

# MAKE OUR PLANET GREAT AGAIN



# KICKOFF CONFERENCE

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PARIS



UNIVERSITÄT  
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Leipziger Institut  
für Meteorologie

## PACIFIC - Particles in aerosol-cloud interactions: Stratification, CCN/INP concentrations, and cloud lifecycle

Matthias Tesche, Torsten Seelig, Fani Alexandri, Goutam Choudhury,  
Peggy Achtert, Peter Bräuer, and Johannes Quaas

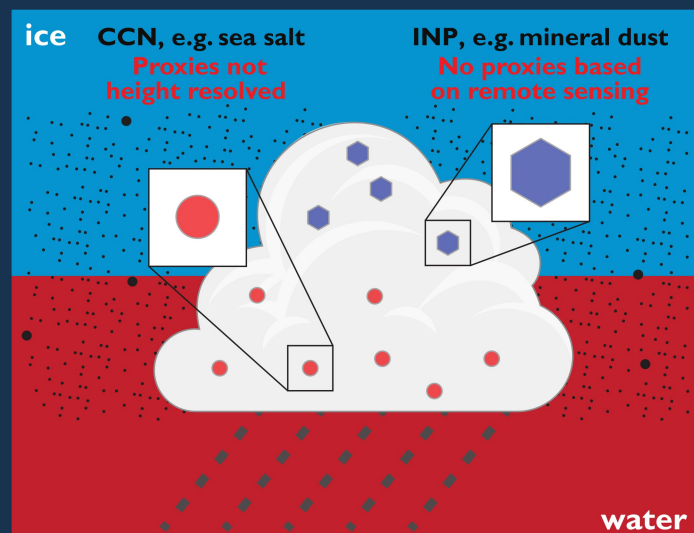
Leipzig Institute for Meteorology, University of Leipzig, Leipzig, Germany  
matthias.tesche@uni-leipzig.de | <https://research.uni-leipzig.de/aerocloud>

### Abstract

Atmospheric aerosol particles act as cloud condensation nuclei (CCN) in liquid-water clouds and as ice nucleating particles (INP) in ice-containing clouds. Changes in aerosol concentration affect the albedo, development, phase, lifetime and rain rate of clouds. These aerosol-cloud interactions (ACI) and the resulting climate effects have been in the focus of atmospheric research for several decades. Nevertheless, the IPCC still concludes that ACI cause the largest uncertainty in assessing climate change as they are understood only with medium confidence.

The MOPGA-GRI project PACIFIC will improve our understanding of ACI by enhancing the representation of the aerosols relevant for cloud processes and by quantifying temporal changes in cloud properties throughout the cloud life cycle. PACIFIC will provide unprecedented insight in CCN and INP concentrations from spaceborne lidar data. In addition, the development of clouds before and after the snap-shot view of polar-orbiting sensors will be characterised by tracking those clouds in time-resolved geostationary observations. This novel information will be used to study the effects of CCN and INP on the albedo, liquid and ice water content, droplet and crystal size, development, phase and rain rate of clouds within different regimes carefully accounting for the meteorological background.

### How do aerosols affect clouds?



### PACIFIC team and project structure



The PACIFIC team as of August 2019 from left to right:

Peggy Achtert  
Peter Bräuer  
Fani Alexandri  
Goutam Choudhury  
Torsten Seelig  
Matthias Tesche

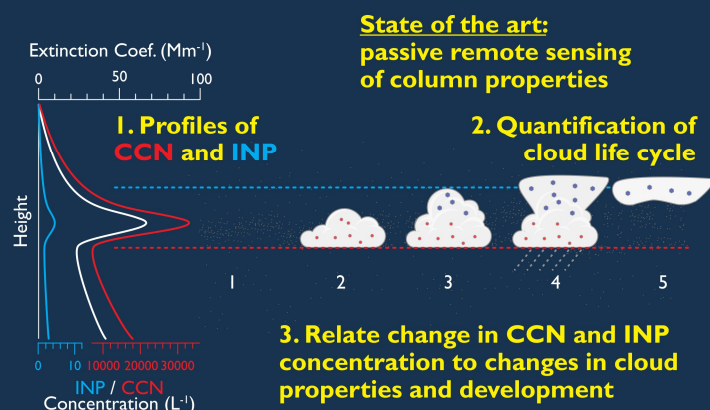
Work within PACIFIC is distributed over seven work packages (WPs):

- ▶ WP 1: A lidar-based proxy for cloud albedo
- ▶ WP 2: CCN profiles replace AI as CCN proxy
- ▶ WP 3: INP profiles from active remote sensing
- ▶ WP 4: Cloud life cycle from observations with geostationary sensors
- ▶ WP 5: Aerosol-cloud interactions on warm and cold clouds
- ▶ WP 6: Model evaluation and process understanding
- ▶ WP 7: Quality assurance and data consistency

	2019	2020	2021	2022
PI	WP 1	WP 2	WP 3	WP 4
PD 1	WP 1	WP 2	WP 3	WP 4
PhD 1	WP 1	WP 2	WP 3	WP 4
PhD 2	WP 1	WP 2	WP 3	WP 4
PhD 3	WP 1	WP 2	WP 3	WP 4
PD 2	WP 1	WP 2	WP 3	WP 4

### Methodology

The core of PACIFIC is formed by the combination of detailed snap-shot observations from polar-orbiting satellites with the time-resolved but less detailed observations of geostationary sensors.



Aerosols and clouds

from polar-orbiting observations

Cloud life cycle

from geostationary observations

Measurement-based assessment of aerosol effects on both liquid and ice-containing clouds

1. for various regions on Earth
2. assessment with independent data and process modelling
3. methods will be readily applicable for new spaceborne sensors