Activity report on the automatic observation buoy at Lake Nyos

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Aim of the activity

For the real time observation of Lake Nyos is only possible through the satellite communication. In this activity, the data sent from the automatic observation buoy has been received in Japan and Cameroon since March 2014.

Automatic Observation Buoy (AOB)

The AOB was installed in March 2014 at the central part of Lake Nyos. The AOB are floating on the water surface. It hangs a steal wire on which five sensor units were attached at -4, -120, -160, -200 and -204m. The sensor unit include temperature sensor and electric conductivity sensor, the precision of which is 0.01C and 0.1μS/cm, respectively. The AOB collects the data every hour from the five sensor units through the steel wire. The data is transmitted to the Iridium satellite. The sent data is distributed to Japan and Cameroon through internet. The obtained data is sent to the assigned mail address as an attached text file. The software "tsBase" can automatically remove the attached file and generate a CSV file.

Telecommunication charge

For the satellite communication, some charge should be paid every month to the Telecommunication Company. It is regret that due to the lack of research money in IRGM, T Ohba paid the charge personally, tentatively. The detail of payment is shown in the following list. After the secure of research money by IRGM, IRGM should pay back the equivalent amount to T Ohba, because the AOB is the instrument donated to IRGM. The property of AOB belongs to IRGM. IRGM has the responsibility for the payment.

Year	Month	Charge (Yen)	Charge (CFA)	Remark
2014	4	54,000	270,000	Including the first contract charge. 24 sending/day

2014	5	37,800	189,000	24 sending/day
2014	6	37,800	189,000	24 sending/day
2014	7	37,800	189,000	24 sending/day
2014	8	37,800	189,000	24 sending/day
2014	9	37,800	189,000	24 sending/day
2014	10	37,800	189,000	24 sending/day
2014	11	37,800	189,000	24 sending/day
2014	12	37,800	189,000	24 sending/day
2015	1	37,800	189,000	24 sending/day
2015	2			4 sending/day
	Sum	394,200	1,971,000	

In order to save the research money of IRGM, the frequency of data sending was reduced to 4 times per day since 1st Feb 2015.

Results

The change of temperature and conductivity at various depth are shown in Fig 1 and 2, respectively. The shallow sensor at -4m changed significantly affected by seasonal climate. Except the shallow layer, deep water is quite stable. At -120 and -160m, the gradual decreasing trend is found in both the temperature and conductivity, suggesting a steady subsidence of water in hypolimnion due to the removal of bottom water through the three degassing pipes. The enlargement for the change at -200 and -204m is shown in Fig 3 and 4 for the temperature and conductivity, respectively. The changes at those depths are different from that at -120 and -160m, namely, in the period from March 2014 to November 2014, the temperature and conductivity at -200m gradually decreased. In December 2014 and January 2015, those values was almost stable with some variation. The change at -204m is much complicated. In March to June 2014, a cyclic variation was observed in the temperature and conductivity.

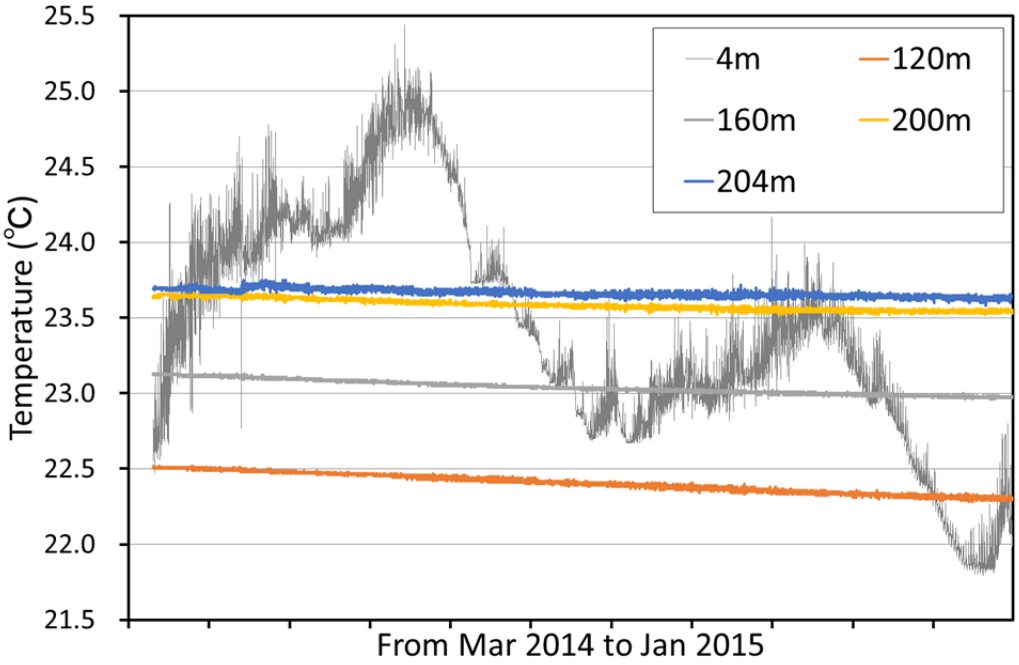

Fig.1. Temperature change of water in Lake Nyos at various depth

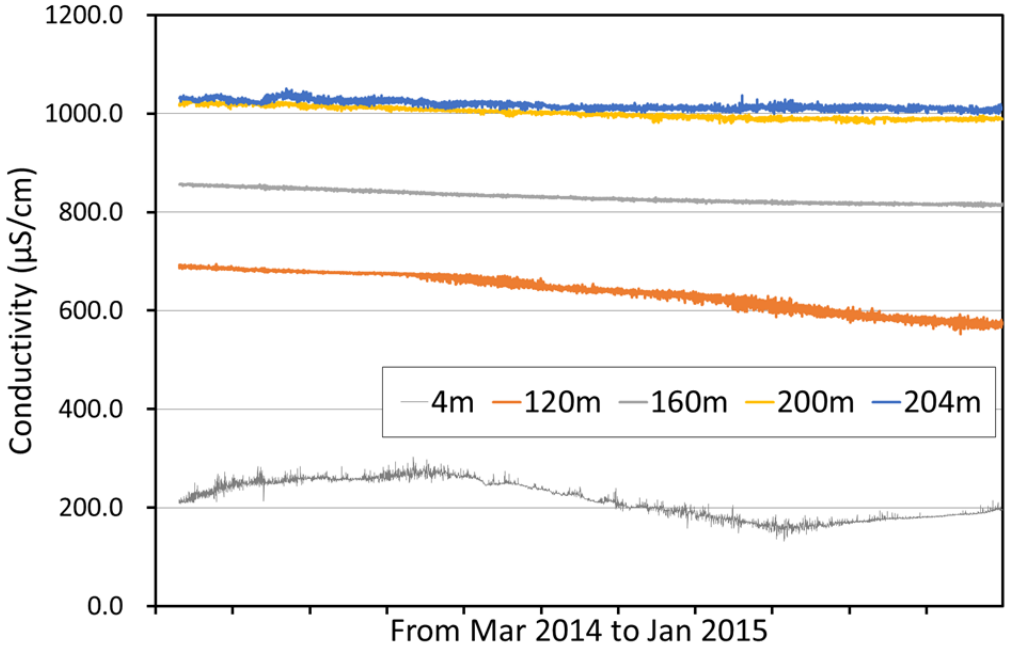

Fig.2. Conductivity change of water in Lake Nyos at various depth

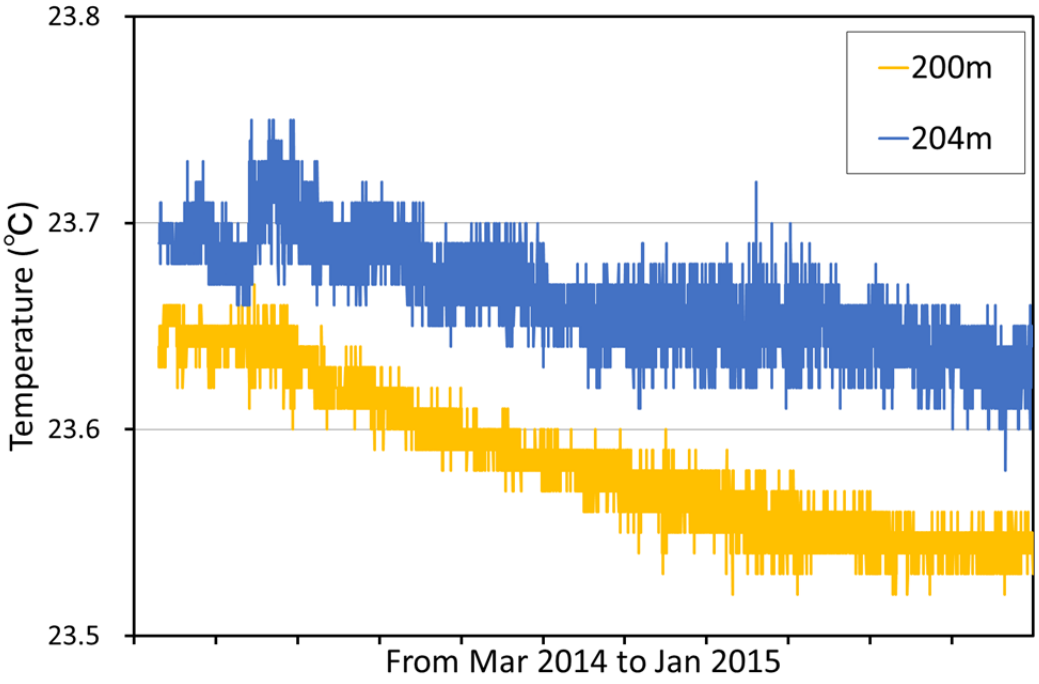

Fig.3. Temperature change at -200 and -204m

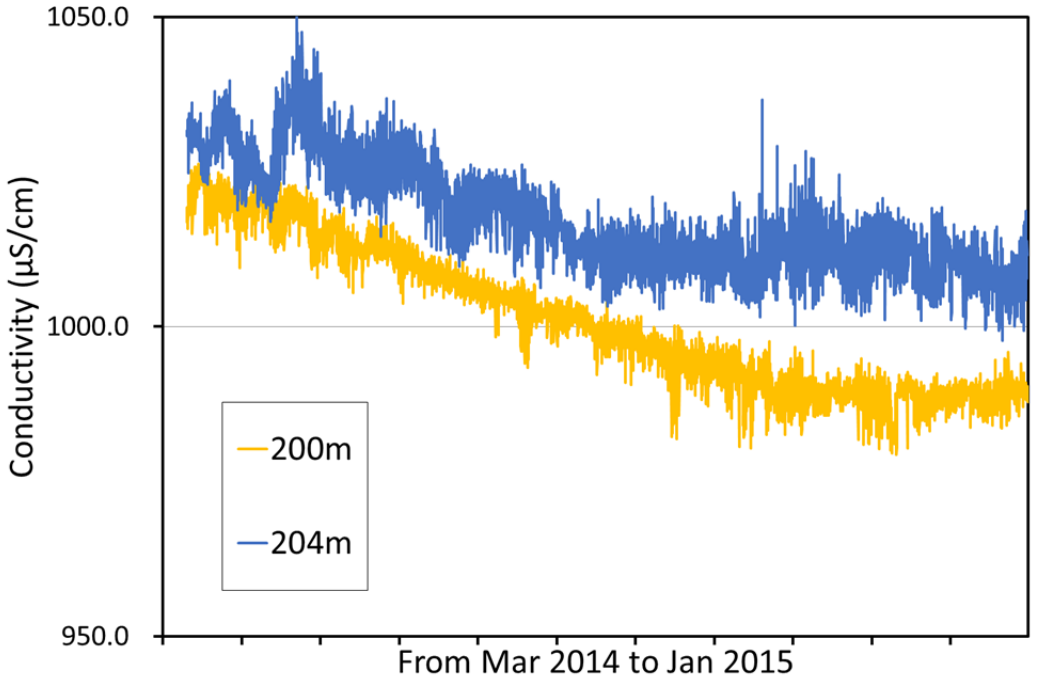

Fig.4. Conductivity change at -200 and -204m