

Thorsten Fehr<sup>1</sup>, Dirk Bernaerts<sup>1</sup>, Jonas von Bismarck<sup>1</sup>, Patrick Deghaye<sup>1</sup>, Michael Eisinger<sup>2</sup>, Björn Frommknecht<sup>3</sup>, Timon Hummel<sup>3</sup>, Robert Koopman<sup>1</sup>, Stephanie Rusli<sup>1</sup>, and Kotska Wallace <sup>1</sup>European Space Agency (ESA), ESTEC, Noordwijk, The Netherlands / <sup>2</sup>European Space Agency (ESA), ECSAT, Harwell, United Kingdom / <sup>3</sup>European Space Agency (ESA), ESRIN, Frascati, Italy

## EarthCARE Objective

How do aerosols and clouds, heat or cool the Earth?

- Largest uncertainty in projections of the future climate to be addressed in order to improve climate modelling and numerical weather prediction comes from cloud, aerosol and radiation interactions.
- EarthCARE will provide systematic provision of vertical profiles of clouds & aerosols, collated with measurements of solar & emitted thermal radiation • Direct verification of impact of clouds & aerosols on atmospheric heating rates & radiative fluxes.

terrestrial radiation Satellite size 17.2 m long, 2.5 m wide and 3.5 m deep Earth radiation budget Mass 2200 kg (including a maximum of 310 kg fuel) **Instruments** Cloud Profiling Radar, Atmospheric Lidar, Multispectral Imager, Broadband Radiometer repeat cycle of 25 days for at least one year extension of operation ESA JAXA Prime contractor Airbus (DE) **Ground Segment** Space Segment 24 Data Processors, 47 Data Products Unique Combination of Instruments earthca<sup>re</sup> Most complex ESA Earth Explorer Mission 25 Level 2 Science Products CPR Level 1b (JAXA) ATLID Level 1b (ESA) Radar reflectivity and Doppler Attenuated backscatter in tmospheric LIDA Rayleigh channel elocity profiles ATLID (Airbus TLS Co-polar Mie channel h spectral resolu Cross-polar Mie channe thermal channel 355nm LIDAR tical profiles of a MSI Level 2a ATLID Level 2a Feature mask and target



# EarthCARE, ESA's Cloud and Aerosol Mission, Preparing for Launch

# EarthCARE Facts

adar echo product, feature ask, cloud type, liquid and

classification, extinction, backscatter & depol. profiles, aerosol properties, ice cloud

Radiative Transfer Products

calculated radiances, fluxes, heating rate profiles



Scientific goals To measure the 3D structure of cloud and aerosols, together with collocated observations of solar and

- **Orbit** Polar, dawn-dusk, Sun-synchronous with a descending node at 14:00, at altitude of 393 km inclined at 97°,

Life Minimum of three years, with consumables to allow

- Satellite has been transported on an Antonov aircraft from Munich (DE) to the launch site with preparations for the launch ongoing
- Satellite Launch and Early Operations Phase Flight Simulations ongoing
- Instrument Commissioning being prepared
- Final updates on the processors currently being implemented
- Communications campaign ongoing Science Community ready

### Everything on track for the launch





MSI Level 1b/c (ESA) TOA radiances for four solar channels, TOA brightness temperatures for three

physical parameters, cloud t

height, aerosol parameters,

BBR Level 1b (ESA) Filtered TOA short-wave and total-wave radiances

BBR Level 2a f-atmospher adiances. short-wave a lona-wave fluxes BBR Level 2b: enhanced roducts using MSI

EarthCARE **Data Production** Model

omparison of calculate uxes and radiances to BBF

Level 2 product chains at ESA and JAXA

- L1 and L2 processors:
- Ready with corrections and improvements ongoing
- both in frame of CARDINAL and satellite contract PDGS final updates upcoming
- Target data release dates after launch (L):

Level 1	Level 2a	Level 2b
L + 6 months	L + 9 months	L + 18 months
~Dec. 2024*	~March 2025*	~Dec. 2025*

Assumption launch end May 2024

EarthCARE Cal/Val and Science Workshops coordinated along with the data release

# Ready for Launch

EarthCARE will launch in May 2024 on SpaceX Falcon-9 from Vandenberg, California (US)

·eesa

Validation EarthCARE ESA Validation Portal https://earthcare-val.esa.int/



**C**ECMWF

irborne Campaign Opportunities 2025		
Sep Oct Nov De	c Jan Feb	
Home base	'25 and '26 collaborations in progress:	
Home PACE PAX, WhyMSIE, GLOVE PERCUSSION/ MAESTRO Home base Home base	<ul> <li>HALO South &amp; GO SOUTH (ground) &amp; CAPE-K (ground) ('25)</li> <li>PONEX (NRC Convair) ('26)</li> <li>Denman Glacier Voyage (ship)</li> <li>COAST-K (ship '25)</li> </ul>	
PACE PAX Omme base MAESTRO CELLO CELLO LOAC Home base	<ul> <li>Tentative:</li> <li>FAAM MLU flights (TBC)</li> <li>CARES(FAAM, TBC)</li> <li>ARISTOTLE (P3 TBC '25, '26)</li> <li>CARINA (NCAR Gulfstream TBC, AUG-OCT '25)</li> <li>ACAROA (Ship, JAN-FEB'26)</li> <li>Mediterranean campaign '25 or '26</li> </ul>	
PACE PAX PERCUSSION Home base	<ul> <li>HALO tentative slot '26</li> <li>STEP-CHANGE, Palau '25 or '26</li> <li>CELLO-ARCTIC, '26</li> </ul>	

### → THE EUROPEAN SPACE AGENCY