

May 2024



Image: European Space Agency

EarthCARE – Earth Cloud and Aerosol Radiation Explorer

The EarthCARE satellite carries four instruments that will measure clouds, precipitation and aerosol particles. To date, it stands as the largest and most complex mission within the European Space Agency's Earth Explorer programme.



Opportunities EarthCARE will offer

EarthCARE's data will improve weather forecasts and climate projections. It will provide better understanding of the role clouds and aerosols play in reflecting incoming solar radiation back into space and trapping infrared radiation emitted from Earth's surface. It will accomplish this goal by measuring the vertical distributions of cloud droplets, ice crystals and both natural and human-made aerosols.

Beyond directly impacting Earth's energy balance, aerosols also influence the life cycle of clouds. The interaction between aerosols and clouds represents one of the most significant gaps in our understanding of the climate system. Consequently, measuring both of them will give more precise observations of the Earth's energy budget. EarthCARE will travel in a Sun-synchronous 393km polar orbit, crossing the equator in early afternoons to optimise daylight conditions.

"Data from EarthCARE will be invaluable in helping us observe the precise mechanisms involved in how clouds, aerosols and dust reflect, emit and absorb heat and light energy" - Prof Anthony Illingworth, University of Reading, who conceived the mission

Mission Partners

- European Space Agency (ESA)
- Japan Aerospace Exploration Agency (JAXA)

UK Expertise

- University of Reading
- National Centre for Earth Observation (NCEO)
- University of Leicester
- European Centre for Medium-Range Weather Forecasts (ECMWF)
- National Centre for Atmospheric Science (NCAS)
- National Physical Laboratory (NPL)
- Oxford University
- Imperial College
- University of Hertfordshire
- Airbus Defence & Space
- RAL Space
- Surrey Satellite Technology Ltd (SSTL)
- Telespazio UK
- Thales Alenia Space UK
- SEA (Systems Engineering & Assessment Ltd, now part of Thales Alenia Space)
- CGI
- GMV-UK
- ABSL Space
- ACTRiS
- Critical Software Technologies Ltd
- E2V Technologies ESTL
- Sula Systems Ltd
- ESTL

Mission Timeline

- 1996**
EarthCARE is first proposed by Prof Anthony Illingworth, University of Reading, as 'Earth Radiation Mission'
- 2004**
Adopted as an Earth Explorer mission by ESA
- May 2008**
Airbus (Astrium) appointed as prime contractor
- March 2024**
EarthCARE arrives in California from Germany for pre-launch activities
- May 2024**
Launch planned from Vandenberg Space Force Base, California, on board a SpaceX Falcon 9 rocket

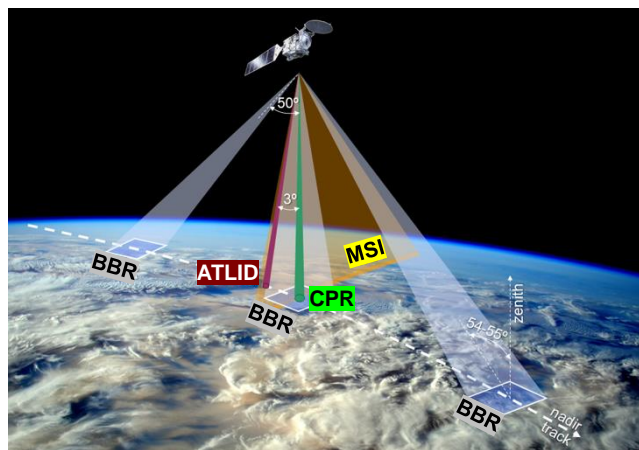
The four satellite instruments

ATmospheric LiDAR (ATLID) – the second European spaceborne ultraviolet lidar after the wind sensing spacecraft Aeolus. It will provide profiles of aerosols, thin clouds and the top of thick clouds.

Cloud Profiling Radar, developed by JAXA and National Institute of Information and Communications Technology, Tokyo. A 94GHz cloud radar with Doppler capability that will provide vertical profiles of clouds and precipitation to gain detailed insight into weather systems structure.

Multi-Spectral Imager, developed by SSTL. Its visible and infra-red images will set the overall spatial context for EarthCARE's active instruments (which see only a narrow curtain in the centre – see images below).

Broad Band Radiometer (BBR), designed and developed by a UK consortium led by Thales Alenia Space as prime contractor. It will measure Earth's reflected solar radiation and outgoing infrared radiation with three fixed viewing directions pointing ahead, down and behind. All four instruments will measure the same atmospheric column at almost the same time.



This diagram shows how EarthCARE's four instruments will work together
BBR – Broad Band Radiometer
ATLID – Atmospheric Lidar
CPR – Cloud Profiling Radar
MSI – Multi-spectral imager.
 Image: European Space Agency

Further Information

[EarthCARE's instrument package](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/EarthCARE/EarthCARE_instrument_package)
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EarthCARE in numbers:

- 11m Solar Panel (21sqm)
- 2.5m Cloud Profiling Radar antenna
- 1130W power
- 1546kg mass
- 6th satellite in ESA's Earth Explorer Programme



Watch ESA's EarthCARE video explainer



Download this explainer