High-end Equipment/Facilities available at Ministry of Earth Sciences (MoES) Institutes

No.	Institute	Instrumentation Facilities	Potential use
1.	**1. Indian Institute of Tropical Meteorology, Pune**	C-band radar, radiosonde flights, radiometers for profiling the atmospheric parameters such as temperature and humidity and clouds, measurements surface aerosol physical and chemical properties	The ground based observatory gives unique opportunity for students and young researchers to learn about atmospheric instrumentation, their application, data and monitoring. Students will get idea of the clouds and their precipitation characteristics.
2.		Automatic Weather Station	Surface temperature, pressure, humidity, wind speed and wind direction.
3.		Radiosonde	Vertical profile of atmospheric temprature, pressure, relative humidity, wind speed and wind direction.
4.		Microwave radiometric profiler	Vertical profile of atmospheric Temperature, RH, Liquid and Vapour upto 10Km.
5.		X-band radar	For precipitation studies in the range of 125 km region in Western Ghats
6.		Ka-band radar	For studying clouds and their vertical structure covering 25 km range

7.		Cloud Condensation Nuclei(CCN)	Cloud Condensation Nuclei (CCN) concentration as a function of super saturation.
8.		Nephelometer	Light-scattering coefficient of atmospheric aerosols.
9.		OCEC Analyser	Mass concentration of Organic & Elemental Carbon in air.
10.		Wide range aerosol spectrometer (WRAS)	Size Distribution and Number concentration of Aerosol particles from5 nm to 32000 nm.
11.		Aerosol Chemical Speciation Monitor (ACSM)	Mass loading and chemical composition in real-time for non-refractory sub-micron aerosol particles.
12.		Athelometer	Black carbon concentration.
13.		TSI SMPS	Measuring Size Distribution and Number concentration of Aerosol particles .
14.		Neutral Air Cluster Ion Spectrometer(NAIS)	Atmospheric Ion/particle concentration and its size distrubutions.
15.		Spectrometer for Ice Nuclei(SPIN)	Measure the spectrum of ice nuclei as a function of temperature & supersaturation.
16.		Cloud combination probe (CCP)	Size distribution, Number

			Concentration, Image and Liquid water content of clod droplets.
17.		Impact distrometer	Rain intensity and rain droplet size distrubution.
18.		2D Video distrometer	Size distribution, fall velocity, 2D images of Rain drops and Rain fall.
19.		Micro rain radar (MRR)	Vertical Profiles of hydrometeors, rain rate and liquid water content.
20.		Precipitation Monitor	Collects rain water & measures its conductivity &PH.
21.		Automatic Rain Gauge	measure the amount of precipitation continiously.
22.		Total radiation sensor (KIPP & ZONEN)	Measures Global, Direct, Ultraviolet (UV) and Far Infrared (FIR) radiation.
23.		Sky radiometer	Aerosol optical thickness, Sky radiance at 7 different wavelengths.
24.		Microtops	Measurement of Aerosol Optical Depth.
25.		Whole sky Imager	Ground based cloud detection and sky analysis
26.		High volume air sampler	Continuous measurement of PM-2.5, PM-10
27.		SO2 analyzer	Measures SO2 in ambient air.
28.		Particle into liquid sampler	Continuous measurement of ambient aerosol bulk composition

29.		Hotwire Anemometry System 08 channel system, probes for measurement in air and water flows, automatic calibrator for air probes, inbuilt signal conditioner, high sampling rate up to 250 kHz per channel	Measurement of turbulence in laboratory flows, simultaneous measurements for correlation/structure function studies, coherent structures etc. Currently in use in wall-jet experiments.
30.		Low-Speed PIV System 15 Hz, 200 mJ/pulse double pulsed 532 nm Laser, 03 CCD cameras (5 MP @ 14 Hz) for tomographic PIV measurements	Whole field measurements of laboratory turbulent flows enabling evaluation of complete velocity gradient tensor. Currently in use in wall-jet experiments
31.		High-Speed PIV System 1 kHz, 22.5 mJ/pulse double pulsed 527 nm Laser, 02 high speed CMOS cameras (1.3 MP @ 4 kHz) for high-speed stereoscopic PIV measurements	Measurement of three velocity components in transient/non-stationary/ rapidly varying turbulent flows. Currently in use in wall-jet experiments.
32.		Ion Chromatograph	For analysis of water soluble chemical species
33.		OC/EC analyzer	Measurement of organic carbon and elemental carbon
34.		Integrating Nephelometer	Aerosol Scattering Coefficient and Backscatter at 3 wavelengths
35.		Sun sky radiometer	Measurement of column optical

			parameters of aerosols
36.		Particles Into Liquid Sampler	Collection of liquid samples for chemical analysis
37.		Pyranometer	Measuring solar irradiance on a planar surface
38.		Wet collector	Collection of rain water
39.		Fog collector	Collection of fog water
40.		Anderson sampler	For collection of PM1, PM2.5 , PM5 and PM 10 samples
41.		PM2.5 sampler	Collection of aerosol dia.less than 2.5micron
42.		PM10 sampler	Collection of aerosol dia. less than 10micron
43.		AWS	Measurement of met parameters
44.		Cloud Droplet Probe (CDP)	Cloud droplet number measurement of diameter range 2 to 50 µm (for airborne measurements)
45.		Aircraft Integrated Meteorological Measurement System (AIMMS)	Meteorological and Thermodynamical Parameters such as wind speed, direction, true air speed, temperature,

			RH, aircraft position etc. (for airborne measurements)
46.		Passive Cavity Aerosol Spectrometer (PCASP)	Aerosol concentrations of diameter size range from 0.1 to 2.5 µm. (for airborne measurements)
47.		Cloud Image Probe (CIP)	Cloud Image and counts of diameter range from 25 to 1550 µm. (for airborne measurements)
48.		Precipitation Image Probe (PIP)	Precipitation image and counts from diameter 100 µm – 6.2 mm . (for airborne measurements)
49.		Hot Wire Liquid Water Content	Cloud water content (for airborne measurements)
50.		Ultra-High Sensitivity Aerosol Spectrometer (UHSAS)	Aerosol size distribution from diameter 60 nm – 1 µm (for airborne measurements)
51.		Dual column CCN counter	It provides concentrations of cloud condensation nuclei at different supersaturation. (Aircraft and

			ground based instrument)
52.		Scanning Mobility Particle Sizer (SMPS)	Particle size concentration and spectra (diameter below 800 nm)
53.		Aerodynamic Particle Sizer (APS)	Particle size concentration and spectra (diameter from 500 nm to 20 µm)
54.		Automatic Rain Gauges (36 numbers)	For measurement of rainfall accumulation
55.		JWD Disdrometer	Rain drop size distribution from 0.3 mm to 5.5 mm.
56.		Micro Rain Radar (MRR)	Vertical Profiles of rain drop size distribution and fall velocity of drops.
57.		Next Generation Aethalometer	Black Carbon (BC) mass concentration at 7 wavelengths along with Biomass Burning %.
58.		Photoacoustic Extinctiometer	Aerosol Scattering and Absorption Coefficients, SSA and BC mass at 870 nm
59.		Integrating Nephelometer	Aerosol Scattering Coefficient and Backscatter at 3 wavelengths

60.		Particles Into Liquid Sampler with Ion Chromatograph (PILS-IC)	Inorganic chemical composition of aerosols.(Aircraft and ground based instrument)
61.		Mixing Condensation Particle Counter (MCPC)	Provides condensation particle number concentrations
62.		Microwave radiometer profiler	Provides profiles of T, RH and liquid water
63.		Photoacoustic Extinctiometer	Aerosol Scattering and Absorption Coefficients, SSA and BC mass at 870 nm
64.		Integrating Nephelometer	Aerosol Scattering Coefficient and Backscatter at 3 wavelengths
65.		Particles Into Liquid Sampler with Ion Chromatograph (PILS-IC)	Inorganic chemical composition of aerosols.(Aircraft and ground based instrument)
66.		Mixing Condensation Particle Counter (MCPC)	Provides condensation particle number concentrations
67.		Microwave radiometer profiler	Provides profiles of T, RH and liquid water
68.		NH3 Analyser	Provides information of NH3 present in the atmosphere

69.		SODAR	Provides wind information in the boundary layer
70.		Tethersonde Balloon and system	For profiling boundary layer aerosols, thermodynamical and meteorological parameters
71.		Multi component all in one weather sensor	To measure the wind, temperature, relative humidity, rainfall and atmospheric pressure. Required for the computation of the vertical gradients to parameterize the surface fluxes.
72.		Three dimensional Sonic anemometer and thermometer	To measure the fast variations in wind components and temperature to quantify the turbulence effect.
73.		Net Radiometer	Measures the four components of the radiation. Required for the surface energy balance closure.
74.		Infrared Thermometer	Measures the surface skin temperature. Required to see the response of the surface temperature tendency.

75.		Soil Heat Flux Plate	Measures the heat flux conducted into the soil. Required for the surface energy balance closure.
76.		Soil Temperature and moisture	Measures the soil temperature and moisture. Required for the purpose of the moisture transport to the atmosphere under varying conditions.
77.		Datalogger	To record all the data from tower instruments in a time synchronized fashion.
78.		Open Path IRGA CO_2-H_2O, methane Analyzer and sonic anemometer	To measure the fast variations in CO2 and H2O and methane in the atmosphere to compute their vertical fluxes due to turbulence. It is required for the moisture and carbon budget of the atmosphere.
79.		TSI Sky Imager	Sky Image
80.		Dual polarized C Band Radar	To measure storm structures, type of hydrometeors and rain parameters.
81.		FM-120 fog monitor	fog droplet spectrum

82.		Monitor for AeRosols and Gases in Ambient air (MARGA)	Chemical analysis of Aerosol and gases
83.		Ceilometer	Cloud base height, cloud layers and boundary layer height observations
84.		All in one weather sensors	Co-located measurements of temperature, wind, relative humidity, rainfall and pressure
85.		Mini aethalometer	Black carbon observations in the boundary layer
86.		Ion chromatograph	To measure concentrations of major anions and cations in water samples
87.		Gas Chromatograph	Used for monitoring of greenhouse gases e.g. CO2, CH4 etc. (Nov. 2009 onward)
88.		Automatic Air Sampler	Used for smart sampling of air in the field for greenhouse gases monitoring
89.		Glass Flask conditioning Unit	Used for conditioning of glass flasks before re-using in the field
90.		Cavity Ring Down Spectroscopy	Used for continuous monitoring of Greenhouse Gases (at 01 sec interval) and other trace gases e.g. CO2,

			CH4, H2O, CO
91.		Upcoming facilities and instruments to be deployed at Sagar tall tower site (72 meter tower):	CO2 flux monitoring using eddy co-variance technique, Greenhouse gases continuous monitoring using Cavity Ring Down Spectroscopy, automatic weather stations at multi height at the tower
92.		Indigenously fabricated Atmospheric Electric Field Mill and Gerdien's apparatus. Lightning Location Network over Maharashtra. Neutral Atmospheric Ion Spectrometer (NAIS) SO_2 Analyser Radon Analyser Ammonia Analyser Vertical Wind Tunnel Scanning Mobility Particle Sizer Meteorological measurements instruments like Thermometer, Gill	For measurements of Atmospheric Electric Field and Conductivity. Locating occurrence of lightning over Maharashtra and to know the movement of lightning cell. Measurement of ions of different mobility and to understand the processes of new particles formation. Breakup characteristics of water drop under the influence of electric field. For size distribution of aerosols. For Micro-meteorological studies.

		Anemometer, Eddy Covariance system etc. Disdrometer NI Fast data acquisition system	 Raindrop distribution.
93.		Fluid Dynamics Laboratory (FDL): To simulate flows of interest to atmospheric and oceanic sciences in controlled environments. FDL is equipped with a variety of measurement systems ranging from simple Pitot and Pitot-static tubes and alcohol manometer to hotwire anemometry and PIV systems. Various flow configurations can be designed and investigated in the lab to study the details of turbulent transport and fluxes crucial to atmospheric flows.	The current objectives of the FDL are to study the wall-jet flow (a laboratory counterpart of the vertical structure of the low level jets in the atmosphere) and cloud flows. FDL presents an attractive opportunities for research scholars and students to work on fundamental fluid dynamics problems of atmosphere and oceans.
94.		CPM Analyzer (Total 23 Nos.)	To Measure ambient PM10, PM2.5and PM1 at one time
95.		PM1 Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 21)	To Measure the Particure less than 1 miron
96.		PM2.5 Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 41)	To Measure the Particure less than 2.5miron
97.		PM10 Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 41)	To Measure the Particure less than 10 miron
98.		O3 Analyzer	To measure

		(at Pune, Mumbai, Ahemedabad and Delhi; Total 42)	Ambient Ozone.
99.		CO/CO2 Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 42)	To measure Ambient Carbon monoxide and carbon-dioxide
100.		Nox Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 42)	To measure Ambient Nitrogen monoxide/Nitroge n dioxide /Total
101.		So2 Analyzer (at Pune, Mumbai, Ahemedabad and Delhi; Total 31)	To measure Ambient Sulphardioxide
102.		VOC Analyzer (at Pune, Mumbai and Ahemedaba; Total 25)	To measure Ambient Volatile organic compounds
103.		No2 only Analyzer (at Pune, Mumbai; Total 42)	To measure Ambient Nitrogen dioxide
104.		HC Analyzer (at Pune, Mumbai; Total 4)	To measure Ambient Methane and Non Methane hydrocarbon
105.		Hg Analyzer (at Pune, Mumbai, ; Total 3)	To measure Ambient Mercury
106.		BC Analyzer (at Pune, Ahemedabad and Delhi ; Total 12)	To measure Ambient Only Black carbon
107.		UV Radiometer (at Pune, Mumbai, Ahemedabad; Total 18)	To measure Ambient UV radiations
108.		Automatic Weather Station (at Pune, Mumbai, Ahemedabad and Delhi; Total 70)	Surface temperature, pressure, humidity, wind speed and wind direction,Solar radiation
109.		Athelometer (1)	To measure

			Ambient Black carbon concentration.
110.		PTRMS Analyzer (1)	Measuring 17 compodents of VOC
111.		Net Rediometer (1)	Measuring Solar radiations
112.		Thermal optical carbon analyzer (OCEC) (1)	Measuring 2 compodents of Black carban
113.		Isotope Ratio Mass Spectrometer (IRMS)	Measurement of stable oxygen and hydrogen istope ratios
114.		LED digital displays (51)	To showcase the SAFAR air quality and weather information to public in SAFAR cities.
115.		Air Quality Mobile lab (1)	Monitoring of All air quality parameters
116.		Ceilometer(1)	To measure the boundary layer /inversion layer height
117.		Beckman Coulter	To count particles and their sizes in snow/ice melts samples
118.		Ion Chromatograph system	To measure concentrations of major anions and cations in water samples
119.		Microplate Reader/ UV-Visible spectrophotometer	UV-visible optical density &colorometric analysis of samples
120.		Total organic Carbon Analyser	Measurement of total organic carbon in water samples
121.		Fluorescence Microscope	Microscopic analysis of water, sediment

			samples and cell cultures
122.		Gel electrophoresis system	Used for separation of nucleic acids and proteins based on size.
123.		Gel electrophoresis system	Used in molecular biology work for imaging and documentation of nucleic acid and protein gels
124.		Real time PCR	Used for amplification and quantification of DNA.
125.		Biospectrometer Fluorescence (Flurometer)	used for fluorometric analysis of samples for determining concentration of DNA, RNA & proteins.
126.		Inductively Coupled Plasma Mass Spectrometer (ICP MS)	To measurement trace element concentrations in natural samples.
127.		Multi collector ICP Mass Spectrometer (MC ICP MS)	Measurement of radiogenic and stable metal isotope ratios in natural samples .
128.		Elemental Analyzer	Determination of carbon and nitrogen concentrations of sedimentary organic matter
129.		Isotope Ratio Mass Spectrometer	Analysis of carbon, oxygen, nitrogen isotopes in water, carbonates, and sedimentary organic matter
130.		Inductively Coupled Plasma Optical Emission Spectrometer	Trace Element Ratio Analysis of carbonate samples
131.		Stereo Microscope	Picking of Foraminifera samples

132.	**2. National Centre for Antarctic and Ocean Research (NCAOR) , Goa**	Ion Chromatograph	Anion ,Cation, Silica and Transition metal analysis in water samples
133.		Atomic Absorption Spectrometer	Elemental analysis of water samples using flame (ppm) and furnace (ppb).
134.		Atomic Fluorescence Spectrometer	trace level (ppt) and sub ultra trace level analysis of hydride forming elements.
135.		Microwave Digestion System	Microwave assisted digestion of samples.
136.		Gas Chromatograph-Mass Spectrometer (Triple Quadrupole)	Volatile/Semi-volatile analytic identification, in air, water and solid samples
137.		Mercury Vapor Analyzer	Total Gaseous Mercury measurements
138.		Stack Monitoring kit	Monitors Particulate Matter (PM) and water soluble gaseous pollutants
139.		HACH Colorimeter	Determines physico-chemical parameters in water samples.
140.		Carbon monoxide analyzer	Measures gas concentrations of CO in ambient air (ppm)
141.		Sulfur dioxide analyzer	Measures SO2 in ambient air, upto 0.4 ppb
142.		NO-NO2-NOxanalyser	Measures amount of NO,NO2 and total oxides of nitrogen in ambient air.
143.		Integrating Sound Level Meter	Ambient noise monitoring
144.		BOD Track Apparatus	BOD in water sample
145.		ADV 6600	Measures water velocity and water quality parameters (pH, DO, NH3,NO3)

146.		Aerosol Spectrometer	Measurement of aerosol particles (size range 0.3 µm to 20 µm)
147.		Aethalometer	Measurement of black carbon in ambient air
148.		Sunphotometer	Measures aerosol optical thickness (AOT)
149.		Integrating Nephalometer	Measures light scattering properties of aerosols.
150.		Multistage Impactor	Aerosol speciation up to 0.3 micron size
151.		Electron Probe Micro Analyzer (EPMA)	Geological applications, Mineral chemistry
152.		X-Ray fluorescence Spectrometry (XRF)	Geological application, whole rock chemistry
153.		Biospectrometer	Biological application
154.		Inverted Microscope	Phytoplankton taxoomy and culture
155.		Stereo zoom Microscope	Zooplanktron taxonomy
156.		FlowCAM	Cultured Phytoplankton enumaration
157.		Fluorometer	Chlorophyll analysis for Biomass estimation
158.		Multi Plankton Sampler (MPS)	Study of vertical zooplankton samples from desired depths
159.		Bongo Net	Study of horizontal zooplankton samples from the sea surface
160.		Fast Repetition Rate Fluorometer	Measures electron transport rate, photochemical efficiency and light absorption cross section of phytoplankton
161.		Hyperspectral Radiometer	Measures apparent

			optical properties (AOP) of the water column
162.		UV-VIS Spectrophotometer	Measures light absorption by phytoplankton and CDOM
163.		PAR Sensor	Measures surface incident solar radiation in the visible range
164.		pH meter	pH measurements
165.		Potentiometer	Alkalinity measurements
166.		Dossimat-Titrator	DO measurements
167.		Coulometer	DIC measurements
168.		TOC analyzer	TOC &TN analysis
169.		Auto-analyzer	Nutrient analysis
170.		Conductivity Temperature Depth (CTD)	Measures Temperature conductivity and Depth of the Ocean
171.		Expendable CTDS (XCTD)	Measures Temperature conductivity and Depth of the Ocean
172.		Lowered Acoustic Doppler **Current** Profiler (LADCP)	Ocean Current measurements
173.		Underway CTD (uCTD)	Measures Temperature conductivity and Depth of the Ocean
174.		Microstructure Profiler	Measure Turbulence
175.		Autosal Laboratory Salinometer	Salinity measurement
176.		Microtop with GPS	Atmospheric study
177.		UCTD probe	Physical Oceanographic study
178.		CTD	Physical Oceanographic study
179.		HydroCAT	Physical Oceanographic study
180.		TOC/TN Analyzer	Carbon and nitrogen analyses
181.		Nutrient Analyzer	Nitrate, nitrite, ammonia, urea, phosphate and

			silicate
182.		Epifluorescent Upright microscope	Bacterial analyses
183.		Centrifuge	Sample preparation
184.		Hot air oven	Glassware drying
185.		Laminar flow	Microbiological work
186.		Autoclave	Microbiological work
187.		RT-PCR	Molecular biology work
188.		Incubators with shaker	Microbiological work
189.		Milli-Q system	Laboratory work
190.		Analytical balance	Laboratory work
191.		Coulometer	Inorganic carbon analyses
192.		Spectrophotometer	Laboratory work
193.		Polarizing Microscope	To study nano-fossils, rock sections and diatoms
194.		Binocular Stereo zoom Microscope	To study foraminifera
195.		SEM-EDS	To study microscopic solid objects and for elemental analysis of solid objects
196.		Ultrasonic Bath	To separate particles
197.		Binocular Stereo zoom Microscope	To study foraminifera
198.		Automatic Table Top Grinding cum Polishing machine Polishing Wheel:	To process rock samples for slide preparation
199.		Vacuum Pump	To filter water samples
200.		Fluroprobe Chlorphyll system	To get vertical profiles of chlorophyll, diatoms, chl-b, Chl-c
201.		Laboratory fluorometer	For chlorophyll a analysis
202.		Total Inorganic Carbon Analyzer	TIC analysis
203.		Nikon TI-U inverted microscope	for phytoplankton and diatom analysis
204.		Bio Safety Cabinet	For bacterial plate formations
205.		pH meters	for pH measurements
206.		Hot plate for acid digestion	For making

			permanent diatom and nano fossil slides
207.		UV Vis Spectrophotometer	For analysis of water samples
208.		Planetary ball Mills	To powder hard sediment samples
209.		Rotary cone sample divider	To divide grains/water samples in to equal fraction
210.		Sieve Shaker	for sediment analysis
211.		Underwater camera with accessories	For bathymetry observations of Antarctic lakes
212.		FE-SEM	For analysis of solid microscopic samples
213.		Magnetic meter	For magnetic analysis of sediment samples
214.		Piston Coring System	For collecting sediment cores from Antarctic lakes
215.		Vortex Mixer	To mix liquid samples
216.		Portable Hot plate	For making permanent diatom and nano fossil slides
217.		Eco-sounder	For bathymetry studies of Antarctic lakes
218.		Cubis Ultra Micro Balance	For weighing ultra small samples
219.		Upright Laboratory Double Door Deep Freezer (-20°C)	To store sediment cores and water samples
220.		Free Zone 6L freeze Dry system unit with PTFE	TO freeze dry sediment and water samples
221.		Total Inorganic Carbon Analyzer	for Inorganic carbon analysis
222.		Vertical Shaker	For metal speciation

223.		Ship time onboard Sagar Kanya	Annual scientific cruises plan are chalked out. Vacant berths are being provided to university students. Already students from many universities are sailing onboard as part of their curriculum, training/acclimatization with onboard scientific facilities and research works.
224.	**3. National Centre for Earth Science Studies, Thiruvananthapuram, Crustal Processes Group**	Spinner Magnetometer	Measuring intensity and direction of magnetization
225.		Susceptibility Meter	Measuring susceptibility
226.		Temperature-Susceptibility system	Thermomagnetic experiment
227.		Impulse Magnetizer	Induse Isothermal Magnetization
228.		Alternating Field Demagnetizer	Alternating field demagnetization
229.		Thermal Demagnetizer	Thermal demagnetization
230.		Portable Drilling Machine	Drilling palaeomagnetic core samples
231.		Single blade saw cutting machine	Cutting palaeomagnetic specimens
232.		Digital Laser Raman Micro spectrometer with three lasers (785 nm, 325 nm & 405 nm)	Raman spectral analysis and Photo Luminescence (PL) studies
233.		Heating Freezing stage	For fluid inclusion studies
234.		UV microscope	For hydrocarbon

			studies
235.		Transmitted-Light, binocular polarising microscope	Petrographic studies of rocks and other samples in thin section
236.		Stereo bionocular Microscope with 20.5:1 zoom.	Petrographic studies of rocks and other samples in thin section
237.		Advanced petrological Microscope	Petrographic studies of rocks and other samples in thin section
238.		Multifunction Digital DC Resistivity Meter	Subsurface resistivity measurements
239.		Hydrophone	Converts ground movement (velocity) into voltage
240.		Geophone	Recording and listening to underwater sound
241.		Crystal CAM	Underground Visualization
242.		L S Terrameter	Subsurface resistivity measurements
243.		X-Ray Fluorescence Spectrometer	For qualitative and quantitative determination of elements
244.		Fused beads preparation equipment	For XRF sample preparation
245.		Pellet press	For XRF sample preparation
246.		Cast N Vac 1000	Vaccum system for sample mounting
247.		Lab Pol-25	Thin section Polishing
249.		Binocular stereo zoom microscope	For mineral separation
250.		LC-MS/MS Agilent, 6420 Triple quad	Pesticide Analysis (Nonvolatile)
251.		GC-MS/MS Thermofisher	Pesticide Analysis (Volatile)
252.		GC-MS/MS TSQ DUO, QQQ	Gas Analysis
253.		GC - Perkin Elmer Clarus 5800	Gas Analysis
254.		GC - Nucon 5700	Pesticide Analysis

255.		GC - Perkin Elmer Clarus 500	Nutrient Analysis
256.		Continuous flow Analyzer	Trace metal Analysis
257.		V-Analyzer	Carbon, hydrogen, nitrogen, Sulphur determination in Soil/Sediment
258.		CHNS	TOC in water/ Soil/Sediment
259.		TOC	Metal Analysis
260.		AAS	Nutrient analysis
261.		Spectrophotometer	Organic bond determination
262.		FTIR	Surface Area of Solid Samples
263.		Surface Area Analyzer	Available nitrogen, Organic Nitrogen
264.		TKN Analyzer	Chlorophyll analysis
265.		Spectro fluorimeter	Microbiological Analysis
266.		Electrophorosis	Microbiological Analysis
267.		PCR	Microbiological Analysis
268.		Gel Documentation	Microbiological Analysis
269.		Research Microscope	
270.		Micro rain radar	Vertical distribution of rain drop size distribution
271.		Optical Disdrometer	Rain drop size distribution at the surface
272.		Automatic weather station	Ambient temperature, wind speed humidity
273.		Ceilometer	Cloud base height and pbl height
274.		Rain drop charge sensor	Atmospheric electric charge in rain drop size.
275.			
276.		Fine particulate sampler	For measuring PM10 and PM2.5 particle

			concentration using gravimetric method
277.		Portable Dust monitor	Automatic measurement of PM10, PM2.5, PM1.0
278.		Directional Wave rider Buoy with current rider	Wave and current measurement
279.		Aquatic Doppler Current Profiler	Current Profile measurement
280.		Aquatic Current Profiler	Current Profile measurement
281.		Eco Sounder	Depth Measurement
282.		Wave and Tide Gauge	Wave and tide measurement
283.		Aquatic Doppler Velocity meter	Current measurement in the surface zone
284.		Piston Corer	Sediment core collection
285.		Vanveen Grab	Surface sample collection
286.		GPS - Trimple	Shoreline measurement
287.		Shallow Seismic Profiler	Subsurface Information
288.		Recording Current Meter	Current measurement at a point
289.		Automatic Weather Station	Wind. Temperature, humidity and rainfall measurement
290.		Radio Monitoring System	Coastal Monitoring
291.		X-ray diffractometer	Phase identification of a crystalline material
292.		Scanning Electron Microscope with Energy Dispersive Spectrometer and CL imaging	Obtain information about the surface topography and composition
293.		Laser Diffraction Particle Size Analyzer	Analyze the sediment samples for particle size distribution
294.		Double Distillation Unit	Distilled Water Collection
295.		Deep Freezer	Sample Freezing
296.		Centrifuge	

297.		Microwave Reaction System	Sample Digestion
298.		Isodynamic Separator	For mineral separation
299.		Vibratory Sieve Shaker	Grain Size Separation
300.		Stereoscopic zoom microscope	For identifying and picking different minerals
301.		Density Determination kit	Density Determination
302.			
303.		Cross Belt Magnetic Separator	Magnetic Mineral Separation
304.	**4. National Institute of Ocean Technology, Chennai**	Onboard training on Data Buoy Systems, Tsunami Buoy systems and CTD sampling instruments	Measurement of Meteorological parameters and Oceanographic parameters
305.		Prototype models of Moored Buoy, Tsunami buoy, Desalination plants, Remotely operable submersible (ROSUB), Deep sea Crawler and Ocean Research vessel.	To create awareness and get acquainted with Ocean Technology Projects
306.		Conductivity , temperature and depth sensor	Measurement of salinity, sea water temperature and depth parameters
307.		Multi parameter sensor	Measurement of Wind speed & direction, air pressure, precipitation, humidity and temperature
308.	**5. Centre for marine Living Resources and Ecology (CMLRE), Kochi**	HPLC, Spectrophotometer, NC Analyser, TOC Analyser, Dosimat, PCR thermal cycler, Gel Documentation Systems, Electrophoretic units and Microscopes	
309.		The unique national facility, FORV Sagar	

		Sampada managed by CMLRE is being operated as floating laboratory for the marine living resources related studies undertaking in the country. The 74m OAL floating laboratory harbours state of the art facilities to carry out data/sample collections on physical, chemical and biological parameters. Conductivity-Temperature-Depth Profiler (CTD). Acoustic Doppler Current profiler (ADCP), Autonomous weather station, facilities for nutrient analysis, microbiology, different gear/ net for plankton collection, Grab and Dredge for collection of bottom dwelling organism, various gears for mesopelagic and bottom trawling EXPO and HSDT are the major facilities available onboard.	
310.	**6. Integrated coastal and Marine Area Management Project Directorate (ICMAM-PD), Chennai**	Trace Metal Lab	Heavy metal Analysis
311.		Ecotoxicology Lab	Bio-Assay experiment
312.		Spectrophotometer with Integrating sphere	Analysis of chlorophyll, phytoplankton absorption, CDOM absorption, and inorganic macronutrients
313.		Aspirator pump with 6-place manifold	Pressure filtration of water samples
314.		Lab Fluorometer	Fluoresce based analysis of chlorophyll, CDOM and turbidity

315.		Sunphotometer with GPS Receiver	Measurement of Aerosol Optical Depth and Aerosol Size
316.		Hyperspectral Radiometer	Optical properties of water column
317.		Automatic Weather Station	Meteorological parameters
318.		Spectrophotometer with Integrating sphere	Analysis of chlorophyll, phytoplankton absorption, CDOM absorption, and inorganic macronutrients
319.		Aspirator pump with 6-place manifold	Pressure filtration of water samples
320.		Lab Fluorometer	Fluoresce based analysis of chlorophyll, CDOM and turbidity
321.		Sunphotometer with GPS Receiver	Measurement of Aerosol Optical Depth and Aerosol Size
322.		Hyperspectral Radiometer	Optical properties of water column
323.		Automatic Weather Station	Meteorological parameters