

Oceanography Lab Practice Final

MEASURING AND ANALYZING OCEAN SWELL AT OCEANSIDE PIER

Directions: Use the following Oceanside pier-measured swell data to answer questions 1 through 5.

DATA: Average wave speed = **22 feet per second**. Average wave period = **18 second interval**. Average swell height = **6 feet tall**. Water depth is **16 feet deep**. Wave direction is from the **Southwest**.

- 1. What is the calculated wavelength for the above measured swell? (Use formula)**
 - a) 436 feet
 - b) 396 feet
 - c) 280 feet
 - d) 162 feet
 - e) 94 feet

- 2. What is the wave-base depth for the above measured swell? (Use formula)**
 - a) 218 feet
 - b) 198 feet
 - c) 140 feet
 - d) 81 feet
 - e) 47 feet

- 3. What is the approximate wavelength for this swell when it was a deep-water wave? (Check handout)**
 - a) 1940 feet
 - b) 1645 feet
 - c) 1284 feet
 - d) 955 feet
 - e) 528 feet

- 4. What is the wave speed (meters/second) for this swell in deep water? (Check deep water handout)**
 - a) 27 meters/second
 - b) 22 meters/second
 - c) 16 meters/second
 - d) 12 meters/second
 - e) 7 meters/second

- 5. The shoreline faces due West. Which direction will the longshore current most likely flow in the surf zone for the specific swell listed above swell?**
 - a) The longshore current will move south to north.
 - b) The longshore current will move north to south.
 - c) A longshore current will most likely not develop.
 - d) The above data insufficient for a longshore current prediction.

SOUTHERN CALIFORNIA COASTAL SWELL MODELS ANALYSIS

Directions: Use the CDIP Buoy Wave Model Chart (end of test) for the Southern California Bight (see separate handout) to answer questions 6 through 9 below.

6. **What is the maximum wave height of the larger deep water swell?** (listed in the CDIP data table)
- a) Between 0 and 2 feet
 - b) Between 3 and 6 feet
 - c) Between 7 and 10 feet
 - d) Between 11 and 14 feet
 - e) 15 feet and over
7. **What is the wave period of the larger swell?** (listed in the CDIP data table)
- a) Less than 6 seconds
 - b) Between 7 and 12 seconds
 - c) Between 13 and 17 seconds
 - d) Between 18 and 21 seconds
 - e) 22 seconds or greater
8. **What is the predominant swell direction of the larger swell?** (listed in the CDIP data table)
- a) from due north (or within 5 degrees of due)
 - b) from the northwest
 - c) from due west (or within 5 degrees of due west)
 - d) from the southwest
 - e) from due south (or within 5 degrees of due south)
9. **The larger swell hitting the California coastline is not hitting Southern California coastline in the Santa Barbara coast nor the Los Angeles coast, but it does hit north of Point Conception, Orange County and San Diego County coastlines. What is the most influential reason why this is so?**
- a) Swell is being blocked by Pt Conception.
 - b) Swell is being blocked by offshore islands.
 - c) Swell angle is too steep.
 - d) Both a) and c)
 - e) Answers a), b) and c) all apply.

WATER WAVE TANK EXPERIMENTS

10. **Which of the following is NOT TRUE when ocean swell encounter increasingly-shallower sea bottom conditions in water depths that is less than wave base?**
- a) Wave speeds up
 - b) Wavelength shortens
 - c) Wave height increases
 - d) Wave period remains the same
 - e) Wave speed controlled by water depth.

11. When ocean swell approach an irregular shoreline, the refracted wave energy will _____.
a) concentrate in bays and spread out at the headlands
b) concentrate at the headlands and spread out in bays
c) be essentially the same, whether in the bay or at a headland.
12. Based on your experimental wave tank observations in lab of smaller versus larger waves' effects on a simulated beach (berm), which of the following statements is True?
a) Smaller waves build up the berm.
b) Larger waves build up the berm.
c) Smaller waves have a similar effect on berms compared to that of larger waves.
d) Larger waves create a summer profile.
e) Smaller waves create a winter profile.
13. Based on your experimental wave tank observations in lab of shallow water waves traveling in water of various depths, which of the following statements is FALSE?
a) The shallower the water, the faster the wave.
b) The shallower the water, the slower the wave.
c) The deeper the wave, the faster the wave.
d) Water depth has an effect on wave speed.
14. As the wave period increases, the wave's *speed, wavelength, and wave base* do what?
a) Wave speed increases; wavelength lengthens; wave base increases
b) Wave speed increases; wavelength shortens; wave base decreases
c) Wave speeds decreases; wavelength shortens; wave base increases
d) Wave speed decreases; wavelength lengthens; wave base decreases

TAMARACK BEACH PROFILING

15. Why were the two beach profiles that you measured at Tamarack beach so different?
a) One end of beach got replenished, the other not.
b) Waves only hit one end of beach; the other end lacks waves.
c) Longshore current effects in and around the adjacent jetties north and south of the beach.
d) Rip currents
e) Hey wait, the two profiles were very similar!
16. What time of year would you expect the two beach profiles at Tamarack to be most-likely the lowest, steepest, and narrowest, with the most cobbles?
a) February/March
b) August/October
c) Does not matter what time of year – typically the same.
17. Which side of the jetties does the beach sand naturally pile up over time?
a) North sides
b) South sides
c) Neither side – they are about the same.

18. You are in charge of beach replenishment for City of Carlsbad. To maximize the benefit (time span) of the replenishment sand for your city beaches, where would you place most the sand?

- a) At the north end of the city beaches
- b) Along the central city beaches
- c) At the south end of the city beaches
- d) Evenly distributed along the entire stretch of city beaches

19. You are in charge of jetty channel dredging for SDGE. To maximize the benefit (time span) of the dredging program for the jetty channels, where would you place most the sand?

- a) At the northside of the northern-most jetty
- b) At the southside of the northern-most jetty
- c) At the northside of the southern-most jetty
- d) At the southside of the southern-most jetty

STONESTEPS BEACH AND BLUFF EROSION AND SEAWALLS

20. A bluff top homeowner wants to minimize bluff erosion by building the CHEAPEST , long-lasting seawall, BUT also wants to minimize the seawall's direct effect on beach erosion. Which of the following is the best option?

- a) Armor the Bay Point Formation with a rebar-cement gunite anchor wall.
- b) Armor the Torrey Sandstone Formation with a 20-foot tall concrete gravity wall.
- c) Construct a rip-rap rock pile wall at the base of the Torrey Sandstone Formation.
- d) Hit Home Depot for a bunch of lumber and nails, and make a do-it-yourselfer seawall!

21. You are a sea bluff-top property owner that needs to armor your increasingly unstable bluff. What part of the bluff is the most important to protect?

- a) The top portion of the bluff.
- b) The center portion of the bluff.
- c) The base of the bluff.

22. Most of the seawalls built in San Diego North County were designed to directly armor/protect Which part of the shoreline system?

- a) The base of the bluff
- b) The upper parts of the bluff
- c) The beach
- d) The tide pools

23. Who is in charge of overseeing any sort of human construction efforts along California's coast?

- a) Federal government
- b) State government
- c) City of Encinitas
- d) Private homeowners
- e) California Coastal Commission.

24. Which of the following erosional agents is typically the ***greatest threat*** to bluff stability?
- a) Groundwater
 - b) Ocean waves hitting against the bluff (undercutting at base of the bluff)
 - c) Rain and surface water slope runoff
 - d) Wind
 - e) Animals

THE BIRCH AQUARIUM

25. The Scripps Institute of Oceanography has collected and cataloged millions of marine organisms over the last 100 years. Which of the following is NOT one of the 4 major groups of marine organisms that Scripps has collected?

- a) Geological
- b) Marine vertebrates
- c) Pelagic invertebrates
- d) Benthic Invertebrates
- e) Terrestrial vertebrates

26. What is the primary cause for the worldwide increase in coral reef bleaching?

- a) Increase in ocean acidity
- b) Increase in sea temperatures
- c) Increase in air temperature
- d) Increase in eutrophication

27. What is causing the increasing ocean acidity in our oceans?

- a) Increasing salinity
- b) Increasing dissolved oxygen
- c) Increasing dissolved carbon dioxide
- d) Increasing ocean temperature

28. Why is increasing ocean acidity bad for marine life?

- a) More difficult to build and maintain carbonate shell material
- b) Decline in fertility/reproduction
- c) Both a) and b) apply

29. Where is the geographic boundary between California's two coastal marine ecosystems?

- a) Dana Point in southern Orange County
- b) Palo Verde Península in LA County
- c) Point Conception north of Santa Barbara
- d) Cape Mendocino north of San Francisco

30. Which of the following physical factors makes California's offshore marine ecosystems so exceptionally productive?

- a) Upwelling
- b) Downwelling
- c) Warm waters

31. What is the most important marine physical factor that controls the variety and diversity of marine life off the West Coast?

- a) Salinity
- b) Dissolved oxygen
- c) Dissolved carbon dioxide
- d) Sunlight
- e) Water temperature

SWAMIS TIDE POOLS

32. What is useful about an INDEX organism found in a tide pool?

- a) Index organism controls the abundance of other organisms.
- b) Index organism helps in identifying the specific tide pool zone.
- c) Index organisms are used for classifying invertebrates.

33. Which tide pool zone generally has the harshest conditions?

- a) splash/upper zone
- b) middle zone
- c) lower zone

34. Buckshot barnacles and periwinkles are most concentrated in which tide pool zone?

- a) upper zone
- b) middle zone
- c) lower zone
- d) Evenly distributed across all three zones

35. Mussels and gooseneck barnacles are most concentrated in which tide pool zone?

- a) upper zone
- b) middle zone
- c) lower zone
- d) Evenly distributed across all three zones

SWAMIS BEACH SAND

36. The Swami's beach sand has _____ amounts of *Quartz* and _____ amounts of *Feldspar* than that of the source granite from which it was derived.

- a) higher; lower
- b) lower; higher
- c) Granite and the beach sand have similar amounts of both minerals
- d) Neither granite nor swamis beach sand have those two minerals.

37. What is the primary difference between the observed lighter- and darker-colored beach sands?

- a) Grain size
- b) Grain shape
- c) Proportion of quartz to magnetite
- d) Proportion of calcite to feldspar

38. What is the most **TYPICAL percentage of DARK mineral** in the Swamis Beach sand?
- a) 70% or greater
 - b) Somewhere between 40% and 60% (close to 50/50)
 - c) 30% or less
39. What is the **most abundant mineral** in the Swamis Beach sand?
- a) Magnetite
 - b) Quartz
 - c) Carbonate (calcite)
 - d) Clay
 - e) Feldspar
40. The percentage of quartz mineral _____ from the source region to the beach via rivers.
- a) decreases
 - b) increases
 - c) stays the same
 - d) There is no quartz – neither at the source, nor at the beach.

BATIQUITOS ESTUARY

41. What is the **specific geographic setting of an estuarine environment?**
- a) Open ocean shelf
 - b) Open ocean shoreline
 - c) Intertidal protected bay or lagoon
 - d) Intertidal lagoon or bay where a river empties into ocean
42. Which of the following is **NOT a halophyte?**
- a) Saltgrass
 - b) Sagegrass
 - c) Pickleweed
 - d) Cordgrass
43. Which of the following is **FALSE about San Diego's marine terraces?**
- a) The highest elevation terraces are the oldest.
 - b) The lowest elevation terraces are the oldest.
 - c) The lowest elevation terraces are nearest to the coastline.
 - d) The highest elevation terraces are furthest from the coastline.
 - d) All of San Diego's marine terraces were originally a shoreline..
44. Averaged over the entire year, which group of birds (resident or migratory) has the **LEAST number of species found in our estuaries?**
- a) Resident
 - b) Migratory
 - c) About equal
 - d) Hey, wait! All the birds in an estuary are resident birds
 - e) Hey, wait! All the birds in an estuary are migratory birds

THE OCEAN TIDES

Directions: Use the two attached tide charts (at end of test) to answer questions 45 to 54.

- 45. California has which type of tide?**
- a) Diurnal
 - b) Semidiurnal
 - c) Mixed
- 46. What part of the monthly lunar tidal cycle occurs mid-December 2019?**
- a) Neap
 - b) Spring
- 47. When will the tomorrow's high-high tide occur in Gaviota, CA?**
- a) At about the same time as today's high-high tide.
 - b) About 30 minutes later than today's high-high tide.
 - c) About 30 minutes earlier than today's high-high tide.
 - d) San Diego shorelines do not experience high-high tides
- 48. Which type of tide occurs in the late afternoon in Gaviota, CA on December 13?**
- a) A high-high tide.
 - b) A low-high tide.
 - c) A high-low tide.
 - d) A low-low tide.
- 49. Which of the following locations would you expect a given tide to have the largest amplitude (and range) along North America's west coast?**
- a) Alaska
 - b) Washington
 - c) Northern California
 - d) Southern California
- 50. For a given tide on a specific day, that tide would occur FIRST at which of these locations along North America's west coast?**
- a) Alaska
 - b) Washington
 - c) Northern California
 - d) Southern California
- 51. Based on the tide chart data, which of the two tide locations listed on the attached tide charts has the EARLIER FIRST HIGH TIDE?**
- a) Gaviota,, CA
 - b) Crescent City, CA
 - c) The two locations have similar tide times.

52. Based on the tide chart data, which of the two tide locations listed on the attached tide charts has the **GREATERTIDE RANGE**?

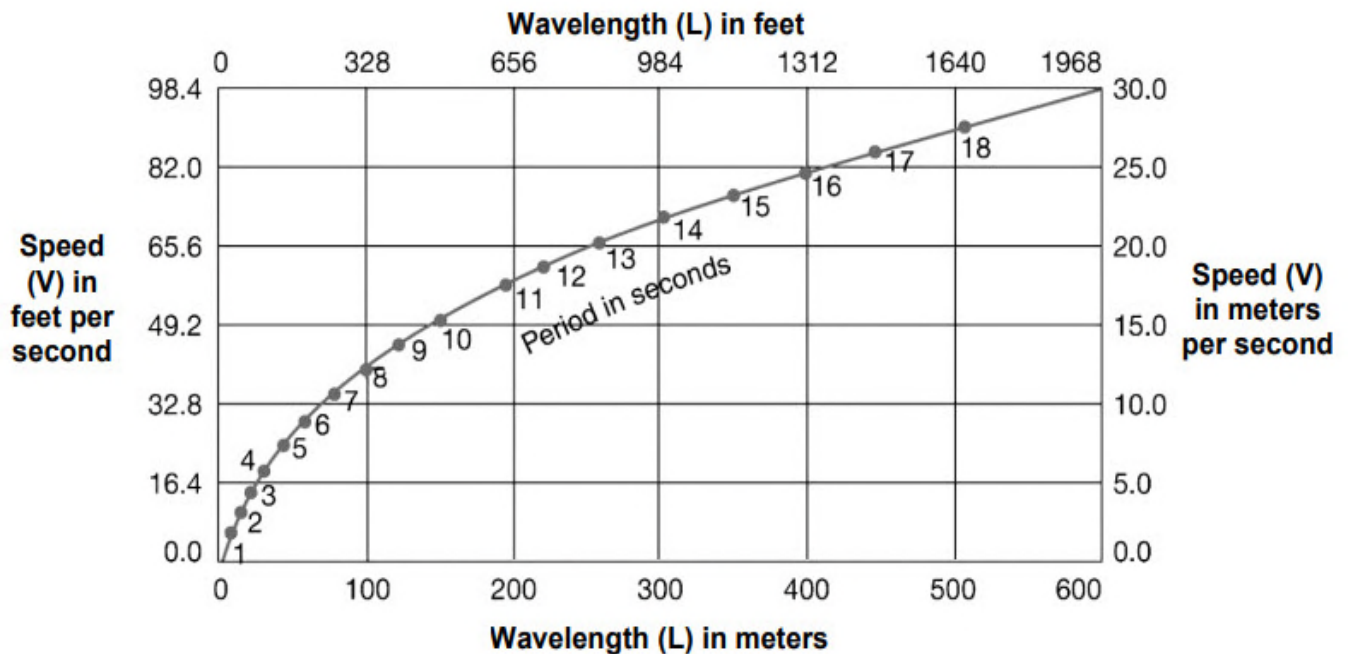
- a) Gaviota,, CA
- b) Crescent City, CA
- c) The two locations have similar tide ranges

53. Based on the tide chart data, which of the two tide locations listed on the attached tide charts is **located further south**?

- a) Gaviota,, CA
- b) Crescent City, CA
- c) Cannot tell from the tide chart data

54. Based on the tide chart data, which of the two tide locations listed on the attached tide charts is **located furthest away** from the local amphidromic node (no tide point) located between the **West Coast and Hawaii**?

- a) Gaviota,, CA
- b) Crescent City, CA
- c) CANNOT TELL FROM THE TIDE CHART DATA



Deep - Water Wave Chart

December 2019 Tides Chart for Gaviota, CA

Gaviota, CA - Dec 2019

Date		High				Low				☀		☾
		AM	ft	PM	ft	AM	ft	PM	ft	Rise	Set	Moon
1	Sun	2:25	3.5	11:51 AM	4.7	6:01	3.2	7:47	0.1	6:47	4:52	☾
2	Mon	3:37	3.7	12:48	4.2	7:27	3.3	8:43	0.4	6:48	4:51	☾
3	Tue	4:28	3.9	2:03	3.8	9:35	3.1	9:39	0.6	6:49	4:51	☾
4	Wed	5:03	4.1	3:35	3.5	11:03	2.6	10:27	0.8	6:50	4:51	☾
5	Thu	5:32	4.4	4:55	3.4	11:54	2.1	11:08	1.0	6:51	4:51	☾
6	Fri	5:58	4.7	6:01	3.4	12:35 PM	1.5	11:44	1.2	6:52	4:51	☾
7	Sat	6:24	5.0	6:58	3.4			1:11	0.9	6:52	4:51	☾
8	Sun	6:50	5.3	7:48	3.5	12:18	1.4	1:46	0.3	6:53	4:51	☾
9	Mon	7:17	5.6	8:33	3.6	12:51	1.5	2:20	-0.1	6:54	4:52	☾
10	Tue	7:46	5.8	9:16	3.6	1:24	1.7	2:55	-0.5	6:55	4:52	☾
11	Wed	8:15	6.0	10:00	3.6	1:56	1.9	3:31	-0.8	6:55	4:52	☾
12	Thu	8:47	6.1	10:46	3.5	2:29	2.1	4:09	-1.0	6:56	4:52	☾
13	Fri	9:20	6.1	11:37	3.5	3:03	2.3	4:50	-1.0	6:57	4:52	☾
14	Sat	9:58	5.9			3:40	2.5	5:34	-1.0	6:58	4:53	☾
15	Sun	12:32	3.5	10:41 AM	5.6	4:27	2.7	6:21	-0.8	6:58	4:53	☾
16	Mon	1:30	3.6	11:33 AM	5.2	5:32	2.8	7:11	-0.5	6:59	4:53	☾
17	Tue	2:27	3.8	12:38	4.6	6:56	2.8	8:04	-0.2	6:59	4:54	☾
18	Wed	3:22	4.1	1:58	4.1	8:40	2.6	9:02	0.2	7:00	4:54	☾
19	Thu	4:10	4.6	3:34	3.6	10:22	2.0	9:59	0.5	7:01	4:54	☾
20	Fri	4:55	5.0	5:07	3.4	11:36	1.1	10:53	0.9	7:01	4:55	☾
21	Sat	5:37	5.5	6:27	3.4	12:34 PM	0.3	11:42	1.2	7:02	4:55	☾
22	Sun	6:18	5.9	7:35	3.5			1:26	-0.4	7:02	4:56	☾
23	Mon	6:59	6.2	8:32	3.6	12:29	1.4	2:13	-0.9	7:03	4:56	☾
24	Tue	7:40	6.4	9:23	3.7	1:15	1.7	2:57	-1.3	7:03	4:57	☾
25	Wed	8:18	6.4	10:11	3.6	1:58	1.9	3:39	-1.4	7:03	4:58	☾
26	Thu	8:56	6.3	10:58	3.6	2:40	2.1	4:20	-1.3	7:04	4:58	☾
27	Fri	9:31	6.0	11:47	3.6	3:20	2.3	5:00	-1.1	7:04	4:59	☾
28	Sat	10:07	5.6			4:01	2.4	5:40	-0.8	7:05	4:59	☾
29	Sun	12:36	3.5	10:43 AM	5.2	4:45	2.6	6:18	-0.4	7:05	5:00	☾

December 2019 Tides Chart for Crescent City, CA

Crescent City, CA - Dec 2019

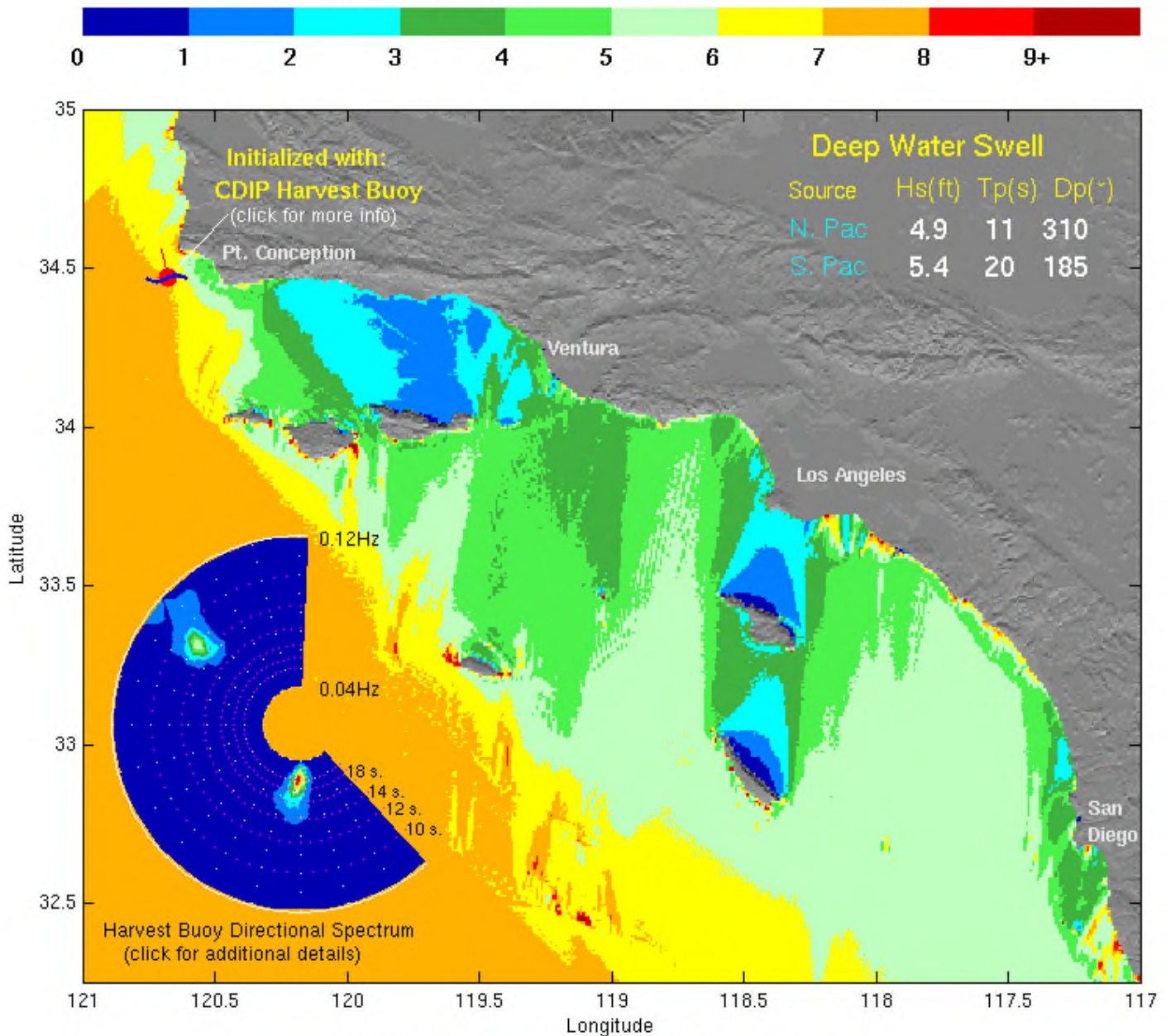
Date		High				Low				☀️		🌙
		AM	ft	PM	ft	AM	ft	PM	ft	Rise	Set	Moon
1	Sun	3:28	5.9	2:04	6.4	8:34	3.6	9:16	0.1	7:22	4:48	🌑
2	Mon	4:23	5.8	2:58	5.8	9:39	3.7	10:06	0.6	7:23	4:48	🌑
3	Tue	5:17	5.9	4:02	5.3	10:54	3.6	10:58	1.0	7:24	4:48	🌑
4	Wed	6:07	5.9	5:18	4.9	12:09 PM	3.2	11:50	1.5	7:25	4:48	🌑
5	Thu	6:51	6.1	6:38	4.8			1:14	2.7	7:26	4:47	🌑
6	Fri	7:29	6.4	7:49	4.8	12:41	1.8	2:06	2.1	7:27	4:47	🌑
7	Sat	8:03	6.6	8:51	5.0	1:28	2.1	2:50	1.5	7:28	4:47	🌑
8	Sun	8:35	6.9	9:43	5.2	2:12	2.4	3:28	0.8	7:29	4:47	🌑
9	Mon	9:06	7.2	10:30	5.5	2:53	2.7	4:05	0.2	7:30	4:47	🌑
10	Tue	9:39	7.5	11:14	5.7	3:33	2.9	4:41	-0.3	7:31	4:47	🌑
11	Wed	10:13	7.7	11:57	5.9	4:13	3.1	5:18	-0.7	7:32	4:47	🌑
12	Thu	10:49	7.8			4:53	3.2	5:57	-1.0	7:33	4:47	🌑
13	Fri	12:40	6.0	11:28 AM	7.9	5:35	3.3	6:38	-1.1	7:33	4:48	🌑
14	Sat	1:25	6.1	12:10	7.8	6:20	3.4	7:21	-1.1	7:34	4:48	🌑
15	Sun	2:12	6.1	12:56	7.5	7:10	3.4	8:07	-0.9	7:35	4:48	🌑
16	Mon	3:01	6.2	1:48	7.1	8:07	3.4	8:55	-0.6	7:35	4:48	🌑
17	Tue	3:52	6.3	2:48	6.5	9:14	3.3	9:47	-0.1	7:36	4:49	🌑
18	Wed	4:44	6.5	4:00	6.0	10:30	3.0	10:41	0.5	7:37	4:49	🌑
19	Thu	5:36	6.8	5:23	5.5	11:49	2.4	11:38	1.1	7:37	4:49	🌑
20	Fri	6:26	7.1	6:50	5.3			1:02	1.7	7:38	4:50	🌑
21	Sat	7:14	7.5	8:11	5.4	12:36	1.7	2:05	0.8	7:38	4:50	🌑
22	Sun	8:00	7.8	9:21	5.6	1:34	2.2	3:00	0.0	7:39	4:51	🌑
23	Mon	8:45	8.1	10:20	5.9	2:29	2.6	3:49	-0.6	7:39	4:51	🌑
24	Tue	9:28	8.2	11:13	6.1	3:22	2.9	4:35	-1.0	7:40	4:52	🌑
25	Wed	10:11	8.2			4:12	3.1	5:18	-1.2	7:40	4:52	🌑
26	Thu	12:00	6.2	10:53 AM	8.1	5:00	3.2	6:00	-1.2	7:41	4:53	🌑
27	Fri	12:45	6.3	11:34 AM	7.8	5:46	3.3	6:40	-1.0	7:41	4:54	🌑
28	Sat	1:27	6.3	12:15	7.5	6:31	3.4	7:20	-0.7	7:41	4:55	🌑
29	Sun	2:09	6.2	12:56	7.1	7:17	3.4	7:59	-0.3	7:41	4:55	🌑
30	Mon	2:51	6.2	1:38	6.5	8:06	3.5	8:38	0.2	7:42	4:56	🌑

CDIP Chart



Analysis Time – 4 MAY 2015 : 0602 PST

Swell Height (ft) – Southern California Bight



Additional Information @ <http://cdip.ucsd.edu/>



California Department
of
Boating and Waterways



U.S. Army Corps of Engineers
Field Wave Gaging Program



Office of Naval Research
Advanced Wave
Prediction Program