

5.8 Water-vapor and ozone soundings

(1) Personnel

Masatomo FUJIWARA (Hokkaido University) - Principal Investigator (not on board)
 Junko SUZUKI (JAMSTEC) - on board (Leg-1 and 2)
 Fumio HASEBE (Hokkaido Univ.) - not on board
 Masato SHIOTANI (Kyoto Univ.) - not on board
 Takashi SHIBATA (Nagoya Univ.) - not on board

(2) Objective

The research objective is to investigate the transport and dehydration processes around the tropical tropopause. A total of 20 sets of the Development measurement technologies Cryogenic Frostpoint Hygrometer, 10 sets of the EN-SCI electrochemical concentration cell (ECC) ozonesonde, and 20 sets of the Meisei RS06G radiosonde are flown with meteorological rubber balloons to obtain water vapor and ozone profiles up to the middle stratosphere.

(3) Methods

The payload consists of the following four parts:

- Cryogenic Frostpoint Hygrometer (CFH)
(Development measurement technologies, Corp., USA)
- ECC ozonesonde: Standard ozonesonde using potassium iodide solutions
(Development measurement technologies, Corp., USA)
- RS06G: Standard radiosonde
(Meisei, Corp., Japan)

The payload is flown with the TA1200 rubber balloon, 160 or 190 type parachute, and unwinder (TOTEX, Japan). The Helium gas is used to obtain the buoyancy of about 5 m/s ascent. The CFH sensor is injected the cryogen refrigerated ~80° C by a deep freezer in the No.1 Chemistry/Biology Laboratory.

The ground receiving system consists of a Meisei GPS sounding receiver system (RS-08AC), Brown antenna, and laptop computer. Software “MGPS_R” developed at Meisei is used for calculation, real-time graphics, and data storage. The antenna was installed around the top of the Main Mast, and the receiving system together with the ozonesonde preparation system was installed in the Aft Wheel House.

The following table shows the sounding date and time.

Table 5.8-1: Sounding date and time (UTC)

5 Oct. 10:25	19 Oct. 10:20	21 Oct. 10:15	1 Nov. 10:01	2 Nov. 10:45
3 Nov. 10:03	4 Nov. 7:51	5 Nov. 7:50	6 Nov. 19:50	7 Nov. 20:02
*10 Nov. 9:57	*15 Nov. 7:51	*16 Nov. 7:46	*17 Nov. 7:44	*18 Nov. 10:23
*20 Nov. 7:45	*21 Nov. 9:54	*22 Nov. 7:42	*24 Nov. 9:55	*26 Nov. 7:39

*with the ECC ozonesonde

The balloon inflation was made at the backside of the upper deck where the launch was made. We used a balloon protection cover during the inflation. The frequency range of 404.0 MHz was used for the radiosonde transmitter.

(4) Preliminary results

The CFH is capable of measuring water vapor inside clouds but may occasionally suffer from an artifact in which the optical detector collects water or ice. The condition leads to a malfunction of the instrument controller and thus needs to be screened out of the processed data [Selkrik et al., 2010]. Therefore we could not show here the vertical distributions of temperature, ozone, relative humidities, and the CFH as house-keeping profiles. All but three ascents reached altitudes of 29 km or more. The cold-point tropopause was around 17 km during this cruise.

(5) Data Archive

All data obtained during this cruise will be submitted to the JAMSTEC Data Integration and Analysis Group (DIAG). The corrected datasets will be available at CINDY website.