5.2 Doppler Radar

(1) Personnel (*: Leg-1, **: Leg-2, ***: Leg-1+2)

Kunio YONEYAMA*	(JAMSTEC)	- Principal Investigator (Leg-1)
Masaki KATSUMATA***	(JAMSTEC)	- Principal Investigator (Leg-2)
Kazuaki YASUNAGA**	(JAMSTEC)	
Mariko SEKI**	(JAMSTEC)	
Keisuke TASHIRO**	(JAMSTEC)	
Ayumi KUROTAKI*	(JAMSTEC)	
Aya TSUBOI*	(Kyoto Univ.)	
Nao TAKAMURA*	(Kyoto Univ.)	
Tetsuya TAKEMI	(Kyoto Univ.)	- not on board
Taro SHINODA	(Nagoya Univ.)	- not on board
Souichiro SUEYOSHI***	(GODI)	- Operation Leader (Leg-1 and 2)
Asuka DOI***	(GODI)	
Toshimitsu GOTO***	(GODI)	
Katsuaki MAENO*	(GODI)	
Ryo KIMURA*	(GODI)	
Satoshi OKUMURA**	(GODI)	
Kazuho YOSHIDA**	(GODI)	
Wataru TOKUNAGA***	(MIRAI Crew)	

(2) Objective

The objective of the Doppler radar observation in this cruise is to investigate three dimensional rainfall and kinematic structures of precipitation systems and their temporal and special variations in the central Indian Ocean, especially at around (8S, 80.5E).

(3) Method

The Doppler radar on board of Mirai is used. The specification of the radar is:

Frequency:	5290 MHz
Beam Width:	less than 1.5 degrees
Output Power:	250 kW (Peak Power)
Signal Processor:	RVP-7 (Vaisala Inc. Sigmet Product Line, U.S.A.)
Inertial Navigation Unit:	PHINS (Ixsea S.A.S., France)
Application Software:	IRIS/Open (Vaisala Inc. Sigmet Product Line, U.S.A.)

Parameters of the radar are checked and calibrated at the beginning and the end of the intensive observation. Meanwhile, daily checking is performed for (1) frequency, (2) mean output power, (3) pulse width, and (4) PRF (pulse repetition frequency).

During the cruise, the volume scan consisting of 21 PPIs (Plan Position Indicator) is conducted every 10 minutes. A dual PRF mode with the maximum range of 160 km is used for the volume scan. Meanwhile, a surveillance PPI scan is performed every 30 minutes in a single PRF mode with the maximum range of 300 km. At the same time, RHI (Range Height Indicator) scans of the dual PRF mode are also operated whenever detailed vertical structures are necessary in certain azimuth directions. Detailed information for each observational mode is listed in Table 5.2-1. The Doppler radar observation is from Sep.25 to Oct.26, 2011 during the Leg 1, and from Oct.29 to Dec.01, 2011 during the Leg 2.

Table 5.2-1 Parameters for each observational mode

	Surveillance PPI	Volume Scan	RHI
Pulse Width	2 (microsec)	0.5 (microsec)	0.5 (microsec)
Scan Speed	18 (deg/sec)	18 (deg/sec)	Automatically determined
PRF	260 (Hz)	900/720 (Hz)	900 (Hz)
Sweep Integration	32 samples	50 samples	32 samples
Ray Spacing	1.0 (deg)	1.0 (deg)	0.2 (deg)
Bin Spacing	250 (m)	250 (m)	250 (m)
Elevation Angle	0.5	0.5, 1.0, 1.8, 2.6, 3.4, 4.2, 5.0, 5.8, 6.7, 7.7, 8.9, 10.3, 12.3, 14.5, 17.1, 20.0, 23.3, 27.0, 31.0, 35.4, 40.0	0.0 to 60.0
Azimuth	Full Circle	Full Circle	Optional
Range	300 (km)	160 (km)	160 (km)

(4) Preliminary results

Figure 5.2-1 shows the time series of the areal coverage of the radar echo greater than 10 dBZ, obtained by the volume scans, during the period when Mirai was staying at (8S, 80.5E). As in the figure, the Leg-1 (Sep.30 to Oct.24) is clearly separated as former “convectively active” period and latter “convectively inactive” period. On the other hand in the Leg-2 (Oct.31 to Nov.28), the certain amount of radar echo was appeared for the most of the observation time. Somewhat periodic variations, with the cycle of several days, or diurnal cycle, are apparent. The lower panel indicate that the large coverage was mostly contributed by the extension of stratiform precipitating area. The further detailed analyses will be studied soon.

(5) Data archive

All data of the Doppler radar observation during this cruise will be submitted to the JAMSTEC Data Integration and Analysis Group (DIAG). The corrected datasets will be available at Mirai website at http://www.jamstec.go.jp/cruisedata/mirai/e/, and CINDY website.

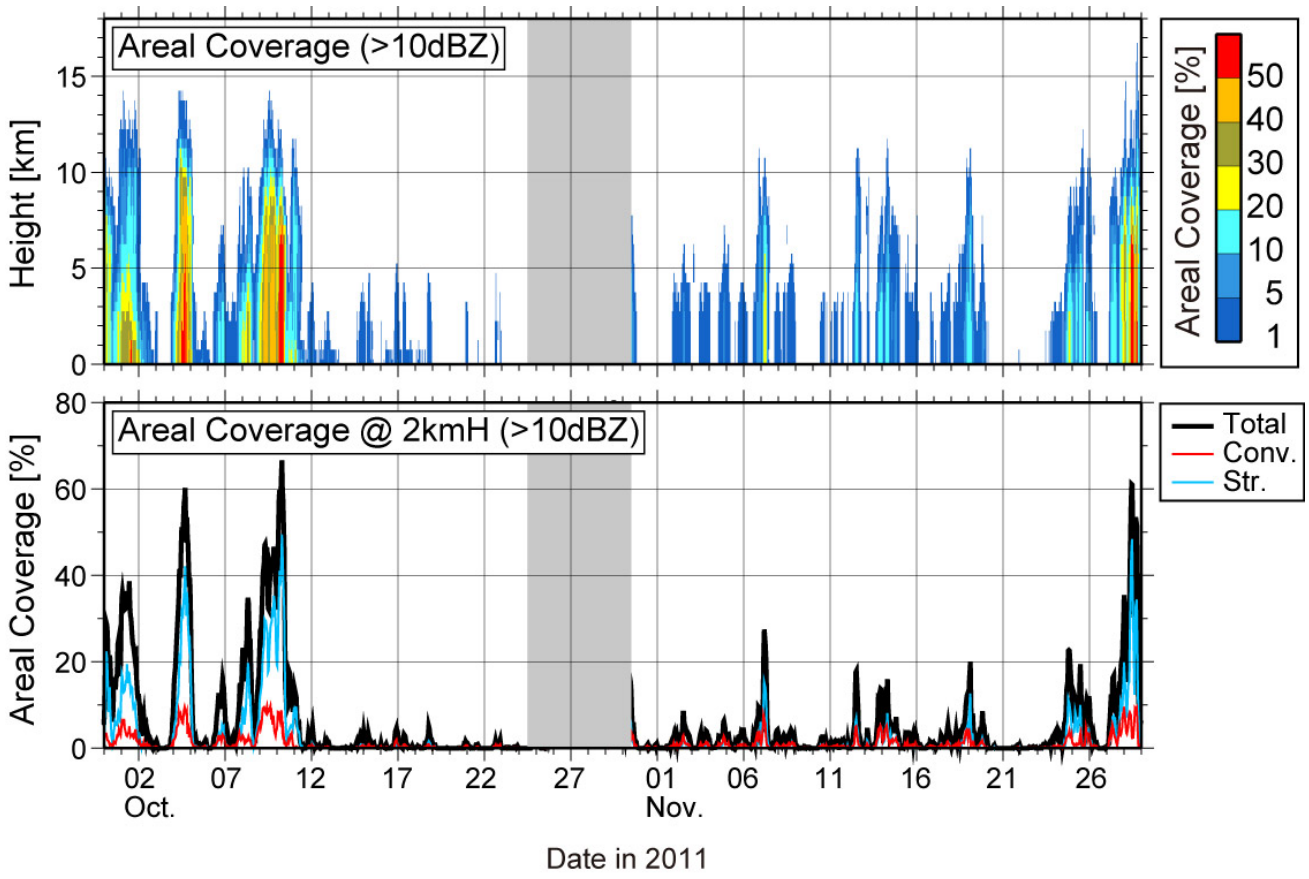

Fig. 5.2-1: Time series of the areal coverage of the radar echo greater than 10 dBZ; (upper) vertical profile, and (lower) at 2 km height, with value for convective (red) and stratiform (blue) portions.