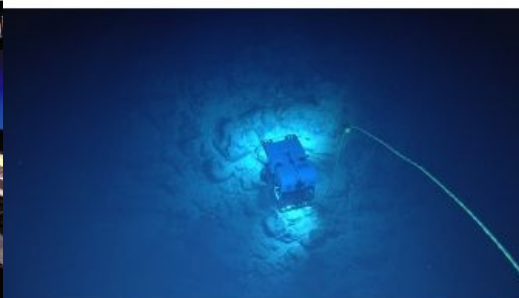


Successful Shoreside ROV Piloting Expedition Narrows Gap Between Ship and Shore



During a recent expedition on NOAA Ship *Okeanos Explorer*, an engineer on shore, over a thousand miles away from the ship, successfully piloted a remotely operated vehicle (ROV) to explore the deep ocean. A first for NOAA Ocean Exploration and the Global Foundation for Ocean Exploration, this test of piloting an ROV from shore opens new possibilities for deep-ocean exploration.



[Telepresence technology](#) has been a game changer for deep-ocean exploration. It has changed who can participate, and when, how and from where they can do so. First, we used it to engage scientists from shore in real time, then to invite the public into deep-ocean exploration, and finally to conduct mapping operations from shore.

Shoreside Pilot and Shipboard Team of Engineers

On 1 March 2022, during NOAA Ocean Exploration's 2022 ROV and Mapping Shakedown on NOAA Ship *Okeanos Explorer*, with all other objectives having been met, engineers from the Global Foundation for Ocean Exploration (GFOE) turned their attention to a new use of telepresence: piloting ROV *Deep Discoverer* from shore. From Rhode Island, specifically, approximately 2,575 kilometres away from the ROV in the depths of the Straits of Florida.

During the test, a shoreside GFOE engineer piloted the ROV for more than an hour of typical exploration activity over a boulder field in an unexplored canyon on the West Florida Shelf. The test required a coordinated effort between the shoreside pilot and the shipboard team of ROV engineers, officers and scientists to determine and control ship moves and the camera and ROV manipulator arm functions required for the imaging and geological sampling typically performed during a dive.

"The ability to pilot the ROV from a shoreside location is the result of a team of very talented engineers who worked together to overcome the multiple challenges necessary to make this possible," said Dave Lovalvo, GFOE president. "GFOE is excited about the development of this capability and continues to advance our technology in the field of deep-ocean robotics."



Remotely operated vehicle *Deep Discoverer* is skillfully piloted from shore over a boulder field in a canyon on the West Florida Shelf in the Straits of Florida during Dive 06 of the 2022 ROV and Mapping Shakedown. (Courtesy: NOAA Ocean Exploration, 2022 ROV and Mapping Shakedown)

Pushing the Boundaries of Deep-ocean Exploration

Earlier efforts to improve the telepresence capabilities aboard *Okeanos Explorer* resulted in a significant reduction in the communication delay between ship and shore. During the recent test, the shoreside engineer was able to initiate ROV movements and actions (e.g. imaging and sampling) from shore and view the ROV's response in the livestreamed video, taken 1,800 metres underwater, in a mere 1.25 seconds. This is remarkable considering that the signals have to travel approximately 70,811 kilometres to a satellite in space and then back to Earth, twice (action input and video response).

"As a national leader in ocean exploration, it's NOAA Ocean Exploration's responsibility to push the boundaries of what's possible for deep-ocean exploration," said Jeremy Weirich, director of NOAA Ocean Exploration. "Our future depends on the ocean, and new and evolving technologies are critical to helping us better understand it, protect it and manage its many uses. The ability to pilot an ROV from

shore is full of promise and just one of many technological advancements that we have supported through partnerships with organizations like GFOE.”



During the 2022 ROV and Mapping Shakedown, engineers in the control room on NOAA Ship Okeanos Explorer assisted with and observed the shoreside piloting of remotely operated vehicle Deep Discoverer. (Courtesy: NOAA Ocean Exploration, 2022 ROV and Mapping Shakedown)

Testing an ROV in Yellowstone National Park

The test in March was just the second test of this evolving capability, and the first that the partners tested in the deep ocean. GFOE first tested its shoreside piloting capability in Yellowstone National Park’s Yellowstone Lake in August 2021, a collaboration between the NOAA Office of Marine and Aviation Operations and GFOE. During the Yellowstone testing, GFOE piloted their ROV *Yogi* from shore in Rhode Island and also developed the capability to operate their Research Vessel *Annie* in autonomous mode, enabling the ship to automatically follow *Yogi* during a dive.

While ocean exploration has relied on the use of ROVs for more than 30 years, how we operate them has not changed very much. For example, during ROV operations conducted by NOAA Ocean Exploration and GFOE on *Okeanos Explorer*, shipboard engineers, who are needed to operate and maintain the ROV and related systems, typically comprise a relatively large percentage of the science team.

After years of telepresence upgrades and technological and staff development, the successful demonstration of shoreside ROV piloting is a significant accomplishment that has broad implications for the future of deep-ocean exploration. Shoreside ROV piloting provides opportunities for engineers on shore who may be unable to go to sea and for the training of new ROV engineers. It also provides redundancy in case of emergency and may eventually free up valuable ship berths to expand science teams in new directions.

Source: NOAA Ocean Explorer.



This graphic illustrates the process that NOAA Ocean Exploration uses to deliver data from sensors on NOAA Ship Okeanos Explorer back to shore. (Courtesy: NOAA Ocean Exploration)

<https://www.hydro-international.com/content/news/successful-shoreside-rov-piloting-expedition-narrows-gap-between-ship-and-shore>
