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NATO EXPERIMENT MULTI-PIEZOMETER SUPPORT

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LONG TERM GOALS

The ultimate goal of this research project is to improve understanding of the dynamic pore water pressure gradients in shallow-water, surficial sediments generated by wind waves, and the impact of these gradients on burial of seafloor-resting mines by sediment scour and liquefaction.

OBJECTIVES

The objective of this work is to provide logistic and technical support for the deployment of the Multi-Piezometer Array System (MPAS) during the Mine Burial Specialist Team (MBST) critical field experiment conducted in the North Sea during May 1997.

APPROACH

NRL arranged for technical support of Texas A&M Engineering Experiment Station (TEES) required to prepare the MPAS piezometers for deployment during the North Sea MBST experiment. TEES examined thoroughly the data acquisition hardware and software and implemented necessary improvements, designed and fabricated support framework for MPAS components to facilitate deployment by divers, and arranged logistics and on-site support of MPAS for the May NATO experiment.

WORK COMPLETED

TEES identified a problem in the seafloor computer, replaced that unit with an upgraded PC. Software was written to permit interrogation of the seafloor unit during deployment to ensure that all components remained operational during deployment. A second set of batteries and sealed containers was added to boost power available to the seafloor unit. A piezometer saturation system was designed, fabricated and successfully demonstrated in the experiment. A support frame for the seafloor data acquisition system, the battery power supply, and 12 piezometer units with cabling was designed, fabricated, and successfully deployed.

RESULTS

The MPAS system was successfully mobilized, deployed and retrieved during the April/May NATO Phase I mine burial study. The divers were able to place nine probes on the seafloor in a grid pattern and pore pressure data was collected from each of these probes. A minor problem with the data acquisition software prevented the collection of an extensive data set while the surface computer was disconnected from the seafloor system. Changes to the software were proposed for the second NATO exercise. Complete verification of the modified data acquisition system performance remains to be accomplished.

IMPACT/APPLICATIONS

The impact of the efforts on this research project has been to permit the deployment and recovery of an extremely sophisticated scientific measurement system. The results from this research will have a direct and significant impact on the scientists and engineers who will attempt to use the MPAS pore pressure data in the future to infer basic behavioral mechanisms or to validate scientific models.

TRANSITIONS

The dynamic pore water pressure data sets obtained in this project will be used to validate, or improve, analytical models for predicting such pore pressure gradients in the 6.2 Mine Burial Processes Task Area. The validated models, in turn, will be used in that 6.2 project to better understand when one can expect mine burial due to sediment scour and/or liquefaction. Improvements in the mine burial models will eventually find their way into MEDAL used in the field by MCM forces.

RELATED PROJECTS

Interface Dynamics in Coastal Environments, Philip Valent, NRL and Glen Andersen, TAMU.
Mine Burial Processes, NRL Task Area BE-35-02-27, P.I. Michael Richardson, NRL Code 7431.

REFERENCES

Andersen, G.R., Bennett, R.H., Barber, M.E., Todorovski, L. and Maynard, G.L. (1996), "A Multi-Sensor Piezometer for Shallow Marine Sediments in Coastal Environments", American Society for Testing Materials (ASTM), Geotechnical Testing Journal, GTJODJ, Vol. 19, No. 4, pp. 373-383