Science Payload Bay Undersea Observation

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Abstract

Since the English engineer William Thompson devised the first method for taking underwater photographs in 1856, the ability to remotely take undersea pictures has been a major goal for marine biologists. This last summer we focused on getting Sloccum Webb Gliders the ability to take digital pictures. This required us to mount a camera inside the science payload bay of a glider (RU10) and then demonstrate its ability to take pictures of the sea floor as the glider undulated autonomously in the ocean. We successfully used the glider to take pictures and propose that this technology will improve the monitoring methods by providing photographs of the ocean floor to complement other available data. We propose that new technology will be very useful for understanding the extent of low dissolved oxygen in bottom waters and enhance the study of benthic organisms currently being conducted by Mike Kennish of the JC National Estuarine Research Reserve. Scientists can apply a similar method for monitoring hypoxia, and shellfish beds along the coast.

Introduction

The Rutgers University Glider (RU05), an autonomous underwater vehicle (AUV), is being deployed routinely to provide researchers an accurate view of underwater weather. Furthermore, the autonomous underwater vehicle (AUV) is providing a sampling network that can increase our knowledge of the world's oceans [5]. The slocum glider is a 1.8m long torpedo-shaped, winged AUV. The speed of the glider is 30-40 cm/s. Also, the glider travels in a saw tooth-shaped trajectory. The AUV is propelled by a buoyancy change and directed by a tail fin rudder. Once the vehicles are ballasted (stability test) for the ambient densities at the deployment site, they can be deployed and operated remotely with internet access. The objective is to develop and engage a broader community. Communication is done by the satellite service Iridium calling into a modem bank located at Rutgers University. Furthermore, gliders are deployed and recovered out of small vessels by one or two people" [5].

Experimental Procedure

1) The science payload bay was dismantled.
2) Then, various cameras were tested from inside the payload bay.
3) A plexi-glass mount was designed and mounted (Fig.1).
4) The interval timer and resolution was set.
5) The camera mount was tested inside the ballast tank (Fig.4).
6) After viewing the photos the flash was turned off and the landscape mode was selected.
7) The camera was tested from a focal length of 0.3 meters to 2 meters.
8) Glider (RU10) was deployed at LEO15 (Longterm Ecological Observatory) and programmed to hover 10 meters below the surface for 1 hour (Fig 5).

Figure 1. Components

1) Slocum Science Payload Bay
2) Light Emitting Diode (6 volt AC/DC), 6v battery pack, and ON/Off rocker switch
3) Plexi-glass camera mount
4) Digital Camera
5) Camcorder

Figure 2. Experimental Method

1-4) Inside view through each Science Payload Bay Lens

Figure 3.

Figure 4.

Figure 5.

Figure 6.

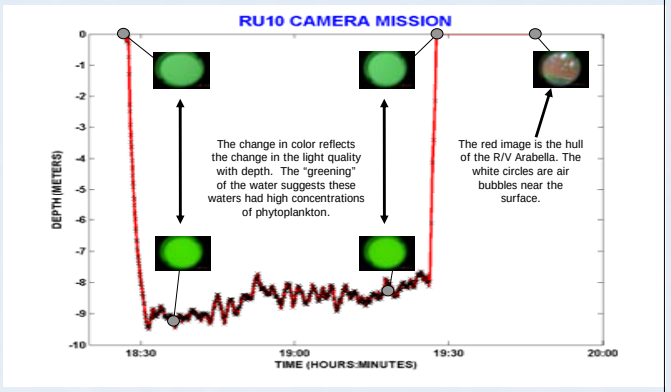
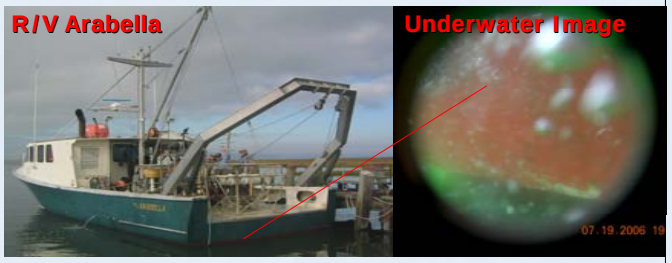


Figure 7.



Results and Discussion

After six trials and numerous attempts to configure the camera, the Nikon coolpix digital camera was successfully configured to take 1 picture for 30 second intervals. The shaded area on the pictures was a result of the close-up camera mode. The camera settings were adjusted and set to landscape mode for better picture quality. The dark green images of figure 6 resulted from the light absorption as the depth increased. The final picture is the hull of the R/V Arabella (Fig 7). The battery capacity of the camera is approximately 2 hours. This limitation may be improved by the manufacturer. The sea floor depth of LEO15 was 15 meters but, the glider hovered at 10 meters. During the 1.42 hour mission, 170 photos were successfully taken underwater using the Glider camera. The next step would be to deploy the camera in clear oligotrophic water to allow for a better sensitivity test (Fig 8).

Figure 8.

References

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