

GROUND TRUTH MEASUREMENTS FOR THE LITTORAL REMOTE SENSING PROGRAM

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LONG-TERM GOAL

The goal of this effort is to provide ground truth coastal oceanographic and meteorologic field measurements in support of ONR's Littoral Remote Sensing Program. The observations were collected by the Field Research Facility (FRF) (Figure 1) of the U.S. Army Engineer Waterways Experiment Station located in Duck, NC. The measurements culminated in 1997 with coverage during the SandyDuck Nearshore Field Experiment, a comprehensive study of the nearshore environment cosponsored by the Coastal Dynamics Program of ONR, the U.S. Army Corps of Engineers and the U.S. Geological Survey.

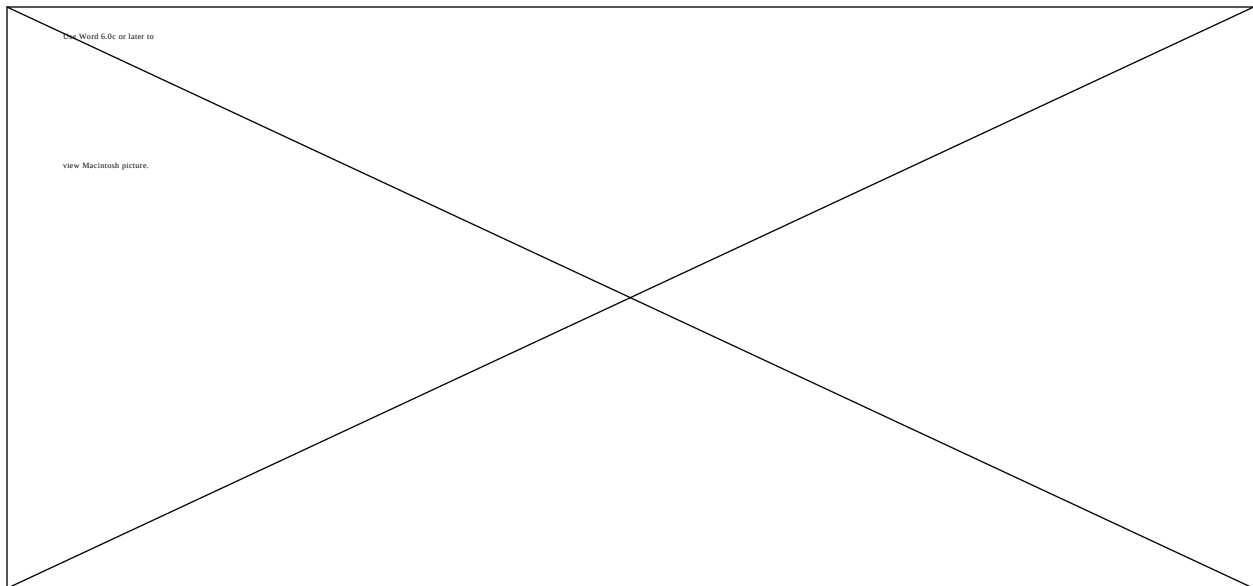


Figure 1. U.S. Army Corps of Engineers Field Research Facility in Duck, NC

SCIENTIFIC OBJECTIVES

The objectives were to provide continuous measurements from April 1996 to October 1997 of scientifically useful parameters that characterize the nearshore zone. Continuous measurements were required to insure that measurements coincided with remote sensing opportunities.

APPROACH

Since 1977 the FRF has routinely collected data from an extensive suite of instruments, complemented by accurate and frequent surveys of the nearshore. The long-term nature of the measurements make the Duck beach probably the best known and most studied beach in the

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world. Although this study focused on groundtruth measurements over a relatively short period of time, the historic data allow the observations to be put into perspective. In order to make the FRF data available to Navy researchers, the FRF created a series of monthly CD-ROMs containing all data collected during the month. FRF researchers Clifford Baron, Kent Hathaway, Michael Leffler, and Dr. Charles Long contributed to the collection and processing of the data. Mr. Cliff Baron worked closely with Dr. John Dugan and Mr. Ken Vierra of Areté Associates, who duplicated and distributed the CD-ROMs.

The data set includes a wealth of different information including wave measurements at several depths, vertical current profile measurements, tide variation, and wind and weather observations. Two significant data sets are high-resolution directional wave spectra measurements in 8 m water depth, and a K-Gill Anemometer to measure wind stress. Table 1 summarizes the primary FRF instrument data sets. FRF data were supplemented by an additional Acoustic Doppler Current Profiler supported by Dr. Peter Smith of the Naval Research Laboratory.

Table 1. FRF Primary Instruments and Locations

Gauge ID	Description	FRF Coordinates (m)		Water Depth (m)
		Cross-shore	Longshore	
616	Atmospheric Pressure	12	569	
3932	Anemometer	585	517	
111	8-m Directional Wave Array	914	826	-8.1
630	Waverider Buoy	3853	-2403	-17.0
625	Baylor Wave Staff 1860	568	517	-8.4
641	Pressure Wave Gauge	239	517	-2.0
11	NOAA Tide Gauge	597	514	-7.6
Acoustic Doppler Current Profiler		1601	896	-13.0
5-m Bipod (wave, bottom current, bottom change)		581	890	-5.0
8-m Bipod (wave, bottom current, bottom change)		915	937	-8.0
13-m Bipod (wave, bottom current, bottom change)		1605	909	-13.0
K-Gill Anemometer		597	514	
Daily CTD Profiles		597	514	-7.6
Hourly Video Images from Observation Tower		53	141	

Monthly surveys, conducted using the Coastal Research Amphibious Buggy (or CRAB, see Figure 2), provided bathymetric maps over an area 2 km longshore by 1 km offshore at an accuracy of a few cm. One of the many uses of the survey data was to provide groundtruth for Areté Associates to develop and refine their jet-ski based hydrographic survey system. Hourly time exposure video images from the FRF observation tower documented the changing nearshore morphology using a technique originally developed by Dr. Rob Holman (Oregon State University) under ONR sponsorship. A video camera operated remotely by Areté Associates provided additional coverage of the waves and beach.

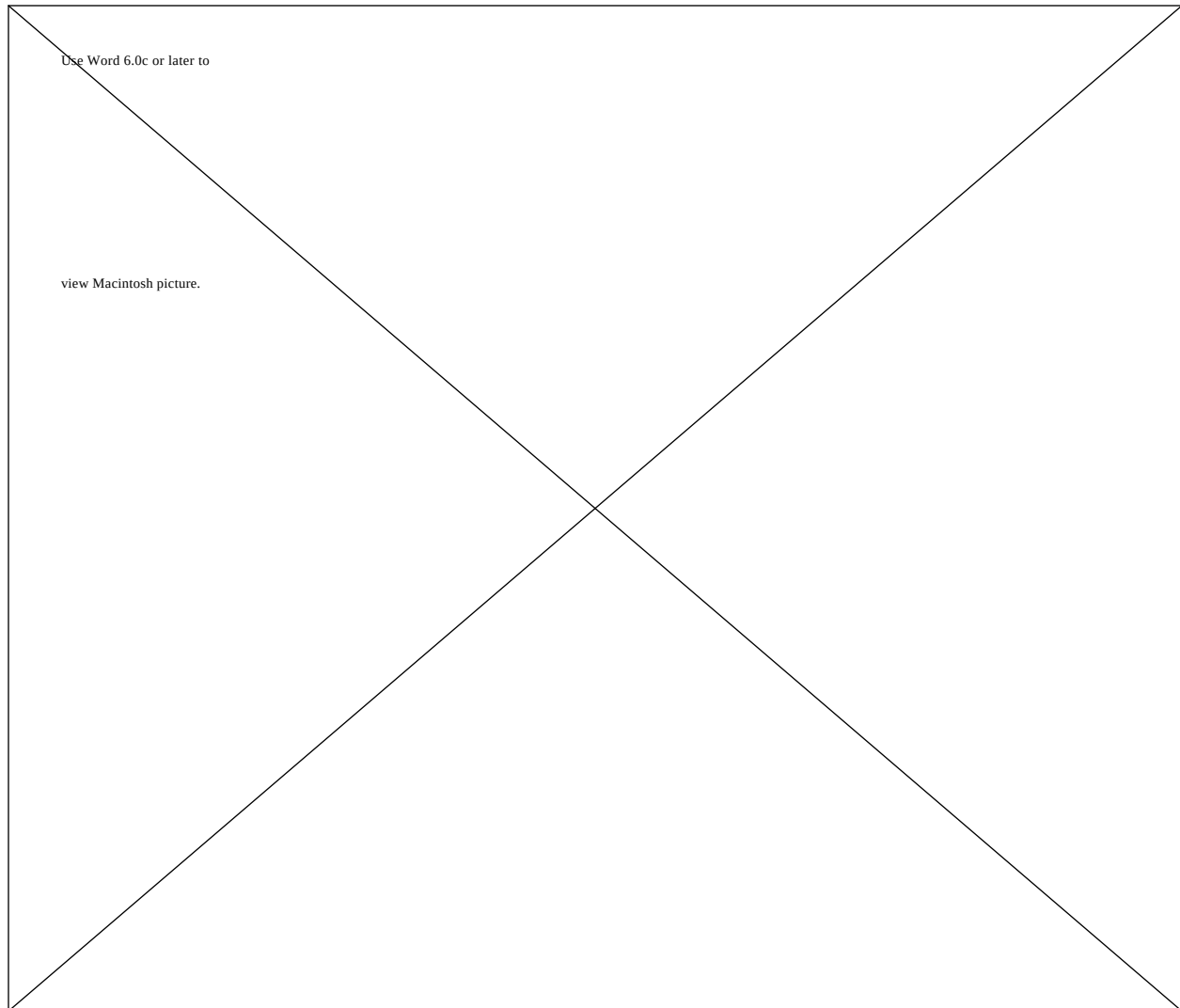


Figure 2. The CRAB surveying during the SandyDuck experiment

WORK COMPLETED

The CD-ROMs and data collection began in March 1996 and ended in October 1997. The final two months covered the SandyDuck experiment period when an additional 400 instruments were deployed between the shoreline and depth of 20 m. Most of the instruments were placed close to shore within the inner surf zone. Deployed instruments included a wide variety of sensors for measuring the waves, currents, sediment transport, and bottom changes at many locations providing both point and spatial coverage of the dynamics. Extensive video and physical surveys by the FRF, Oregon State, USGS, and Areté Associates provided spatial coverage of the morphology over a wider area than usually surveyed.

IMPACT/APPLICATION

The data collected by this program are being used to support the groundtruth measurement requirements of the Littoral Remote Sensing Program.

REFERENCES

Considerable information about the Field Research Facility along with access to current and historic FRF data and a description of the SandyDuck experiment can be found on the web at: <http://www.frf.usace.army.mil>