Autonomous Underwater Vehicles of the Underwater Technology Laboratory

Department of Marine and Environmental Systems – Ocean Engineering

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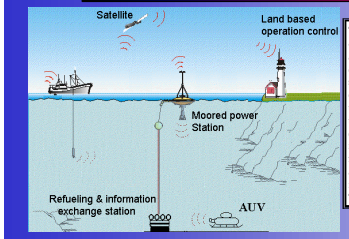
AODAS (Autonomous Oceanographic Data Acquisition System)



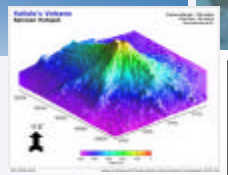
The development of an inexpensive autonomous oceanographic data acquisition system that is capable of operating at depths to 6000 meters. The system will comprise of four key components: 1) an autonomous underwater vehicle (AUV), 2) an underwater refueling and information exchange station, 3) an oceanographic mooring similar to those used by NOAA for measurement of surface conditions, and 4) a satellite connection between the mooring and Florida Institute of Technology.

AUV "Tuvaaq" (Eskimo for Hunter)

The investigation of environmental impacts from oil development in the Prudhoe Bay region of the Beaufort Sea, along Alaska's northern coast is currently underway at the Florida Institute of Technology (Florida Tech). Of particular interest are the impacts of the construction of offshore gravel islands used for oil drilling and production. Construction of these islands may contribute to an increase in suspended sediment concentrations in the waters of Prudhoe Bay, which could have adverse affects on the health of local marine ecosystems.

In response to the needs of the project, the Underwater Technologies Laboratory (UTL) at Florida Tech has developed a unique Autonomous Underwater Vehicle (AUV). The purpose of this AUV is to perform automated point-to-point data collection missions underneath the thick winter ice sheet.

AUV "Kamikaze" / "Hokulea"



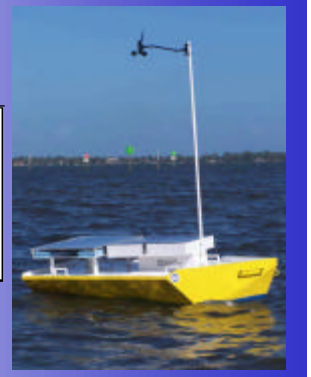
Some of the most exciting ocean research areas are the mid-Atlantic and Pacific smokers and active underwater seamounts. Research on these and other features of interest require non-traditional approaches to acquire detailed scientific information. The Florida Institute of Technology has been invited to join the Hawaii Undersea Research Laboratory (HURL) in the analysis of the Vailulu'u seamount, an active submarine volcano that was discovered on October 18, 19751, and surveyed for the first time by the RV Melville in 1999. Vailulu'u is located at the eastern end of the Samoan chain 45 kilometers east of Ta'u Island, Samoa, and rises from the 5000-meter-deep ocean floor to a summit depth of 590 meters, with a two-kilometer-wide 400-meter-deep summit crater.2

Surf-zone reconnaissance by the military or research by oceanographers and marine biologists requires specialized robust vehicles that are capable of surviving the harsh environment they will be operated in. These vehicles must also be relatively inexpensive in order to deploy the number necessary for military or marine studies. As the depth decreases within the surf-zone so does the design complexity of controlling a vehicle within this zone. Consequently, the surf-zone of an ocean is still a difficult area for mine detection and removal, and for oceanographers and marine biologists due to the difficulties in developing vehicles that operate under the turbulent waves of the surf zone

AUV "Manta Ray"

AUV "A-M-B" (Autonomous Mobile Buoy)

The proposal is to develop an A-M-B, automated buoy with advanced control algorithms that will make the vehicle able to perform autonomous pre-programmed surveys and sampling. Research at Florida Institute of Technology's Underwater Technology Laboratory is currently underway to implement a unified approach to developing autonomous devices that can reside and navigate in estuaries or oceans, explore, collect data, and selectively search for specific biological, chemical, or physical aspects that can be observed in the ocean environment, using neural networks in conjunction with distributed neurons imbedded in sensor systems. Consequently, this innovative system will lead to a completely new, improved quality of data collection in terms of marine biological, chemical and geological surveys in the coastal zone.



AUV "MAUSS" (Mobile Autonomous Underwater Surveillance System)

A new generation of Autonomous Underwater Gliders is needed for marine biological studies, physical oceanography, environmental impact assessment and integrated marine environment management. It is proposed within this document to develop an entirely novel vehicle (an autonomous powered glider) that collects video, acoustic, physical data, simultaneously obtain water samples for chemical analysis through mass-spectrum analysis, and able to gather and photograph autonomously biological specimens. The power-glider will be programmed for surveying and analyzing specific phenomenon. During the project several scientific surveys will be performed to test the abilities of the new autonomous underwater vehicle (AUV). For example, the assessment of the biodiversity of organisms (e.g., phytoplankton) that live at a specific region (i.e., depth, location, or habitat) will be done from collected samples, photographs and video. All operations will be completely autonomous with the exception of the high level communication between the AUV and the support vessel. The AUV will contain a specially developed modular measurement unit that contains a multi-chemistry analyzer, conductivity, temperature, depth, and a fluorimeter that detects various chemicals such as chlorophyll, rhodamine, and fluorescein.