Meteotsunami Poject

SCOPE, STUDY AREA
WORK PLAN

Juan J Horrillo
Bill Knight
Wei Cheng
Collaborators:
Kirby, Grilli, Chu, Wu
Sacramento, CA
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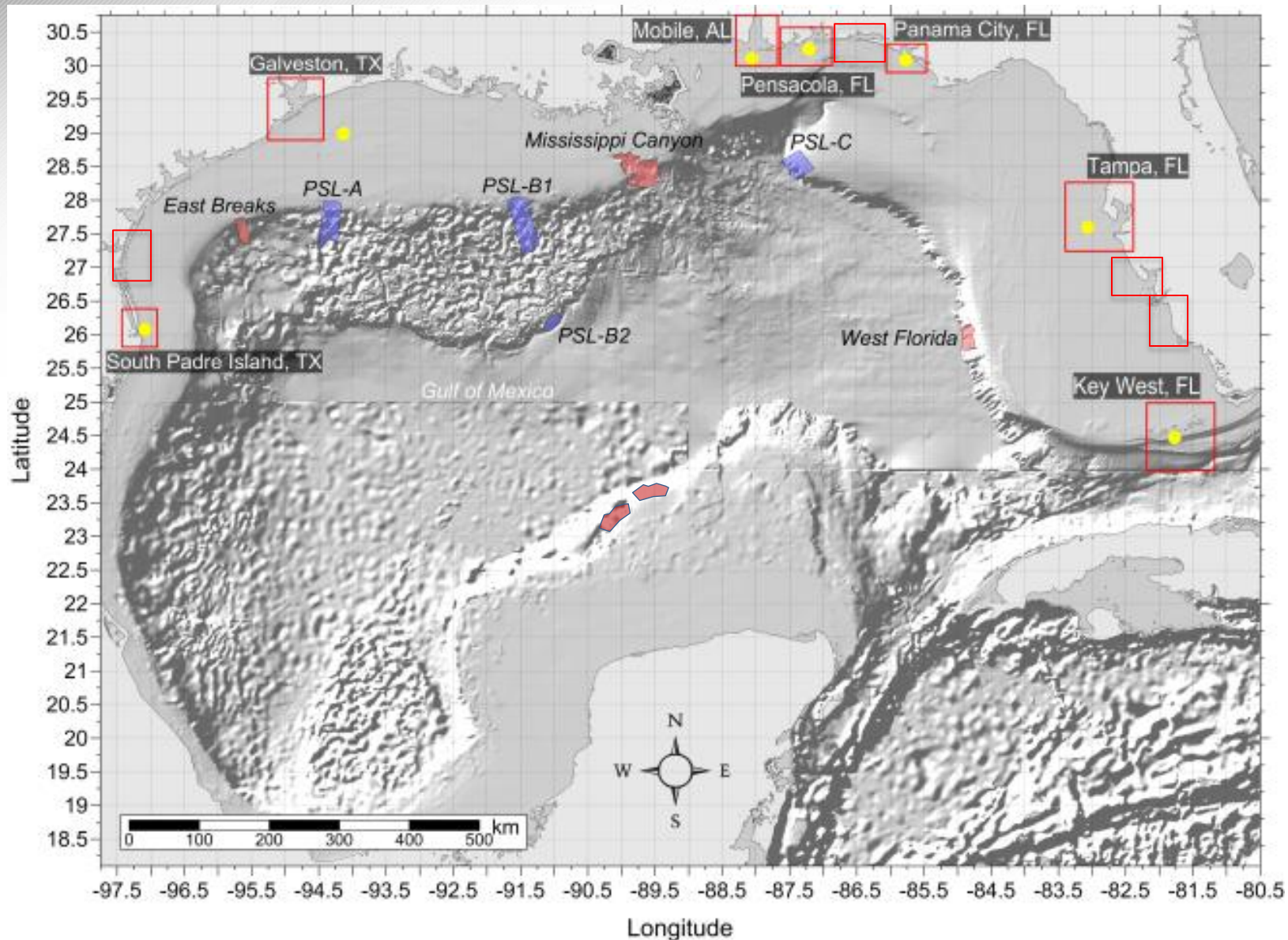
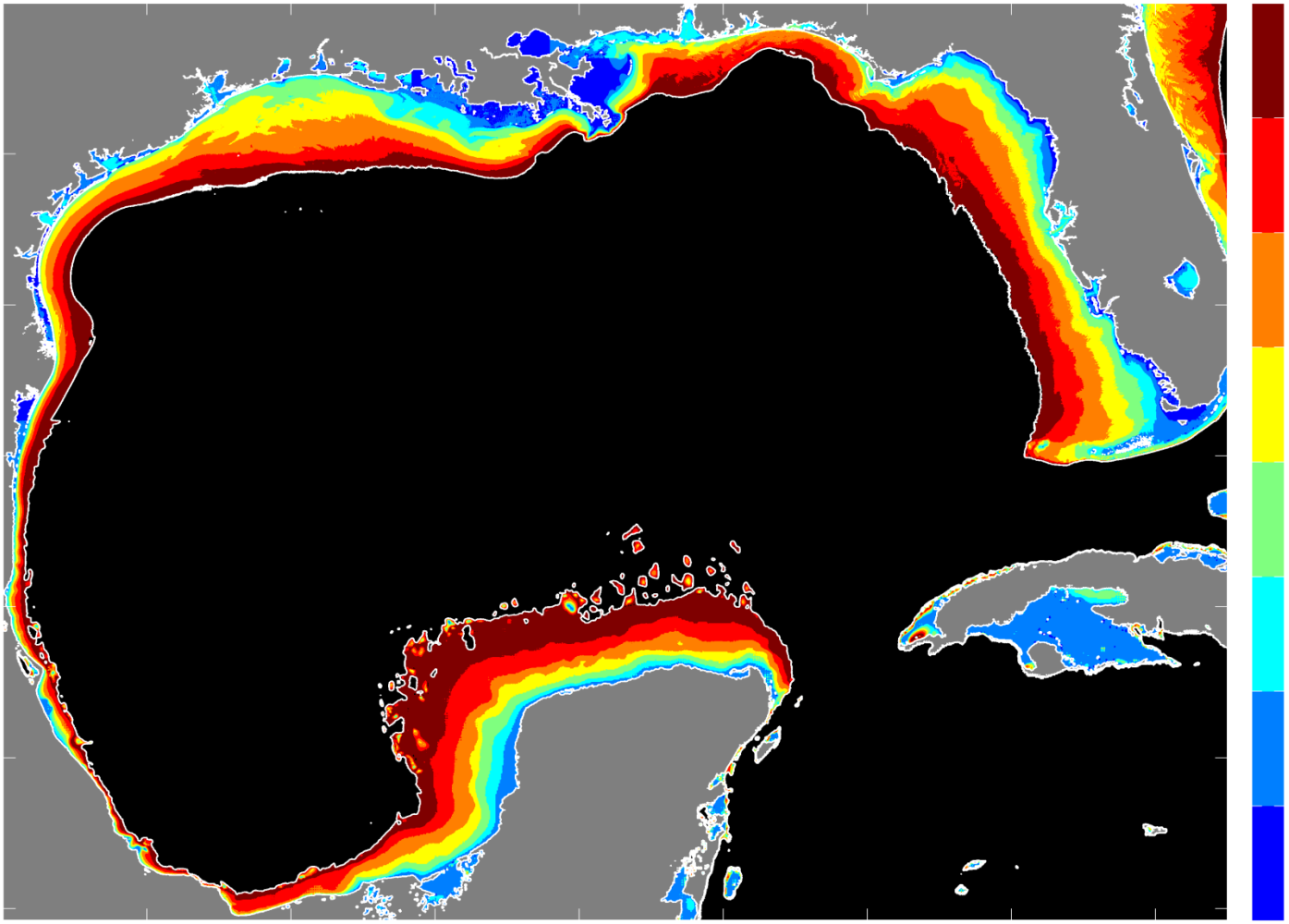
GOM METEOTSUNAMI ACTIVITY

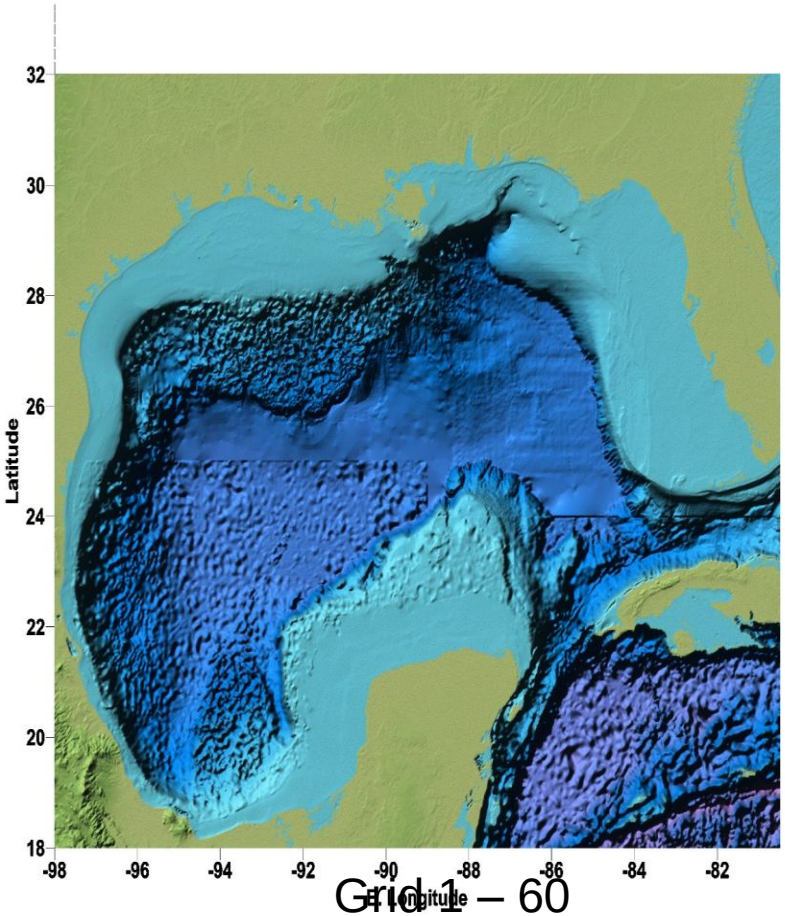
- Meteotsunamis are ubiquitous in the northeastern Gulf of Mexico and can be triggered by winter and summer extra-tropical storms and by tropical cyclones. In Panama City Beach most of the meteotsunami events occurred during the winter/dry season, whereas in Naples and in Clearwater Beach meteotsunami activity was also relevant during the summer/wet season. A total of 15 to 25 meteotsunamis per year were observed in the stations analyzed, and on average, 1 to 3 meteotsunamis per year were >0.5 m.


Mobile, AL
Panama City, FL
Galveston, TX
Pensacola, FL
Mississippi Canyon
PSL-C
Tampa, FL
PSL-A
PSL-B1
East Breaks
PSL-B2
West Florida
South Padre Island, TX
Gulf of Mexico
Key West, FL
N
W
E
S
0 100 200 300 400 500 km
Latitude
Longitude
30.5 30 29.5 29 28.5 28 27.5 27 26.5 26 25.5 25 24.5 24 23.5 23 22.5 22 21.5 21 20.5 20 19.5 19 18.5
-97.5 -96.5 -95.5 -94.5 -93.5 -92.5 -91.5 -90.5 -89.5 -88.5 -87.5 -86.5 -85.5 -84.5 -83.5 -82.5 -81.5 -80.5

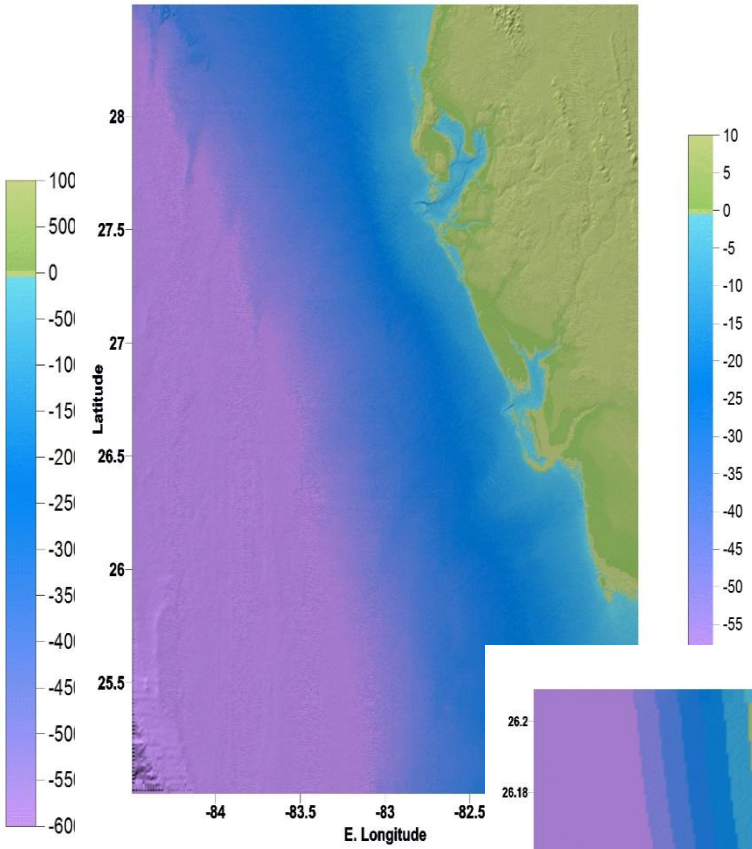
Generation meteotsunami areas

Cold front more efficient speed

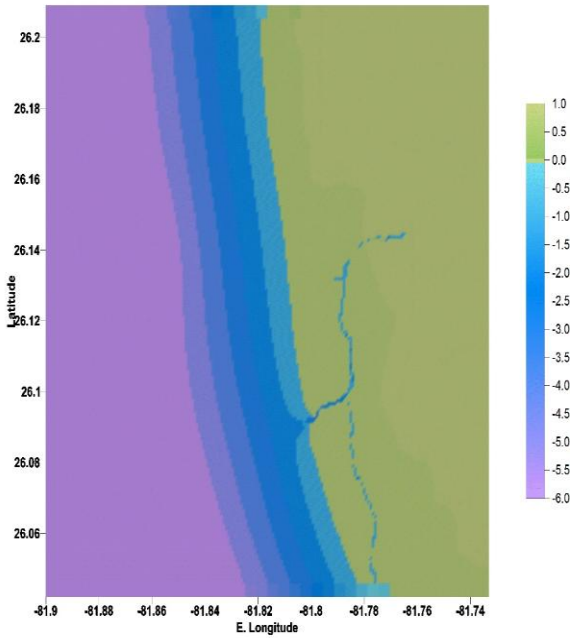




Grid 1 – 60 sec



Grid 2 – 15 sec



Grid 3 – 3 sec

GOM meteo tsunami at Naples FL, 1/17/2016

a simple first pass study

Simplifying assumption: a single, linear atmospheric surface pressure ridge (Derecho) of height 6 mb (P_0) and width (λ) 12 km moves across the Gulf of Mexico at speed *C*. In this case: $P(x) = P_0 COS^2\left(\frac{x-Ct}{\lambda}\right)$ for $\left|\frac{x-Ct}{\lambda}\right| < \frac{\pi}{2}$

The speed is varied from 20 to 35 m/s and is constant within each run . Directions of propagation tested are west-to-east, east-to-west, south-to-north, and SW-to-NE. The maximum amplitude at Naples, FL occurs at C = 25 m/s with SW to NE direction of pressure wave propagation. This is also the direction that shows the wave arrival at St. Petersburg FL later than at Naples.

Results shown are for the SW-NE going wave. Units are in meters, and hours

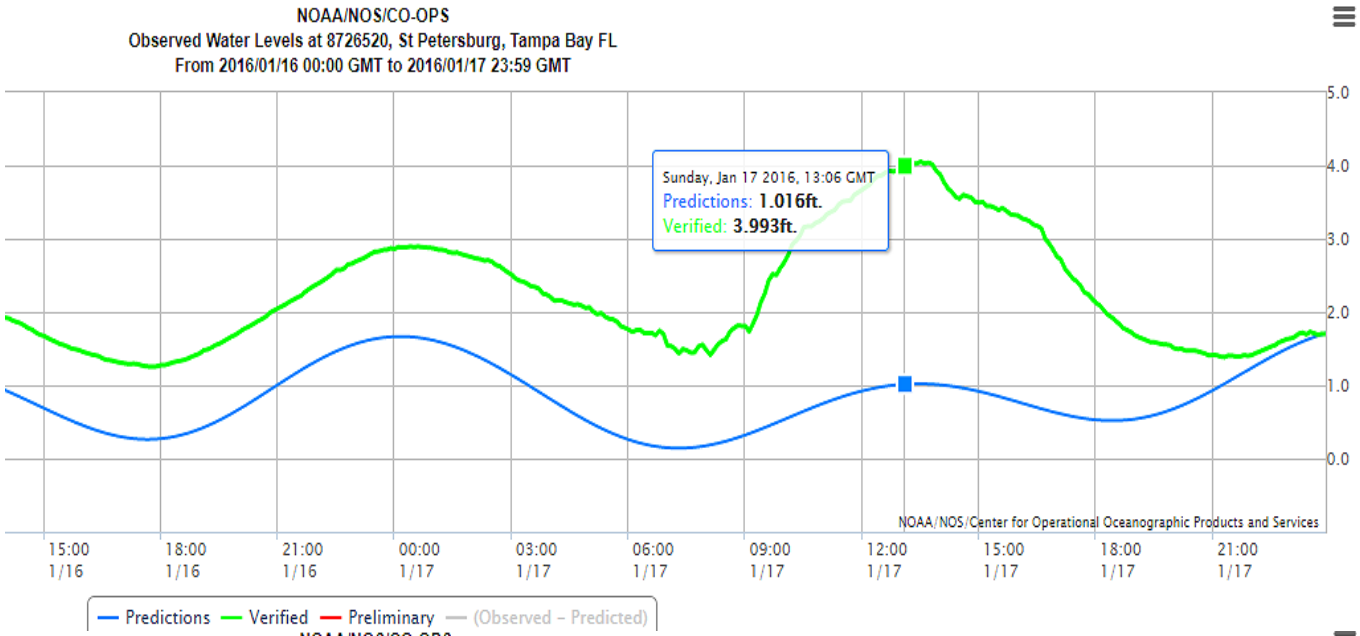
The model is ATFM-2 - All amplitudes in meters, coordinates in degrees

The coarse grid is 1 minute resolution from Etopo 1

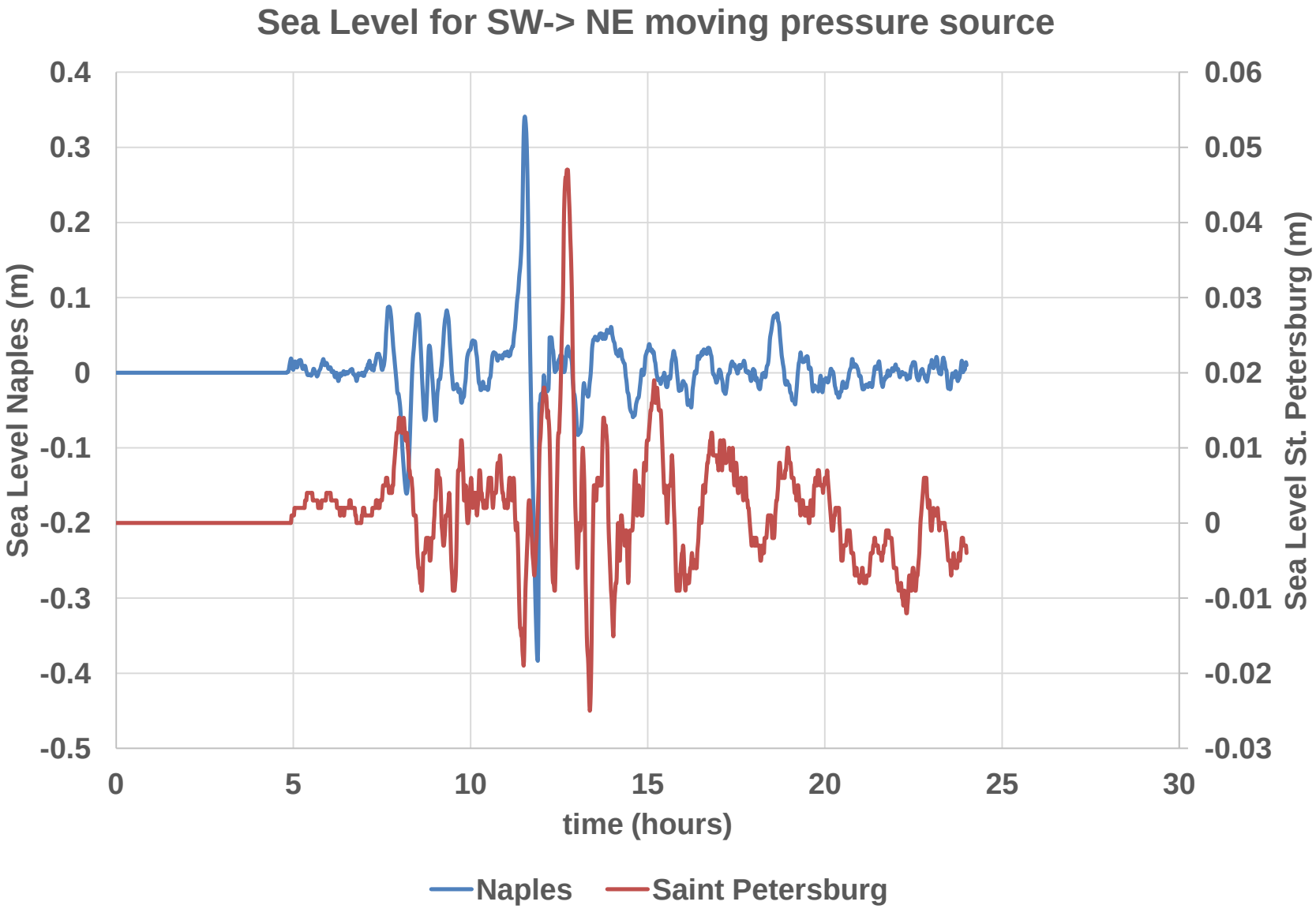
Fine grid 1 is 15 arcseconds resolution, centered on the SW Florida coast – derived from the 3 second CRM dataset
Fine grid 2 is 3 arcseconds resolution, centered on Naples, FL – 3s resolution – same CRM.

http://www.spc.noaa.gov/misc/AbtDerechos/derechofacts.htm#strength

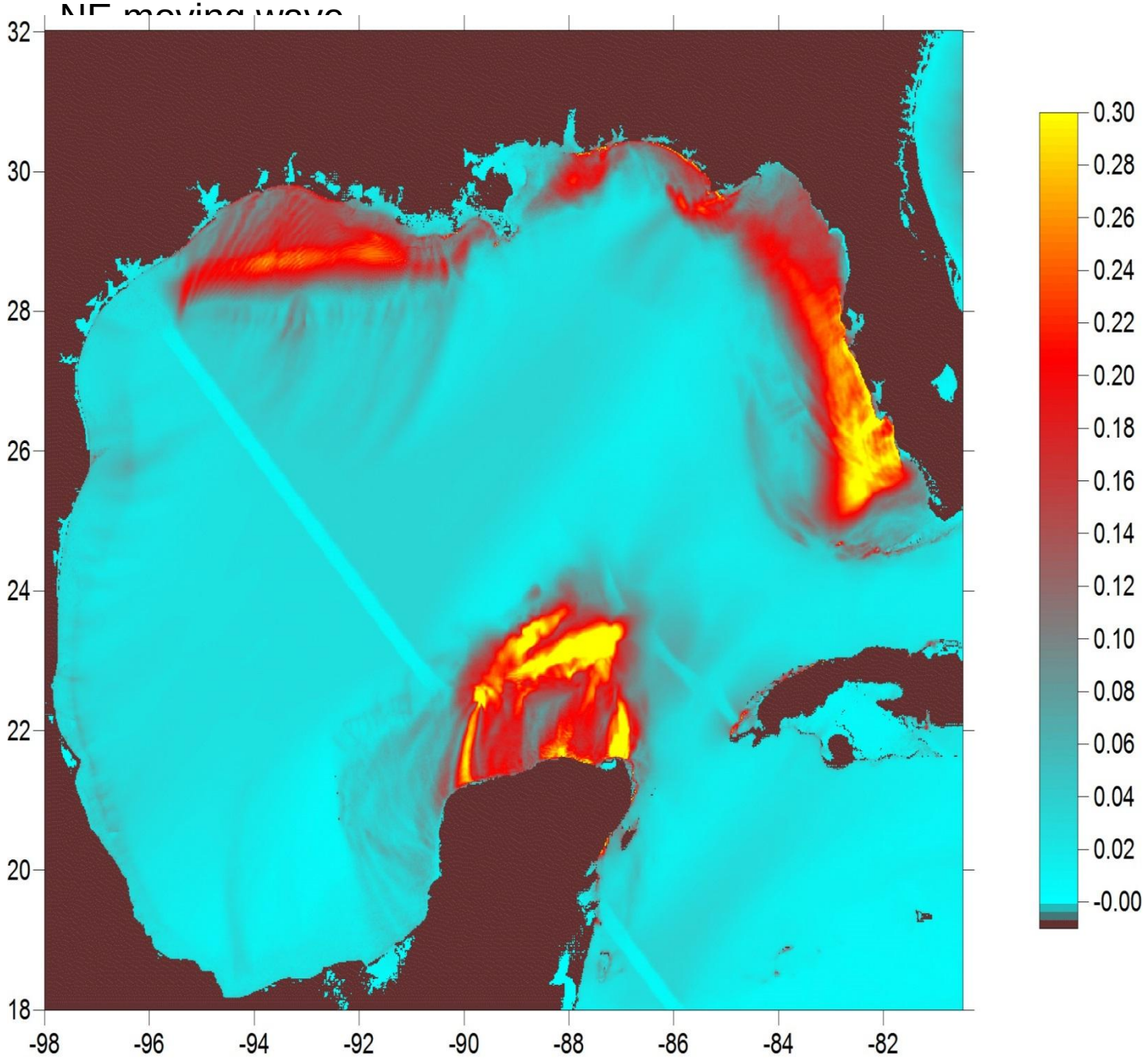
Comparisons of the Saint Petersburg and Naples gauges seem to indicate an atmospheric pressure wave moving to the N or NE at ~25 m/s rather than straight Eastward as suggested by news reports



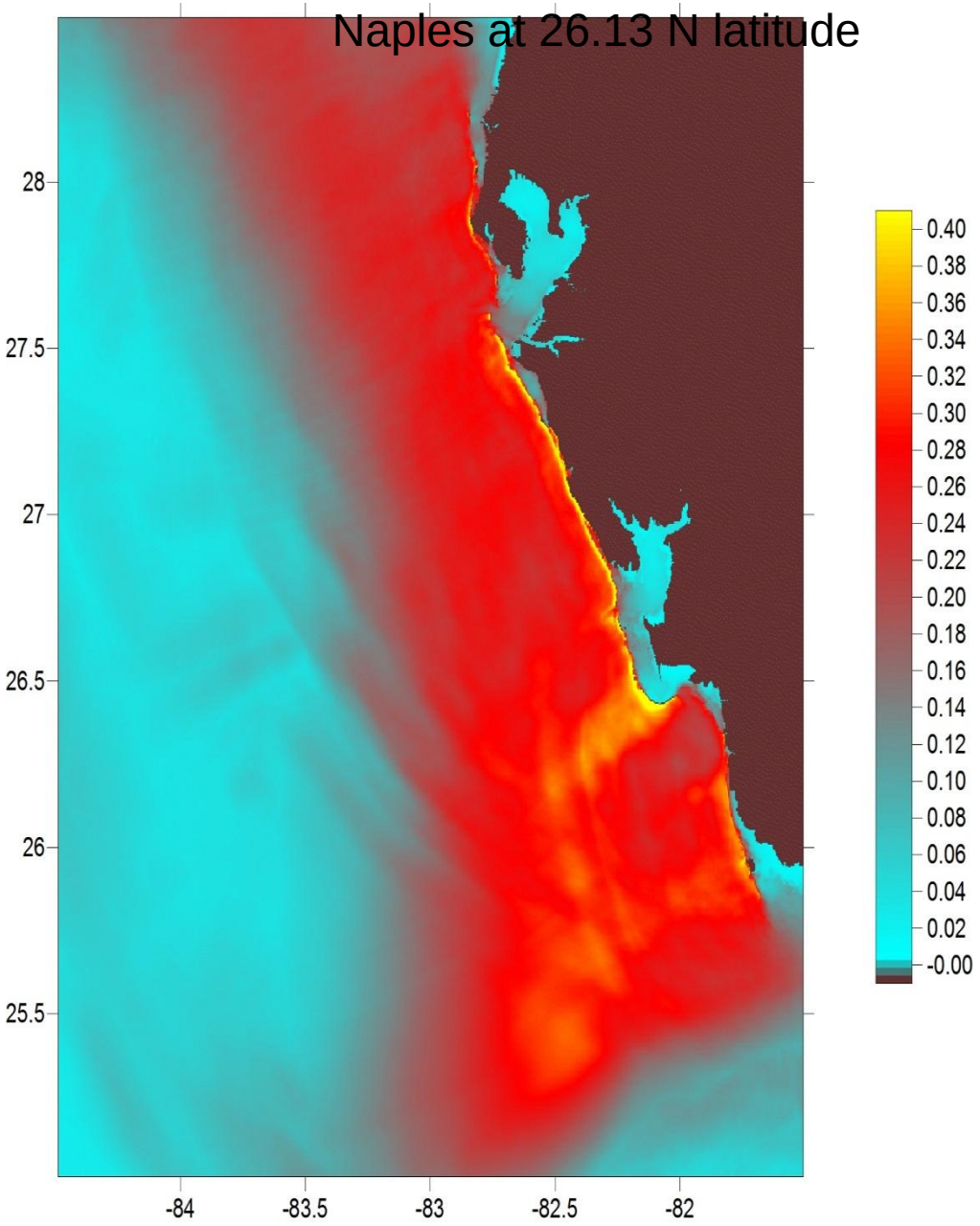
Marigrams for two locations –
ATFM results



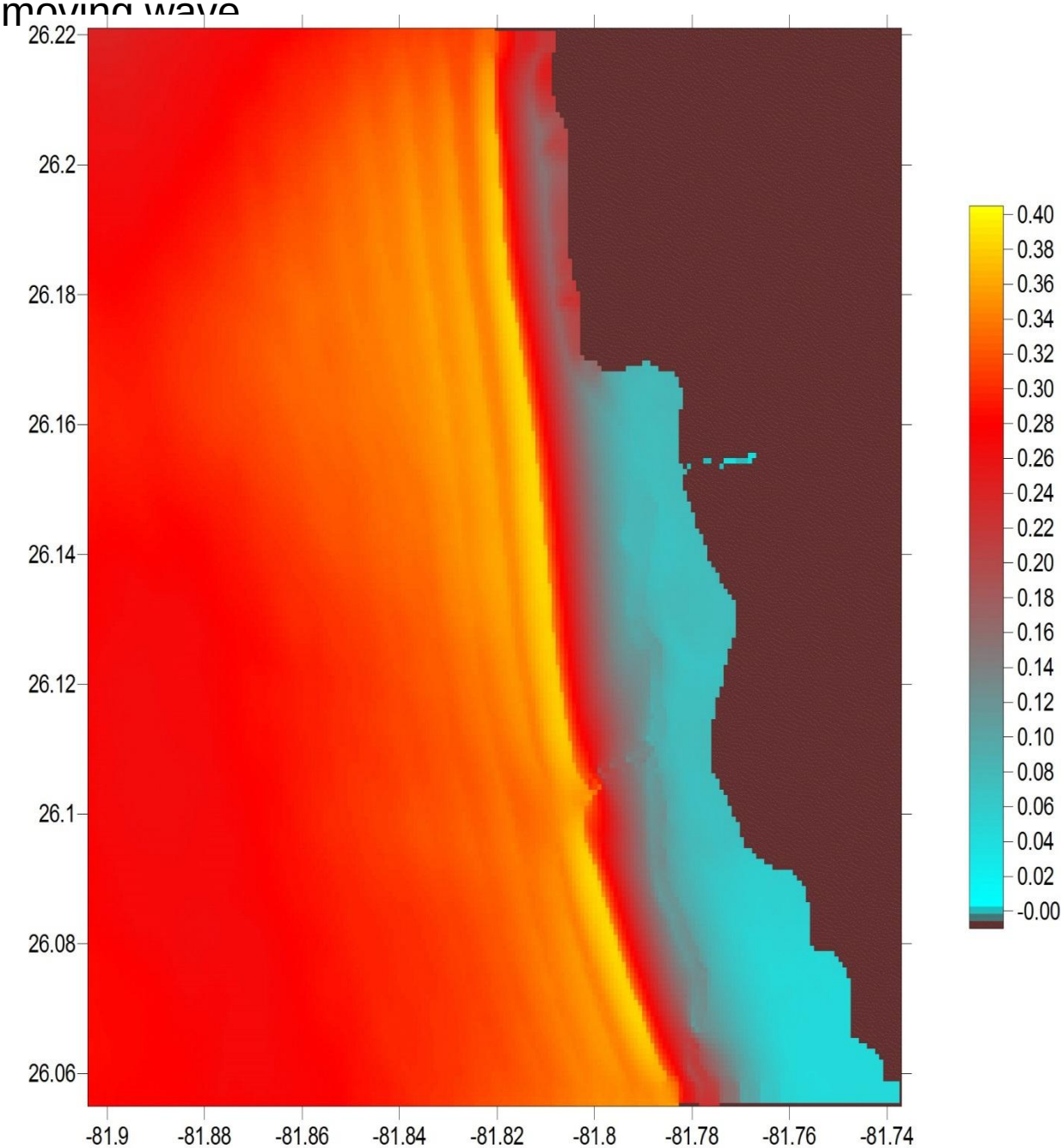
Maximum Amplitude during the model run – Grid 1 – SW-> NE moving wave



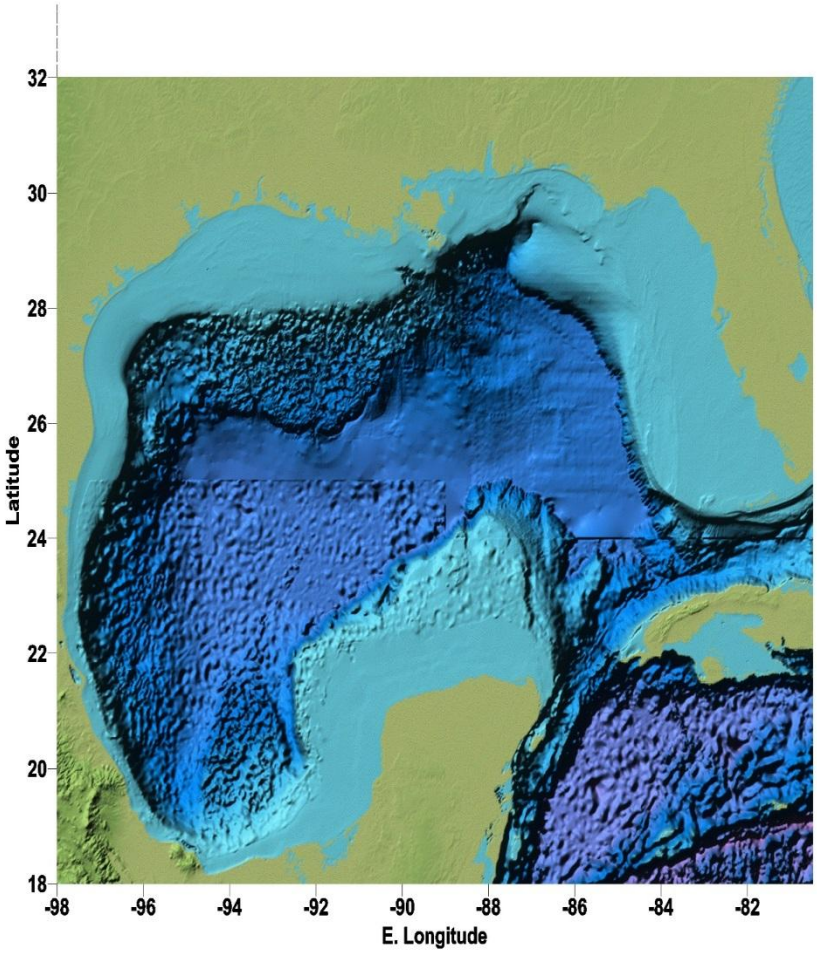
Maximum Amplitude during the model run – Grid 2 – SW-> NE moving wave

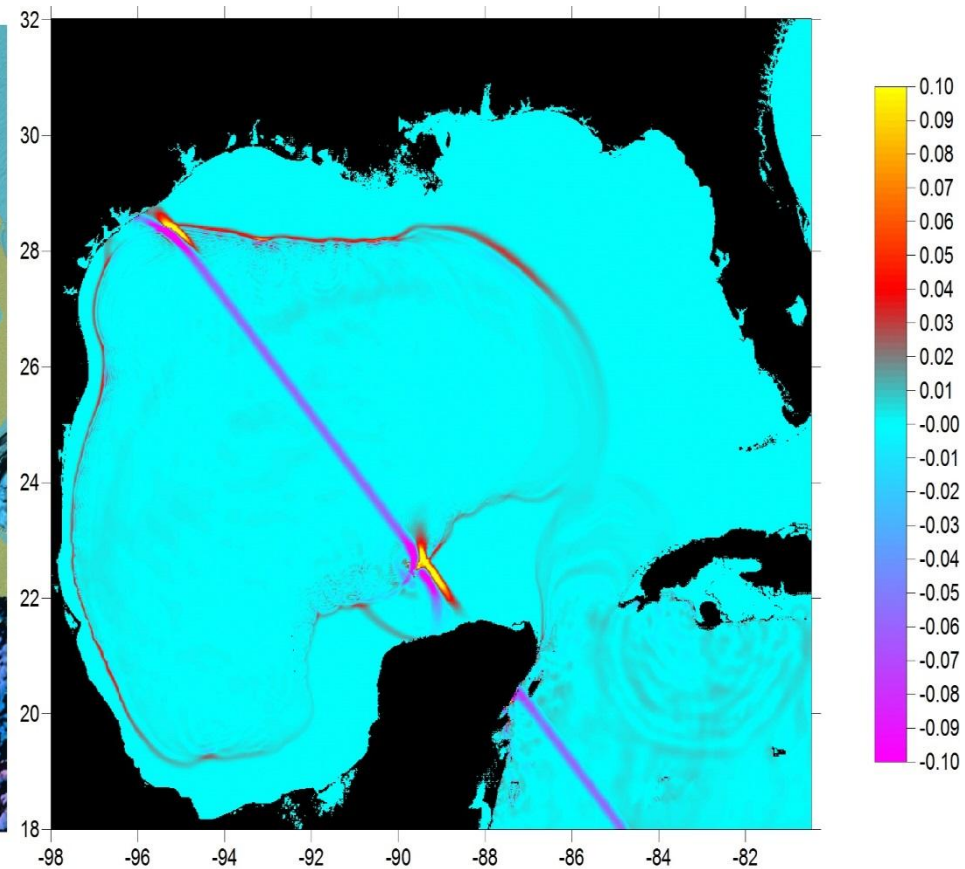


Maximum Amplitude during the model run – Grid 3 – SW-> NE moving wave

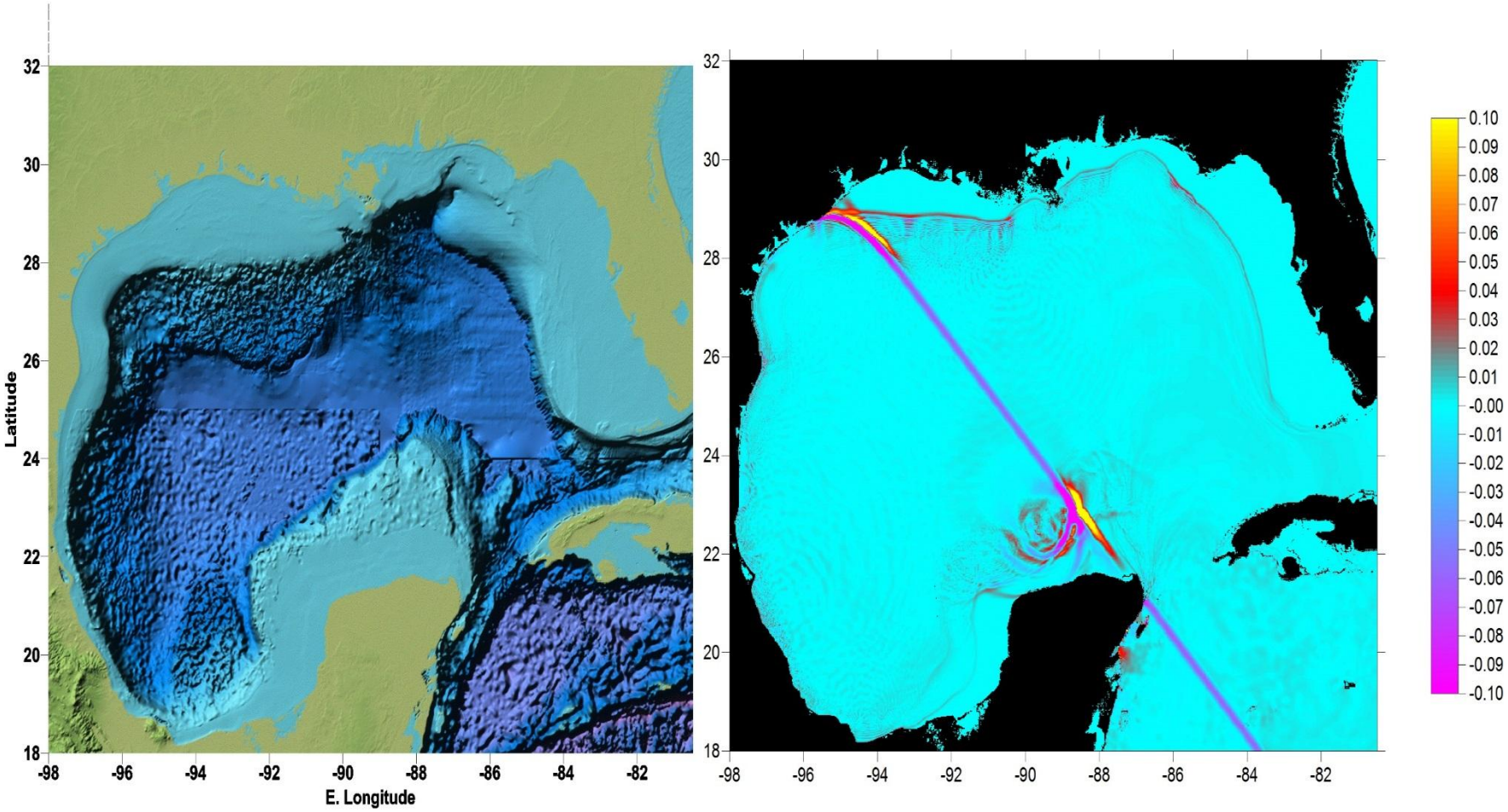


T = 1 hour C = 25 m/s

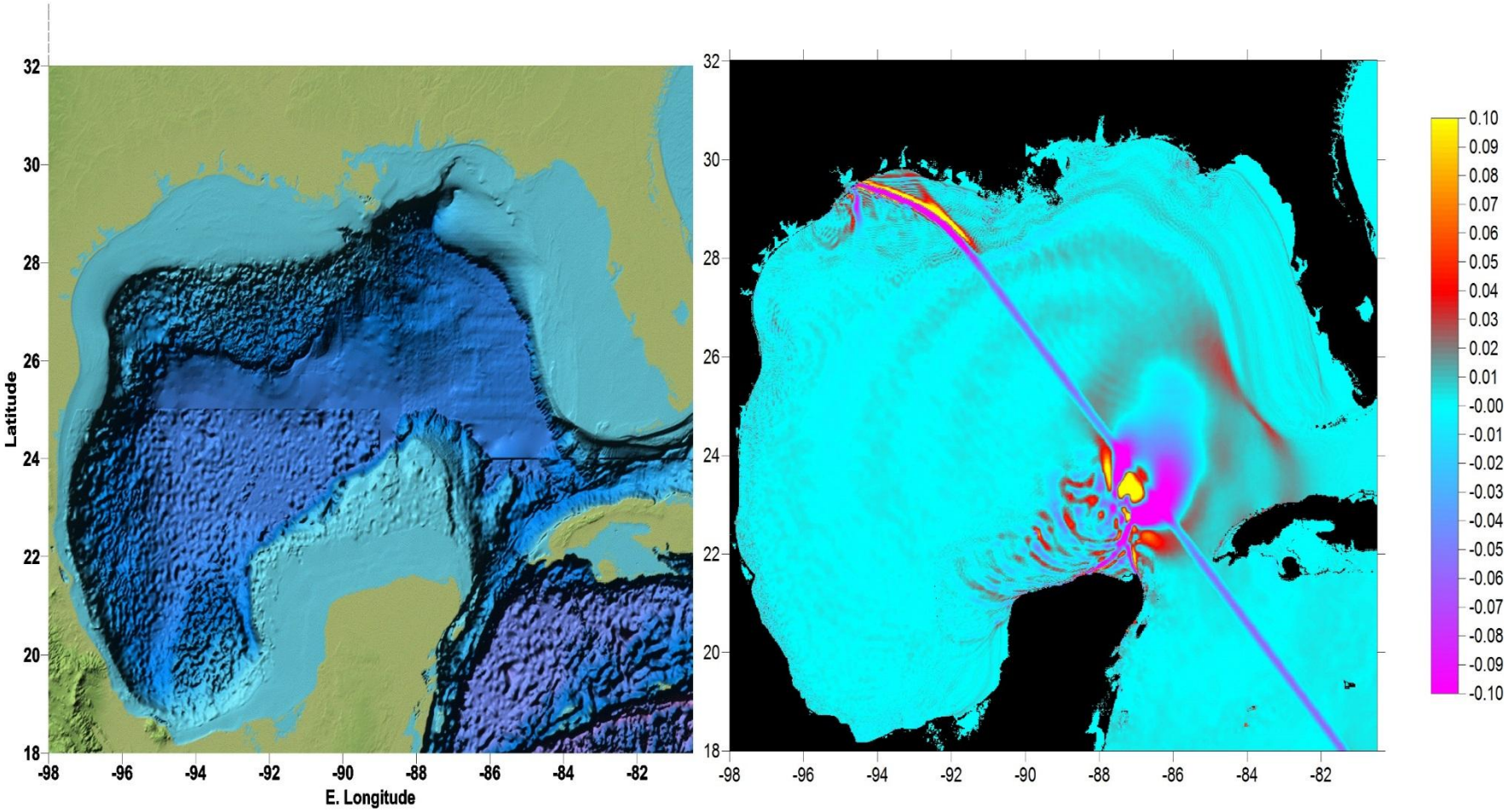




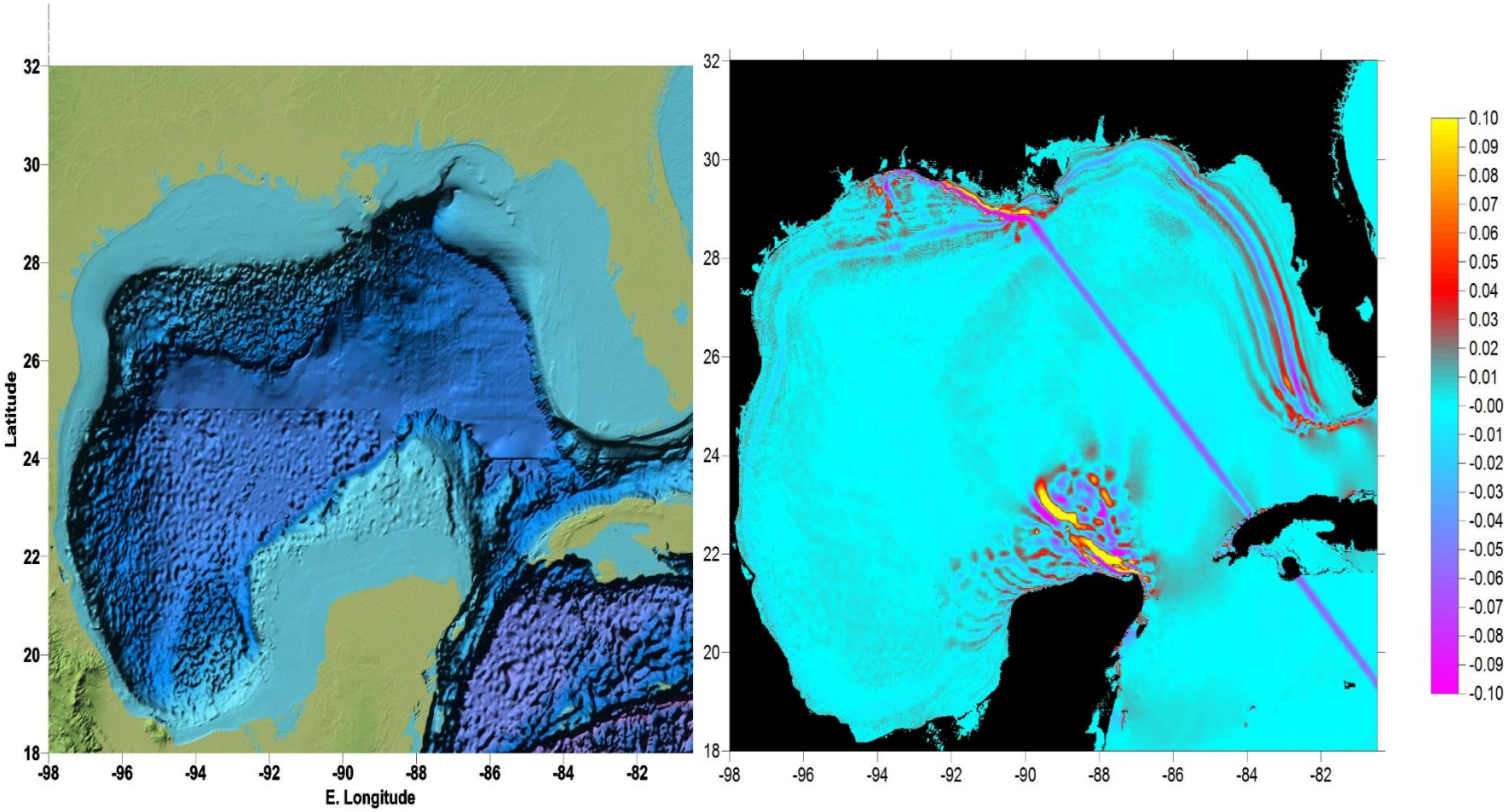
T = 2 hours C = 25 m/s



T = 4 hours C = 25 m/s

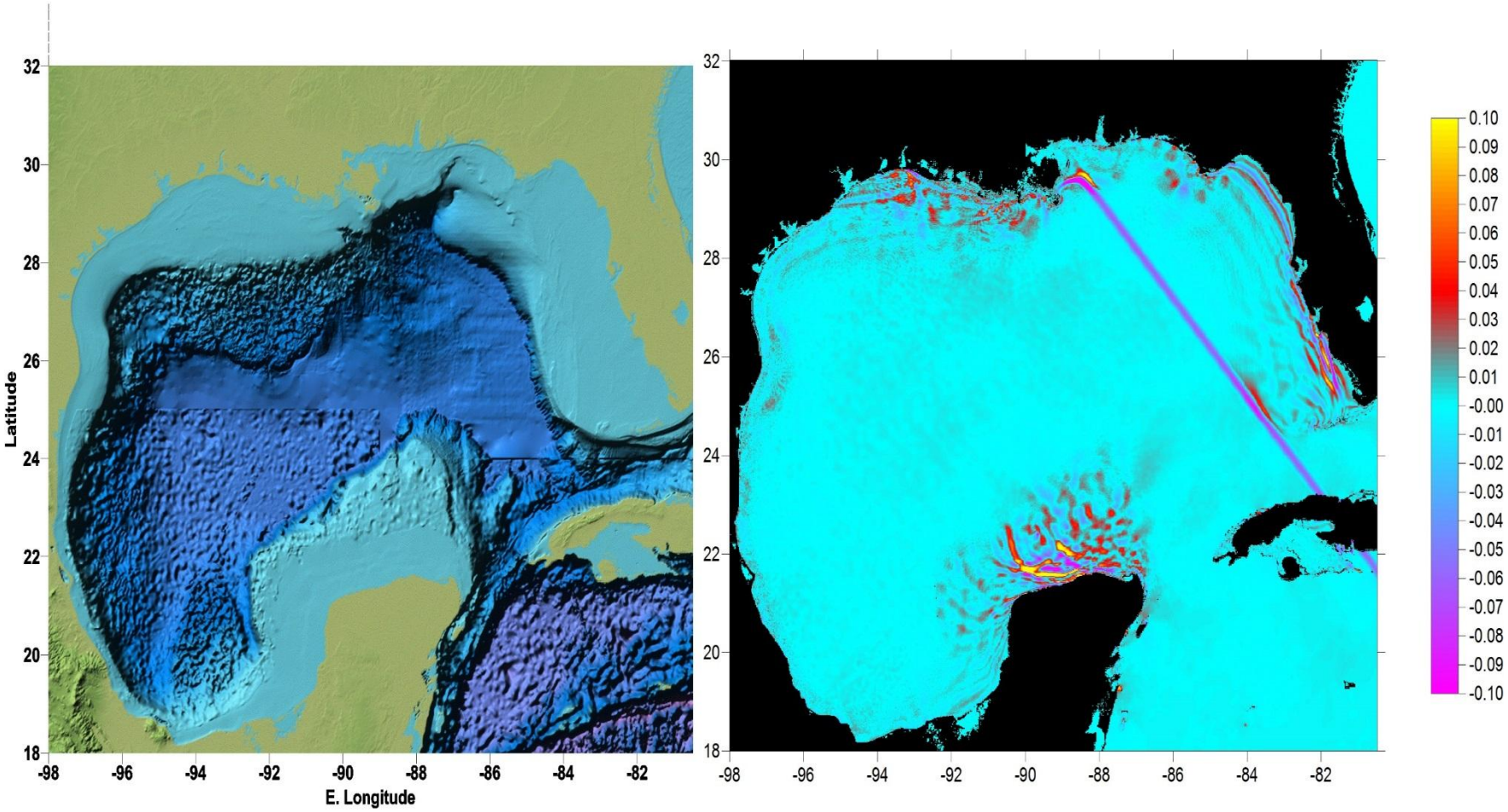


T = 6 hours C = 25 m/s

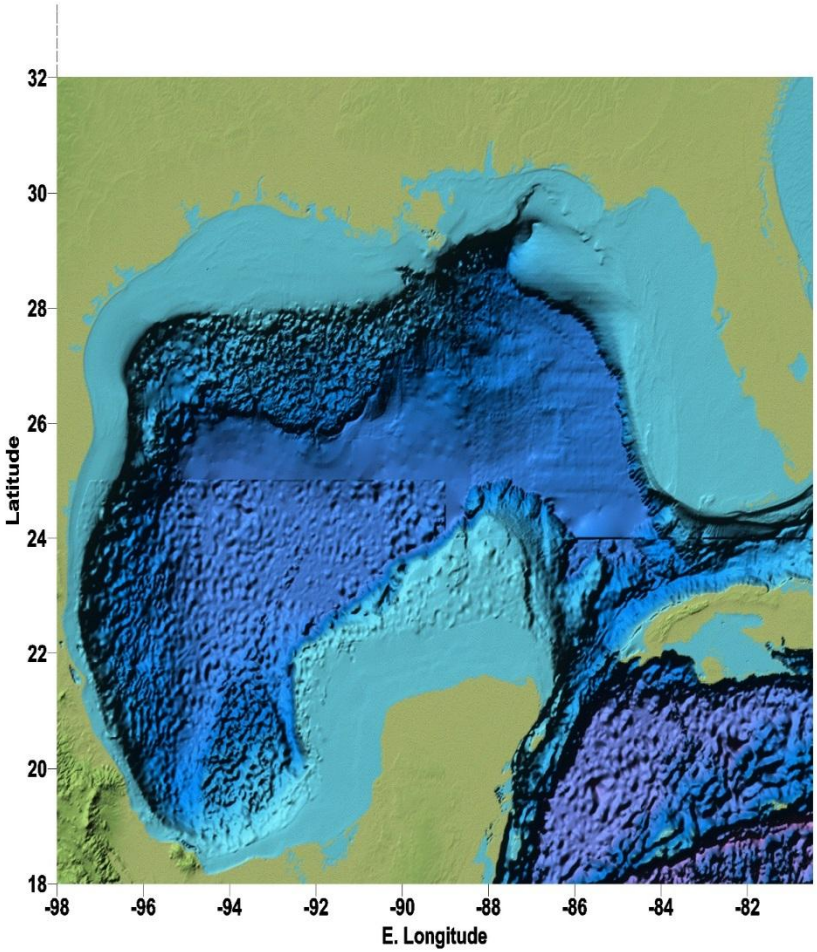


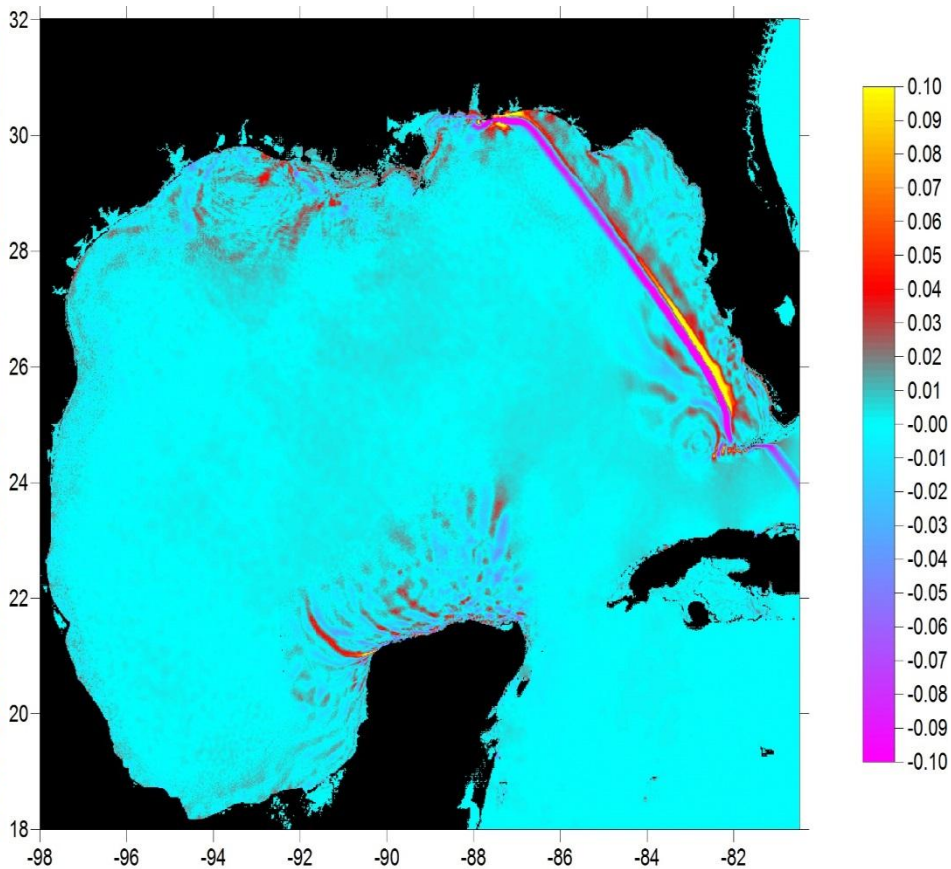
Maximum amplitude appears to follow the shelf break – rather like the Mendocino Scarp during the 2006 KIT

T = 8 hours C = 25 m/s



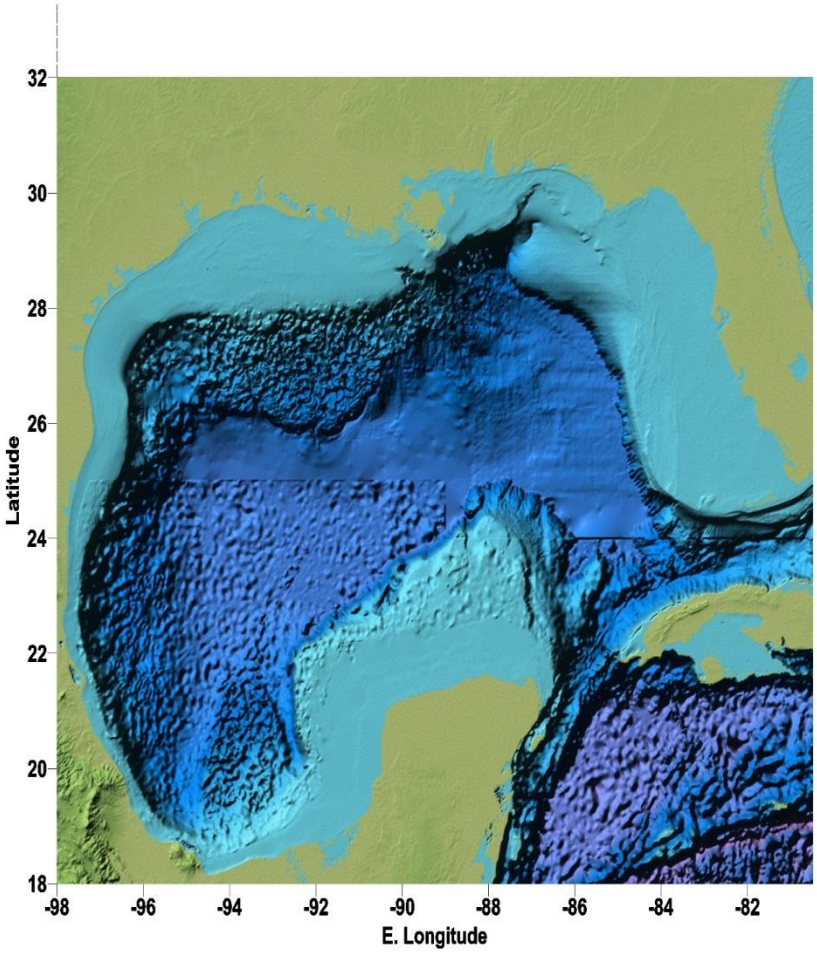
T = 10 hours C = 25 m/s

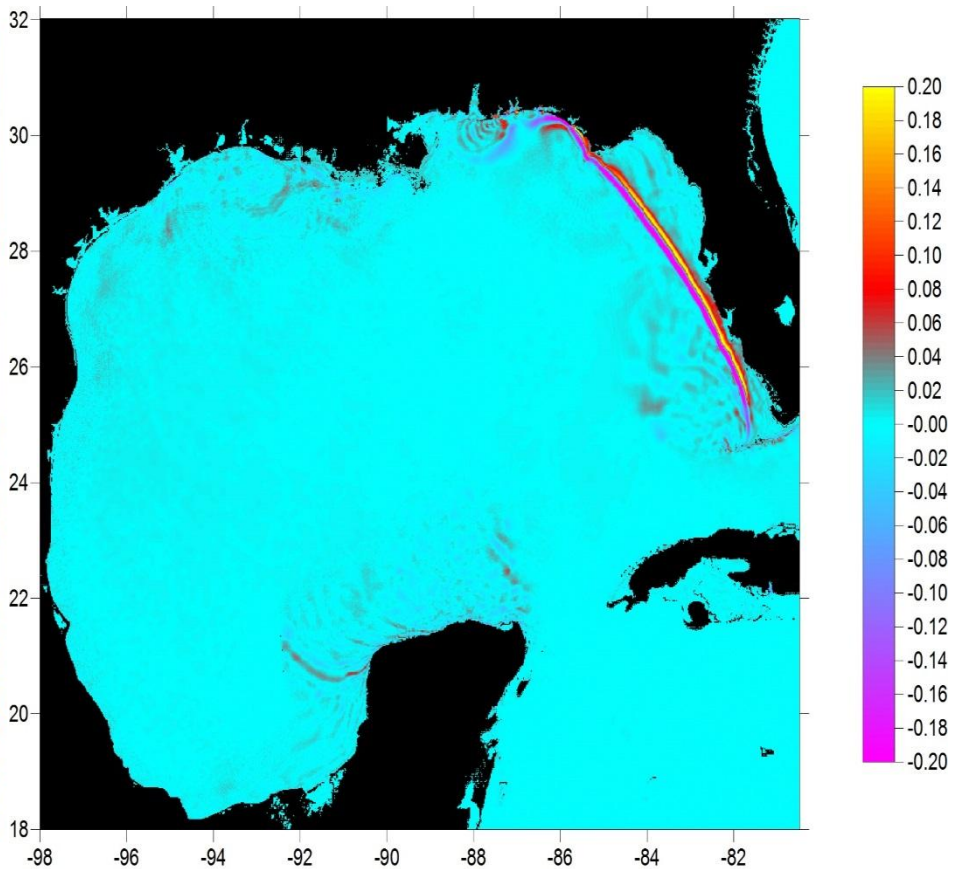




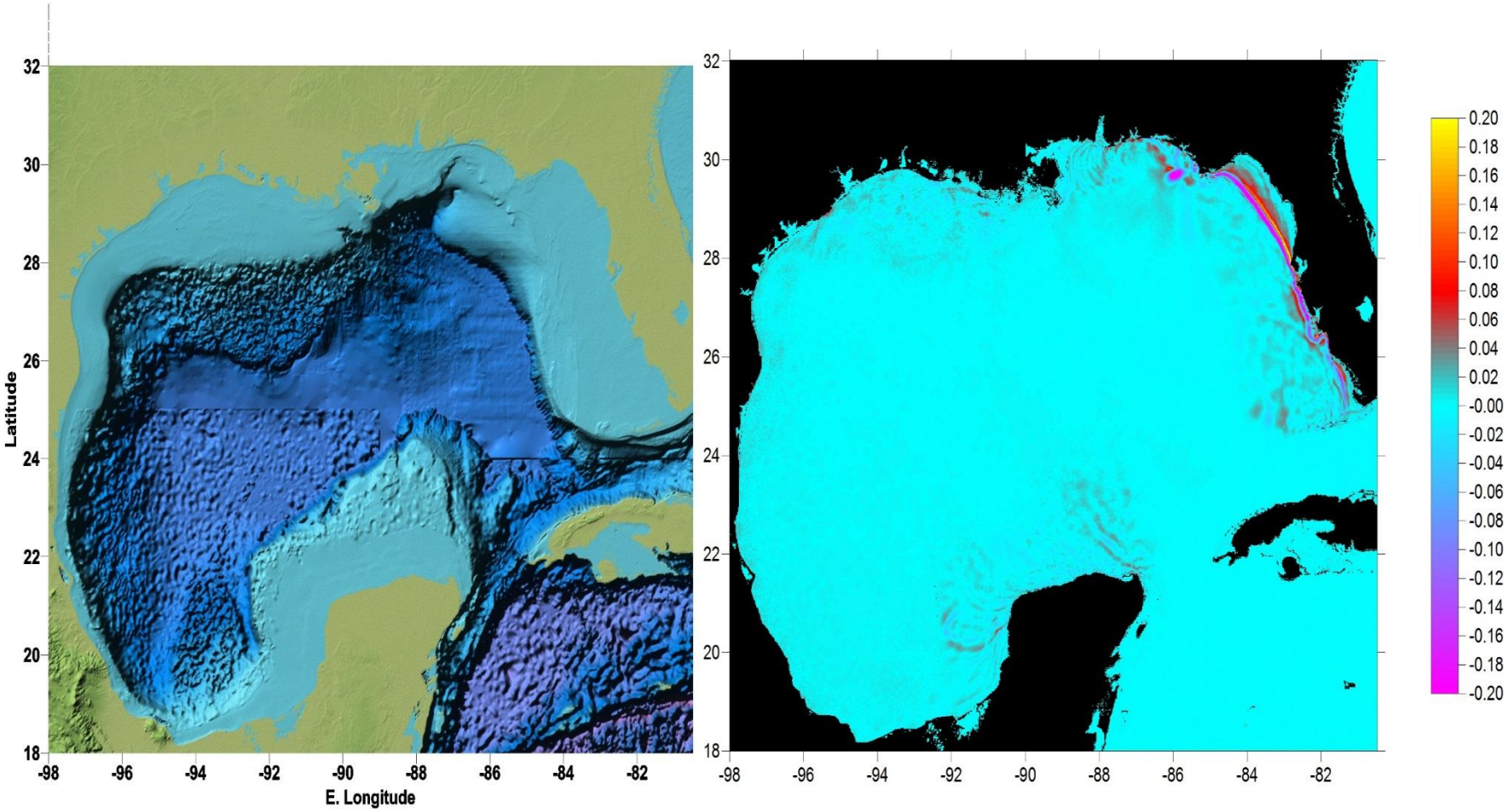
Edge wave interrupted by the Mississippi delta?

T = 11 hours C = 25 m/s

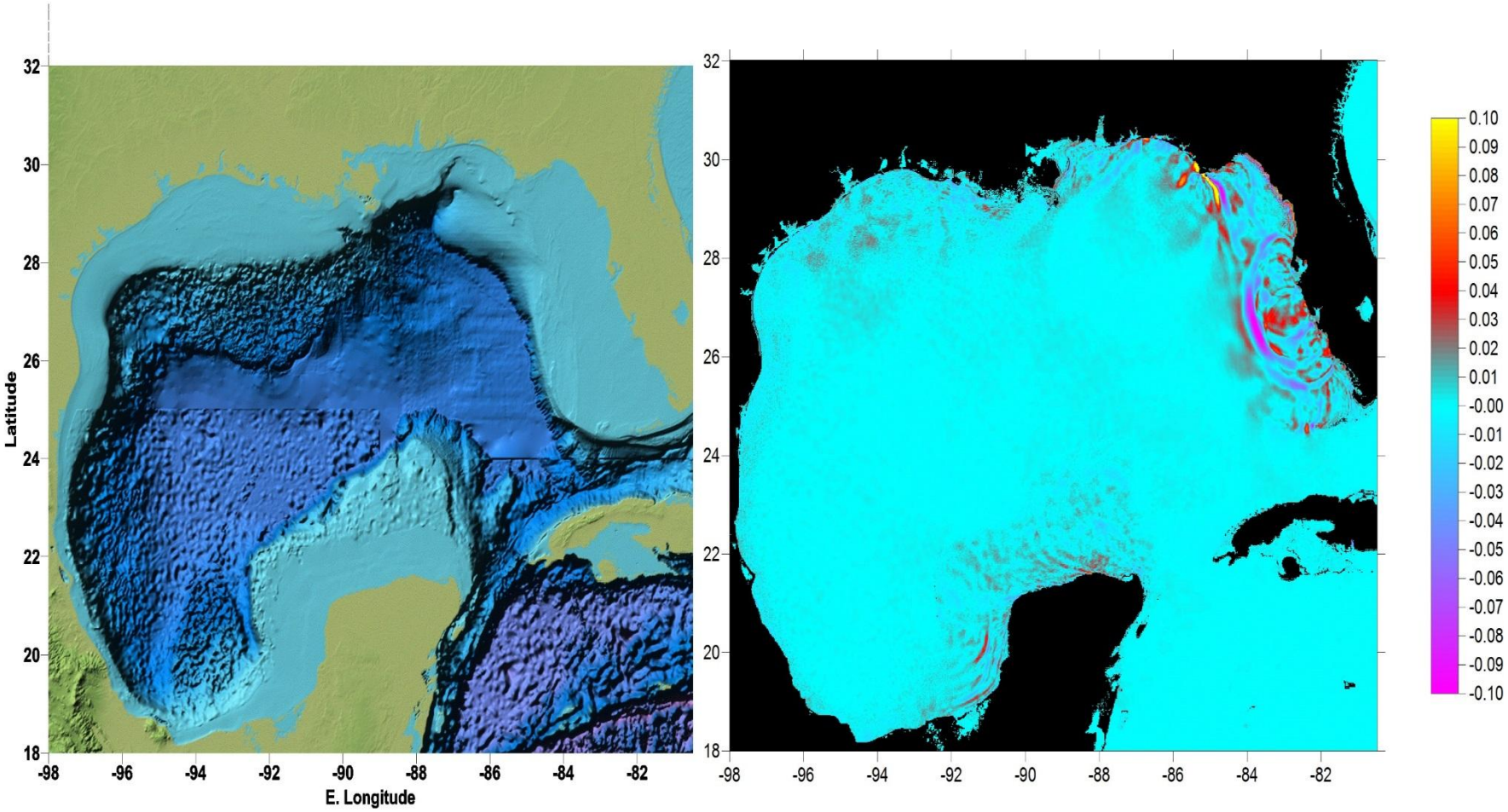




T = 12 hours C = 25 m/s

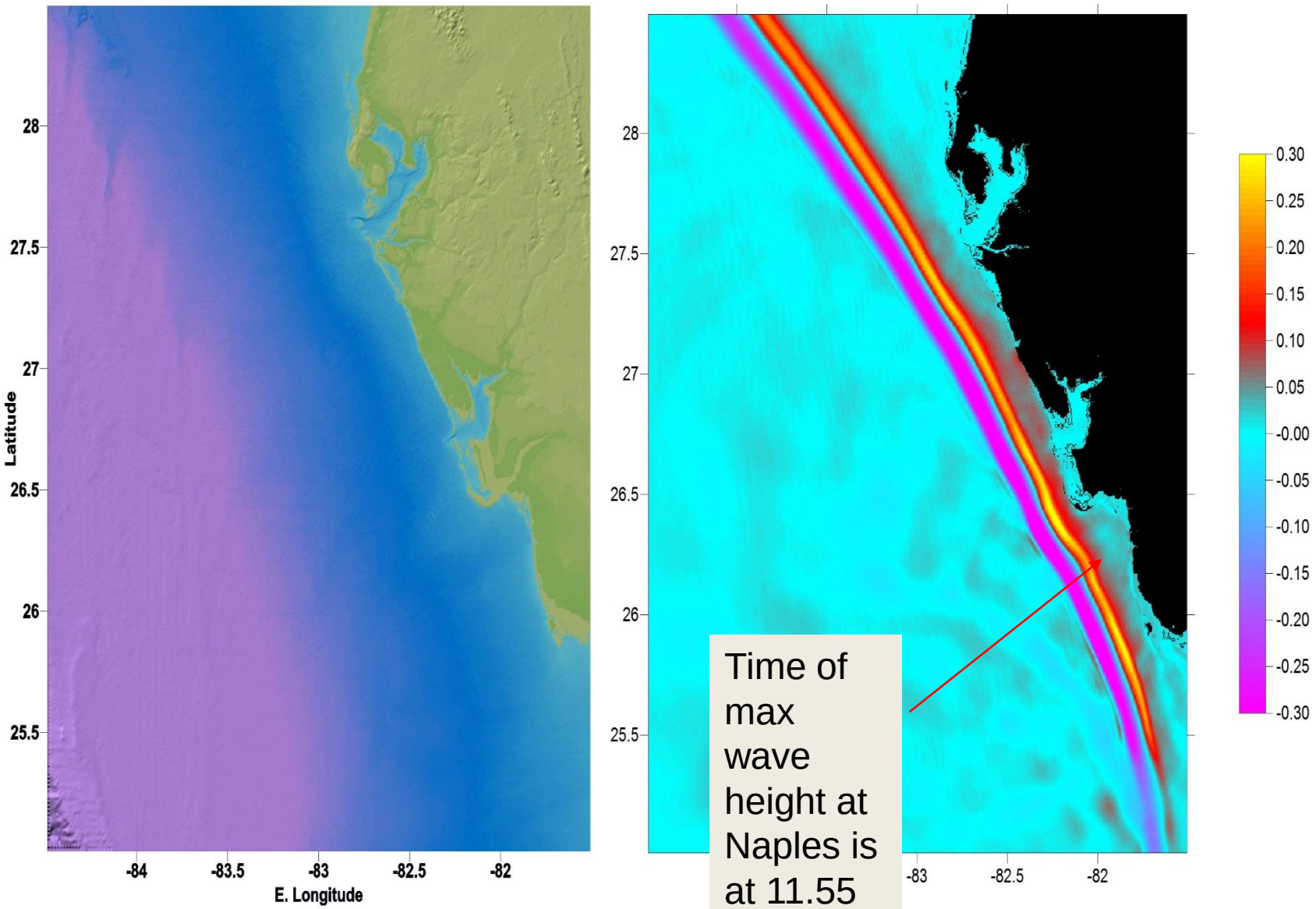


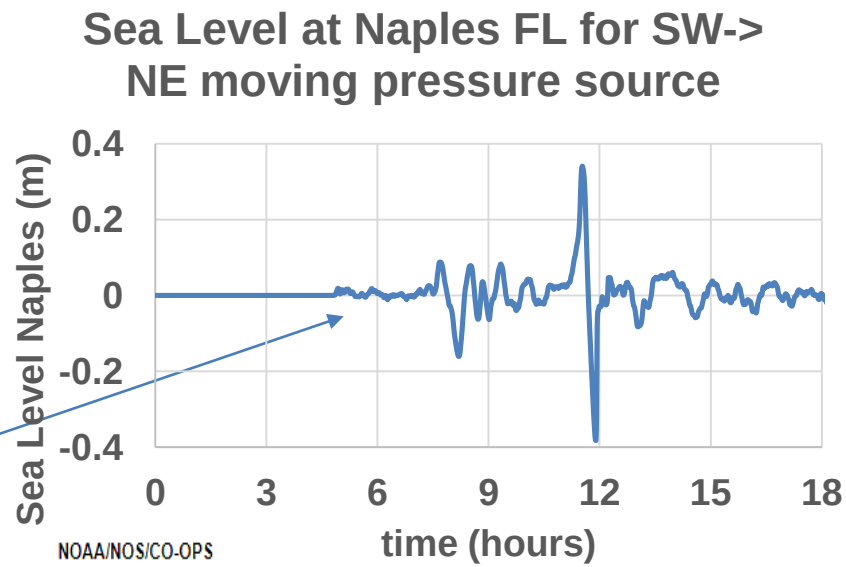
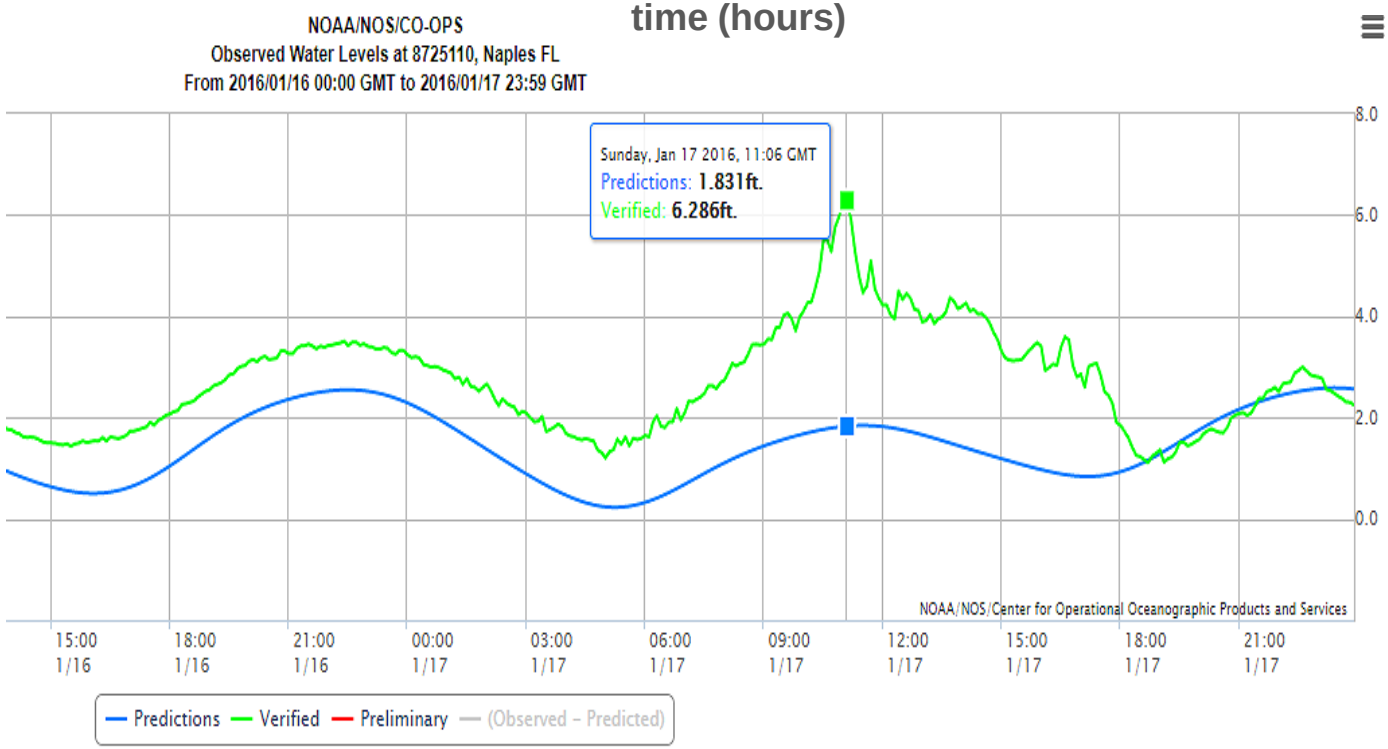
T = 14 hours C = 25 m/s



Reflection moving southwestward

15 second grid T = 11 hours
C = 25 m/s



Computed marigram – scaled and translated to same time scale and event time shown in the observed marigram. Model amplitude is 25% of the observed and the negative swing comes much later in the real data

Note early free wave arrivals