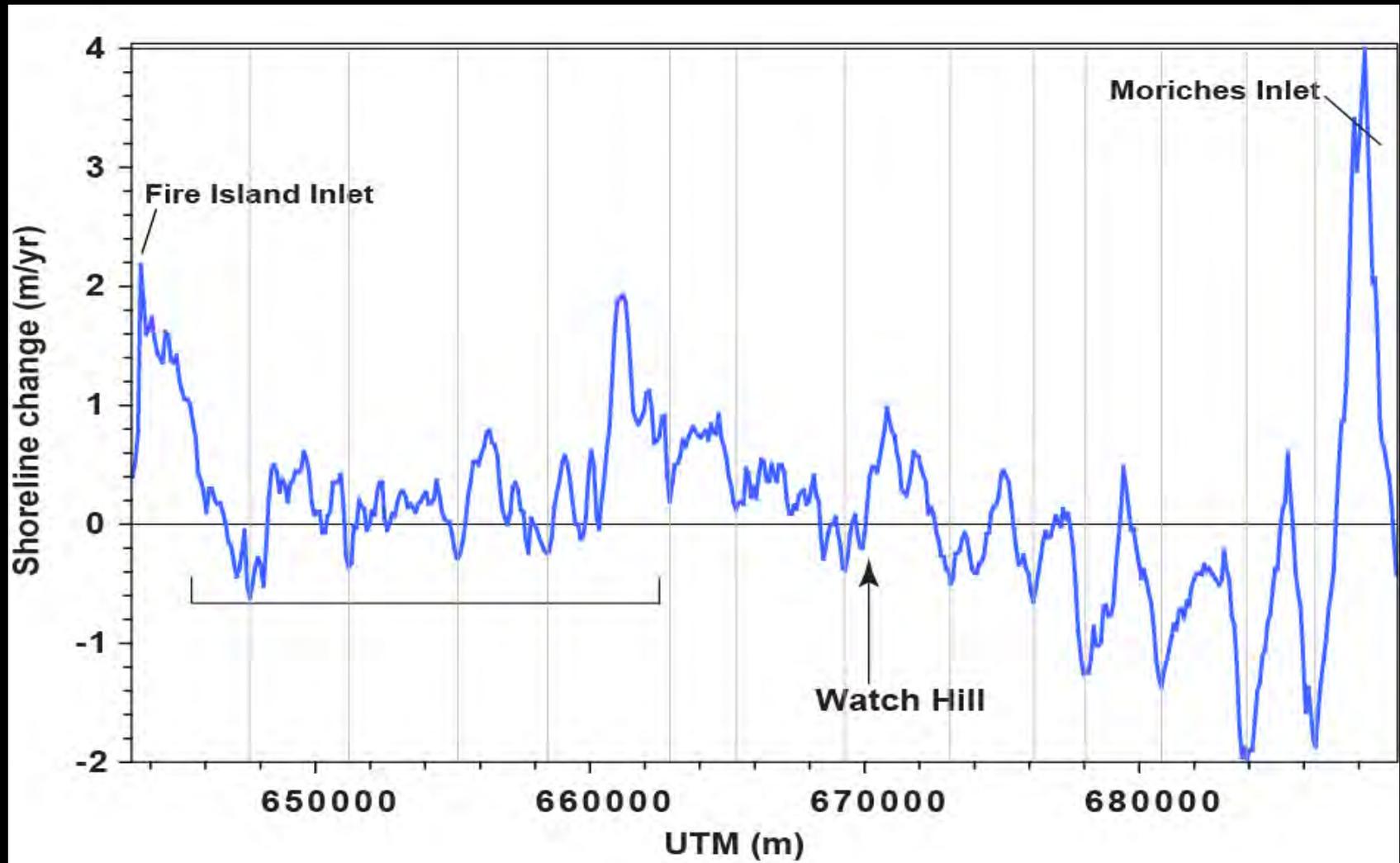
Shoreline Date

- 1933
- 1969
- 1979
- 1983
- 1988
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2001
- 2002
- 2005
- 2006
- 2007

Atlantic Ocean



Linear regression shoreline change, 1933 - 2007



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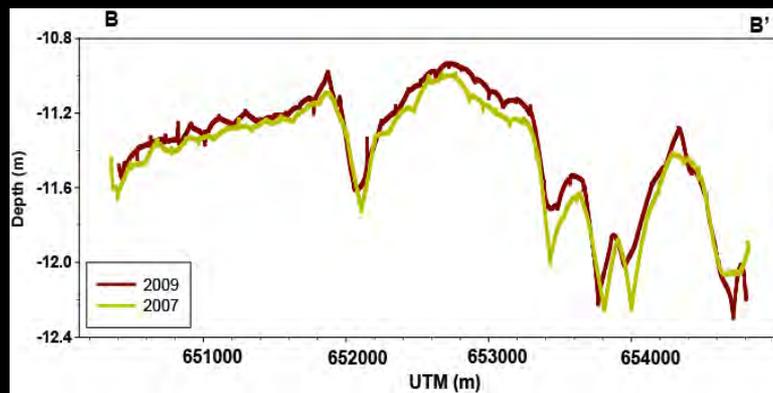
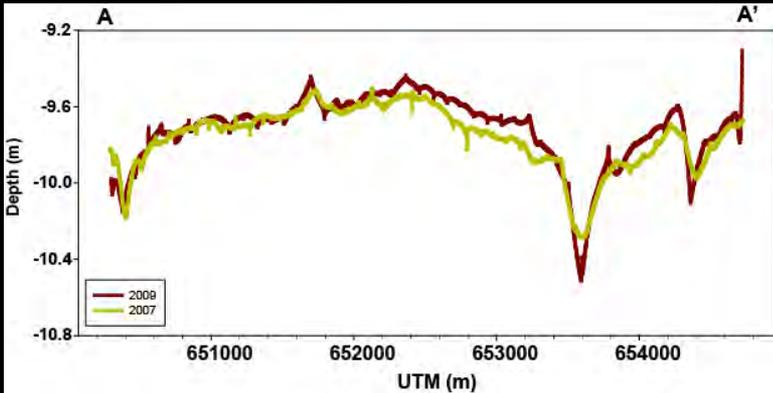
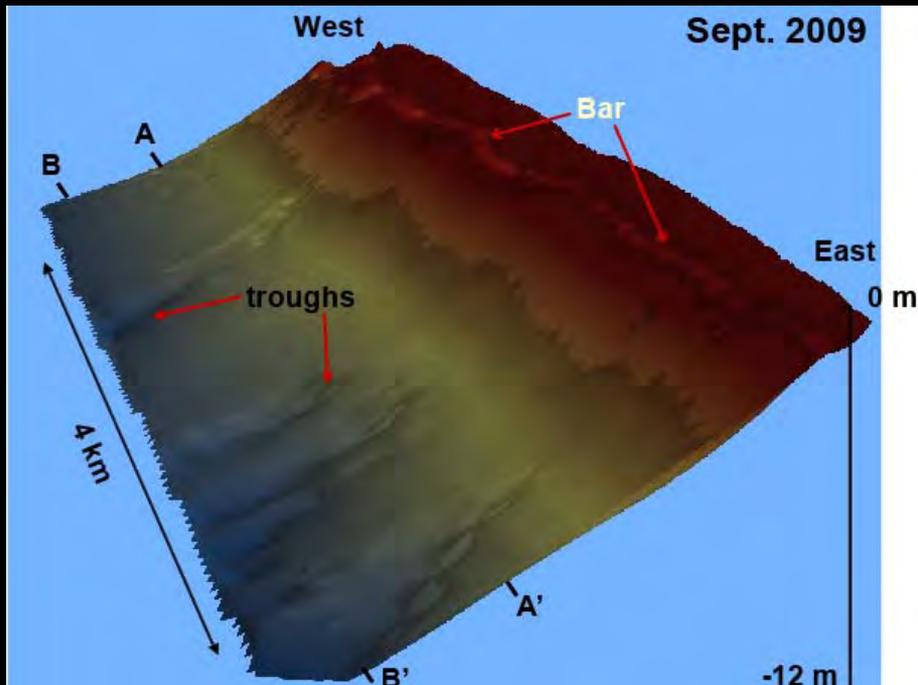
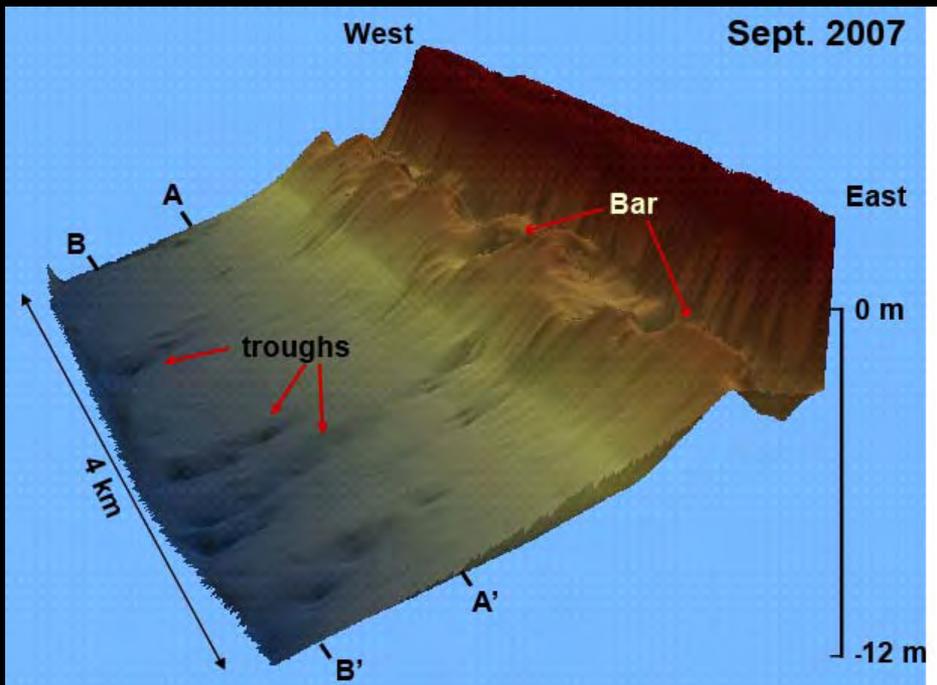
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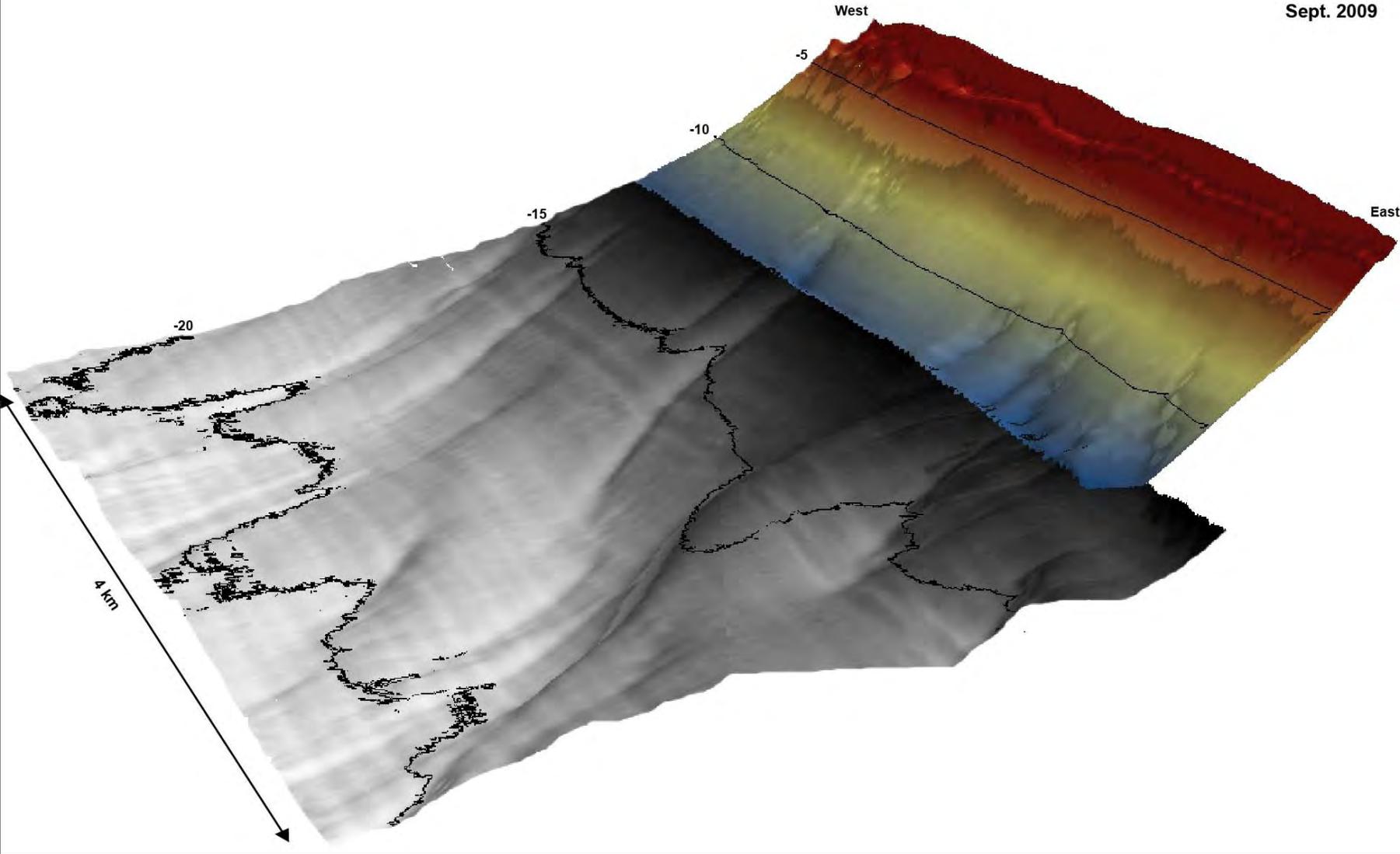
**Coastal Carolina
University**
BERM System

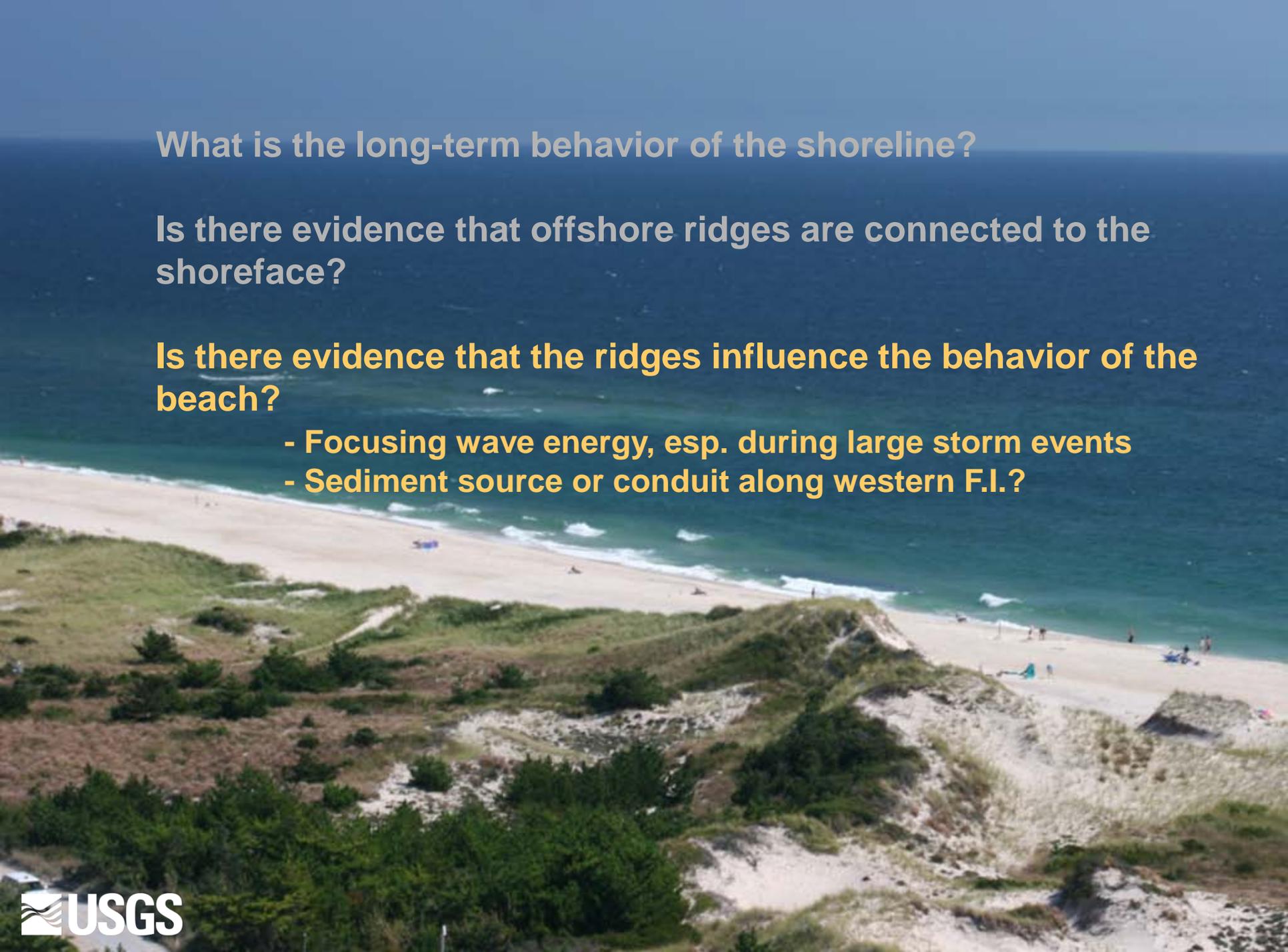
**Single beam
fathometer & GPS**





Sept. 2009



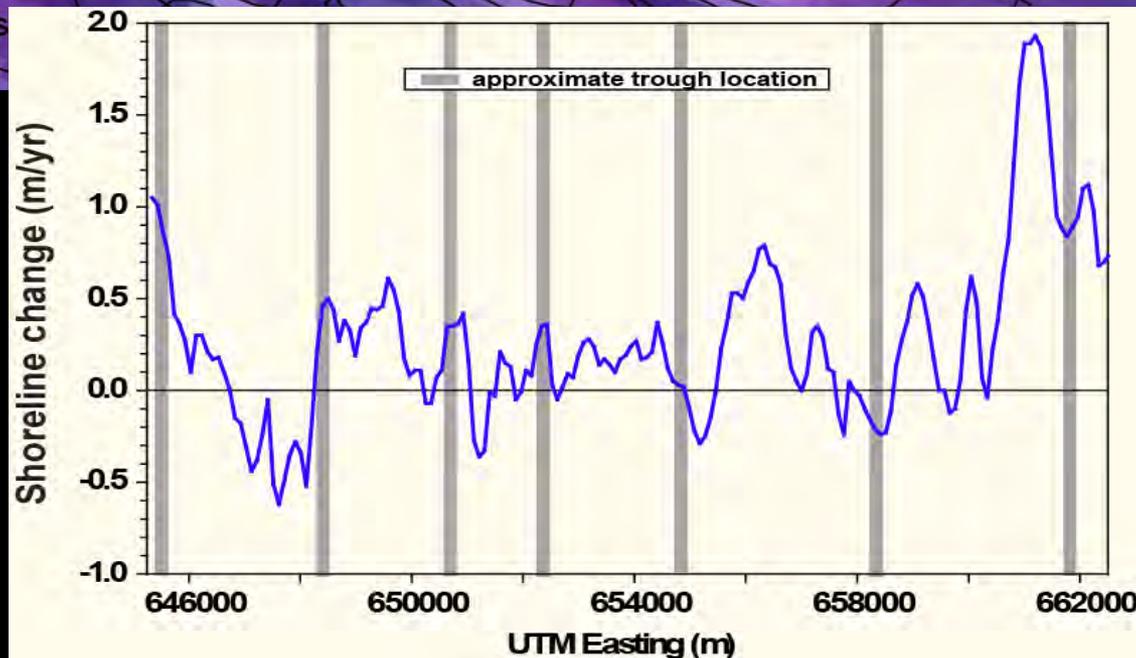
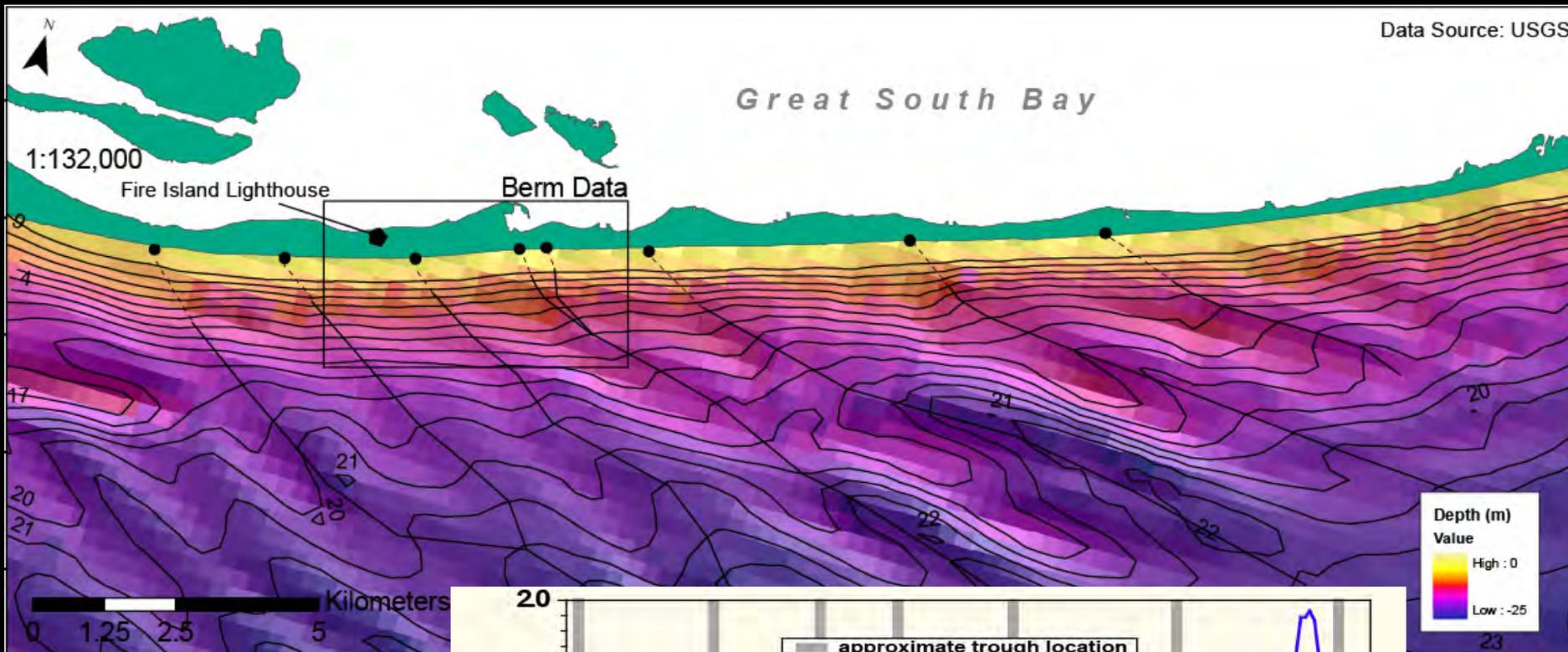
An aerial photograph of a coastal area. In the foreground, there are green dunes with sparse vegetation. A wide, sandy beach runs along the coast, with several people visible. The ocean is a deep blue, with white waves breaking near the shore. The sky is clear and blue.

What is the long-term behavior of the shoreline?

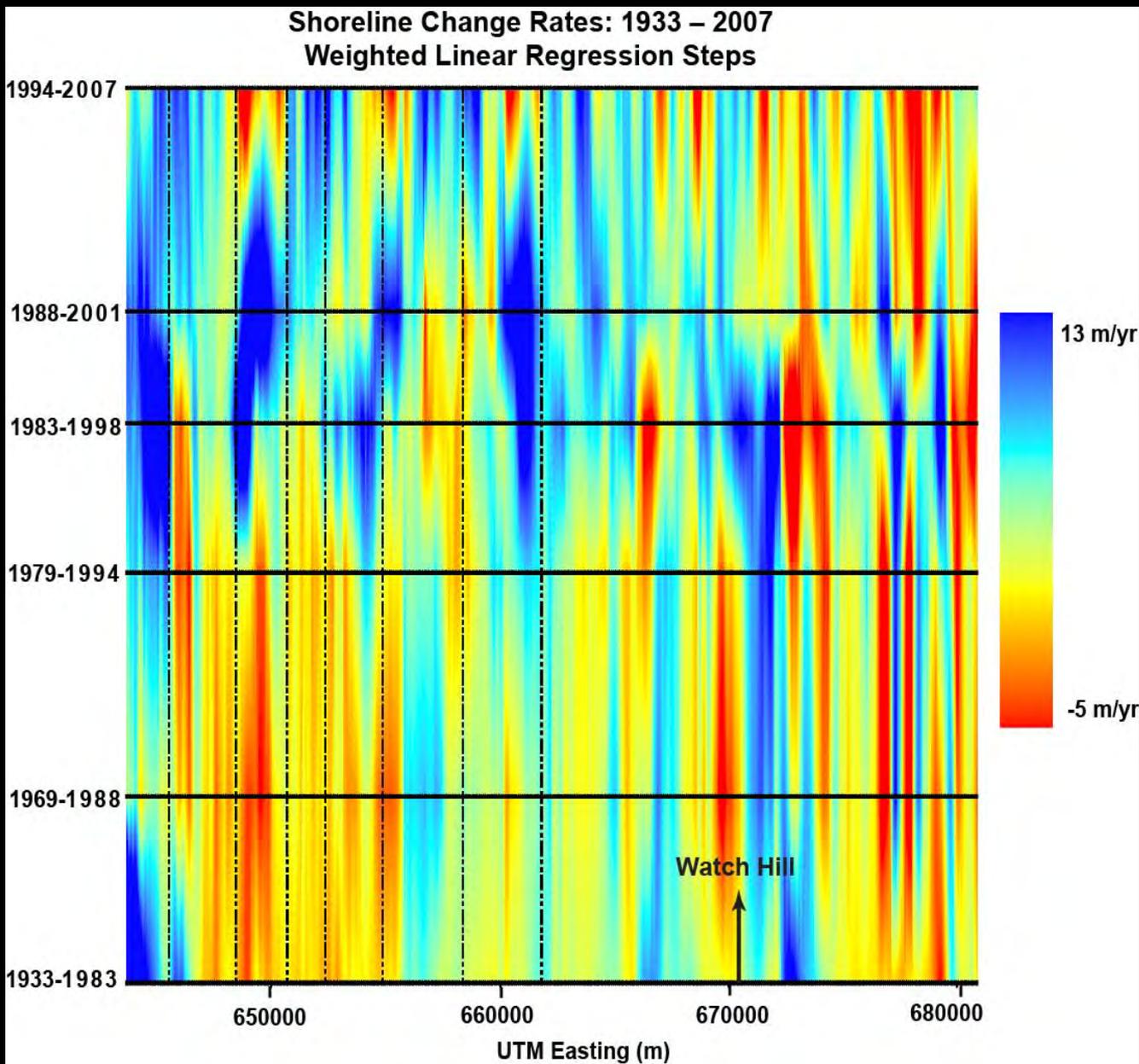
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Spatio-temporal Shoreline Change: 1933-2007



Conclusions

- Imbalance in sediment budget requires addition of material to the littoral system between Moriches and Fire Island Inlets
- Nearshore bathymetry shows that inner shelf ridges and troughs are continuous into the upper shoreface
- Zones of erosion and accretion and shoreline morphology are spatially and temporally persistent, and occur in locations and length-scales expected if ridges are focusing wave energy

• Collectively, data suggest that inner shelf morphology exerts control on behavior of beach and bar and they are a coupled system

Thank you!