

Aerosol-Cloud-Interaction at JOYCE

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Motivation

Today the physical mechanisms of Aerosol-Cloud Interaction (**ACI**) are well known (Twomey, 1977). Nevertheless, the magnitude of ACI and the scales on which it acts in radiative transport are still reasons of uncertainty in climate models (IPCC, 2013). A method for the calculation of ACI-metrics, using ground-based cloud remote sensing and the backscatter signal of a ceilometer, already exists (Sarna et. al., 2015). A multi-year application and a detailed analysis of this method is still missing. The JOYCE site allows the use of a unique data set of collocated aerosol in-situ and cloud remote sensing observations.

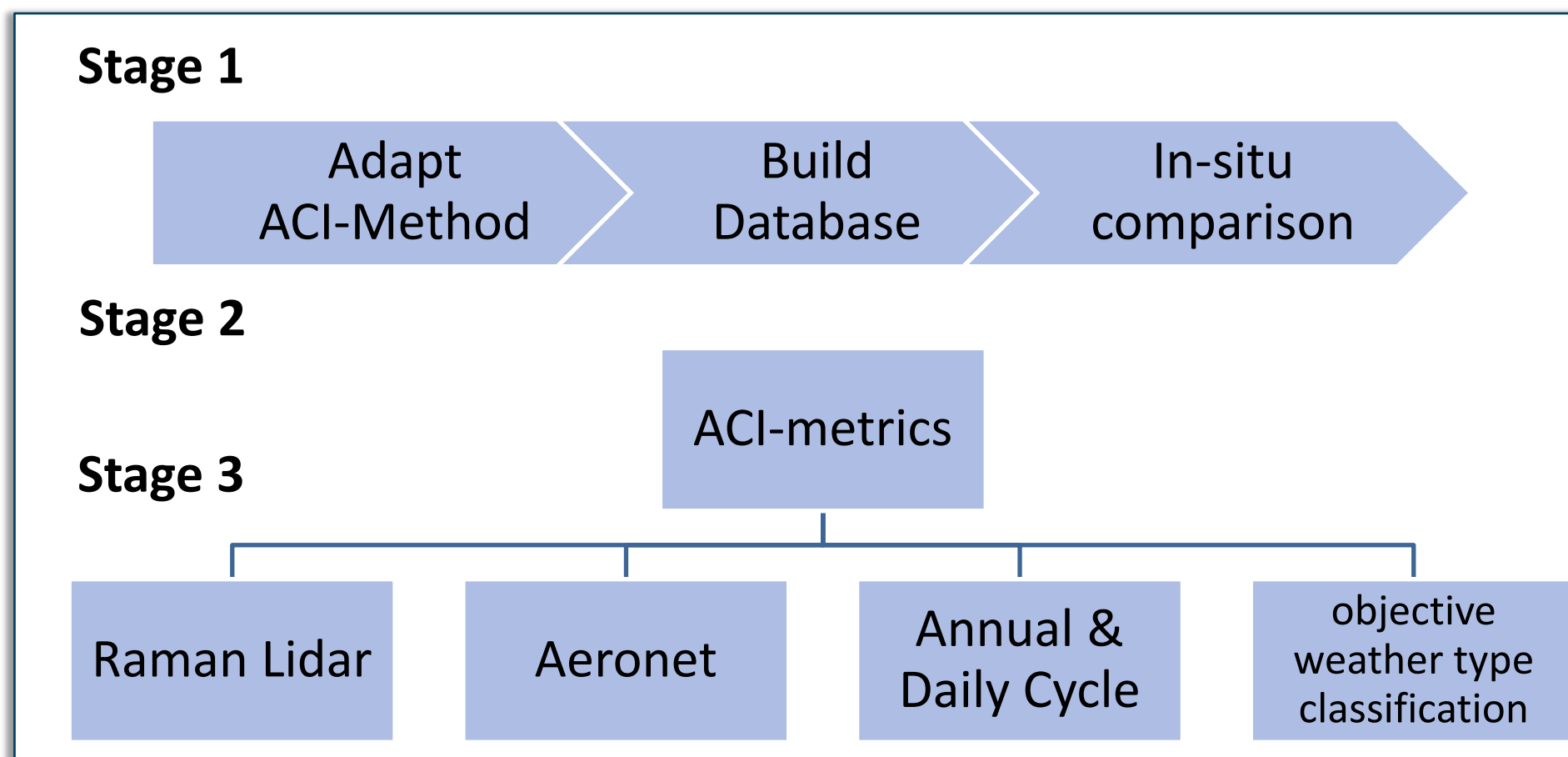
Research Questions

1. Is the backscatter signal of a ceilometer suitable to represent Cloud Condensation Nuclei (CCN) concentration?
2. Is it possible to confirm and quantify ACI-effects on a long-term JOYCE dataset?

Goals

- Adapt the method (Sarna et. al., 2015) and apply it to long-term JOYCE data.
- Compare the ceilometer backscatter signal to in-situ aerosol-measurements to verify the applicability of the method.
- Integrate a Planetary Boundary Layer (PBL) classification (Manninen et. al., 2018).
- Set ACI-metrics in context to environmental conditions.

Schedule

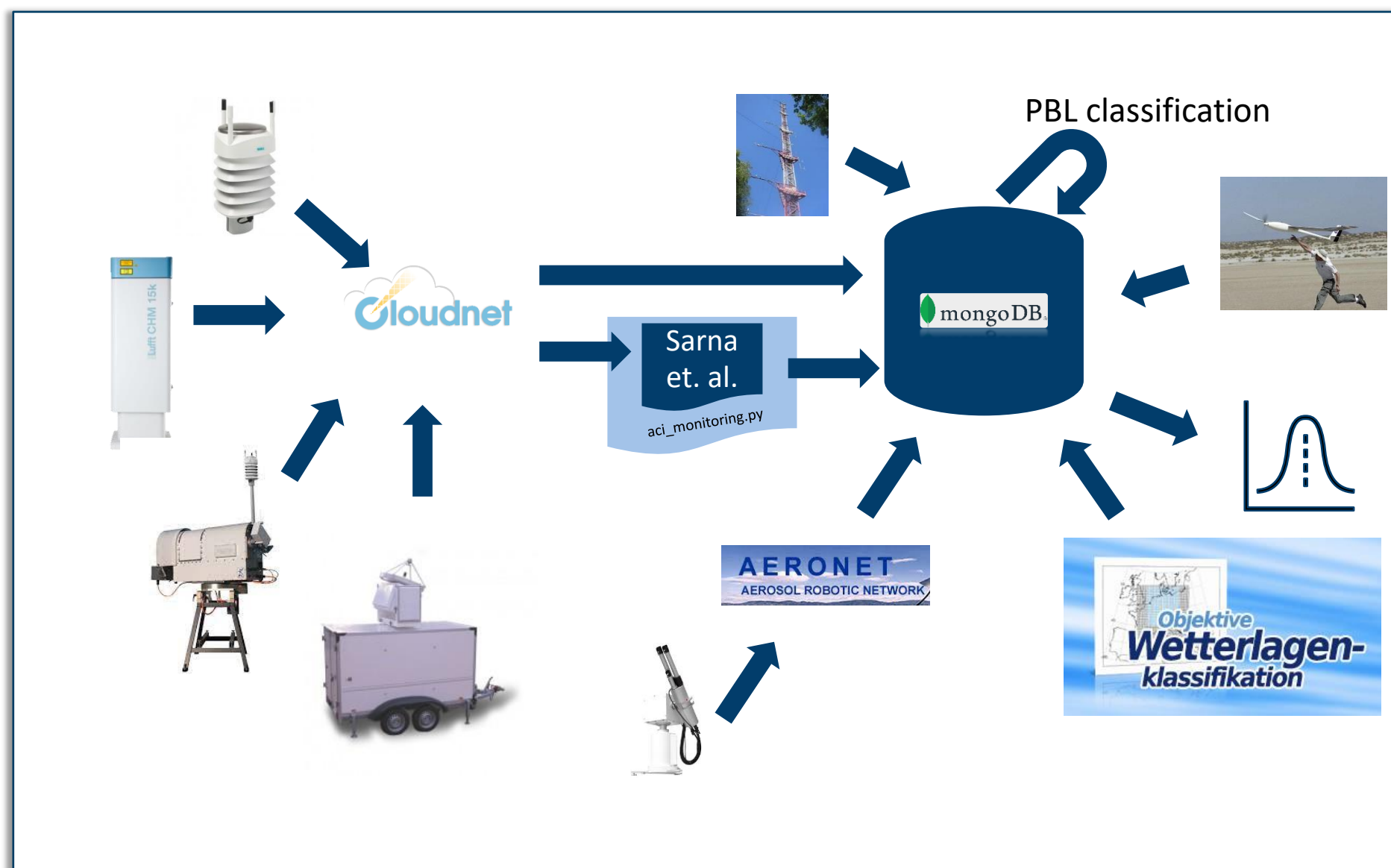


JOYCE

- Jülich **ObservatorY** for Cloud Evolution
- Multi-year tower measurements of CCN
- Cloud & aerosol remote sensing
 - Ceilometer
 - Cloud Radars
 - Microwave Radiometer
 - Sun Photometer



Concept

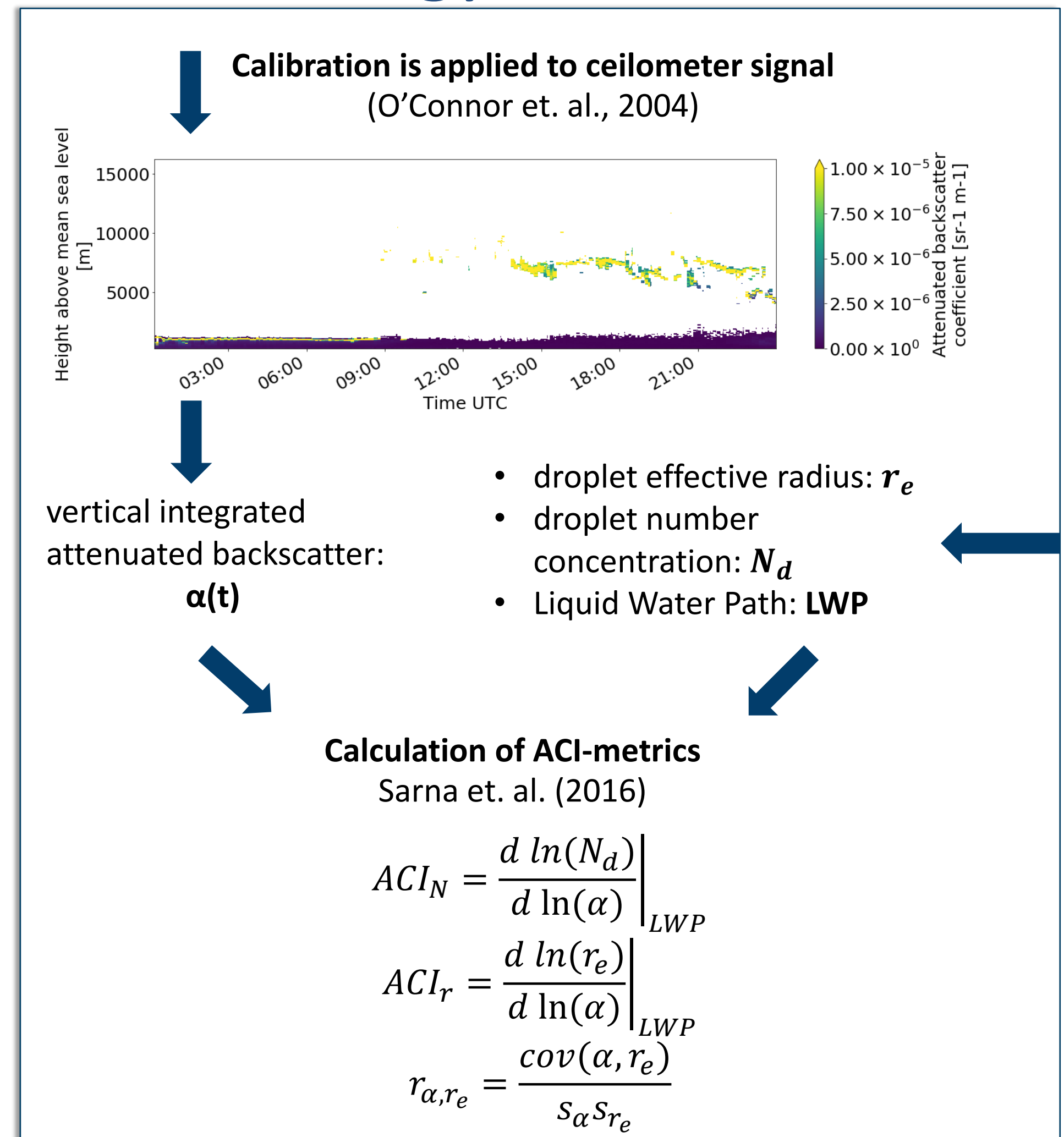


Suitable Application Data

The ACI algorithm (Sarna et. al. 2015) will be applied to data characterized by:

- Low-level liquid water clouds
- Well mixed conditions (Manninen et. al., 2018)
- Cloud base in range 500 m – 2000 m AGL
- Only profiles with liquid cloud droplets and aerosols (based on Cloudnet classification)

Methodology for ACI Metrics



References

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