Cloud condensation nuclei (CCN) measurements during ACRIDICON-CHUVA

M. L. Krüger[1], C. Pöhlker[1], T. Klimach[1], H. M. J. Barbosa[2], B. Nillius[1], D. Rose[3], S. Mertes[4], P. Artaxo[2], M. O. Andreae[1], U.Pöschl[1]

m.kruger@mpic.de

1 Max Planck Institute for Chemistry, 55020 Mainz, Germany

2 Institute of Physics, University of São Paulo, São Paulo 05508-900, Brazil
3 Institute for Atmospheric and Environmental Sciences, Goethe University Frankfurt am Main, 60438 Frankfurt am Main, Germany
4 Institut for Tropospheric Research, Leipzig, Germany

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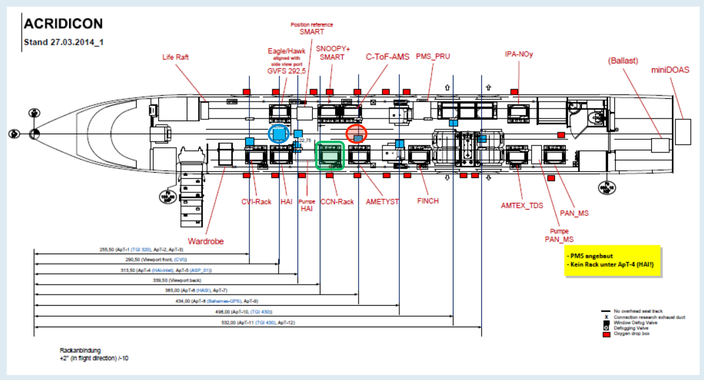
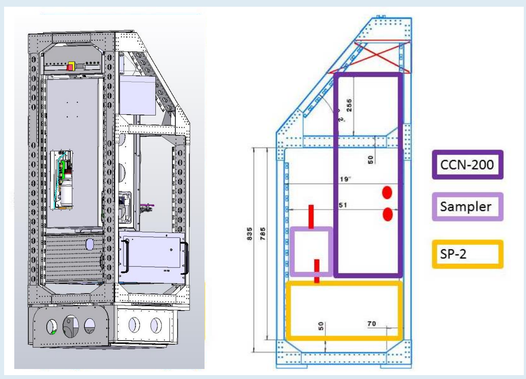
Aircraft measurements (Sep. 2014):

HALO aircraft



CCN-Rack ○ CVI Inlet ○ HASI Inlet

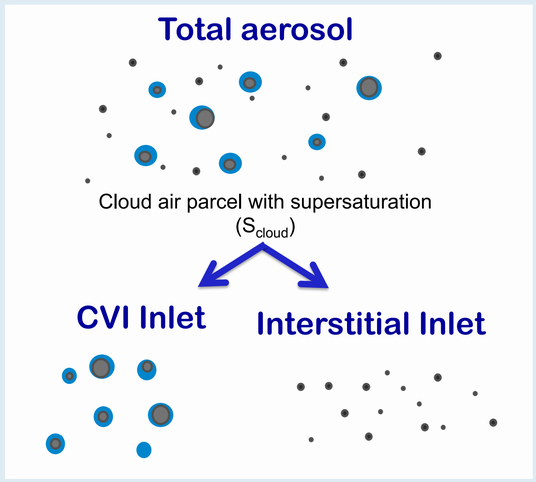


CCN-Rack

Two different aerosol inlets:

- **CVI inlet:** The counterflow virtual impactor (CVI) inlet selects large particles, including liquid and frozen cloud droplets (clouds).

  → Evolution of convective clouds



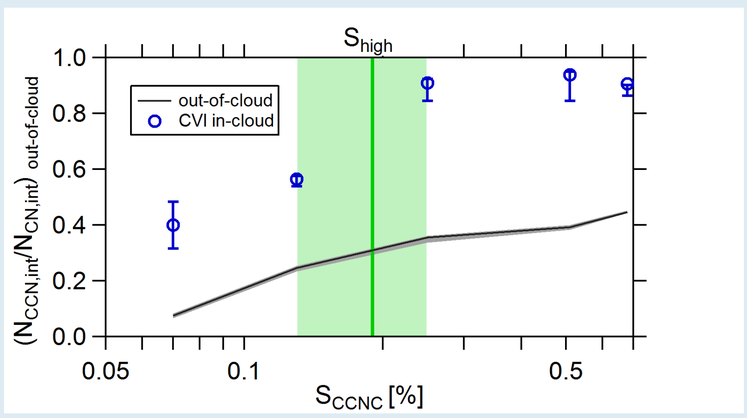
- **Interstitial inlet:** HASI inlet, selects only small particles, which could not act as CCN or IN (aerosols) for in-cloud conditions.

  → Evolution of convective clouds

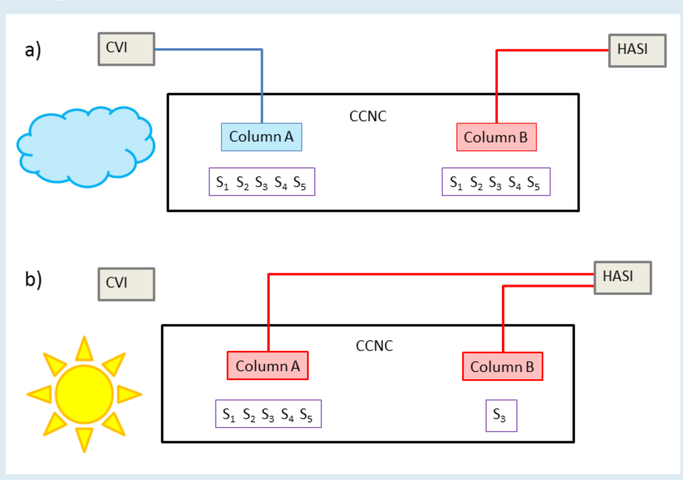
- **Total aerosol inlet:** HASI inlet, total aerosol inlet for out-of-cloud conditions.

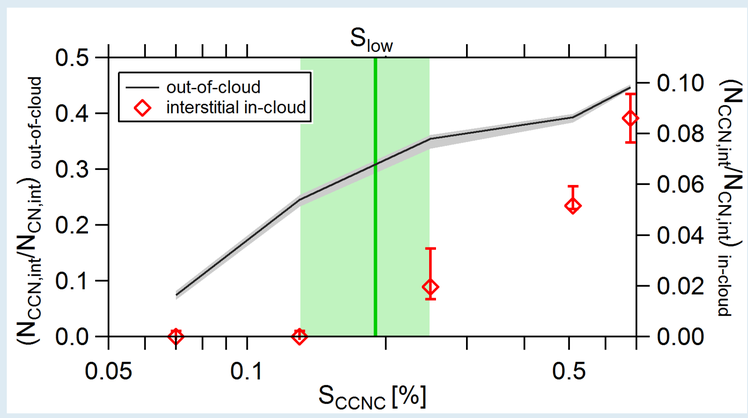
  → Different between frosted and defrosted areas
  → Anthropogenic influence
  → Biomass burning

Estimates for the lower and upper bounds (S_{high}, S_{low}) of peak supersaturation by CCN measurements during in-cloud conditions:



Data from ACRIDICON-Zugspitze campaign, 19.Sep. 2012





Data from ACRISICON-Zugspize Campagne, 19.Sep. 2012

Assessment of S_{high}(CCNC):

lowest S value with N_{CCN}/N_{CN} =1 for all diameters.

S_{high}(CCNC) = 0.13% - 0.25%

Measurement strategy:

In-cloud-conditions: measurements at both inlets changing S at both columns.

Out-of-cloud-conditions: measurements only at HASI inlet changing S at one column.

Assessment of S_{low}(CCNC):

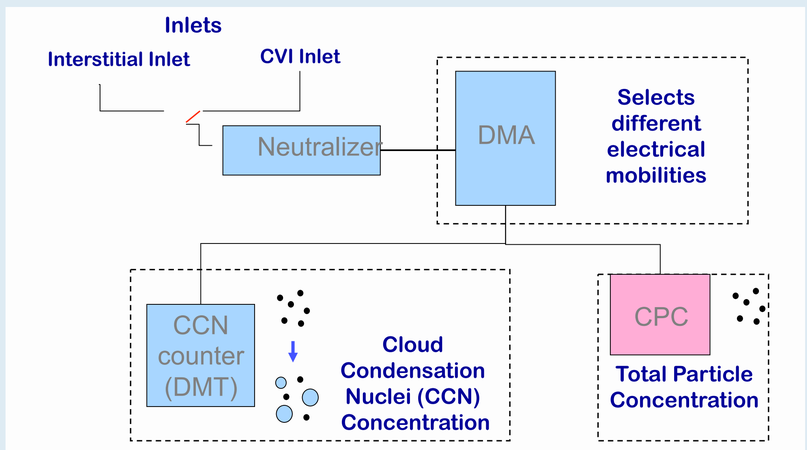
the lowest S_{CCNC} level at which significant activation of interstitial particles is observed.

S_{low}(CCNC) = 0.13% - 0.25%

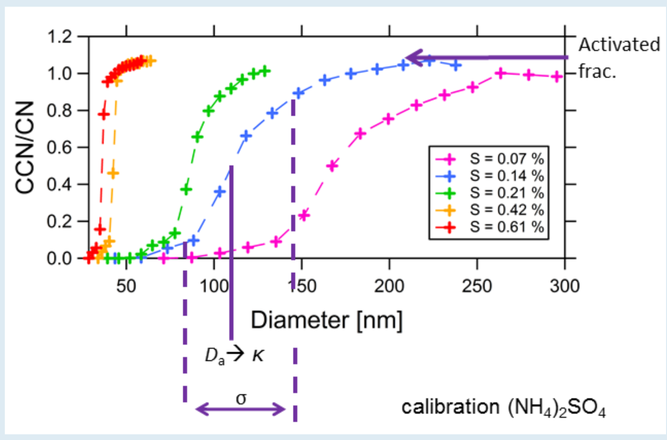
Krüger et al. (AMTD, 2013)

Ground-based size-resolved CCN measurements (since March 2014):

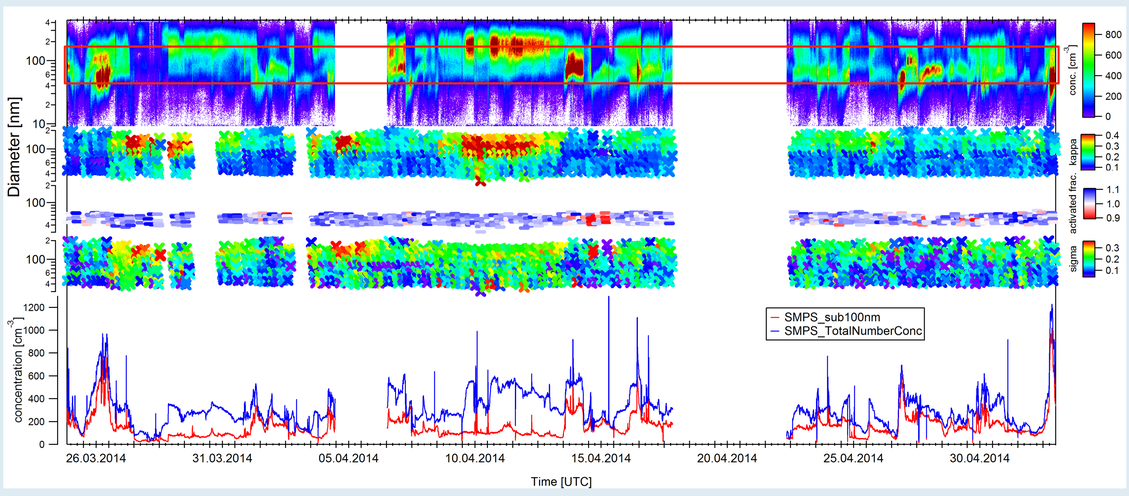
Brazil, Amazonian Rainforest, ATTO, Container 4



Measurement Setup



Activation curve



Results from the first month

Interpretation of Results:

- Two modes visible in SMPS data and κ
  → intensive peak of large particles mainly sea salt with organic coating
  → Peak of small particles seems to be pure organic (biogenic)

- Activated fraction ~ 1
  → no significant amount of soot particles

- Lager κ values are correlated with slightly higher σ values
  → more heterogeneous mixing for sea salt events
  → more homogeneous mixing for the events with lager numbers of small particles