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AUV

SEAMOUNT “Poggy” - a novel bionic AUV from EvoLogics

EvoLogics GmbH from Berlin, Germany, recently introduced “Poggy” - a new bionic autonomous underwater vehicle that uses Fin-Ray® technology.

Nicknamed “Poggy”, the AUV is a one of a kind, novel bionic design with two propulsion thrusters and two independent flexible “tails” that give the robot unique mobility features.

Its dual-tail construction is an original idea that stemmed from previous work on EvoLogics’ Manta Ray AUV and its lifelike “flapping wing” propulsion system. The design was simplified and optimized - the robot lost the wings, and its tail was divided in two.

Together with the rigid part of the body, the progressively bendable tails perform as two adjustable hydroplanes that in every steering position have an overall streamlined shape. The new concept facilitates outstanding roll and depth control combined with low drag performance.

Both parts of the dual-tail use independent bionic Fin-Ray® drives and allow for precise heave, pitch and roll adjustments, enabling dynamic climbs and dives, leveled gliding and bottom following.

Due to the small size of its basic AUV components, “Poggy” has an excellent payload capacity and can carry multiple sensors and instruments at the same time.

In addition, the dual-tails facilitate unique maneuvers that could open new opportunities for sensing and monitoring: the vehicle was designed to keep any desired roll angle and maintain a steady glide, even at very low speeds.

In early October 2019 EvoLogics team performed the first sea trials of the “Poggy” prototype as part of the Breaking The Surface workshop on underwater communication and networking for UUVs (Biograd na Moru, Croatia).

BONUS SEAMOUNT - locating and monitoring groundwater discharge in the Baltic Sea

The Poggy AUV is being developed as part of BONUS SEAMOUNT collaborative R&D project.

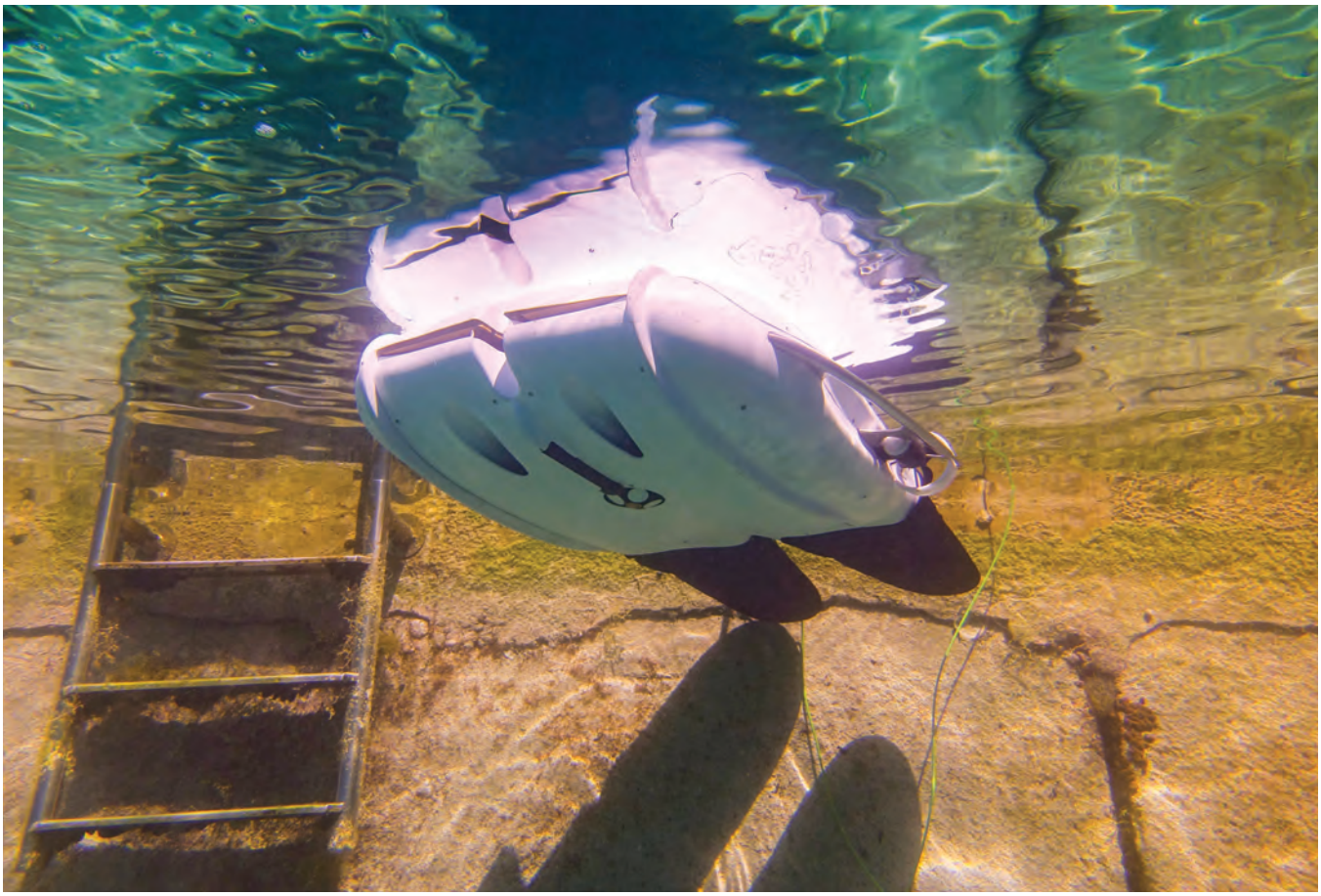


Photo credit: EvoLogics

Photo credit: EvoLogics

Coordinated by EvoLogics, SEAMOUNT project is funded within the framework of "BONUS - Science for a better future of the Baltic Sea region", the joint Baltic Sea research and development programme. Project partners are EvoLogics GmbH (Germany), Christian-Albrechts-University Kiel, Institute of Geosciences (CAU - Germany), Leibniz Institute for Baltic Sea Research (IOW - Germany), Geological Survey of Denmark and Greenland (Denmark), Geologian tutkimuskeskus - Geological Survey of Finland (GTK - Finland), Maritime Institute in Gdansk (Poland), NOA (Poland).

The goal of BONUS SEAMOUNT is to develop innovative autonomous vehicles and integrated sensor systems for complex real-time sea surveying, analysis and monitoring, and then to apply these in the studies of submarine groundwater discharge (SGD) in the Baltic Sea.

Background

The international organization HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission), the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, classifies the German Baltic Sea status as eutrophic. It is rich in nutrients for algae and aquatic plants to prolifer, which reduces dissolved oxygen and kills marine life in these hypoxia areas. Excess nutrient loading from rivers and the atmosphere are considered as the major cause of this poor ecological status (HELCOM, 2009). However, a considerable amount of unmonitored nutrient-rich waters flow to the Baltic Sea and contribute to its eutrophication (Hannerz and Destouni 2006; Destouni et al. 2008). To date, one of the unmonitored water flows is submarine groundwater discharge.

Discovering and analysing SGDs, their dynamic fluxes and composition, and human influence on their nutrient and contaminant load would provide valuable data to enable informed decisions on environmental management.

In an interdisciplinary effort, SEAMOUNT project partners work on novel technologies and methods customized to discover SDGs in shallow and deep waters, measure their physical and chemical properties, perform spatial examinations of discharge areas and their continuous monitoring over longer periods of time to investigate the influence of weather, seasonal change and human activities.

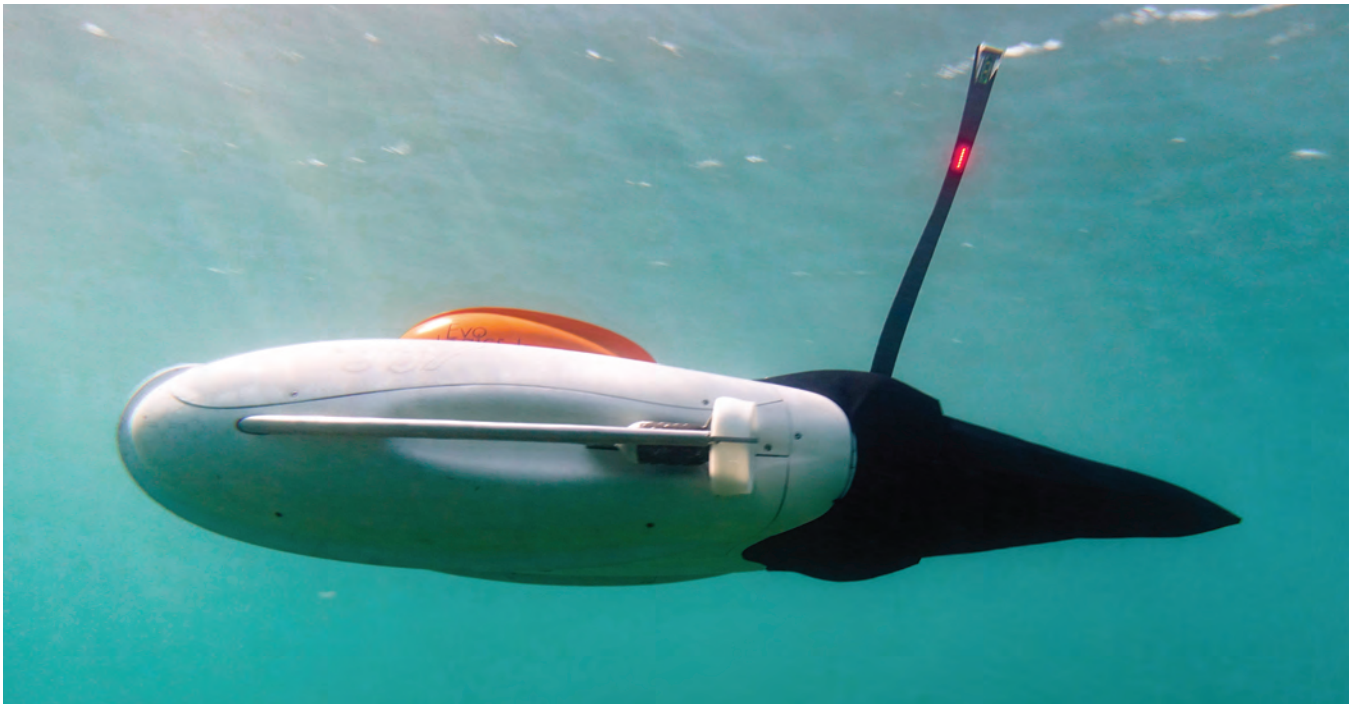
SEAMOUNT Technologies

Groundwater discharge mostly occurs through so called pockmarks, crater like features on the seafloor. Radon-222 concentrations in groundwater are significantly larger than in surface waters, making it an excellent natural tracer for SGDs.

Modern methods for SGD surveys imply continuous measurements of radon concentrations in the water from a moving vessel. This, however, requires significant time, cost and logistical effort, as the water must be continuously pumped up to the vessel and degassed. Such surveys are conducted mostly near the shorelines in shallow waters, as discovery and studies of deep-water pockmarks face too many technical difficulties.

SEAMOUNT's goal is to enable more efficient SGD studies with comprehensive short- and long-term data acquisition without the need of continuous presence of a support vessel.

The project aims to overcome the common obstacles for SGD studies by deploying an intelligent subsea monitoring network, comprised of interacting underwater vehicles and moored seafloor sensor nodes that are linked by a communication network and controlled remotely from land via radio or satellite.



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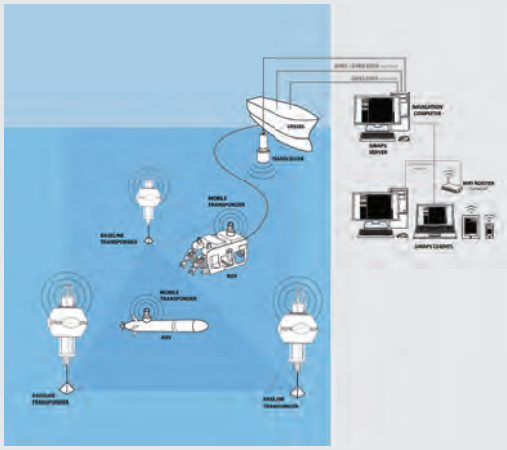
- data rate: up to 62.5 kbps

LBL POSITIONING SYSTEMS

highly accurate, precise and stable performance, simultaneous positioning and data transmissions

- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: better than 0.01m



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"Poggy" AUV's novel design with large payload capacity and unique maneuvering characteristics enables it to carry a modular set of sensors, cameras and a side scan sonar for in situ search, detection and observations of SGDs. The set of sensors would later include a built-in radon detector that would eliminate the need for pumping water up to the surface, currently being developed within the SEAMOUNT framework.

In addition, a set of linked SEAMOUNT stationary nodes would allow for long-term deployment of sensors at discovered SGD pockmarks for long-term observation of their dynamics.

Besides in situ radon detection, SEAMOUNT explores the options to trace other compounds as an additional or an alternative investigative tool for identifying SGDs.

Recent trials

In late October 2019, GTK organized SEAMOUNT sea trials, where EvoLogics, CAU and IOW conducted tests at known SGD locations near Hanko peninsula in the south of Finland, previously surveyed by GTK.

Based on EvoLogics S2C beacons with acoustic release devices and networking functionality, 2 seafloor sensor nodes were deployed at 2 known active SGD pockmarks approximately 12-13 meters deep. Another sensor node was deployed away from any the pockmarks to act as a reference. For approximately 24 hours in total, each seafloor node collected data with multiparameter probes and a Trios OPUS UV spectral sensor that allows to further investigate detecting SGDs using other chemical tracers than radon.

EvoLogics "Poggy" AUV was used as a mobile laboratory and scanned the area carrying a side-scan sonar, a multiparameter sensor probe and the UV spectral sensor.

While the acquired data is being processed and analyzed, project partners continue their work on measurement instrumentation. EvoLogics team gained valuable insight to further improve the AUV and sensors nodes, preparing for future studies.

EvoLogics GmbH (Berlin, Germany) is a high-tech enterprise, specializing in underwater acoustic communications, acoustic positioning equipment and innovative solutions for robotics

BONUS is funded jointly from the national research funding institutions in the eight EU member states around the Baltic Sea and the European Union by a total of EUR 100 million for the years 2011–2020.

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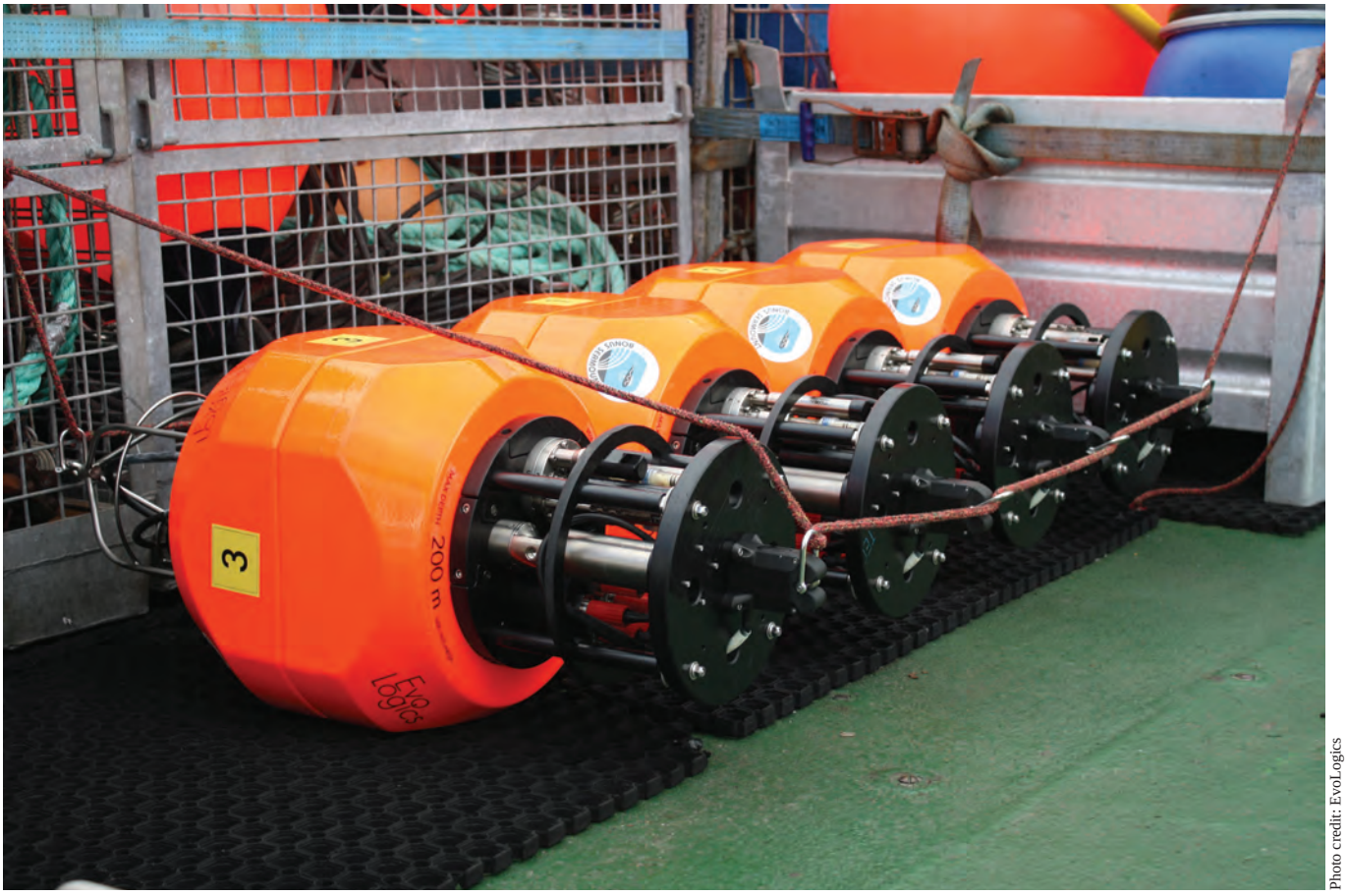

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