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# MR06-05 Leg1 Cruise Summary

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## 1. Cruise Title

MISMO (Mirai Indian Ocean cruise for the Study of the MJO-convection Onset)  
Cruise code : MR06-05 Leg-1

## 2. Objectives

The Madden-Julian oscillation (MJO), that is a dominant eastward propagating intraseasonal oscillation in the Tropics, is a key issue to be solved, as it influences not only the tropical atmospheric and oceanic variations but also the global climate. Since the MJO is a phenomenon coupled with deep cumulus convections, it is manifested over the warm pool region from the eastern Indian Ocean through the western Pacific Ocean. However, past major field experiments conducted in the Indian Ocean were devoted to study the summer monsoon, and there are few data especially in the boreal fall-winter season.

On the one hand, recent studies using reanalysis and satellite data revealed various aspects of the large-scale MJO structure. However, current general circulation models still fail to simulate the "slow" eastward propagation and underestimate the strength of the intraseasonal variability. It is believed that this deficiency is mainly due to the insufficient cumulus parameterization. Therefore, it requires that fine-scale observation data is invaluable to promote our knowledge on the mechanism of the MJO.

Based on the fact mentioned above, we at JAMSTEC have planned to conduct the intensive observation using the R/V Mirai to capture the detailed features from the ocean surface to the entire troposphere in the period from late October through November when the onset of convection in the MJO is often observed.

## 3. Period and Ports of call

Oct. 04, 2006	departed Sekinehama (mother port of MIRAI)
Oct. 04, 2006	called at Hachinohe, Japan
Oct. 15 - 16, 2006	called at Singapore
Nov. 27, 2006	arrived at Male, Maldives

## 4. Chief Scientist

Kunio Yoneyama JAMSTEC / IORGC E-mail : yoneyamak@jamstec.go.jp

## 5. Themes and Participants List

- a. Study of the air-sea interaction in the tropics.  
K. Yoneyama, K. Yasunaga, M. Fujita, C. Yokoyama (JAMSTEC), K. Kikuchi (IPRC),

- R. M. Reynolds, J. M. Reynolds (RMR Co.), C.-Y. Ku (National Central Univ.)
- b. Tropical Ocean Climate Study  
Y. Ishihara, T. Matsumoto (JAMSTEC)
  - c. Argo float observation  
N. Sato (JAMSTEC)
  - d. Rain and water vapor sampling  
N. Kurita (JAMSTEC)
  - e. Cloud radar and Lidar observation  
N. Mashiko (Tohoku Univ.), I. Matsui (NIES)
  - f. Sky radiometer observation  
Nobody was on board (operation was done by GODI)
  - g. Underway geophysics  
Nobody was on board (operation was done by GODI)
  - h. Wind profiler observation  
H. Hashiguchi (Kyoto Univ.), N. Kawano (Univ. de Toulon et du Var)
  - i. Videosonde observation  
K. Suzuki, S. Shigeto, T. Koga, K. Morinaga (Yamaguchi Univ.)
  - j. Ozone and water vapor sonde observation  
Y. Inai (Hokkaido Univ.)
  - k. Surface eddy flux measurement and CO<sub>2</sub> measurement  
O. Tsukamoto, Y. Suwa, C. Watanabe (Okayama Univ.)
  - l. Near surface temperature measurement  
K. Ando (JAMSTEC), H. Qin (Tohoku Univ.)
  - m. Biogeochemical measurement  
N. Nakatani, K. Ohta, A. Yoshimura (Osaka Prefecture Univ.)
  - n. Technical Staff  
S. Okumura, Si. Okumura, K. Maeno, N. Nagahama (GODI),  
K. Wataki, H. Matsunaga, M. Enoki, K. Matsumoto, T. Noguchi, Y. Ishikawa, A. Takeuchi, T. Tanaka, T. Kiyokawa, H. Ushiomura (MWJ)

## 6. Overview of the Observations

In order to investigate the atmospheric and oceanic conditions in the central equatorial Indian Ocean in the fall–winter season, when and where the convections in the MJO are often initiated, the intensive observations by the R/V Mirai and the buoy network around (0, 80.5E) were carried out. First, we deployed 12 Argo floats along 80.5E line from 8S to 3N. Then, we deployed four sub–surface ADCP moorings and two m–TRITON buoys in that area to construct the buoy array to monitor the ocean heat budget. Then, we conducted the observation at fixed site at (0, 80.5E) from October 28 through November 21 (24 days). Actually, as we stayed near (0, 80.5E) for deployment / recovery buoys and conducted observations, hereafter, we define the intensive observation period (IOP) from 0000 UTC on October 24 through 0000 UTC on November 26, 2006 (33 days).

Observations were conducted under the Indian Ocean Dipole mode event (sea surface temperature in the equatorial eastern Indian Ocean was cooler than that in the western Indian Ocean). In the lower troposphere, weak easterlies prevailed through the entire IOP. During the first half of IOP, it corresponded to the convectively suppressed period and shallow convections were observed. On the other hand, deep convections were frequently observed during the second half of IOP and heavy precipitation systems passed over the Mirai. It is worth noting that while westerlies prevailed at the upper troposphere near the tropopause in the first half of IOP, it drastically changed to easterlies and then became convectively active period. Although we have to confirm the relationship with the MJO in detail using not only in–situ data obtained during this cruise but also other large–scale data sets such as satellite data, at least we might be able to meet the onset of the convectively active phase of the intraseasonal oscillation.