R/V Baruna Jaya III
CINDY2011
Cruise Report

Tropical Eastern Indian Ocean
December 2 - 21, 2011

Japan Agency for Marine-Earth Science & Technology (JAMSTEC)
&
Agency for the Assessment and Application of Technology (BPPT)

[Contents]

1. Introduction

This cruise was designed to improve our knowledge on the initiation processes of the Madden-Julian Oscillation (MJO) by providing in-situ data, as a part of the international field experiment “Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011 (CINDY2011)”. The MJO, which is the dominant intraseasonal mode in the tropics and has strong impact onto the global climate, is an eastward propagating disturbance, occurring primarily over the central equatorial Indian Ocean and its convection often terminates before arriving the western Hemisphere. Thus, the observations by the research vessel in the eastern Indian Ocean are expected to provide useful data in studying the features of MJO-convection and associated circulation before entering the maritime continent, where the Indian Ocean and the Pacific connect.

CINDY2011 and its US component “Dynamics of the MJO (DYNAMO)” project are officially endorsed by the World Climate Research Programme (WCRP) / Climate Variability and Predictability Project (CLIVAR). All data taken by this cruise will be available to use for public by following the CINDY2011/DYNAMO data policy. These data as well as other information on CINDY2011 can be found at their web site “http://www.jamstec.go.jp/iorgc/cindy/”.

This cruise was based on the Implementing Agreement for Tropical Ocean Climate Observational Studies between Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and the Agency for the Assessment and Application of Technology (BPPT), which entered into force on April 1st, 2011, and also based on the Agreement for the Collaborative Research concerning CINDY2011 between JAMSTEC and the Technology Center for Marine Survey (Balai Teksurla) of BPPT, which entered into force on October 7th, 2011.

Acknowledgments

I, on behalf of on-board scientists, would like to express our sincere thanks to Captain Tiur Maida and her crew, BPPT technical staff, and Security Officer for completing this cruise successfully. Thanks are extended to the all ground staff of BPPT and JAMSTEC who made this cruise possible.

Chief scientist Kunio Yoneyama / JAMSTEC

***** Remarks *****

This cruise report is a preliminary documentation as of the end of the cruise. It may not be corrected even if changes on content are found after publication. It may also be changed without notice. Data on the cruise report may be raw or not processed. Please ask the Chief Scientist for the latest information.

2. Cruise Summary

2.1 Ship

Name	Research Vessel BARUNA JAYA - III
L x B x D	60.40 m x 11.60 m x 6.50 m
Gross Tonnage	1,184 tons
Call Sign	YEAU
Home Port	Merak, Indonesia

2.2 Project Name

Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011 (CINDY2011)

2.3 Undertaking Institutes

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
2-15, Natsushima, Yokosuka, Kanagawa 237-0061, JAPAN
Agency for the Assessment and Application of Technology (BPPT)
Jl. MH. Thamrin 8, Jakarta 10340, Indonesia

2.4 Chief Scientist

Dr. Kunio Yoneyama Research Institute for Global Change (RIGC) / JAMSTEC

2.5 Periods and Ports of Call

2011	December 2	departed from Merak, Indonesia
	December 21	arrived at Merak, Indonesia

2.8 Observation Summary

GPS Radiosonde	58 times	from December 5 to 18
Surface Meteorology	continuously	from December 5 to 18
Sea surface temperature	105 times	from December 5 to 18
Sky images	43 times	from December 5 to 18

** Remarks ** All observations were done only over the international waters.

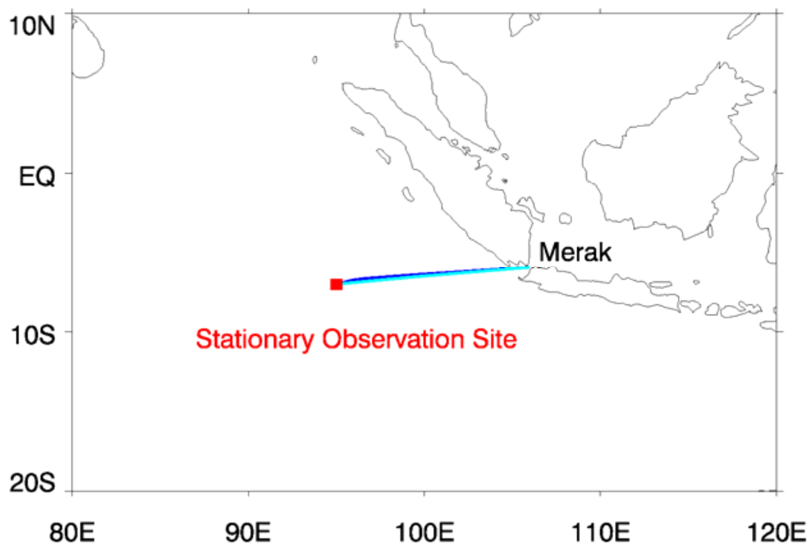
2.9 Overview

Due to the rough sea conditions, the ship could not cruise smoothly with enough cruising speed to the west. By considering the importance to obtain the sounding data at a fixed site rather than being under cruise, we decided to be on station at 7S, 95E for 10 days from December 7 through 16.

Based on the satellite data analysis, it was suggested that the MJO-convection has just passed over the eastern Indian Ocean. However, sounding data showed that relatively moist condition continued, that may be partly associated with ITCZ. In addition, satellite data also shows relatively slow (~ 10m/s) eastward propagating system during December 9 - 13 over 95E. Strong north-westerly prevailed in the lower troposphere and extended vertically during the first half, while calm condition prevailed in the second half. CAPE shows gradual decrease with large variation. Total precipitable water vapor shows the increase/decrease in the first/second half period with distinct diurnal cycle. It is also an intrigue feature that a strong dry layer, which was associated with north-westerlies, appeared in the lower troposphere in the last couple of days.

3. Cruise Track and Log

3.1 Cruise Track



3.2 Cruise Log

Date	SMT / UTC	Events		
Dec 02	17:46 / 10:46	Departed from Merak, Indonesia		
Dec 05	12:41 / 05:41	(06-22S, 99-56E)	Radiosonde #01	
		Start of observation (entered into the international waters) * Location of radiosonde is shown when preparation was started. Thus, it may slightly differ with actual point, when ship is cruising.		
	13:00 / 06:00	(06-23S, 99-51E)	SST sample #001	
		* Time and location for SST measurement by bucket are rough ones. Sampling was done between 15 min before and 5 min after the time shown.		
	16:00 / 09:00	(06-24S, 99-30E)	SST sample #002	
	18:25 / 11/25	(06-26S, 99-17E)	Radiosonde #02	
	19:00 / 12:00	(06-26S, 99-12E)	SST sample #003	
	22:00 / 15:00	(06-28S, 98-50E)	SST sample #004	
Dec 06	00:25 / 17:25	(06-29S, 98-36E)	Radiosonde #03	
	01:00 / 18:00	(06-29S, 98-31E)	SST sample #005	
	04:00 / 21:00	(06-30S, 98-17E)	SST sample #006	
	06:26 / 23:26	(06-32S, 98-02E)	Radiosonde #04	
	07:00 / 00:00	(06-32S, 97-56E)	SST sample #007	
	10:00 / 03:00	(06-34S, 97-35E)	SST sample #008	
	12:26 / 05:26	(06-35S, 97-20E)	Radiosonde #05	
	13:00 / 06:00	(06-36S, 97-14E)	SST sample #009	
	16:00 / 09:00	(06-37S, 96-53E)	SST sample #010	
	18:26 / 11:26	(06-38E, 96-38E)	Radiosonde #06	
	19:00 / 12:00	(06-39S, 96-34E)	SST sample #011	
	22:00 / 15:00	(06-41S, 96-13E)	SST sample #012	
Dec 07	00:38 / 17:38	(06-44S, 96-00E)	Radiosonde #07	
	01:00 / 18:00	(06-45S, 95-57E)	SST sample #013	
	04:00 / 21:00	(06-49S, 95-42E)	SST sample #014	
	06:25 / 23/25	(06-52S, 95-31E)	Radiosonde #08	
	07:00 / 00:00	(06-53S, 95-26E)	SST sample #015	
	10:00 / 03:00	(06-57S, 95-10E)	SST sample #016	
	12:26 / 05:26	(07-00S, 95-01E)	Radiosonde #09	Start of stationary observation
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #017	
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #018	
	18:30 / 11:30	(07-00S, 95-00E)	Radiosonde #10	
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #019	

	22:00 / 15:00	(07-00S, 95-00E)	SST sample #020
Dec 08	00:22 / 17:22	(07-01S, 94-59E)	Radiosonde #11
	01:00 / 18:00	(07-00S, 94-59E)	SST sample #021
	04:00 / 21:00	(07-00S, 94-59E)	SST sample #022
	06:25 / 23:25	(06-59S, 95-01E)	Radiosonde #12
	07:00 / 00:00	(07-00S, 94-59E)	SST sample #023
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #024
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #13
	13:00 / 06:00	(07-00S, 94-59E)	SST sample #025
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #026
	19:00 / 12:00	(07-00S, 95-00E)	Radiosonde #14
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #027
	22:00 / 15:00	(07-02S, 94-56E)	SST sample #028
Dec 09	00:25 / 17:25	(07-00S, 95-00E)	Radiosonde #15
	01:00 / 18:00	(07-01S, 94-59E)	SST sample #029
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #030
	06:25 / 23:25	(07-00S, 94-59E)	Radiosonde #16
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #031
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #032
	12:23 / 05:23	(07-00S, 95-01E)	Radiosonde #17
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #033
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #034
	18:23 / 11:23	(07-00S, 95-00E)	Radiosonde #18
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #035
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #036
Dec 10	00:28 / 17:28	(07-00S, 95-00E)	Radiosonde #19
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #037
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #038
	06:23 / 23:23	(07-00S, 95-00E)	Radiosonde #20
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #039
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #040
	12:24 / 05:24	(07-00S, 95-00E)	Radiosonde #21
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #042
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #043
	18:21 / 11:21	(07-00S, 95-00E)	Radiosonde #22
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #044
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #045
Dec 11	00:27 / 17:27	(07-00S, 95-00E)	Radiosonde #23
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #045
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #046
	06:28 / 23:28	(07-00S, 95-00E)	Radiosonde #24
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #047
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #048
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #25
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #049
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #050
	18:22 / 11:22	(07-00S, 95-00E)	Radiosonde #26
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #051
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #052
Dec 12	00:20 / 17:20	(07-00S, 95-00E)	Radiosonde #27
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #053
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #054
	06:25 / 23:25	(07-00S, 95-00E)	Radiosonde #28
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #055
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #056
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #29
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #057
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #058
	18:21 / 11:21	(07-00S, 95-00E)	Radiosonde #30
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #059
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #060
Dec 13	00:22 / 17:22	(07-00S, 95-00E)	Radiosonde #31
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #061
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #062
	06:25 / 23:25	(07-00S, 95-00E)	Radiosonde #32
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #063
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #064
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #33
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #065

	16:00 / 09:00	(07-00S, 95-00E)	SST sample #066	
	18:21 / 11:21	(07-00S, 95-00E)	Radiosonde #34	
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #067	
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #068	
Dec 14	00:22 / 17:22	(07-00S, 95-00E)	Radiosonde #35	
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #069	
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #070	
	06:25 / 23:25	(07-00S, 95-00E)	Radiosonde #36	
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #071	
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #072	
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #37	
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #073	
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #074	
	18:24 / 11:24	(07-00S, 95-00E)	Radiosonde #38	
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #075	
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #076	
Dec 15	00:22 / 17:22	(07-00S, 95-00E)	Radiosonde #39	
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #077	
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #078	
	06:23 / 23:23	(07-00S, 95-00E)	Radiosonde #40	
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #079	
	09:25 / 02:25	(07-00S, 95-00E)	Radiosonde #41	
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #080	
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #42	
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #081	
	15:25 / 08:25	(07-00S, 95-00E)	Radiosonde #43	
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #082	
	18:21 / 11:21	(07-00S, 95-00E)	Radiosonde #44	
	19:00 / 12:00	(07-00S, 95-00E)	SST sample #083	
	21:24 / 14:24	(07-00S, 95-00E)	Radiosonde #45	
	22:00 / 15:00	(07-00S, 95-00E)	SST sample #084	
Dec 16	00:24 / 17:24	(07-00S, 95-00E)	Radiosonde #46	
	01:00 / 18:00	(07-00S, 95-00E)	SST sample #085	
	03:22 / 20:22	(07-00S, 95-00E)	Radiosonde #47	
	04:00 / 21:00	(07-00S, 95-00E)	SST sample #086	
	06:25 / 23:25	(07-00S, 95-00E)	Radiosonde #48	
	07:00 / 00:00	(07-00S, 95-00E)	SST sample #087	
	09:25 / 02:25	(07-00S, 95-00E)	Radiosonde #49	
	10:00 / 03:00	(07-00S, 95-00E)	SST sample #088	
	12:25 / 05:25	(07-00S, 95-00E)	Radiosonde #50	
	13:00 / 06:00	(07-00S, 95-00E)	SST sample #089	
	16:00 / 09:00	(07-00S, 95-00E)	SST sample #090	
	18:19 / 11:19	(07-00S, 95-00E)	Radiosonde #51	End of stationary observation
	19:00 / 12:00	(07-00S, 95-04E)	SST sample #091	
	22:00 / 15:00	(06-57S, 95-25E)	SST sample #092	
Dec 17	00:29 / 17:29	(06-56S, 95-41E)	Radiosonde #52	
	01:00 / 18:00	(06-55S, 95-47E)	SST sample #093	
	04:00 / 21:00	(06-53S, 96-07E)	SST sample #094	
	06:25 / 23:25	(06-52S, 95-21E)	Radiosonde #53	
	07:00 / 00:00	(06-51S, 96-27E)	SST sample #095	
	10:00 / 03:00	(06-49S, 96-47E)	SST sample #096	
	12:32 / 05:32	(06-47S, 97-01E)	Radiosonde #54	
	13:00 / 06:00	(06-47S, 97-01E)	SST sample #097	
	16:00 / 09:00	(06-45S, 97-20E)	SST sample #098	
	18:23 / 11:23	(06-44S, 97-35E)	Radiosonde #55	
	19:00 / 12:00	(06-43S, 97-41E)	SST sample #099	
	22:00 / 15:00	(06-41S, 98-01E)	SST sample #100	
Dec 18	00:21 / 17:21	(06-40S, 98-14E)	Radiosonde #56	
	01:00 / 18:00	(06-39S, 98-21E)	SST sample #101	
	04:00 / 21:00	(06-37S, 98-41E)	SST sample #102	
	06:25 / 23:25	(06-35S, 98-56E)	Radiosonde #57	
	07:00 / 00:00	(06-34S, 98-03E)	SST sample #103	
	10:00 / 03:00	(06-32S, 99-24E)	SST sample #104	
	12:35 / 05:35	(06-32S, 99-31E)	Radiosonde #58	
	13:00 / 06:00	(06-31S, 99-32E)	SST sample #105	
	16:00 / 09:00	(06-29S, 99-55E)	End of all observations	
Dec 19		Cruising		
Dec 20		Cruising		
Dec 21	07:00 / 00:00	Arrived at Merak, Indonesia		

4. List of Participants

NO.	NAME	INSTITUTION	DUTY
1	Dr. Kunio Yoneyama	JAMSTEC	Chief Scientist
2	Dr. Hisayuki Kubota	JAMSTEC	Scientist
3	Dr. Agus Sudaryanto	Balai Teksurla, BPPT	Scientist
4	Ir. Ikhsan Budi Wahyono, MSc.	Balai Teksurla, BPPT	Scientist
5	Ir. Iwan Eka Setiawan, MSc.	Balai Teksurla, BPPT	BJ Research Program Officer
6	Ir. Handoko Manoto	Balai Teksurla, BPPT	BJ Research Survey Officer
7	Alfi Rusdiansyah, ST	Balai Teksurla, BPPT	BJ Research Survey Officer
8	Anan Fauzi, ST	Balai Teksurla, BPPT	BJ Research Survey Officer
9	Bayu Sumarno Putro, ST	Balai Teksurla, BPPT	BJ Research Infrastructure Officer
10	Fathurohman	Balai Teksurla, BPPT	BJ-III Technician
11	Rochani Abdul	Balai Teksurla, BPPT	BJ-III Technician
12	Sulaiman	Balai Teksurla, BPPT	BJ-III Technician
13	Sodik	Balai Teksurla, BPPT	BJ-III Technician
14	Captain Purwanto	Ministry of Defense	Security Officer
15	Tiur Maida	Crew BJ-III, BPPT	Master
16	Lukman Hakim	Crew BJ-III, BPPT	Chief Officer
17	Samsu	Crew BJ-III, BPPT	2nd Officer
18	Subardiyanoor	Crew BJ-III, BPPT	3rd Officer
19	Eka Rusli Safari	Crew BJ-III, BPPT	Chief Engineer
20	Sunarto	Crew BJ-III, BPPT	1st Engineer
21	Solikhin	Crew BJ-III, BPPT	2nd Engineer
22	Sayut Wiyanto	Crew BJ-III, BPPT	3rd Engineer
23	Slamet	Crew BJ-III, BPPT	Electrician
24	Syaifudin	Crew BJ-III, BPPT	Quarter Master I
25	Sahroni	Crew BJ-III, BPPT	Quarter Master II
26	Harmanto	Crew BJ-III, BPPT	Quarter Master III
27	Santoso Darso	Crew BJ-III, BPPT	Quarter Master IV
28	Ojan Sunadis	Crew BJ-III, BPPT	Oiler I
29	Nur Kholik	Crew BJ-III, BPPT	Oiler II
30	Slamet Adi Sucipto	Crew BJ-III, BPPT	Oiler III
31	Samsuri	Crew BJ-III, BPPT	Oiler IV
32	Siswanto	Crew BJ-III, BPPT	Chief Cook
33	Mustofa	Crew BJ-III, BPPT	Steward I
34	Dudi Ilham	Crew BJ-III, BPPT	Steward II
35	Agung Wicaksono	Crew BJ-III, BPPT	Cadet

5. Summary of the Observations

5.1 GPS Radiosonde

Objective

Atmospheric soundings of temperature, humidity, and wind speed/direction.

Method

The main system consists of processor (Vaisala, DigiCORA III - MW31 Software Ver. 3.61), Portable Antenna Set for GPS and UHF (CG31), ground check kit (GC25), and GPS radiosonde sensor (RS92-SGPD). GPS sensor was launched with balloon filled with Helium gas. During this cruise, radiosondes were launched every 6 hours except on December 15 - 16 (3-hourly).

Results

Time-height cross sections of equivalent potential temperature, relative humidity, zonal and meridional wind components are shown in Fig.5.1-1, respectively. Several basic parameters are calculated from sounding data (Fig. 5.1-2). They include convective available potential energy (CAPE), convective inhibition (CIN), lifted condensation level (LCL), 1000-700 hPa layer-mean zonal and meridional wind components, and total precipitable water vapor (TPW). In Appendix-A, vertical profiles of temperature and dew point temperature on the thermodynamic chart with wind profiles are attached.

In addition to normal soundings, we also examined the influences of heat from ship's body and funnel onto the near surface sounding values using a tethered sonde on deck and on small boat deployed up-wind side on December 18, when it was calm and the most plausible date to be affected. We confirmed that values at height within 20m from the deck shows suspicious values (not shown).

Remarks

Since we used a software MW31 ver. 3.61 for data processing, Vaisala's new algorithm, which is available from ver. 3.64.1 and it reduces the solar radiation-induced dry bias in the upper troposphere, is not applied. Instead, temporarily dry bias was removed by a scheme developed by Yoneyama et al. (2008). In addition, surface values, which are usually affected by daytime/nighttime heating/cooling due to ship's iron body, have also been removed by following Yoneyama et al. (2002). Figures 5.1-1 and 5.1-2 are produced using those data. Final data sets will be released after careful quality-check procedure is done from CINDY web site at http://www.jamstec.,go.jp/iorgc/cindy/.

References

Yoneyama, K., M. Hanyu, S. Sueyoshi, F. Yoshiura, and M. Katsumata 2002: Radiosonde observation from the ship in the tropical region. *JAMSTECR*, **45**, 31-39.

Yoneyama, K., M. Fujita, N. Sato, M. Fujiwara, Y. Inai, and F. Hasebe, 2008: Correction for radiation dry bias found in RS92 radiosonde data during the MISMO field experiment. *SOLA*, **4**, 13-16.

Table 5.1-1 Radiosonde launch log. Surface values and maximum height.

	YYYYMMDDHH	deg	deg	hPa	C	%	deg	m/s	hPa	m	Amount	Type
RS01	2011120506	99.93	-6.37	1008.8	28.2	76	16	2.7	28.1	24141	02	Cu, As
RS02	2011120512	99.28	-6.43	1007.8	28.2	79	30	6.1	40.9	21797	02	Cu, Cb
RS03	2011120518	98.60	-6.48	1009.2	27.7	81	352	3.0	45.4	21170	07	Cu, Cb, Ci
RS04	2011120600	98.04	-6.53	1008.3	27.0	80	324	2.4	34.8	22807	09	Cu, Ac, Sc
RS05	2011120606	97.34	-6.59	1008.6	28.5	75	16	4.9	47.3	20936	02	Cu, Ci, As
RS06	2011120612	96.64	-6.64	1007.2	28.0	77	1	6.8	27.3	24287	02	Cu, Cb, Ci
RS07	2011120618	96.00	-6.73	1008.7	26.1	80	291	10.5	44.0	21335	05	Ac, As, Cu
RS08	2011120700	95.51	-6.86	1007.5	28.0	75	321	8.3	32.5	23212	09	Cu,Cc,Ci,Ac,Sc
RS09	2011120706	95.01	-7.00	1007.0	28.6	72	343	5.2	27.2	24319	07	Cu, As, Ac
RS10	2011120712	95.00	-7.00	1006.0	28.5	75	327	7.7	36.9	22418	09	Ac,As,Cu,Cb
RS11	2011120718	94.99	-7.01	1008.3	28.3	75	300	8.4	39.7	21980	06	Ac, As
RS12	2011120800	95.01	-6.99	1007.6	27.6	71	297	7.7	28.0	24145	08	Cu,As,Cc,Ci
RS13	2011120806	95.00	-7.00	1007.9	28.4	77	291	6.7	24.8	24940	06	Ci,Cu,Cb,As
RS14	2011120812	95.00	-7.00	1006.1	27.7	78	337	6.8	35.8	22592	10	As, Cu
RS15	2011120818	95.00	-7.00	1007.8	27.2	82	319	6.1	45.5	21154	10	As
RS16	2011120900	94.99	-7.00	1006.2	26.9	74	285	14.4	42.4	21557	10	Ns, As, Sc
RS17	2011120906	95.01	-7.00	1007.5	26.3	86	261	10.1	26.7	24461	10	As, Cb
RS18	2011120912	95.00	-7.00	1006.1	26.6	86	213	4.8	41.0	21760	10	As, Ac, Cu
RS19	2011120918	95.00	-7.00	1007.3	27.3	80	261	10.0	62.5	19252	10	Ns, As
RS20	2011121000	95.00	-7.00	1006.4	25.9	87	311	4.4	35.9	22593	10	As,Ns,Sc,Cb
RS21	2011121006	95.00	-7.00	1008.9	25.2	85	349	10.2	48.9	20719	10	Ns, As
RS22	2011121012	95.00	-7.00	1007.6	26.1	87	300	6.7	116.9	15671	10	Ns, As, Cu
RS23	2011121018	95.00	-7.00	1010.2	26.7	80	334	12.5	50.1	20546	10	Ns, As, Cu
RS24	2011121100	95.00	-7.00	1007.8	27.6	77	316	8.2	30.1	23702	09	Cu,Cs,Ci,As,Ac
RS25	2011121106	95.00	-7.00	1009.2	28.4	71	281	5.5	28.3	24092	03	Cu, As, Ac
RS26	2011121112	95.00	-7.00	1007.9	28.2	76	322	3.7	31.3	23452	03	Ac, Cu, Cb
RS27	2011121118	95.00	-7.00	1010.0	27.7	77	329	3.6	57.5	19731	01	Ac, Cu
RS28	2011121200	95.00	-7.00	1008.5	27.5	81	305	4.0	31.4	23442	07	Cu, Cs, Ci
RS29	2011121206	95.00	-7.00	1009.3	28.5	73	252	2.4	26.7	24489	06	Cu, As, Cs, Ci
RS30	2011121212	95.00	-7.00	1007.2	28.2	74	240	2.8	41.0	21773	05	Cs, Ci, Ac, As
RS31	2011121218	95.00	-7.00	1009.2	27.6	76	258	2.5	38.3	22206	01	Cs, Cu
RS32	2011121300	95.00	-7.00	1008.1	27.2	76	226	2.2	24.8	24903	04	Cu, Ci, Cc, As
RS33	2011121306	95.00	-7.00	1008.9	29.2	62	2	0.5	29.9	23730	06	Cu, Cs
RS34	2011121312	95.00	-7.00	1007.5	28.4	68	322	1.1	48.6	20735	05	Ci, Cu
RS35	2011121318	95.00	-7.00	1009.8	27.7	70	334	0.3	37.3	22353	01	Cu, Cc
RS36	2011121400	95.00	-7.00	1008.5	27.5	73	317	0.9	26.4	24505	02	Cu, Ci
RS37	2011121406	95.00	-7.00	1009.6	29.4	63	199	1.5	26.5	24475	03	Cu, Cs
RS38	2011121412	95.00	-7.00	1008.1	28.2	76	125	0.7	43.6	21383	04	Ac, Cu, Cb
RS39	2011121418	95.00	-7.00	1009.5	28.2	71	237	1.9	42.2	21592	04	Cu, Cb, Ci
RS40	2011121500	95.00	-7.00	1008.3	25.6	87	320	2.9	29.5	23813	10	Cu, Ns, As
RS41	2011121503	95.00	-7.00	1009.5	28.0	70	227	4.2	35.0	22745	07	Cu, Sc, Cs, As
RS42	2011121506	95.00	-7.00	1008.3	28.3	67	184	3.7	26.5	24515	08	Cu, Cs, As
RS43	2011121509	95.00	-7.00	1006.8	28.3	68	224	3.0	78.6	17906	07	Cu, As, Cs
RS44	2011121512	95.00	-7.00	1007.4	28.5	66	217	2.1	39.4	22000	08	Ac, Cu
RS45	2011121515	95.00	-7.00	1009.4	27.9	68	283	0.8	46.7	20990	04	As, Cb
RS46	2011121518	95.00	-7.00	1009.4	27.7	72	339	2.2	32.1	23289	04	Cu, As
RS47	2011121521	95.00	-7.00	1007.4	27.5	69	289	2.7	44.9	21206	04	Ac, As
RS48	2011121600	95.00	-7.00	1007.6	27.5	69	274	2.5	25.1	24838	03	Cu, Cs, Ac, As
RS49	2011121603	95.00	-7.00	1009.3	28.0	69	274	2.6	25.4	24790	03	Cu, Cs, Ci
RS50	2011121606	95.00	-7.00	1008.0	28.3	68	301	3.4	26.7	24408	10	Cu, Cs, Ac
RS51	2011121612	95.00	-7.00	1007.0	28.1	72	265	2.8	46.8	20957	10	Ac, Cu
RS52	2011121618	95.68	-6.93	1008.3	28.1	69	294	2.6	42.8	21514	07	Cu, Cb, Ac
RS53	2011121700	96.35	-6.86	1007.3	27.8	73	245	2.8	26.5	24480	10	Cu, As, Ac
RS54	2011121706	97.01	-6.79	1008.0	29.7	65	295	1.0	27.8	24182	10	Cu, As, Ac
RS55	2011121712	97.58	-6.73	1007.3	28.4	68	291	1.6	43.6	21402	08	Cb, Ac, Ci
RS56	2011121718	98.24	-6.66	1008.5	26.7	81	332	1.3	44.5	21265	02	Cb, Sc
RS57	2011121800	98.94	-6.59	1008.2	27.4	75	264	1.3	30.5	23613	06	Cu, Cb, As, Ac
RS58	2011121806	99.52	-6.53	1008.2	28.8	65	61	1.5	39.0	22064	06	Cu, Ci, Cs, Cc

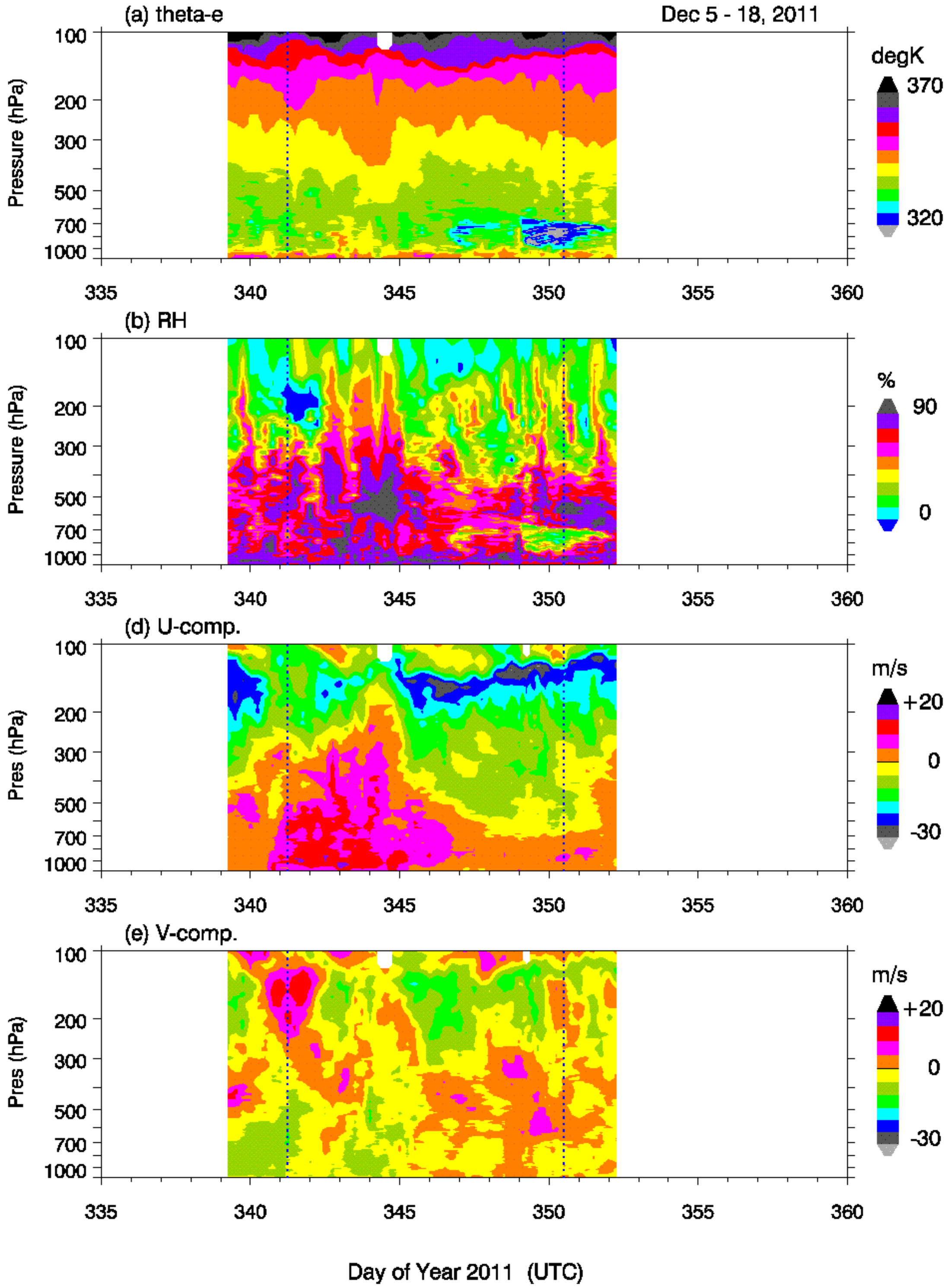


Fig. 5.1-1. Time-height cross sections of (a) equivalent potential temperature (degK), (b) relative humidity (%), (c) zonal wind component (m/s), and (d) meridional wind component (m/s).Blue dotted line indicates the period of stationary observation at 7S, 95E.

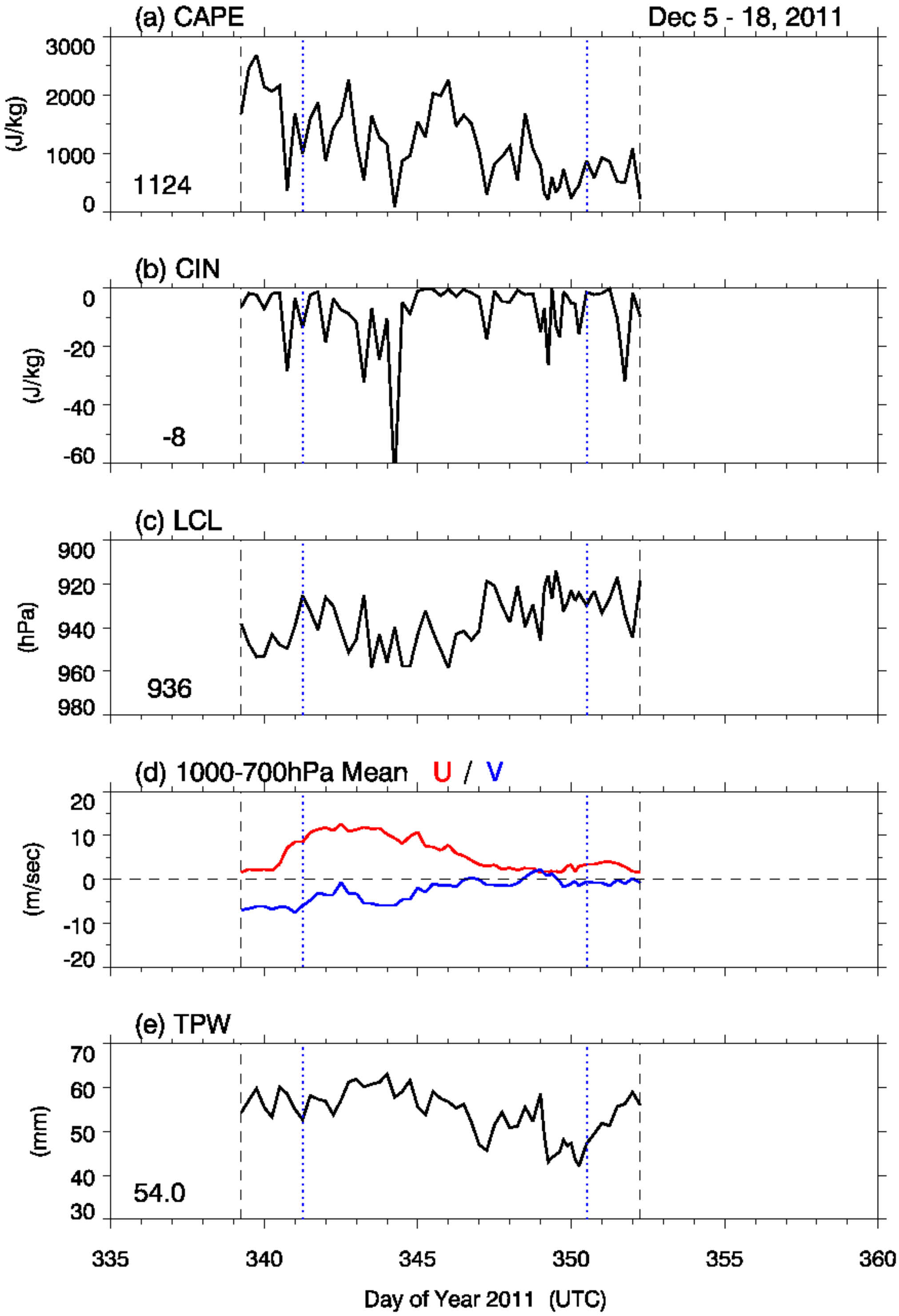


Fig. 5.1-2. Time series of (a) convective available potential energy, (b) convective inhibition, (c) lifted condensation level, (d) 1000-700 hPa layer-mean zonal (red) and meridional (blue) wind components, and (e) total precipitable water vapor. Numbers on panel are the averages over the whole 14-day period.

5.2 Sky images

Objective

Record the atmospheric conditions (cloud amount and type) when the radiosonde is launched.

Method

A photo was taken by a camera (Canon EOS Kiss X3) with a fish-eye lens (SIGMA 4.5mm F2.8 FX DC Circular Fisheye) after launching the balloon during daytime.

Results

Photos are attached in Appendix-B.

5.3 Sea surface temperature

Objective

To obtain basic ocean surface condition.

Method

Water was sampled every 3 hours by bucket (Rigo Co. Ltd., No. 5002) and sea surface temperature was measured by the thermometer (Sansyo Co. Ltd., accuracy +/- 0.2 degC).

Results

Time series is included in the plot for surface meteorology in section 5.4 (Fig. 5.4-2).

5.4 Surface meteorology

Objective

As basic atmospheric information, surface meteorological parameters (pressure, temperature, relative humidity, rainfall, and wind) are recorded.

Method

Automated Weather Station (AWS; Meitec Co. Ltd., Meteo Note FM-100A) was operated and surface meteorological parameters are recorded every 10 minutes (averaged from 1 minute value) during the cruise in the international waters. AWS was set at the front deck port side and its data processing unit was located in the nearest room (Fig. 5.4-1). Since the current AWS is designed to use on land (namely no correction for moving platform), surface wind data is converted from relative wind to true wind by using ship's navigation system data.

Results

Time series of each parameter is shown in Fig. 5.4-2.

Fig. 5.4-1. Automated weather station.

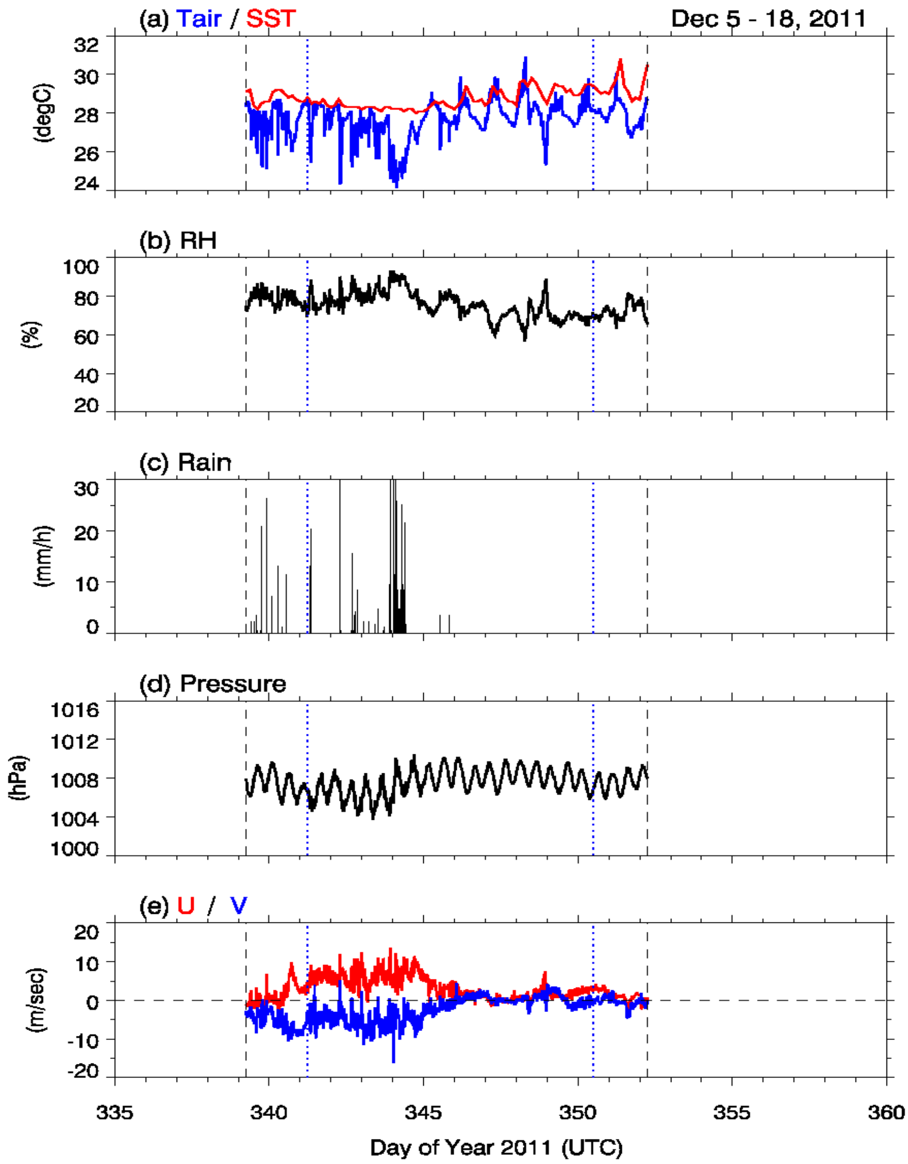
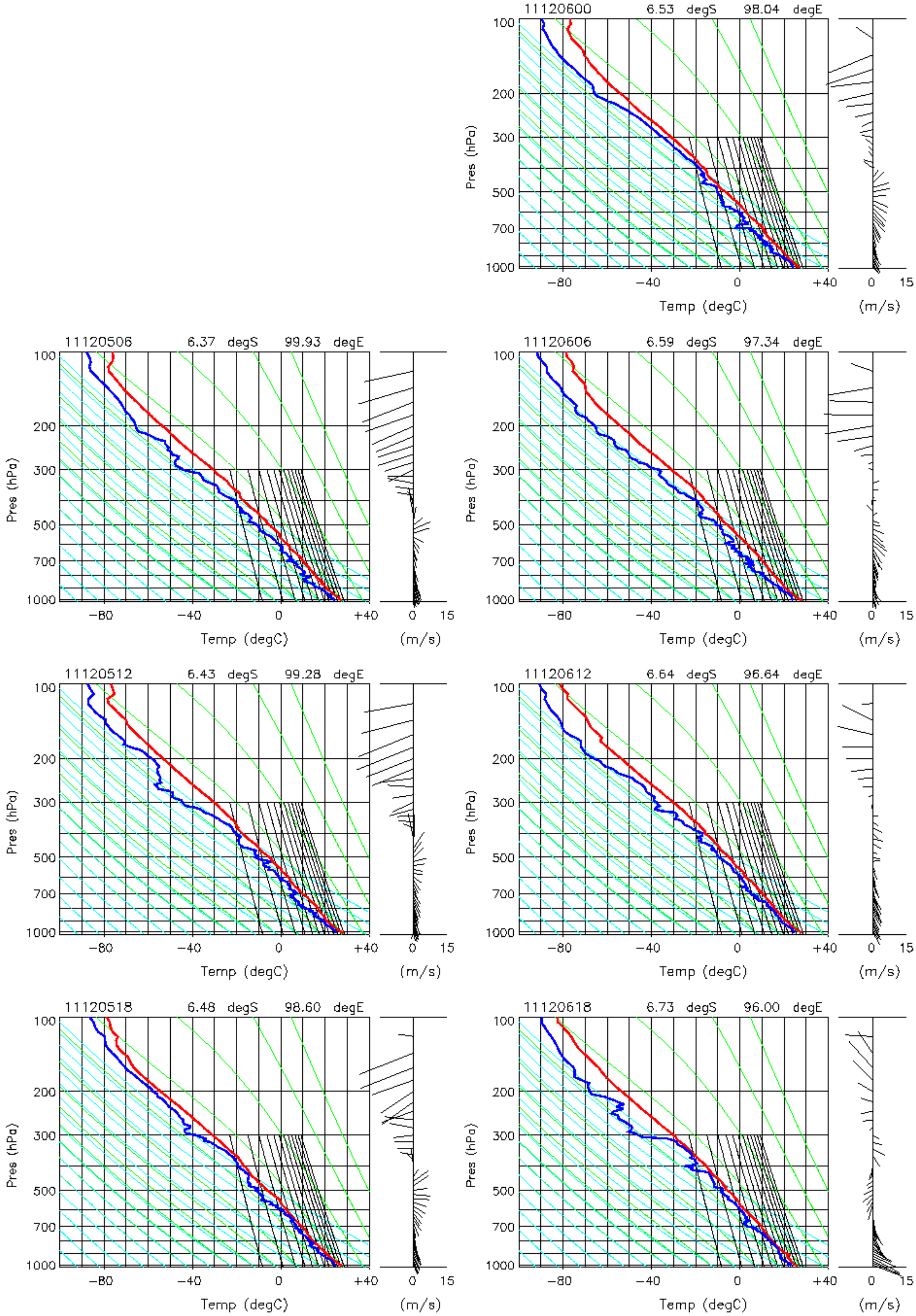
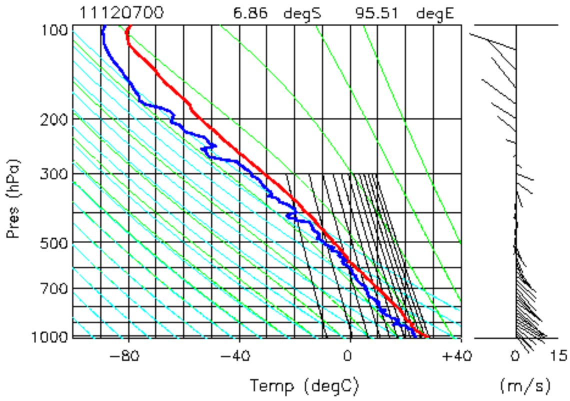


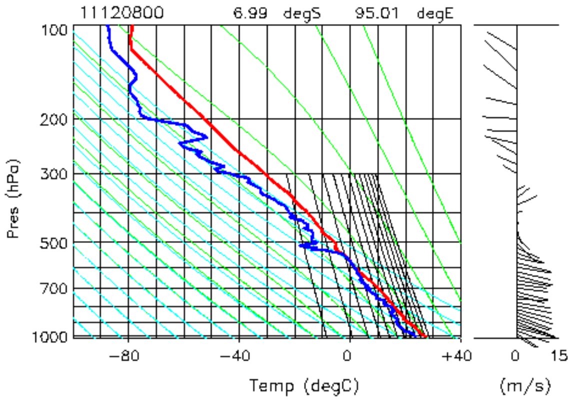
Fig. 5.4-2. Time series of surface meteorology.

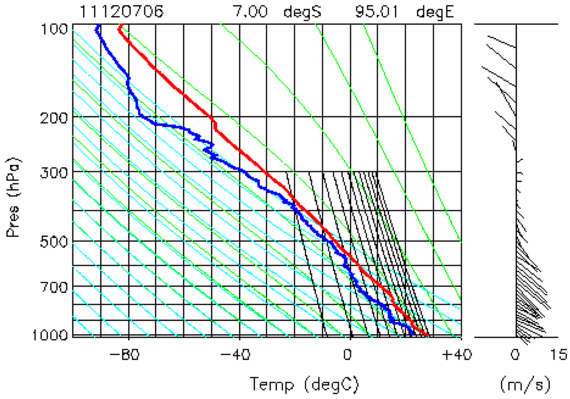
Appendix-A

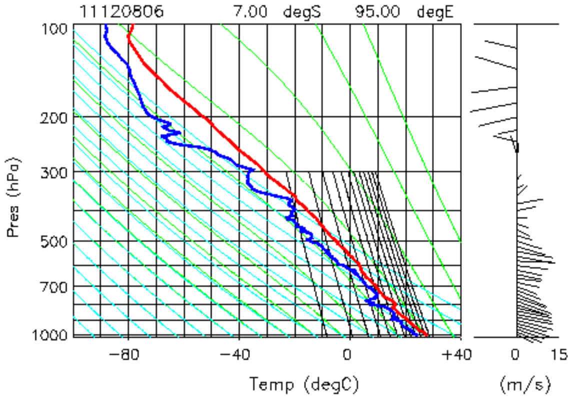


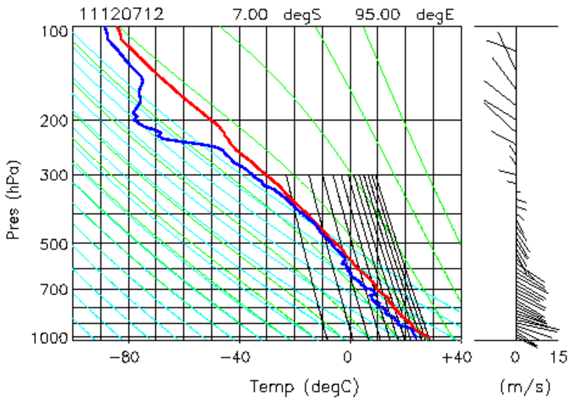
Emagram with wind profile. Red/blue lines indicate temperature/dew point.

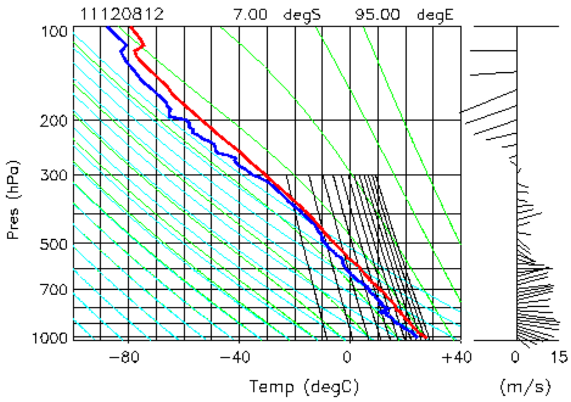

11120700 6.86 degS 95.51 degE
Pres (hPa)
Temp (degC)
(m/s)

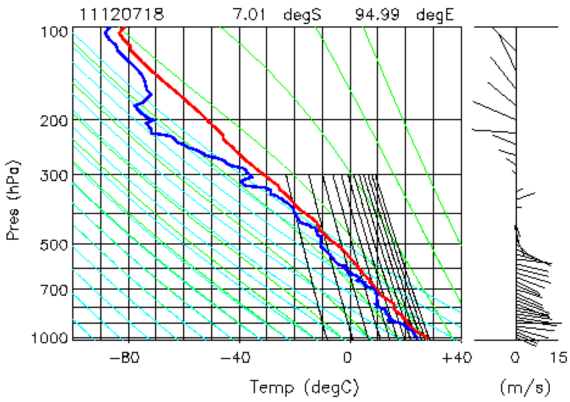

11120800 6.99 degS 95.01 degE
Pres (hPa)
Temp (degC)
(m/s)

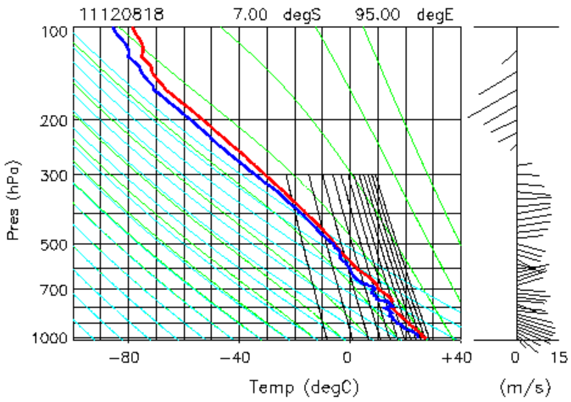

11120706 7.00 degS 95.01 degE
Pres (hPa)
Temp (degC)
(m/s)


11120806 7.00 degS 95.00 degE
Pres (hPa)
Temp (degC)
(m/s)


11120712 7.00 degS 95.00 degE
Pres (hPa)
Temp (degC)
(m/s)


11120812 7.00 degS 95.00 degE
Pres (hPa)
Temp (degC)
(m/s)


11120718 7.01 degS 94.99 degE
Pres (hPa)
Temp (degC)
(m/s)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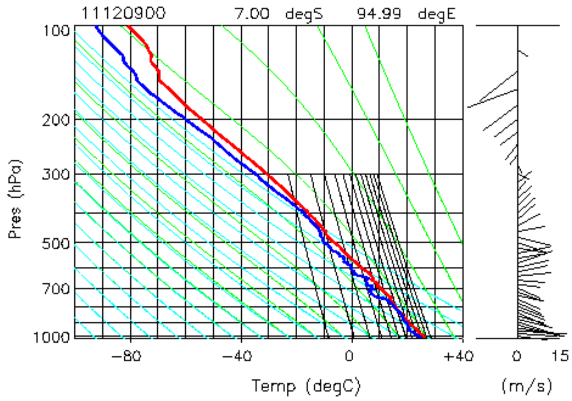
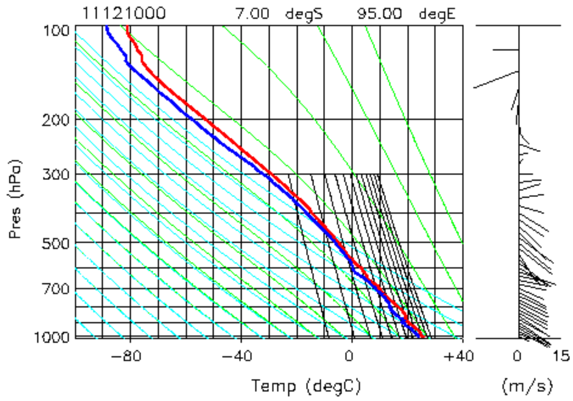
Pres (hPa)
Temp (degC)
(m/s)


11120900 7.00 degS 94.99 degE
100
200
300
500
700
1000
Pres (hPa)
-80 -40 0 +40
Temp (degC)
0 15
(m/s)


11121000 7.00 degS 95.00 degE
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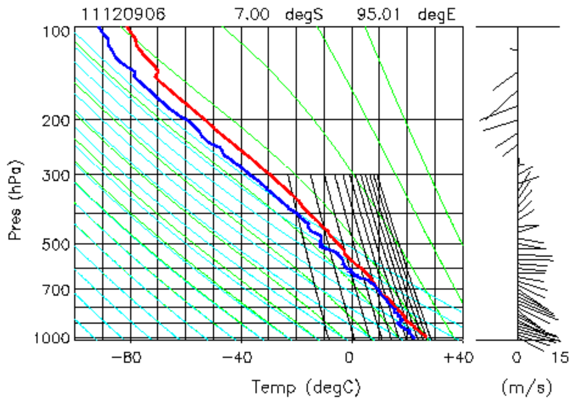
Temp (degC)
0 15
(m/s)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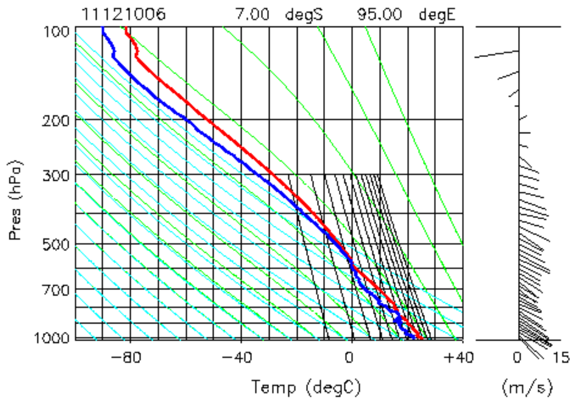
(m/s)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200
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500
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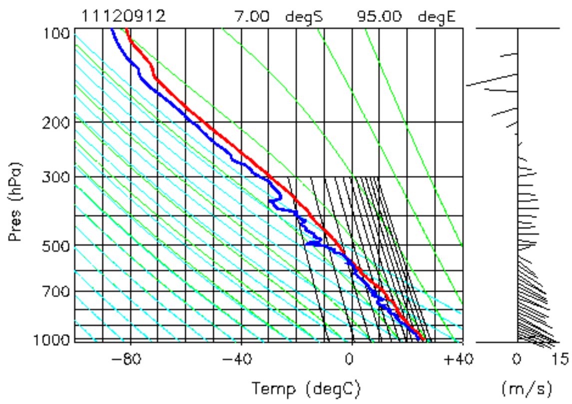
(m/s)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200
300
500
700
1000
Pres (hPa)
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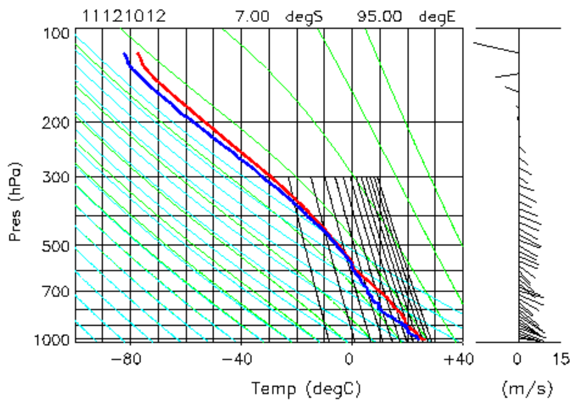
Temp (degC)
0 15
(m/s)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200
300
500
700
1000
Pres (hPa)
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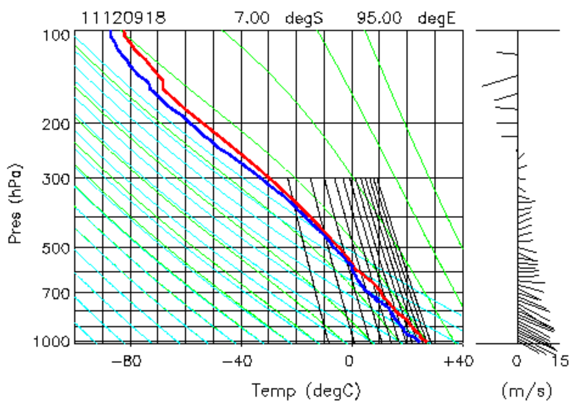
Temp (degC)
0 15
(m/s)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500
700
1000
Pres (hPa)
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Temp (degC)
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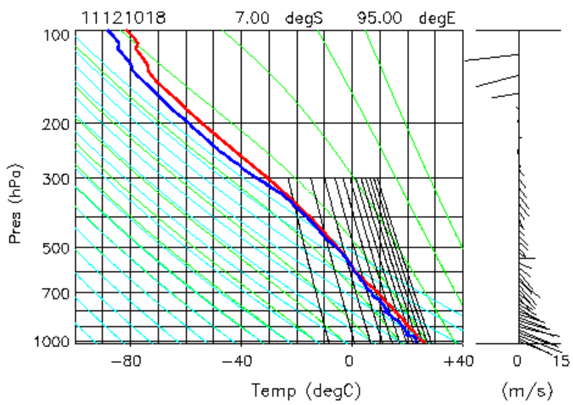
(m/s)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200
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1000
Pres (hPa)
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Temp (degC)
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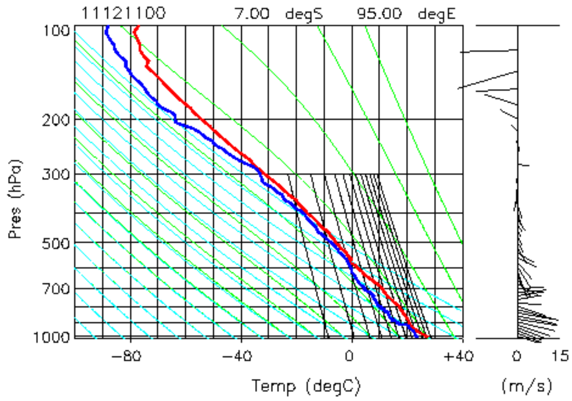
(m/s)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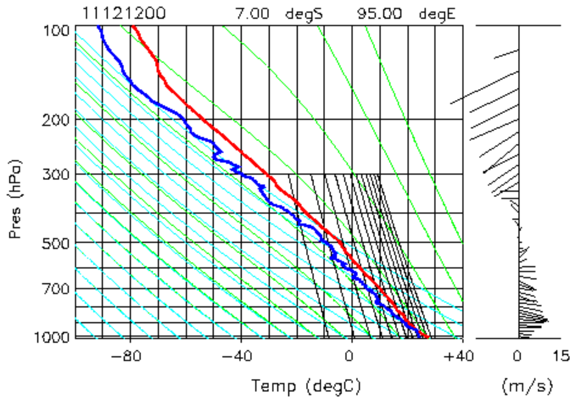
(m/s)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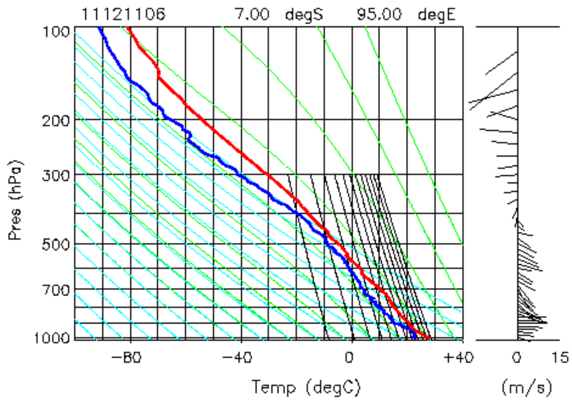
(m/s)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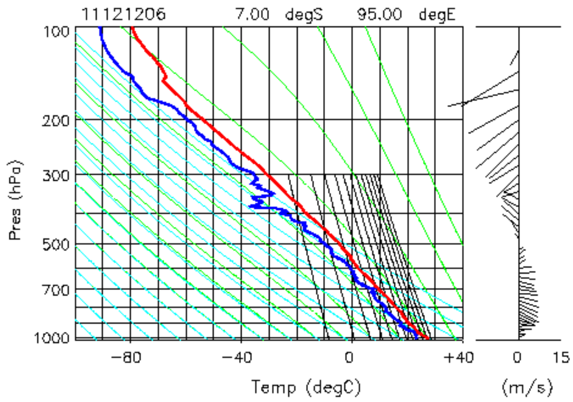
0 15
(m/s)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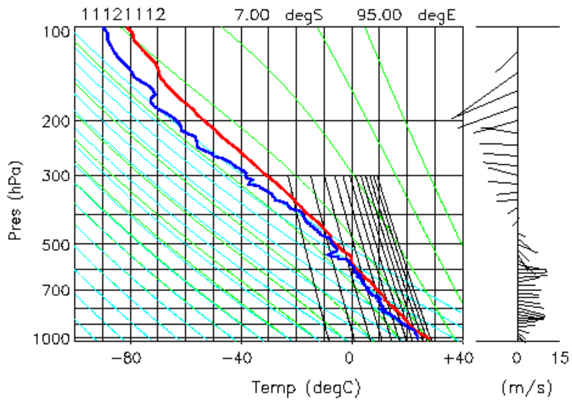
(m/s)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Pres (hPa)
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200
300
500
700
1000
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0
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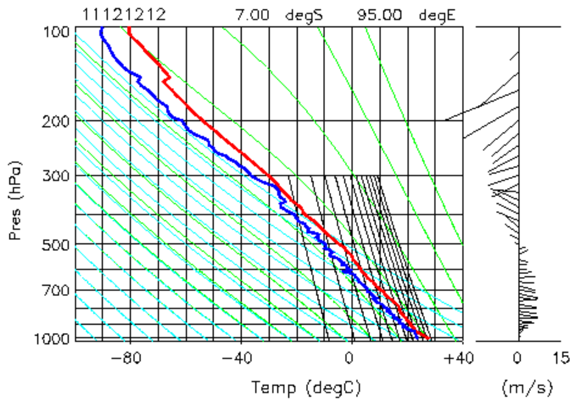
Temp (degC)
0 15
(m/s)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Pres (hPa)
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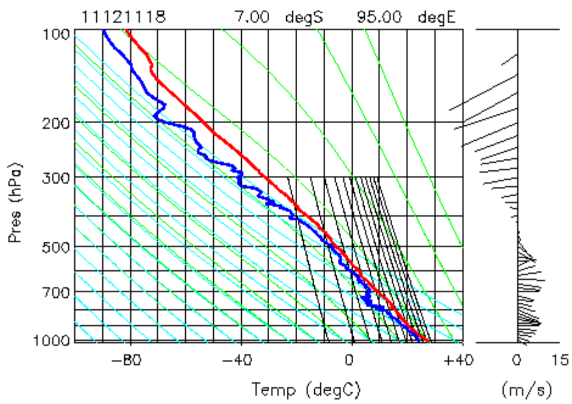
300
500
700
1000
-80
-40
0
+40
Temp (degC)
0 15
(m/s)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Pres (hPa)
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300
500
700
1000
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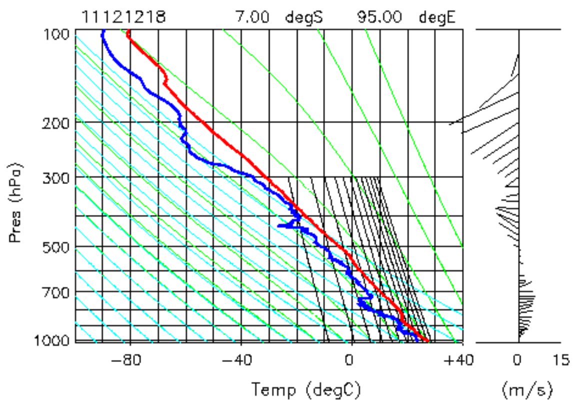
0 15
(m/s)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Pres (hPa)
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500
700
1000
-80
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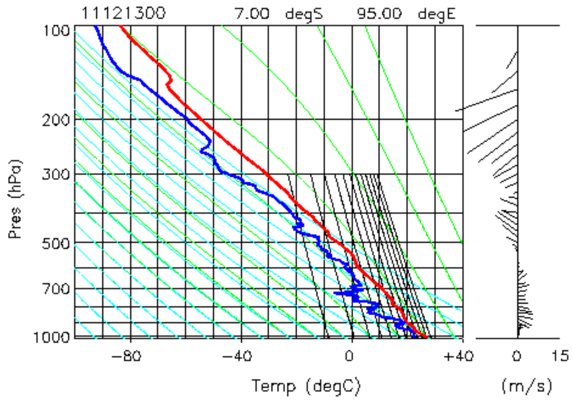
0
+40
Temp (degC)
0 15
(m/s)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500
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−40
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+40
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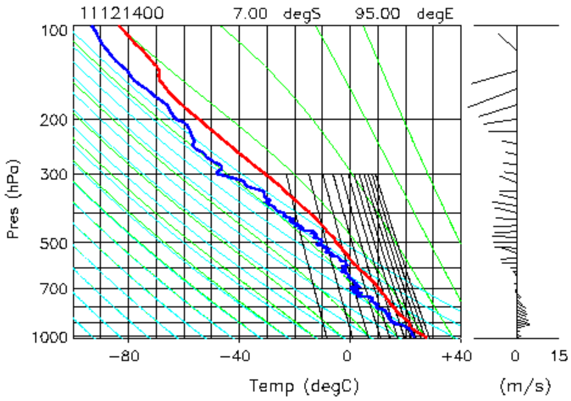
15
(m/s)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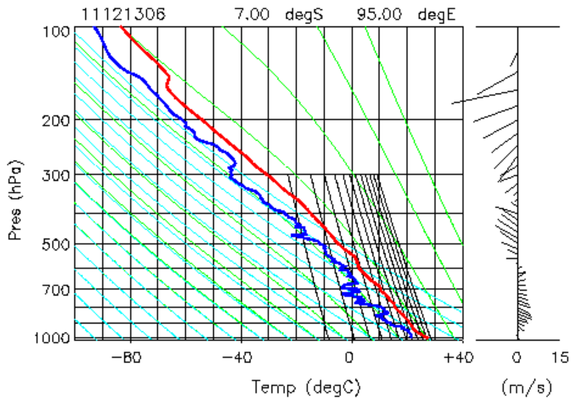
15
(m/s)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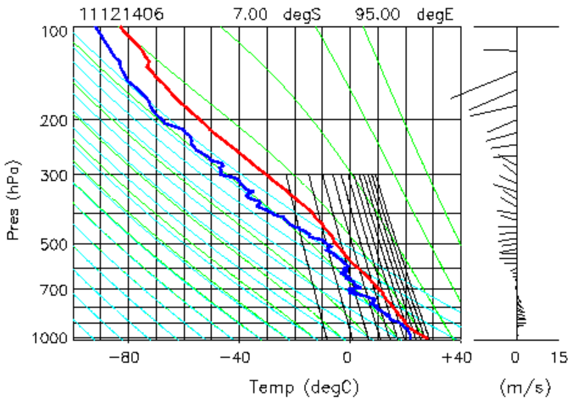
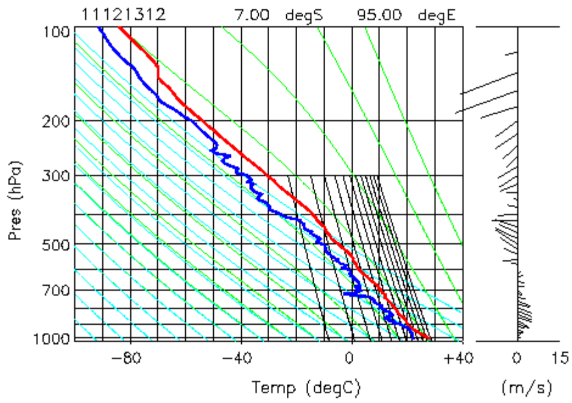
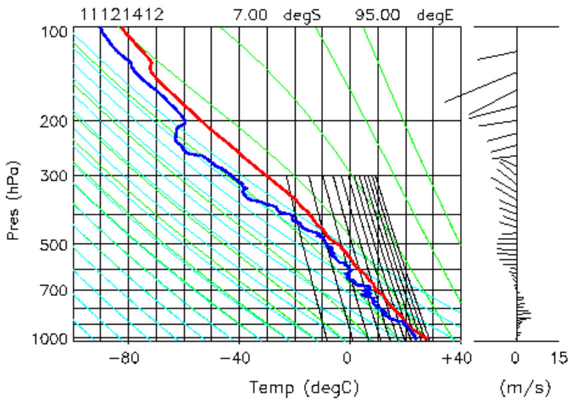
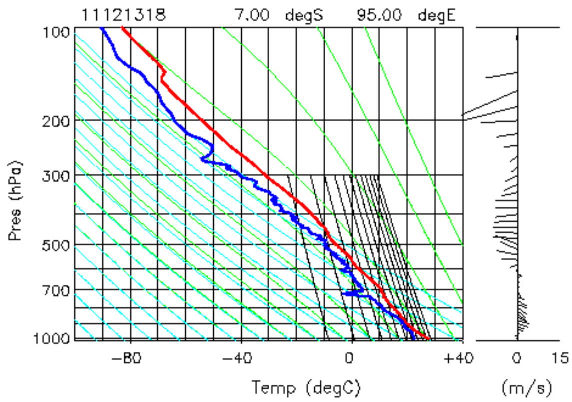
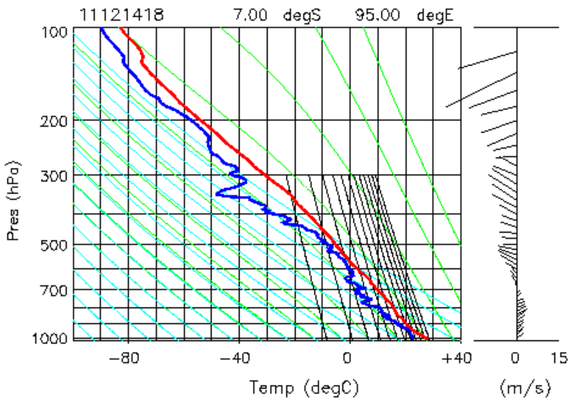
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

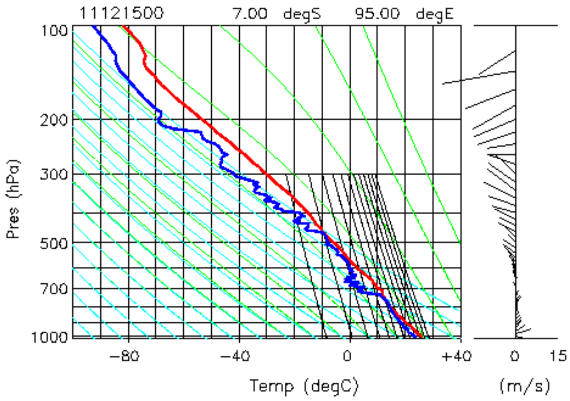

11121406 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

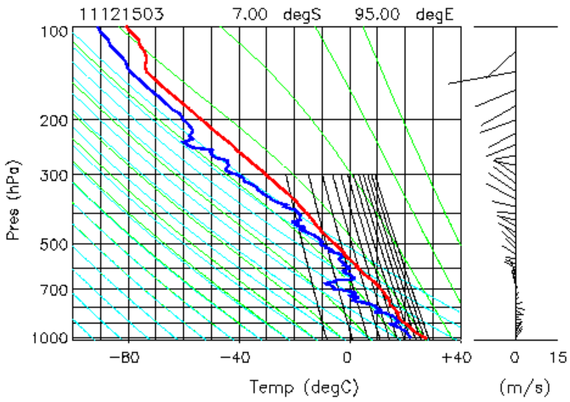

11121312 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

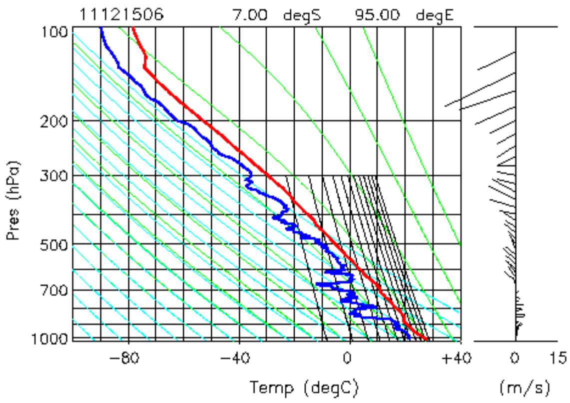

11121412 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

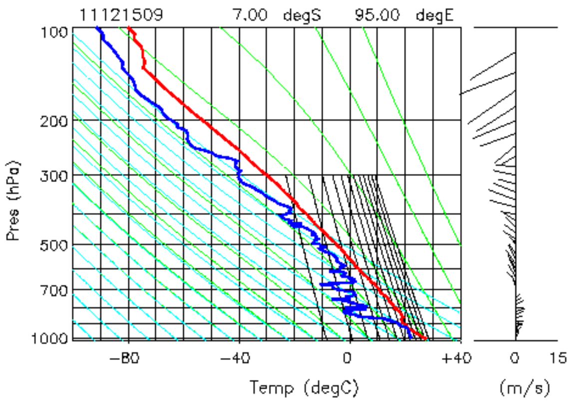

11121318 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

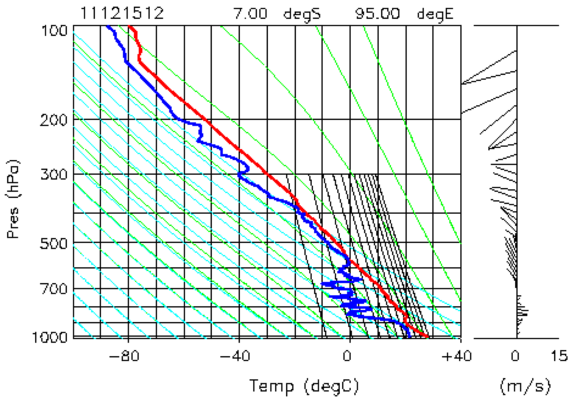

11121418 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80
−40
0
+40
Temp (degC)
0
15
(m/s)

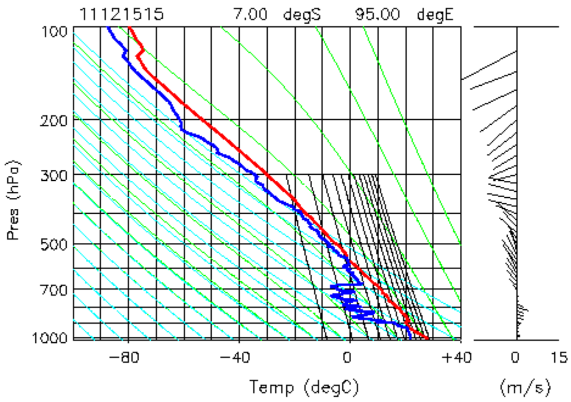

11121500 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

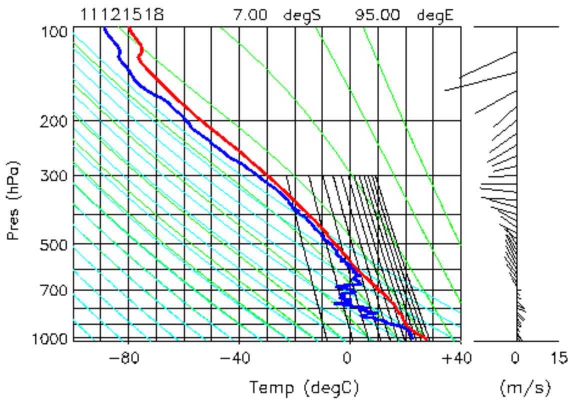

11121503 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

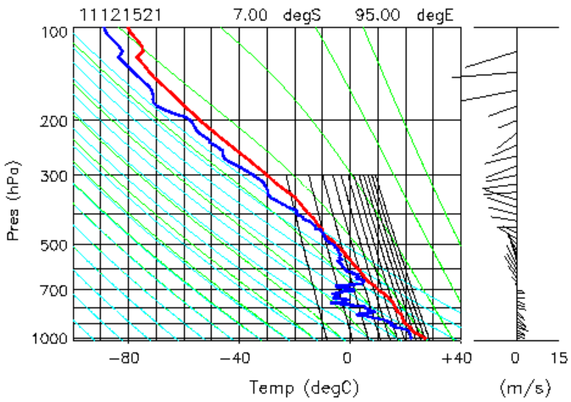

11121506 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

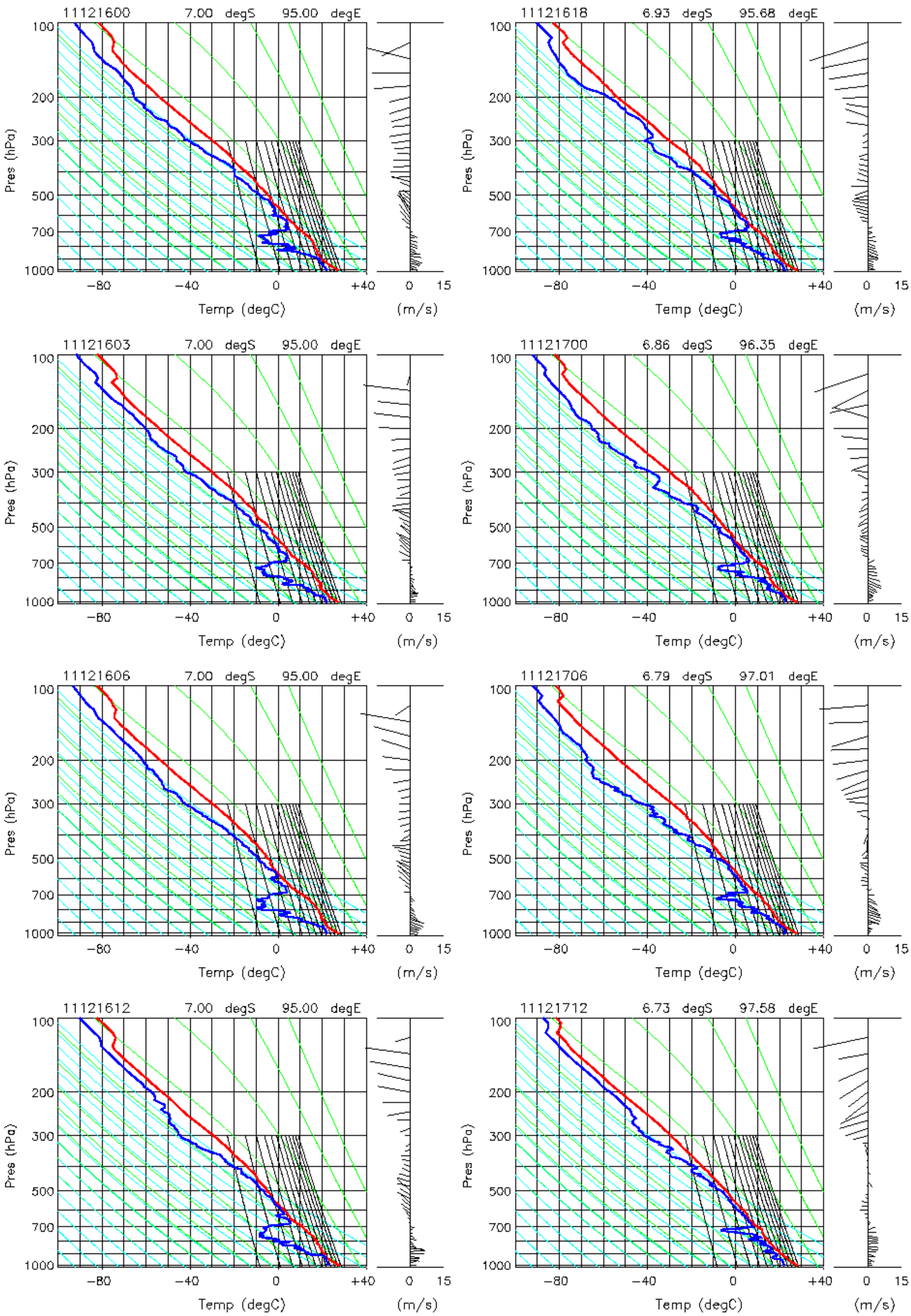

11121509 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)


11121512 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

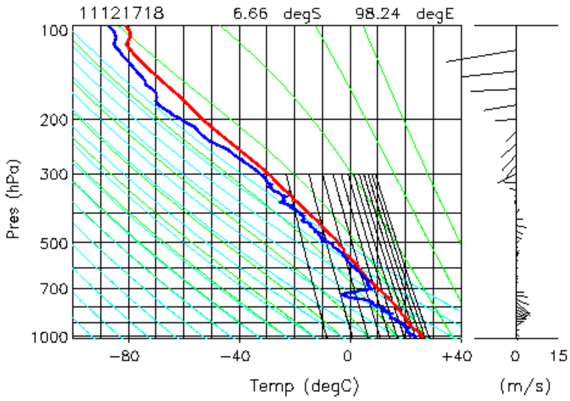

11121515 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

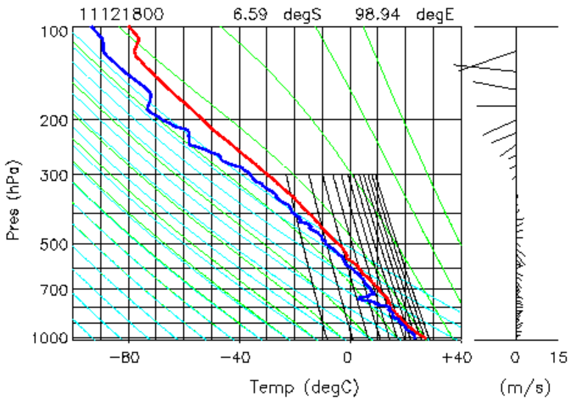

11121518 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)

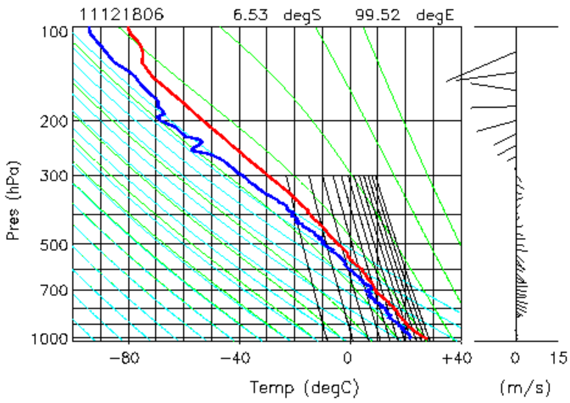

11121521 7.00 degS 95.00 degE
Pres (hPa)
100
200
300
500
700
1000
−80 −40 0 +40
Temp (degC)
0 15
(m/s)



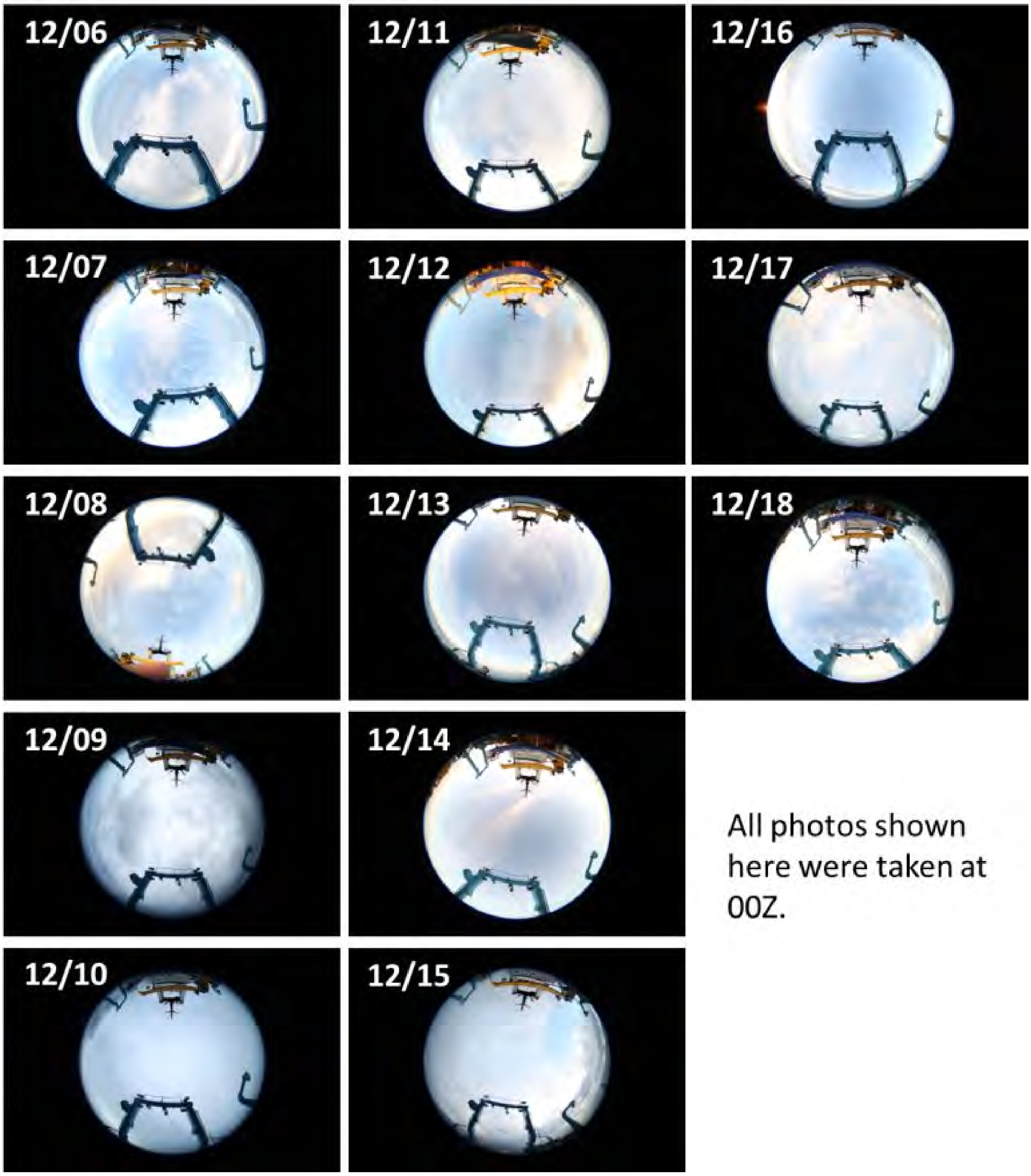
11121600 7.00 degS 95.00 degE
11121618 6.93 degS 95.68 degE
11121603 7.00 degS 95.00 degE
11121700 6.86 degS 96.35 degE
11121606 7.00 degS 95.00 degE
11121706 6.79 degS 97.01 degE
11121612 7.00 degS 95.00 degE
11121712 6.73 degS 97.58 degE
Pres (hPa)
Temp (degC)
(m/s)


11121718 6.66 degS 98.24 degE
Pres (hPa)
100
200
300
500
700
1000
-80
-40
0
+40
Temp (degC)
0 15
(m/s)


11121800 6.59 degS 98.94 degE
Pres (hPa)
100
200
300
500
700
1000
-80
-40
0
+40
Temp (degC)
0 15
(m/s)

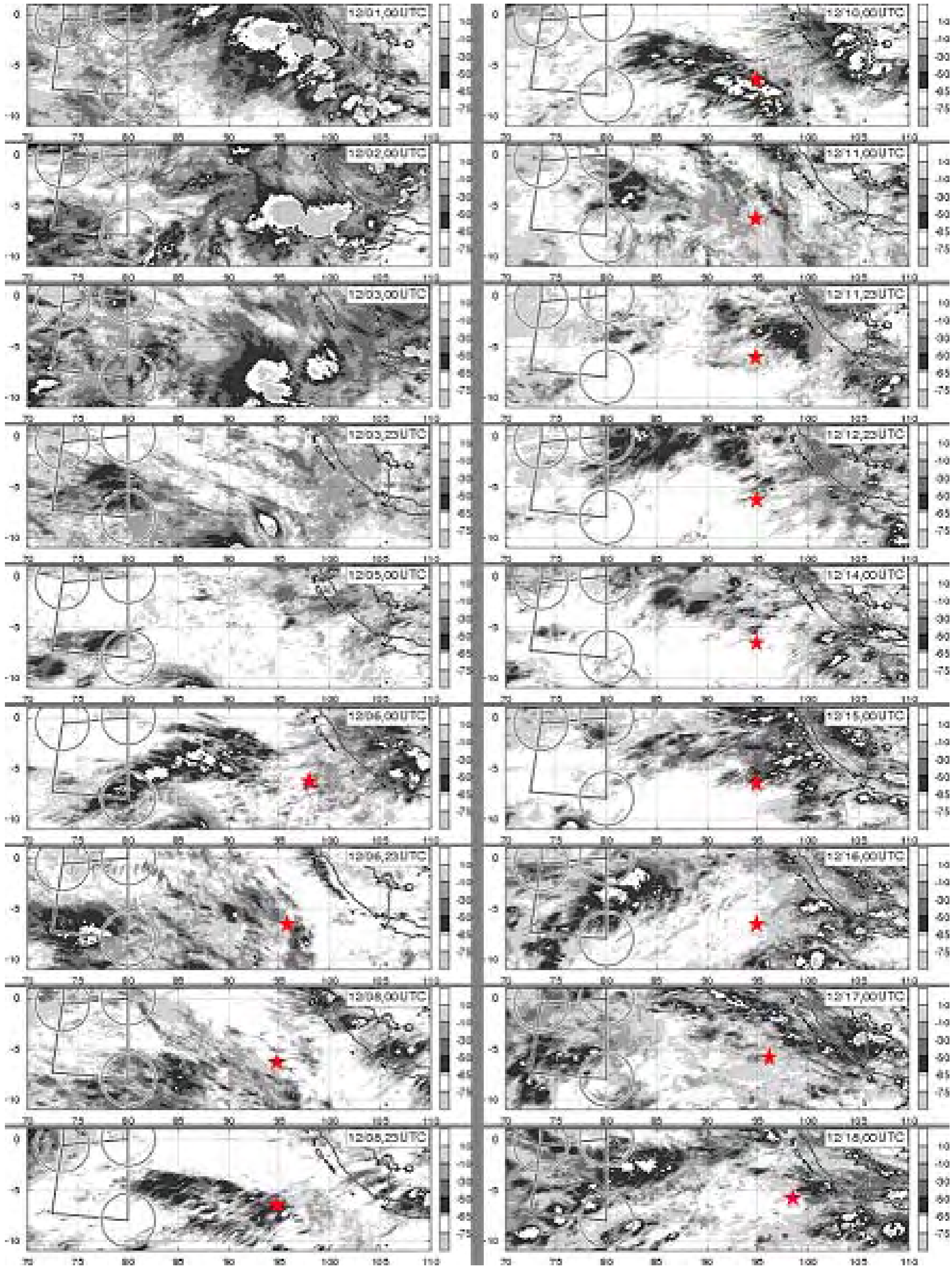

11121806 6.53 degS 99.52 degE
Pres (hPa)
100
200
300
500
700
1000
-80
-40
0
+40
Temp (degC)
0 15
(m/s)

Appendix-B



Sky images taken by a fish-eye camera.

Appendix-C



Infrared images taken by MTSAT. Red star indicates the rough position of R/V Baruna Jaya III.