Comparison of CCN activity measured in pristine and polluted sites during the Intensive Operation Periods (IOP) of the GoAmazon 2014 campaign

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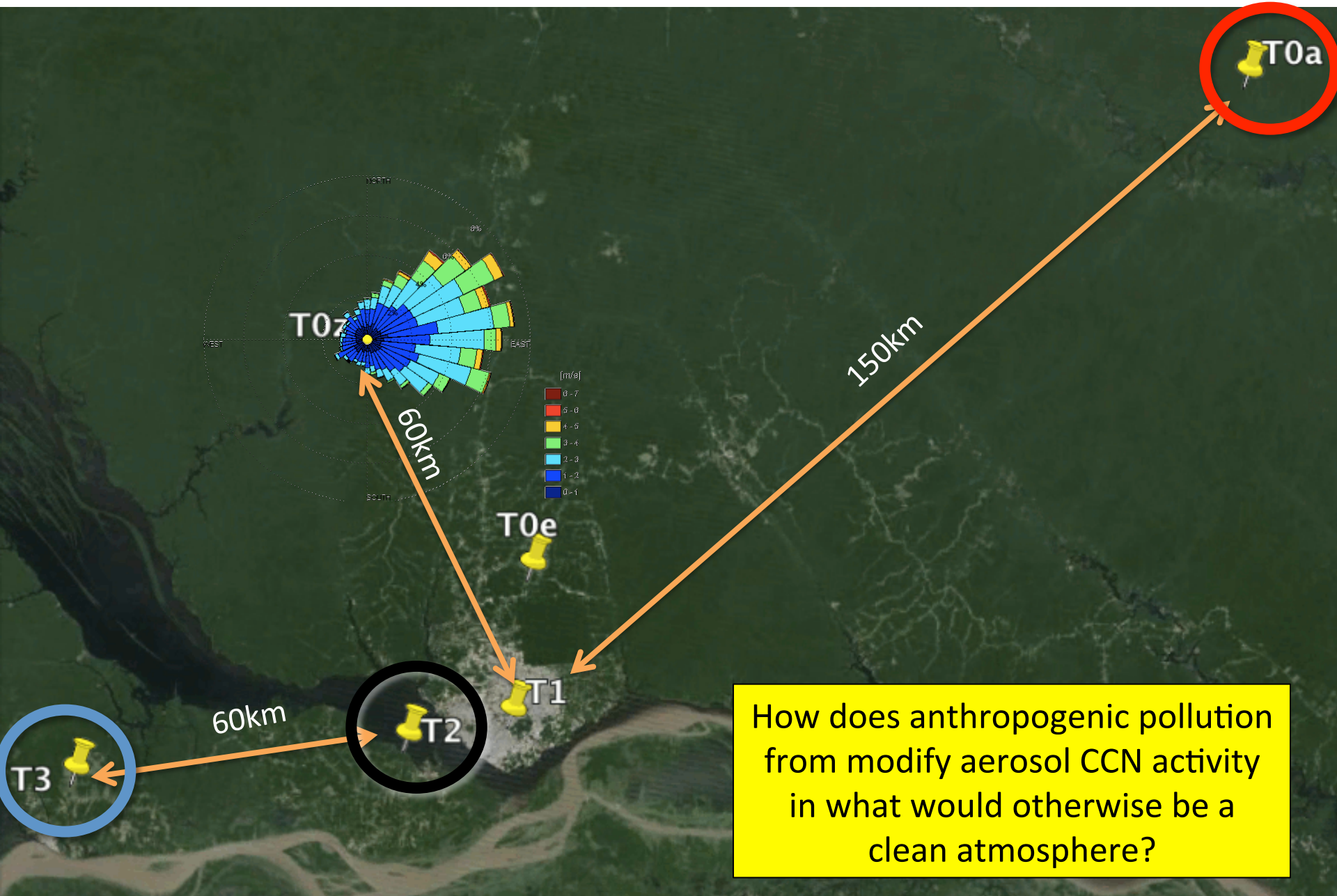
AGU Fall Meeting 2014
San Francisco, December 15th

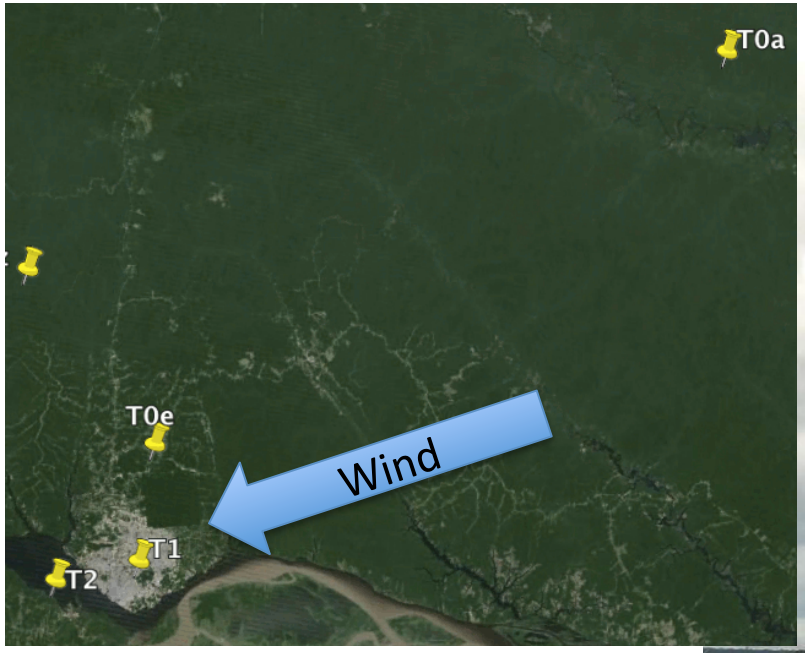
The Amazon region

- susceptible to changes in number-diameter distributions
- a regime of cloud properties highly sensitive to aerosol microphysics

Experimental Sites



T0a site – 150km upwind



- Not affected by Manaus plume
- Affected by long-range BB

Photos: ATTO team

T2 site – 5km downwind

Photo: P. Artaxo

- Most of the time in near-field Manaus plume
- Affected by long-range BB

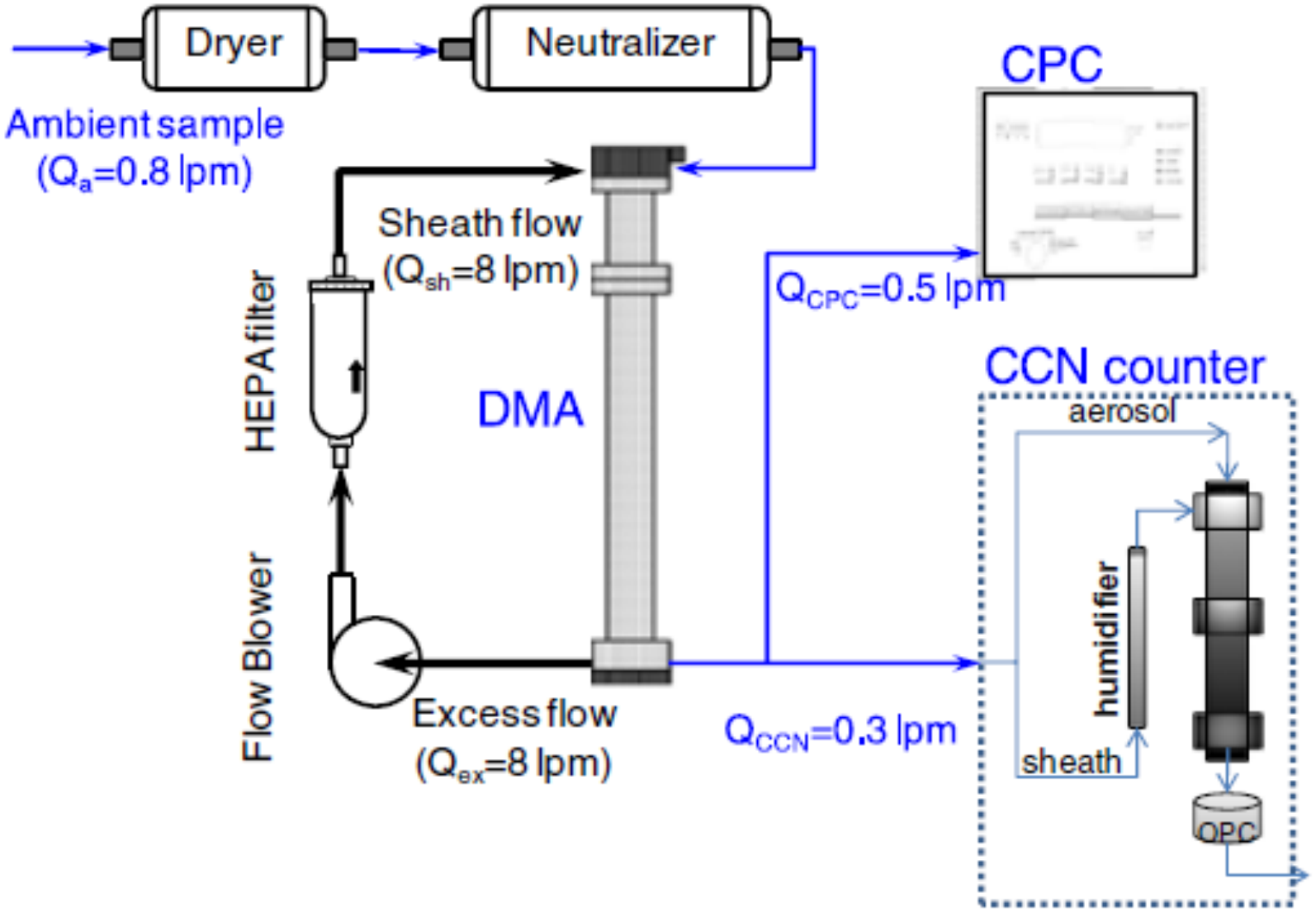
T3 site – 70km downwind

Photo: H. Barbosa

Photo: J. Beat

- Mixed medium-field Manaus aged plume and clean conditions
- Affected by long and short-range BB

SCCN Instrument

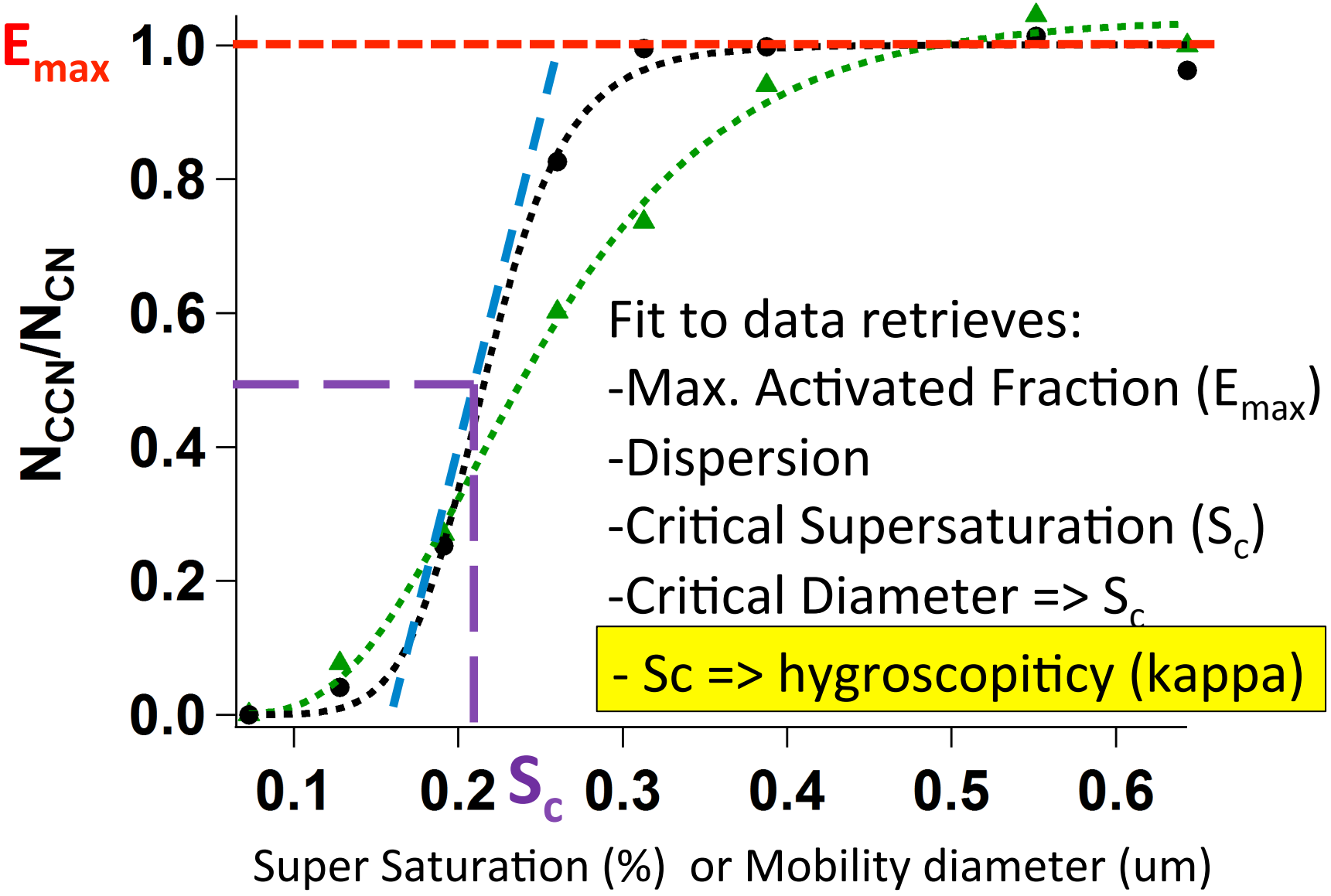


Instrument Setups

For CCN results from T3 see:
Poster A23A-3199
R. Thalman et al
Tuesday, 01:40 PM
Moscone South

- T3, 70km downwind, 10/Mar/14 to 28/Feb/15
  - Fix size, scan SS (changing Temp & Flow)
  - Long DMA
- T2, 5km downwind, 15/Sep/14 to 28/Feb/15
  - Fix SS, scan size
  - Long DMA
- T0, 150km upwind, 1/Apr/14 to …
  - Fix SS, scan size
  - Nano DMA (different transfer function)

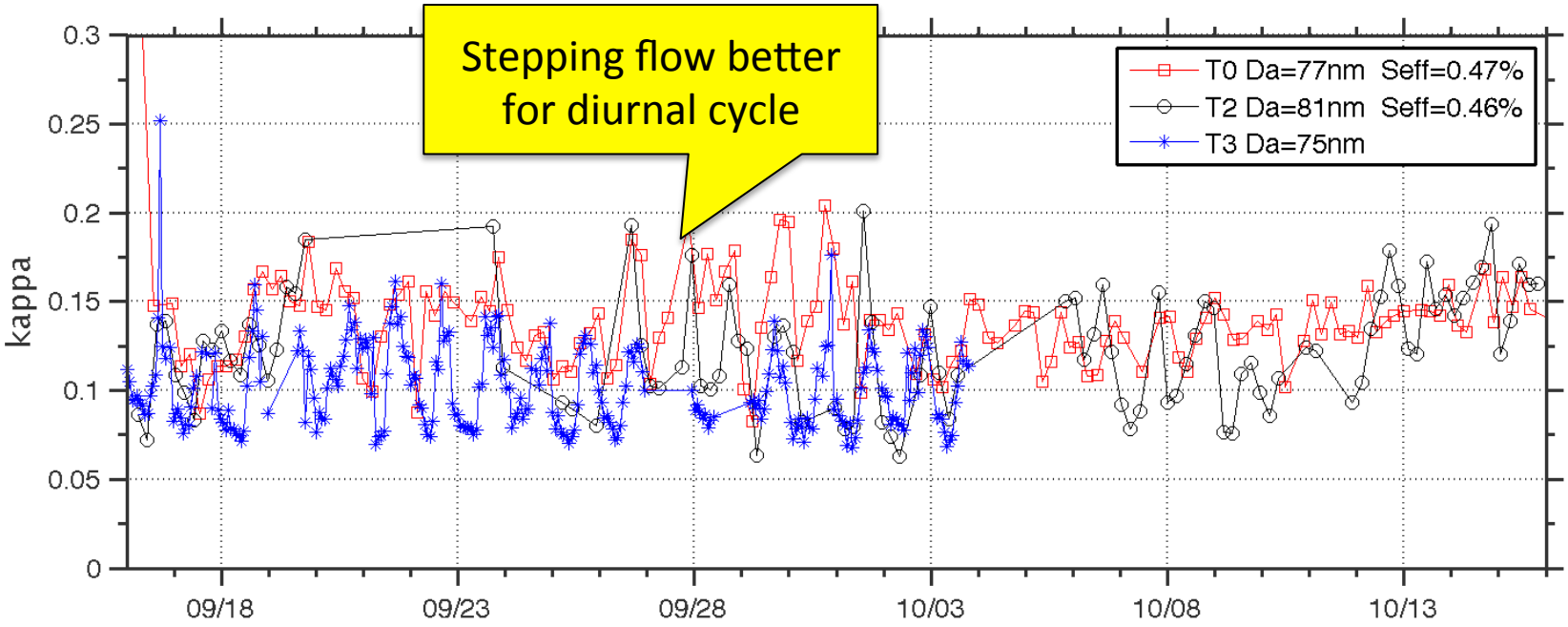
Sample Particle Activation at 142 nm



For IOP2, dry season – High SS

Differences compatible with different Sc

	D_c	S_c	Kappa
T0	77 nm	0.47 %	0.14±0.03
T2	81 nm	0.46 %	0.12±0.03
T3	75 nm	0.57 %	0.10±0.04

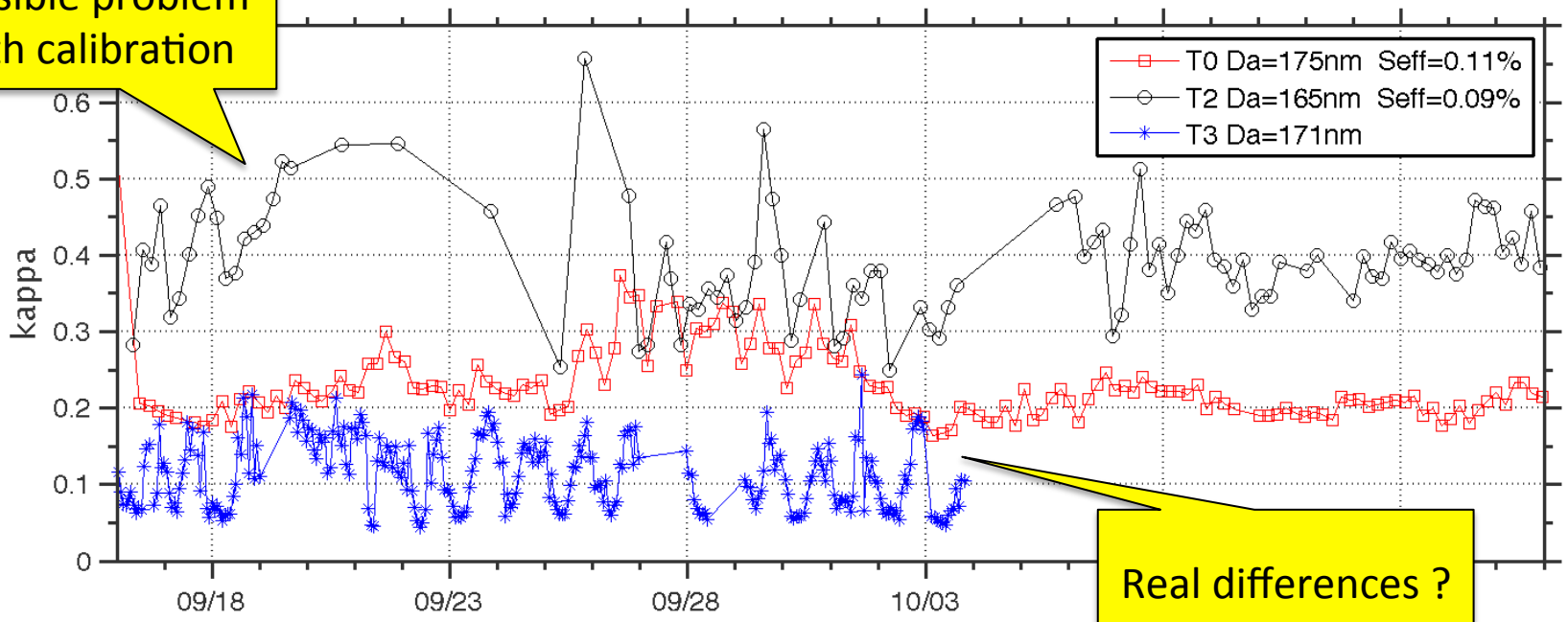


Preliminary data

For IOP2, dry season – Low SS

	D_c	S_c	Kappa
T0	175 nm	0.11 %	0.22±0.05
T2	165 nm	0.09 %	0.39±0.07
T3	171 nm	0.16 %	0.11±0.04

Possible problem with calibration

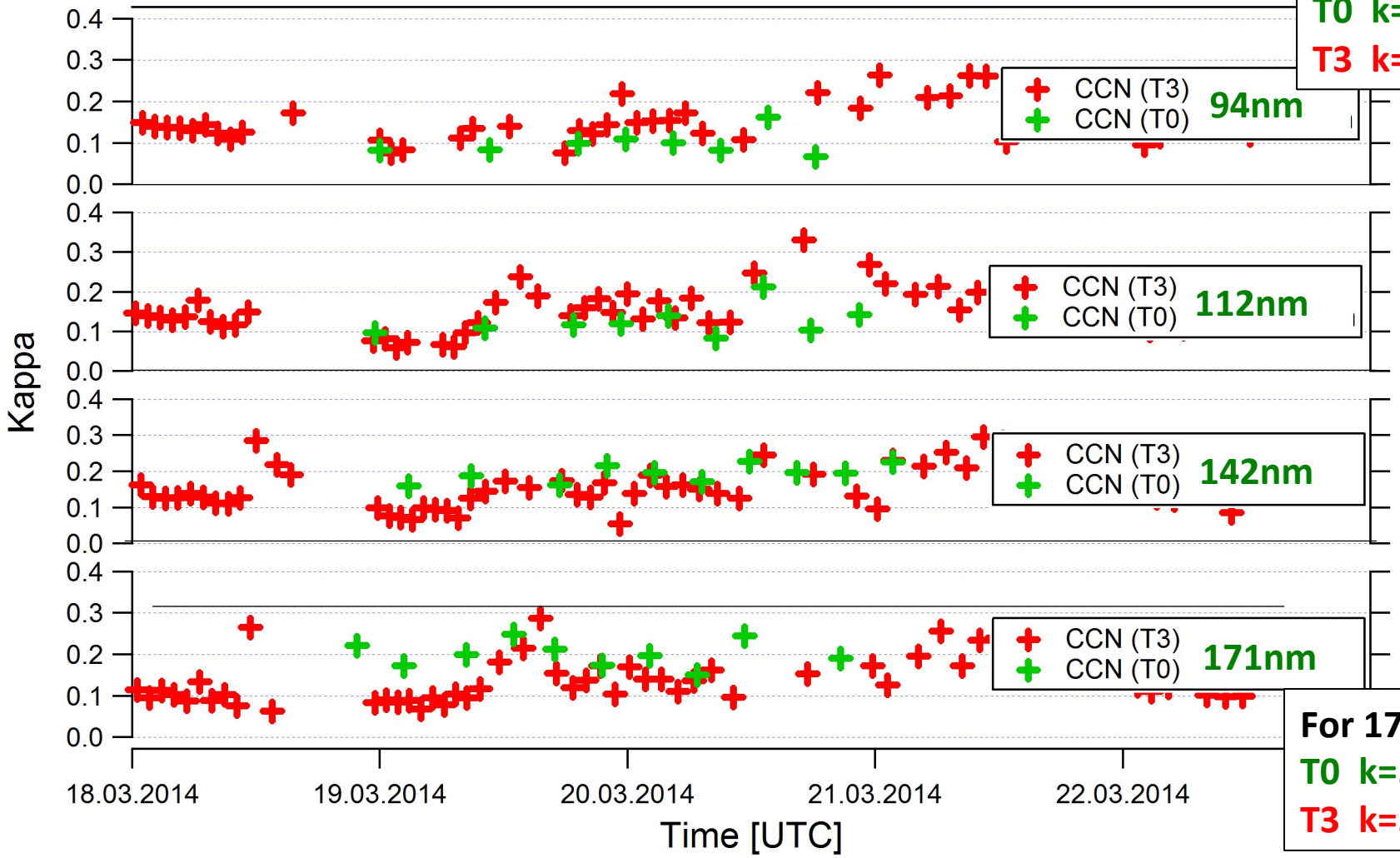


Real differences ?

Preliminary data

Instrument Comparison @ T3, Mar/14

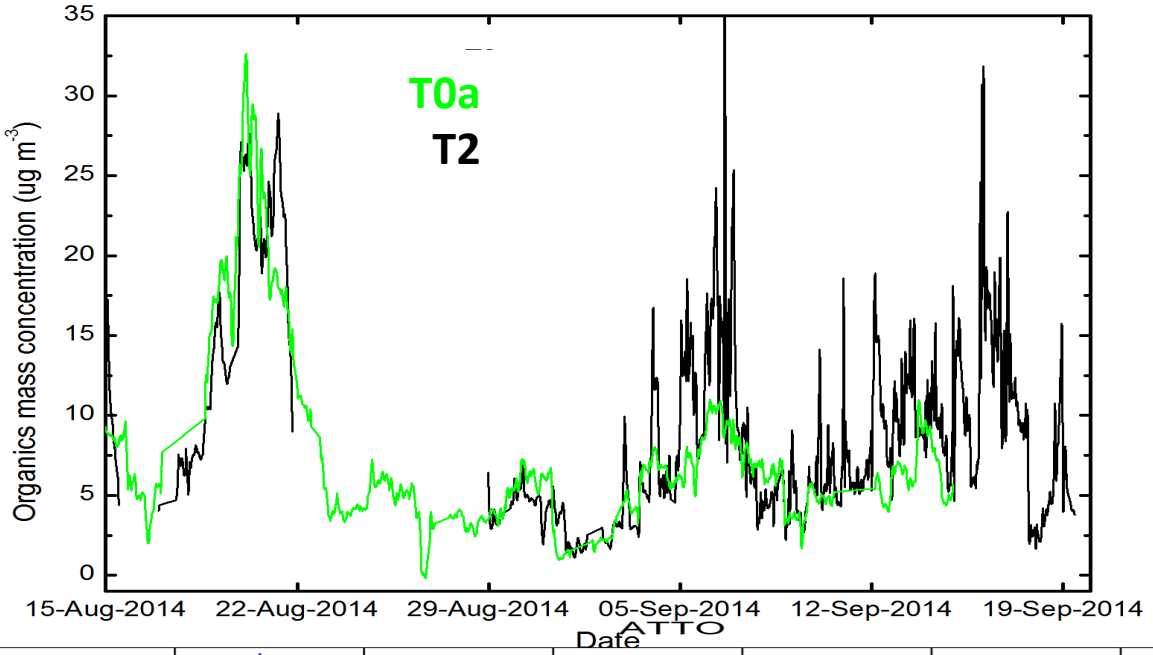
Kappa obtained while sampling from same inlet



Preliminary data

OA concentration – IOP2

Preliminary data



Aerosols at T2
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Aerosols at T0
Poster A23A-3189
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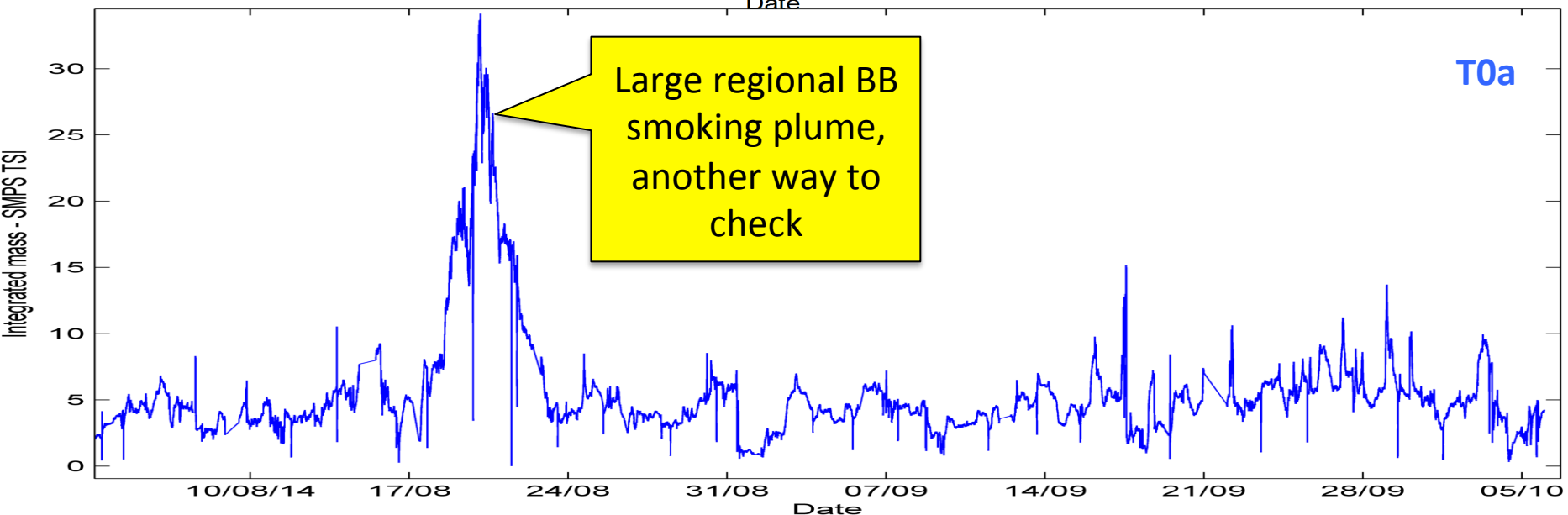
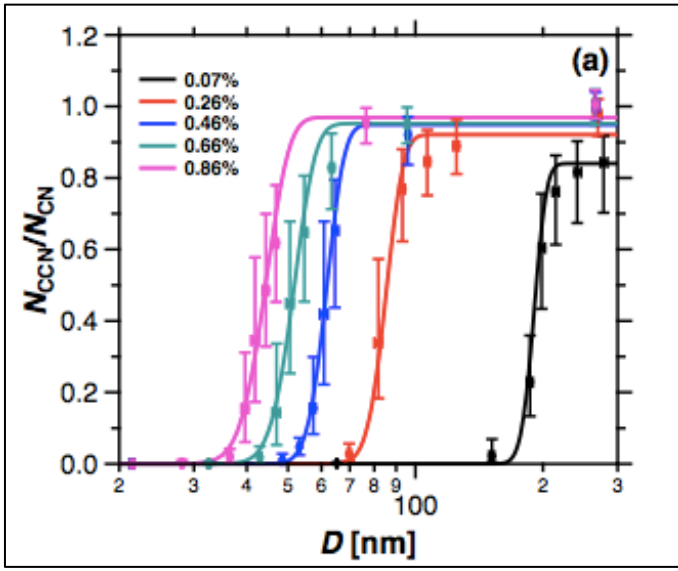
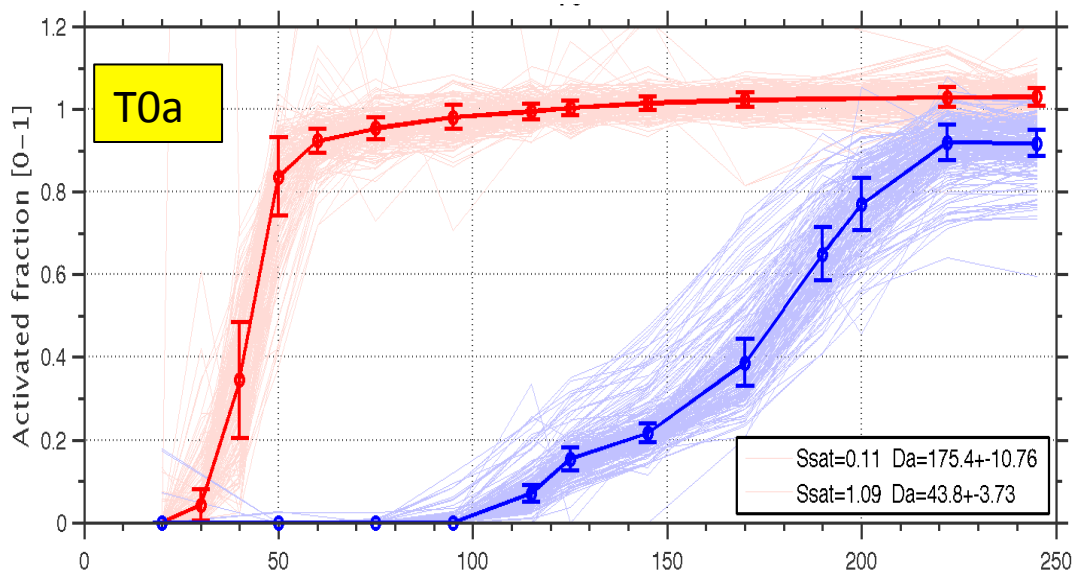
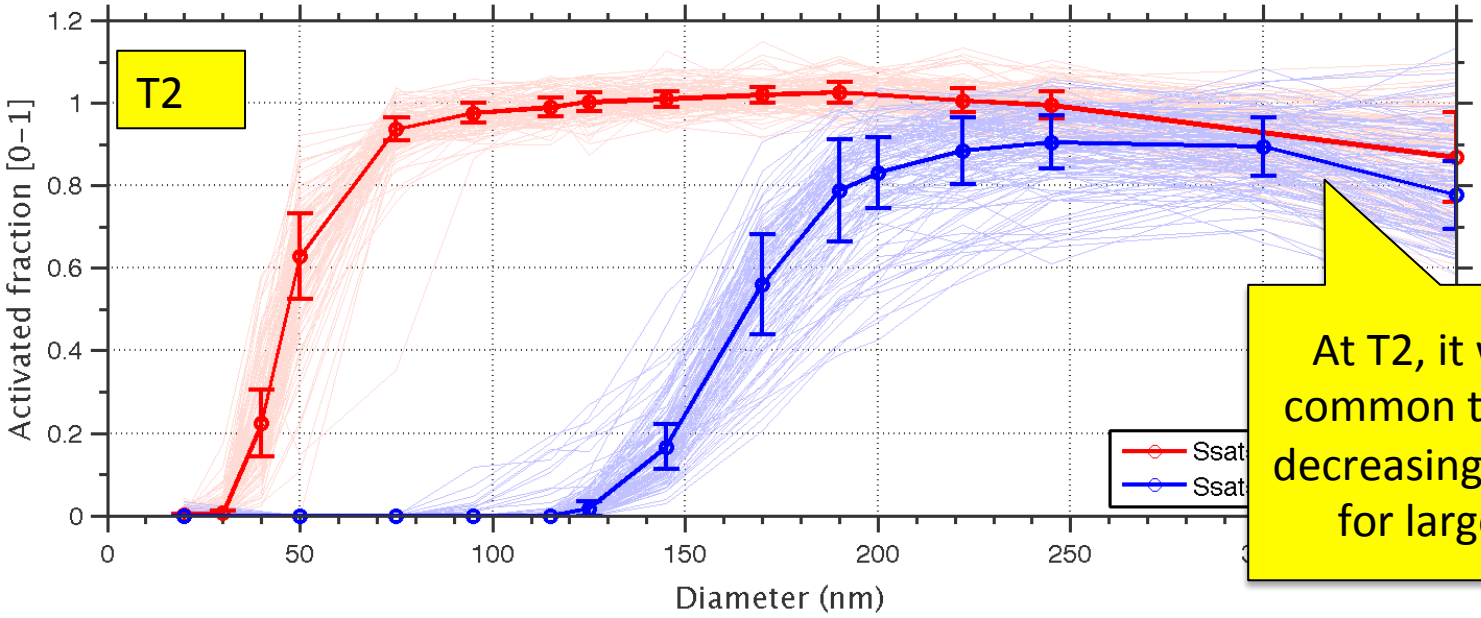


IOP2, Sep 16-Oct 16 - Activated Fraction

Gunthe et al, ACP 2011





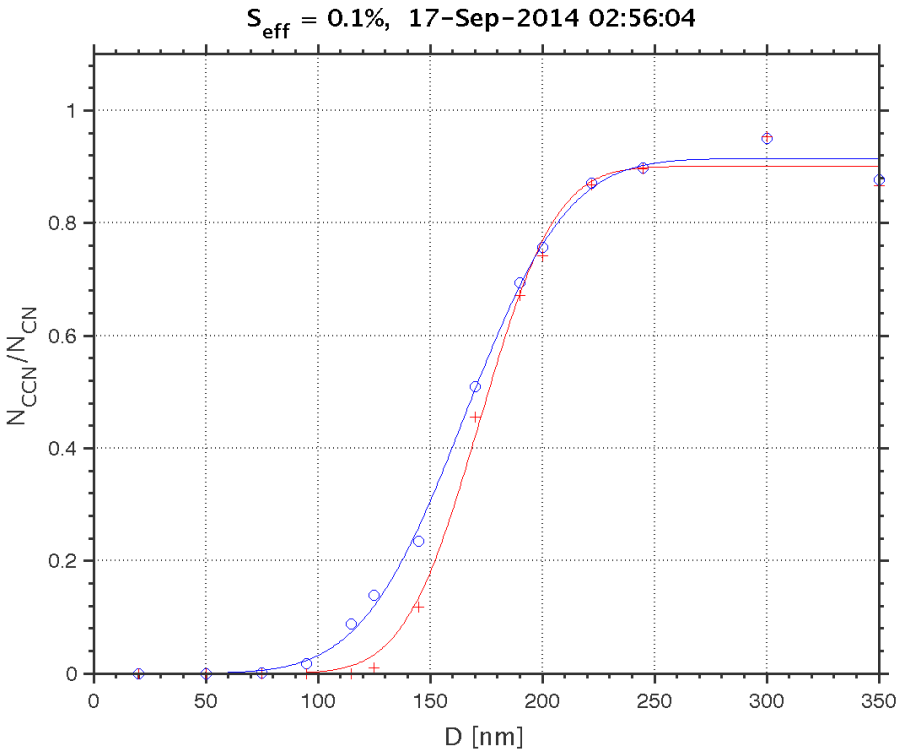


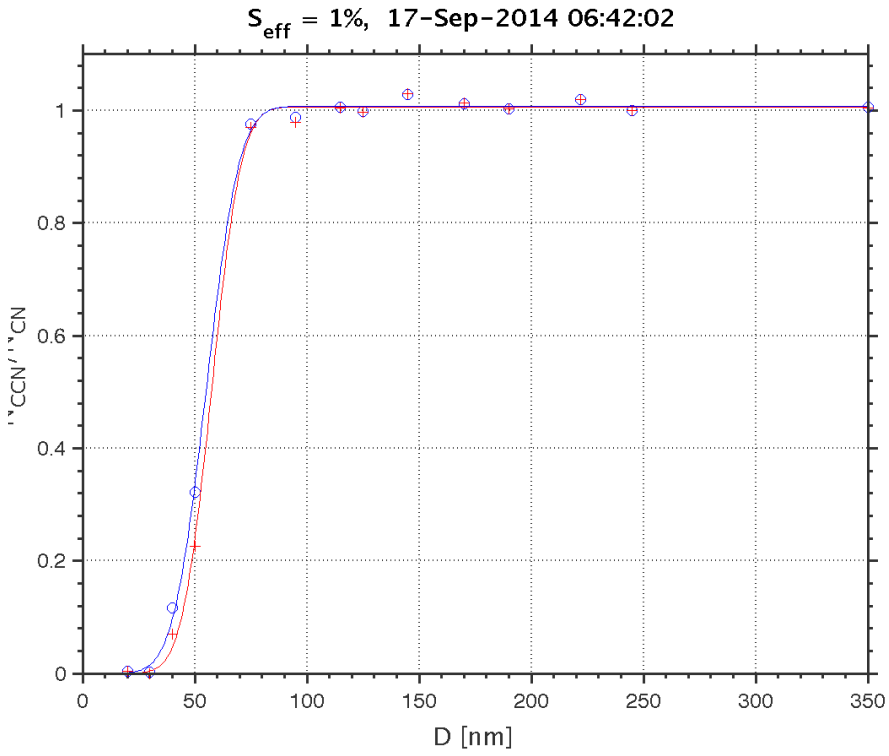
Preliminary data

At T2, it was very common to observe decreasing activation for larger sizes

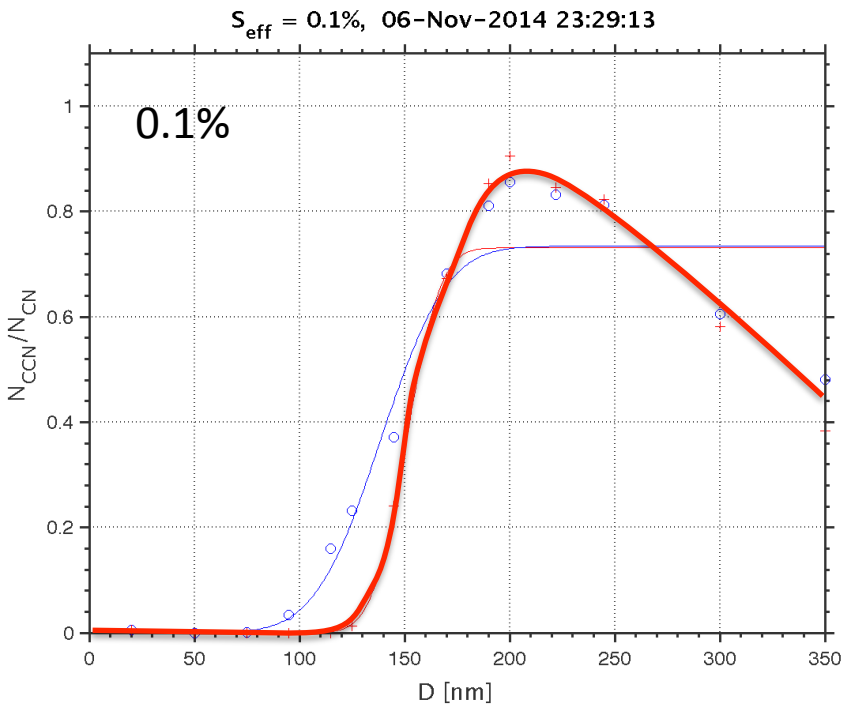
Not systematic error

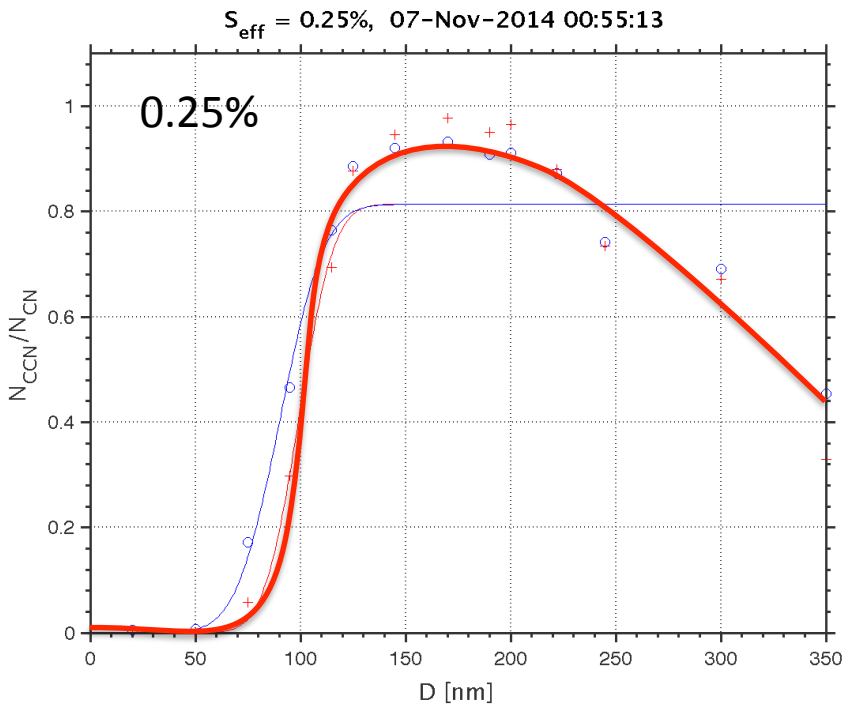
- We have many flat activation curves

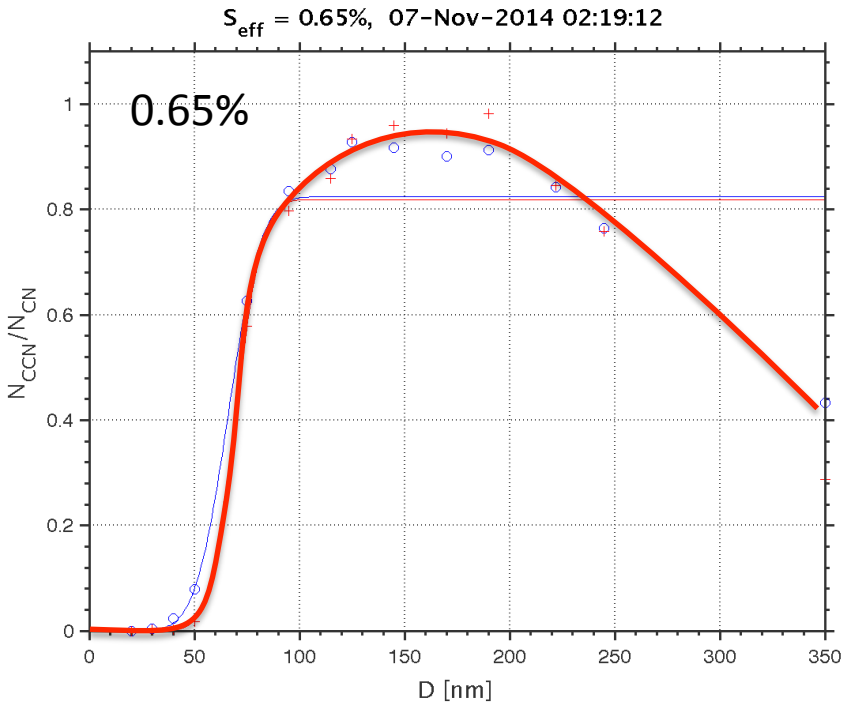




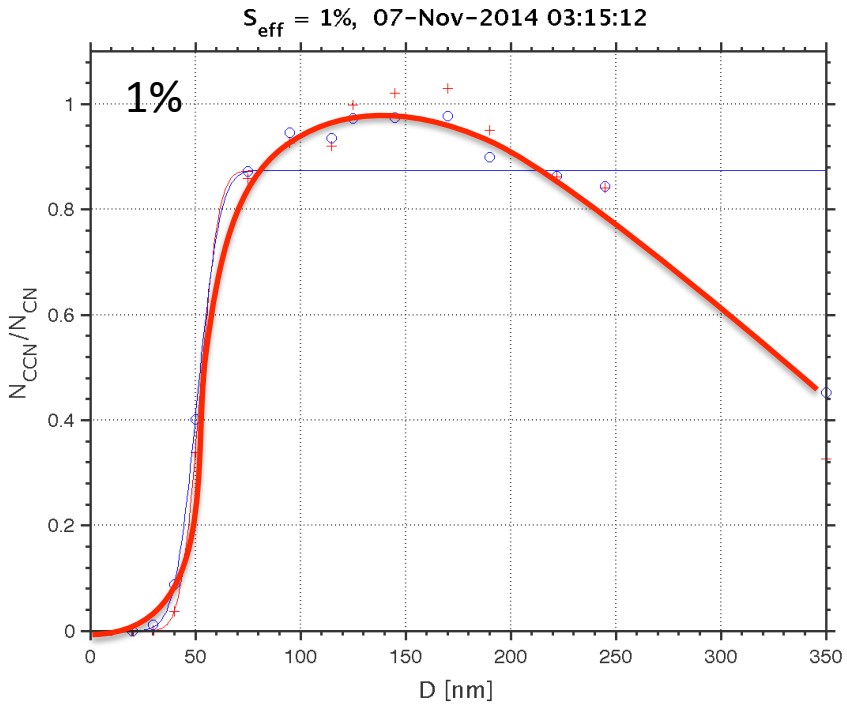
Preliminary data



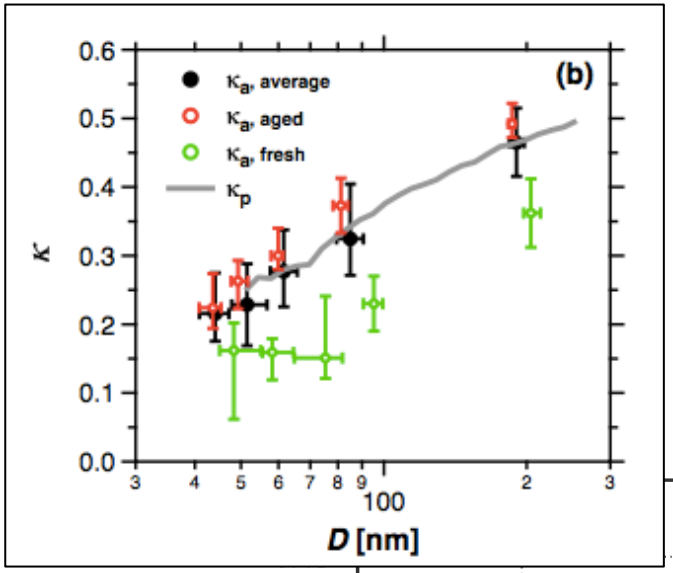




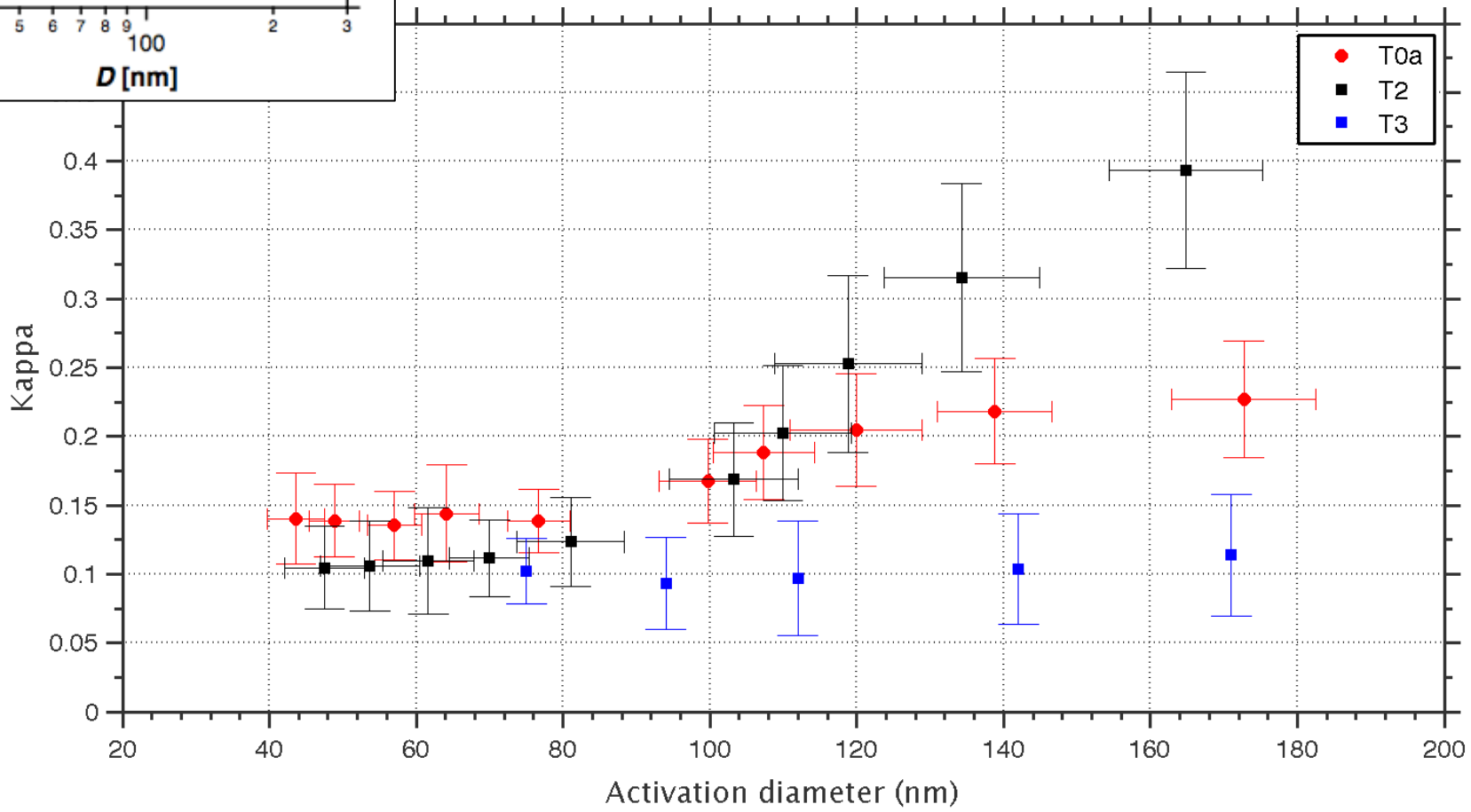
Preliminary data



Gunthe et al, ACP 2011

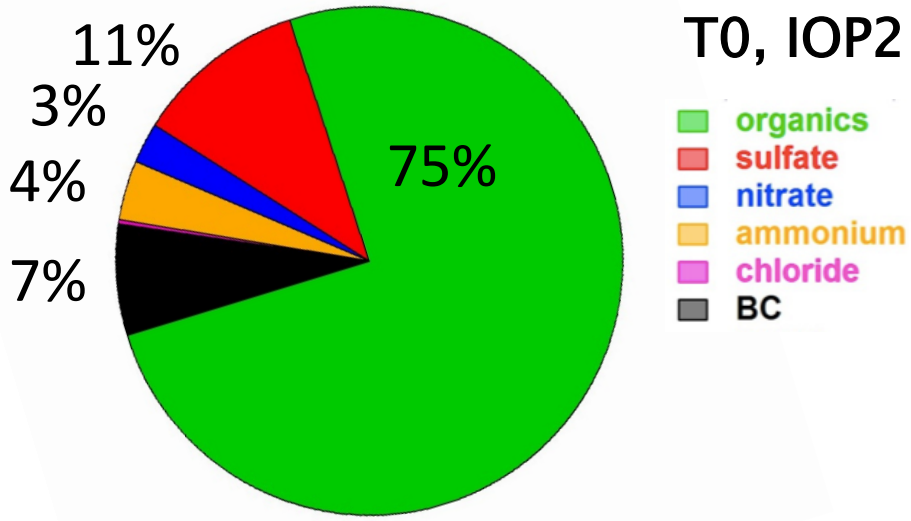


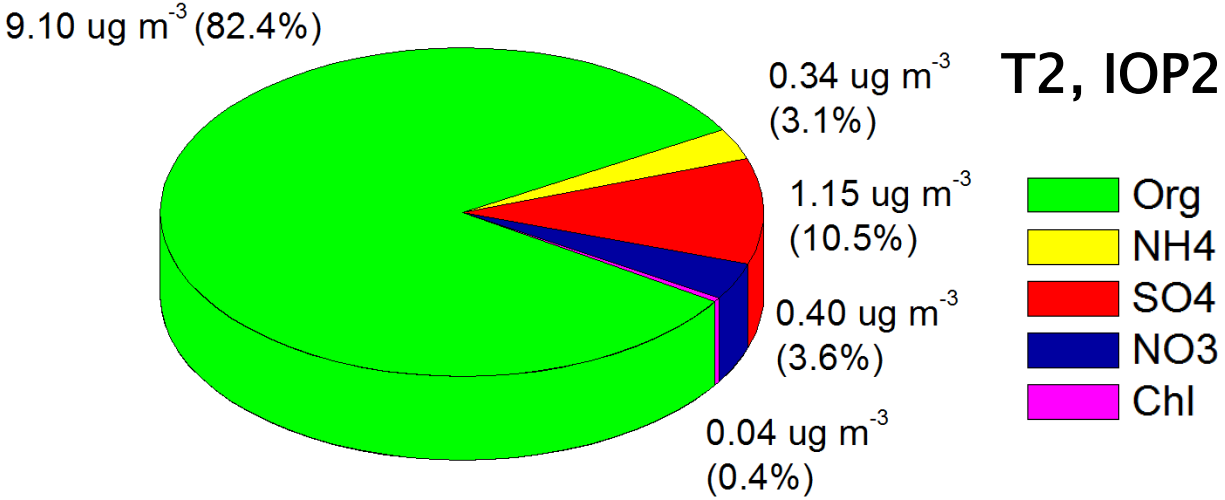
Kappa x Activation Diameter
IOP2, Sep 16-Oct 16



Preliminary data

… we need to look into composition, etc…





Aerosols at T0
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Aerosols at T3
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Aerosols at T2
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Preliminary Conclusions – IOP2

- Unprecedented comprehensive datasets of CCN activity are being collected during GoAmazon 2014/15;
- T3: same hygroscopiticy for all sizes
- T2: signs of fresh plume and occasional large particles that don't activate
- T0: well mixed and aged aerosol

- Data would not be useful without on-site calibration AND instrument comparison
  - … Yet to understand differences between T0 and T3
  - … Yet to check calibration at T2
  - … Yet another side by side comparison is needed