

# Wave & Surface Currents Observations In Support of Marine Operations



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*CMANC*  
*Marina Del Rey*  
*January 21, 2011*



# Coastal Data Information Program



- Based at SIO since 1975
- 45 Wave Stations  
LIDAR & In-Situ Beach  
Surveys
- 17 People
- Major Funding by:  
**USACE, CDBW**
- Partners  
(IOOS, NOAA  
CA Coastal Conservancy  
ONR/NAVY...)

## CDIP Mission:

Monitor and predict  
nearshore waves and  
shoreline change.

# CDIP Wave Buoys – 45 Stations



<http://cdip.ucsd.edu>

September 16, 2010



# CDIP “operated” spectral data coverage: 2009

Stn Name	% Deployed	% Coverage
028 SANTA MONICA BAY, CA	99.95	99.30
029 POINT REYES, CA	90.96	98.14
036 GRAYS HARBOR, WA	99.92	100.00
045 OCEANSIDE OFFSHORE, CA	100.00	99.94
071 HARVEST, CA	84.14	98.13
076 DIABLO CANYON, CA	100.00	98.34
092 SAN PEDRO, CA	99.95	99.78
093 MISSION BAY OFFSHORE, CA	100.00	100.00
094 CAPE MENDOCINO, CA	97.29	99.99
096 DANA POINT, CA	100.00	98.91
100 TORREY PINES OUTER, CA	99.94	99.52
107 GOLETA POINT, CA	97.66	99.40
111 ANACAPA PASSAGE, CA	99.97	99.52
121 IPAN, GUAM	100.00	100.00
128 HUMBOLDT BAY SOUTH SPIT, CA	99.97	100.00
132 FERNANDINA BEACH, FL	92.25	99.99
134 FORT PIERCE, FL	99.97	99.57
139 UMPQUA OFFSHORE, OR	95.64	99.64
141 PORT HUENEME NEARSHORE, CA	17.18	22.72
142 SAN FRANCISCO BAR, CA	99.97	99.99
143 CAPE CANAVERAL NEARSHORE, FL	100.00	100.00
147 CAPE HENRY, VA	96.05	99.99
155 IMPERIAL BEACH NEARSHORE, CA	99.59	99.80
156 MONTEREY CANYON OUTER, CA	100.00	99.54
157 POINT SUR, CA	100.00	99.99
158 CABRILLO POINT NEARSHORE, CA	95.30	98.47
161 SAN ELIJO NEARSHORE, CA	69.92	99.98
162 CLATSOP SPIT, OR	26.91	96.50
191 POINT LOMA SOUTH, CA	95.43	98.46

**% Deployed:**  
Percentage of  
the year during  
which the buoy  
was deployed  
and on-site

**% Coverage:**  
Percentage of  
the deployed  
period for  
which good  
spectral data  
was obtained.

**Validation Buoys**

**Deployed 9/2009**

**Benchmark Solutions**

# Real-Time (updating @ 30 min) and Historic Data

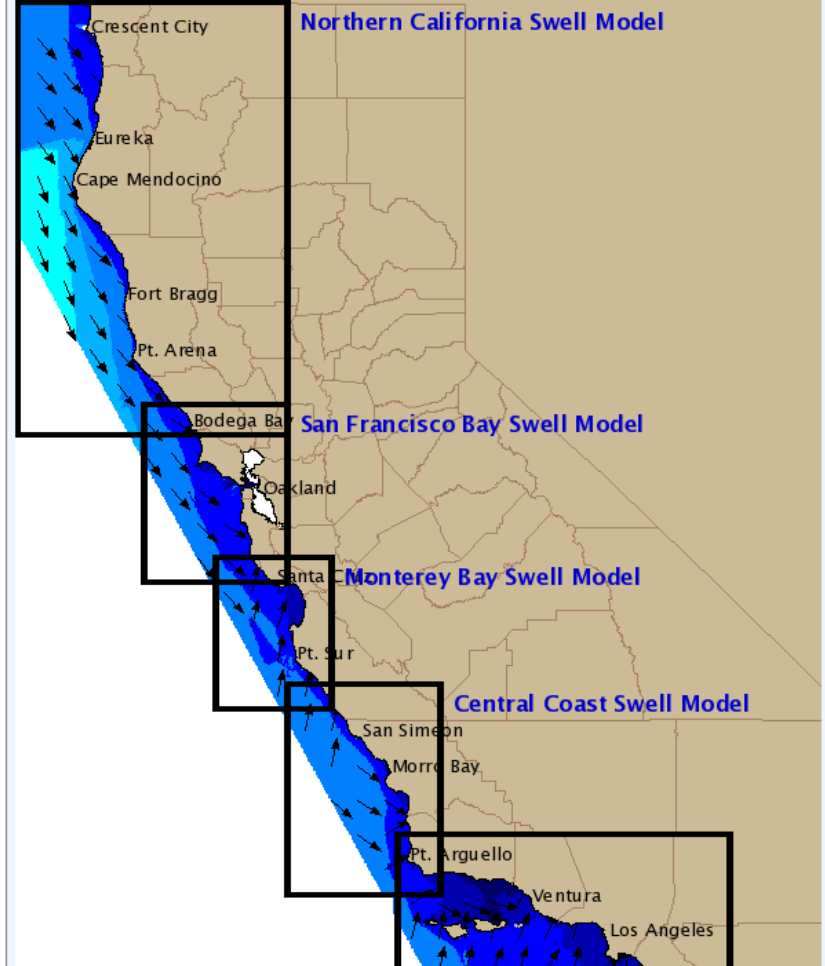
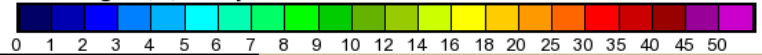
## Nowcast and Forecast Models - California

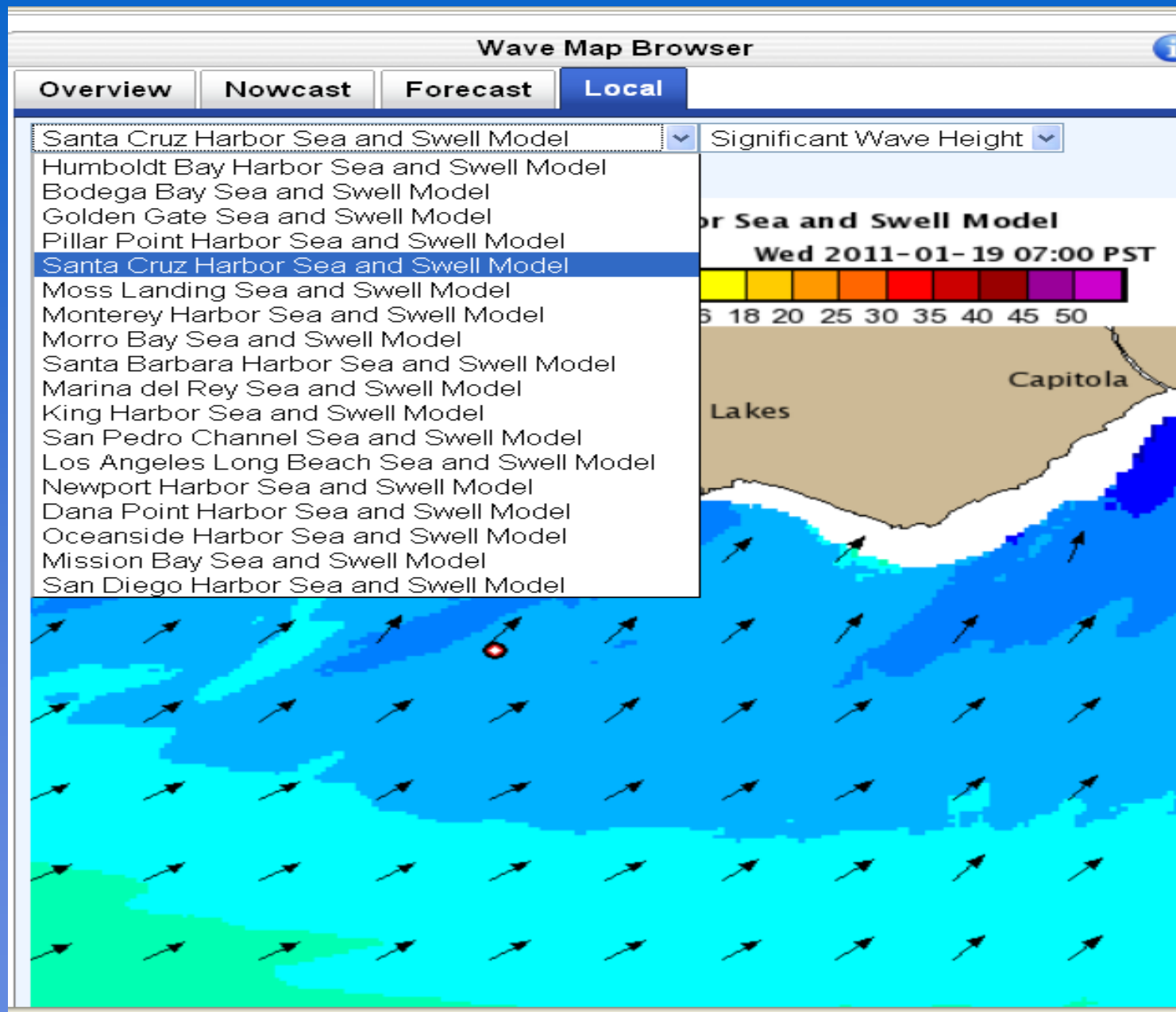
WAVES AND SEA SURFACE TEMPS		Date	Time	Hs	Tp	Dp	SST
Stn #	Station Name	(m/d)	(UTC)	(m)	(s)	(deg)	(C)
163	KALO, MAJURO, MARSHALL ISLANDS	08/21	01:29	1.37	12.5	122	28.9
121	IPAN, GUAM	08/21	01:26	1.06	9.9	78	29.8
146	KAUMALAPAU, LANAI, HI	08/21	00:49	1.07	13.3	179	26.0
164	BARBERS POINT 19NM SW, HI	08/21	01:17	1.66	9.9		
098	<u>MOKAPU POINT, HI</u>	08/21	00:43	1.81	6.7		
106	WAIMEA BAY, HI	08/21	01:16	1.28	8.3		
166	OCEAN STATION PAPA	08/21	00:02	1.37	7.1		
191	POINT LOMA SOUTH, CA	08/21	00:57	1.23	18.2		
093	MISSION BAY OFFSHORE, CA	08/21	01:16	1.06	18.2		
100	TORREY PINES OUTER, CA	08/21	00:58	0.92	18.2		
161	SAN ELIJO NEARSHORE, CA	08/21	00:36	0.92	18.2		
045	OCEANSIDE OFFSHORE, CA	08/21	00:49	1.08	18.2		
043	CAMP PENDLETON NEARSHORE, CA	08/21	01:00	0.98	18.2		
067	SAN NICOLAS ISLAND, CA	08/21	00:59	1.90	18.2		
167	SAN NICOLAS ISLAND NORTH, CA	08/21	01:00	1.54	5.6		
096	DANA POINT, CA	08/21	00:59	1.05	18.2		
092	SAN PEDRO, CA	08/21	01:21	0.80	18.2		
028	SANTA MONICA BAY, CA	08/21	01:21	1.12	16.7		
111	ANACAPA PASSAGE, CA	08/21	01:25	1.10	18.2		
169	VENTURA NEARSHORE, CA	08/21	01:10	0.97	18.2		
107	GOLETA POINT, CA	08/21	00:57	0.92	5.3		
071	HARVEST, CA	08/21	01:17	1.36	18.2		
157	POINT SUR, CA	08/21	01:27	1.48	18.2		
158	CABRILLO POINT NEARSHORE, CA	08/21	01:19	0.52	18.2		
156	MONTEREY CANYON OUTER, CA	08/21	01:24	0.95	13.3		
142	SAN FRANCISCO BAR, CA	08/21	01:09	0.84	8.3		
029	POINT REYES, CA	08/21	01:08	1.83	8.3		

### CDIP California Swell Model

Wave Height (ft) and peak dir

Fri 2010-08-20 17:00 PDT

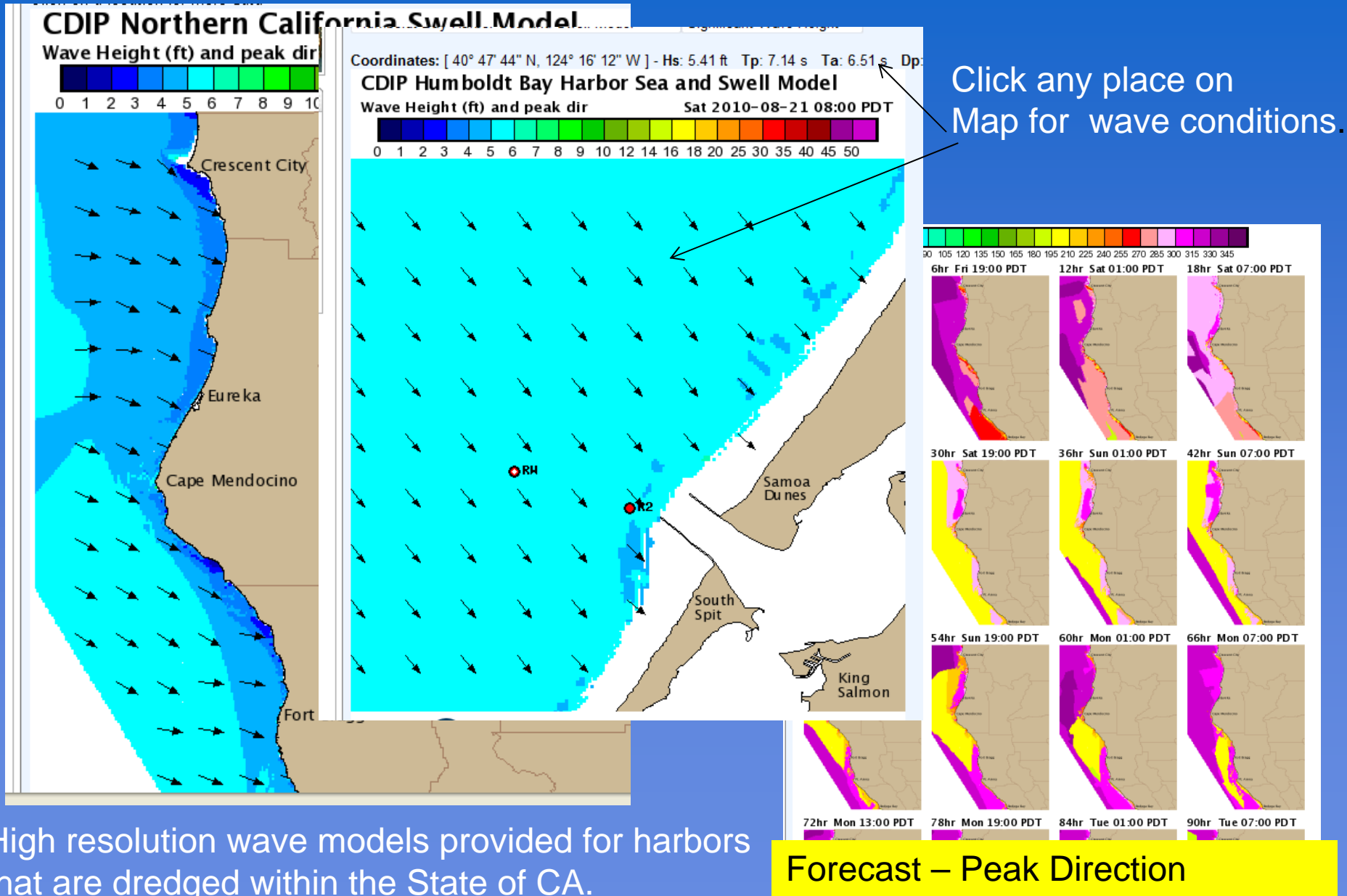




High  
Resolution  
Harbor &  
Port  
Models

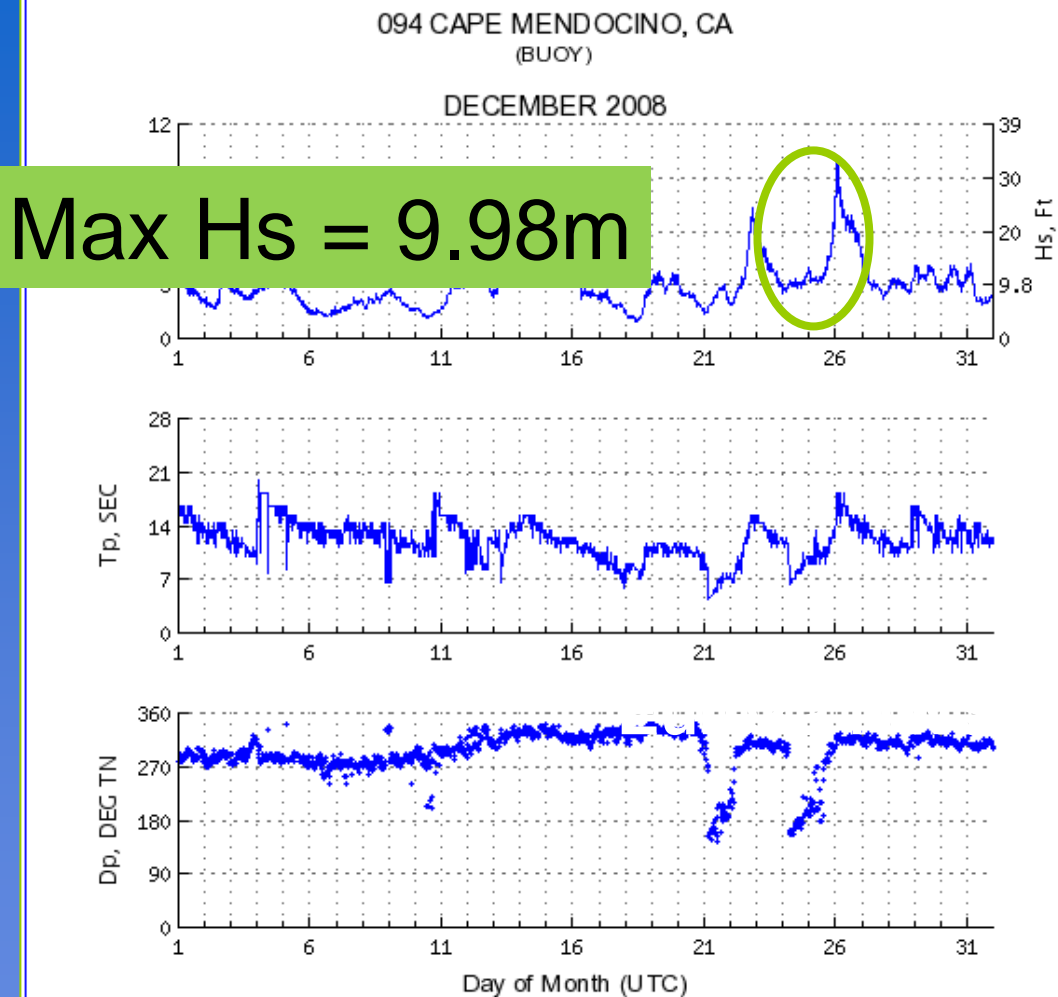
Update @  
Hour.

# Humboldt - Wave Map Browser





# PORT Of HUMBOLDT - Eureka



North Spit

South Spit

Cape Mendocino

CDIP providing detailed wave data for  
USACE San Francisco to be used for RSM.



# Humboldt Bay North Spit

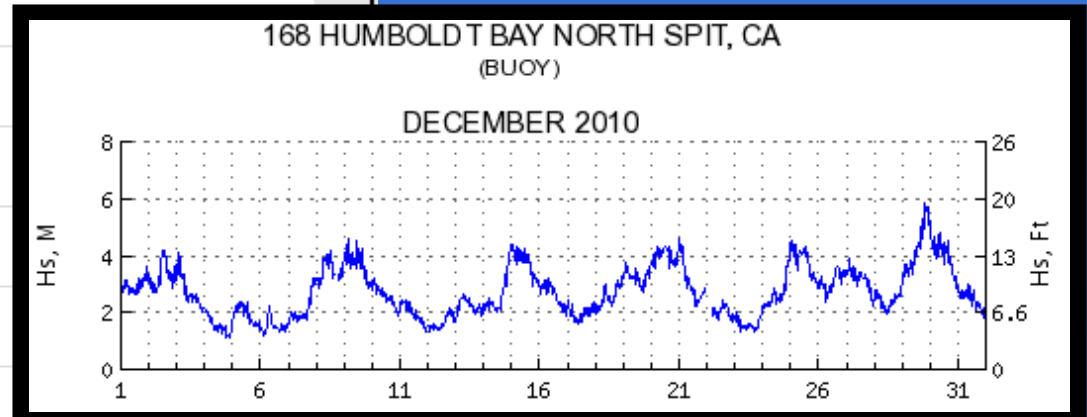
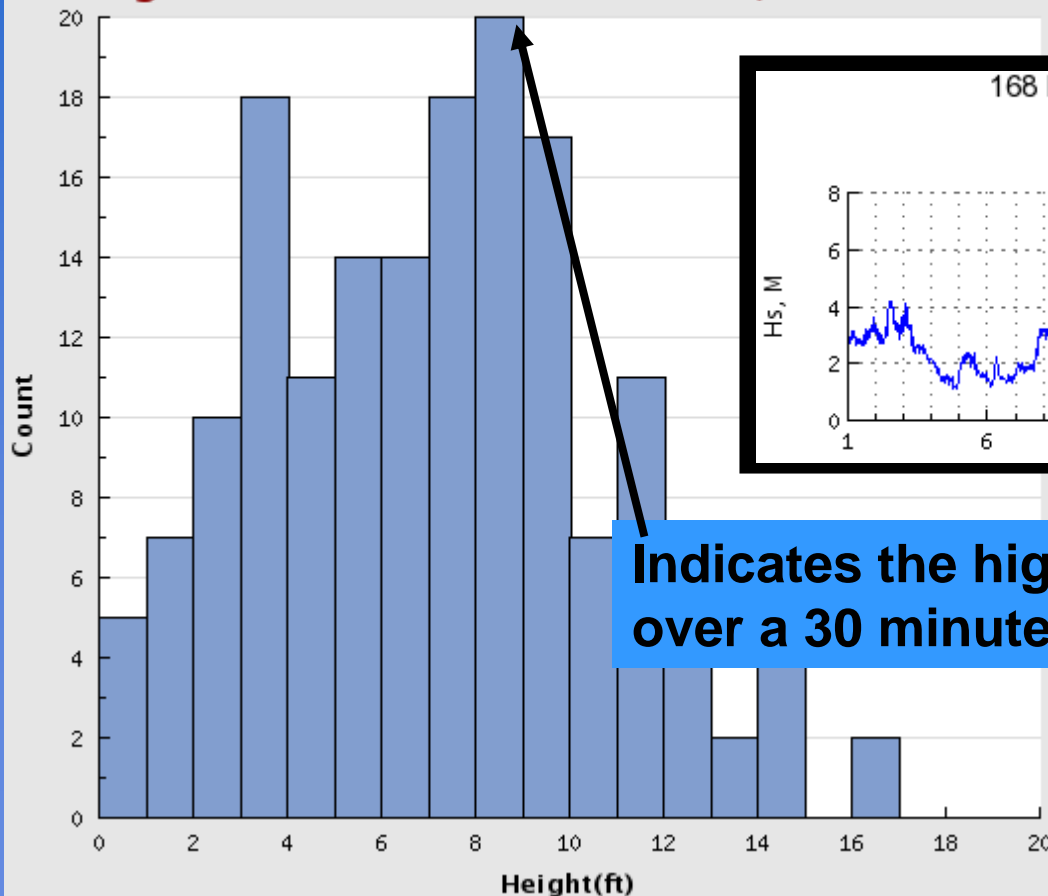
## ***SAFETY***

Station 168 trough-to-crest wave heights

Sample start time: 2011-01-18 17:55 UTC

**Largest wave: 16.70 ft**

**H1/10: 14.11 ft**

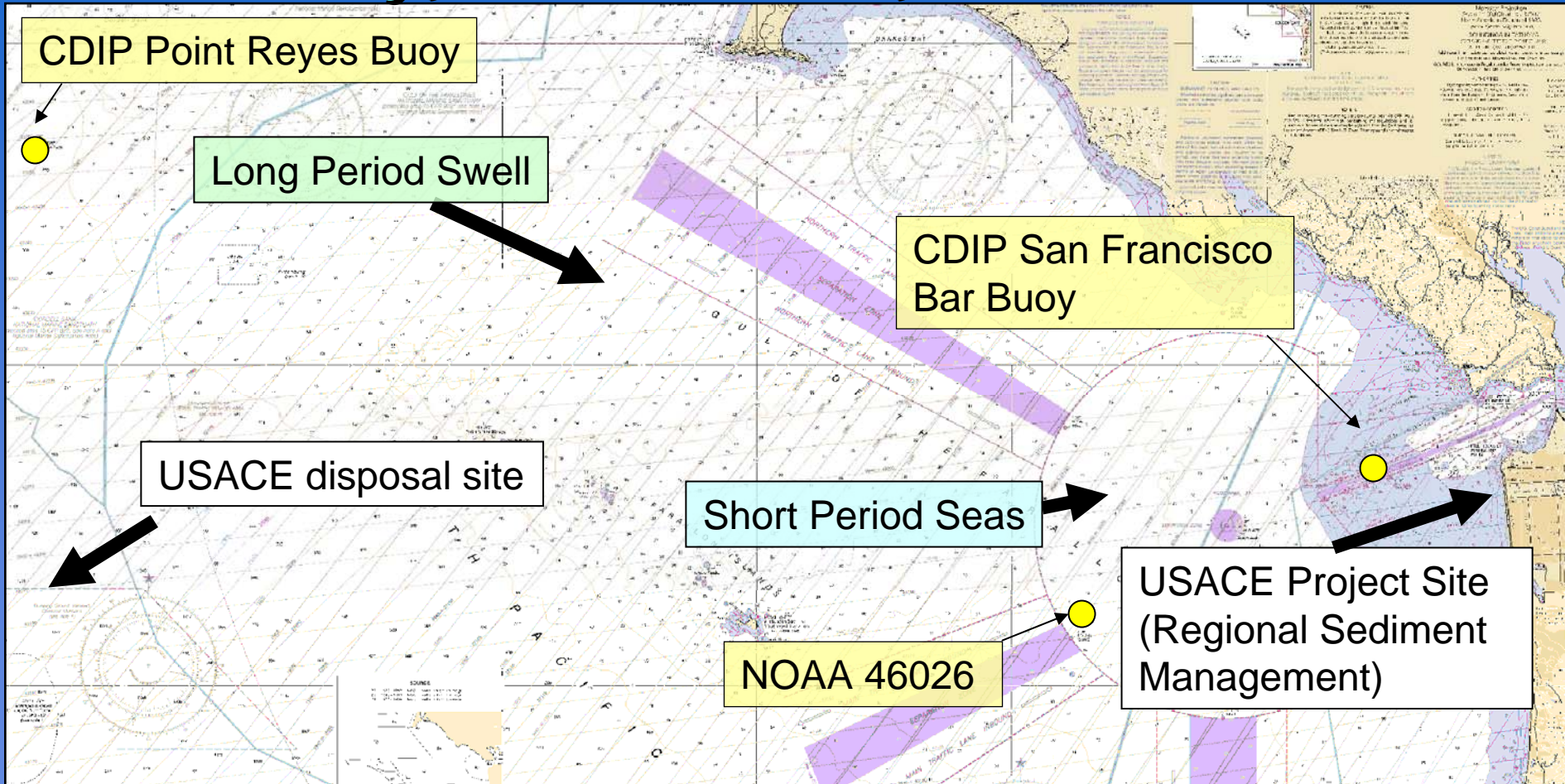


**Indicates the highest, single wave (xyz value) over a 30 minute interval.**

Customized product developed at the request of the Columbia River Bar Pilots.

# San Francisco

## *Safety, Economics, Environment*

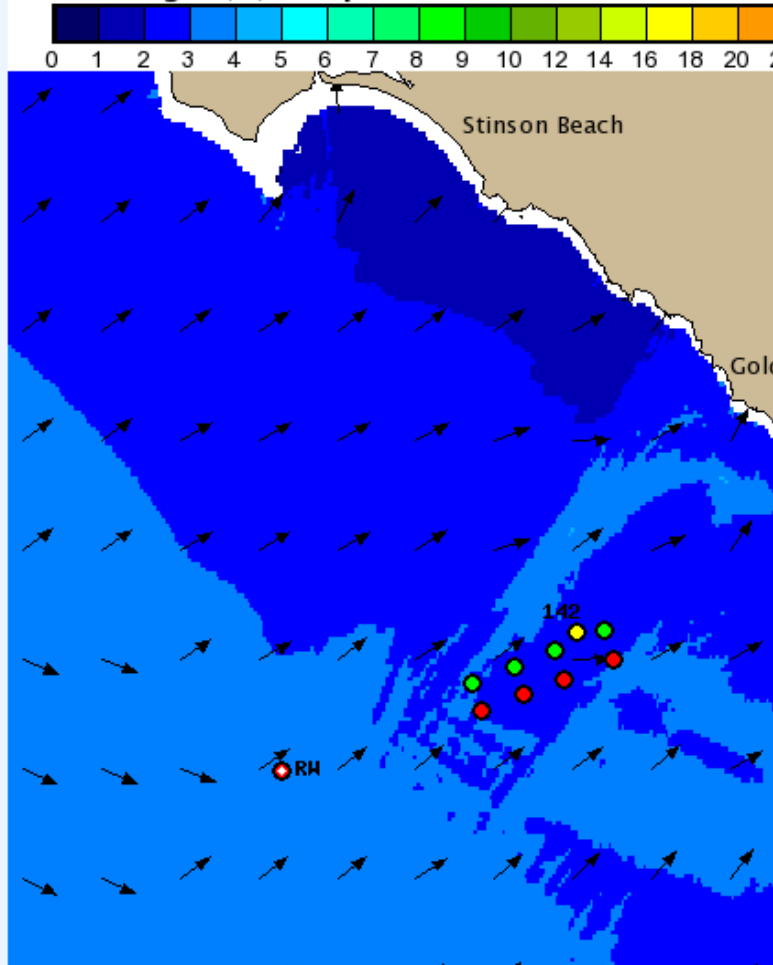


# San Francisco Wave Map Browser *Safety, Efficiency*

## CDIP Golden Gate Sea and Swell Model

Wave Height (ft) and peak dir

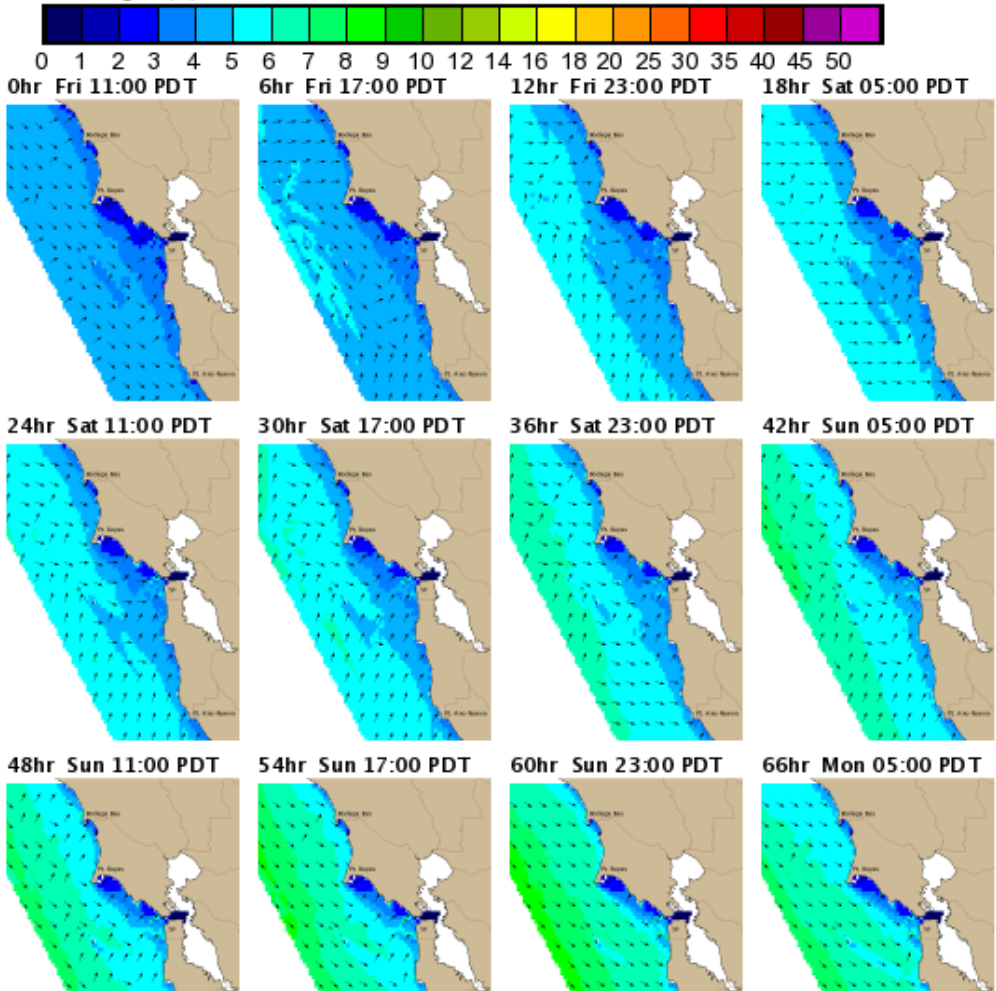
Fri 20



## CDIP San Francisco Bay Swell Forecast Model

Wave Height (ft)

Run: 2010-08-20 11:00 PDT



High Resolution wave model  
Providing information to Bar  
Pilots and Corps dredgers.





# San Francisco Bar Pilots

## *Safety & Efficiency*



SF NWS



*“This buoy allows for **safer** transits, **safer** pilot boat operations, and **efficiency** for the shippers that call at San Francisco Bay.”*

*Captain Bill Greig*

*“The valuable information available from this weather buoy plays a very crucial roll in my decision that relates to **safe** navigation of ships across the bar.”* *Captain Carl Martin, Jr.*

*“This station has been a great benefit to me as a San Francisco Bar Pilot in route planning and **risk assessment**.”*

*Captain H.W. Kenyon*

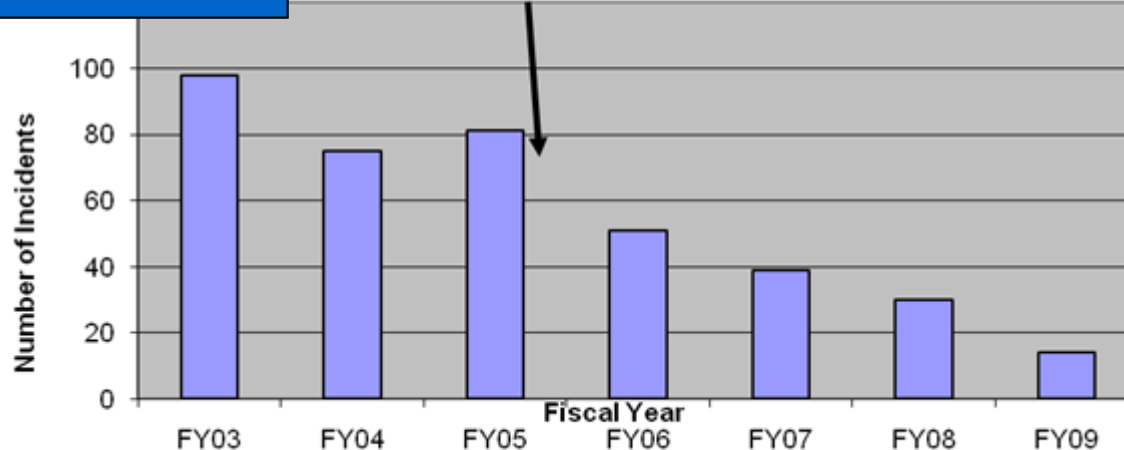


# San Francisco - ***SAFETY***

Fiscal Year (FY)	Surf Cases	IVO of SF Bar	Total
FY03	32	98	130
FY04	28	75	103
FY05	29	81	110
FY06	18	51	69
FY07	20	39	59
FY08	19	30	49
FY09	11	14	25
<b>TOTAL:</b>	<b>157</b>	<b>388</b>	<b>545</b>

## Marine Incidents (rescues) near SF Bar

Bar Forecast Begun by MTR



Data supplied by the Coast Guard. Assimilated and Disseminated by the SF NWS Office.

Incidents in the Vicinity of SF Bar (IVO)

# Pt. Reyes and SF Bar Deployments

## Contributions of “Services-in-Kind”



*Aspen – US Coast Guard*



*Mussel Shoals – UC Bodega/USGS*

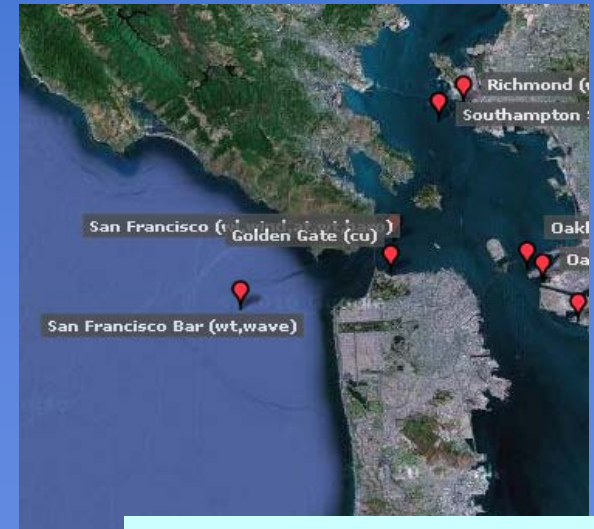
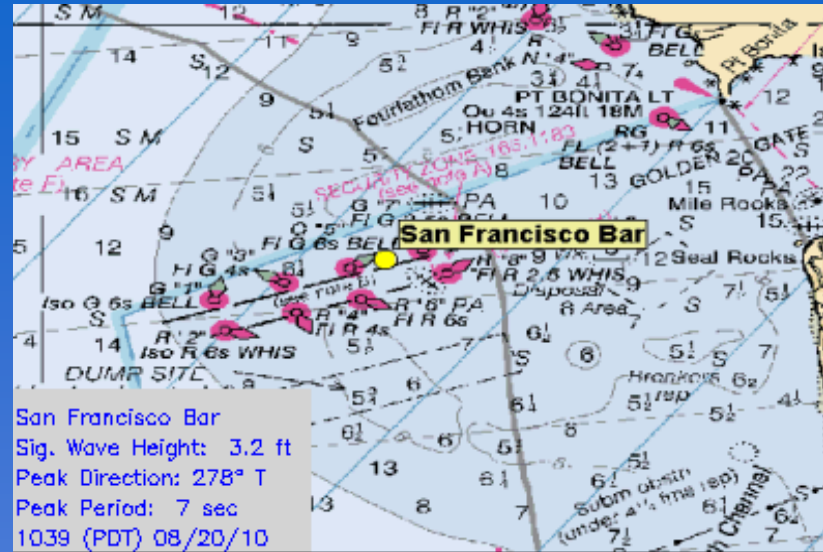


*Fulmar – National Marine Sanctuaries/CeNCOOS*

# CDIP WAVE DATA INTEGRATION WITH NOAA PORTS



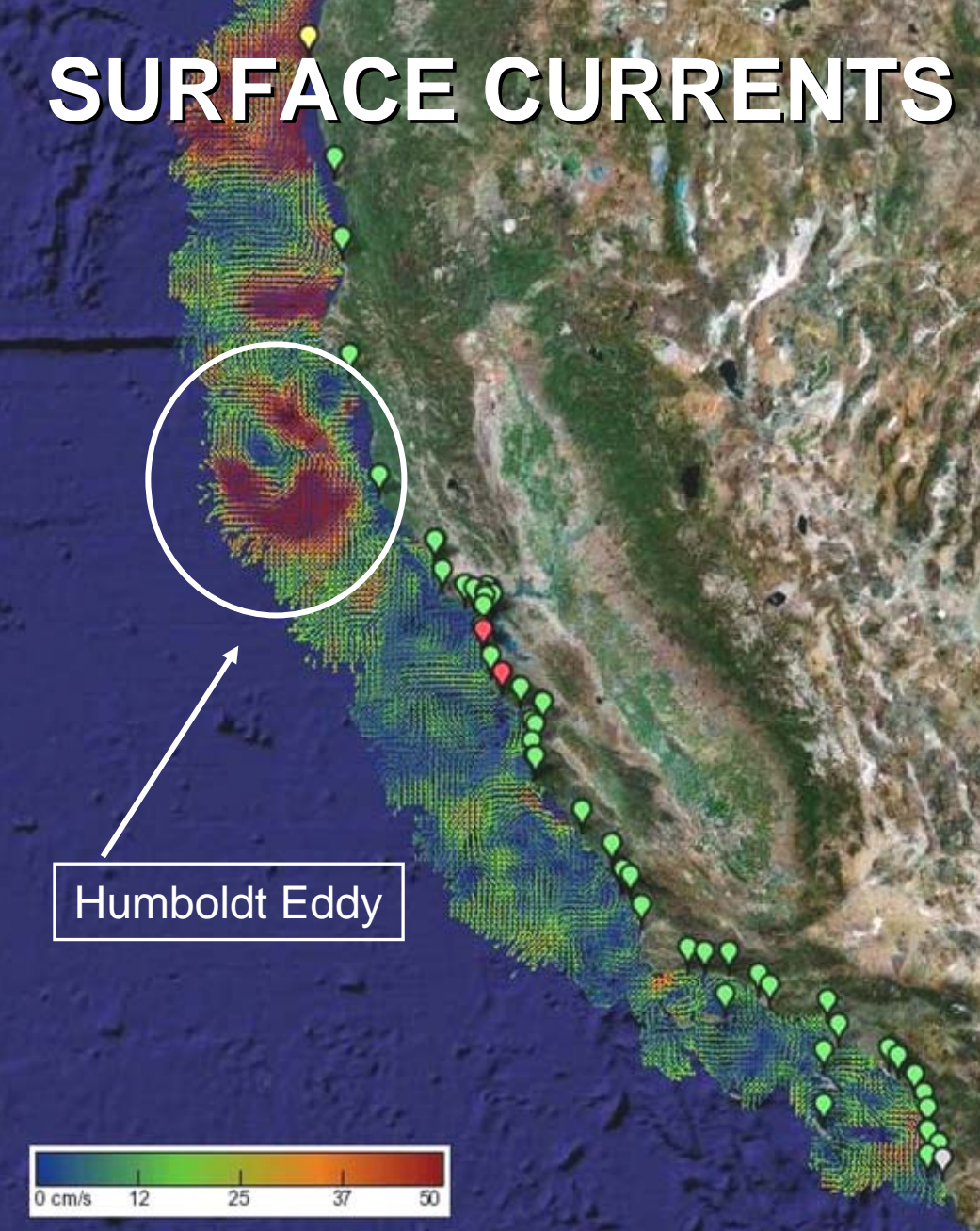
**LOS ANGELES / LONG BEACH**



**SAN FRANCISCO BAY**



# SURFACE CURRENTS





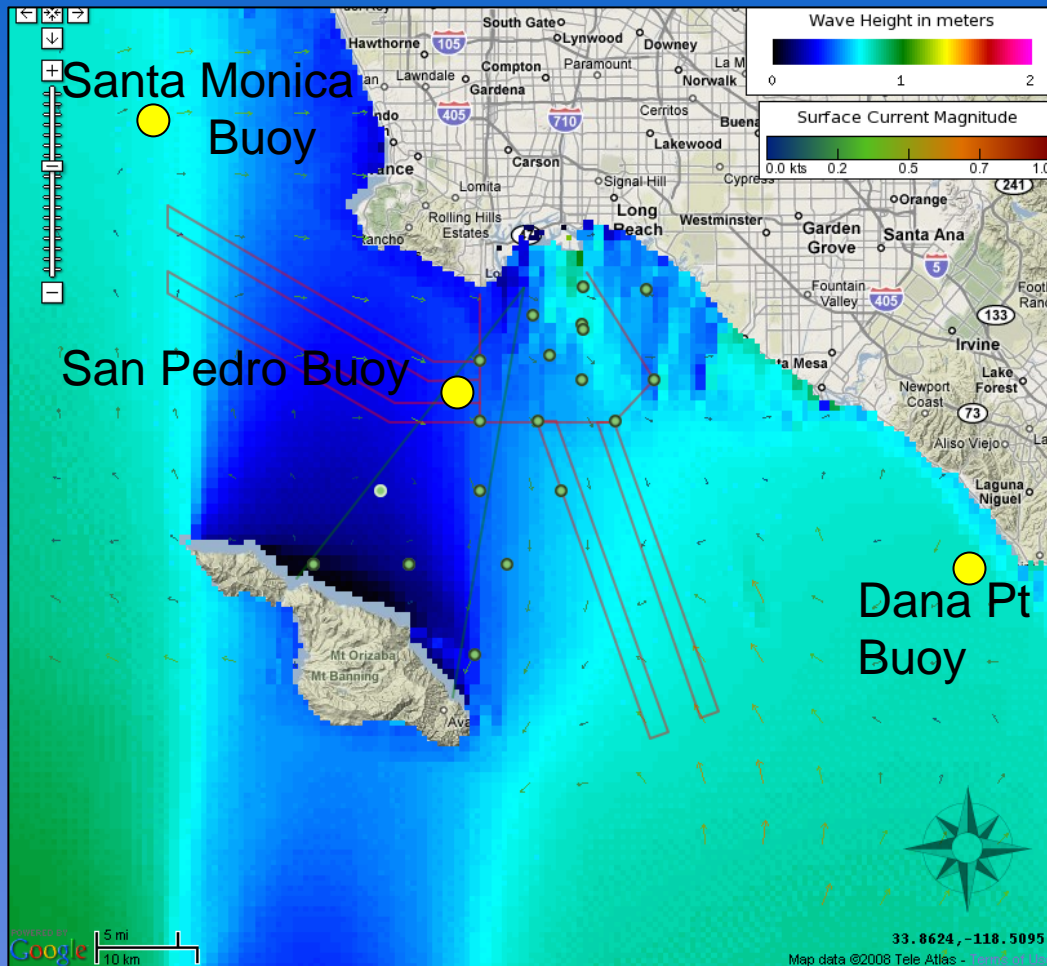
# SCCOOS Surface Currents



HF Radar, Santa Catalina provides surface currents



# Ports of LA/LB *Economics & Environment*



*CDIP providing wave observations, forecasts.*

*Southern California Coastal Observing System (SCCOOS) providing HF Radar surface currents*

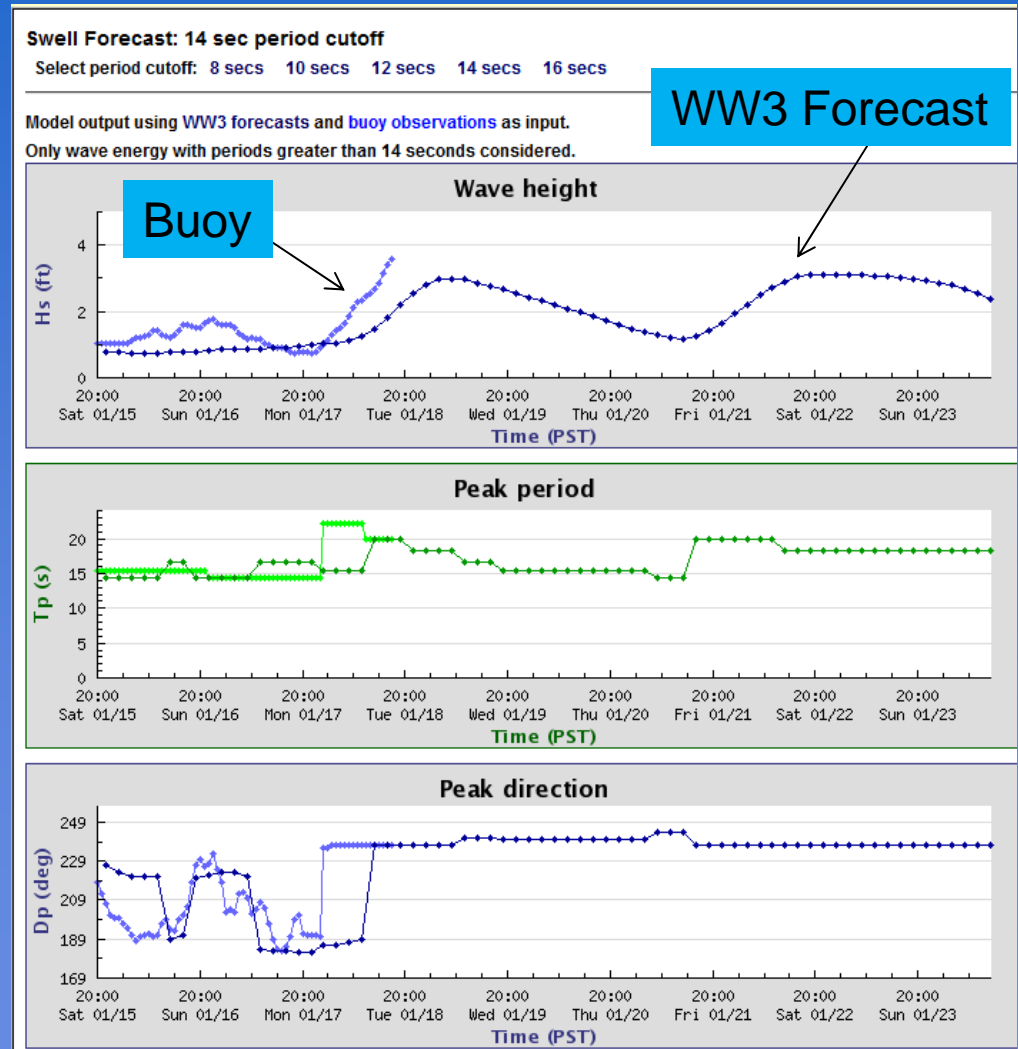
**USACE - LAD**  
**Catalina Express**  
**Los Angeles Bar Pilots**  
**Long Beach Bar Pilots**  
**NOAA - Navigation**  
**San Pedro Marine Exchange**  
**Sause Brothers**  
**US Coast Guard**

<http://www.sccoos.org/data/harbors/lalb/fullscreen.php>

# Port of Long Beach – Jacobsen Pilots

3 day alert messaging for long period (10-22 sec), energetic wave forecast.

Long super tankers will start to pitch in long period waves, Thus creating a possible under-keel clearance problem.





# How can CDIP & the Ocean Observing Systems better serve the Maritime Community?

<http://cdip.ucsd.edu>

<http://sccoos.org>

