

POPULAR SUMMARY

K193 CAPE ROBERTS TIDE GAUGE

In November 1990 a new pressure transducer was installed at Cape Roberts to measure ocean tides. The installation was achieved by drilling a 12.8m long 45° angled hole in the shore line rock at the eastern end of Cape Roberts which exited into free water beneath the ice foot approximately 6m below high tide. The hole is lined with 32mm low density polyethylene pipe with the transducer cage at the end of the liner pipe exiting, into free water.

The tide pressure transducer is connected by a suspended cable to a datalogger sited on top of the seaward coastal cliff at the eastern end of Cape Roberts (77°02'02.5194"S 163°11'23.779"E). The logger also records meteorological data from a 4m high mast at this site. The instrumentation is designed to provide year round tide and meteorological data from Cape Roberts.

IMMEDIATE SCIENCE REPORT

K193 CAPE ROBERTS TIDE GAUGE

by A.R. Pyne

NEW ZEALAND ANTARCTIC RESEARCH PROGRAMME 1990/91

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November 1990

Introduction

The purpose of this project was to install a permanent tide gauge at Cape Roberts. In November 1988 a tide gauge pressure transducer was installed at Cape Roberts within a steel pipe bolted to the coastal rock. This installation was subsequently lost when the coastal ice foot broke off in February 1989. The transducer site we had chosen was the best available because it had deep freely circulating water under the ice foot close to shore but it was clear that a permanent installation required greater protection. I believed this could be achieved by installing the transducer in a hole drilled at an angle through the rock to exit into free water beneath the ice foot.

Scientific Endeavours & Achievements.

The first stage of this seasons field programme was to drill a hole in the coastal rock using the "portable" Winkie diamond coring drill belonging, to DSIR Antarctic. This season the ice foot (above free water) was thicker than usual (5.5m) and a large amount of ice had been pushed against the shore and incorporated into the overthickened ice foot. These unusual ice conditions prevented the use of video camera modified to work under the ice which we intended to use to establish the best site for the transducer hole. Instead five holes were drilled in the ice foot to establish the ice thickness and where free water occurred. The site chosen for drilling was within 5m of the previous tide gauge site and required a hole to be drilled 45⁰ from the vertical. This was accomplished successfully in 2 days of drilling, with breakthrough occurring at approximately 12.8m. Sea water with a small quantity of Calcium chloride (50kg) was used for drilling fluid and will have no lasting effect on the near shore environment. All equipment was removed after drilling leaving, only the transducer cable protected in a polyethylene pipe and steel support cable anchored at the hole.

The transducer is located in a cage at the end of a 32mm low density polyethylene pipe lining the drilled hole. The transducer cable became frozen within the hole as expected within a few hours. Two days later the transducer was removed and rechecked by unfreezing the cable with about 5 litres of isopropal alcohol poured into the plastic liner pipe. This shows that it will be possible to remove the transducer for replacement if it becomes faulty in the future and it should also be possible to adjust the liner pipe and transducer cage at a later date by unfreezing the liner pipe with a submersible heating element.

The water level transducer is connected via a 32m suspended cable to the data logger/meteorological instrumentation on a rock promontory at the eastern end of Cape Roberts. New gel cell batteries were installed and the meteorological instruments replaced and checked this season. The system is currently programmed to record a 10 minute average of water depth each hour with hourly averages of wind speed and direction, air temperature and solar radiation. Memory storage has been increased so that data can be recorded for a full year.

In the 1991/92 season it will be necessary to accurately relevel, and recalibrate the water depth transducer for connection to the tide gauge bench mark and to Cape Roberts trio,. Installation and operation of the tide gauge / meteorological instrumentation at Cape Roberts has been jointly sponsored by the Antarctic Research Centre, Victoria University of Wellington, the N.Z. Meteorological Service and the Department of Survey and Land Information (DOSLI). This seasons programme was carried out as DOSLI event # K193 and DSIR Antarctic provided logistic support, drill equipment and drilling, expertise for the transducer installation.

Conclusion

The success of this seasons programme has shown that it is now possible to establish similar remote tide gauge systems on other parts of the Antarctic coastline. Sites would be on rocky capes or promontories where sea ice breakout occurs regularly with deep water close to shore and rock suitable for drilling and setting up the drill rig.

Acknowledgments

The other members of this event, Garth Varcoe, Paul Woodgate and "Ben" Bensemann require special mention for their efforts in drilling the hole for the transducer installation at Cape Roberts. Also at Cape Roberts members of the survey event K192 helped with this programme. Peter Isaac provided valuable advice and encouragement from Britina Island while setting up and programming the instrumentation. John Alexander (Operations Manager) and other members of the Scott Base staff provided invaluable support. At Victoria University; Eric Broughton, Jimmy Millar and the Mechanical Workshop helped with the preparation and checking of equipment. Finally Charlie Thurgood of Scott Technical Instruments Ltd. provided an excellent service to replace a faulty transducer for the programme.