

Borehole video observation of Langhovde Glacier, Antarctica

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To elucidate the interaction between the ocean and the Antarctic ice sheet, a hot-water drilling project was carried out on the floating tong of the Langhovde glacier, Soya Coast, East Antarctica, during the austral summer activity of the 53rd Japanese Antarctic Research Expedition 2011-2012. As one of the various observations using the boreholes in depth of 400 m, we were able to take some video records looking in and under the holes.

For the borehole video observation, we adopted two types of thin camera, P and S-types, in order to enter the boreholes 60 mm in diameter. P-type camera is a compact camera jointly developed by the Little Leonardo Co. and NIPR for use of bio-logging, which has a proven track record in use of observing Antarctic marine mammals such as penguins or seals. S-type camera is commercially available from the company Looxcie LX2, which has bluetooth wireless link function with mobile gadgets such as iPad or iPhone. Although P-type camera has the pressure resistance of up to 500 m water depth, it has no lighting function. As well, S-type camera is not a product originally intended for use in the water. Thus, we developed pressure-resistant attachable camera-housings with a battery container for lighting LED. The size of the outer diameter of these barely at 50-60 mm is allowed to insert into the borehole. Essentially, real-time monitoring was not performed, but mpeg4 format videos were recorded in the internal memory of the cameras. A pressure and temperature sensors (ATD-HR JFE Advantech Co., Ltd.) is attached to the cameras, which recorded the insertion depth and time down into the hole simultaneously.

The recorded video clearly indicated that the borehole was smoothly bored without bending or branching. Images somewhat blurred due to the change in the refractive index of water were captured at the boundary depth between fresh water and seawater in the borehole. The camera reached the bottom of the sea at 25 m further below the borehole of 400 m in length, where suspended fine white flakes were observed. It is thus suggested that calm and relatively slow water flow environment exists between the ice bottom and sea floor. Also, within the white fine sand and silt matrix, we can see some sub-rounded dark brown conglomerates of 40-50 cm in diameter characterized by four-surface with flat facets. This is typical shape of glacial eroded gravels that has been dragged at the ice bottom.

An arthropodous creature has been taken which seems to be invited to the lighting of the camera. It was a very unexpected result that at such an environment under the 400 m thick ice shelves approximately 2.5 km inland from the calving front.

Consequently, the floating snout area of the Langhovde glacier is a quite promising area for research issues across multiple disciplines such as geology - biology – glaciology - oceanography of the Antarctic environment, which indicates great potential that can be developed by the hot water drilling methods.

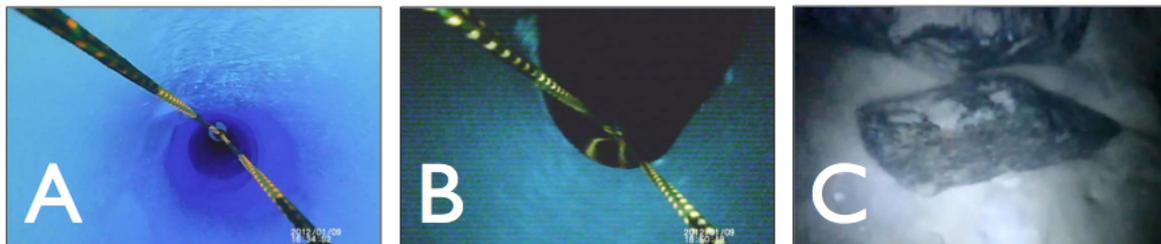


Fig.1 Borehole video images. A: Interior features of the borehole; B: Boundary between fresh water and seawater; C: Glacial erosional boulders within fine marine sediments on the sea floor.