

## Toward under ice exploration using a high-mobility lightweight AUV

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Autonomous Underwater Vehicles (AUVs) are now recognized as a convenient and high-performance tool for underwater survey. They are suitable for mapping tasks such as bathymetry, water quality, and even optical images. However, under ice observation is still challenging. Because the surface is packed with ice, AUVs cannot directly surface even in case of emergency. Support vessels cannot stay in close to the vehicle either. The vehicle mostly has to return to a pinpoint open water nearby the ship through long lonely journey home. All these issues cause a higher risk for vehicle loss.

In this presentation, we propose a novel high-mobility, lightweight, and low-cost AUV toward under ice exploration around Antarctica, capable of mapping both seafloor and ice. The concept is based on AUV HATTORI, developed in 2016 at the Univ. of Tokyo. The AUV HATTORI (Highly Agile Terrain Tracker for Ocean Research and Investigation) is a lightweight and low-cost testbed designed for rapid and efficient imaging of rugged seafloor, such as coral reefs. Most of current AUVs suitable for seafloor imaging are heavy and expensive, requiring a crane-equipped vessel for their operation. As HATTORI is one-man portable, it can be operated from any available boat. In the terrain tracking algorithm, the seafloor surface is estimated based on the potential method using the measurements of a scanning sonar and basic status of the vehicle, or depth, attitude and surge speed. The path to be followed is generated based on the algorithm. The AUV succeeded in following a rocky terrain at the altitude of around 2m, with a surge speed of around 0.8m/s.

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**AUV HATTORI**