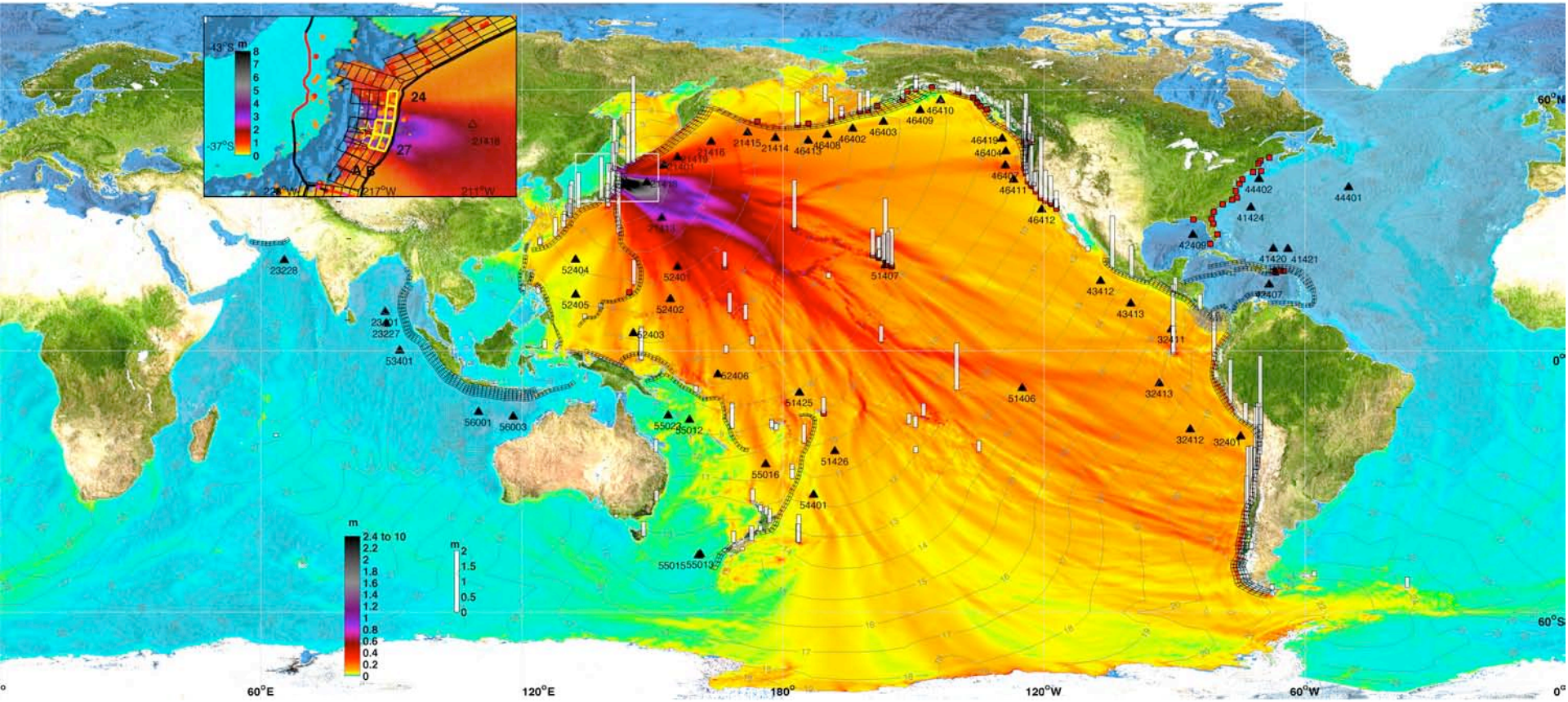
Maritime forecast products research and development

Vasily Titov, Rachel Tang
NOAA Center for Tsunami Research

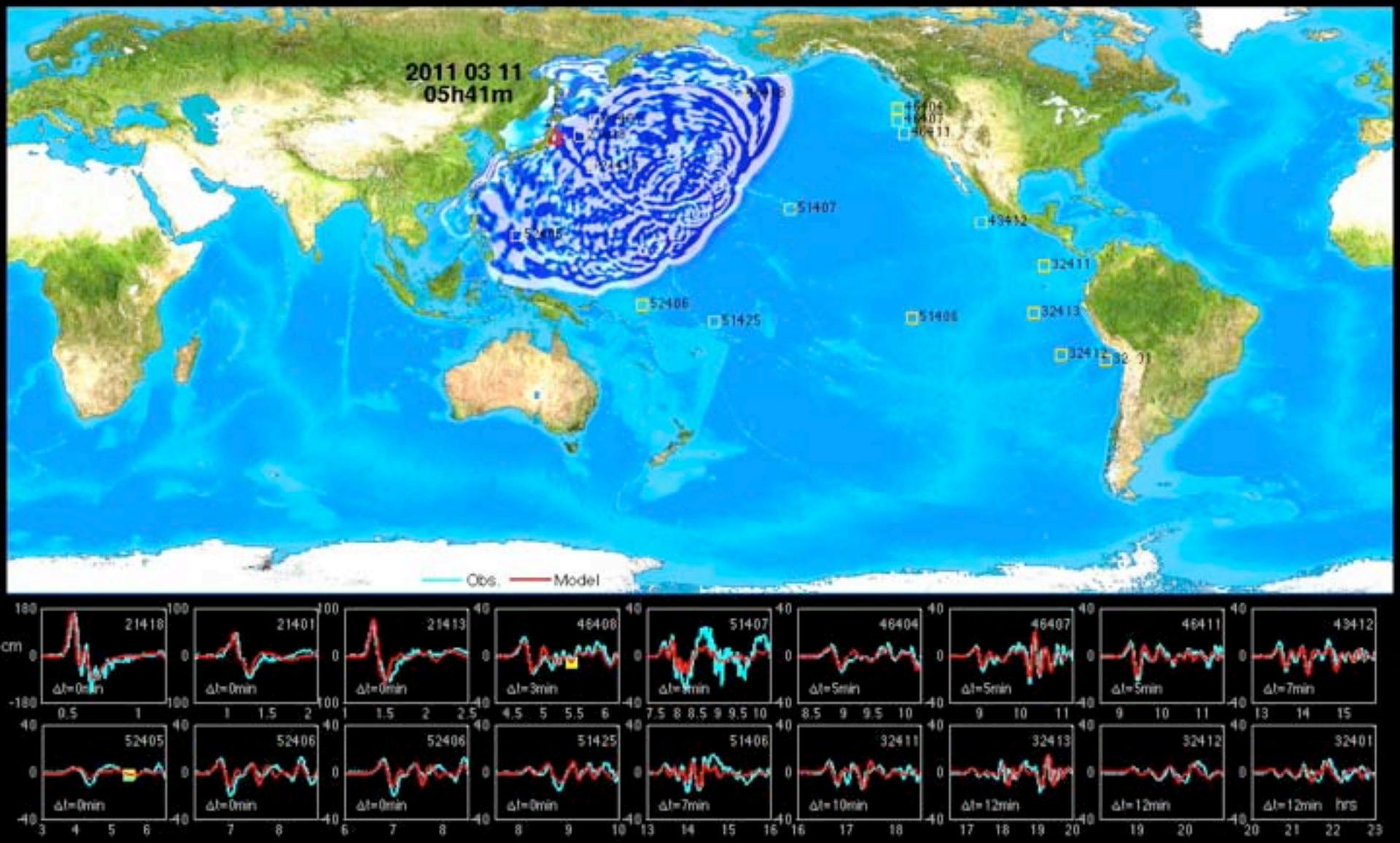
The 2011 Japan Tsunami



Forecast based on 2 DART measurements

Tsunami Energy Map

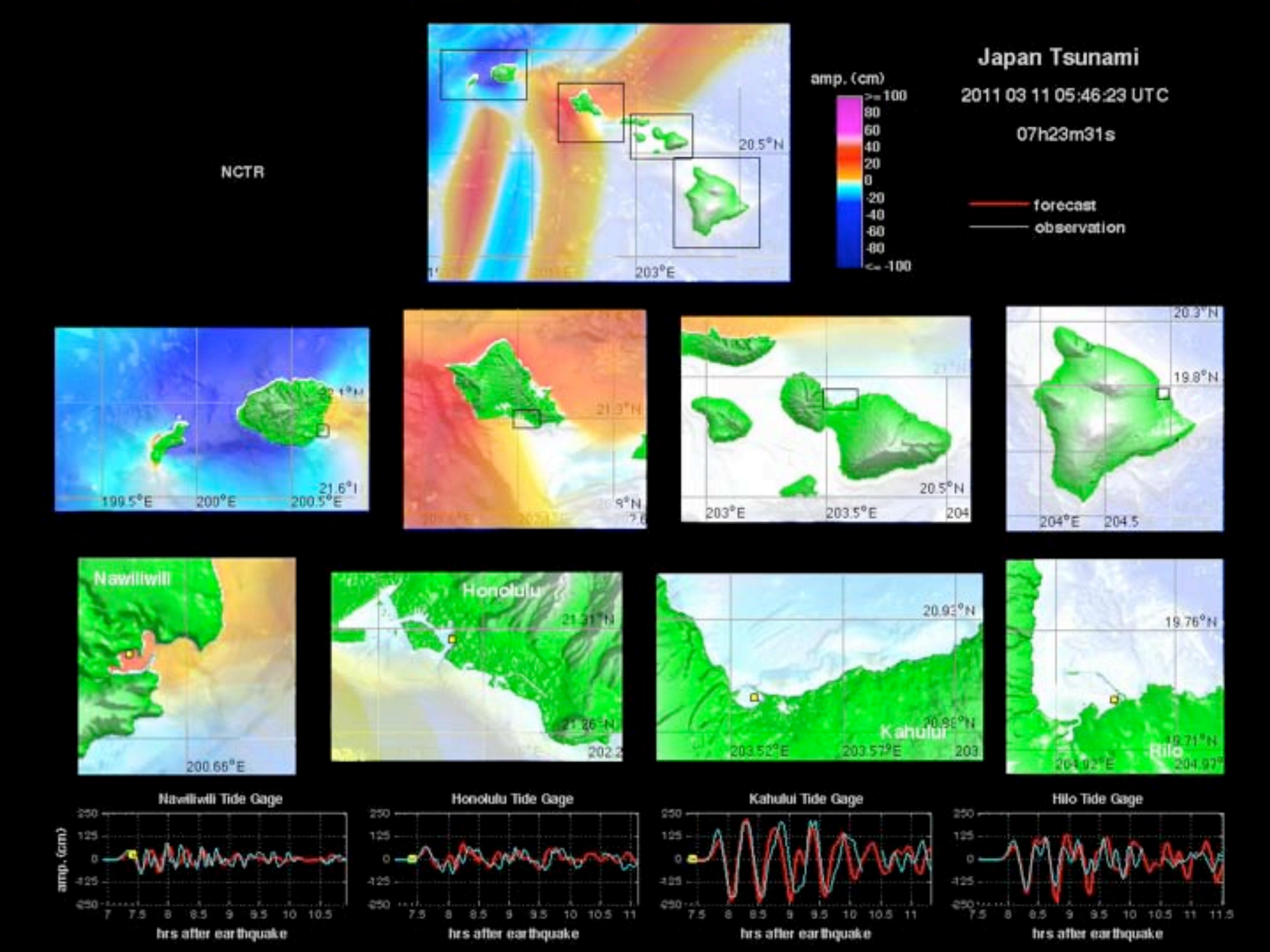
Global Propagation – 2011 Japan Tsunami



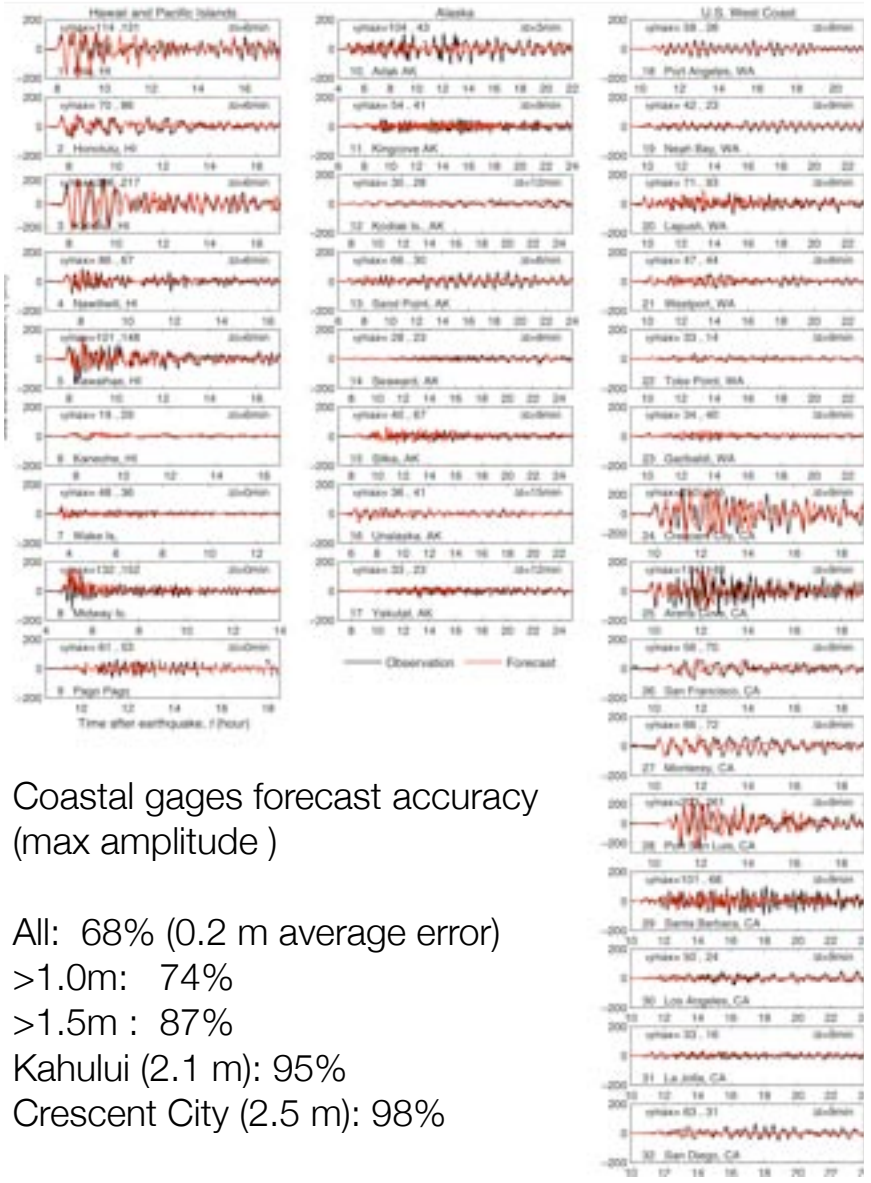
DART stations

Observation

Forecast (MOST)


Japan Tsunami
2011 03 11 05:46:23 UTC
07h23m31s
forecast
observation
amp. (cm)
>=100
80
60
40
20
0
-20
-40
-60
-80
<=-100
NCTR
20.5°N
203°E
199.5°E
200°E
200.5°E
21.6°N
203.5°E
204°E
204.5
19.8°N
Nawiliwili
200.66°E
Honolulu
21.31°N
Kahului
20.89°N
203.52°E
203.57°E
19.76°N
Hilo
204.92°E
204.97°
Nawiliwili Tide Gage
Honolulu Tide Gage
Kahului Tide Gage
Hilo Tide Gage
amp. (cm)
hrs after earthquake

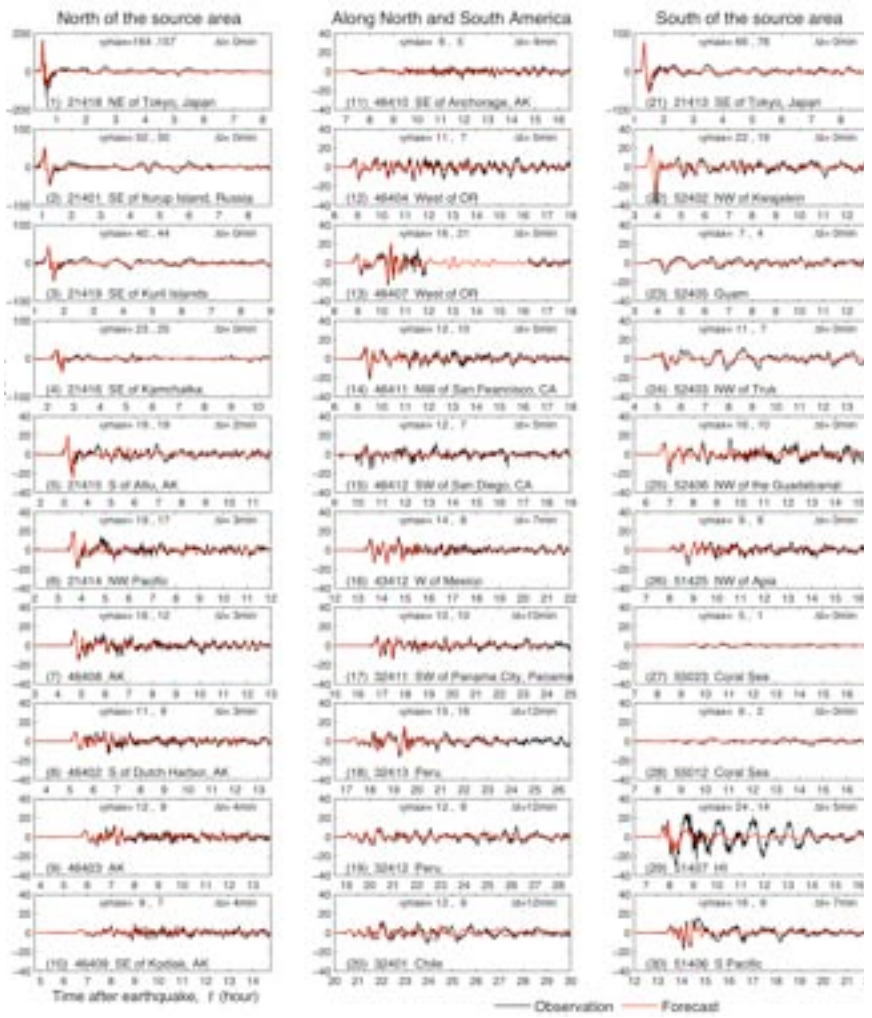
U.S. Tide Gages



Coastal gages forecast accuracy
(max amplitude)

All: 68% (0.2 m average error)
>1.0m: 74%
>1.5m : 87%
Kahului (2.1 m): 95%
Crescent City (2.5 m): 98%

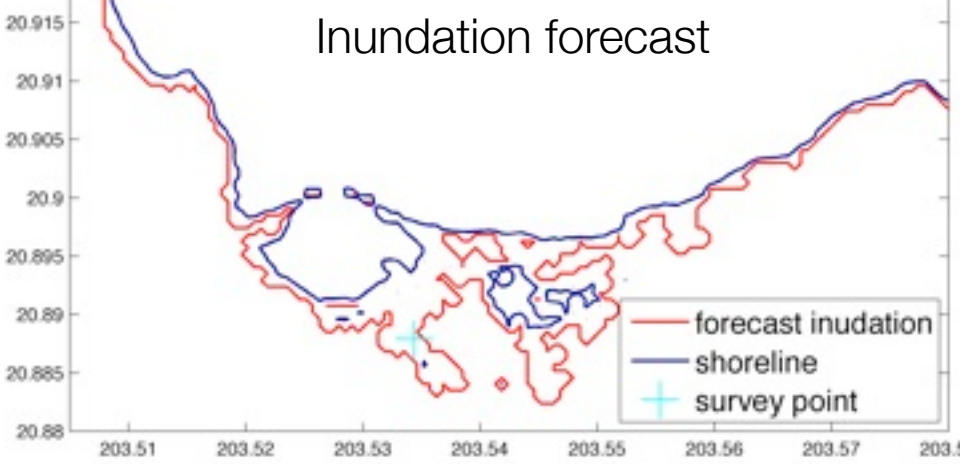
DART amplitudes

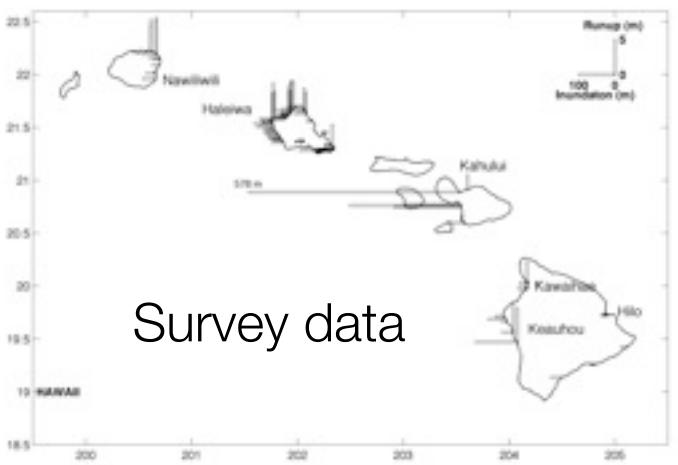


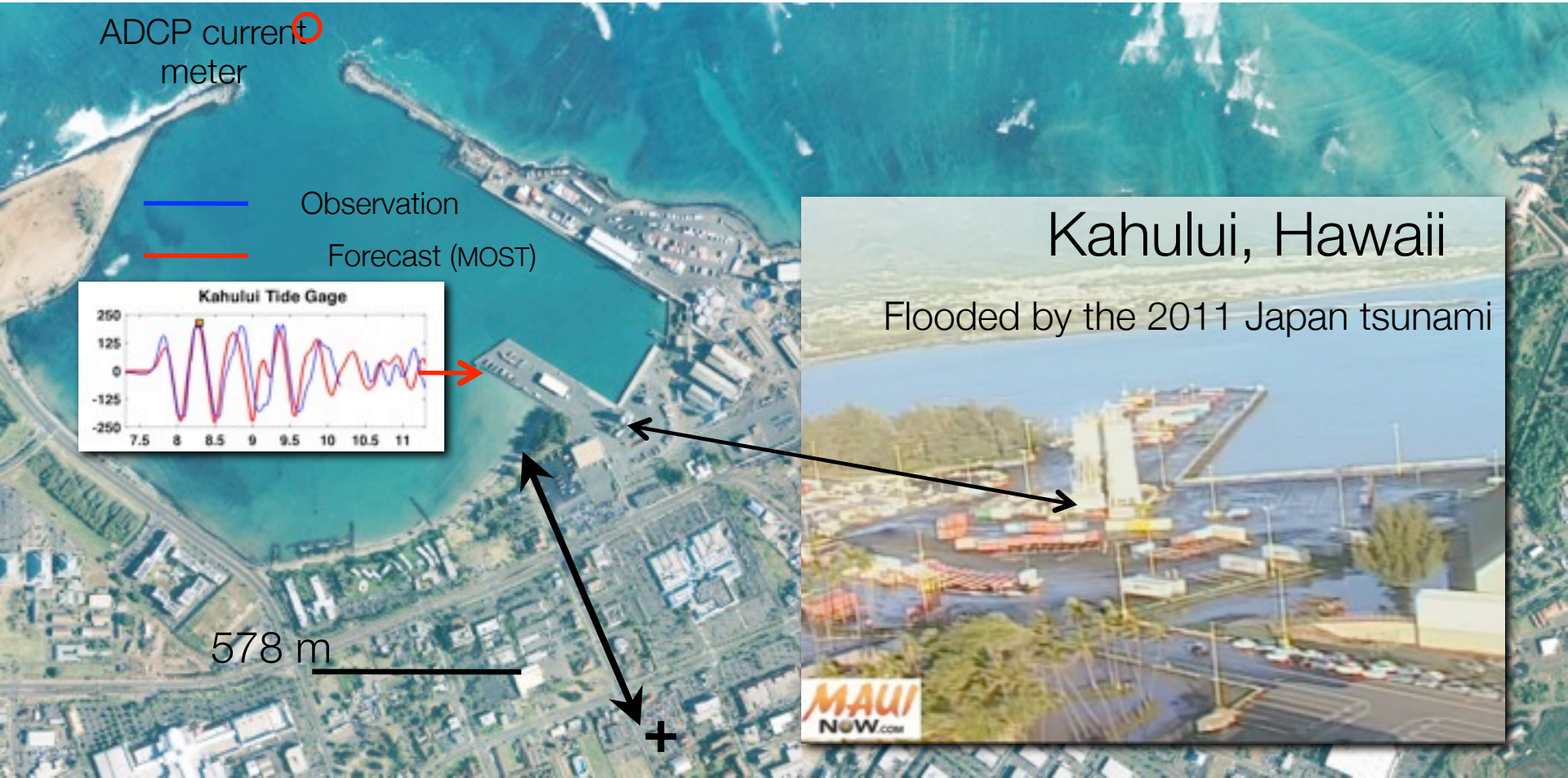
Observation

Forecast (MOST)

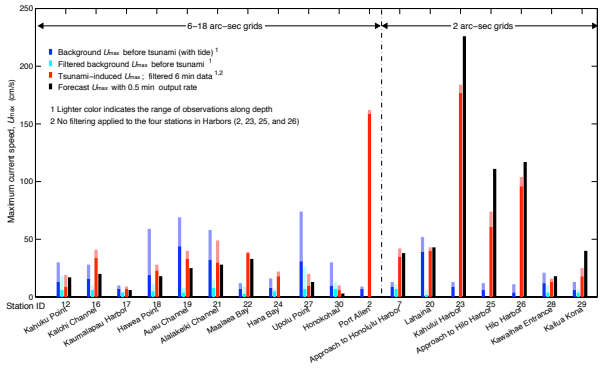
Tang et al. (2012) Direct energy estimation of the 2011 Japan tsunami using deep-ocean pressure measurements. *J. Geophys. Res.*, 117, C08008, doi: 10.1029/2011JC007635

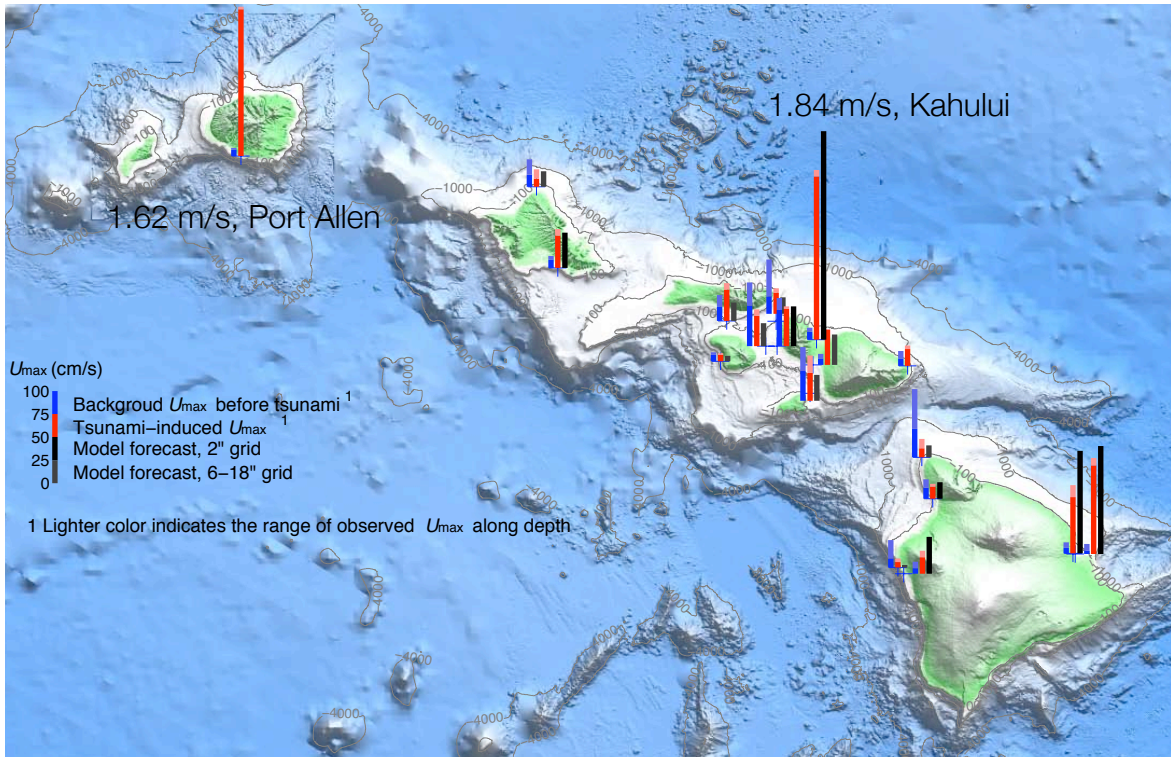

Inundation forecast
20.915
20.91
20.905
20.9
20.895
20.89
20.885
20.88
203.51
203.52
203.53
203.54
203.55
203.56
203.57
forecast inudation
shoreline
survey point


Survey data
Nawiliwili
Haloiwa
Kahului
Kawaihae
Hilo
Kaiuhou
HAWAII


ADCP current meter
Observation
Forecast (MOST)
Kahului Tide Gage
250
125
0
-125
-250
7.5
8
8.5
9
9.5
10
10.5
11
578 m
Kahului, Hawaii
Flooded by the 2011 Japan tsunami
MAUI NOW.com

2011 Japan Tsunami

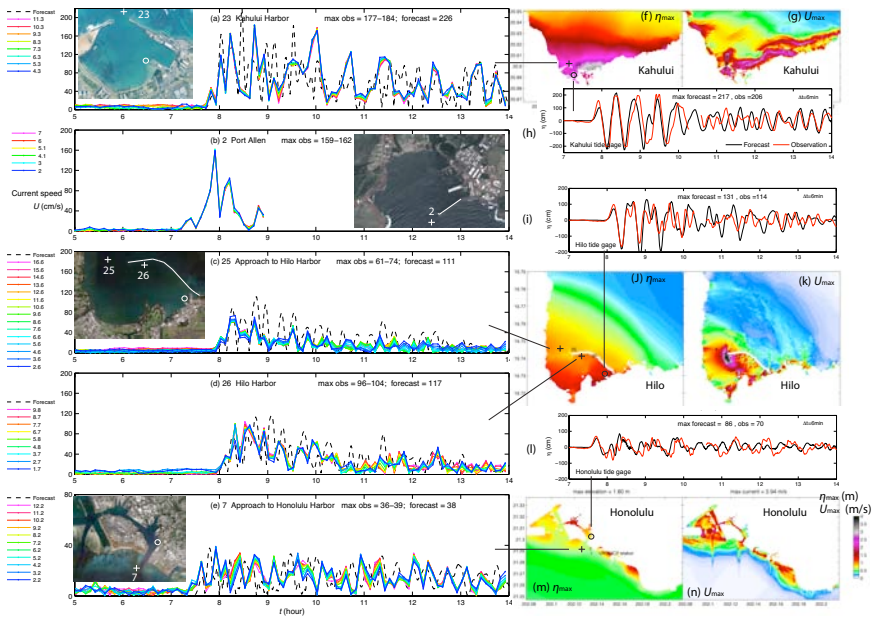




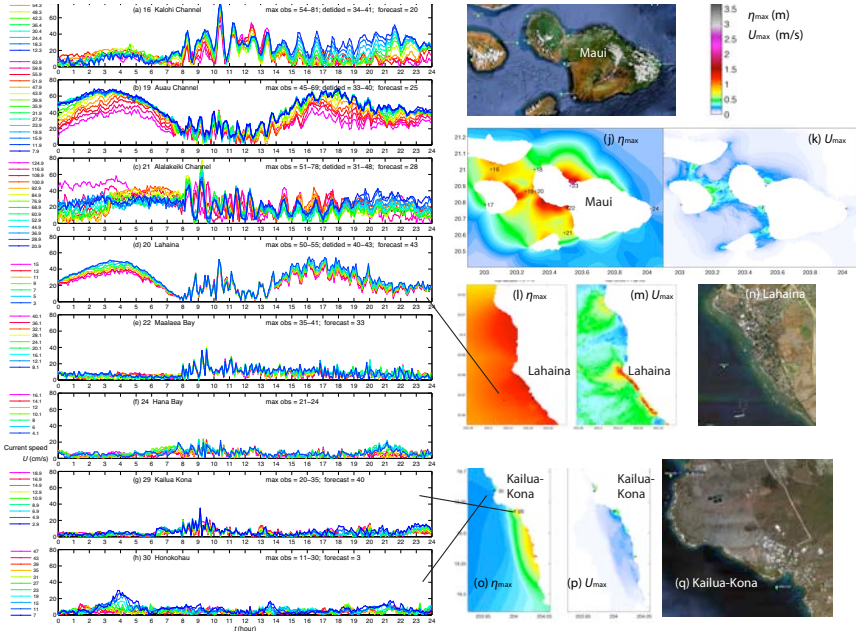
Estimated accuracy:
71% for all
76% for high-resolution grids

Maximum observed and forecast current speeds
at 18 ADCP current stations in Hawaii

2011 Japan Tsunami



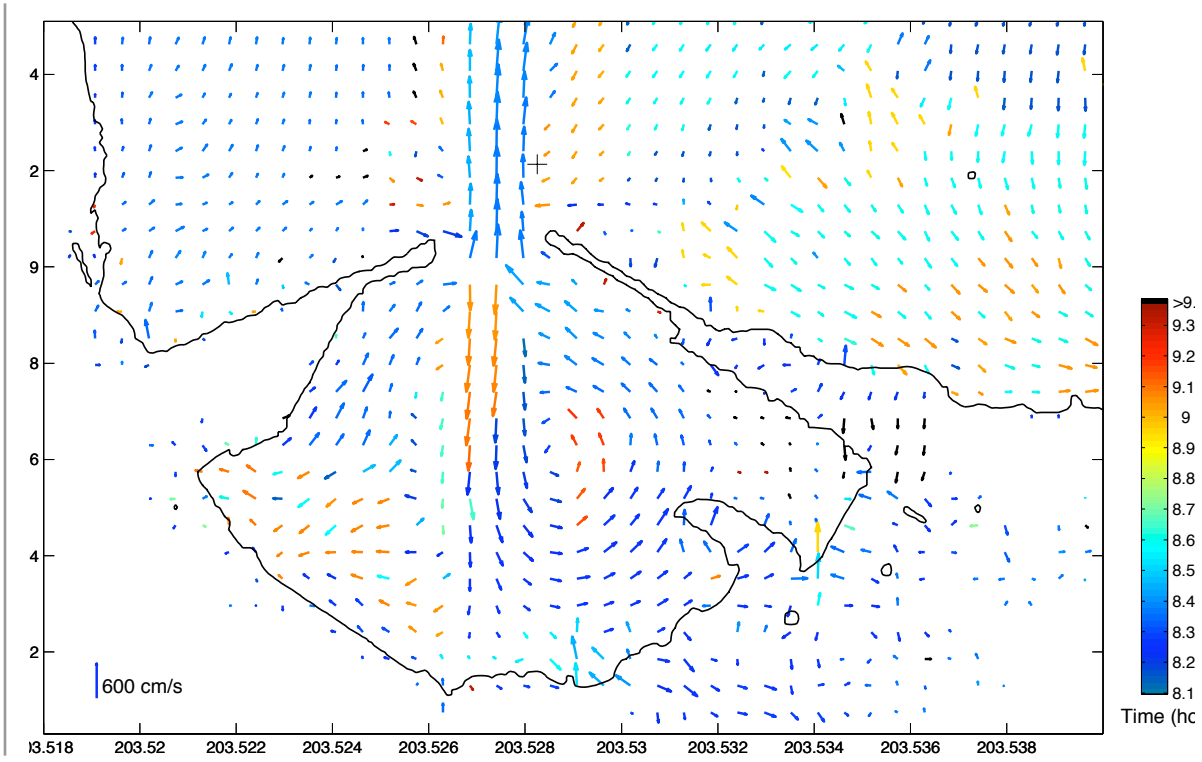
Harbors



Channels and bays

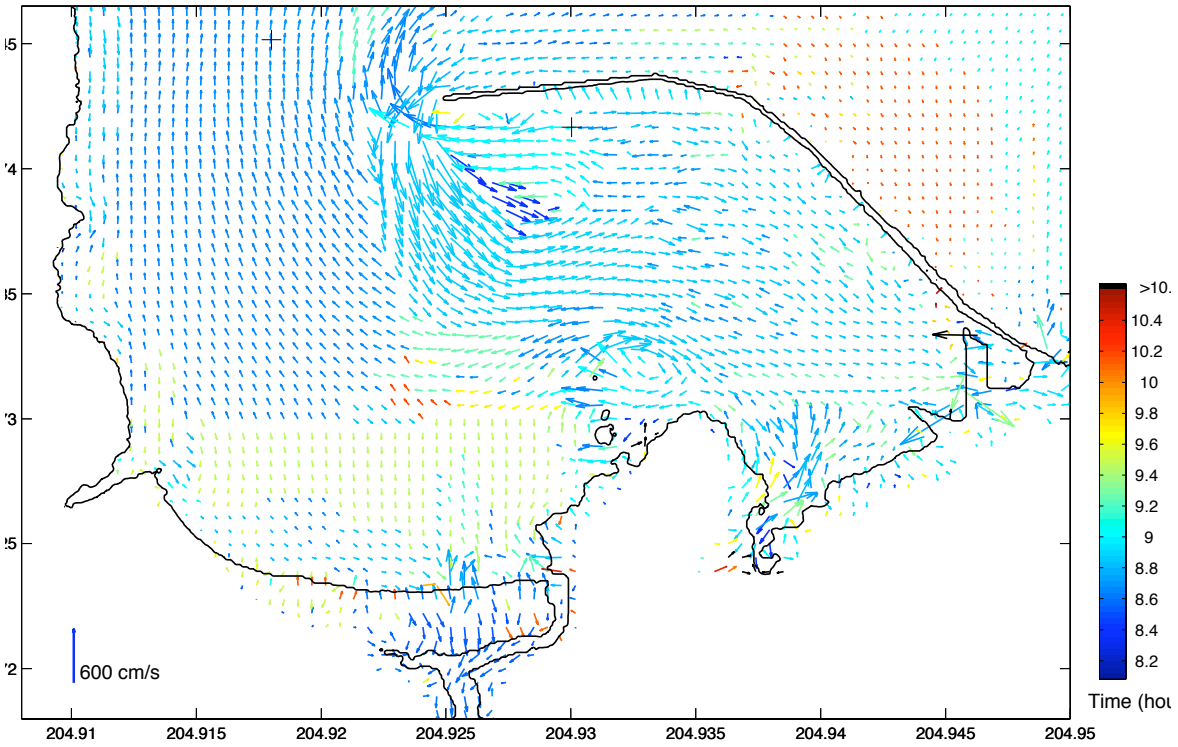
ADCP current data at bays, harbors and channels in Hawaii

2011 Japan Tsunami



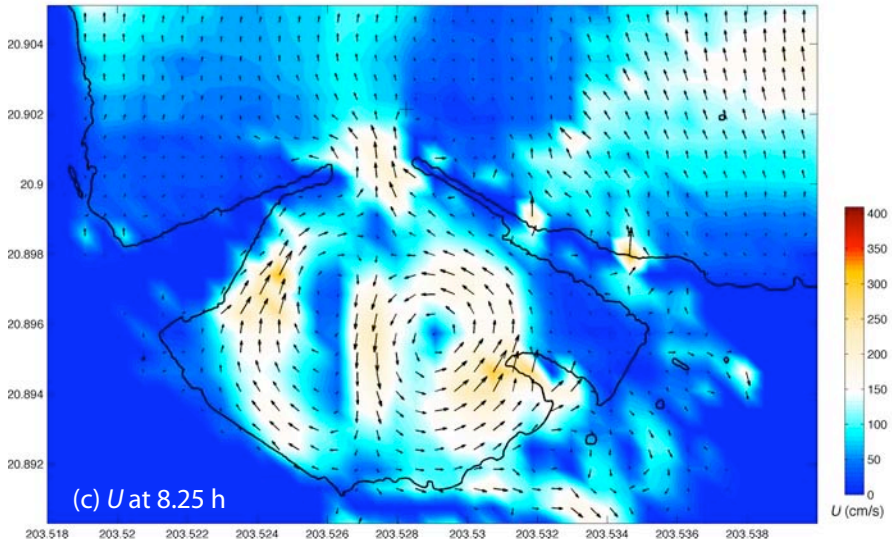
Kahului HarborMaximum current speeds and directions

2011 Japan Tsunami

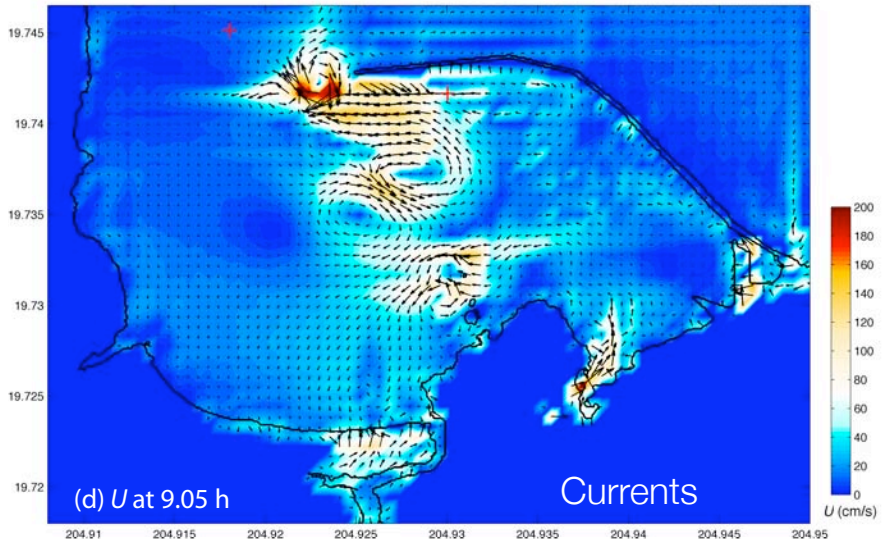


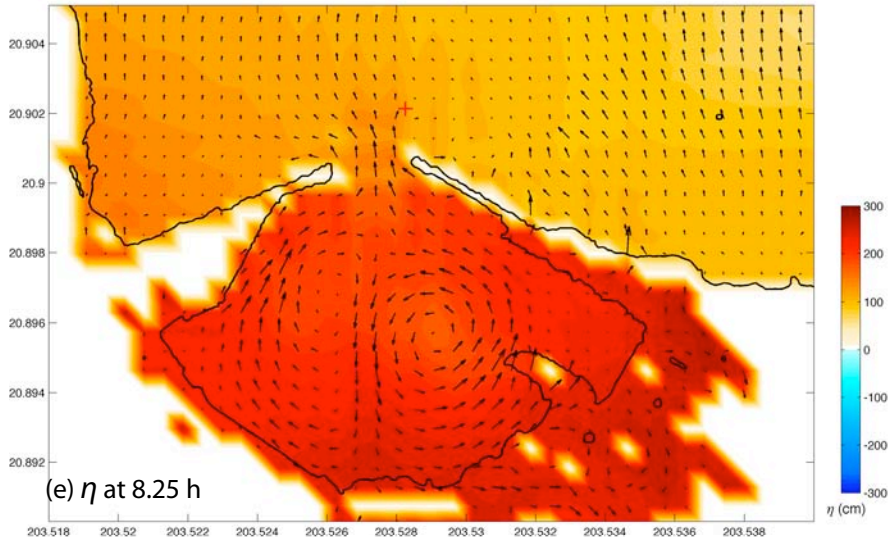
Hilo Harbor, Maximum current speeds and directions

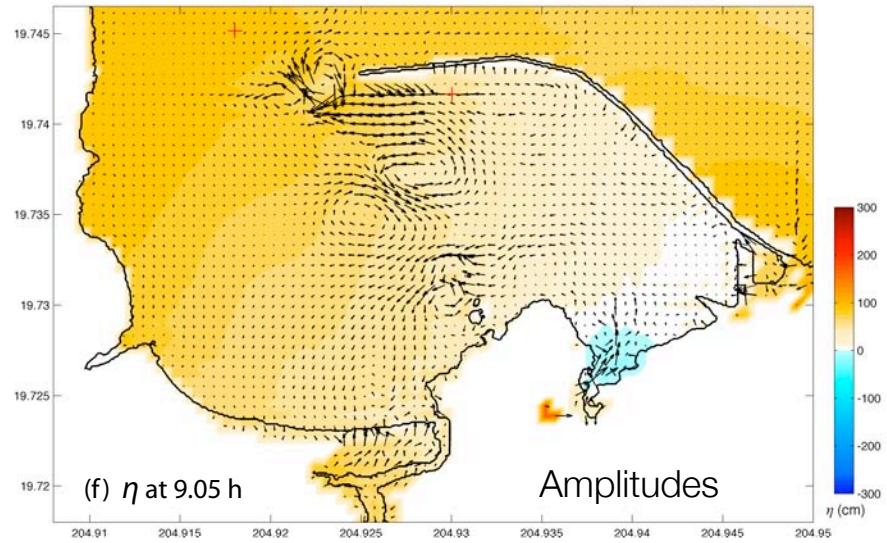
Kahului



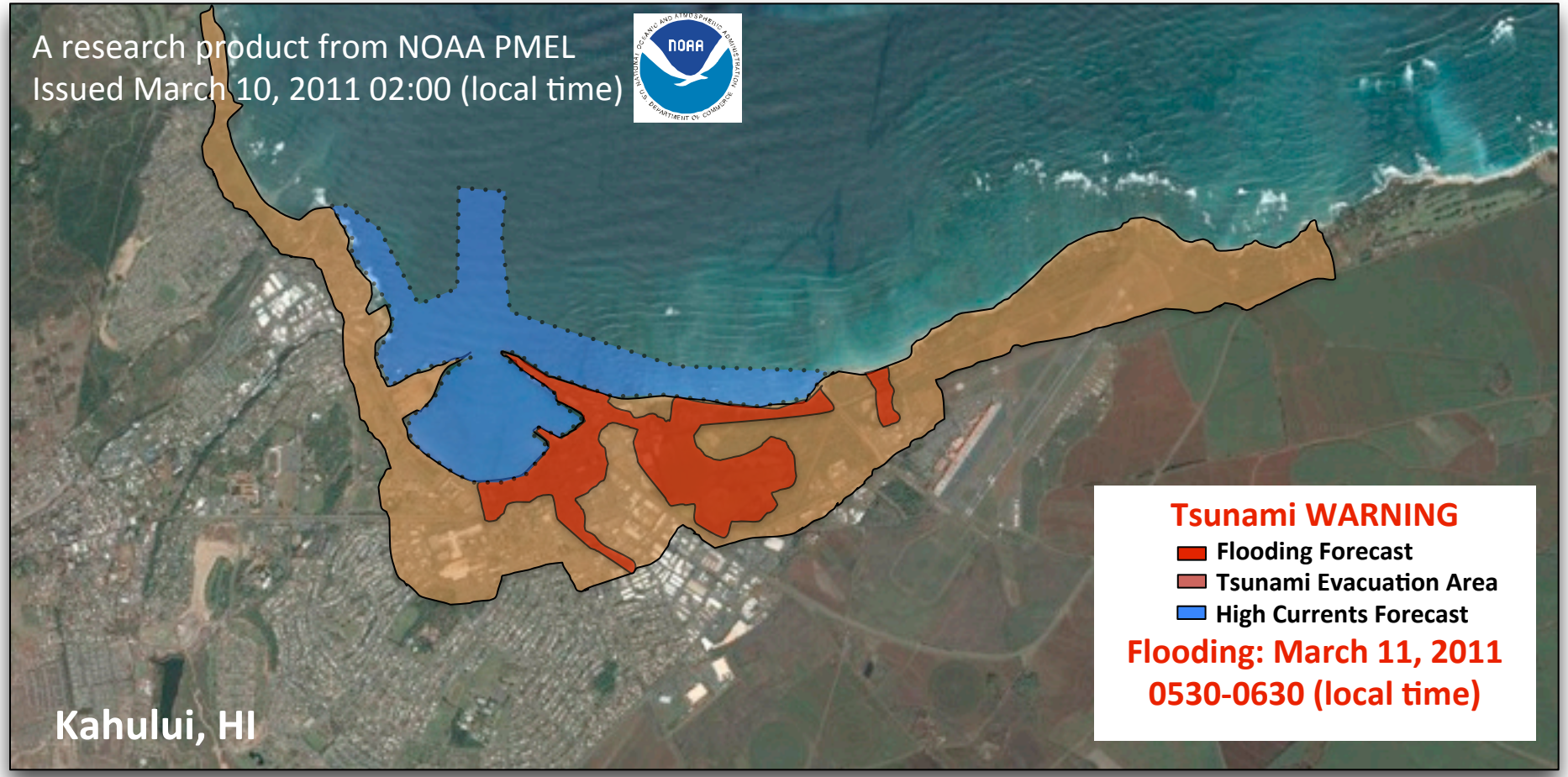
Hilo







Whirlpools modeled inside harbors
Snapshots of model simulations

Summary

- Future tsunami forecast products for maritime safety applications