Xinxin Busch Li, 14 Octbor, 2015

THE OBSERVATION OF THE FIRST AEROSOL INDIRECT EFFECT ON CLOUDS

ITaRS

Initial Training for atmospheric Remote Sensing

PEOPLE

MARIE CURIE ACTIONS

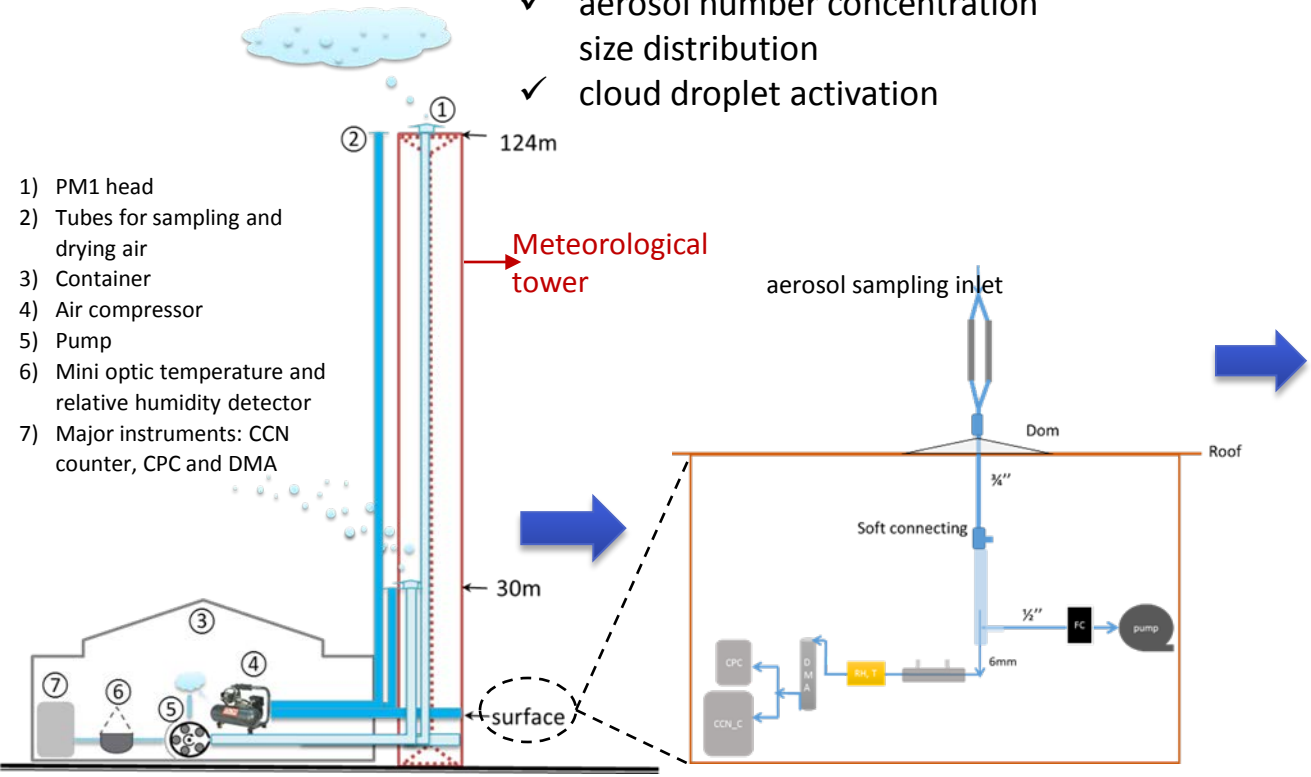
In-situ aerosol measurements

ITaRS
Initial Training for atmospheric Remote Sensing

Aerosol measurement set-up

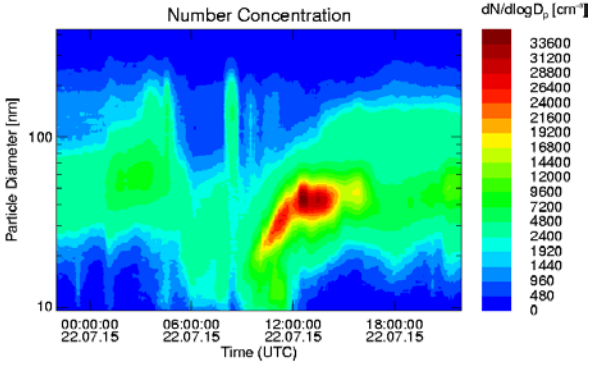
Measurements:
- ✓ aerosol number concentration size distribution
- ✓ cloud droplet activation

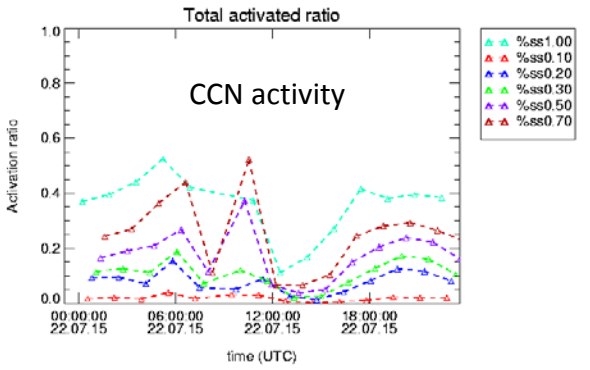
1) PM1 head
2) Tubes for sampling and drying air
3) Container
4) Air compressor
5) Pump
6) Mini optic temperature and relative humidity detector
7) Major instruments: CCN counter, CPC and DMA



Results on 22nd July 2015

Aerosol size distribution

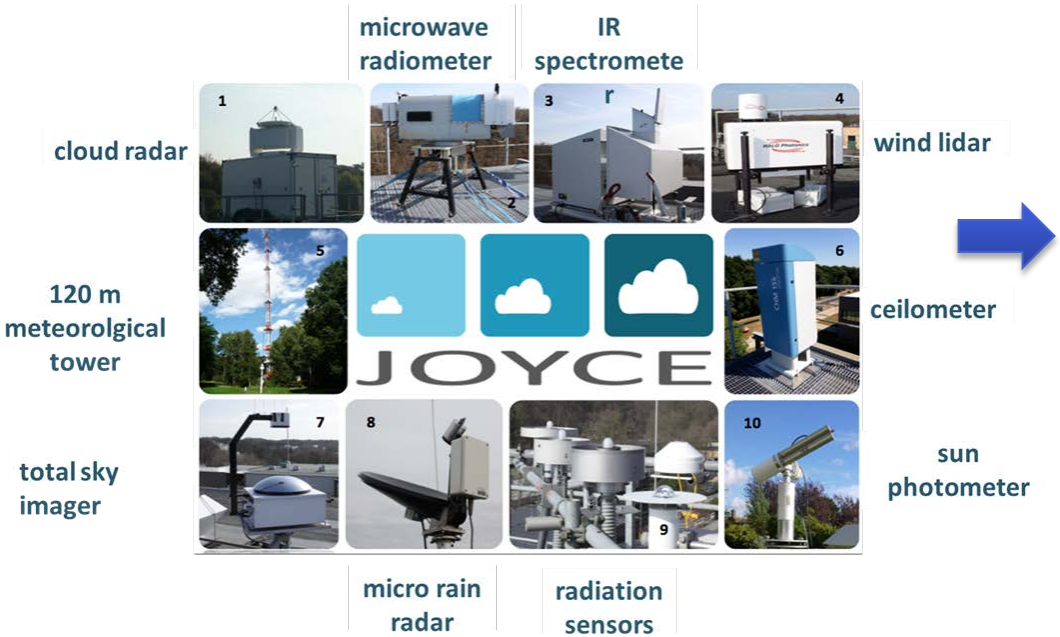




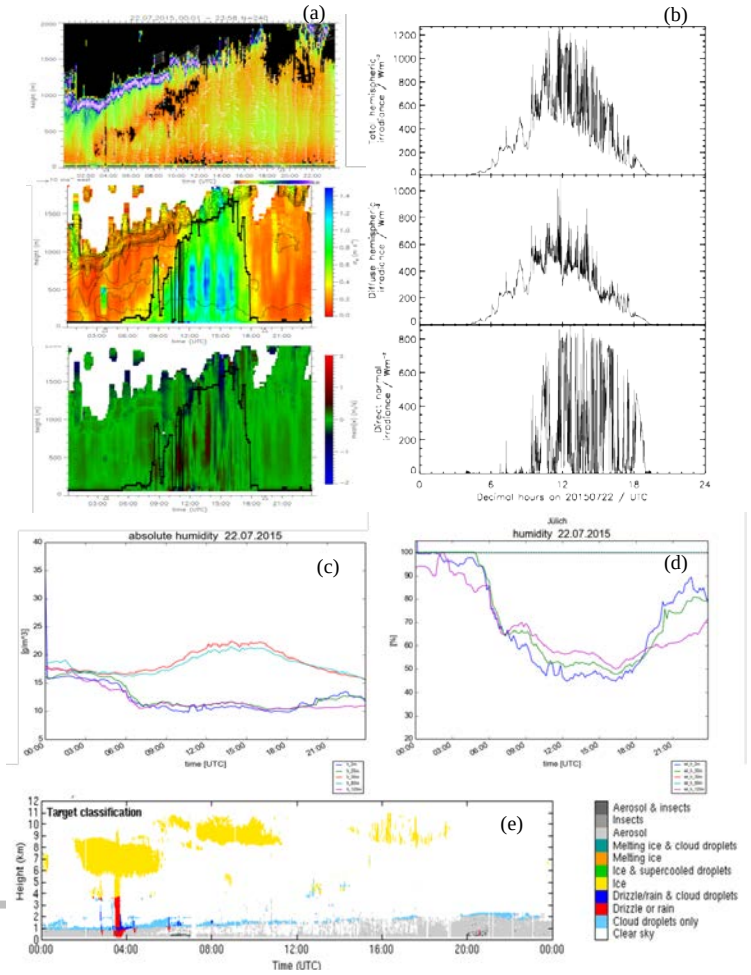
Cloud remote sensing

ITaRS
Initial Training for atmospheric Remote Sensing

JOYCE remote sensing observertory

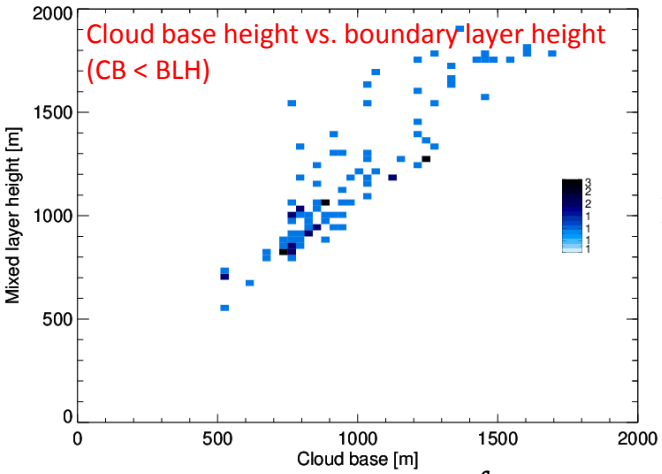


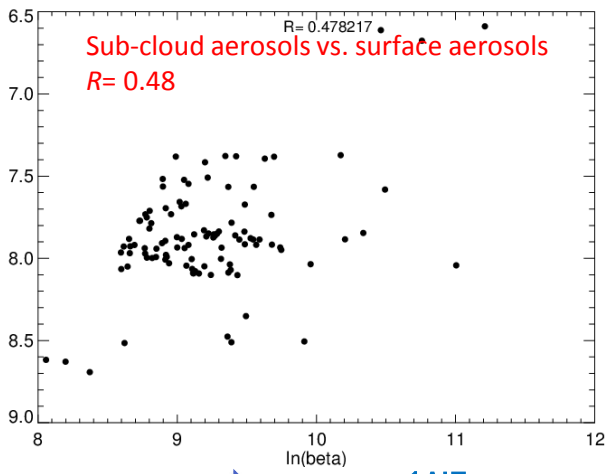
Results on 22nd July 2015

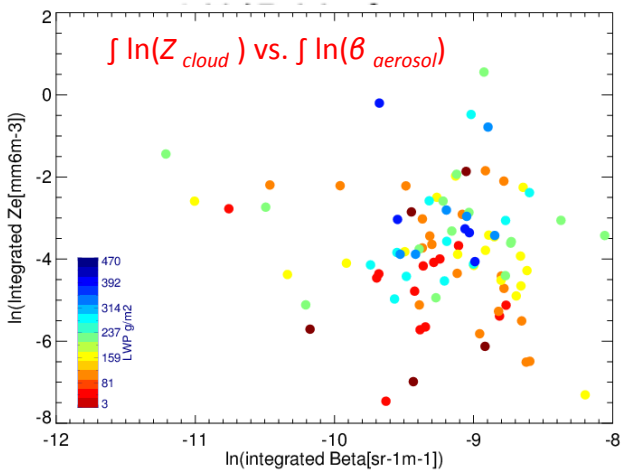


(a) Doppler Lidar measuring the wind field (up: wind speed and direction; middle: vertical wind standard deviation (ABL height); lower: mean vertical wind speed (distinguish updraft and downdraft)), (b) MFRSR measuring the broad band solar radiation, and the humidity sensors on the meteorological tower measuring the (c) absolute and (d) relative humidity at 2 m and 20 m surface heights (blue and green lines). Besides, (e) Cloudiness and cloud type are provided by CloudNet classification.

1st Aerosol indirect effect: results



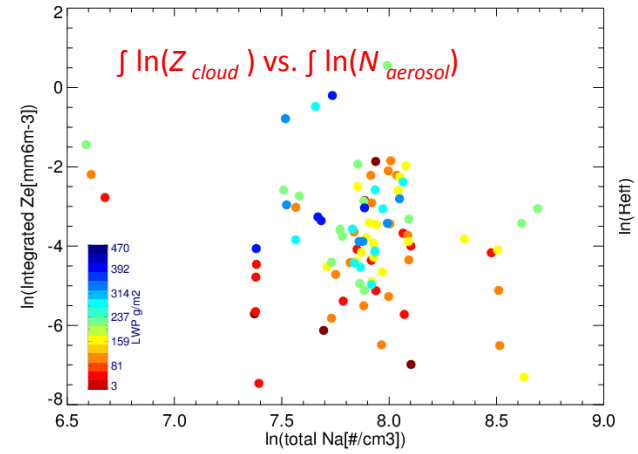


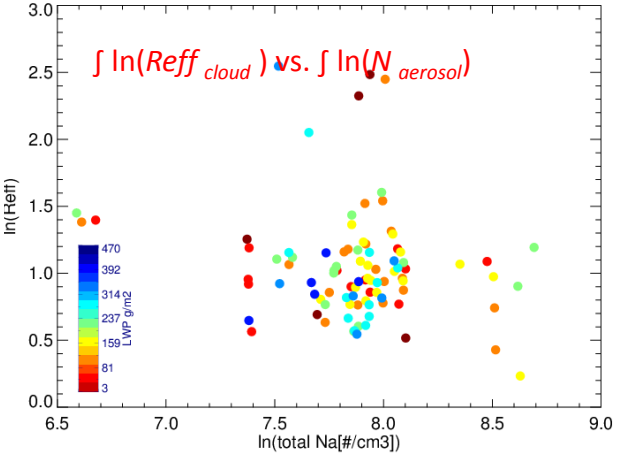


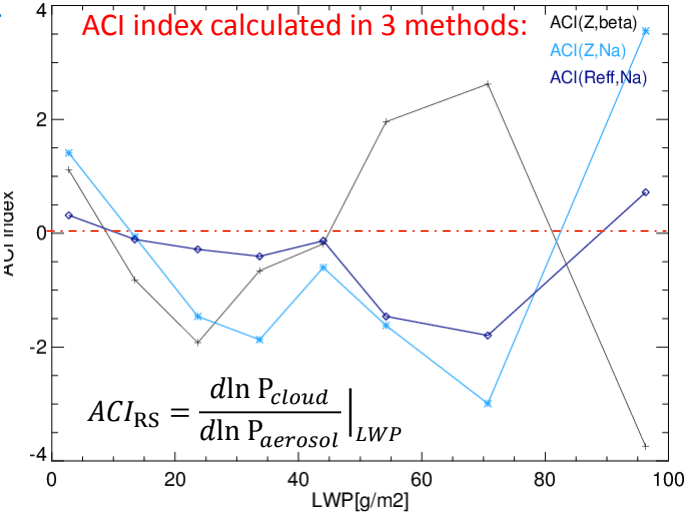
$$Z = \int N_c(d_c) \cdot d_c^6 dd_c \qquad \beta = \int N_a(d_a) \cdot \pi \cdot d_a^2 \cdot Q_{sc} dd_a$$

1AIE

Na ↑, dp ➔ Nc↑, dc↓







$$ACI_{\mathrm{RS}} = \left.\frac{d\ln \mathrm{P}_{cloud}}{d\ln \mathrm{P}_{aerosol}}\right|_{LWP}$$

Add logo

Conclusions

ITaRS
Initial Training for atmospheric Remote Sensing

- The ground-based remote sensing can observe 1AIE but depends on the cloud type
- The set-up of in-situ aerosol measurements takes the most time of this project. The important step of the tower measurements is to test the set-up of the aerosol instrumentation on the surface level. A new particle formation event is captured by the in-situ surface aerosol measurements shown in a case study.
- Further improvement of the in-situ measurements needs to be achieved by the meteorological tower aerosol and CCN in-situ measurements at 30 and 120 m. Particularly, the comparisons of the three sampling heights will be critical for the results of ACI at local scale.

ITaRS
Initial Training for atmospheric Remote Sensing

Thank you for your attention