Long-term Archive of the DUCK94 Nearshore Field Experiment Data

William Birkemeier
US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory
1309 Halls Ferry Road, Vicksburg, MS 39180
phone: 252-261-3511 fax: 252-261-4432 email: William.Birkemeier@erdc.usace.army.mil

Kent Hathaway
US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory
1309 Halls Ferry Road, Vicksburg, MS 39180
phone: 252-261-3511 fax: 252-261-4432 email: Kent.K.Hathaway@erdc.usace.army.mil

Dr. Ravi Sinha
Department of Mathematics and Computer Science
Elizabeth City State University
1704 Weeksville Rd, Elizabeth City, NC 27909
phone: 252-335-3375; fax: 252-335-3465; email: rpsinha@mail.ecsu.edu

Award Numbers:
Document Number: N0001400MP20108 (US Army Corps of Engineers)
Grant Number: N000149910477 (Elizabeth City State University)
http://frf.usace.army.mil/duck94/duck94.stm

LONG-TERM GOALS

The long-term goal of this effort is to compile and distribute data collected during the DUCK94 nearshore field experiments so that coastal researchers worldwide may access these data. Eventually we plan to include data from the SandyDuck'97 experiment.

OBJECTIVES

Conducted in August, September, and October 1994, DUCK94 was an intense, large-scale, multi-agency investigation of surf zone winds, waves, currents, sediment transport, and morphology within a 1 x 0.5 km region at the U.S. Army Corps of Engineers Field Research Facility (FRF) in Duck, North Carolina. DUCK94, which was a pilot for the SandyDuck '97 experiment, included 31 investigations of varying complexity, using a variety of instruments (Table 1). Because these experiments occurred during strikingly different conditions and since they resulted in the two most comprehensive observations of nearshore dynamics ever collected, the data have great potential for fundamentally advancing nearshore science with direct application to Navy and US Army Corps of Engineers modeling efforts. A summary of collected data exists, but the data collected by each experiment resided with the associated principal investigators. There was no central database and no easy public access to the data.

By agreement it was resolved that experimenters' data would become publicly available three years after the completion of each experiment (1998 for DUCK94; 2001 for SandyDuck). The purpose of this project is establish an archive that will make the DUCK94 data available online and in useful

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 2001		**00-00-2001 to 00-00-2001**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Long-term Archive of the DUCK94 Nearshore Field Experiment Data	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **US Army Engineer Research and Development Center,,Coastal and Hydraulics Laboratory,,1309 Halls Ferry Road,,Vicksburg,,MS, 39180**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The long-term goal of this effort is to compile and distribute data collected during the DUCK94 nearshore field experiments so that coastal researchers worldwide may access these data. Eventually we plan to include data from the SandyDuck=97 experiment.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a REPORT	b ABSTRACT	c THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**6**	

formats. The DUCK94/SandyDuck data include a wide variety of data types stored in many different formats. Some data sets are of wide general interest and have been analyzed and quality controlled, while other data sets have not been. The archive, with open access to other investigators, will allow additional and continual use of the data.

APPROACH

For data distribution we adopted and adapted a UNIX/web-based data management system originally developed for the Joint Global Ocean Flux Study *(JGOFS).* It has several features that made it desirable for this application. The data server software already existed, was freely available, customizable, and simple to administer. It is easy for unfamiliar users to navigate, includes documentation pages, screen display, and links to FTP for direct downloading of data files.

Even though the JGOFS server was designed for serving distributed data sets it was decided for practical purposes, to use a single server for the data. This alleviated requiring multiple investigators to maintain web servers for access to their data, and insures that the data remain online, even as interest by the collecting investigators wanes. The original data were translated into a common format, columnar ASCII files which are MATLAB and spreadsheet compatible, making them easy to use by all users. Times were adjusted to Eastern Standard Time and units were converted to MKS. Identical formats have been used for similar data types collected by different investigators (mean current statistics, wave height measurements, etc.).

Some data were not compatible with the data server and are handled by other web tools such as FTP and HTML pages. In particular the "raw" binary time series sampled from single-channel sensors (current component, pressure, optical backscatterance, sonic altimetry, temperature, wind speed, wind direction, etc.), could not be efficiently delivered with a columnar ASCII format but are available with FTP in organized directory structures with associated metadata. Digital image data (camera snapshots, time-averaged images, movie loops of various processes) are delivered with static web pages and FTP.

WORK COMPLETED

During the first and second years (FY99, FY00), the JGOFS system was evaluated and adapted for our use. Data collected by the Field Research Facility, and by the team of Elgar, Herbers, Guza, and O'Reilly, two primary data sets, were incorporated. During FY00 a preliminary version of the web site was activated, presented and demonstrated at the 1999 Fall meeting of the American Geophysical Union. This gave contributing investigators an opportunity to examine and comment on the system. In FY01 the server was moved from ECSU to the FRF, which improved security, reliability, and helped expedite inclusion of more data sets. Two students assisted in the server development, Sharon Goehring (ECSU) and Mathew Wilkerson (Notre Dame), both funded by ECSU. The most significant data sets have now been included and are bolded in Table 1.

Since many of the DUCK94 investigators were also at SandyDuck, the data translators written for these DUCK94 data sets will eventually be used to convert SandyDuck data.

Table 1. DUCK94 Experiments			Participating Months	Wave Shoaling	Nearshore Circulation	Boundary Layers	Swash Processes	Small Scale Sediments	Meso/Macro Morphology	Water Properties
No.	Investigators	Experiment Title								
1	**Beach, Holman, Sternberg**	**Sediment dynamics in the nearshore environment**	**Aug,Oct**		**X**	**X**		**X**		
3	Church, Elgar, Guza	Mine scour, burial, and migration as a function of wave and current forcing	Sep				X			
4	**Drake, Smith**	**Nearshore sedimentary structures**	**Aug,Oct**					**X**		
5	Dugan	Airborne remote sensing of the environment in the littoral zone	Oct	X	X					
6	Earle	Real-time buoy directional wave measurements for driving surf zone numerical models	Aug,Oct	X						
7	Earle, Walsh, Boyd	Scanning radar altimeter sea surface topography & high resolution directional wave measurements	Oct	X						
8	**Elgar**	**Temporal and spatial variability of the bathymetry of a natural beach**	**Aug,Oct**						**X**	
10	Graber, Shay, Haus	An investigation of surface currents and internal waves over the inner and mid-shelf	Oct	X	X					
11	**Elgar, Herbers, Guza, O'Reilly**	**Surface gravity waves and nearshore circulation**	**Aug,Oct**	**X**	**X**					
12	Haines, Gelfenbaum	Vertical structure of mean currents & turbulent stresses in the nearshore boundary layer	Nov		X	X				
13	**Hanes, Vincent**	**Near bed intermittent suspension**	**Aug,Oct**		**X**			**X**		
14	Hanes	Remote video measurement of mesoscale nearshore processes	Aug,Oct				X		X	
15	Hathaway	Rip current mapping	Aug,Oct		X				X	
16	Hay, Bowen	Sediment suspension, local morphology, and bubbles	Oct		X			X	X	X
17	**Holman, Holland, Plant**	**Foreshore dynamics**	**Aug,Oct**				**X**			
18	**Howd, Hathaway**	**Processes of shoreface profile adjustment**	**Aug,Oct**		**X**				**X**	
19	**Jensen**	**Evolution of wave spectra in shallow water**	**Aug,Oct**	**X**						
20	**Lippmann, Thornton, Stanton, Su**	**Spatial distribution of wave breaking and turbulence**	**Aug,Oct**	**X**		**X**				**X**
21	**Long**	**Wind wave frequency-direction spectral measurements**	**Aug,Oct**	**X**						
22	Miller	Longshore sediment transport during storms	Aug,Oct					X		
23	Fabre, Wilson, Earle	Wave and surf generated ambient noise measurements	Aug,Oct							X
24	**Stauble, Smith, Birkemeier**	**Sediment dynamics and profile interactions sampling experiment**	**Aug,Oct**					**X**		
25	Thornton, Dingler	Small-scale morphology in the nearshore	Aug,Oct					X	X	
26	**Thornton, Stanton**	**Suspended and bedload sediment transport**	**Aug,Oct**		**X**			**X**		
27	Trizna	Radar remote sensing of nearshore processes: bar morphology, directional wave spectra, infragravity waves, wave breaking	Aug,Oct	X	X				X	
28	Walker	Hyperspectral optical characterization of surf zone bottom/resuspended sediment	Aug					X		X
29	Werner, Elgar	Swash zone morphology: field manipulation and simulation	Jun,Sep				X		X	
30	White	Field tests of sediment transport theories	Aug,Oct		X			X		
31	Livingston, Wolf, Pasewark	Wave and surf noise measurements: supplementation	Oct							X
32	**Field Research Facility**	**Basic environmental meteorological and oceanographic measurements**	**Aug-Oct**	**X**	**X**				**X**	**X**

The DUCK94 data can be found at http://frf.usace.army.mil/duck94/duck94.stm (Figure 1). This web page has a brief summary of the DUCK94 experiment and a link to the data server. Data from the

DELILAH 1990 nearshore experiment was also added to the data server in FY01, complete with a data report (PDF and HTML formats), statistics, binary time series, and extensive documentation on data quality and analysis methods (metadata). There are presently 35 GB of DELILAH and DUCK94 data on the server.

RESULTS

The data server has proven to be an efficient means to deliver DUCK94 processed data and metadata, and to provide FTP and HTML links to the remaining data sets. Feedback on the server's data accessibility and presentation will be requested for future refinements.

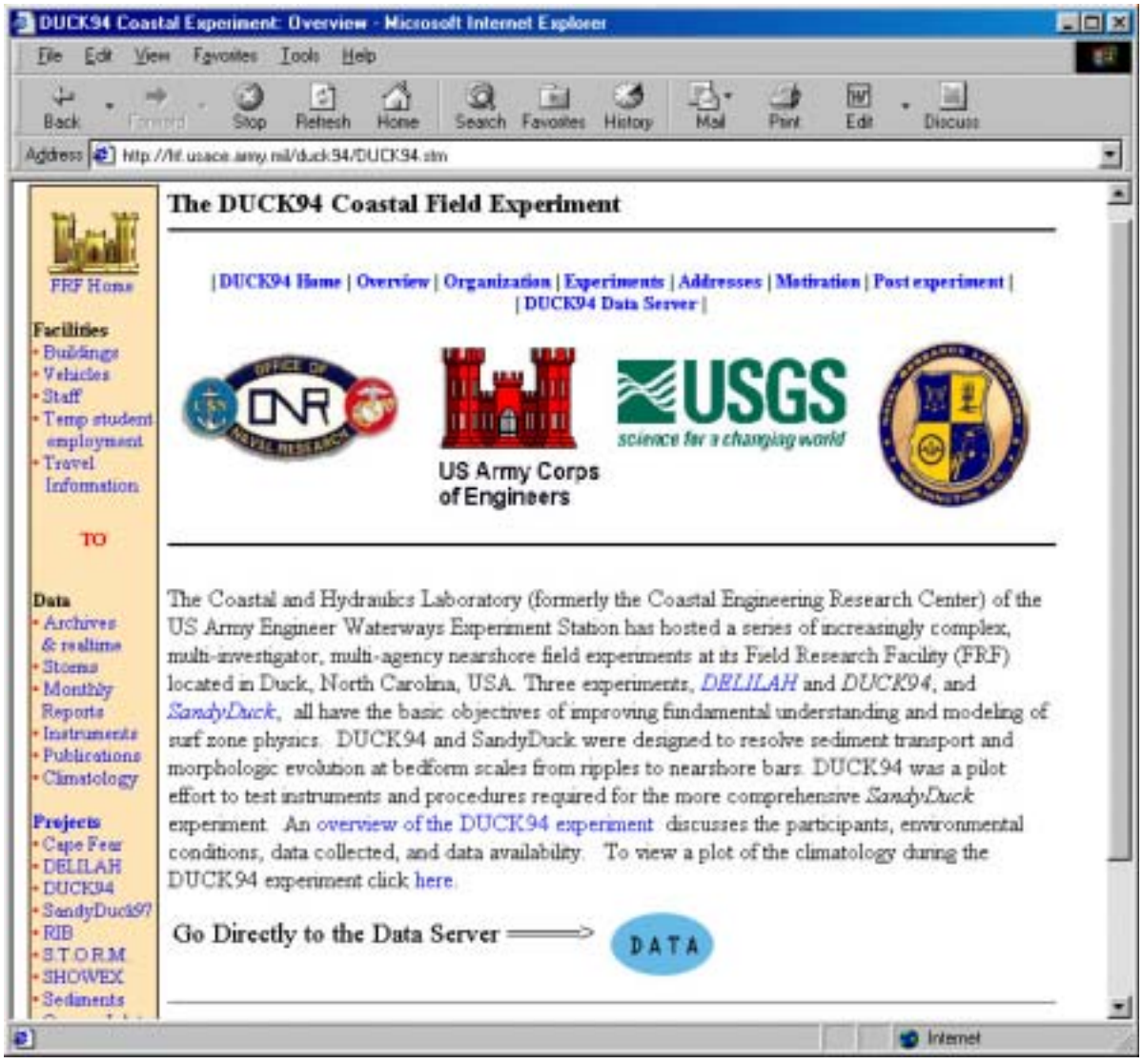

Figure 1. DUCK94 home page showing funding agencies and a brief description of the DUCK94 experiment. The page includes links to DELILAH and SandyDuck home pages, and a link to the DUCK94 data server.

IMPACT/APPLICATIONS

By making the data available to researchers worldwide it will hopefully achieve maximum utilization and permanence. In addition to making these data sets available to other researchers, the archive also provides high quality data for students working on Masters or PhD degrees. Based on the amount and success of research accomplished following earlier FRF experiments, the more comprehensive DUCK94 and SandyDuck data will have wide use and great potential for advancing nearshore science.

TRANSITIONS

Although the data server is new, several government laboratories and universities have already obtained many data sets. During the first quarter of FY02 we will make announcements of the data availability via email and at appropriate conferences (e.g., AGU fall 2001).

RELATED PROJECTS

The success of this effort will greatly facilitate the process of developing the SandyDuck archive. We have also been examining other data format/delivery systems including the potentially more powerful Distributed Ocean Data System (DODS). One advantage of the JGOFS system we have implemented is that the data can be directly imported into DODS.

REFERENCES

For a list of publications that have come from Duck nearshore field experiment data, see: http://frf.usace.army.mil/biblio/p3.stm.