

Report on Oceanographic Cruise of O. R. V. Sagar Kanya

CRUISE No. 67

17th August to 20th September, 1991



**National Institute of Oceanography
Dona Paula-403 004, Goa
INDIA**

NATIONAL INSTITUTE OF OCEANOGRAPHY

(Council of Scientific & Industrial Research)

Dona Paula, Goa - 403 004.

REPORT ON

67th OCEANOGRAPHIC CRUISE OF

ORV SAGAR KANYA

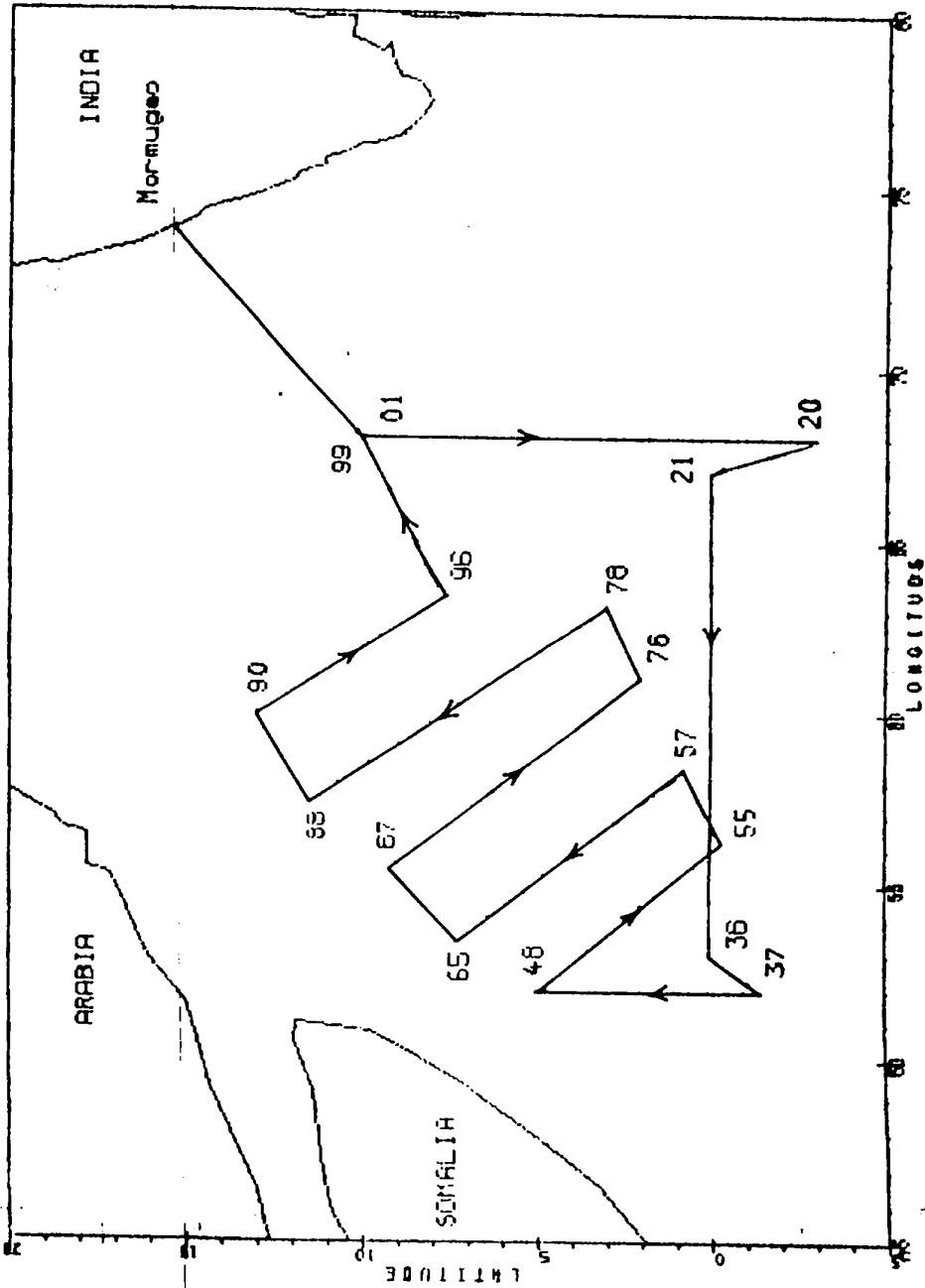
(17 August to 20 September, 1991)

Contents

1. Cruise track
 2. Cruise summary
 3. Participants
 - (a) Scientific component
 - (b) Ship's complement
 4. Objectives and cruise plan
 5. Cruise details
 6. Preliminary results
 7. Losses/Damages
 8. Acknowledgement
- Annex-Summary of observations.

SAGAR KANYA cruise 67

17:08.91-20:09.91



2. Cruise summary:

The 67th Cruise of ORV Sagar Kanya was organised as a part of the Joint Indo-USSR Collaborative Programme for studies on air-sea interaction processes in relation to monsoon dynamics, in the Arabian Sea and western equatorial Indian Ocean from 17th August to 20th September 1991. Physical Oceanographic data, surface meteorological data, upper air data and some plankton samples were collected during the cruise. Altogether 99 oceanographic stations were occupied. Surface Difters were released at 4 stations for collection of data on sea surface temperature and circulation through ARGOS system. Besides scientists from the National Institute of Oceanography, Scientists from India Meteorological Department, Indian Institute of Tropical Meteorology, Cochin University of Science & Technology, Karnatak University and State Oceanographic Institute, Moscow have participated in the cruise. The total distance covered during the cruise was about 6800 nautical miles.

3 Participants:

(a) Scientific component:

L.V. Gangadhara Rao	Chief Scientist
V.S.N. Murty	Physical Oceanography Division, NIO.
R.J.K. Charyulu	- do -
A.A. Fernandes	- do -
A.S. Unnikrishnan	- do -
M.S.S. Sarma	- do -
G. Nampoothiri	- do -
R. Vaithiyathan	- do -
S.D. Prasad	India Meteorological Department
B.B. Das	- do -
P.N. Machwurkar	- do -
S.P. Joshi	- do -
V. Gopalakrishnan	Indian Inst. of Tropical Meteorology
C.G. Deshpande	- do -
C.K. Rajan	Cochin Univ. of Science & Technology
K.C. Anil Kumar	- do -
K. Vamsee	Karnataka University
Lt. Cdr.M.S.Raghunathan	DNOM, Indian Navy
A.K. Jyothi	- do -
I.I. Zveriaev	State Oceanographic Institute, USSR
P.O. Zavialov	- do -

Ganesh M. Chandavale	Shipboard Trainee
C. Ravi	- do -
N.M. Subramaniam	- do -
Vijaya Kumar Patil	- do -
Vivek Govind Pai	- do -

(b) Ship's complement:

J. Abraham	Master
S. Daniel	Chief Officer
S. George	Asst. Watch Keeping Officer
K. Chandrakant	Trainee Navigating Officer
P.K. Ghosh	Chief Engineer
M. Talapatara	Second Engineer
Shivaji Singh	Third Engineer
J. Pratap	Fifth Engineer
V.G. Nair	Electrical Officer
M. Dias	- do -
G.S. Nagarcenkar	Chief Radio Officer
P.A. Biju	Trainee Radio Officer
D.S. Murty	Medical Officer
Morris Fernandes	Catering Officer
M.A.R. Mohammed	Purser

4. Objectives and Cruise Plan:

The main objective of the cruise was to carry out observations on the physical oceanographic and meteorological parameters in the Southern Arabian Sea and western equatorial Indian Ocean for studying the air-sea interaction processes and oceanographic conditions during the withdrawal phase of summer monsoon in 1991. In particular, the following physical oceanographic and meteorological aspects were proposed to be studied in detail:

- (a) Distribution of temperature, salinity and density fields.
- (b) Geostrophic circulation and mass transport
- (c) Heat content/storage and heat transport by vertical and lateral advective processes in the upper layers of the ocean,
- (d) Heat transfer across the air-sea interface and in the atmosphere.

Another important objective of the cruise was to collect the sea-truth data required for ocean remote sensing studies, especially for validation of oceanic parameters/features derived from satellite data.

The present cruise has been organised as a part of the joint Indo-USSR collaborative programme for the study of dynamics of summer monsoon in the western and equatorial Indian Ocean. It was

intended to repeat the observations thrice during various stages of the monsoon viz.,

- (1) The pre-monsoon period April-May
- 2) Peak monsoon period June-July
- 3) Withdrawal phase of the monsoon Aug-September.

The first two cruises of 45 days each were carried out by the Soviet Research Ship Akademik Korolev from 18th March to 3rd May, 1988 and from 5th May to 14th June 1988. The third cruise was carried out by ORV Sagar Kanya from 2nd August to 14th September 1988. The fourth cruise was carried out by SV Priboy from 17th March to 27th May, 1990. The fifth cruise was planned on board ORV Sagar Kanya from 17th August to 20th September 1991. The cruise track is shown in Figure 1.

During the cruise it was planned to collect temperature and salinity data in the upper 1200 m, at stations located at 60 nm interval, surface meteorological data at 3 hourly intervals at standard synoptic hours and upper air data at 00 GMT and 12 GMT along the cruise track. It was also planned to release surface drifters at appropriate locations for collection of data on sea surface temperature and circulation through ARGOS System.

5. Cruise Details:

ORV Sagar Kanya sailed from Mormugao Harbour on 17.8.1991 (evening) with 26 scientists and technical personnel from various organisations namely NIO (8+5), IMD (4), IITM (2), Directorate of Naval Oceanography & Meteorology (2), School of Marine Sciences, Cochin University of Science & Technology (2) Department of Marine Biology, Karnatak University (1) including the two scientists from the State Oceanographic Institute, Moscow deputed by the USSR Government.

A meeting of all the scientists and Ship's Officers was held at 1530 IST on 19.8.1991. The Chief Scientist briefed the cruise plan. The observational programme involving collection of data for studies in the disciplines of physical oceanography, meteorology and biology was discussed and the working schedules for carrying out various observations and data processing were finalised.

Using Seabird CTD system (Model SBE-11) data on temperature, salinity and transparency were collected upto 1200 m depth at 99 stations located at 30 to 100 nautical miles apart along 9 sections covering the area of study. Surface meteorological data were collected at all these stations. Thermosalinograph was operated and surface water temperature was noted at hourly intervals along the cruise track. Surface water samples were collected at all the stations and subsurface water samples upto

1200 m depth were collected at 6 stations (using CTD system with Rosette) and analysed for salinity using AUTOSAL for checking the calibration of CTD system. The data were processed and temperature and salinity profiles against depth were prepared. Surface Drifters were released at 4 stations (10° N-68°E, 5°N-68°E, 7°N-60°E, 13°N-60°E) for collection of data on sea surface temperature and circulation through ARGOS system.

The scientists from IMD collected surface meteorological data at 3 hourly intervals at standard synoptic hours and upper air data (on pressure, temperature and humidity) through Radiosonde ascents daily at 00 GMT and 12 GMT. Altogether 250 surface observations were taken and 60 Radiosonde ascents were operated. The scientists of IITM measured the atmospheric electrical conductivity and potential gradient and recorded on strip chart recorders round the clock throughout the cruise (using the equipment fabricated at IITM) for studying the atmospheric electrical parameters over the ocean and their relation to atmospheric pollution.

The Research Scholar from the Department of Marine Biology, Karnataka University collected Plankton samples at 36 stations occupied between 6 PM and 6 AM, using a Plankton Net (Surface haul) for studying the different species of plankton, their abundance and distribution with respect to physical and chemical

parameters. Samples of surface water were also collected at these stations for chemical and nutrient analysis.

After completing the observational programme, a meeting of scientists was held at 1630 IST on 19.9.1991 to review the scientific work carried out during the cruise and discuss the results of preliminary analysis.

After successfully completing the cruise programme, ORV Sagar Kanya arrived at Mormugao Port on 20.9.1991 (forenoon).

6. Preliminary results:

- 1) Winds were southeasterly in the eastern part of study area and west to southwesterly in the western and central parts. Wind speeds upto 31 knots were observed off Somalia.
- ii) Sea surface temperature varied from about 29°C in the eastern part to about 23°C off Somalia.
- iii) The surface salinity decreased from about 36.6 ppt in the southern Arabian sea to about 35.6 ppt off Somalia and to about 35.2 ppt along the equator.
- iv) Thickness of mixed layer varied between 50 and 60 m along the equator.

v) Surface circulation deduced from geostrophic computations showed presence of alternate cyclonic and anticyclonic eddies off Somalia and eastward flow in the equatorial region.

vi) Heat content in the upper 200 m was high (500 K.Cal/cm^2) in the Southern Arabian sea and decreased (to less than 425 K.cal/cm^2). towards southwest.

7. Losses/Damages: There was no loss of equipment during the cruise.

8. Acknowledgement:

The Chief Scientist and other members of the scientific team express their thanks to the Master, Officers and Crew of ORV Sagar Kanya for their excellent cooperation during the cruise.

SUMMARY OF OBSERVATIONS

SHIP: ORV SAGAR KANYA

Cruise No. 57

AREA: SOUTHERN ARABIAN SEA & WESTERN EQUATORIAL INDIAN OCEAN

St. No.	Station No.	Date	Time (IST) From-To	POSITION		Depth (m)	XBT	CTD	Surf. Met.	Sasplng for Salinity	Plankton Net	OBSERVATIONS
				Latitude	Longitude							
1.	1	20.8.91	0020-0120	09° 57.5'N	67° 59.9'E	4000	-	1	1	1	13	-
2.	2	20.8.91	0720-0809	08° 58.9'N	68° 00.3'E	4560	-	1	1	1	1	-
3.	3	20.8.91	1411-1457	08° 00.0'N	68° 00.0'E	4600	-	1	1	1	1	-
4.	4	20.8.91	2134-2212	07° 01.0'N	68° 00.0'E	4400	-	1	1	1	1	-
5.	5	21.8.91	0420-0455	06° 00.0'N	69° 00.0'E	3000	-	1	1	1	1	-
6.	6	21.8.91	1106-1200	04° 59.9'N	68° 00.0'E	3550	-	1	1	1	1	-
7.	7	21.8.91	1830-1910	04° 00.4'N	67° 59.7'E	3350	-	1	1	1	1	-
8.	8	22.8.91	0142-0213	03° 00.3'N	68° 00.4'E	3100	-	1	1	1	1	-
9.	9	22.8.91	0549-0623	02° 28.9'N	67° 59.8'E	3500	-	1	1	1	1	-
10.	10	22.8.91	0925-1005	02° 01.3'N	68° 00.3'E	3340	-	1	1	1	1	-
11.	11	22.8.91	1330-1445	01° 30.7'N	67° 59.7'E	3750	-	1	1	1	13	-
12.	12	22.8.91	1824-1858	01° 00.5'N	67° 59.7'E	4220	-	1	1	1	1	-
13.	13	22.8.91	2230-2308	00° 29.8'N	67° 59.7'E	3100	-	1	1	1	1	-
14.	14	23.8.91	0233-0313	00° 00.3'N	67° 59.5'E	3200	-	1	1	1	1	-
15.	15	23.8.91	0628-0715	00° 30.2'S	67° 59.6'E	3500	-	1	1	1	1	-
16.	16	23.8.91	1125-1206	01° 00.1'S	67° 59.6'E	3240	-	1	1	1	1	-
17.	17	23.8.91	1600-1640	01° 29.8'S	67° 59.6'E	2800	-	1	1	1	1	-
18.	18	23.8.91	2030-2130	02° 00.1'S	67° 59.8'E	3740	-	1	1	1	1	-
19.	19	24.8.91	0138-0218	02° 30.4'S	67° 58.9'E	2000	-	1	1	1	1	-
20.	20	24.8.91	0630-0708	02° 59.9'S	67° 59.6'E	2400	-	1	1	1	1	-

St. Station No.	Date	Time (IST) From-To	POSITION		Depth (m)	OBSERVATIONS			
			Latitude	Longitude		XBT	CTD	Surf. Net. Sampling for Salinity	Plankton Net
21.	25.8.91	0245-0259	00° 00.3'S	66° 58.3'E	210	-	1	1	1
22.	25.8.91	0510-0556	00° 00.0'	66° 39.9'E	3130	-	1	1	1
23.	25.8.91	0940-1024	00° 00.0'	65° 59.5'E	2100	-	1	1	1
24.	25.8.91	1600-1720	00° 00.1'N	64° 59.6'E	3700	1	1	1	13
25.	25.8.91	2236-2330	00° 00.0'	63° 59.1'E	4050	-	1	1	1
26.	26.8.91	0455-0530	00° 00.6'S	62° 59.9'E	4300	-	1	1	1
27.	26.8.91	1059-1150	00° 00.1'S	62° 00.1'E	4300	-	1	1	1
28.	26.8.91	1720-1814	00° 00.1'S	50° 59.7'E	4300	-	1	1	1
29.	26.8.91	2345-0035	00° 00.3'N	39° 59.5'E	4300	-	1	1	1
30.	27.8.91	0610-0700	00° 00.2'S	38° 59.3'E	4650	-	1	1	1
31.	27.8.91	1401-1438	00° 00.0'	37° 59.3'E	4630	-	1	1	1
32.	27.8.91	2048-2148	00° 00.0'	36° 59.8'E	4650	-	1	1	1
33.	28.8.91	0410-0450	00° 00.1'N	36° 09.5'E	4550	-	1	1	1
34.	28.8.91	1235-1352	00° 00.0'	34° 58.5'E	4330	-	1	1	13
35.	28.8.91	1938-2140	00° 00.0'	34° 00.0'E	4900	-	1	1	1
36.	29.8.91	0502-0535	00° 00.0'	33° 00.0'E	4000	-	1	1	1
37.	29.8.91	1734-1810	01° 29.5'S	32° 00.1'E	5050	-	1	1	1
38.	29.8.91	2150-2310	01° 00.0'S	31° 59.9'E	5050	-	1	1	1
39.	30.8.91	0246-0333	00° 30.2'S	31° 59.8'E	5050	-	1	1	1
40.	30.8.91	0745-0827	00° 00.3'S	31° 59.7'E	5050	-	1	1	1
41.	30.8.91	1225-1305	00° 30.2'N	31° 59.9'E	5100	-	1	1	1
42.	30.8.91	1710-1747	00° 58.5'N	31° 59.2'E	5070	-	1	1	1

St. No.	Station No.	Date	Time (IST) From-to	POSITION		Depth (m)	OBSERVATIONS				
				Latitude	Longitude		XBT	CID	Surf. Met.	Sampling for Salinity	Plankton Net
43.	43	30.8.91	2240-2330	01° 29.8'N	52° 00.7'E	5100	-	1	1	1	1
44.	44	31.3.91	0502-0542	01° 59.0'N	52° 00.0'E	5080	-	1	1	1	1
45.	45	31.8.91	1053-1200	02° 27.2'N	52° 00.0'E	5060	-	1	1	1	1
46.	46	31.8.91	1802-1842	02° 59.3'N	52° 00.1'E	4600	-	1	1	1	1
47.	47	1.9.91	0314-0414	04° 00.9'N	52° 00.5'E	5000	-	1	1	1	1
48.	48	1.9.91	1220-1334	04° 58.3'N	52° 00.0'E	5050	-	1	1	1	1
49.	49	1.9.91	1932-2030	04° 14.8'N	52° 36.2'E	5000	-	1	1	1	1
50.	50	2.9.91	0314-0355	03° 29.6'N	53° 12.6'E	5100	-	1	1	1	1
51.	51	2.9.91	1145-1235	02° 43.9'N	53° 49.2'E	4900	-	1	1	1	1
52.	52	2.9.91	1923-2003	01° 57.5'N	54° 25.9'E	4500	-	1	1	1	1
53.	53	3.9.91	0224-0306	01° 12.1'N	55° 01.9'E	4100	-	1	1	1	1
54.	54	3.9.91	0932-1020	00° 26.2'N	55° 38.3'E	4500	-	1	1	1	1
55.	55	3.9.91	1732-1812	00° 19.2'S	56° 14.6'E	4600	-	1	1	1	1
56.	56	3.9.91	2325-0045	00° 00.2'N	56° 59.8'E	4660	-	1	1	13	1
56A	56A	4.9.91	0530	00° 22.3'N	57° 39.6'E	4670	1	-	1	1	-
57.	57	4.9.91	1014-1054	00° 45.1'N	58° 19.0'E	4800	-	1	1	1	1
58.	58	4.9.91	1650-1735	01° 33.7'N	57° 44.2'E	4400	-	1	1	1	1
59.	59	5.9.91	0000-0045	02° 23.0'N	57° 07.7'E	4680	-	1	1	1	1
60.	60	5.9.91	0734-0811	03° 11.3'N	56° 31.6'E	4850	-	1	1	1	1
61.	61	5.9.91	1520-1558	03° 58.5'N	55° 56.4'E	4800	-	1	1	1	1
62.	62	5.9.91	2350-0030	04° 48.4'N	55° 18.7'E	5080	-	1	1	1	1
63.	63	6.9.91	0818-0903	05° 36.1'N	54° 42.5'E	4880	-	1	1	1	1
64.	64	6.9.91	1630-1716	06° 25.3'N	54° 06.5'E	5100	-	1	1	1	1

St. No.	Station No.	Date.	Time (IST) From-To	POSITION		Depth (#)	OBSERVATIONS				
				Latitude	Longitude		XBT	CTD	Surf. Met.	Salinity	Plankton Net
65.	65	7.9.91	0006-0055	07° 15.1'N	53° 29.8'E	5030	-	1	1	1	1
66.	66	7.9.91	1000-1045	08° 14.5'N	54° 30.2'E	5030	-	1	1	1	1
67.	67	7.9.91	2052-2151	09° 14.4'N	55° 30.0'E	3750	-	1	1	1	1
68.	68	8.9.91	0335-0415	08° 27.8'N	56° 06.4'E	3700	-	1	1	1	1
69.	69	8.9.91	1305-1351	07° 38.9'N	56° 43.6'E	4600	-	1	1	1	1
70.	70	8.9.91	2056-2130	06° 50.6'N	57° 29.0'E	4200	-	1	1	1	1
71.	71	9.9.91	0412-0456	06° 01.2'N	57° 57.5'E	3700	-	1	1	1	1
72.	72	9.9.91	1115-1200	05° 13.2'N	58° 33.8'E	3980	-	1	1	1	1
73.	73	9.9.91	1805-1849	04° 25.2'N	59° 11.1'E	4150	-	1	1	1	1
74.	74	10.9.91	0037-0116	03° 36.7'N	59° 47.3'E	4470	-	1	1	1	1
75.	75	10.9.91	0730-0801	02° 48.3'N	50° 23.3'E	4500	-	1	1	1	1
76.	76	10.9.91	1349-1426	02° 00.3'N	51° 09.2'E	4700	-	1	1	1	1
77.	77	10.9.91	2245-2325	02° 29.8'N	62° 03.0'E	3900	-	1	1	1	1
78.	78	11.9.91	0550-0634	03° 00.0'N	62° 59.8'E	3900	-	1	1	1	1
79.	79	11.9.91	1305-1348	03° 51.0'N	62° 27.5'E	2900	-	1	1	1	1
80.	80	11.9.91	2026-2113	04° 41.9'N	51° 54.4'E	3000	-	1	1	1	1
81.	81	12.9.91	0354-0435	05° 32.2'N	51° 23.2'E	2200	-	1	1	1	1
82.	82	12.9.91	1125-1208	06° 24.0'N	50° 59.0'E	2500	-	1	1	1	1
83.	83	12.9.91	1852-1930	07° 14.8'N	50° 55.0'E	3670	-	1	1	1	1
84.	84	13.9.91	0215-0300	08° 05.3'N	59° 33.5'E	2900	-	1	1	1	1
85.	85	13.9.91	0935-1016	08° 57.0'N	59° 10.0'E	4000	-	1	1	1	1
86.	86	13.9.91	1626-1716	09° 47.7'N	58° 36.7'E	2900	-	1	1	1	1
87.	87	13.9.91	2340-0025	10° 38.8'N	58° 03.3'E	3850	-	1	1	1	1

St. No.	Station No.	Date	Time (IST) From-To	POSITION		Depth (m)	XBT	CTD	Surf. Net.	OBSERVATIONS	
				Latitude	Longitude					Sampling for	Plankton Net
38-	88	14.9.91	0822-0915	11° 29.0'N	57° 30.3'E	3900	-	1	1	1	-
39.	89	14.9.91	1909-1947	12° 14.9'N	58° 44.9'E	4550	-	1	1	1	-
90.	90	15.9.91	0325-0407	13° 50.2'N	60° 00.3'E	4300	-	1	1	1	1
91.	91	15.9.91	1032-1115	12° 07.3'N	60° 33.4'E	4350	-	1	1	1	-
92.	92	15.9.91	1729-1818	11° 13.9'N	61° 07.2'E	4370	-	1	1	1	-
93.	93	15.9.91	0042-0125	10° 20.0'N	61° 41.2'E	4450	-	1	1	1	1
94.	94	16.9.91	0804-0841	09° 27.2'N	62° 13.5'E	4500	-	1	1	1	-
95.	95	16.9.91	1447-1521	08° 34.0'N	62° 46.9'E	4550	-	1	1	1	-
96.	96	16.9.91	2130-2210	07° 39.8'N	63° 20.3'E	4950	-	1	1	1	1
96A	96A	17.9.91	0410	08° 05.6'N	64° 11.6'E	4580	1	1	1	1	-
97.	97	17.9.91	0930-1012	08° 29.8'N	64° 59.9'E	4550	-	1	1	1	-
97A	97A	17.9.91	1509	08° 51.9'N	65° 43.9'E	4470	1	-	1	1	-
98.	98	17.9.91	1954-2047	09° 15.1'N	66° 29.5'E	4500	-	1	1	1	1
98A	98A	18.9.91	0157	09° 37.4'N	67° 14.5'E	4550	1	-	1	1	-
99.	99	18.9.91	0707-0825	09° 59.6'N	67° 59.6'E	4450	-	1	1	1	13