

## Shallow Sea Trial of the Under Ice AUV “MONACA”

\*Hirokazu Yamagata<sup>1</sup>, Toshihiro Maki<sup>1</sup>, Hiroshi Yoshida<sup>2</sup>, Yoshifumi Nogi<sup>3</sup>

1. Institute of Industrial Science, The University of Tokyo, 2. Japan Marine Science and Technology Center, 3. National Institute of Polar Research

This presentation introduces the AUV MONACA (Mobility Oriented Nadir Antarctic Adventurer) and reports the results of shallow sea trials held in Oct. 2019 and Feb. 2020.

The AUV MONACA was developed for under ice survey of Antarctica, supported by JSPS Grant-in-Aid for Scientific Research on Innovative Areas No.4902, to measure the sea ice/shelf ice and seafloor for research of ice sheet-ocean interaction. MONACA is 2 m long, 230 kg weight, and it can cruise for about 8 hours. Depth rating is 1500m. The vehicle is designed to go into ice covered oceans as far as 10 km. The flat body is filled with buoyancy materials at the top so that the battery units and main unit can be accessed from the side. The vehicle has five degrees of freedom (surge, heave, roll, pitch, and yaw) by 4 vertical thrusters and 2 horizontal thrusters. Although the survey range is limited compared with large AUVs, it can conduct a highly precise survey with lower costs. Its modular design enables the necessary and sufficient compositions for various survey needs. Its sensor unit consisting of a multi-beam sonar, an INS (Inertial Navigation System), and a DVL (Doppler Velocity Log) can be flipped upside down, so that the vehicle can survey both the ice and seafloor with minimum modification.

The initial sea experiment was held in Oct. 2019 at Uchiura Bay. The vehicle was deployed with tether cable, and its basic performance such as depth and heading control were verified at the open and calm water. Bathymetry data was also collected by the multibeam sonar. The second experiment is planned in Feb. 2020 at Monbetsu Port, located in Hokkaido and covered by ice, where low temperature endurance test will be carried out. The performance to detect floating ice and measure its shape will be also evaluated.

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