CLAAS-3

The CM SAF MSG-SEVIRI-based cloud property climate data record

Overview and updates

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Presentation Outline

- Introduction
  - The EUMETSAT CM SAF
  - Importance of clouds
  - Advantages of satellite data
- CLAAS-3: contents and properties
- Previous CLAAS editions and their usage
- CLAAS-3: new features and advantages
- Summary and outlook
- Further information

The EUMETSAT CM SAF

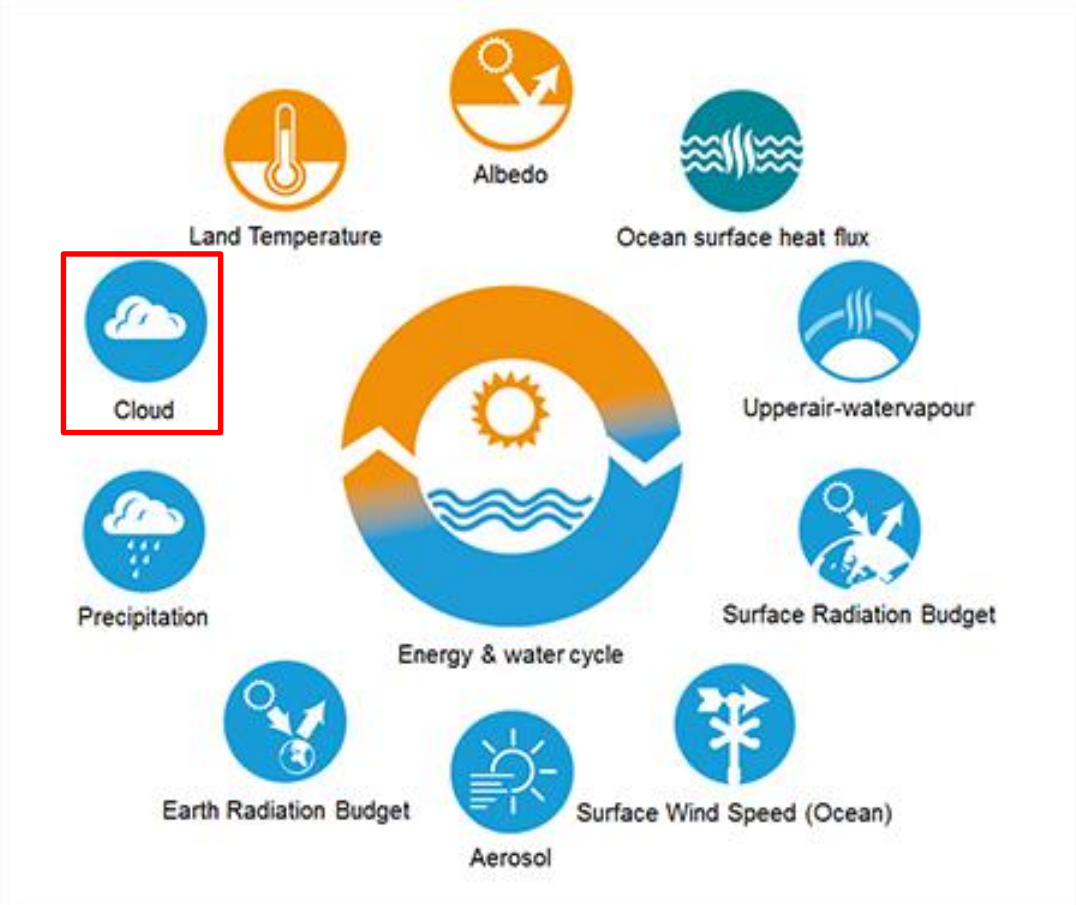


Image credit: CM SAF

- Production of satellite-derived geophysical parameter data sets suitable for climate monitoring
- Support of process studies, climate trend and variability analyses, and improvement of models by providing data sets for validation
- Cloud properties data sets include retrievals from SEVIRI and AVHRR sensors

Why monitoring and studying clouds is important?

Energy budget

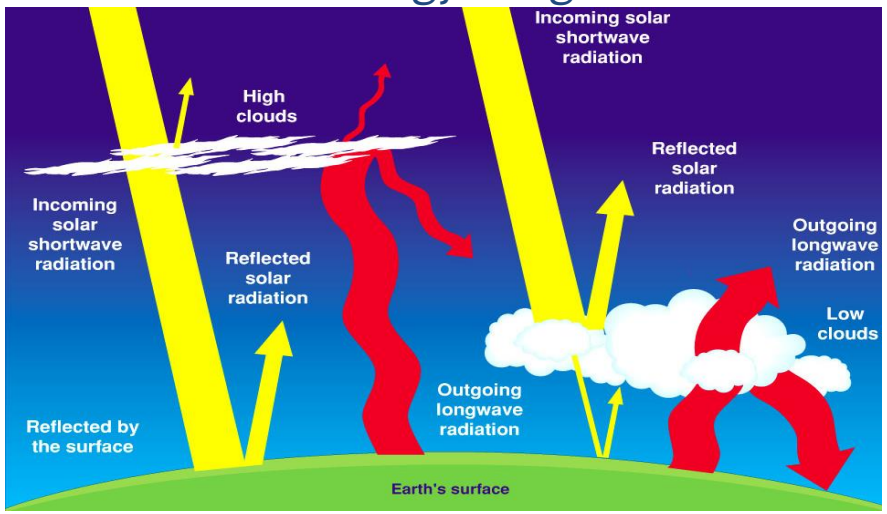


Image credit: NASA

Water cycle

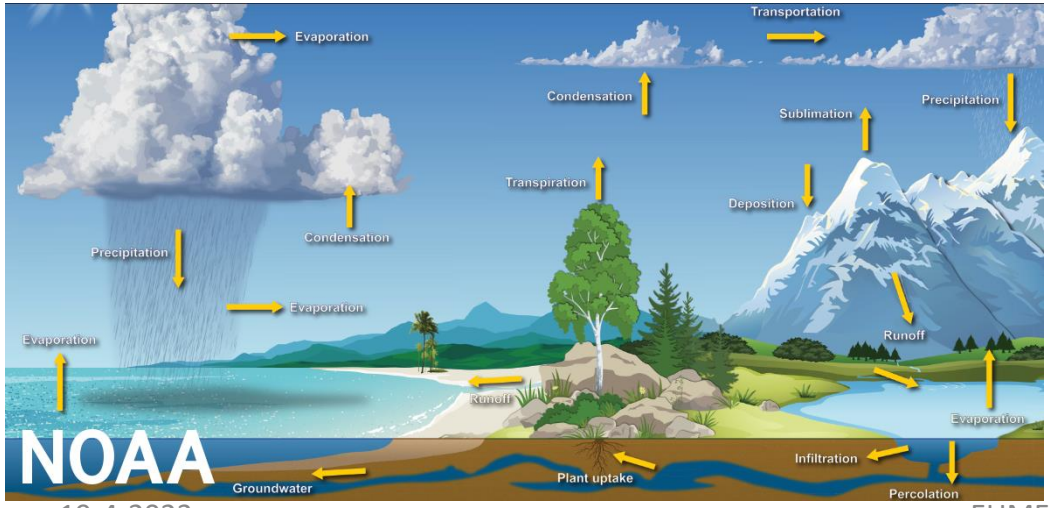


Image credit: NOAA

Climate change feedbacks

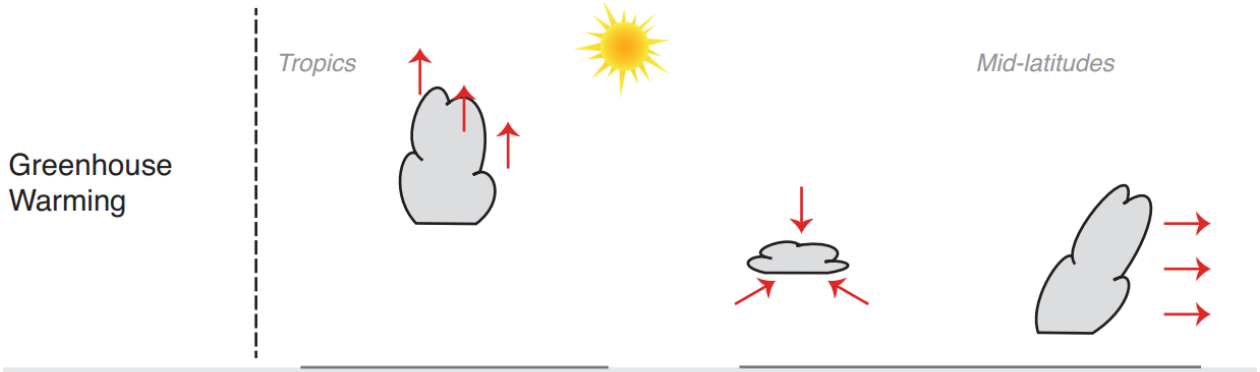


Image credit: IPCC

Why use satellite-based cloud data?

- Polar-orbiting satellites offer global coverage, including oceans
- However, global coverage comes with lower measurement frequency compared to ground stations

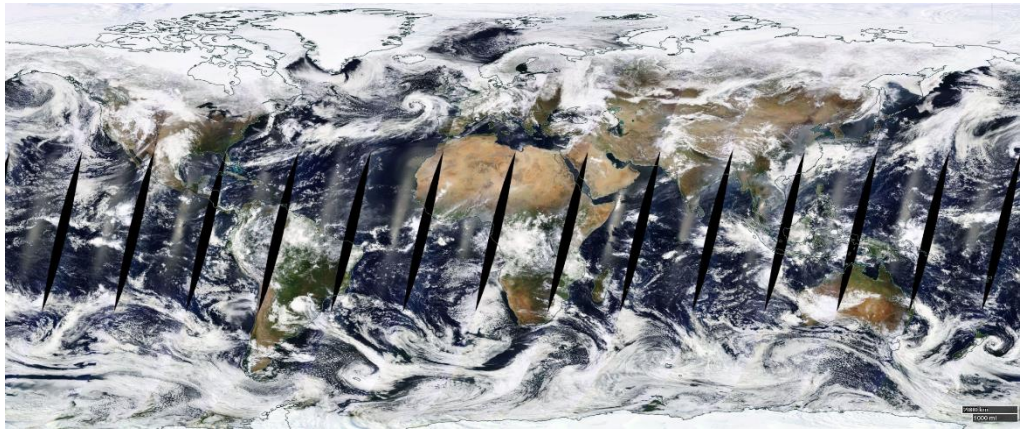
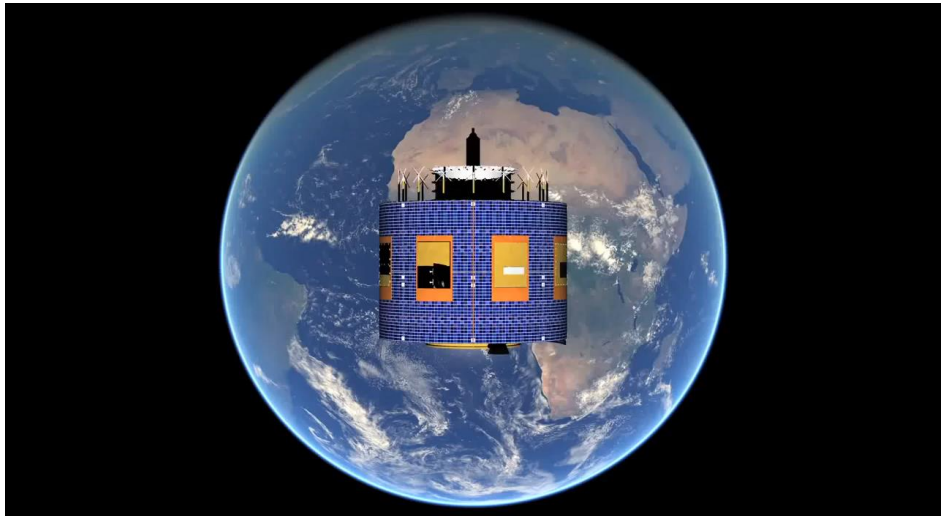


Image credit: NASA Worldview

- Geostationary satellites provide measurements every few minutes
- While geostationary coverage is not global, it is adequate for monitoring large areas of the Earth.



Video credit: EUMETSAT

Why use satellite-based cloud data?

CLAAS-3 is a Cloud property data set based on SEVIRI, a geostationary imager

- 12 channels from visible to thermal infrared part of the spectrum
- Measurements are available every 15 minutes, starting in 2004
- On board EUMETSAT geostationary satellites Meteosat-8, 9, 10, 11, located over 0.0° latitude and longitude

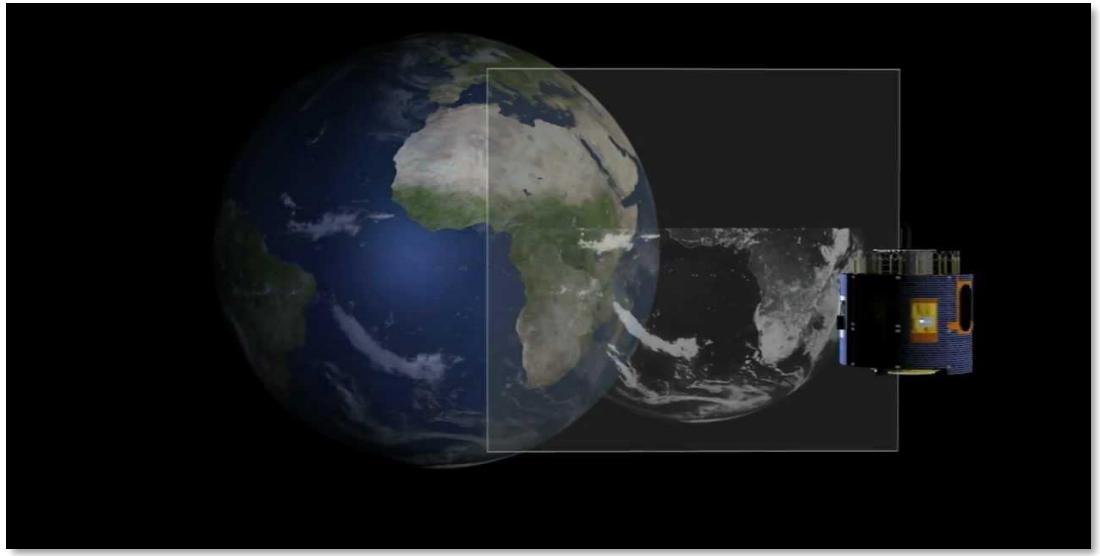
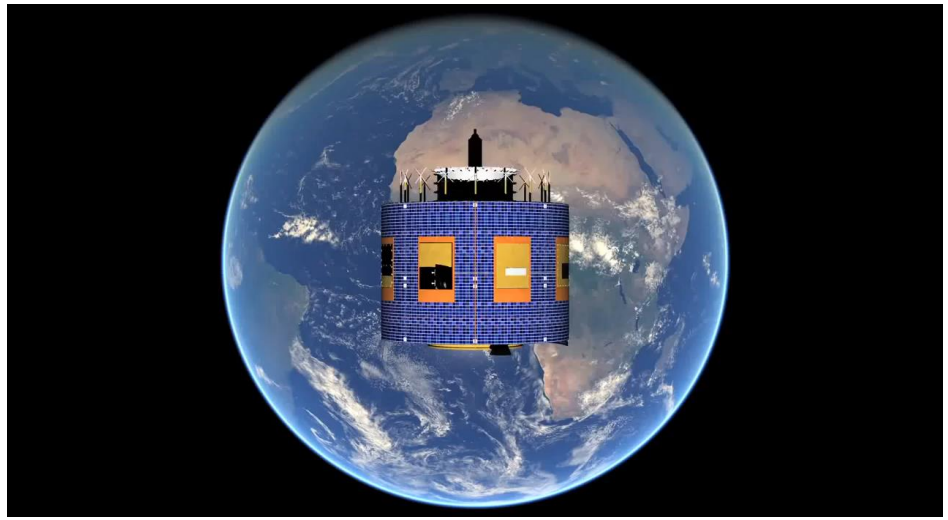
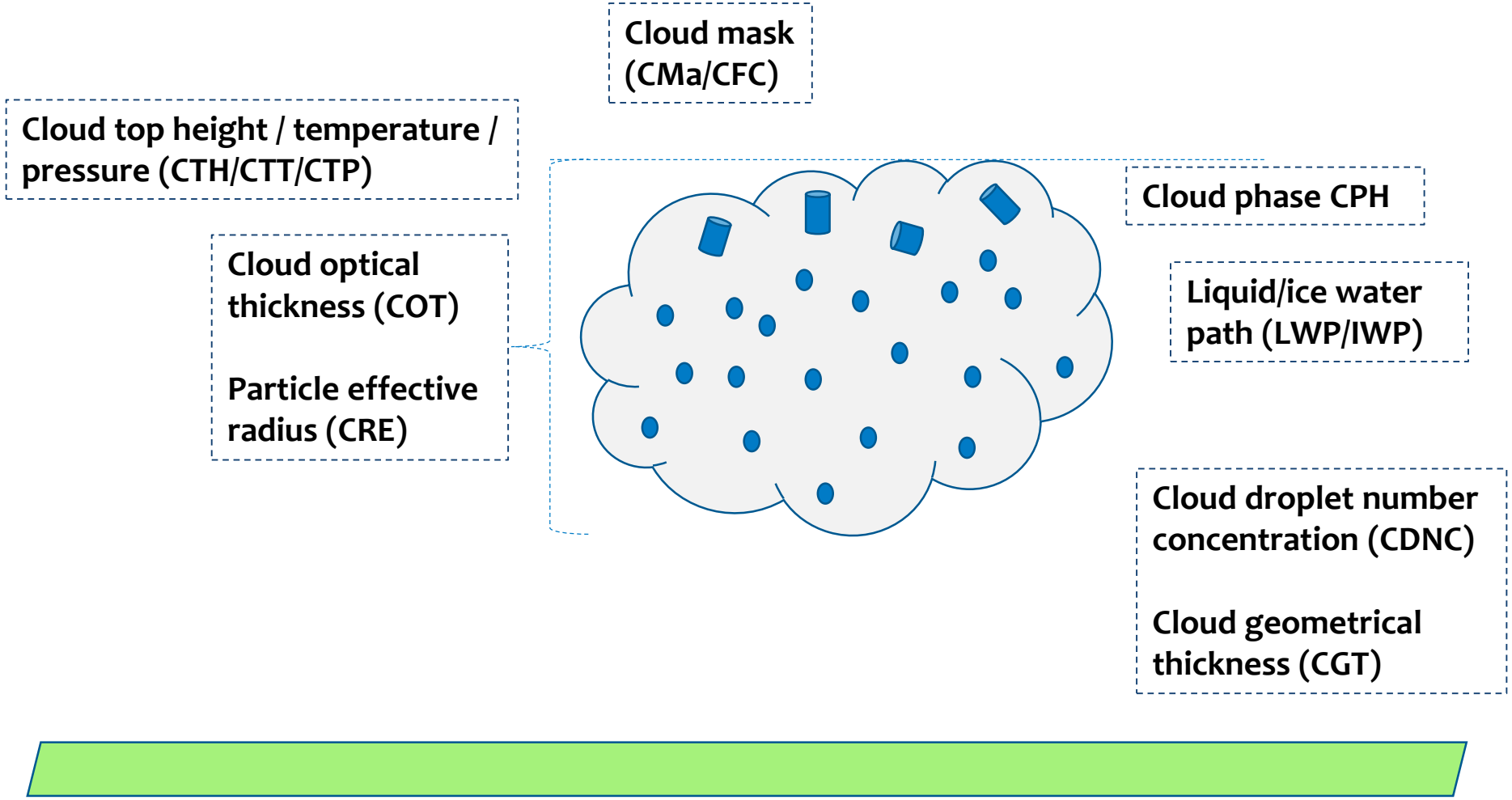


Image credit: EUMETSAT



Video credit: EUMETSAT

Which cloud properties are included in CLAAS-3?



CLAAS-3 temporal and spatial availability

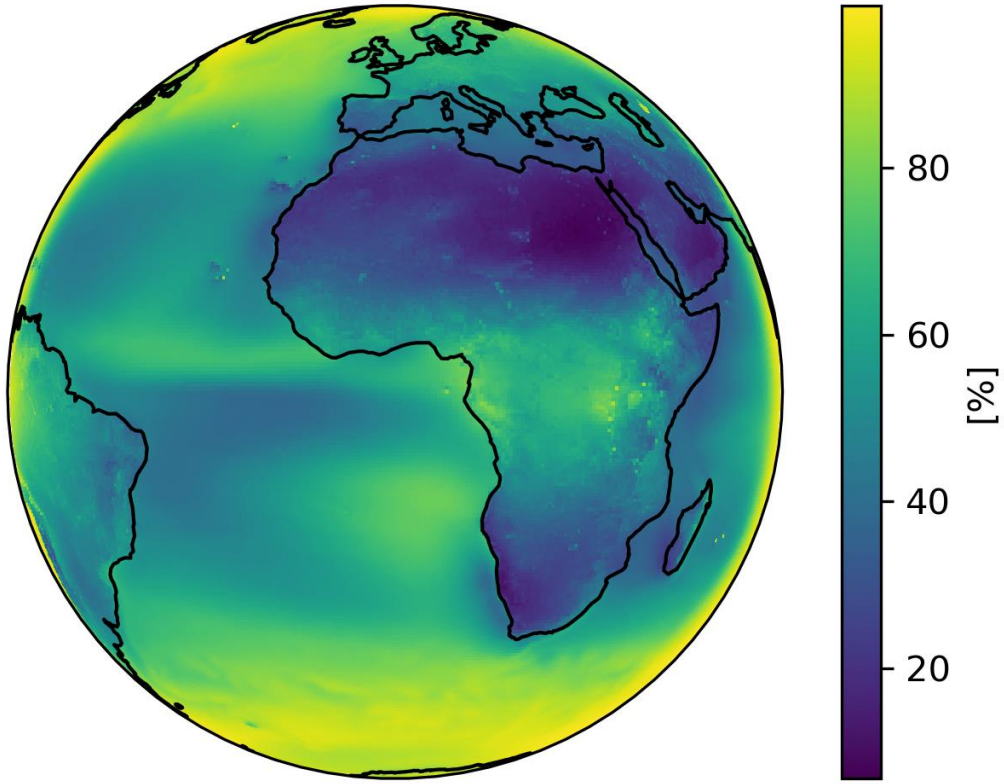
Level 2

- Instantaneous, every 15 min.
- 3 km × 3 km close to nadir (0.0° lat/lon), expanding towards the disk edge

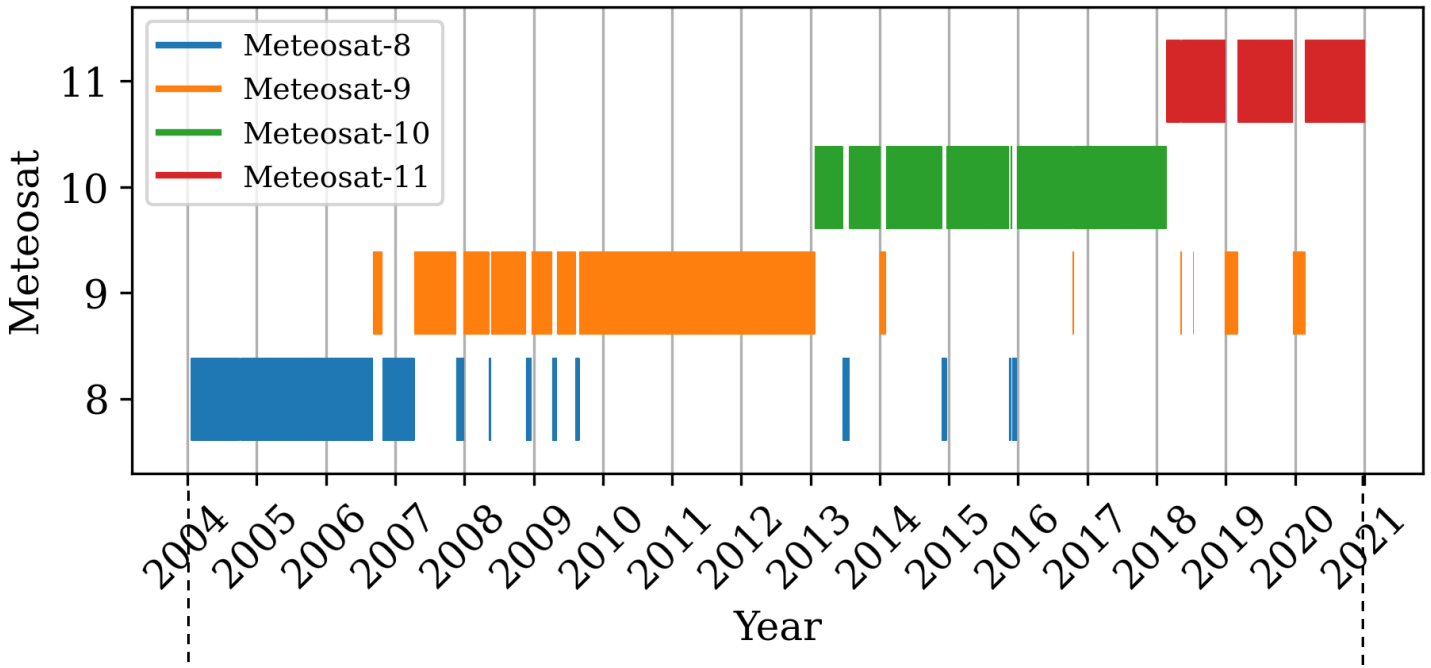
Level 3

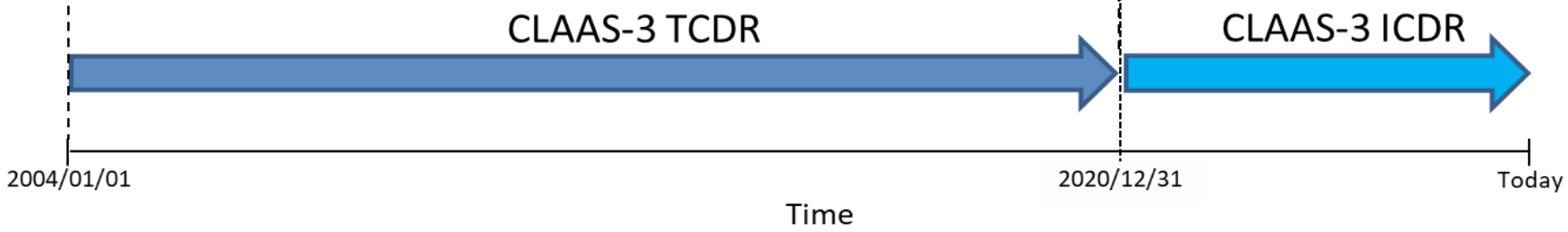
- Daily mean at 0.05° × 0.05°
- Monthly mean at 0.05° × 0.05°
- Monthly mean diurnal cycle at 0.25° × 0.25°

Average cloud fraction in 2004-2020



Editions of the CLAAS data record

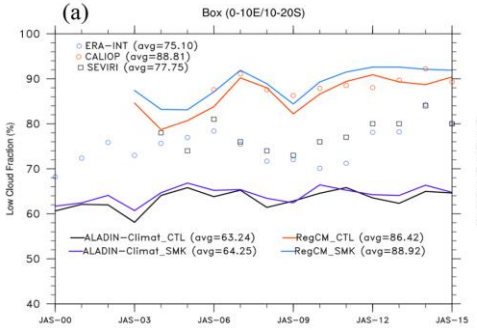




- CLAAS-1 (Stengel et al., ACP, 2014)
  - 2004 - 2011 (2 satellites)
- CLAAS-2 (Benas et al., ESSD, 2017)
  - 2004 - 2015 (3 satellites)
  - + extension 2016-2017 (CLAAS-2.1)
  - + ICDR CFC and CTH
- CLAAS-3 (Benas et al., ESSD, submitted)
  - 2004 - 2020 (4 satellites)
  - + ICDR all variables

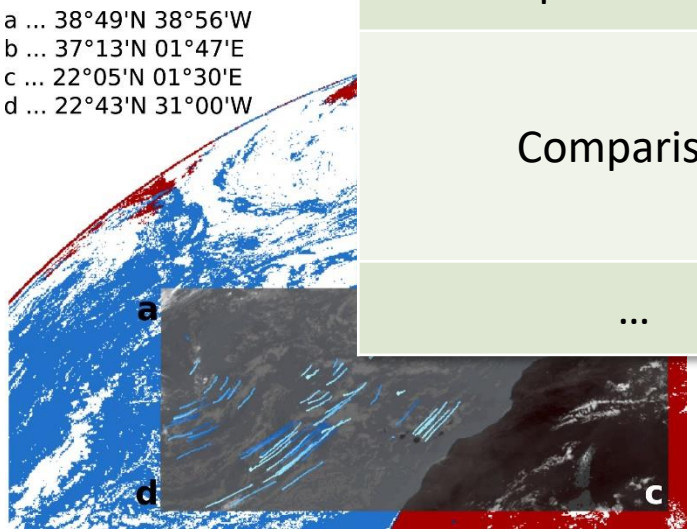
Previous usage of CLAAS data

Evaluation of climate models



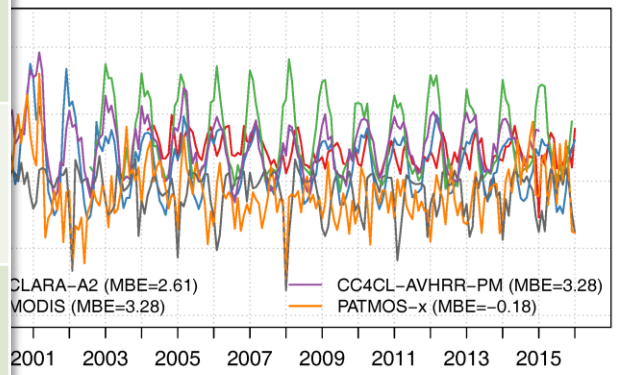
General Applications	Examples
Model evaluation	Regional, WRF, NWP, ML, NN
Cloud filtering/masking	For other retrievals, input to NN
Characterization and processes	Focus mainly on diurnal cycle
Comparison	With ground-based observations or other satellite data
…	

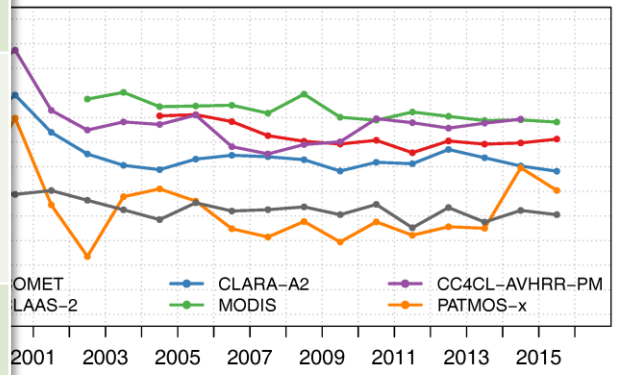
Life cycle of m



Seelig et al., (2021)

with other cloud products





Bojanowski et al., (2018)

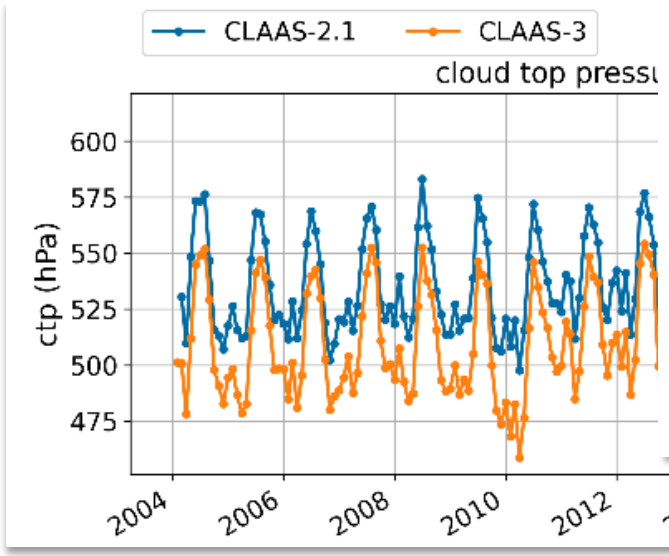
Why use CLAAS-3 and not extend CLAAS-2?

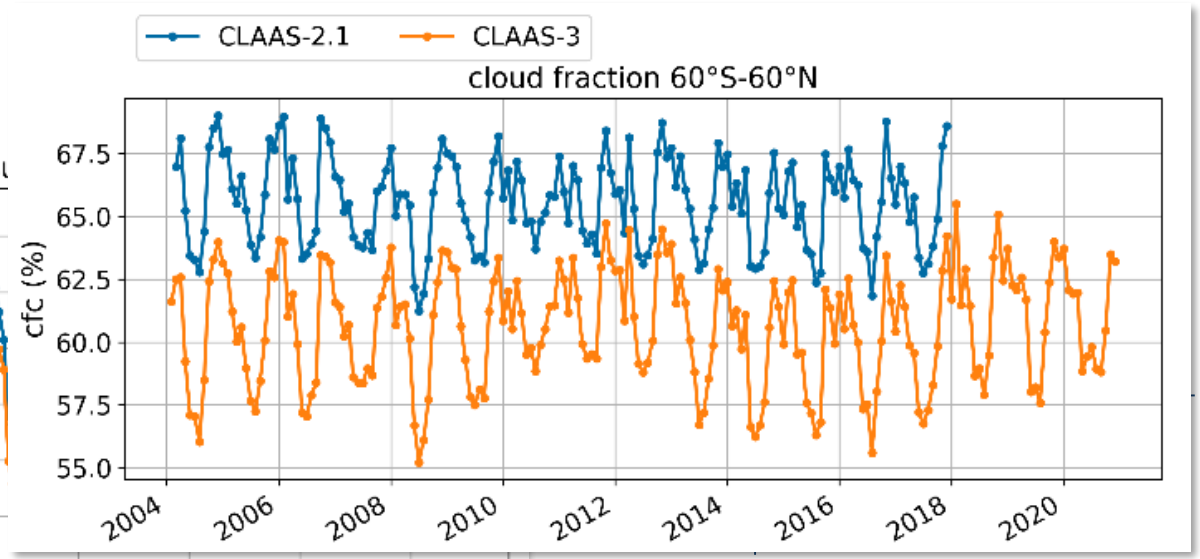
Improved cloud top retrieval based on neural network trained with CALIPSO data

Cloud mask (CMa/CFC)

Improved cloud mask algorithm, incl. probabilistic cloud mask

Cloud top height / temperature / pressure (CTH/CTT/CTP)





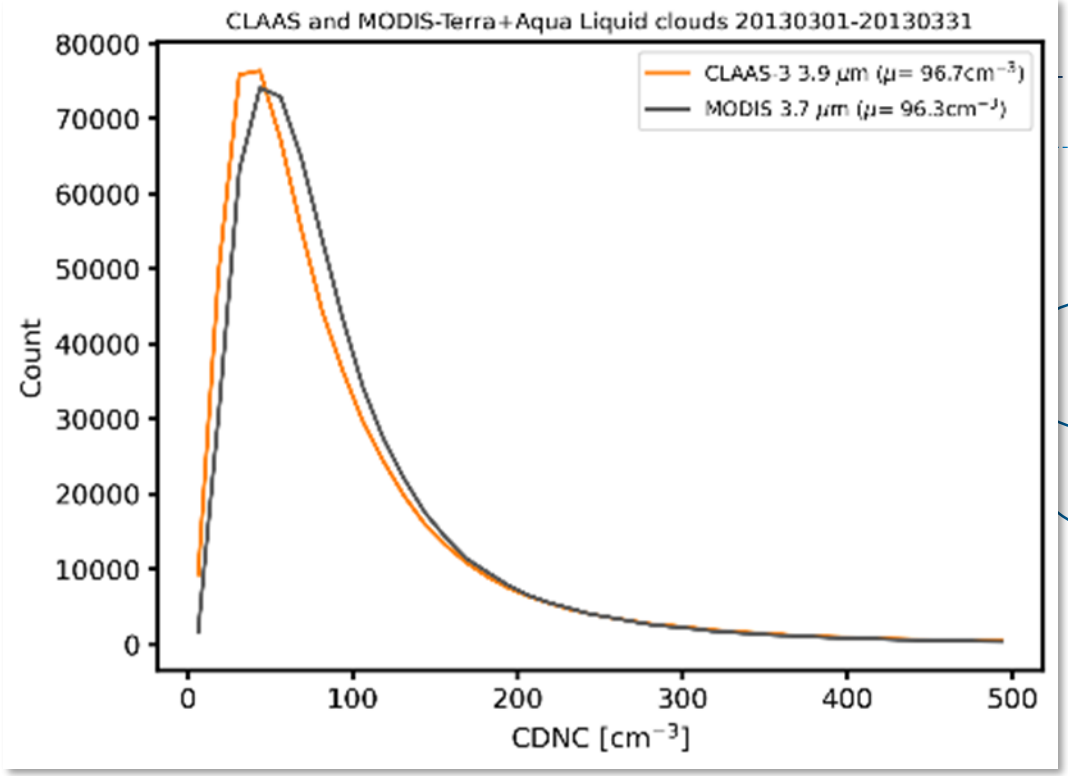
✓ CFC reduced by ~5%

✓ Cloud detection score increased: 0.57 → 0.67

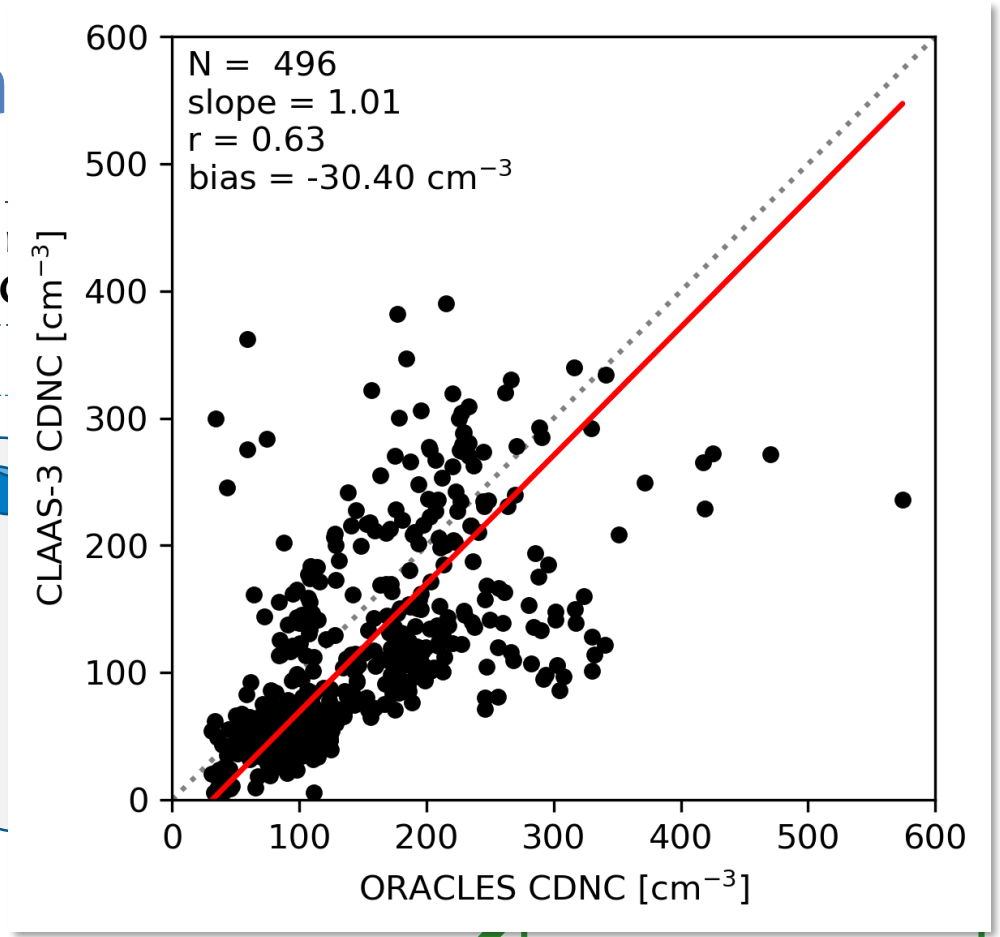
Cloud geometrical thickness (CGT)

✓ CTH bias reduced: -520 m → 230 m

Why use CLAAS-3 an



Cloud
(CMa/



New cloud products

Cloud geometrical thickness (CGT)

Summary & outlook

- CLAAS-3, the new climate data record of cloud properties from SEVIRI measurements has been produced.
- CLAAS-3 offers the advantages of geostationary-based data over Earth regions of high interest (Europe, Africa, the Atlantic ocean…) for a long time period: 2004 – present.
- Extensive validation demonstrates improvements compared to previous editions in various respects
- Preparations for successor CLAAS-4 have already started
  - Seamless transition to MTG-FCI
  - Re-calibration of IR channels by EUMETSAT
  - Cloud phase identification based on neural network trained with CALIPSO
  - …

Further information

- CLAAS-3 is publicly available via the CM SAF website, www.cmsaf.eu: https://doi.org/10.5676/EUM_SAF_CM/CLAAS/V003.
- The same link contains CLAAS-3 documentation, related publications and links for downloading specific CLAAS-3 cloud variables