5.26 Wave Glider experiment

(1) Personnel

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(2) Background and Objectives

Although there are many global air-sea flux products mainly based on Satellite observation, in situ observations by research vessels and mooring buoys are still essential. As a part of the TAO (Tropical Atmosphere and Ocean)/TRITON (Triangle trans-ocean buoy network) array, we are conducting the air-sea flux observation in the western Pacific and eastern Indian Ocean. The mooring observation has the advantage to acquire detailed direct measurement record at a fixed point, however it takes relatively high cost to keep many sites. Because of progress of the development of unmanned ocean surface vehicles, such as the Wave Glider and the Saildrone, we can use these vehicles as a platform for air-sea flux observation. Using the Wave Glider, we are conducting development of air-sea flux observing system.

(3) Instrumentation

Wave Glider is an autonomous surface behicle, which utilize both wave energy for propulsion and solar power for supporting on-board computing, communications and sensor payloads. It can travel tens of thousands of miles, collect data in the most demanding conditions, and deliver this data in real time. The Wave Glider consists of two-part architecture; surface float and underwater glider with umbilical cable (Fig. 5.26-1). As payloads, we install three types of meteorological sensor units; the Weather Station, Weather Transmitter, and JAMMET (Fig. 5.26-2). The observed parameters are air temperature, relative humidity, barometric pressure longwave radiation, shortwave radiation, wind and rain fall amount. Underwater sensors for temperature, conductivity and pressure, thermistor chain for temperature profile within 11 m depth and ocean current profiler within 120 m depth are also installed (Fig. 5.26-3). The acquired data are recorded on logger system and transmitted to land station via iridium satellite communication system.

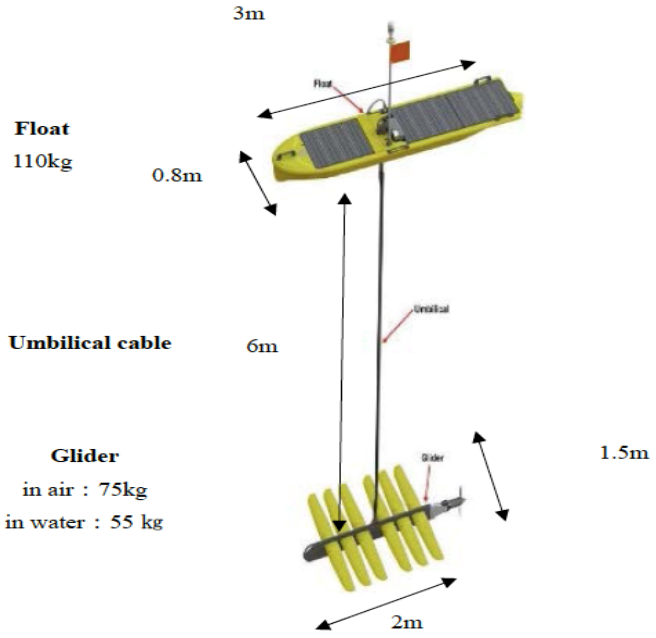


Fig. 5.26-1 Wave Glider SV3 configuration

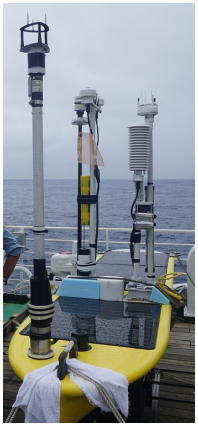


Fig. 5.26-2 Meteolorogical sensor units



Fig. 5.26-3 Thermistor chane and CTD sensor

(4) Observation

1) Data comparison with mooring observation

We conducted observation for confirmation of operational performance and data quality around m-TRITON sites at 5˚S 100˚E. We deployed the Wave Glider on 03 December 2017 (Fig. 5.26-4). Wave Gider made round along 4 nm radius circle centered on mooring anchor point of m-TRITON 2 times, and took 5 round trips along 100.08˚E during a period from 03 Dec. to 12 Dec. 2017 (Fig. 5.26-5).

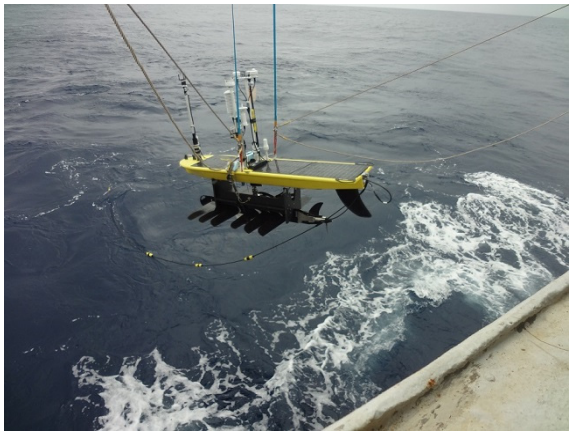


Fig. 5.26-4 Deployment of Wave Gilder on 03 December

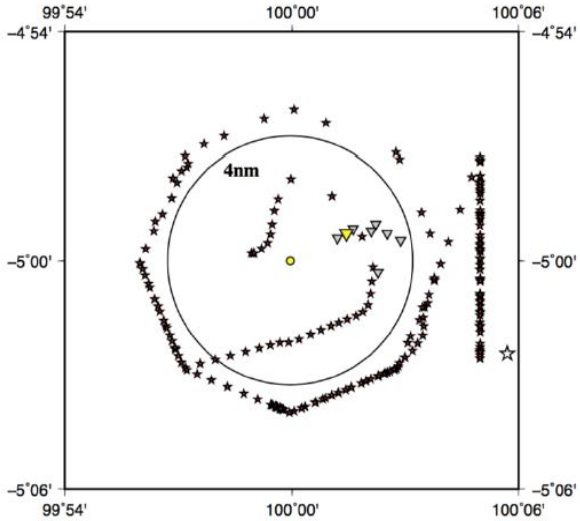


Fig. 5.26-5 Cruise track of the Wave Glider during the period from 03 Dec. to 12 Dec. 2017

2) Data comparison with R/V Mirai observation

The second observation is data comparison with the R/V Mirai. The Wave Glider moved near the R/V Mirai, and then observed between 4.27˚S 101.8˚E to 4.52˚S 101.55˚E 8 times during the period of 14 Dec. to 30 Dec. 2017 (Fig. 5.26-6). Distance from the R/V Mirai to the line is about 25 km. The Wave Glider was recovered 30 December 2017, as shown in Fig. 5.26-7.

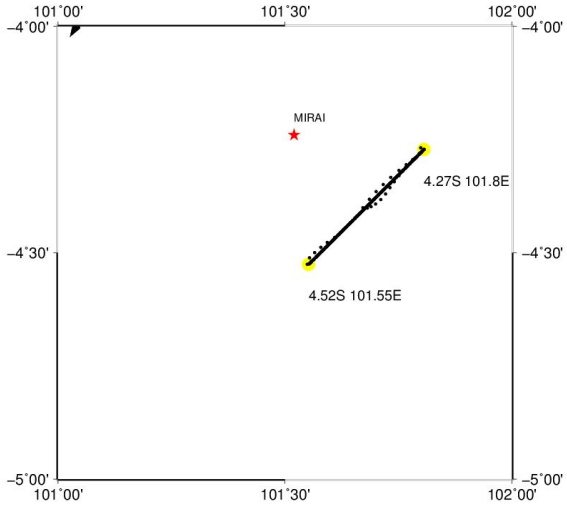


Fig. 5.26-6 Cruise track of the Wave Gilder on 14 December to 30 December 2017



Fig. 5.26-7 Recovery of Wave Glider on 30 December 2016

(5) Preliminary Results

1) Data comparison with mooring observation

Results of data comparison between the Wave Glider and m-TRITON mooring around 5˚S 100˚E are shown in Fig. 5.26-6. As shown in these figures, observed variables with both platform are consistent, which demonstrate effectiveness of the meteolorogical observation by the Wave Glider.

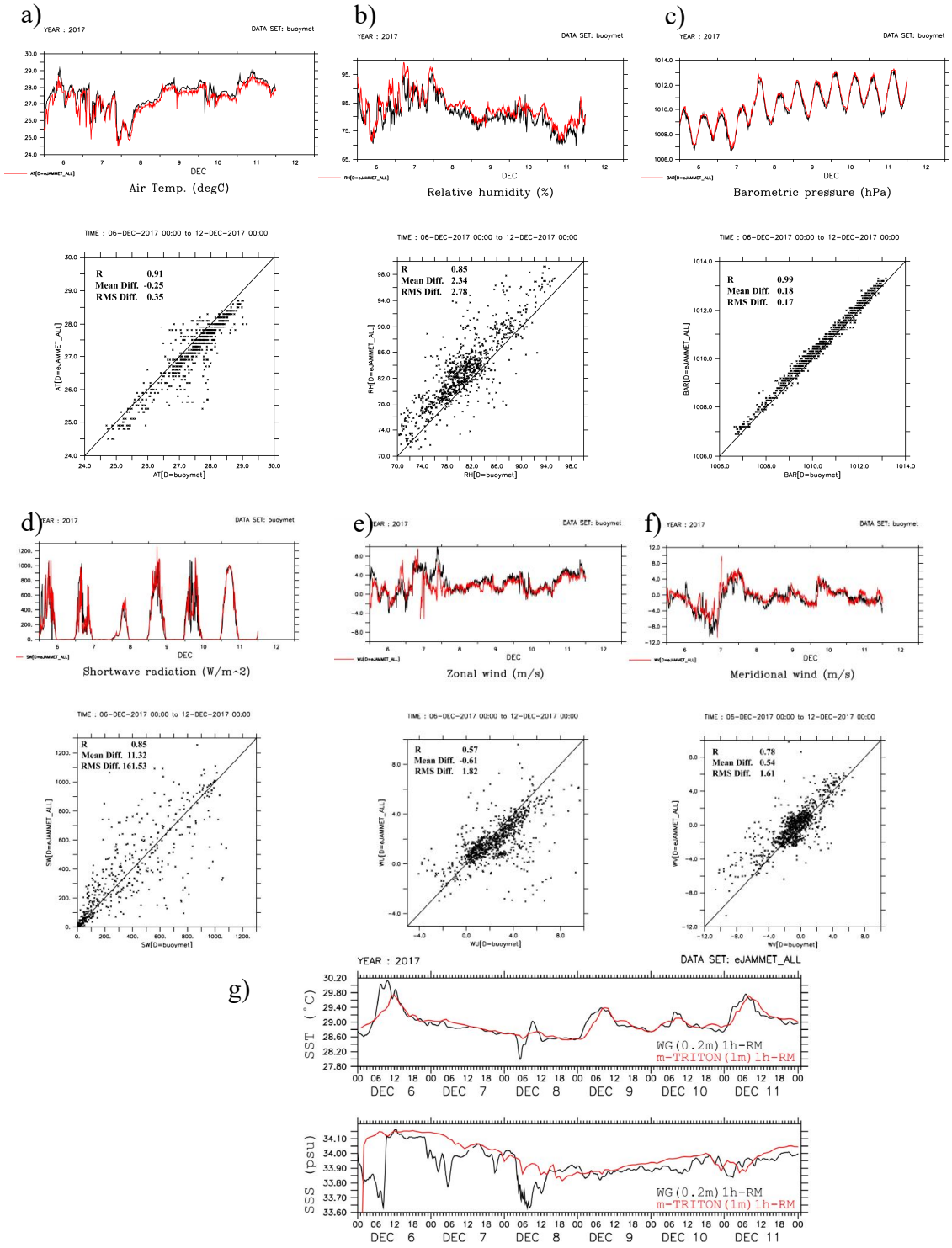


Fig. 5.26-8 Data comparison between the Wave Glider and the m-TRITON at 5˚S 100˚E.
for a) air temparature, b) relative humidity, c) barometric pressure, d) Shortwave radiation, e) zonal wind, f) meridional wind, f) SST, SSS.

2) Data comparison with the R/V Mirai

Although several damage for meteolorogical sensors were shown, the data comparison with the R/V Mirai were favorably conducted. Results of data comparison between the Wave Glider and the R/V Mirai are shown in Fig. 5.26-9. As shown in these figures, observed variables with both platform are consistent, which demonstrate effectiveness of the meteolorogical observation by the Wave Glider.

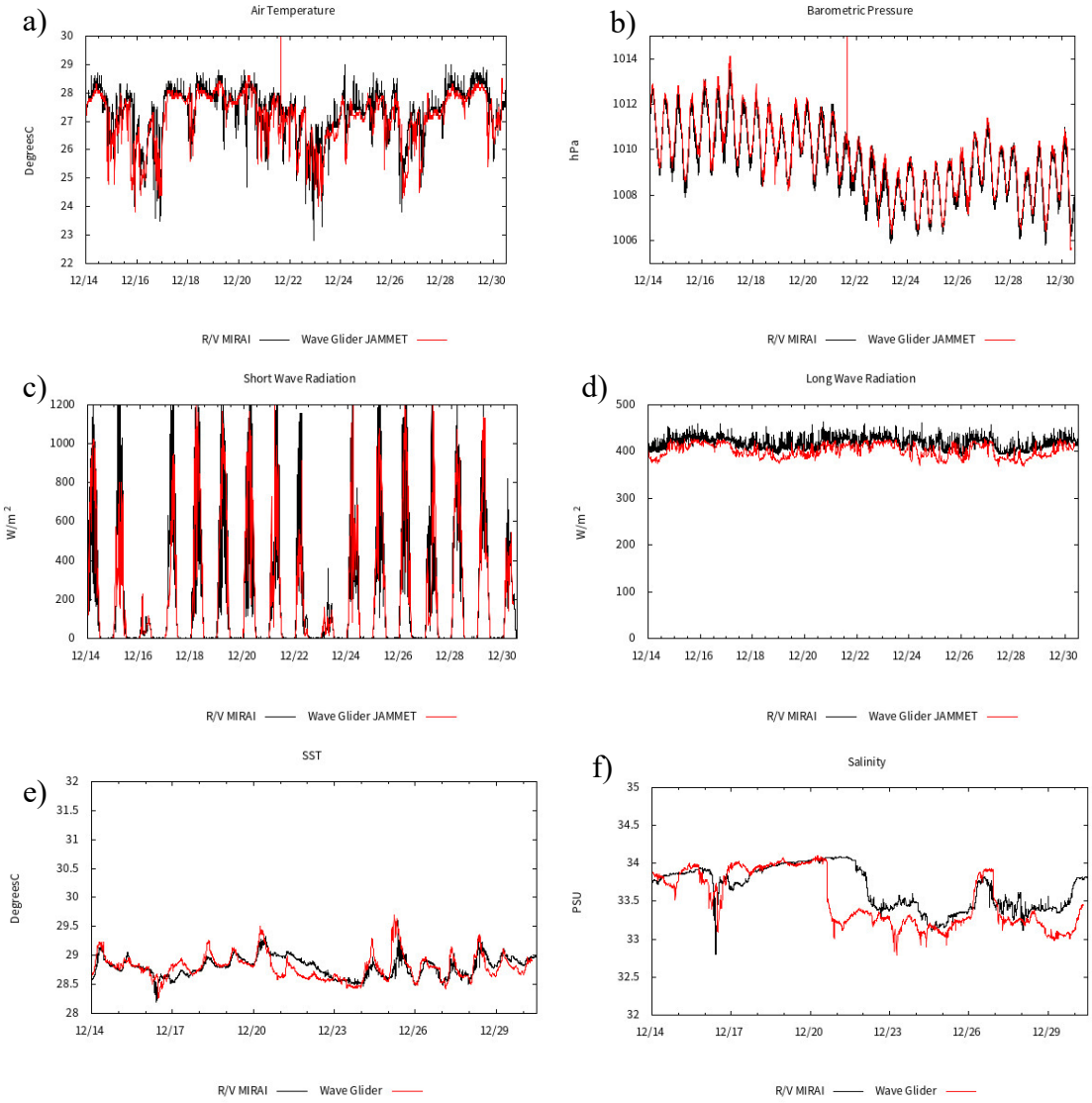


Fig. 5.26-9 Data comparison between the Wave Glider and R/V Mirai for a) air temparature, b) barometric pressre, c) shortwave radiation, d) longwave radiation, e) SST, f) SSS.