



“KAIYO” Cruise Report

KY15-01

Experiments of underwater acoustic technology,

Izu-Ogasawara, Suruga-Bay

Jan/7/2015 – Jan/19/2015

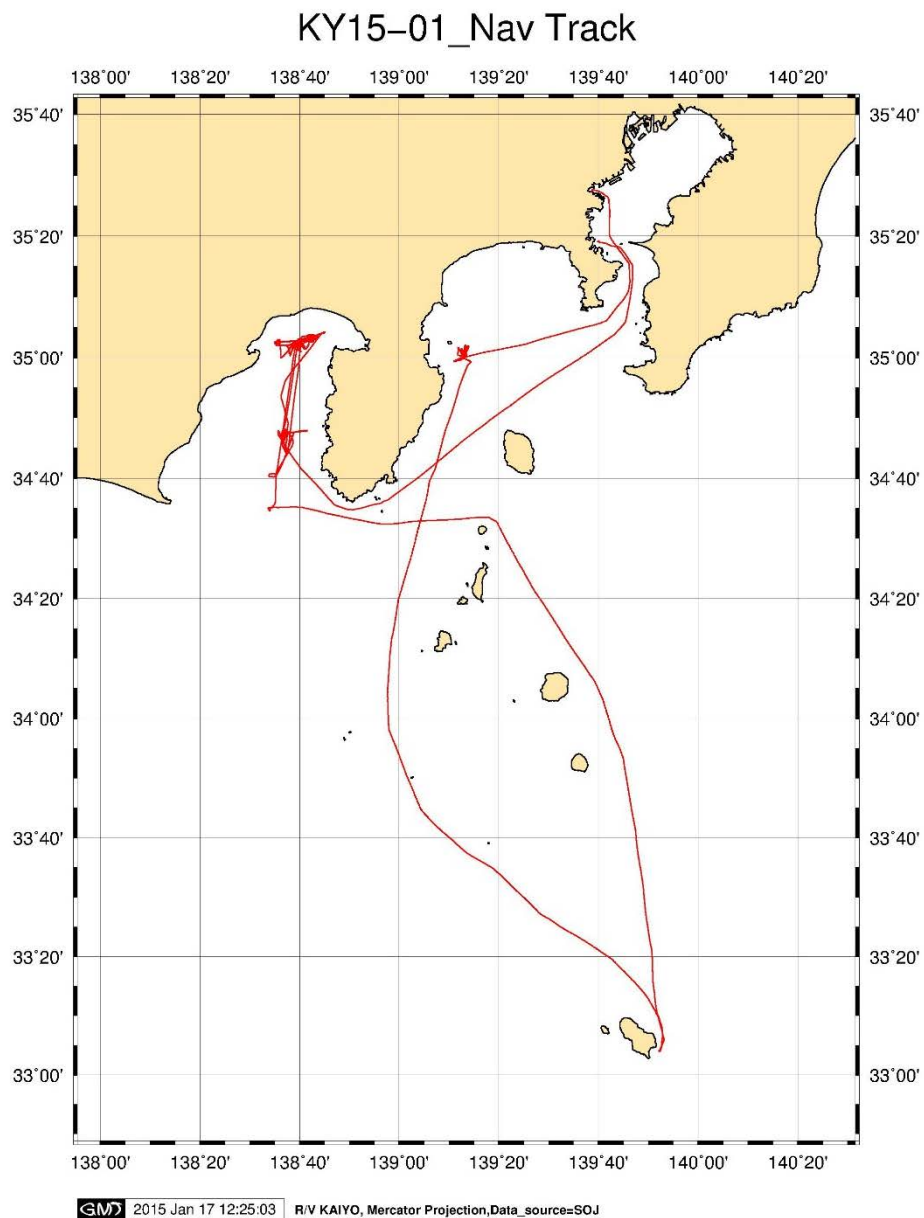
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

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1. Cruise Information

- Cruise ID: KY15-01
- Name of vessel R/V KAIYO
- Title of the cruise Experiments of underwater acoustic technology
- Title of proposal Research on multi-user communication by time reversal in deep ocean
Research on source tracking by real time inversion in deep ocean
- Cruise period 07/Jan/2015 – 19/Jan/2015
- Ports of call Yokohama-Yokosuka JAMSTEC Headquater
- Research area Izu-Ogasawara, Suruga-Bay
- Research Map



2. Researchers

- Chief scientist [Affiliation] Takuya SHIMURA [JAMSTEC]
- Representative of the science party [Affiliation] Takuya SHIMURA [JAMSTEC]
- Science party [Affiliation, assignment etc.]

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Hiroki USHIROMURA, Hiroshi MATSUNAGA, Tatsuya SUGIYAMA [Marine Works Japan. LTD]

3. Flash report of experiment

In our group, research on long-range acoustic communication using time-reversal in deep ocean has been conducted. Time reversal is an attractive solution, originally, for single user communication. It is suitable for underwater acoustic communication in terms of countermeasure to intersymbol interference (ISI) due to rich multipath environment inherent in the ocean acoustic propagation. Spatial and temporal focusing of time reversal removes such ISI by collecting multipath signals. Additionally, time reversal can be easily extended to multiuser communication by the same processing in the single user case without sacrificing throughput.

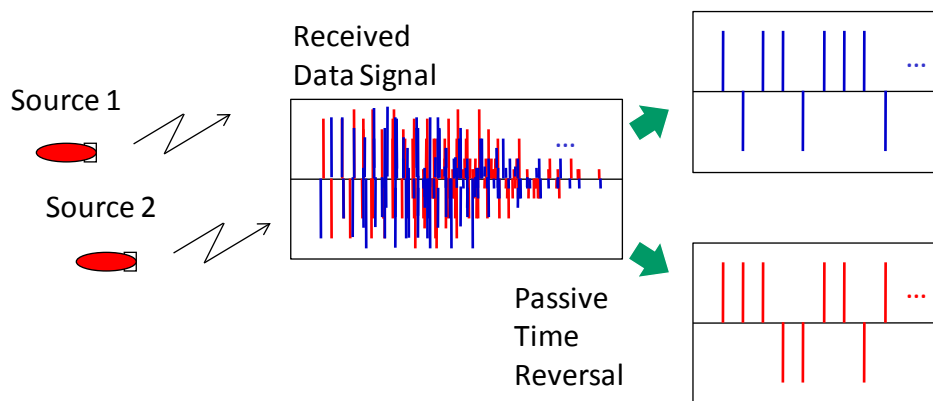


Fig. 1 Schematic of multi-user communication by time reversal.

In this cruise, experiments of multi-user communication were executed in Suruga-bay. Two low-frequency sources, whose source level is 196 dB approximately in the bandwidth from 450 to 550 Hz and a twenty channel receiver array, whose intervals between receivers were 6 m, were used in this experiment. One of the source was suspended from the research vessel with changing its depth and the other source was moored horizontally a few kilometers away from the suspended source.

The figure 2 shows one of demodulated results, which shows that time reversal can separate the signals from two positions well and error-free demodulation achieve. Thus, multi-user communication with time reversal was achieved. As future work, demodulation with adaptive time reversal OFDM and so on will be tried.

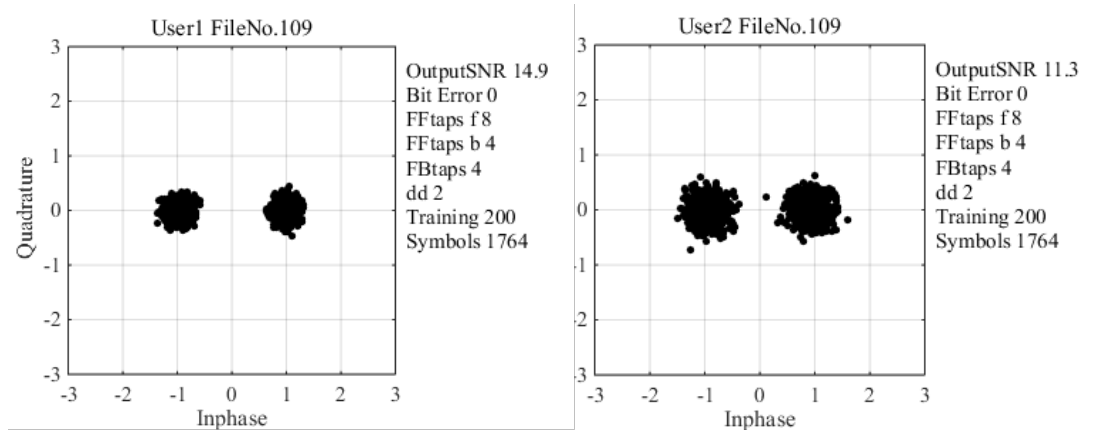


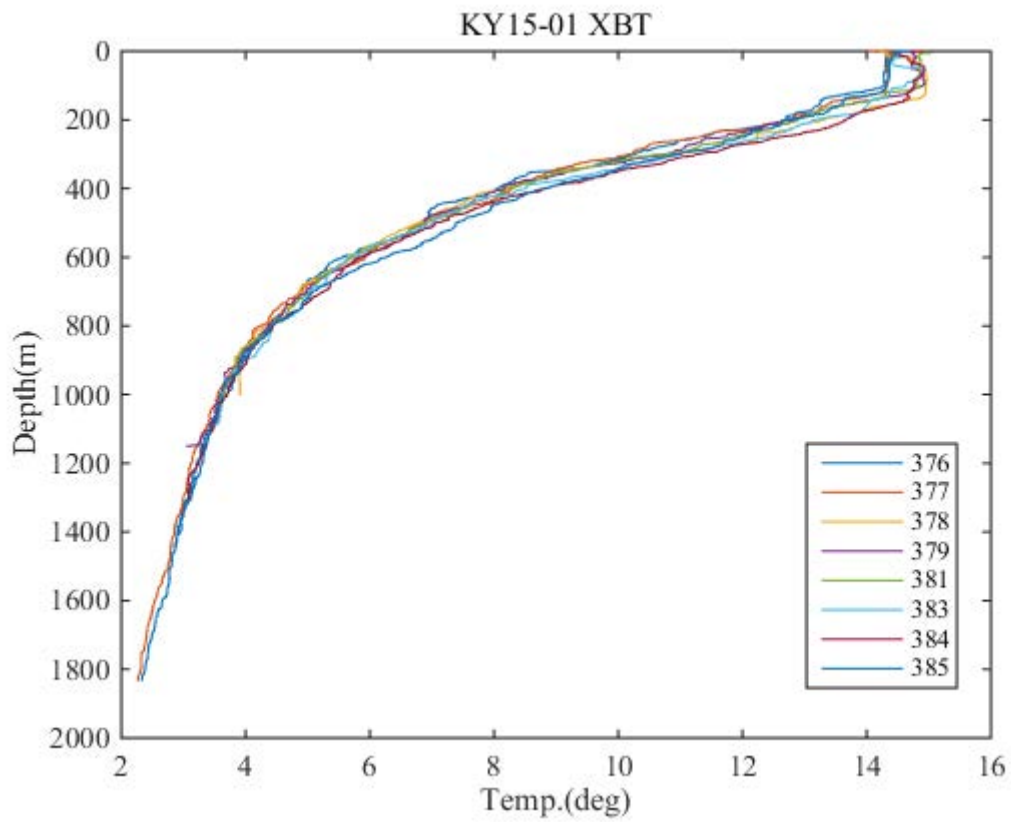
Fig.2 An example of results of time-reversal multi-user communication.

● Deployment and recovery information

Moored number	Moored date	Moored point		Depth	Recovery date
		Latitude	Longitude		
Rx Array	2015/01/11s	35°02.6'N	138°35.8'E	1,089m	2015/01/13
Tx	2015/01/12	35°02.9'N	138°45.6'E	1,300m	2015/01/13
Rx Array	2015/01/14	35°02.1'N	138°38.9'E	1,193m	2015/01/16
Tx	2015/01/14	35°46.6'N	138°36.7'E	1,708m	2015/01/16

- XBT

Cast number	Cast date [JST]	Cast time [JST]	Cast point	
			Latitude	Longitude
376	2015/1/10	20:34:00	34-35.1446N	138-36.1406E
377	2015/1/10	5:33:01	34-40.6770N	138-35.2950E
378	2015/1/11	9:10:01	35-02.5048N	138-35.0728E
379	2015/1/11	12:11:31	35-02.9088N	138-42.4945E
381	2015/1/12	16:12:30	35-03.4529N	138-42.5266E
383	2015/1/13	16:20:00	35-02.2524N	138-36.0152E
384	2015/1/13	5:55:30	35-01.6799N	138-38.4823E
385	2015/1/14	10:48:01	34-45.0448N	138-36.7706E



4. Notice on Using

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.