Incipient rip-current statistics in an open coast

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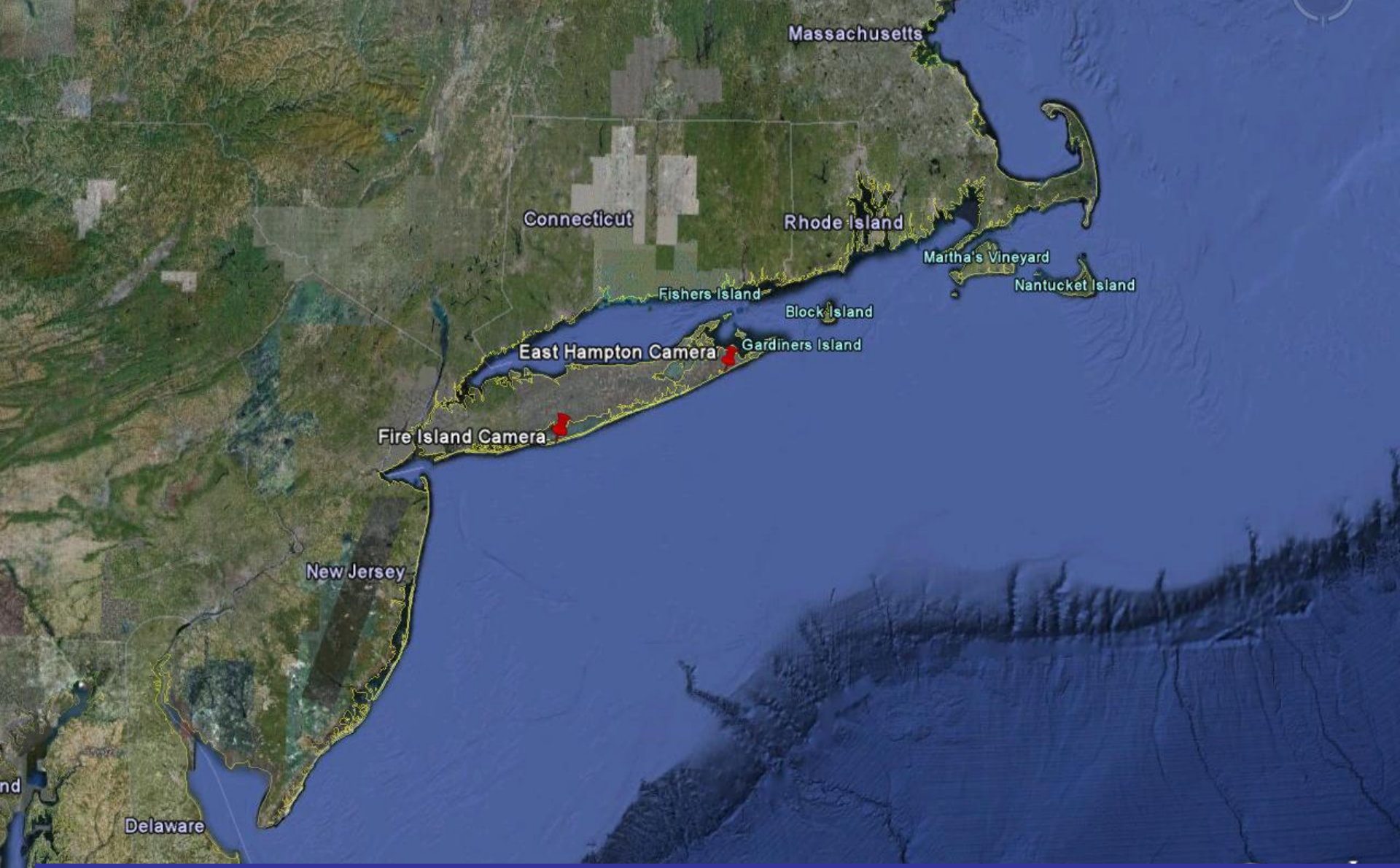
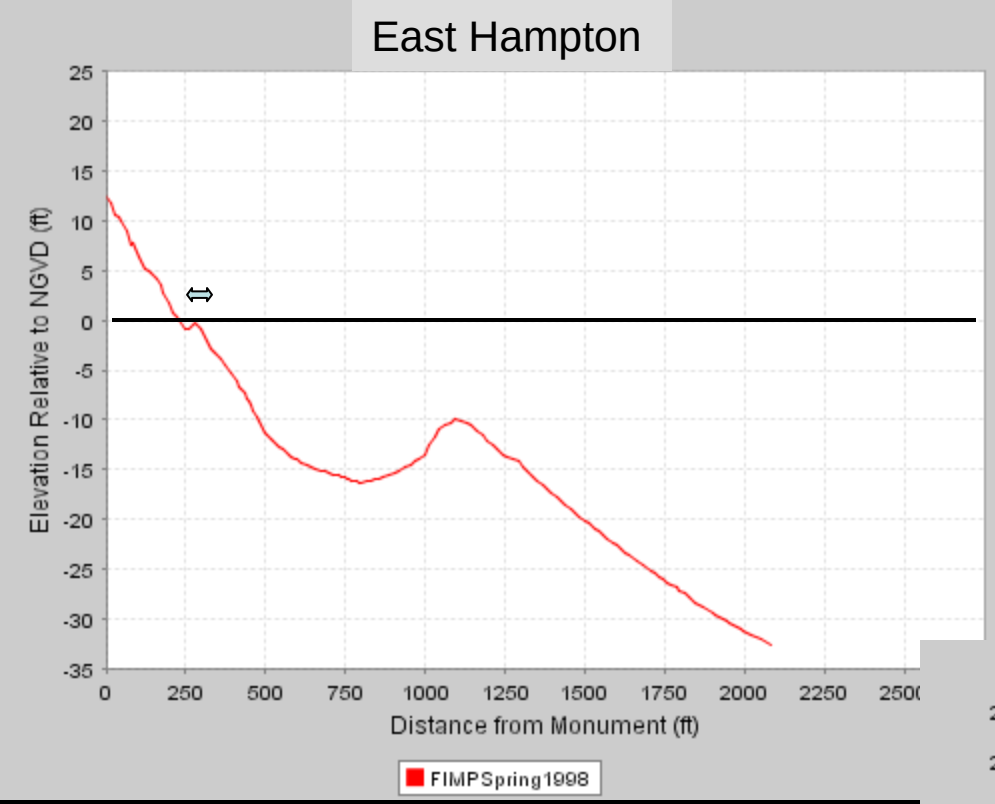
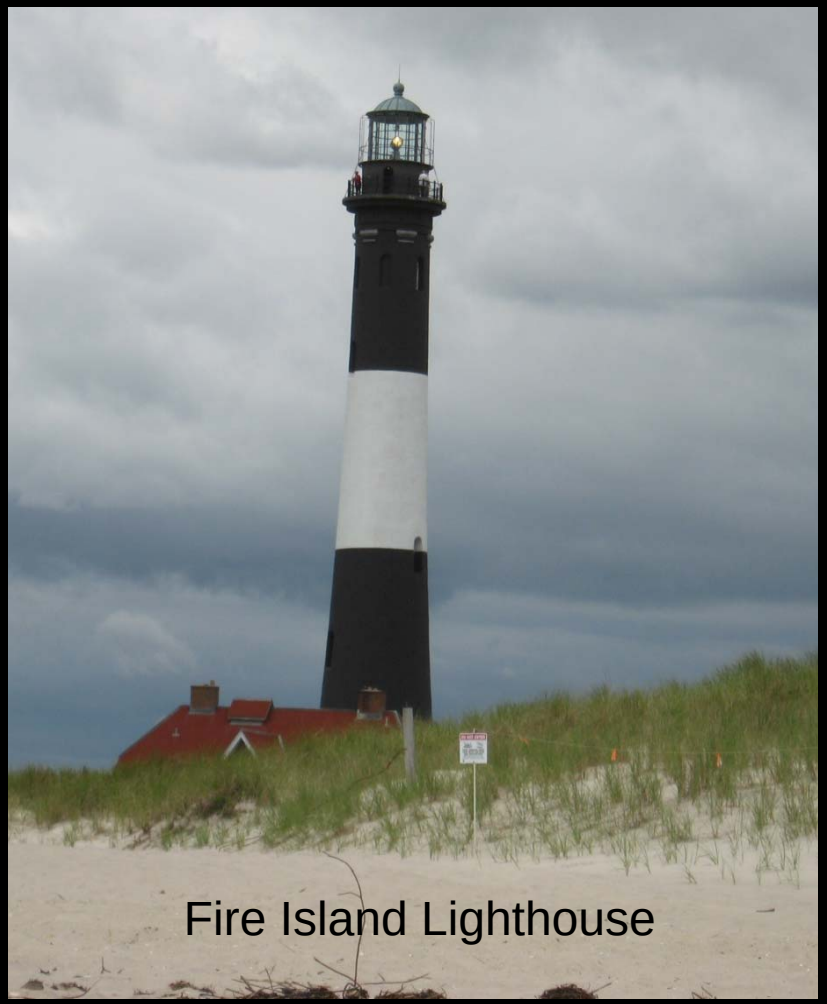


Rip current activity was monitored at two sites along the ocean shoreline of Long Island, New York

Two NOAA buoys located offshore within 40 Km of the shore allow for a fairly reliable record of ocean conditions. However, no stations exist on the Long Island's South shore to monitor waves in the nearshore.

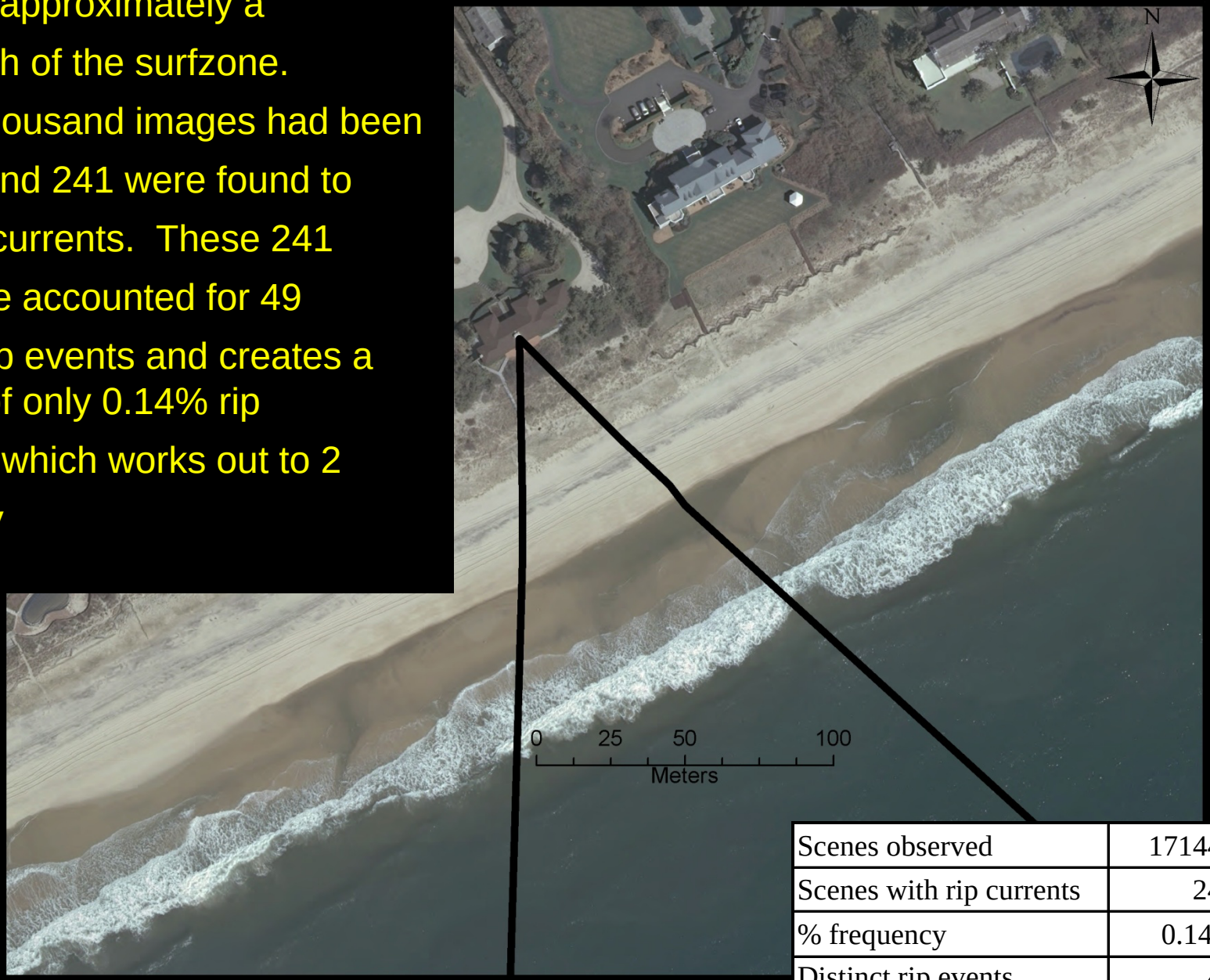


Both East Hampton and Fire Island are fairly steep with slope of 0.04 at East Hampton and 0.06 at Fire Island. Both also have an ephemeral bar about 277 m from the shoreline with the crest in approximately 3 m of water. These are considered reflective beaches.



At East Hampton, the monitoring camera is mounted to the chimney of a private residence 15 m above mean sea and 113 m from the mean low water line, while the FI lighthouse camera, located in the lighthouse lens room, is 50 meters above mean low water and 350 m from the shoreline.

The East Hampton camera is able to see approximately a 100-m swath of the surfzone. Over 171 thousand images had been examined and 241 were found to contain rip currents. These 241 frames have accounted for 49 individual rip events and creates a frequency of only 0.14% rip occurrence which works out to 2 rips/Km/day



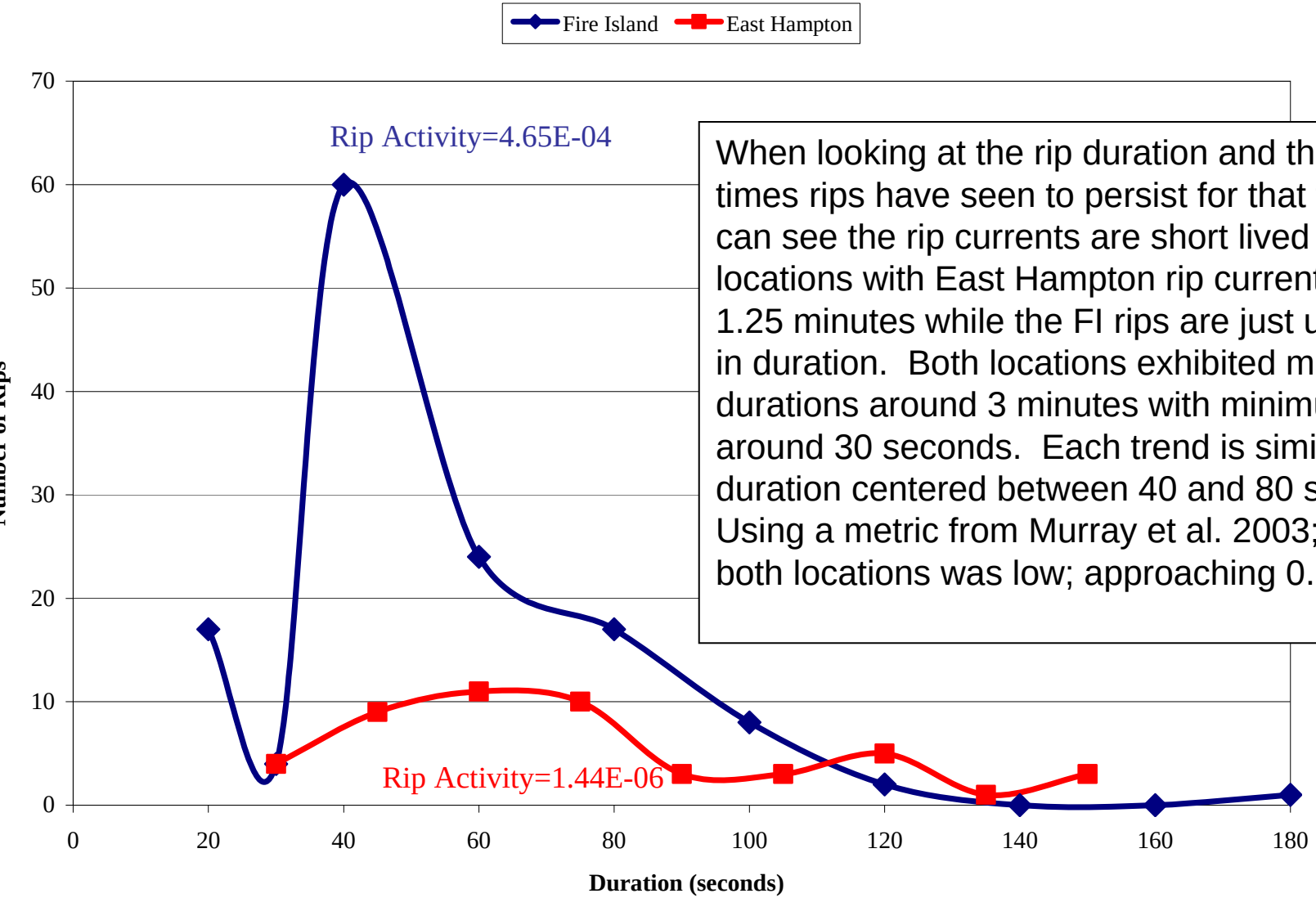
Scenes observed	171443
Scenes with rip currents	241
% frequency	0.14%
Distinct rip events	49
Rips/Km/day	2.00

The white water on the right of this image is a typical rip current at East Hampton NY

Scenes observed	155677
Scenes with rip currents	338
% frequency	0.22%
Distinct rip events	130
Rips/Km/day	13

The elevation and distance from the surf zone allows the FI camera to observe 280 m of shoreline. Over 155K images had been examined, 338 of which contained rip currents. This Gives a rip frequency of 0.22%, about a 50% higher frequency than seen at East Hampton. 130 distinct events have been seen and 13 rips/Km/day are expected

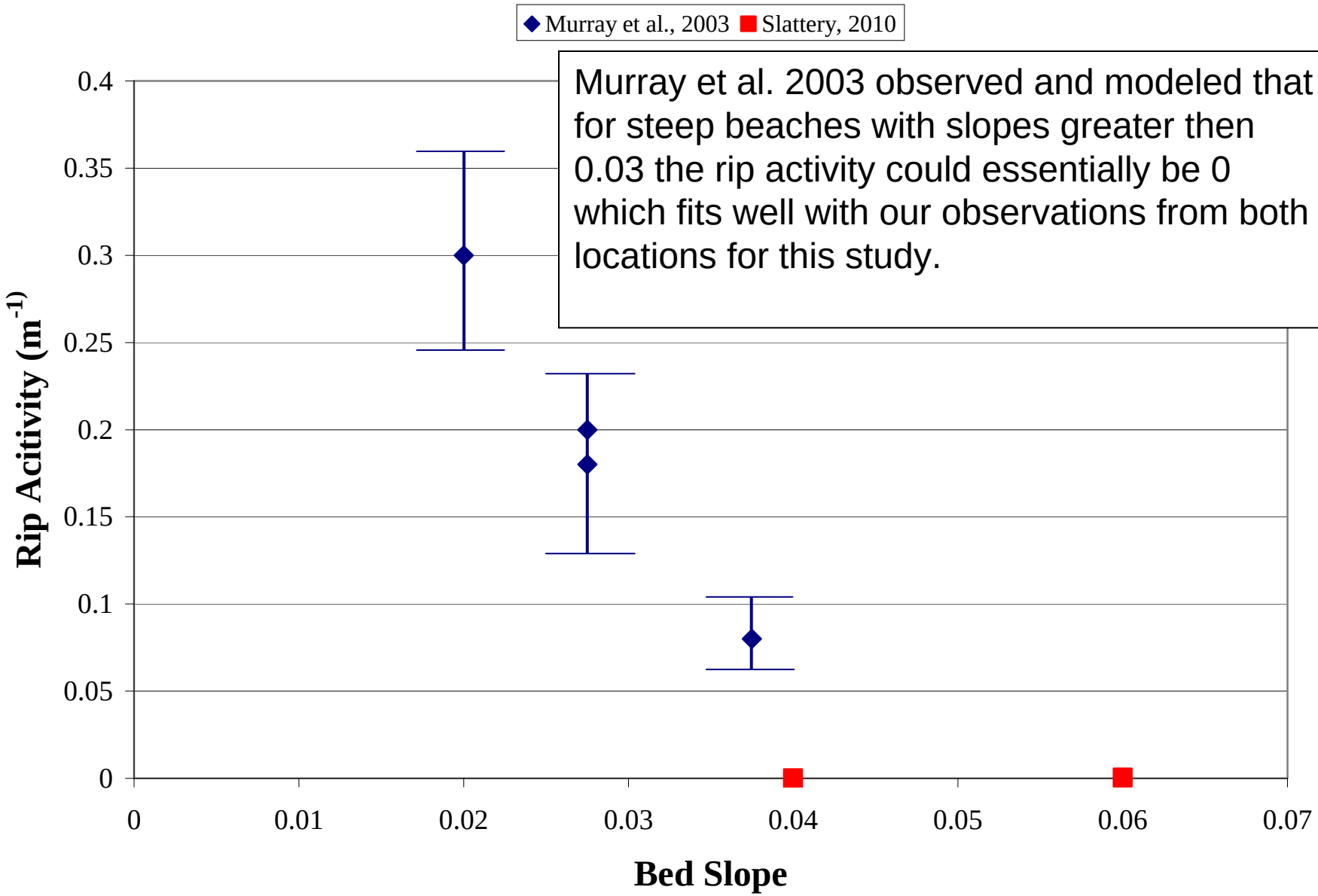
A typical image containing a rip current from FI



When looking at the rip duration and the number of times rips have seen to persist for that time period we can see the rip currents are short lived for both locations with East Hampton rip currents averaging 1.25 minutes while the FI rips are just under 1 minute in duration. Both locations exhibited maximum durations around 3 minutes with minimum durations around 30 seconds. Each trend is similar with rip duration centered between 40 and 80 seconds. Using a metric from Murray et al. 2003; rip activity for both locations was low; approaching 0.

Time Observed (hr)	865
Average Rip Duration (s)	52.4
Minimum Duration (s)	20
Maximum Duration (s)	180

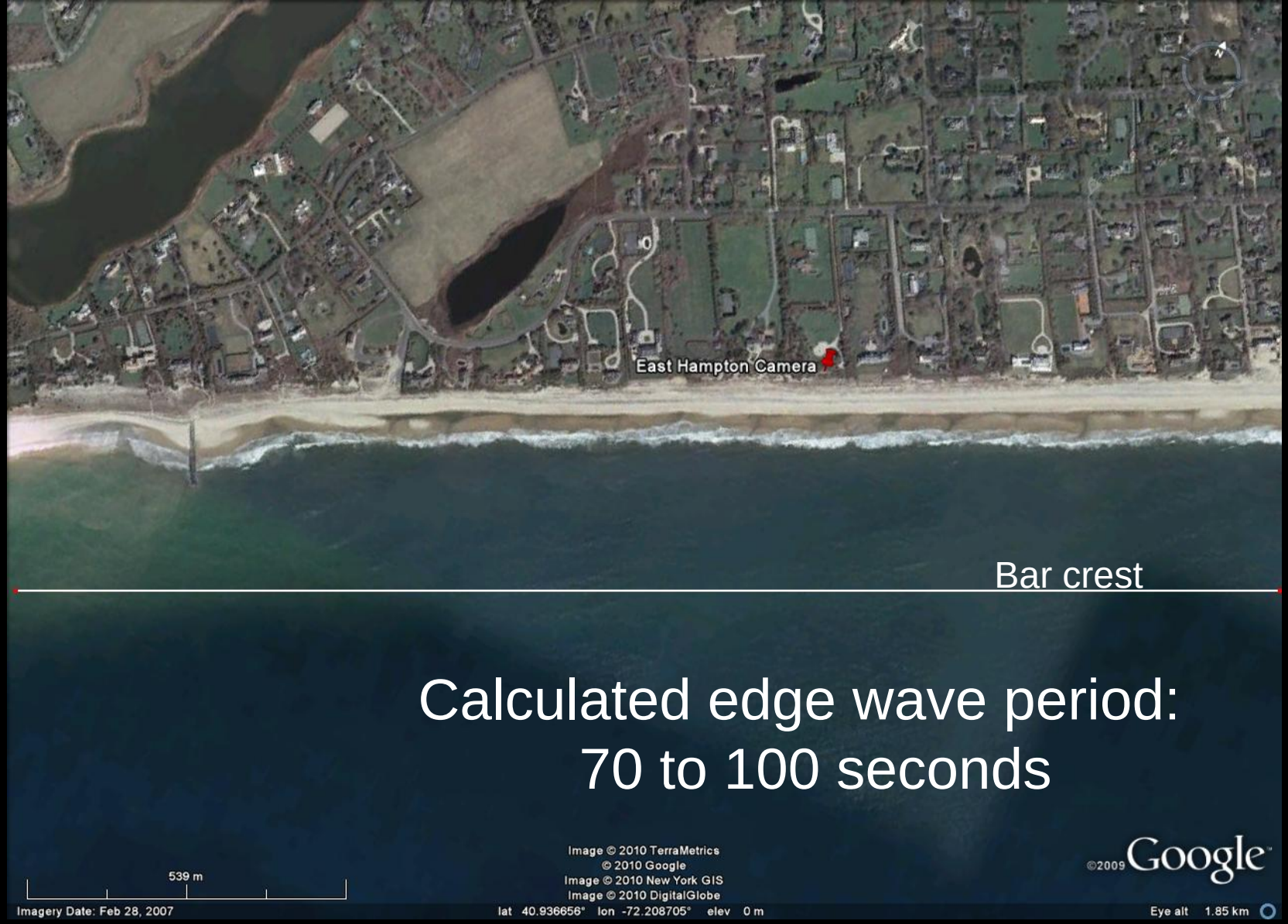
Time Observed (hr)	714
Average Rip Duration (s)	75.6
Minimum Duration (s)	30
Maximum Duration (s)	150



Murray et al. 2003 observed and modeled that for steep beaches with slopes greater then 0.03 the rip activity could essentially be 0 which fits well with our observations from both locations for this study.

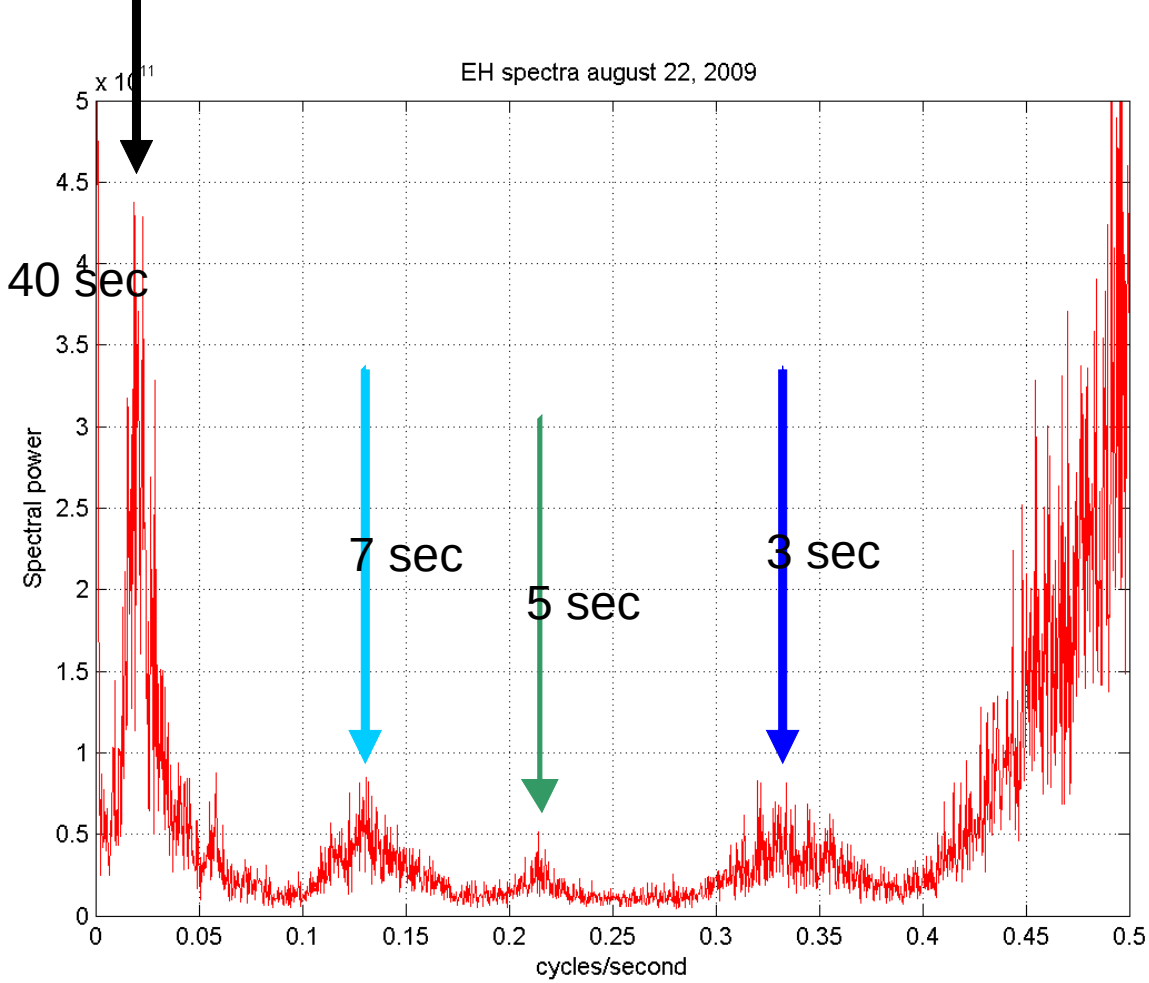
Murray et al. results

- Prior models
  - 1 Steeper=more rip currents
  - 2 Steeper=smaller spacing
- Neither were supported
- Instead alongshore variability in long period waves (wave sets)



Calculated edge wave period:
70 to 100 seconds

“Essential Requirements of the Edge-wave template models are the presence of a significant amount of infragravity energy and the concentration of this energy in a single (dominant) frequency” van Enchevort et al. 2004



In the absence of nearshore wave gages we deployed a seismometer at East Hampton specifically to look for power at the infragravity end of the spectra that could be attributable to edge waves. Such water wave energy has long been the source of background noise (microseisms) on seismographs. We found such peaks in our spectra. Here is one example where multiple peaks include both long period signals common from edge waves and frequencies common for incident wave periods that would be expected along the Long Island’s southshore where the average is considered to be around 7 seconds Kana 1995).

Conclusions

- Short-lived, fairly infrequent “flash rips” dominate
- Bathymetry seems unlikely for control
- Rip activity is low
- Activity at the infragravity periods

Aknowledgements

- East Hampton Beach Preservation Society
- The Halpern Family Foundation
- New York Seagrant
- Porfirio Gonclaves
- The Fire Island Lighthouse Preservation Society (Dave Griese)
- The Maidstone Club (Ken Koch)
- John Labold, Allison Truhlar, Etienne Larangot, and Ashley Norton