

March 2025



Image: European Space Agency

EarthCARE – Earth Cloud and Aerosol Radiation Explorer



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

The EarthCARE satellite carries four instruments to 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 will give better insight into Earth's energy budget.

EarthCARE travels in a Sun-synchronous 393km polar orbit, crossing the equator in early afternoons to optimise daylight conditions. It launched in May 2024, and early data has already been received. It should be available for use in late autumn 2024.

Follow @esa_earthcare on X for updates.

"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 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.

May 2024

Launched from Vandenberg Space Force Base, California, on board a SpaceX Falcon 9 rocket.

January 2025

EarthCARE's first usable data released.

The four satellite instruments

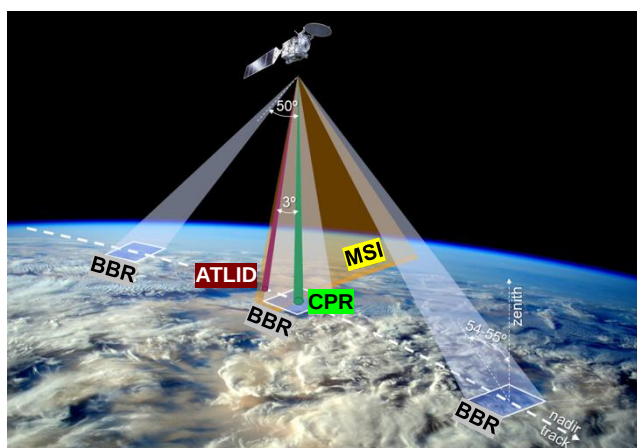
ATmospheric LiDAR (ATLID) – the second European spaceborne ultraviolet lidar, after the wind sensing spacecraft Aeolus. It provides profiles of aerosols, thin clouds and the top of thick clouds.

Cloud Profiling Radar, developed by JAXA and National Institute of Information and Communications Technology, Tokyo. A 94GHz cloud radar with Doppler capability that provides 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 set the overall spatial context for EarthCARE's active instruments (which see only a narrow curtain in the centre – see image below).

Broad Band Radiometer (BBR), designed and developed by a UK consortium led by Thales Alenia Space as prime contractor. It measures Earth's reflected solar radiation and outgoing infrared radiation with three fixed viewing directions pointing ahead, down and behind.

All four instruments measure the same atmospheric column at almost the same time.



This diagram shows how EarthCARE's four instruments work together

BBR – Broad Band Radiometer

ATLID – Atmospheric Lidar

CPR – Cloud Profiling Radar

MSI – Multi-spectral imager.

Image: European Space Agency

Further Information

ESA: [EarthCARE's instrument package](#)

ESA: [EarthCARE's first data published](#)

EarthCARE in numbers:

- 11m Solar Wing (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