Ice Nucleating Particles (INP) in the Antarctic region

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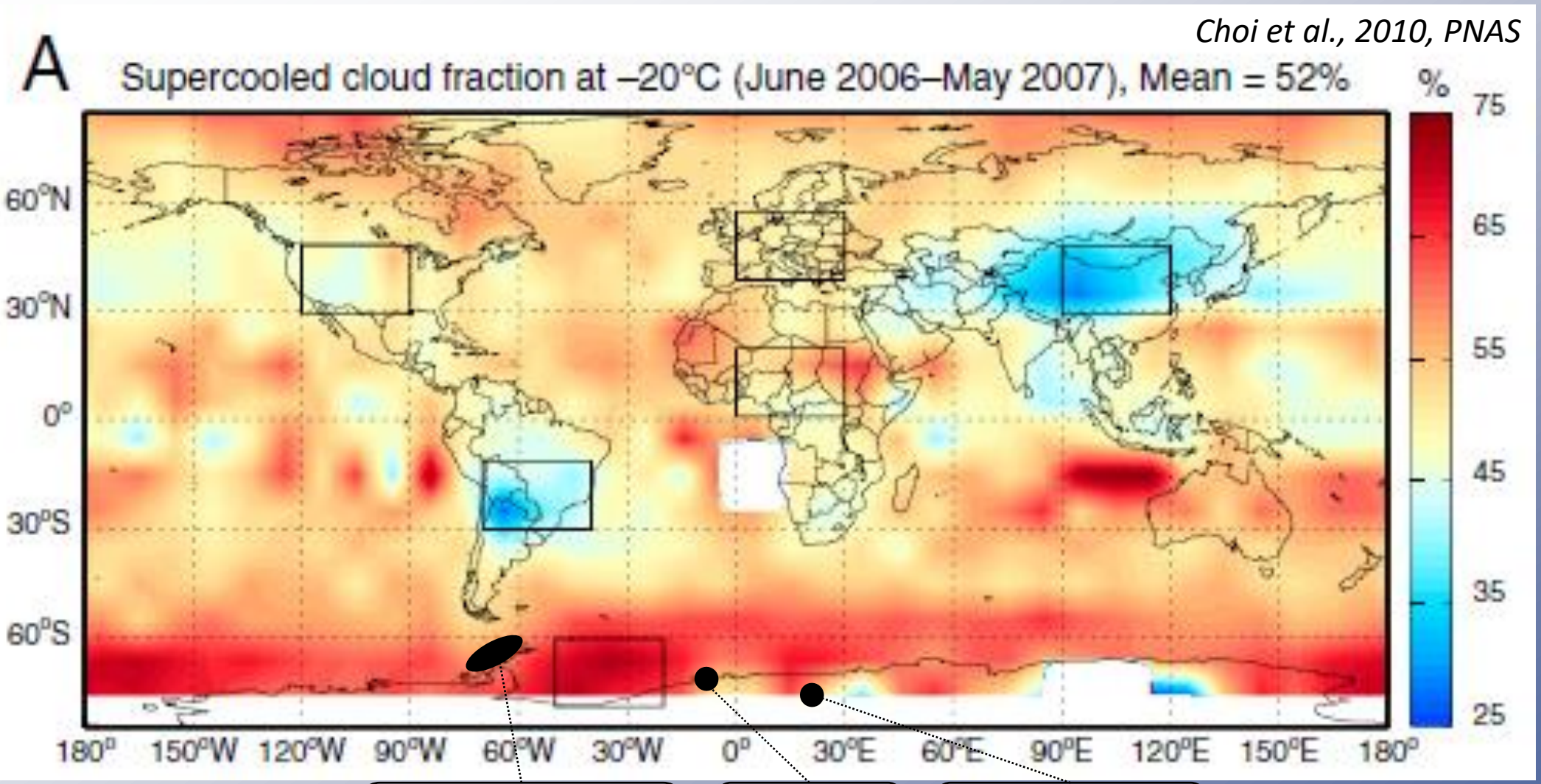
Leibniz Association

TROPOS
Leibniz Institute for Tropospheric Research

looking at the Southern Ocean / Antarctic region

Choi et al., 2010, PNAS



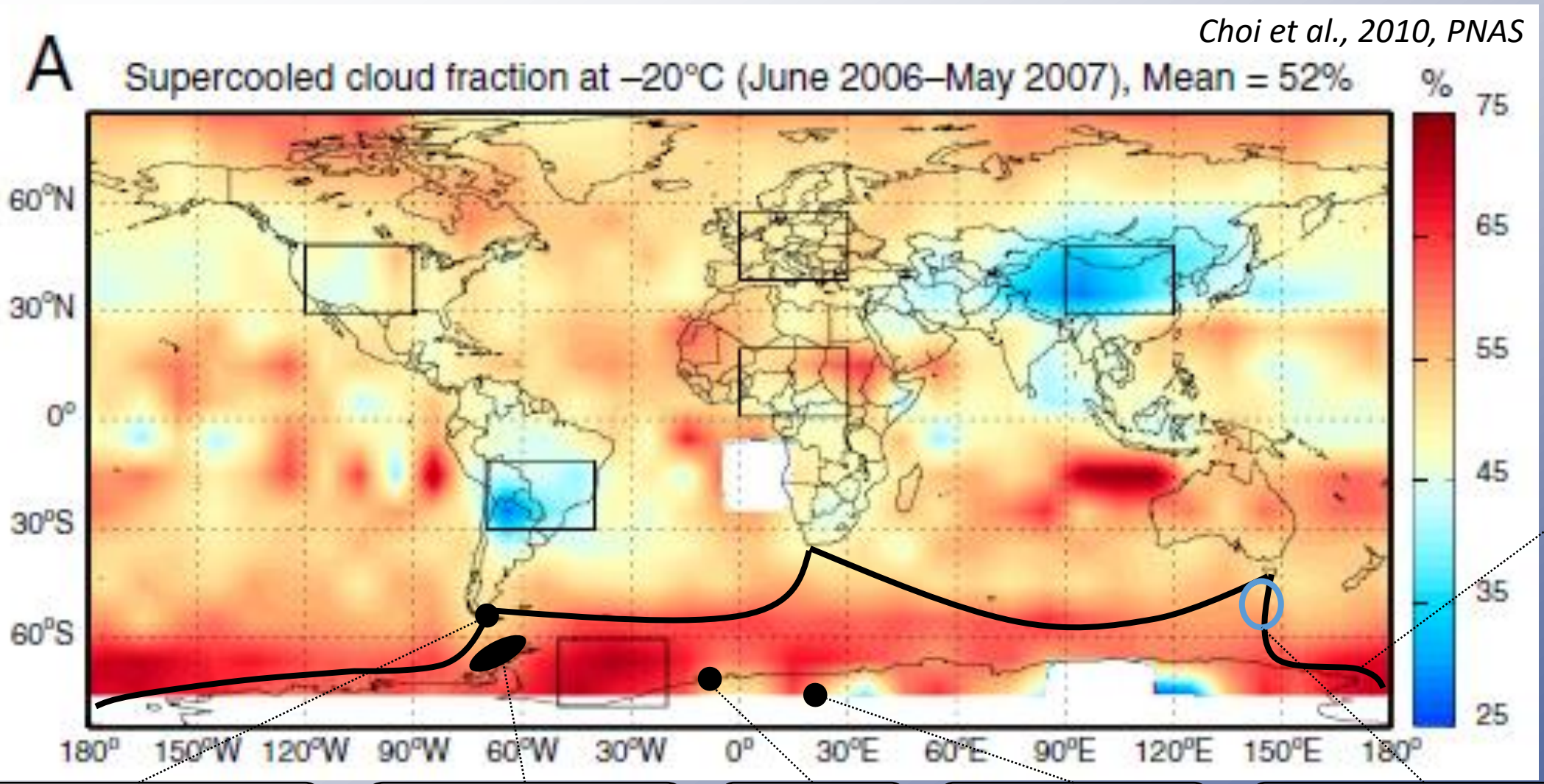
Western Antarctic peninsula Zeppenfeld et al. (2021)

Neumayer III station

Princess Elisabeth station

looking at the Southern Ocean / Antarctic region

Choi et al., 2010, PNAS



Antarctic circum-navigation (ACE-SPACE), Tatzelt et al. (2021), ACPD

Punta Arenas region Gong et al. (2022), ACPD

Western Antarctic peninsula Zeppenfeld et al. (2021)

Neumayer III station

Princess Elisabeth station

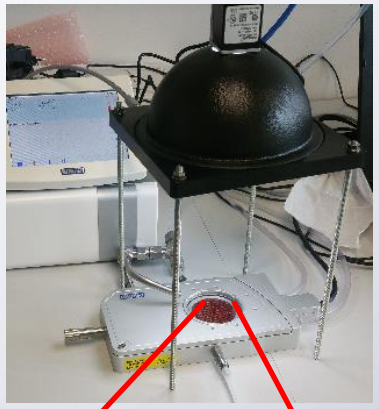
south of Tasmania McCluskey et al. (2018)

measuring INP off-line

cold-stage and freezing array for suspensions (e.g., washed filters, ocean water, …)

LINA (Leipzig Ice Nucleation Array)

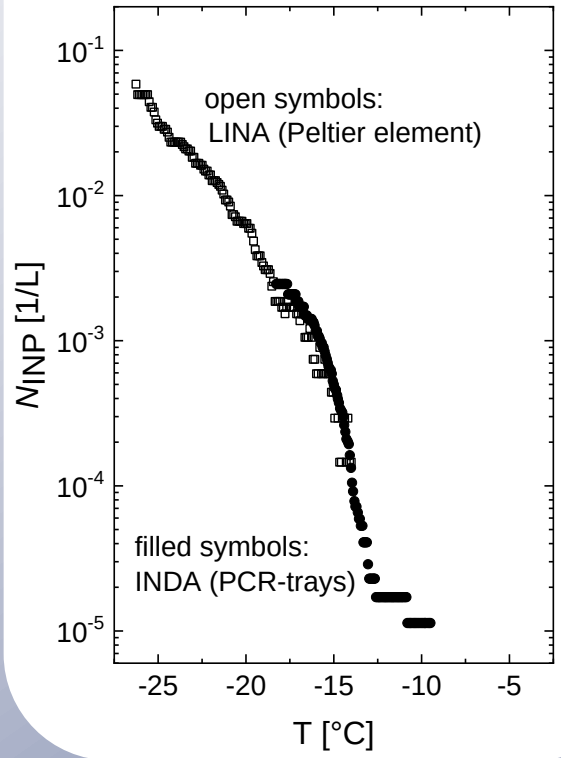
V= 1 µL in one droplet, 90 droplets



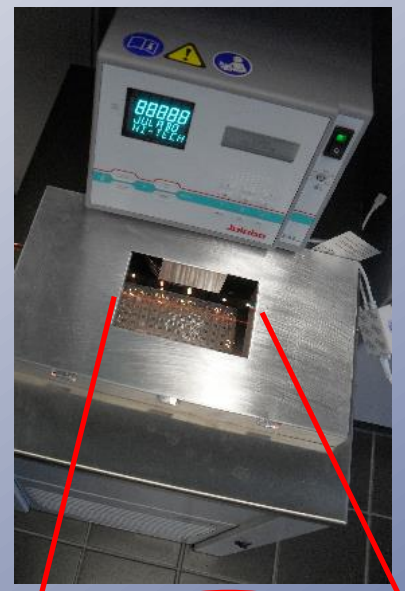
droplets on a glass slide, cooled by a Peltier element

e.g., Budke & Koop et al. (2015)

-> INP spectra

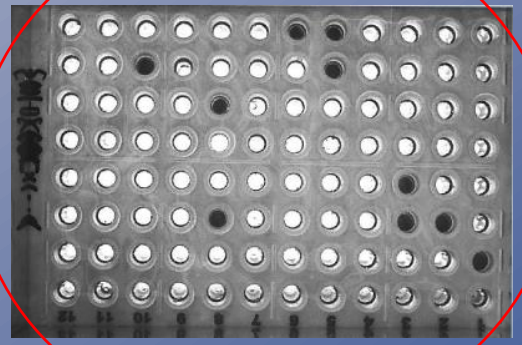


INDA (Ice Nucleation Droplet Array)



V=50 µL in one droplet, 96 droplets

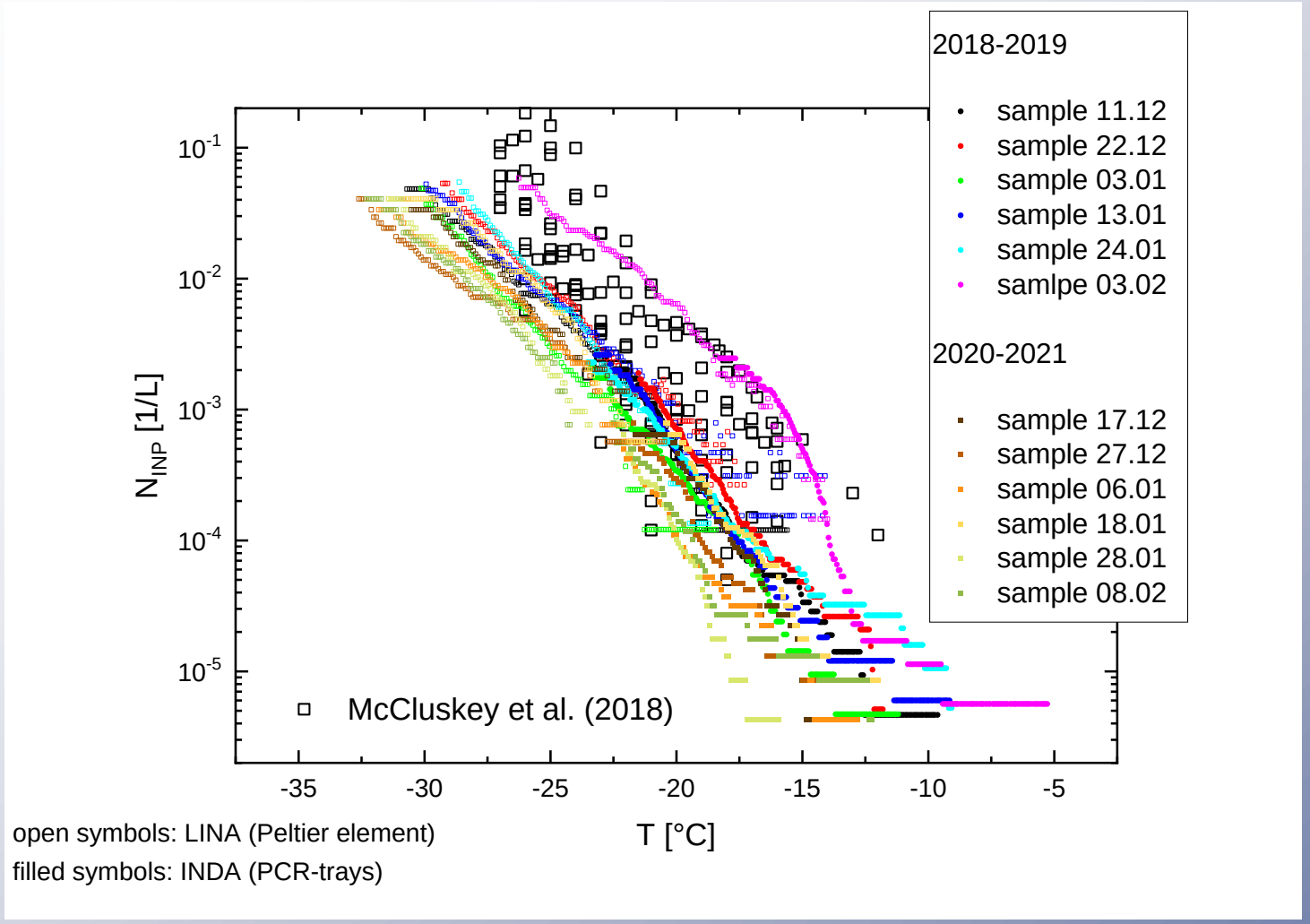
PCR-trays in a thermostat



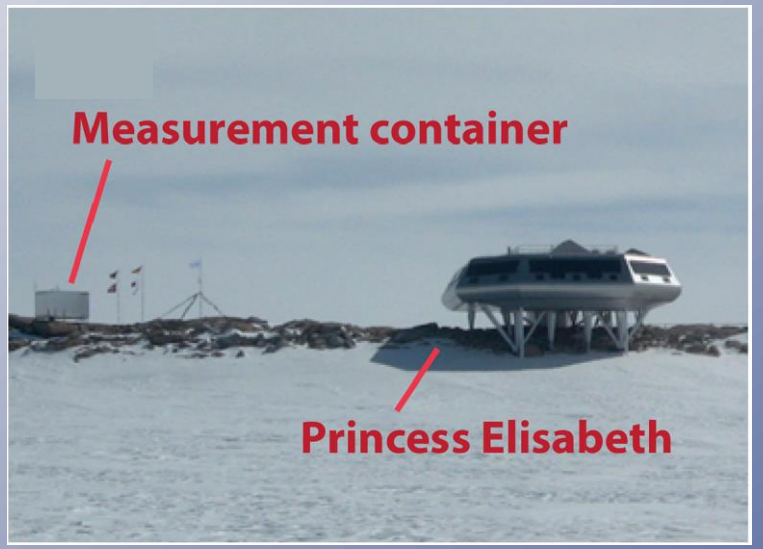
Conen et al. (2012), Hill et al. (2014)

Princess Elisabeth Station – CLIMB

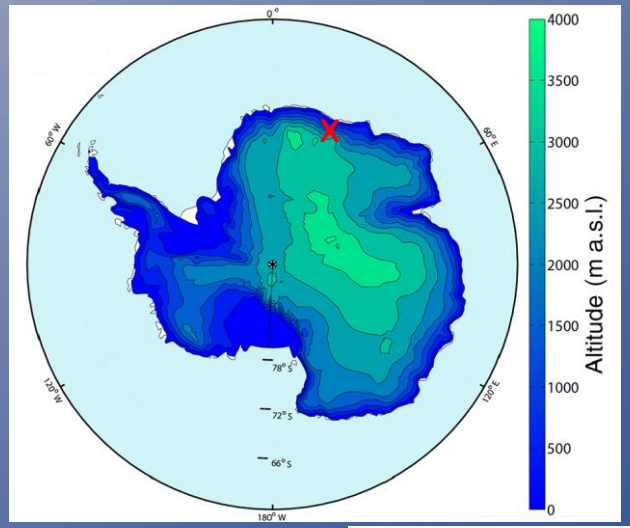
cooperation with KMI, Brussels, Belgium | inland measurements at 1390 m, in the escarpment zone



open symbols: LINA (Peltier element)
filled symbols: INDA (PCR-trays)



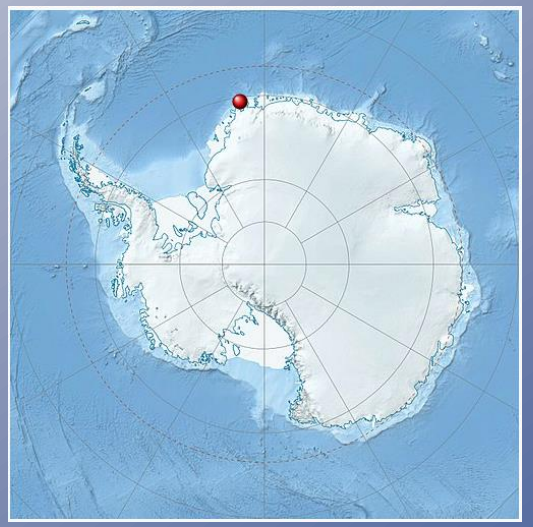
-> low INP concentrations



Neumayer III – VACCINE

cooperation with AWI, Germany

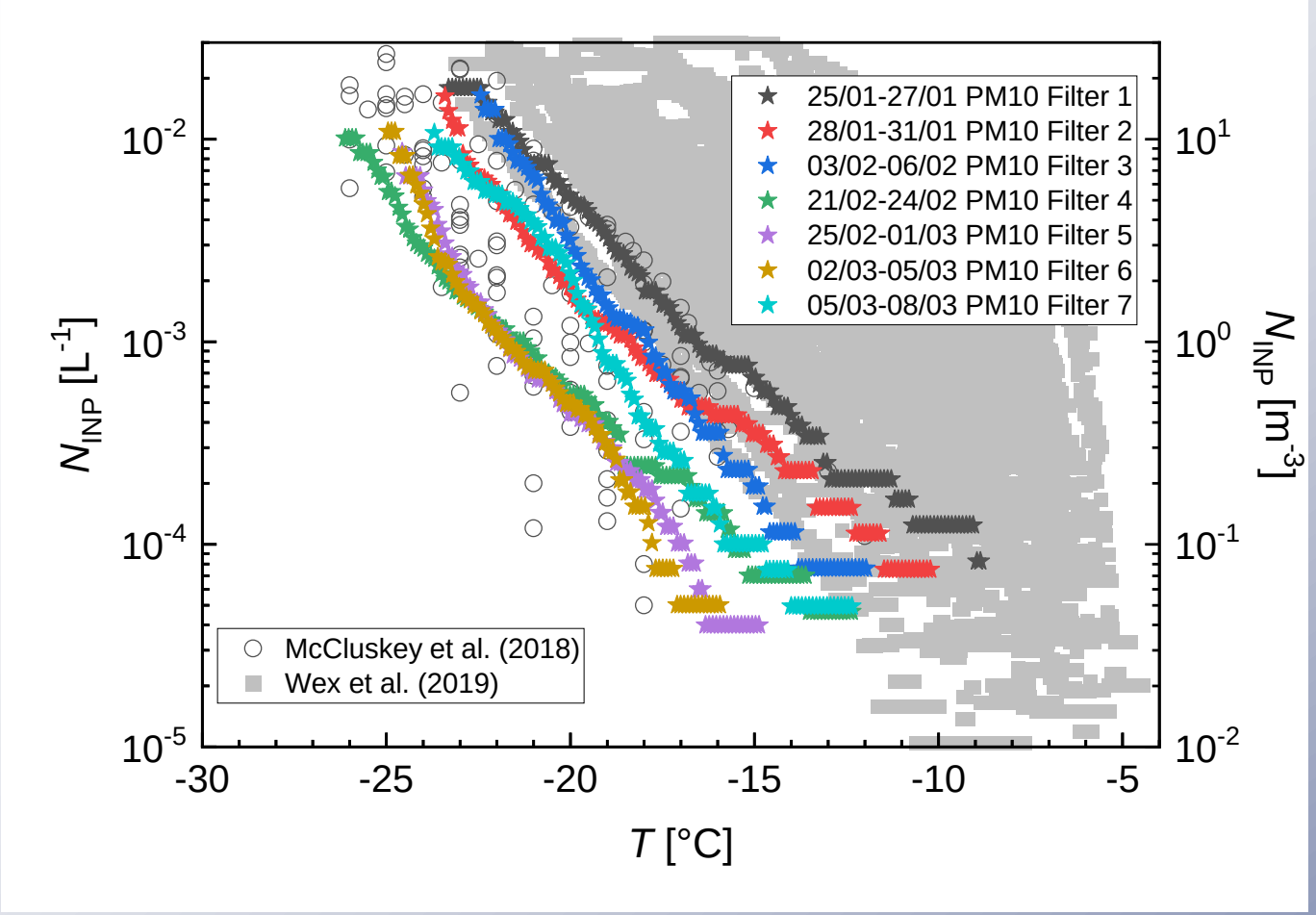
measurement close to the sea ice edge, on 200m thick ice shelf



-> again low INP concentrations

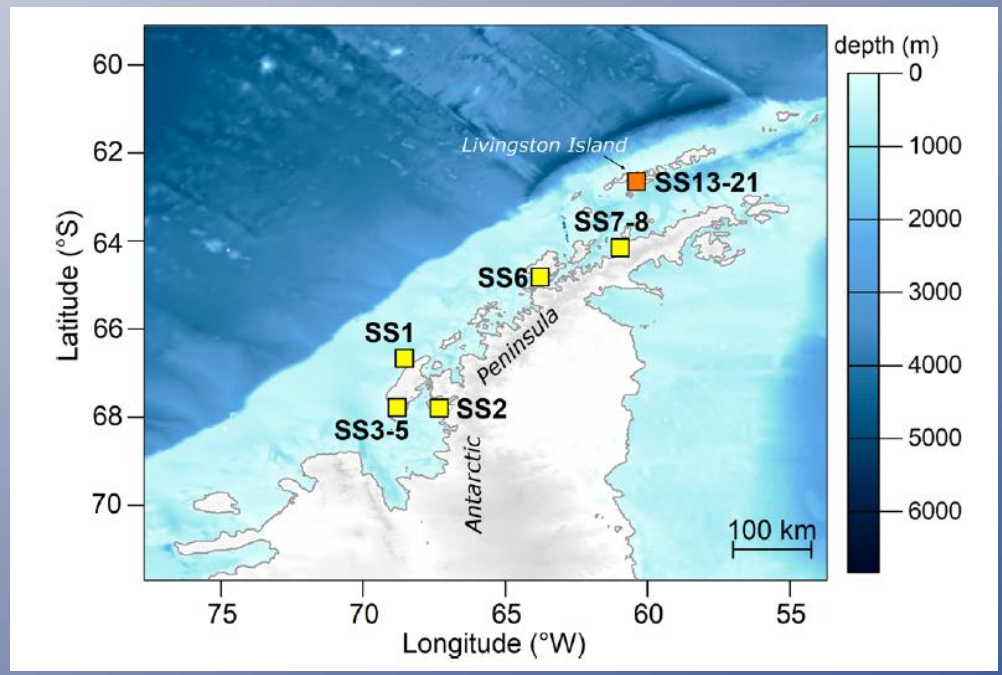
PI-ICE campaign

Zeppenfeld et al. (2021)



cooperation with ICM-CSIC, Barcelona, Spain and TROPOS intern with chemistry dept.

ship cruise along and land based sampling on Western Antarctic Peninsula

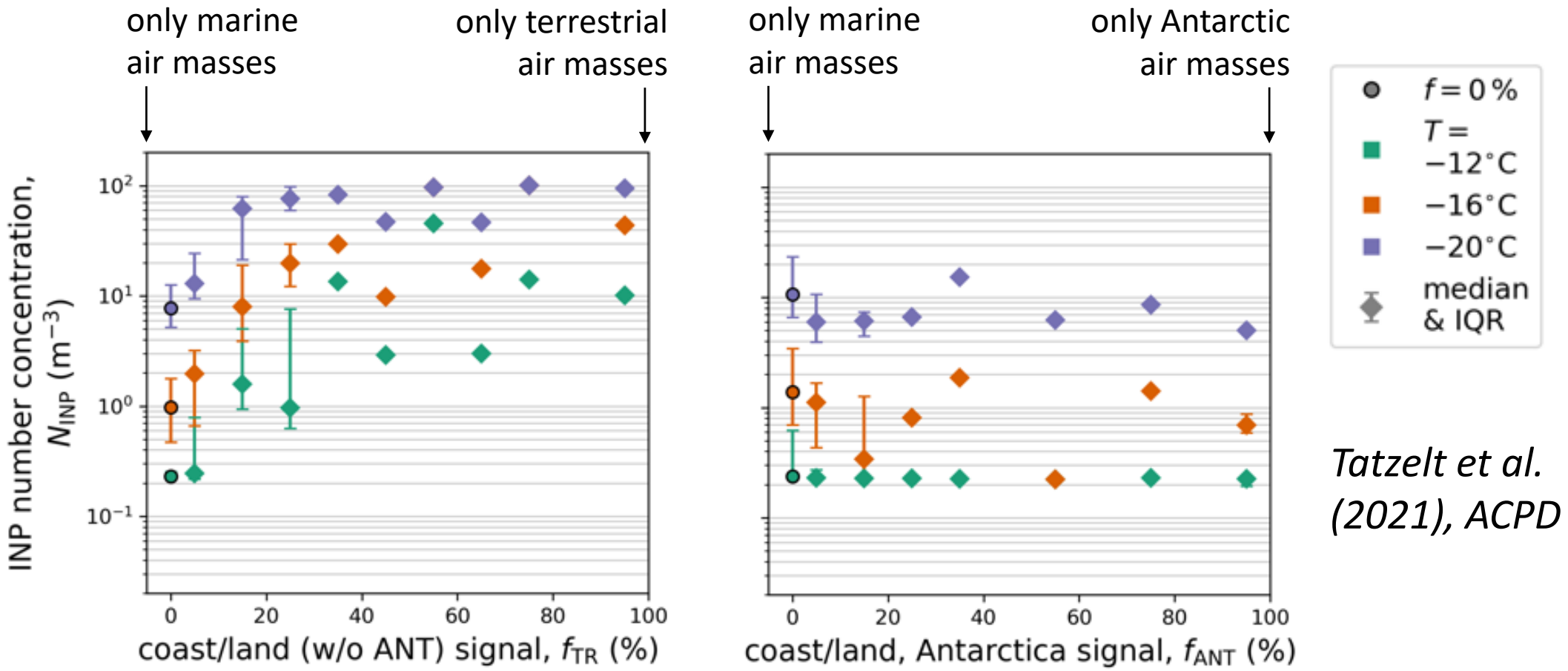


-> low INP concentrations both in sea water and in the air

Antarctic circumnavigation – ACE-SPACE

without contribution from land: similar to data from McCluskey et al. (2018)

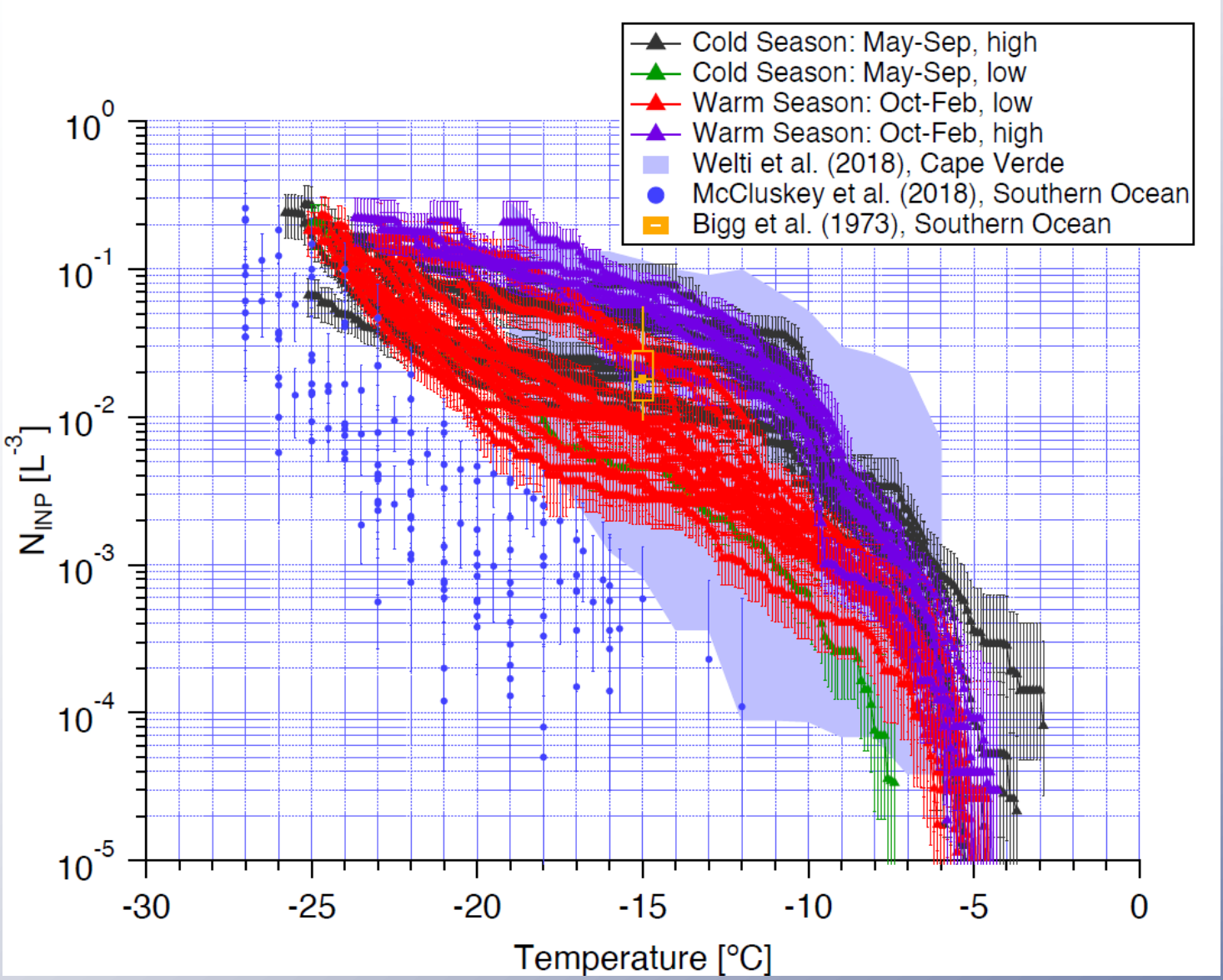
BUT: terrestrial contribution of INP, however NOT from Antarctica



Tatzelt et al. (2021), ACPD

Punta Arenas – DACAPO-PESO

cooperation with UMAG, Punta Arenas, Chile and TROPOS intern with lidar group



- INP concentrations typical for continental conditions, no seasonal cycle

Gong et al. (2022), ACPD

Punta Arenas – DACAPO-PESO

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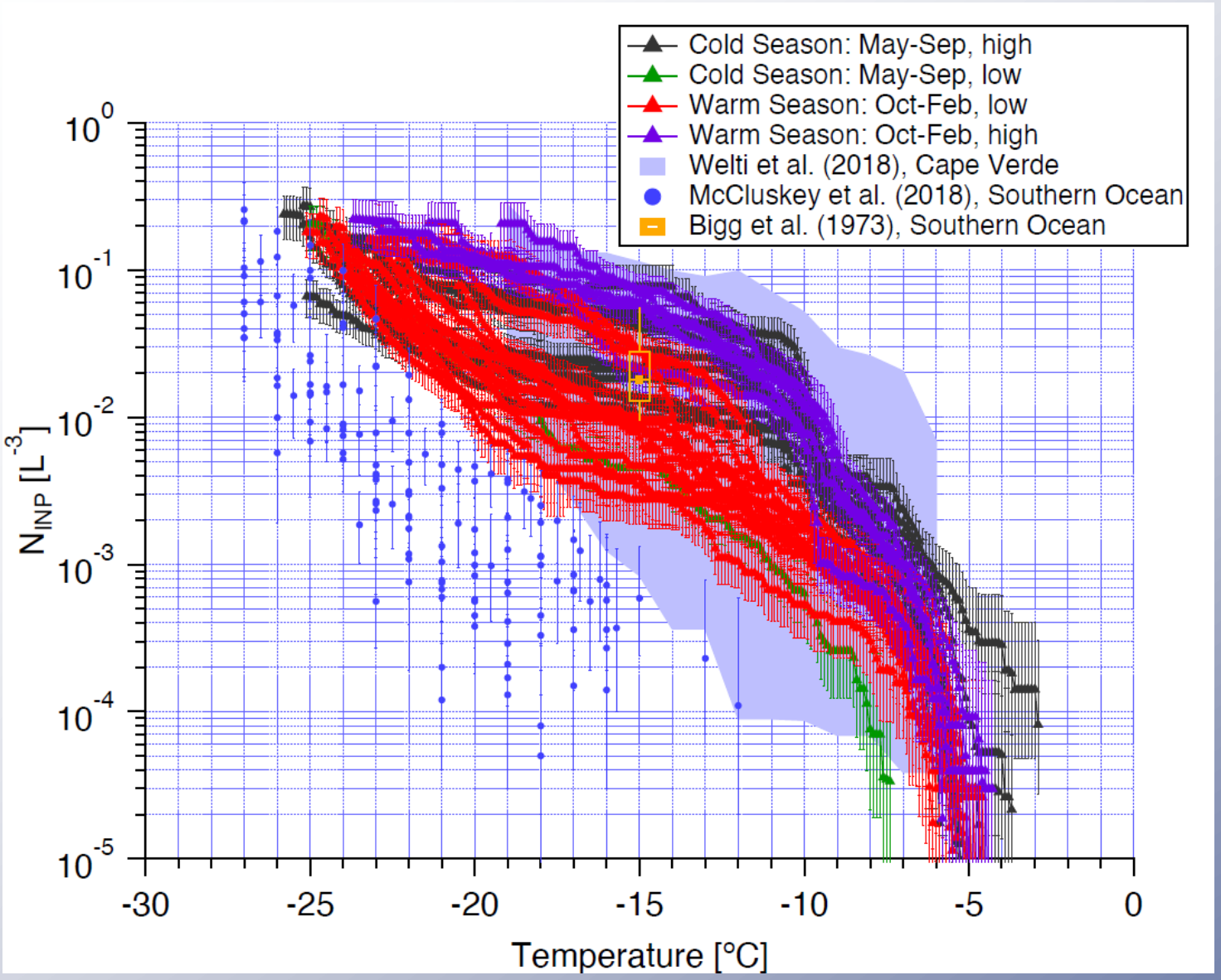
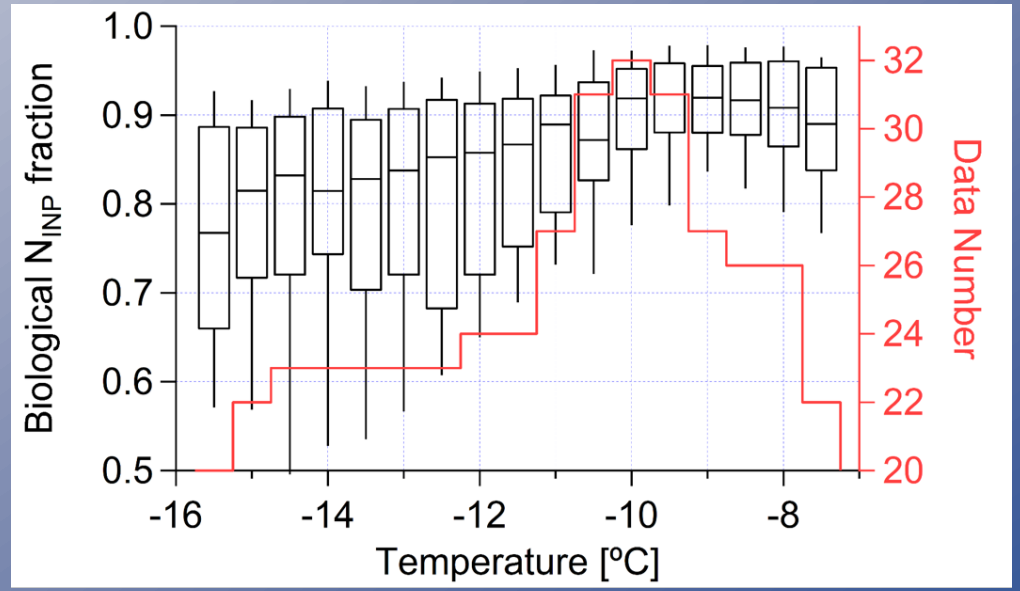


- INP concentrations typical for continental conditions, no seasonal cycle

- large fraction of all INP is biogenic

- rain as possible driver for INP emissions



Gong et al. (2022), ACPD

summary

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- INP concentrations are low over and in the Southern Ocean and over Antarctica

- Antarctica is no source for INP

- other land masses are sources for INP

- INP are possibly emitted due to precipitation and often biogenic (proteinaceous)