

Atmospheric research

Investigator's atmospheric research capabilities include a new generation C-band Doppler weather radar, Air Chemistry and Aerosol Laboratories, space for two dedicated container laboratories on the foredeck, and specialised booms to deploy various instruments, above and just under the sea surface.

While the vessel is at sea, an air sampling system on the foremast continuously pumps air into the laboratories for analysis using the latest technology including:

- ◆ an atmospheric nephelometer
- ◆ greenhouse gas spectrometers
- ◆ a multi-angle absorption photometer (MAAP)
- ◆ a nitrogen oxide monitor
- ◆ an ozone monitor, and
- ◆ a radon detector

Investigator is the first Australian research vessel with laboratories dedicated to analysing the interaction between the ocean and atmosphere. This research helps us understand and predict changes in local, regional and global weather and rainfall patterns.

Meteorological research

There is an extensive suite of meteorological equipment on board *Investigator*.

Only a few research vessels around the world are fitted with weather radars. Data will be gathered from clouds towering 20 kilometres over the tropical ocean to cold ice storms in the Antarctic, in a 150 kilometre radius from the ship, and will have a broad range of research applications.

Investigator's 1.75 tonne new generation C-band Doppler weather radar is mounted within a protective dome on top of *Investigator's* main

mast. It sends and receives 800 microwave pulses per second, which collect information about the number, size, shape and movement of rain, hail, ice and snow.

The information provided by the radar will allow meteorologists, for the first time, to collect data about the atmosphere above the oceans around Australia. Scientists will use this data to improve climate models and weather predictions around Australia and globally.

Equipment capability

Air sampling system

A system that starts with an air intake vent attached to the foremast, which pumps air from the Aerosol Laboratory and onto the Air Chemistry Laboratory.

Atmospheric nephelometer

Scientific equipment that provides continuous measurement of the aerosol light scattering coefficient; it uses reflected light to measure suspended particles in the air.

Container Laboratory – HAZMAT (hazardous materials) locker

A specialised container laboratory for the bulk storage of toxic, corrosive and flammable chemicals.

Greenhouse gas spectrometers

The greenhouse gas spectrometer system is a high-precision instrument that will be used to measure and analyse the atmospheric trace gases: carbon dioxide, methane, nitrous oxide, carbon monoxide and water vapour.

- Gas regulator x 10
- Reference gas cylinder x 8
- Calibration gas cylinder x 8
- Cooling system x 2
- Diaphragm pump x 2
- Switching valve x 4
- CO₂/CH₄ instrument
- N₂O/CO instrument

Met instruments – suite of meteorological instruments used to monitor atmospheric conditions

- RM Young 05106 Propeller Anemometer (propeller and vane type wind sensors).
- Gill Ultrasonic WindObserver II Ultrasonic Anemometer (ultrasonic wind sensor).
- Vaisala MHT333 (combined temperature and humidity sensor).
- RM Young 50203 (siphoning rain gauge).
- Optical Scientific ORG815 (optical rain gauges).
- Licor LI-190 PAR Sensor (photosynthetically active radiation).
- Eppley Precision Infrared Radiometer (infrared radiation).
- Eppley Precision Spectral Pyranometer (ultraviolet radiation).
- Vaisala PTB330 Digital Barometer (atmospheric pressure).

Multiangle absorption photometer (MAAP)

Scientific equipment that uses light to measure aerosols in the atmosphere.

Nitrogen oxide monitor

Used to measure atmospheric nitrogen oxide compounds.

Ozone monitor

Thermo scientific, 49i UV photometric ozone analyser. A piece of equipment used to monitor atmospheric ozone levels near the earth's surface.

Radon detector

Radon detectors determine the presence and amount of radon gas, which is an invisible, tasteless, odourless radioactive gas.

Side towing booms (one each side)

Used for deploying, towing and retrieving equipment. Two are located on the bow and two on the stern of the ship and can be used to deploy atmospheric and seismic equipment. The forward booms can deploy equipment clear of the ship's wake.

Weather research radar

The dual-polarisation C-band Doppler weather research radar sends 800 pulses every second. The 1.75 tonne radar will gather data 20 kilometres over the ocean in a 150 kilometre radius from the ship.

