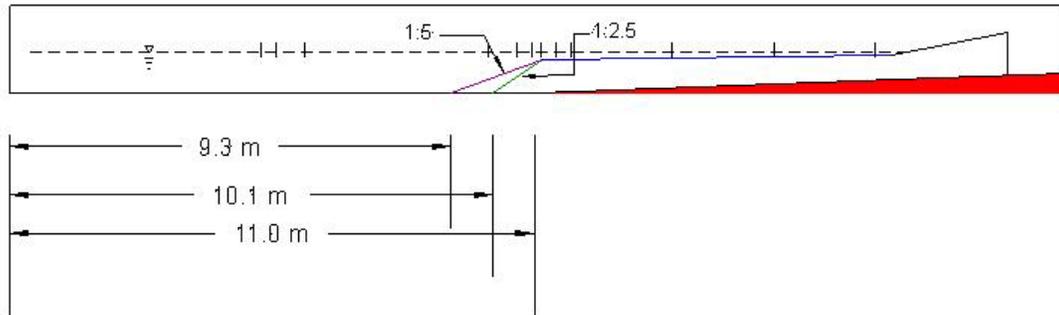


## OVERVIEW OF TWO-DIMENSIONAL REEF EXPERIMENTS

The SWIMS 2D Reef Experiments were conducted in a 3-ft wide flume at 1:50 model to prototype scale, shown in the figure below and in “**Flume\_sketch\_meters.jpg**”. (The figure also is given in English units in “**Flume\_sketch\_ft.jpg**”).



The goal of the experiments was to collect wave and runup data over a range wave heights and periods, water levels, and reef roughnesses. The initial tests were performed in collaboration with the University of Florida (UF). As part of their research, UF provided and installed ADVs and an ADCP in the flume for the unpainted, or smooth bottom, portion of the experiment. Following these tests, the wavemaker failed and was repaired. Subsequent tests couldn't produce waves as high as the original tests. Therefore, the unpainted tests were repeated for the wave conditions it could produce. Data sets from the UF tests and post-repair tests are included. The following paragraphs describe the test conditions, bottom bathymetry, and data collected.

### Test Conditions

Forty-two design (target) wave conditions were generated for each slope, which are shown in the following table and in file “**Design\_Waves\_2D.doc**”. The values in the table are given in prototype units with the corresponding model units given in parenthesis. However, all results are given in model meters. The design conditions include three water levels; 0.490 m (hi), 0.439 m (mid), and 0.415 m (lo).

### SWIMS 2D Reef Design Wave Conditions in Prototype m (Model, m)

	$h=20.8$ m (0.415 m)	$h=21.9$ m (0.439 m)	$h=24.5$ m (0.490 m)
$T_p$ sec	$H_i$ m (m)	$H_i$ m (m)	$H_i$ m (m)
7 (0.99)	4.2 (0.084)	3.9 (0.079)	4.1 (0.081)
7 (0.99)	5.2 (0.103)	5.2 (0.104)	5.2 (0.104)
10 (1.41)	4.5 (0.090)	3.8 (0.076)	4.6 (0.091)
10 (1.41)	5.7 (0.115)	6.0 (0.121)	6.1 (0.122)
10 (1.41)	6.9 (0.137)	6.8 (0.137)	6.9 (0.138)
13 (1.84)	5.5 (0.110)	4.4 (0.088)	4.6 (0.092)
13 (1.84)	6.1 (0.122)	6.0 (0.120)	6.1 (0.122)
13 (1.84)	7.5 (0.149)	7.5 (0.149)	7.7 (0.154)
16 (2.26)	5.5 (0.109)	4.6 (0.091)	4.6 (0.092)
16 (2.26)	6.1 (0.122)	6.0 (0.120)	6.1 (0.122)
16 (2.26)	7.6 (0.152)	7.7 (0.155)	7.7 (0.155)
20 (2.83)	5.2 (0.104)	4.2 (0.084)	4.4 (0.088)
20 (2.83)	6.2 (0.124)	6.0 (0.120)	6.1 (0.122)
20 (2.83)	8.0 (0.160)	6.9 (0.138)	8.0 (0.160)
20 (2.83)	-	8.0 (0.160)	-

Values in parenthesis refer to values in model seconds and meters

Twelve wave gauges and one runup gauge (listed as Gauge 13) were installed during the tests. Wave gauge locations given as distance in meters from the wave maker are shown in the following table for the 1:2.5 and 1:5 reef slope.

### SWIMS 2D Reef Wave Gauge Locations

Gauge	x, Distance from Wall (m)	y, Distance from Wave Maker (m)	
		1:2.5 slope	1:5 slope
1	0.46	4.82	4.82
2	0.46	5.13	5.13
3	0.46	5.74	5.74
4	0.30	9.72	8.77
5	0.30	10.64	10.19
6	0.30	10.84	10.63
7	0.30	11.02	11.02
8	0.30	11.35	11.35
9	0.30	11.66	11.66
10	0.30	12.83	12.83
11	0.30	14.68	14.68
12	0.30	17.73	17.73
13 (Runup)	0.30	18.32	18.32

### Bathymetry

A partition was placed in the flume to produce a 2-ft wide test section beginning at the toe of the reef slope to the shoreward end of the reef. The reef consists of either a 1:2.5 or a 1:5 reef slope, a 24-ft long reef section constructed of molded acrylic to represent reef bathymetry, and a 1:10 nearshore slope. Bathymetry of the flume and reef are given in files “flume\_mm25.dat”, and “flume\_mm50.dat”, which gives xyz

coordinates in model dimensions in meters for the 1:2.5 and 1:5.0 slope, respectively. The origin of the bathymetry is at the wave maker, with x positive in the onshore direction and y longshore across the flume width. The reference depth in the files represents the depth at the mid-water level.

## Results

A total of 310 runs were made for the experiment, of which 252 tests were used for analysis. The data presented include 84 tests each for the unpainted and painted reef surfaces and an additional 84 tests associated with the UF experiments on the unpainted reef. A description of each run is given in the spreadsheet “**Log\_book\_2D.xls**”. Some of the runs were repeated and runs highlighted in gray in the spreadsheet are not presented in the data summary. Data were collected at 20 Hz for 20 minutes.

Wave upcrossing, spectral and wave reflection analysis were performed for each test. The analysis summary files for each run are located in zip files categorized by reef slope and water level. The naming convention of the data files refers the target prototype wave condition. For example, the summary file “**SR2DT20H25\_hi95\_sum.dat**” refers to the summary file for a 20 sec period and 25 ft target incident wave height at the high water level, Run 95. The prefix “SR” indicates the test was performed on the unpainted or “smooth reef.” Tests performed on the painted bathymetry or “roughened reef” are denoted by “RR.” A plot of wave height and mean water level as a function of distance for each wave condition also is included in the zip files.

Time series of each run is presented in ascii format in a separate zip file categorized by slope and water level and using the same naming convention with “a” replacing “sum”: “**SR2DT20H25\_hi95\_a.dat**”. Each file contains 14 columns; Column 1 consists of the time step of each measurement, Columns 2 through 13 contain water surface measurements from the wave gauge, and Column 14 includes water surface elevations from the runup gauge. The runup gauge measurements were converted from distance along the 1 on 10 foreshore slope to elevation with respect to the swl.

The still water level for the low-water experiments was lower than the elevations of Wave Gauge 12 and the runup gauge, i.e., the gauges were out of the water at the onset of the test. Mean water levels recorded for these gauges were adjusted by adding the elevation difference between the particular gauge and the still water elevation. In tests where these gauges didn’t record measurements or recorded a negative mean, the mwl was listed as -999.00. Additionally, negative values in the time series of these gauges were replaced with -999.00. The elevations at the gauges and the correction applied to the raw data are listed in the following table.

### Elevation and mwl correction for low water level (swl = 0.415 m)

Gauge	Elevation (m)	Correction (m)
12	0.4312	+0.0162
13 (runup)	0.4300	+0.0150