International Collaboration

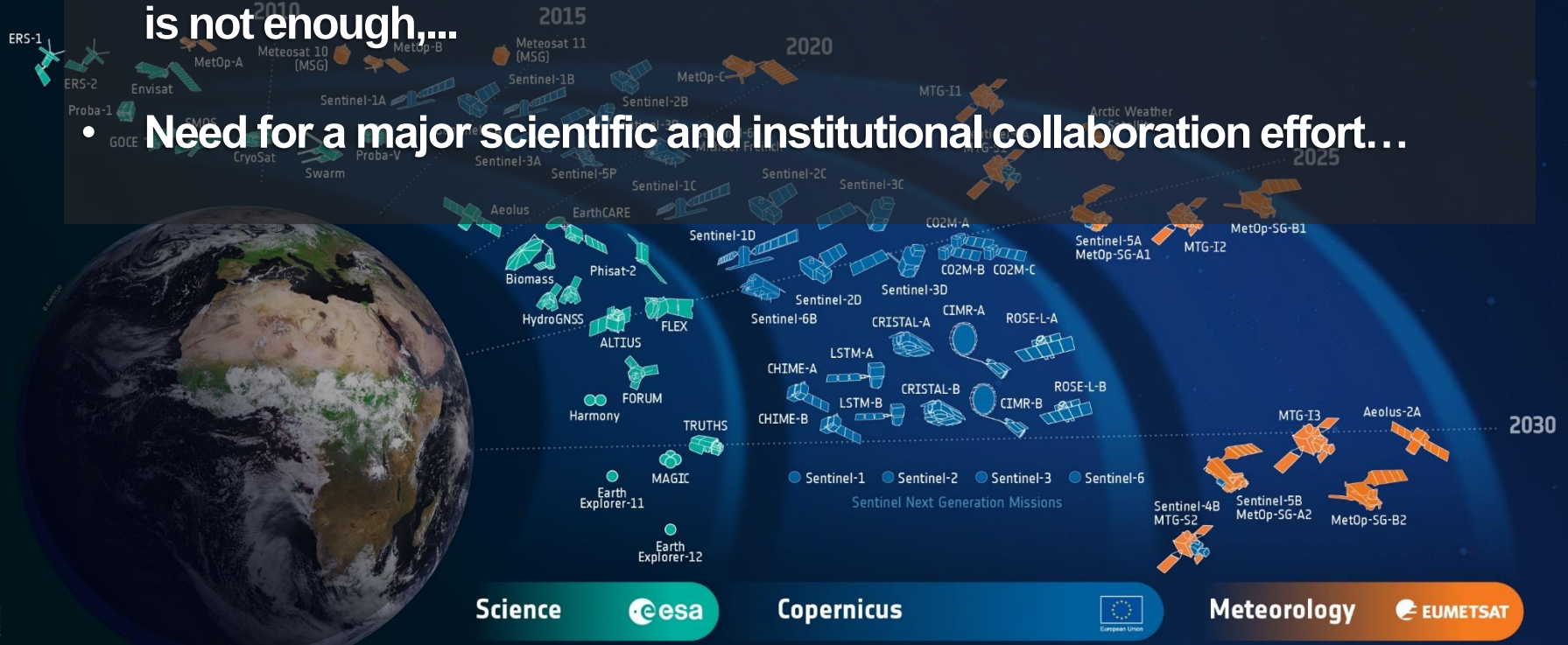
Need for an urgent and collective response…

Need for science as the bedrock for solutions…

*The unique set of **grand challenges** that humankind is facing require more than ever that scientists advance their understanding of the planet, its processes and its interactions with human activities and translate that knowledge into novel solutions for society.*

Earth Observation is part of the solution

- To effectively respond to the major challenges in front of us, EO alone is not enough,...
- Need for a major scientific and institutional collaboration effort…



Basic principle of complementarity

ESA

FutureEO

ESA new Science and Innovation Earth Observation Programme

EC-RTD

Horizon Europe

New EU Research and Innovation Framework Programme

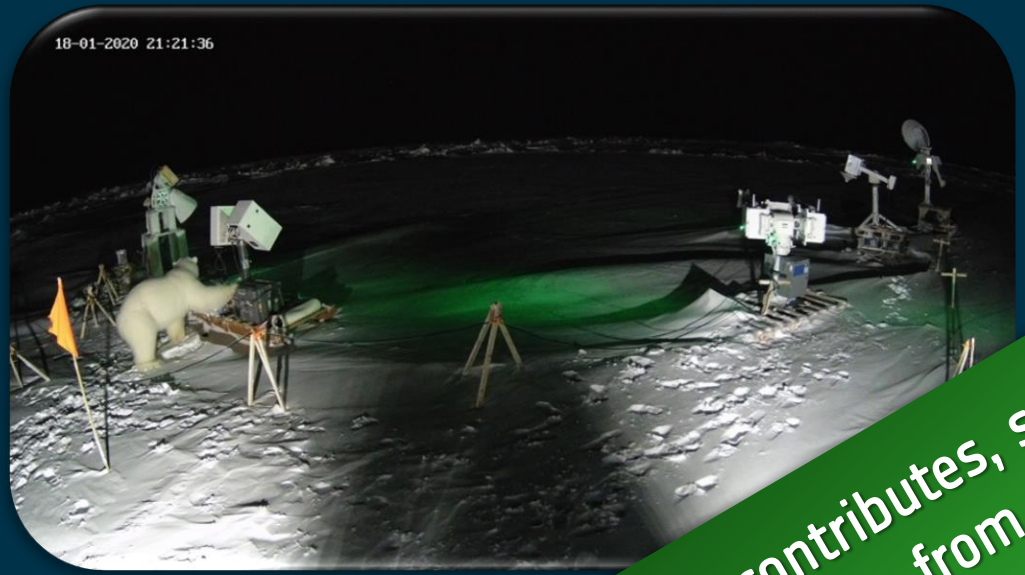
New ICT, Cloud Computing, AI, …

Interdisciplinary & Open Science

Enhanced models and predictions

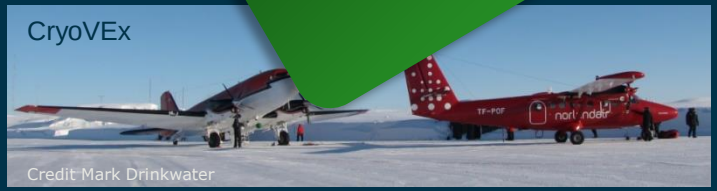
In-situ Networks/citizen data

International collaboration – In situ data



A Polar bear supporting ESA experiments during *...hann)*

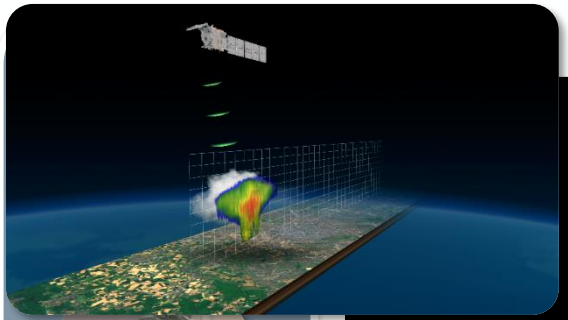
ESA contributes, support and benefit from POLARIN

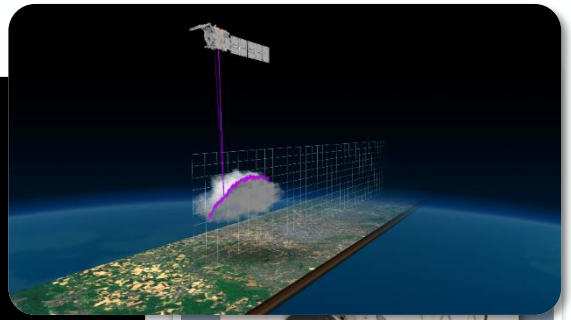


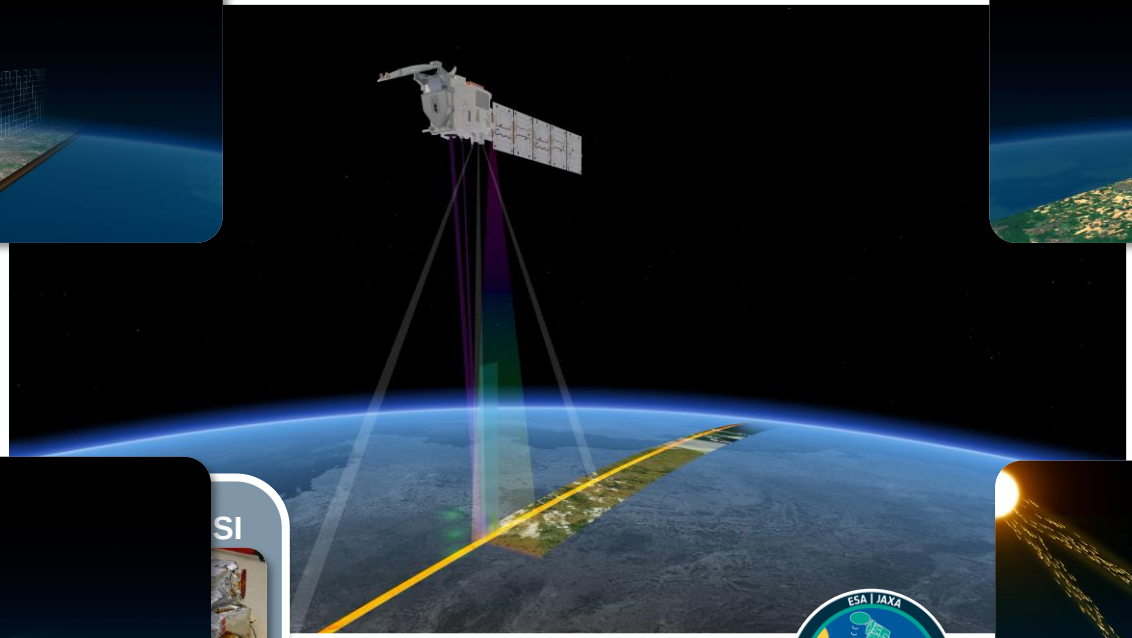
EarthCARE

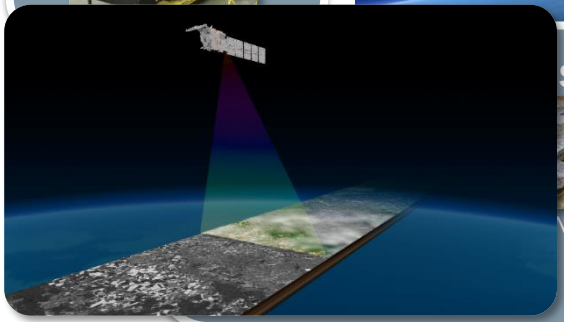
→ THE EUROPEAN SPACE AGENCY

EarthCARE: Earth Cloud and Radiation Explorer









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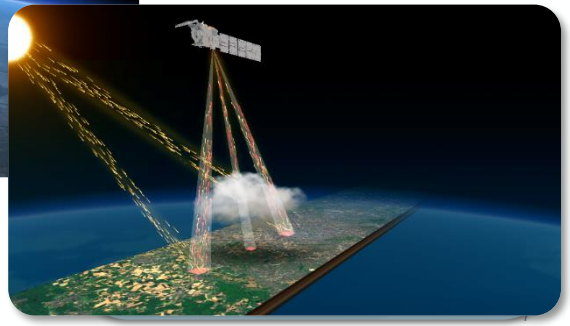
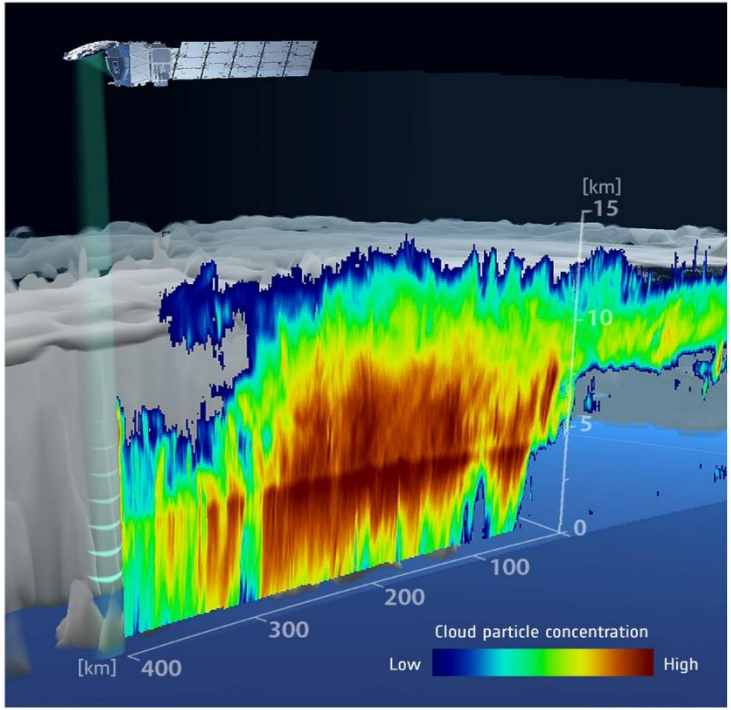
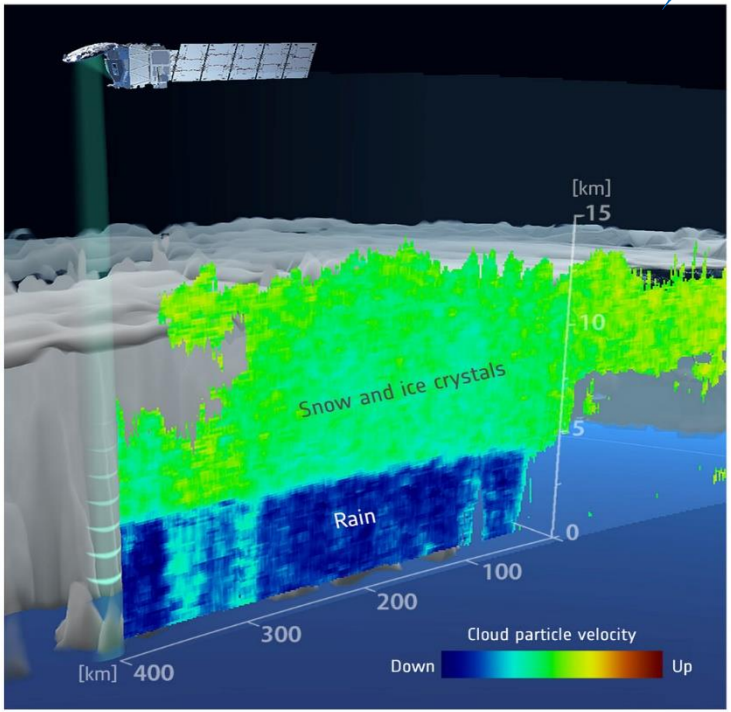


First CPR results from JAXA



Vertically-resolved concentration of cloud particles measured as radar reflectivity. denser part of the cloud is in its centre.



Cloud particle velocities: on top, ice crystals and snowflakes with little vertical motion. Clear boundary at an altitude of around 5 km, which is where the ice and snow melt, forming water droplets falling as rain.

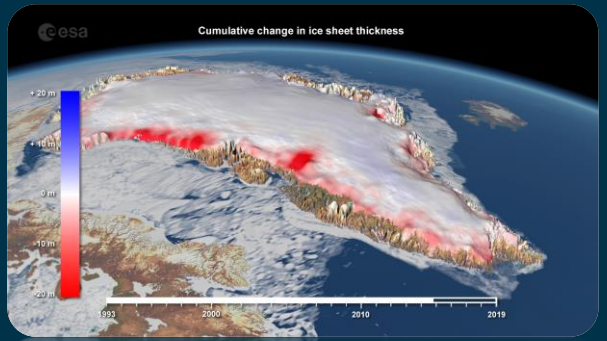
The radar uses its Doppler velocity capability, a unique measurement from space, to derive the vertical speed and motion of the ice, snow and rain.

This detailed information about the density, particle distribution and velocity within the cloud allows scientists to distinguish the cloud constituents and better understand its physics.

Conventionally, these data can only be obtained by cloud radar on the ground or on aircraft. These methods can only measure limited areas, but CPR in EarthCARE now allows cloud structure to be measured uniformly across of the entire planet.

Advances in International cross-Atlantic collaboration

Source: IMBIE Team, GLAMBIE Team and AMPAC Team



IMBIE

Ice sheet mass balance inter-comparison exercise

GLAMBIE

Global Glaciers mass balance inter-comparison exercise

AMPAC

Arctic Methane and Permafrost Challenge

Mass-Change and Geosciences International Constellation

The Mass-Change and Geosciences International Constellation (MAGIC) is a planned National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) joint venture. The mission will consist of four satellites, operating in pairs, and will measure fluctuations in Earth's gravitational field, building upon the success of similar missions such as the Gravity field and steady-state Ocean Circulation Explorer (GOCE) mission, the Gravity Recovery and Climate Experiment (GRACE) and its follow-on mission, GRACE-FO.

Opportunities:

Aiming at improved spatial resolution • Revealing finer scale aspects of the natural and human-influenced water cycle • Better separation of comingled signals (e.g., snowy mountain adjacent to dry plains) • Water budget closure over smaller river basins

Improved temporal resolution • More accurate water budget closure • Data more useful for operational applications…

Longer data record • Distinguishing climate change impacts on TWS from natural variations • Testing the theory that global warming increases the intensity of droughts and rainfall…

The new ESA Earth System Science Hub

A new science facility in ESRIN to boost the scientific output of ESA and its MSs through networking and partnerships, offering ESA as a hub for scientific cooperation, exchange of ideas and promoting a community response to major science challenges

Come to visit and work with us us in ESA ESRIN center