National Centre for Antarctic & Ocean Research
XXXIV Indian Scientific Expedition to Antarctica (2014-15)

MAITRI- Indian Research Station at Schirmacher Oasis, Antarctica

Since 1983 the Indian scientific endeavors in Antarctica have been sustained on a year-round basis, from the Indian Permanent stations “Dakshin Gangotri” (1983-89) and “Maitri” (1989 – till date). In the year 1988 an ice free, rocky area on the Schirmacher Oasis was selected to build the Second Research Station “Maitri” (70° 45′ 01.65" S and 11° 43′ 01.45" E). It is an inland station about 100 km from the shore at an elevation of about 117 meters above sea level.

The building was erected on steel stilts, and has since stood the test of time. The infrastructure available at the station has enabled the scientists to conduct research in various disciplines such as Atmospheric Sciences & Meteorology, Earth Sciences including Glaciology, Human Biology & Medicine, Biology & Environmental Sciences etc.

Maitri during austral summers

Maitri during austral winters

Maitri also serves as a gateway to one of the largest mountain chains in central Dronning Maud land, located south of Schirmacher. About 20,000 sq. km. area in Wohlthat, Orvin, and Muhlig Hoffmann Ranges have been geologically mapped by Indian scientists, making Maitri as their base Station. Several research programs initiated by India in the Schirmacher oasis and its environs have also contributed directly to global experiments mounted under the aegis of the Scientific Committee on Antarctic Research (SCAR). It has a capacity to accommodate 65 persons in summer and 25 in winter.

Maitri is approachable by sea route between November and March of the succeeding calendar year (Austral Summer season) from Cape Town. The voyage plan varies annually depending on the operational requirement. Alternately, Maitri is also approachable by chartered flights between Cape Town and Novolazarevskaya (Novo) air strip under the aegis of Dronning Maud Land Air Network (DROMLAN) between November and February of the succeeding calendar year. Cape Town-Novo flights (ILLUSION-76 aircrafts) take about 5.5 hours. Flight operations require intricate planning and are not available as a matter of choice, but based on operational requirements.

1. MODE OF TRANSPORT AROUND MAITRI

To provide logistical support and smooth transportation for carrying out field work and for collecting samples from far off locations, transport / earth movers /load hauling vehicles are available at the station. These can be used with the prior permission from the Leader at the station. Two helicopters remain onboard ship and provide a convenient and quick way for field work. However, Schirmacher Oasis (area ~32 km^2) for field work and sample collection is approachable on foot.

S. No.	Vehicles	Number	Remark
1	Pisten Bully	10	02 off-road
2	Snow Scooter	02	
3	Toyota arctic truck Tata Xenon – XT	01	
4	Tata Xenon – XT	01	
5	Bulldozer (BD-50)	02	01 off-road
6	Mantis Crane 50 MT	04	01 off-road
7	Excavator	01	
8	Trailer	08	
9	Sledge	08	
10	Side loader	02	

2. OPERATIONAL EXPERIMENTS AT MAITRI STATION

Apart from the experiments performed during the previous expeditions following experiments/ instruments are running in and around the Maitri station;

2.1 Moveable Atmospheric Radar for Antarctica (MARA)

MARA is very high frequency (VHF) radar operating at frequency 54.5 MHz. It provides continuous measurements of full height profiles of turbulence, waves, winds and static stability in the boundary layer, free troposphere, lower stratosphere and in the mesosphere near-mesopause

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2.2 Ionosonde:

Canadian Advanced Digital Ionosonde (CADI), meant for ionospheric studies up to the altitude of about 500 km, is operated in the radio frequency range 1-30 MHZ. High power radio frequency pulses are transmitted from the instrument and waves reflected from the ionosphere are received subsequently, which provides an excellent tool for the diagnosis of the ionosphere.

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2.3 Ionospheric Scintillation and TEC Monitoring:

For the L band ionospheric scintillation and total electron content (TEC) monitoring GSV-4004B GISTM dual-frequency receiver is operational.

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2.4 Magnetometers:

Different types of magnetometers (Digital Fluxgate magnetometer – DFM, Proton Precision magnetometer – PPM, Induction Coil magnetometer – ICM) are continuously monitoring terrestrial magnetic field. Magnetic observations are vital for understanding the electromagnetic changes in the near-Earth environment due to internal or external origin.

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2.5 Imaging Riometer:

Cosmic radio waves reaching to the Earth's surface are monitored by Imaging Riometer at 38.2 MHz. Strength of the cosmic radio signal varies with the changing ionospheric density, which is affected by various space weather events. Riometer in turn provides a method to passively study the ionospheric conditions and dynamics.

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2.6 Global Atmospheric Electricity:

Extremely weak return current is observed in the fair-weather regions, which is driven by thunderclouds in the troposphere. Long-wire antenna and electric field mill monitor atmospheric current and electric field, which in turn provides global pattern of thunderclouds.

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2.7 Meteorological observations:

Automatic weather station (AWS) continuously monitors atmospheric parameters, for example, temperature, pressure and humidity. Balloons are periodically launched from Maitri to record altitude profile of temperature and ozone content.

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2.8 Seismograph:

Seismograph located at 70° 45′ 56.21" S and 11° 44′ 10.78 " E records ground vibrations in the frequency range of 0 to 500 Hz. Mainly used for studying the seismic waves, earthquakes and deep interior of earth.

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2.9 Global positioning system (GPS):

GPS takes signals from satellite and provide accurate coordinates and their temporal variation. It receives signals in the frequency range of 1176-1575 MHz and is located at 70° 45′ 56.21" S and 11° 44′ 10.78 " E. Useful in studying the crustal deformation and plate movements.

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2.10 Meteorology sensor:

Meteorology sensor records/provides temperature, pressure and humidity. This sensor is integrated with GPS and is located at 70° 45′ 56.21" S and 11° 44′ 10.78 " E.

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2.11 NOx Analyser:

It measures NO, NO2 and NOx in ppb level on fifteen minutes average basis at ground level. This analyser utilizes the photometric detection of chemiluminescence which results from the gas phase reaction of ozone with NO. It meets EMC emission (EN-5008-1): Generic emission standards. The lowest detection limit is 0.4 ppb with linearity of ± 1%.

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2.12 Aerosol Spectrometer:

To monitor the concentration of size variation of particles in 15 channels from ≥20 μm to 0.3 μm aerosol spectrometer a class 3-B laser is operated at 15 minutes average interval at ground level.

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2.13 Aethelometer:

It provides real-time readout of the black or elemental carbon aerosol particles (BC or EC) in an air stream in ng/m3 on fifteen minute average interval. Instrument performs optical analysis at seven different wavelengths from 370 to 950 nm.

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3. OPERATIONAL EXPERIMENTS IN THE SOUTHERN OCEAN

Experiments are also performed during the voyage of the ship and instruments are also deployed in the Southern Ocean to unravel the scientific mysteries.

3.1 Bio-Argo floats

In order to continuous monitoring of vertical profile of bio-optical and biogeochemical component in the southwest sector of the Southern Ocean, four PROVOR BIO Argo floats at 42°26'S 31°53'E, 54°52'S 18°5'E, 50°03'S 18°5'E &48°7'S 18°7'E were deployed in southern ocean during 33rd ISEA in collaboration with INCOIS, Hyderabad. All these floats are equipped with Dissolved Oxygen and chlorophyll sensor along with CTD for traditional temperature, salinity and depth measurements and drifts at 2000m depth.

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Please feel free to get in touch for clarifications with our team,

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