Jungfraujoch Observatory, Swiss Alps

Julia Schmale :: Paul Scherrer Institute :: BACCHUS presentation Brussels

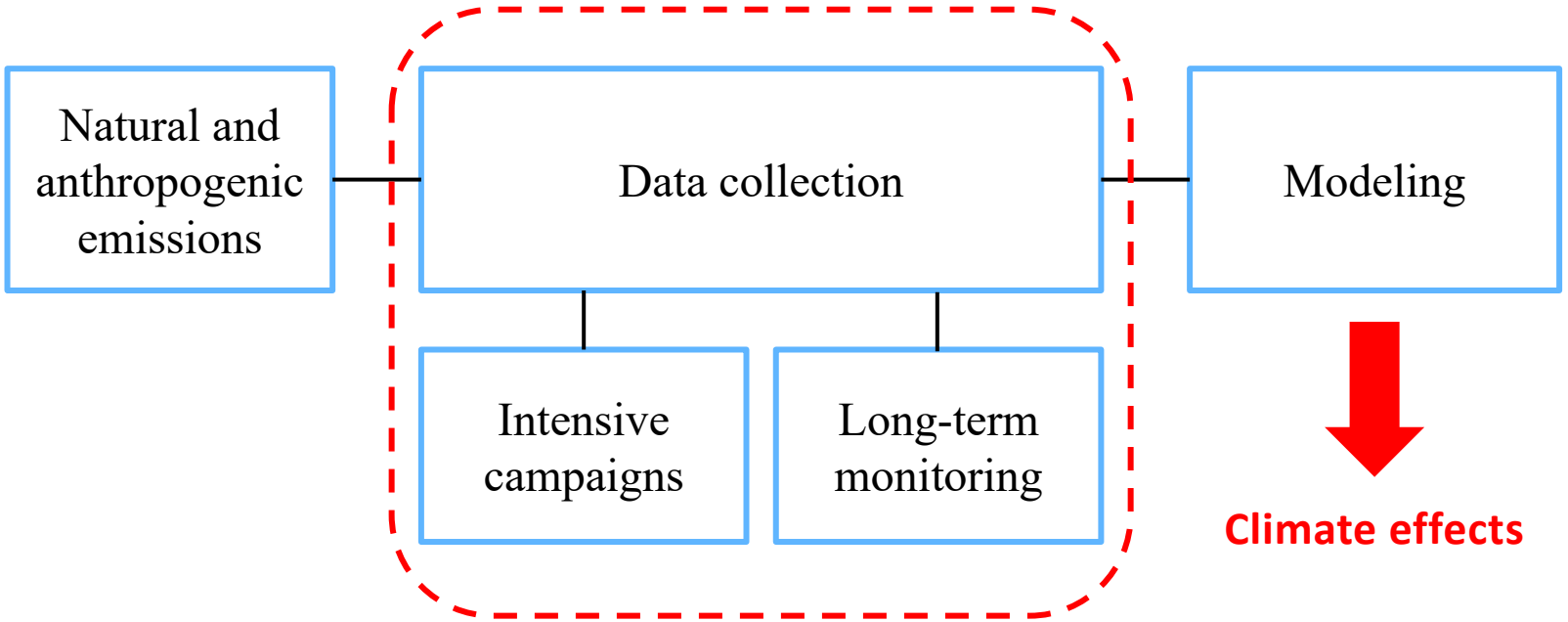
Measurements and Data Collection

BACCHUS
SEVENTH FRAMEWORK PROGRAMME

BACCHUS objective 1

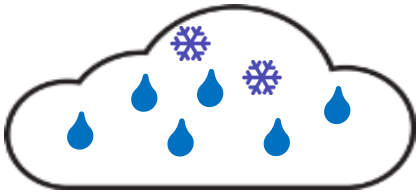
"…quantify the influence of anthropogenic aerosol on cloud properties based on the estimate of the background levels of natural aerosols in various environments, identification of their sources and their role in aerosol-cloud processes…"

From emissions to climate effects

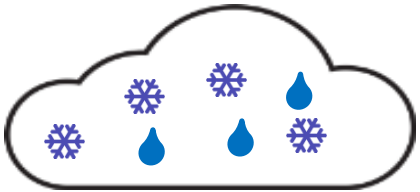


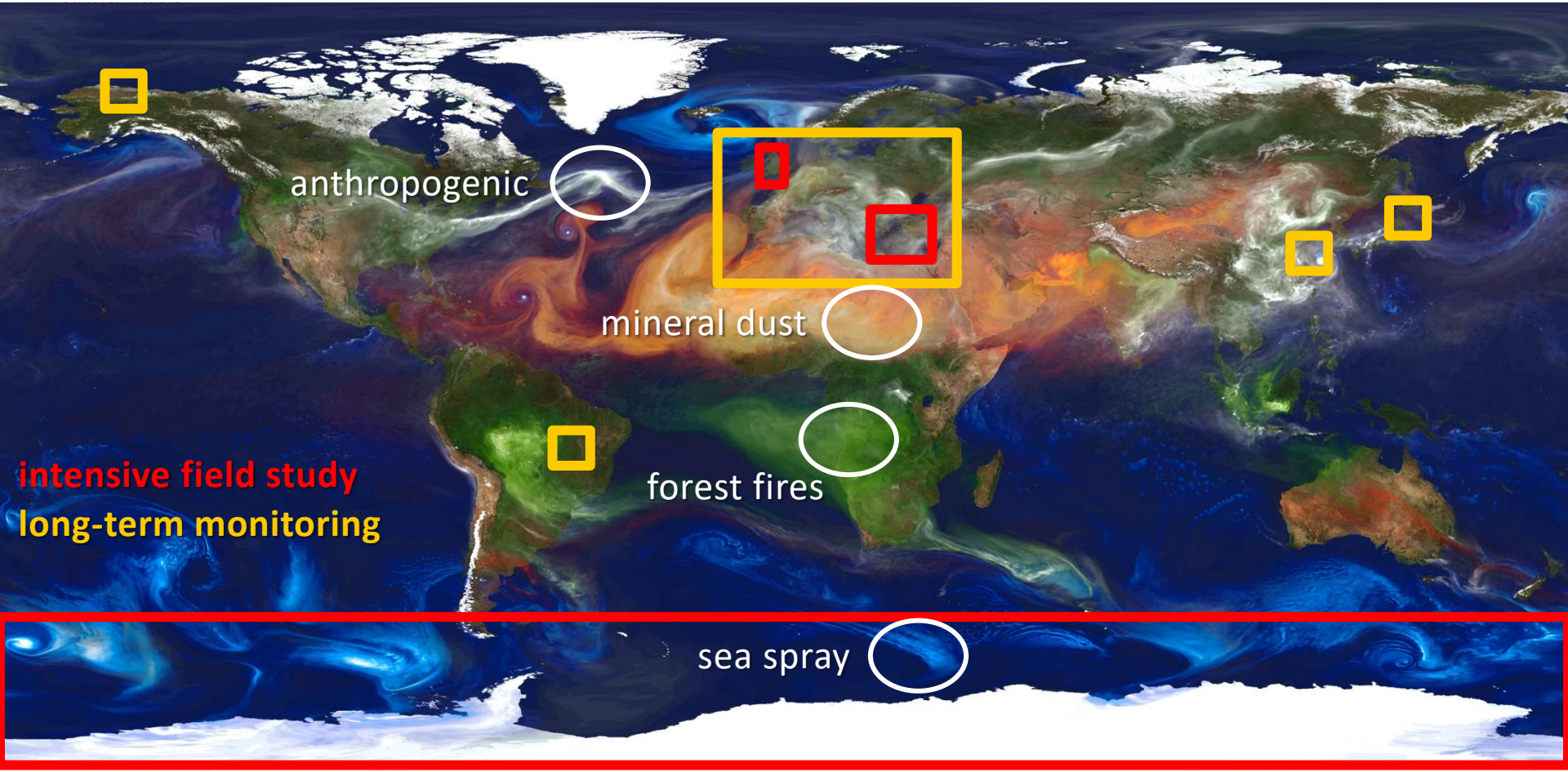
What did we measure in BACCHUS?

Cloud condensation nuclei (CCN)



Ice nucleating particles (INP)





(Nasa.gov)

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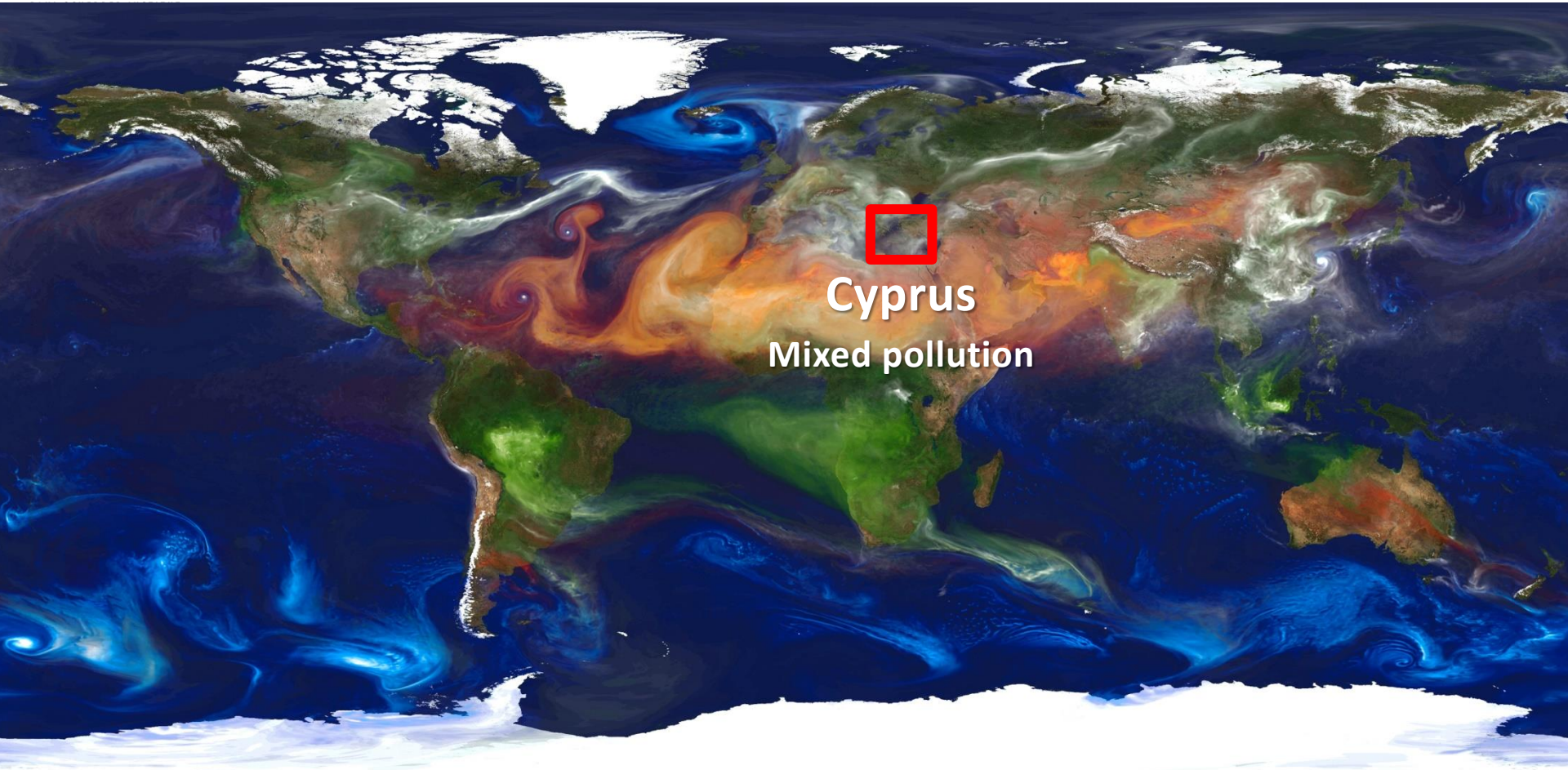

(Nasa.gov)

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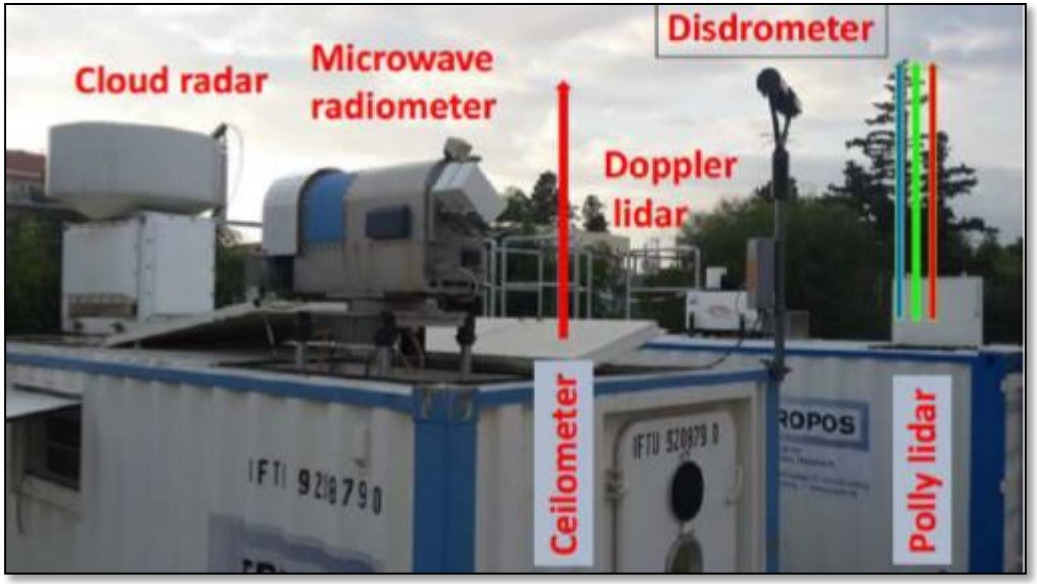
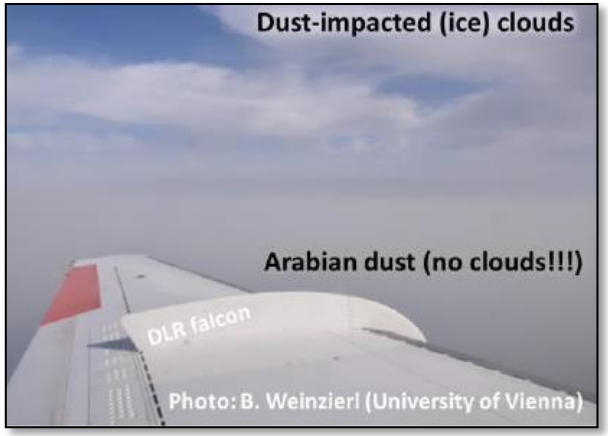
Airborne measurements and remote sensing





Vertical closure experiments
Long-term monitoring

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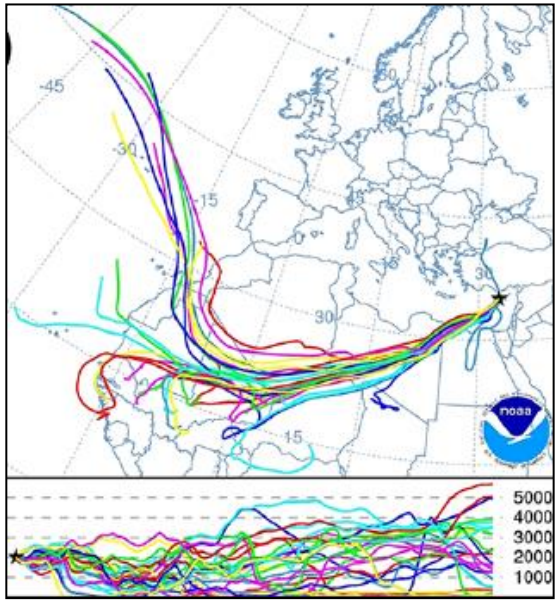
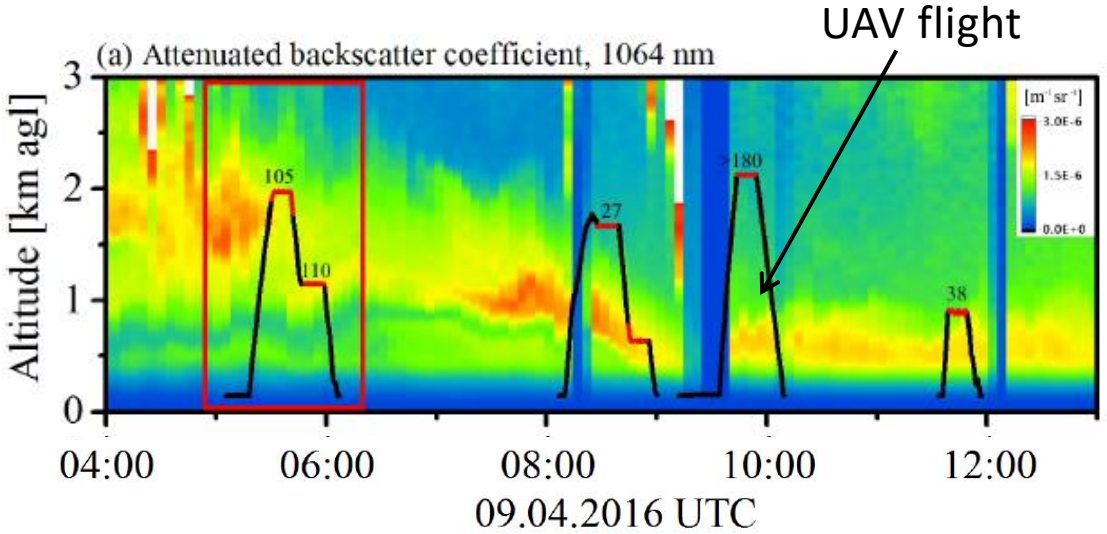
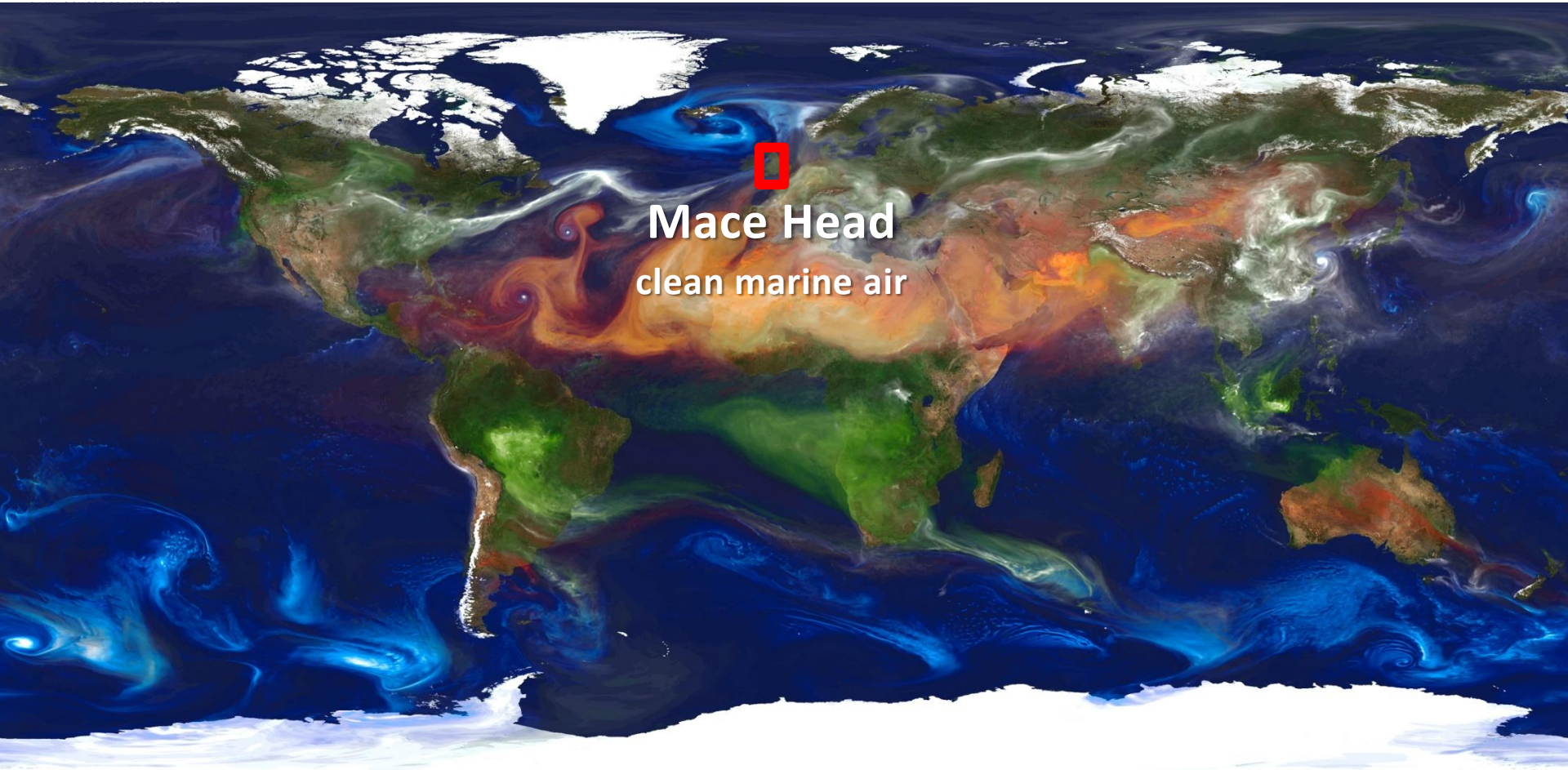
Saharan Dust and Ice Nucleating Particles





Saharan dust increases number of ice nucleating particles over Cyprus.

(Schrod et al., 2017)



(Nasa.gov)

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Special characteristics of marine particles

(Ovadnevaite et al., 2017)

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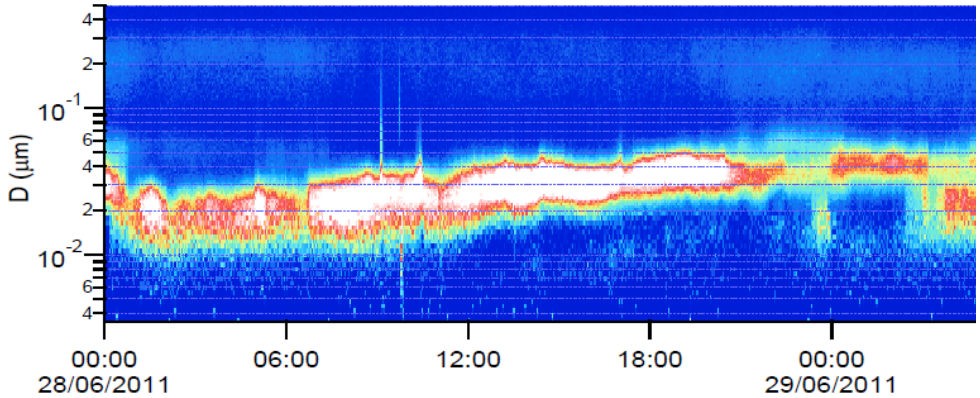
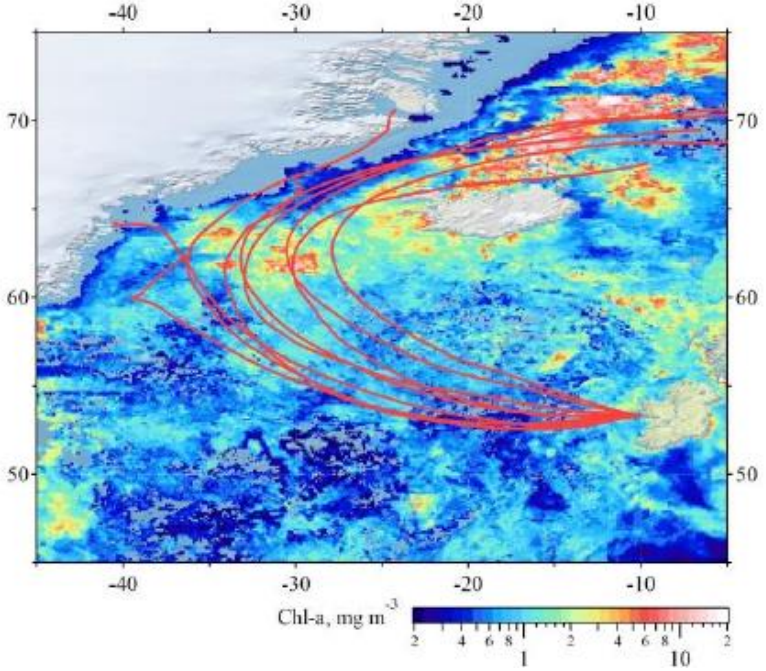
Special characteristics of marine particles

small marine particles



clean marine air masses



«soapy» marine particles are extemely small but can still form cloud droplets

(Ovadnevaite et al., 2017)

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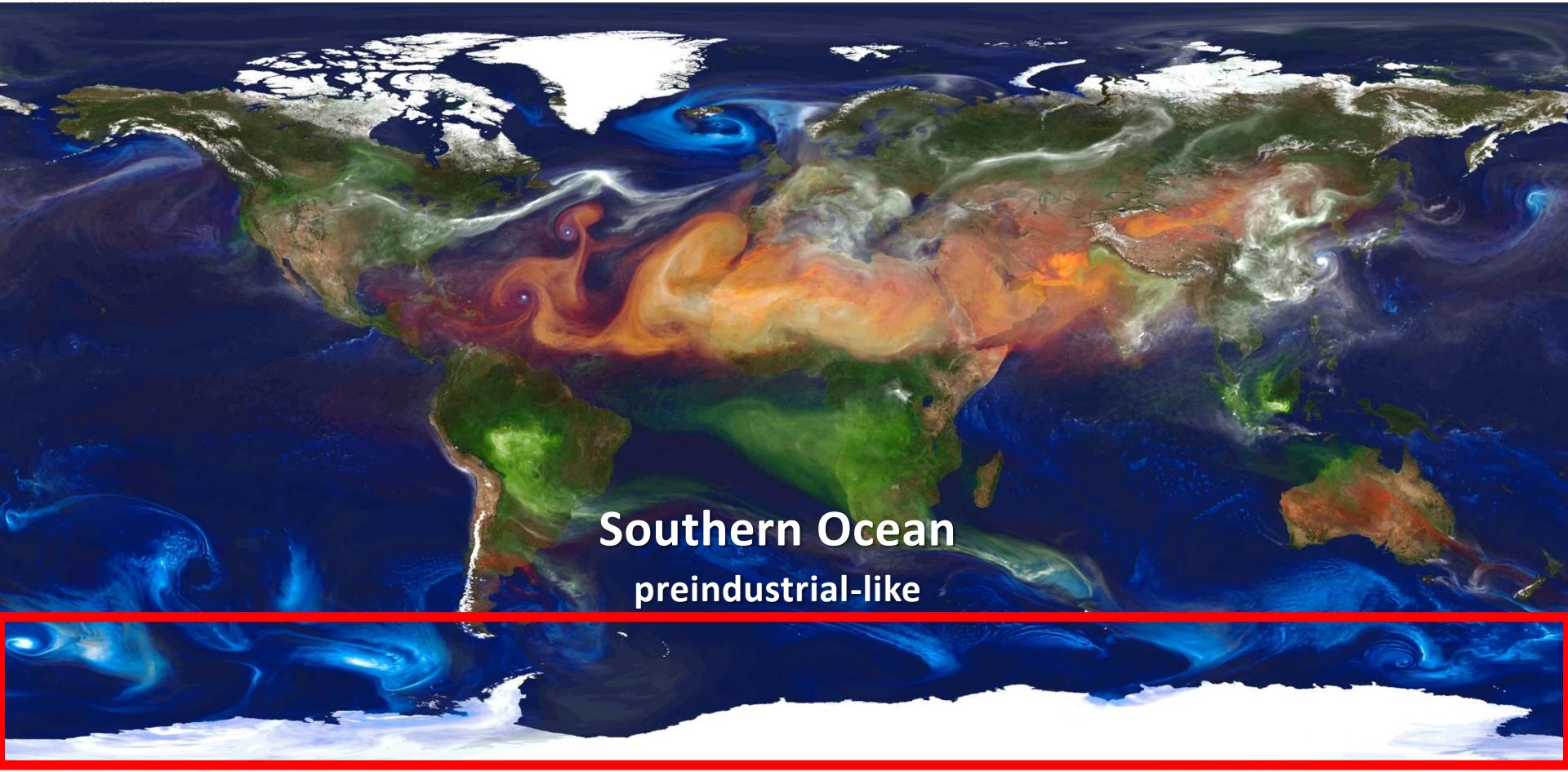

(Nasa.gov)

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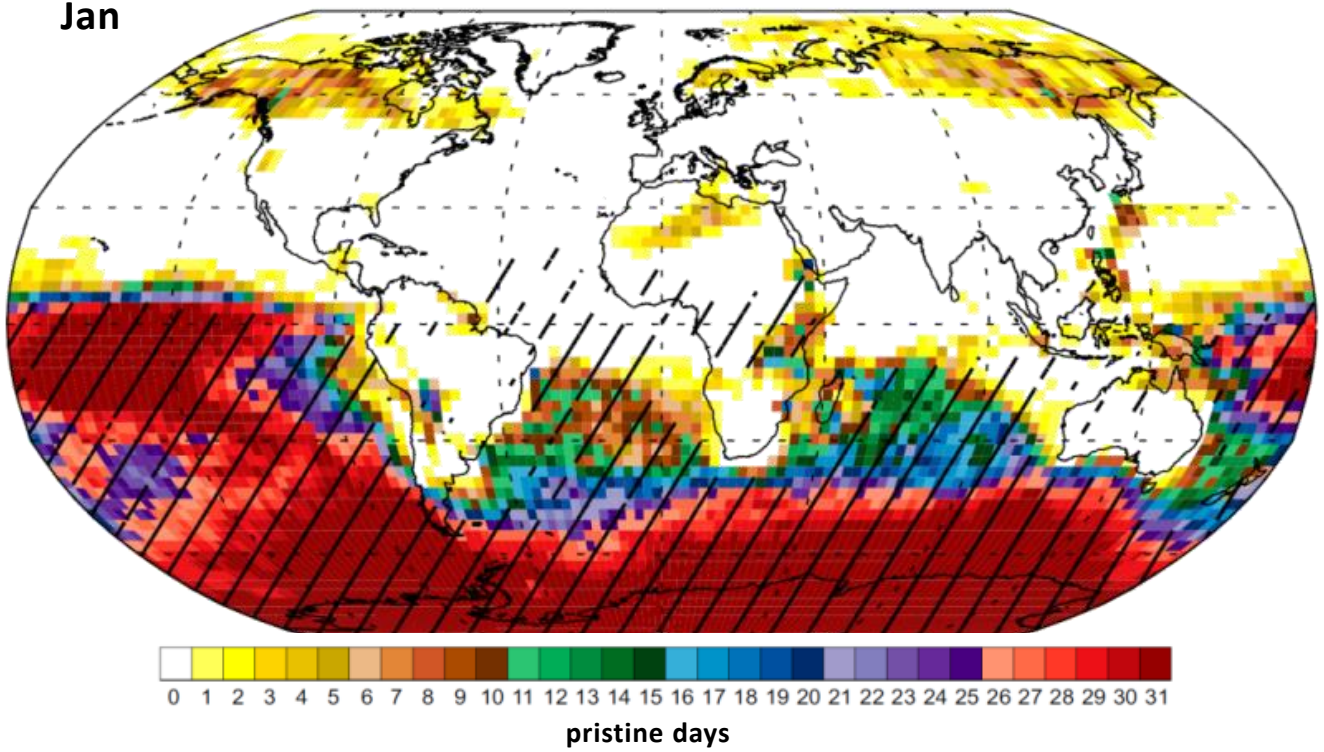
AFRICA
ATLANTIC OCEAN
INDIAN OCEAN
PACIFIC OCEAN
SOUTH AMERICA
AUSTRALIA
ANTARCTIC
South Pole
Antarctic Circle
International Meridien
0°
30° W
60° W
90° W
120° W
150° W
180°
90° E
120° E
150° E
60° S
50° S
40° S
Cape Town
South Africa
December 20 2016
March 19 2017
3rd leg
South Georgia Island
United Kingdom
Bouvet Island
Norway
Marion Island
South Africa
Crozet Islands
France
South Sandwich
United Kingdom
Kerguelen Islands
France
Heard Island
Australia
1st leg
Punta Arenas
Chile
Diego Ramirez Islands
Chile
Peter 1st Island
Mount Siple
Mertz Glacier
South Magnetic Pole
2nd leg
Scott Island
Balleny Islands
Hobart
Australia
Tasmania
New Zealand
0 500 1000 1500 km

Southern Ocean: proxy for preindustrial atmosphere

Least anthropogenic influence on clouds

Jan



(Hamilton et al., 2014)

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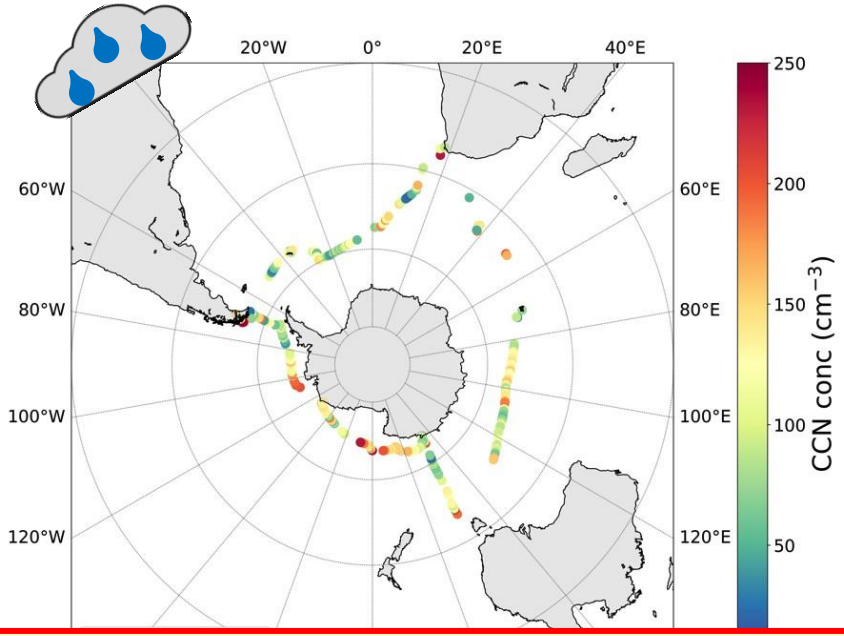
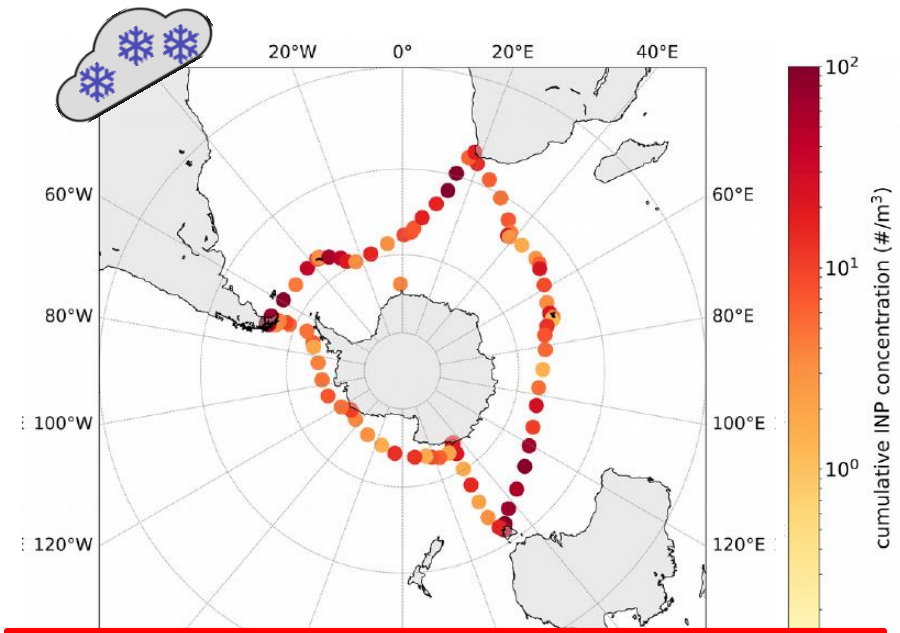
Potential cloud droplets and ice crystals

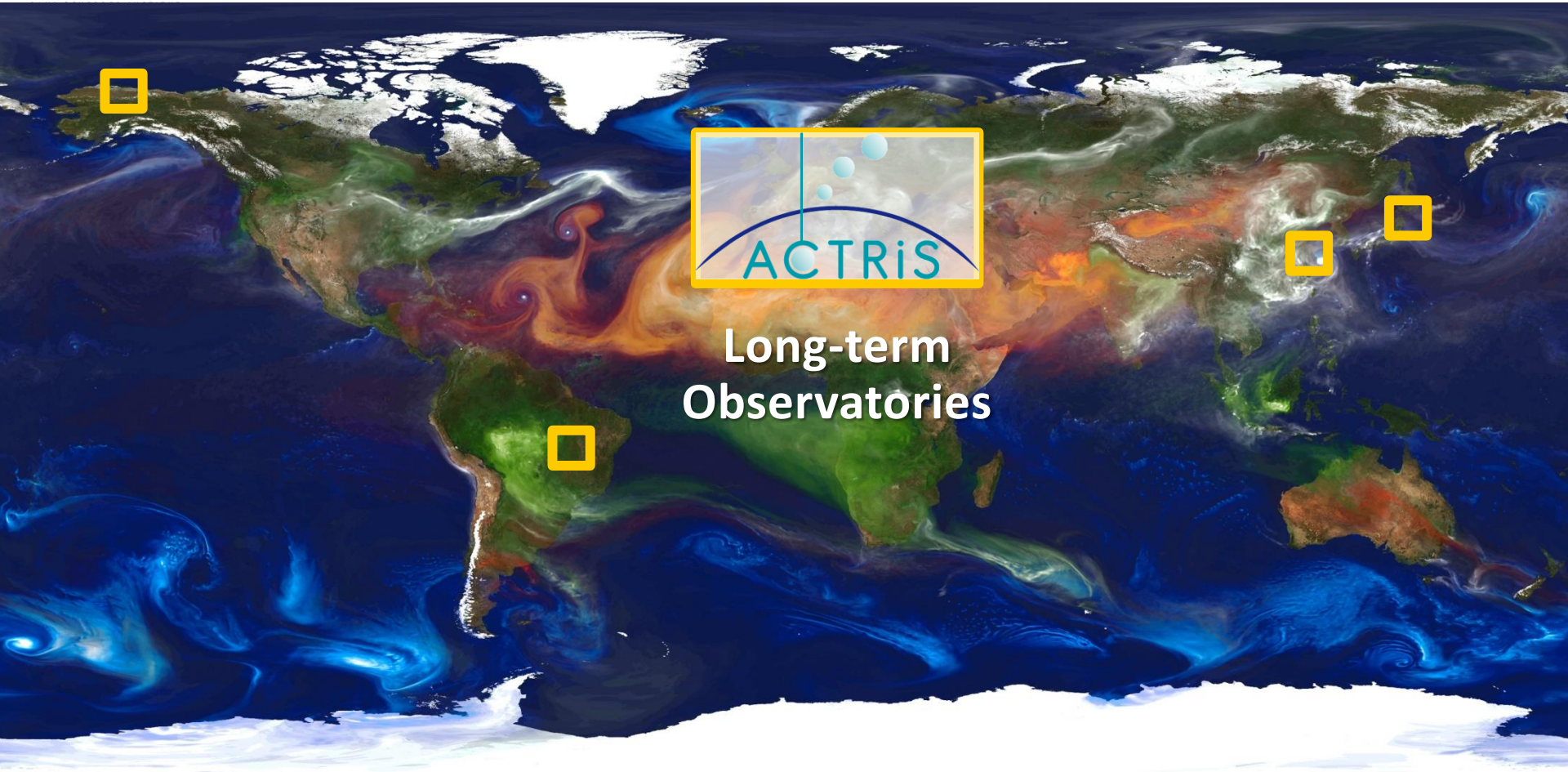




Measurements reveal missing process understanding

1000 times less ice nucleating particles in Southern Ocean compared to Cyprus

(figures, C. Tatzelt)



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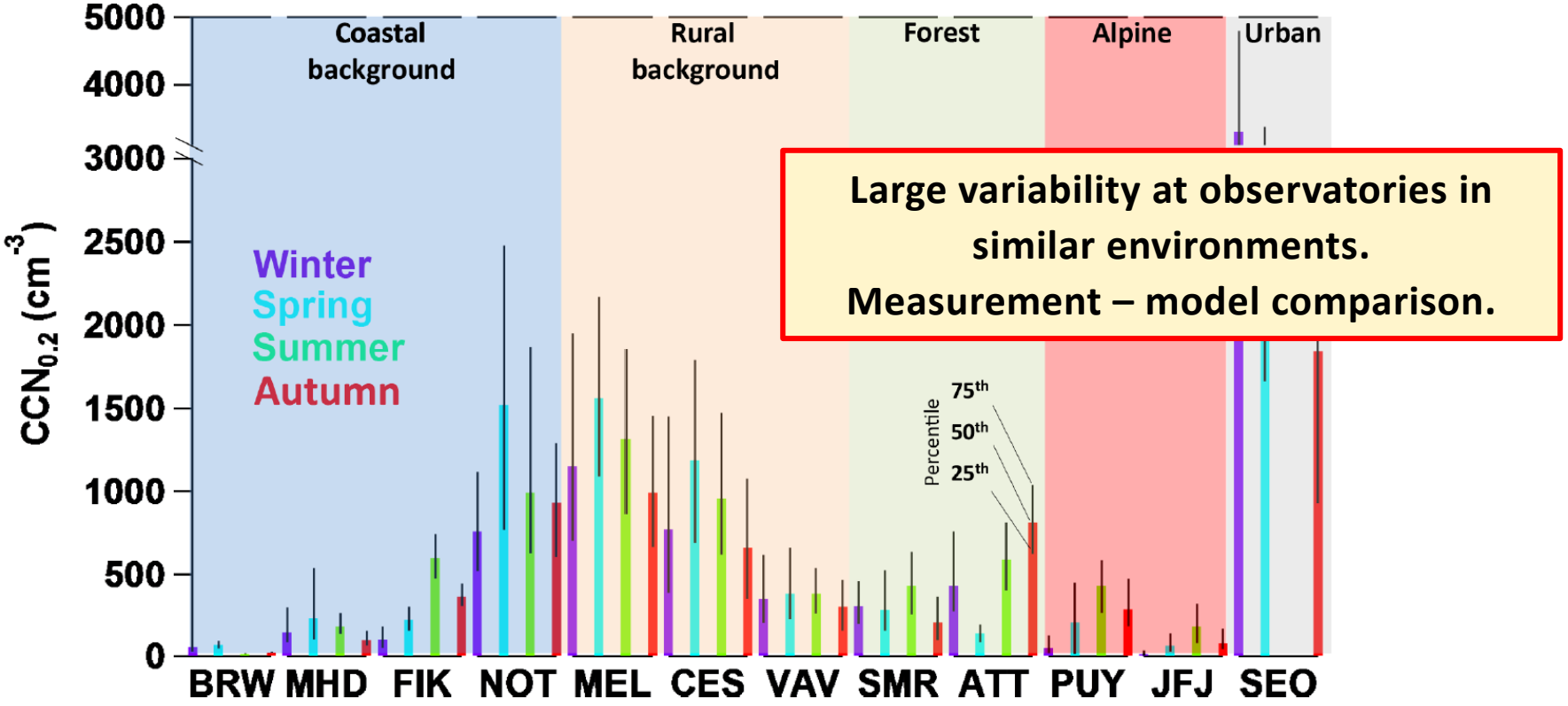
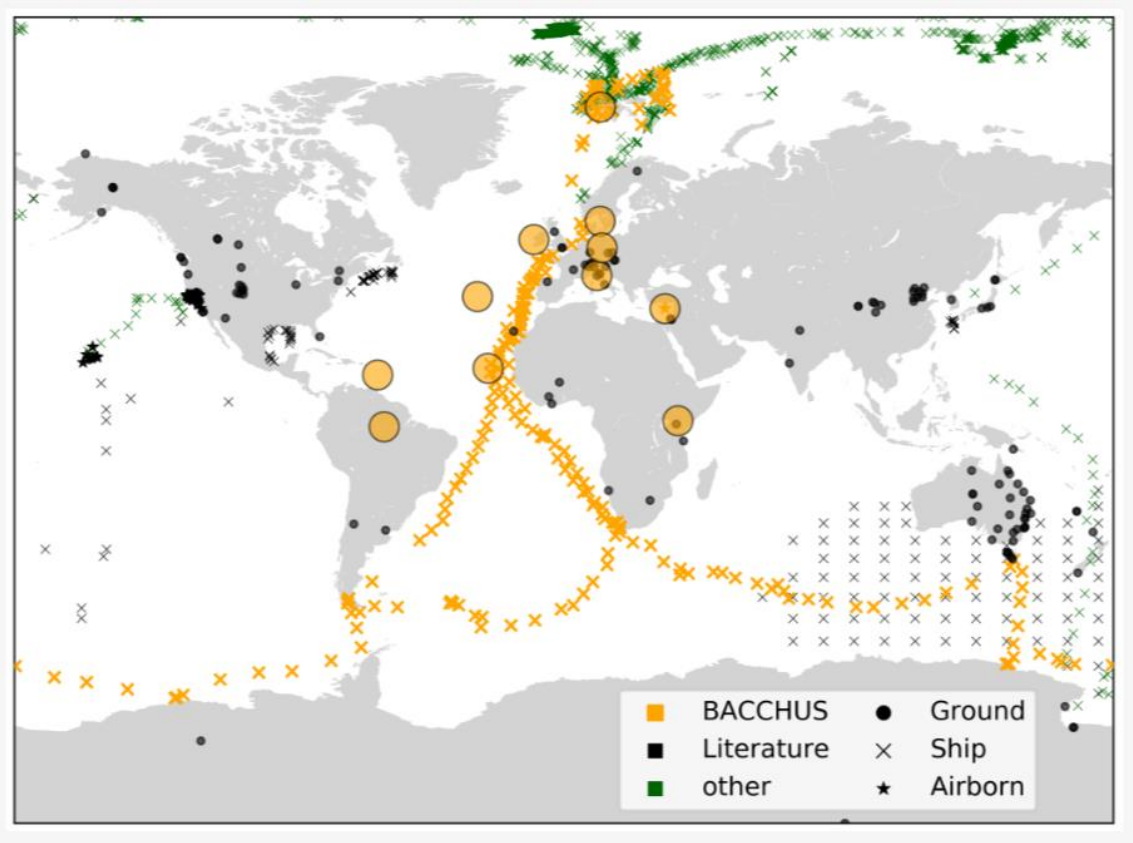
Long-term cloud condensation nuclei data



Large variability at observatories in similar environments.
Measurement – model comparison.

(Schmale et al., 2018)

BACCHUS database: ice nucleating particles



- ~ 40’000 data points
- BACCHUS and other measurements
- First global data base

Legacy product.
Serves larger community.

(figure: André Welti)

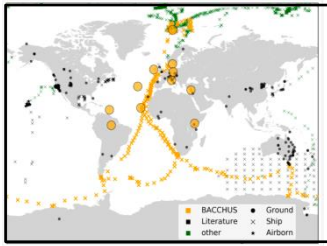
Summary

Intensive field studies → **process understanding**

Observations of natural and anthropogenic aerosol cloud interactions, vertical closure

Long-term observations → **model validation**

Capture seasonal variability, regional specificities, change over time, co-benefits among projects



Database creation → **leverage efforts, model validation**

Collect, standardize and quality check data

Thank you for your attention.

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