

## How fast can the RINKO sensor profile the water?

In past decades, most of DO sensors are difficult to be used in CTD Rosette to profile water at same sinking speed of CTD, because CTD sensors have faster response time (less than 100 millisecond) than DO sensors (normally, larger than 20 seconds).

The dissolved oxygen sensor RINKO developed recently by JFE Advantech Co., Ltd has typical response time about 1.5 second (See figure 1, in which, it showed the best scenario of RINKO response time). We tested RINKO sensor response time both in the water and in the air by measuring the time that RINKO reaches 90% of solution when DO solution or air is changed from 100% to 0% concentration.

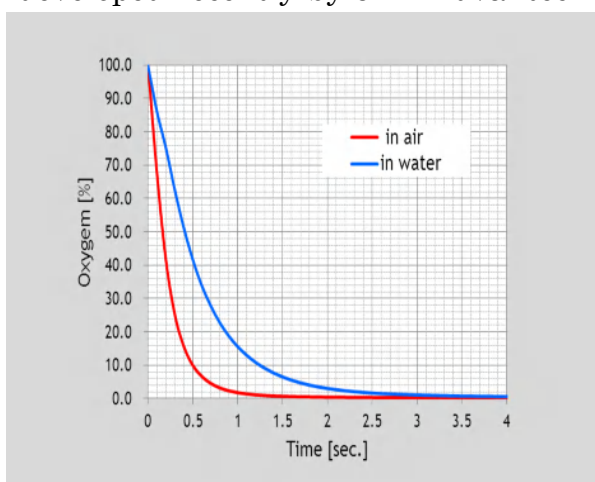


Figure 1, RINKO response time in water and air.

With such fast response DO sensor, it will be possible to sample water in same fall rate together with CTD sensor.

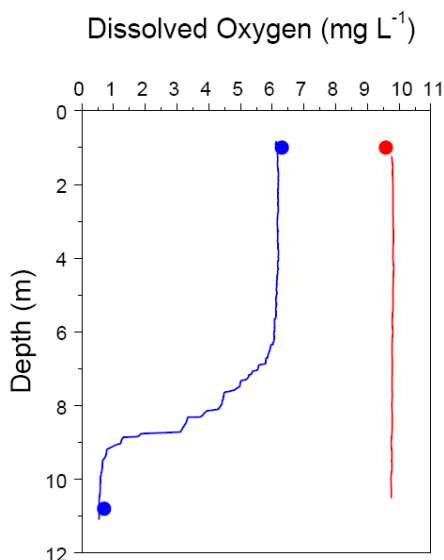


Figure 2, RINKO measurement in a glider (Blue: in summer; red: in winter).

When fall rate of platform that equipped sensor is less than 1 m/s, we got a lot of good results in comparing with Winkler sample analysis. Figure 2 shows a result when RINKO is installed in a glider and profile water with a speed of 30 ~50 cm/s. RINKO data had a good agreement with Winkler analysis.

Conventionally used CTD has typical sinking speed of 1 /s. And underway CTD may sample water as fast as 4 m/s, Is

RINKO able to be used in such platform?

Recently, the scientist from Okinawa Institute of Science and Technology (OIST) has tested the RINKO with existing UCTD winch which is able to profile the water at speed of 1 m/s to 4m/s. Before deployment, the scientist soaked RINKO sensor in a bucket which was filled with surface sea water. We called this processing as warming-up in this paper.



Figure 3, RINKO being soaked in a bucket

Test 1, Profiling water at 1m/s sinking speed without warming-up.

Test 2, Profiling water at 4m/s sinking speed without warming-up.

Test 3, Profiling water at 4m/s sinking speed with warming-up.

At same time, a CTD rosette was used to sample water for Winkler analysis.

Below 100 meter, all tests are in agreement with sample analysis by Winkler method. At surface, there exist some wide differences between RINKO with sample analysis. The reason that generated such differences has not been clearly understood (Uchida 2010). Those may be caused by operation skills on using Winkler analysis, rapid changes of DO in surface layer may also contribute to these differences.

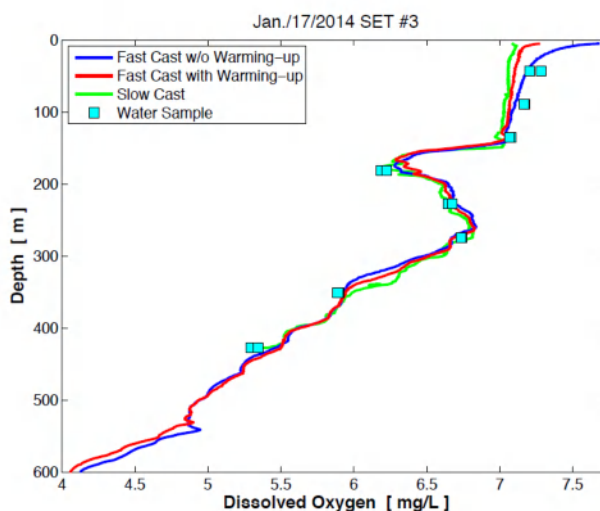


Figure 4, RINKO deployment by using UCTD winch

Reference

Uchida H, Johnson G. C, McTaggart , 2010, CTD oxygen sensor calibration procedures. The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines. IOCCP Report No. 14, ICPO Publication Series No. 134, Version 1, 2010.

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