

FIELD MEASUREMENTS AND NEARSHORE MODELLING AT SANDYDUCK

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LONG TERM GOAL

The long-term goal of this research is to increase our understanding and capabilities of predictive modeling of short-wave-averaged nearshore circulation patterns (shoreline to nominally 15m depth), through use of a combination of numerical modelling and data analysis from field and laboratory experiments.

OBJECTIVES

The project contributes to achieving the long term goal by establishing a cross-shore array of self recording wave and current meters north of the main area of instrument arrays during the SandyDuck experiment. The results from these instruments are expected to enhance our capability of modelling the nearshore circulations in the area of the SandyDuck experiment.

APPROACH

In order to define wave and current boundary conditions perpendicular to the shoreline at the northern boundary of the SandyDuck experiment four self-recording pressure gage/current meters (PUV) have been deployed. Two of the gages are of type SeaPac 2100 manufactured by Woods Hole Instrument Systems, the other two are SonTek ADVO. These instrument packages will measure absolute pressure, water temperature, north-south current and east-west current at 1Hz for a specified number of minutes 5 times a day for 6 weeks. Since the SonTek ADVO is a fairly new instrument, a SonTek and a SeaPac have been placed close to each other at the central cross-shore position, giving a total of three locations along a cross-shore line. This will give a chance for comparison of the performance of the two types of instruments.

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WORK COMPLETED

The field deployment of the instruments took place 16-18 September 1997. Before shipping to Duck the SonTek ADVI instruments were calibrated while installed on the steel pipe mounts with all hardware included. Calibration scores were determined as excellent by the automated calibration software, and the ambient magnetic environment which included the mounting pipe and hardware was less than 20 (out of 100), which was reported to be acceptable by the software.

The Seapac gages were calibrated in a laboratory at Woods Hole Oceanographic Institute in a towing tank. Before deployment fine-tuning, data collection parameter settings and minor adjustments to the equipment were carried out at Duck in consultation with FRF staff. With the chosen collection scheme the batteries and storage capacity of the instruments were expected to last approximately 45 days which corresponds to the planned duration of the rest of the SandyDuck experiments. During inspection on 17 Sept of the planned deployment site at the 1265 meters mark the president of a local civic association voiced objections to the work, resulting in a delay in establishing the final longshore siting of the gages. On 18 Sept discussions with the representative lead to an agreement to place the gages along a beach profile at station 1107, which was just offshore of the southernmost dune crossover approximately 100 m north of the FRF property line. Though this position was more southerly and less ideal than the planned position it was judged that this would not seriously compromise the intended scientific objectives of the experiment. Deployment took place on the afternoon of 18 Sept 1997 and instruments were placed at the chosen cross-shore locations without difficulties. Instrument retrieval took place on 3 November 1997. All gages, mounts and marker pipes were recovered. All recovery operations were completed by 1300 hours and the crew departed FRF by 1600 hrs.

RESULTS

Preliminary review of the data (5 November 1997) indicates that all instruments had 100 % data recovery with memory capacity being reached 12 hours after retrieval. cursory assessment of the data files indicated that the inshore ADVI was buried and exposed twice during the experiment, as were the mid-depth gages. Calibrated time histories and summary files look reasonable; however, they have not been quality controlled or reviewed in detail in any way. Physically, all instruments and mounts survived the experiment without damage. Slight biofouling occurred, especially on the offshore Seapac; however, the inshore gages were cleaner presumably because they were buried for a large percentage of the experiment due the movement of the inshore bar. The pipe mounts were stable throughout the experiment, as verified by the compass, pitch and roll measurements reported by the ADVIs.

IMPACT/APPLICATIONS

It is expected that the collected data will form part of the total dataset for the SandyDuck experiment. They will form an integral part of our testing of the SHORE- CIRC numerical circulation model and hopefully will also be useful to other researchers working on modelling of the SandyDuck flow conditions.

RELATED PROJECTS

The following are related projects in which the first PI is involved in conjunction with the Coastal Dynamics program of ONR, the ARO, and the NOAA Sea Grant program: 1) The mechanisms behind the formation of rip currents and the 3D effects of the vertical variation of the velocities within such currents are being studied (PhD project) 2) Analysis of the generation and propagation of IG waves using the SHORECIRC model. We think we have identified a mechanism that explains why in some cases field data show incident IG wave energy will increase in some cases decrease in the surfzone (PhD project).