establishing a connection between IASOA and the TROPOS cloud group - possible analysis for INP number concentrations based on filter samples taken in the Arctic

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- homogeneous freezing of water at $T < -38^\circ C$

$\rightarrow$ warm clouds ($T > 0^\circ C$)

$\rightarrow$ ice clouds ($T < -38^\circ C$)

$\rightarrow$ mixed phase clouds (-38°C < $T < 0^\circ C$):
  - precipitation formation
  - radiative effects
  - immersion freezing most important het. freez. process

$T < -38^\circ C$

$T = 0^\circ C$

CCN activation

Bergeron-Findeisen process

homogeneous ice nucleation

Hallett-Mossop process

aggregation

secondary ice formation

scattering of light

supercooled droplets

melting

precipitation

aerosol including CCN and INP (cloud condensation nuclei and ice nucleating particles)
- homogeneous freezing of water at $T < -38^\circ C$

-> warm clouds ($T > 0^\circ C$)
-> ice clouds ($T < -38^\circ C$)

- mixed phase clouds ($-38^\circ C < T < 0^\circ C$):
  - precipitation formation
  - radiative effects
  - immersion freezing most important het. freez. process

Currently, we are interested in determining atmospheric number concentrations of INP

- aerosol including CCN and INP (cloud condensation nuclei and ice nucleating particles)
filter samples for off-line analysis of Ice Nucleating Particles (INP) number concentrations ($N_{\text{INP}}$)

- high volume Digitel sampler
  - typically sampled onto quartz fiber filters

exists at Station Villum – also at other Arctic stations?

- low volume Digitel sampler
  - using polycarbonate filters
determining $N_{\text{INP}}$ from filter samples („INDA“)
(based on high volume filter samples, offline analysis at TROPOS)

each filter stance in 50\(\mu\)l water

tubes in a thermostat
detect ice nucleation during cooling
dark grey spot -> frozen tube

method first suggested in Conen et al. (2012)
determining $N_{INP}$ from filter samples („LINA“)
(based on low volume filter samples, offline analysis at TROPOS)

wash filters off in water

1μl droplets

automated detection

resulting in

$N_{INP}$ [L$^{-1}$ air]

$T$ [°C]
- \( N_{\text{INP}} \) one order of magnitude less per 5K T-increase

- at T < -20°C: INP are minerals

- at T > -20°C: biological INP

- biological INP can be:
  - bacteria
  - pollen
  - funal spores
  - algae
  - lichen
  - ...

- also observed in lakes, rivers and the ocean (more the colder the environment)

INP in surface micro layer: Wilson et al., 2015
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INP in surface micro layer: Wilson et al., 2015
my question / request

- At which of the Arctic stations were filter samples taken (ever, or even regularly, and with which sampling time and time resolution)?

- For existing filter samples, would you be willing to give me a punch (per filter, one of these punches with 2 cm diameter would be sufficient, or a 1.5cm x 1.5 cm piece)?

- Ideally, I would be interested in having samples from one or two different years covering different times / conditions during these years for as much of the Arctic region as possible!

- For those of you who say „yes“ to the two questions above:

Please tell me and then I‘ll discuss with you which samples and how to transport them!

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