AEROSOL SPATIAL DISTRIBUTION IN THE ARCTIC TROPOSHERE

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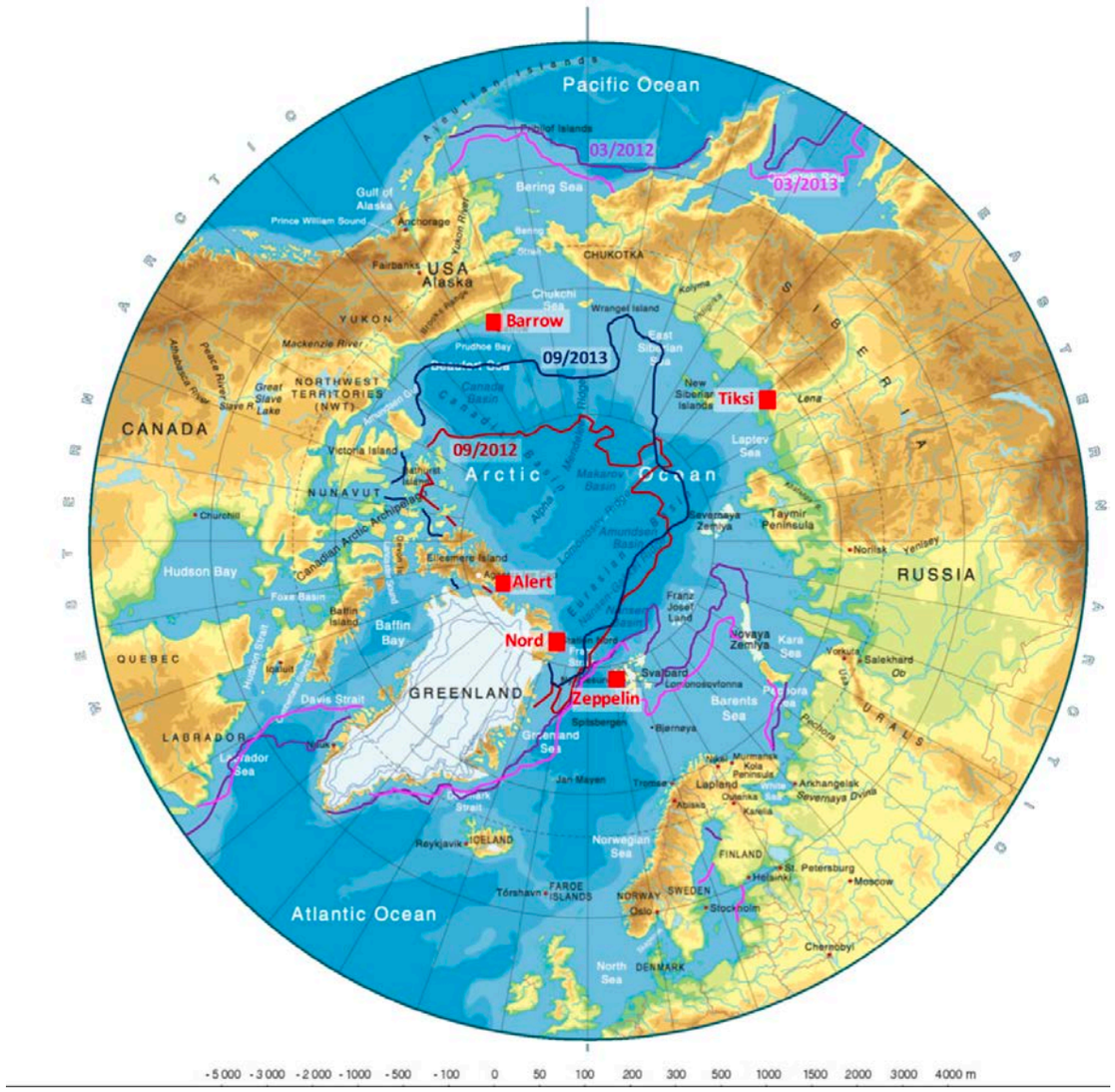
DIPARTIMENTO 2018 di ECCELLENZA 2022
AMIS project

the Pan Arctic approach...ground based



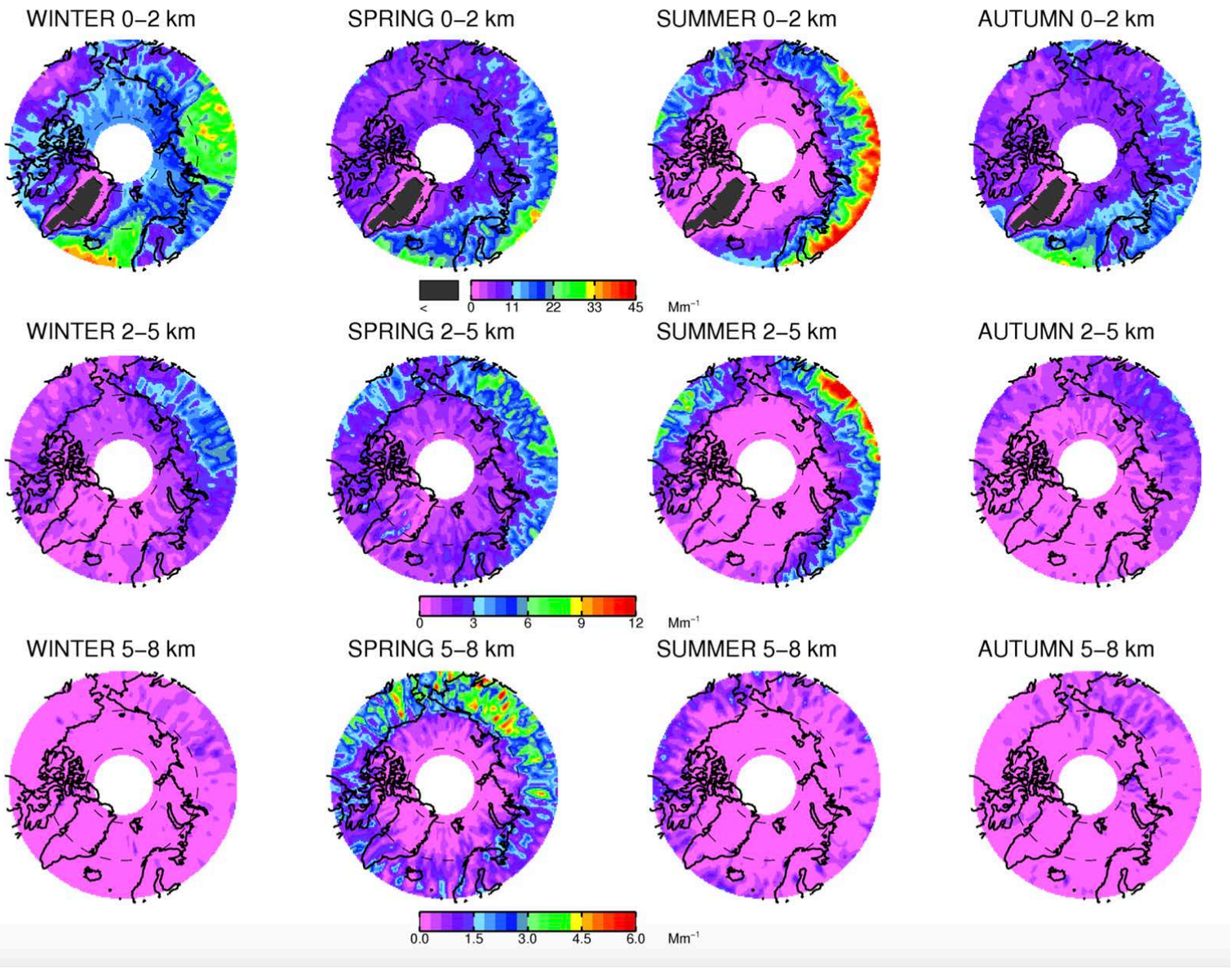
Freud et al, Atmos. Chem. Phys., 17, 8101–8128 (2017)

- consistent differences between the sites (beyond the year-to-year variability)
- proximity to the aerosol source regions
- Arctic Ocean sea-ice edge
- exposure to free tropospheric air
- precipitation patterns

conclusions:

For most purposes, aerosol observations from a single Arctic site cannot represent the entire Arctic region.

the Pan Arctic approach...satellite



Di Pierro et al, Atmos. Chem. Phys., 13, 7075–7095 (2013)

- CALIOP (2006-2012)
- maximum extinction 0-2 km and spring
- sensible differences among sectors

conclusions:

Processes (emissions, transport, deposition) still largely unknown (especially deposition)

the Svalbard experimental campaigns

spring, summer,

fall, winter 2011-2019

(SSG, MIUR, in kind)

vertical + horizontal

summer 2018

(SSG)

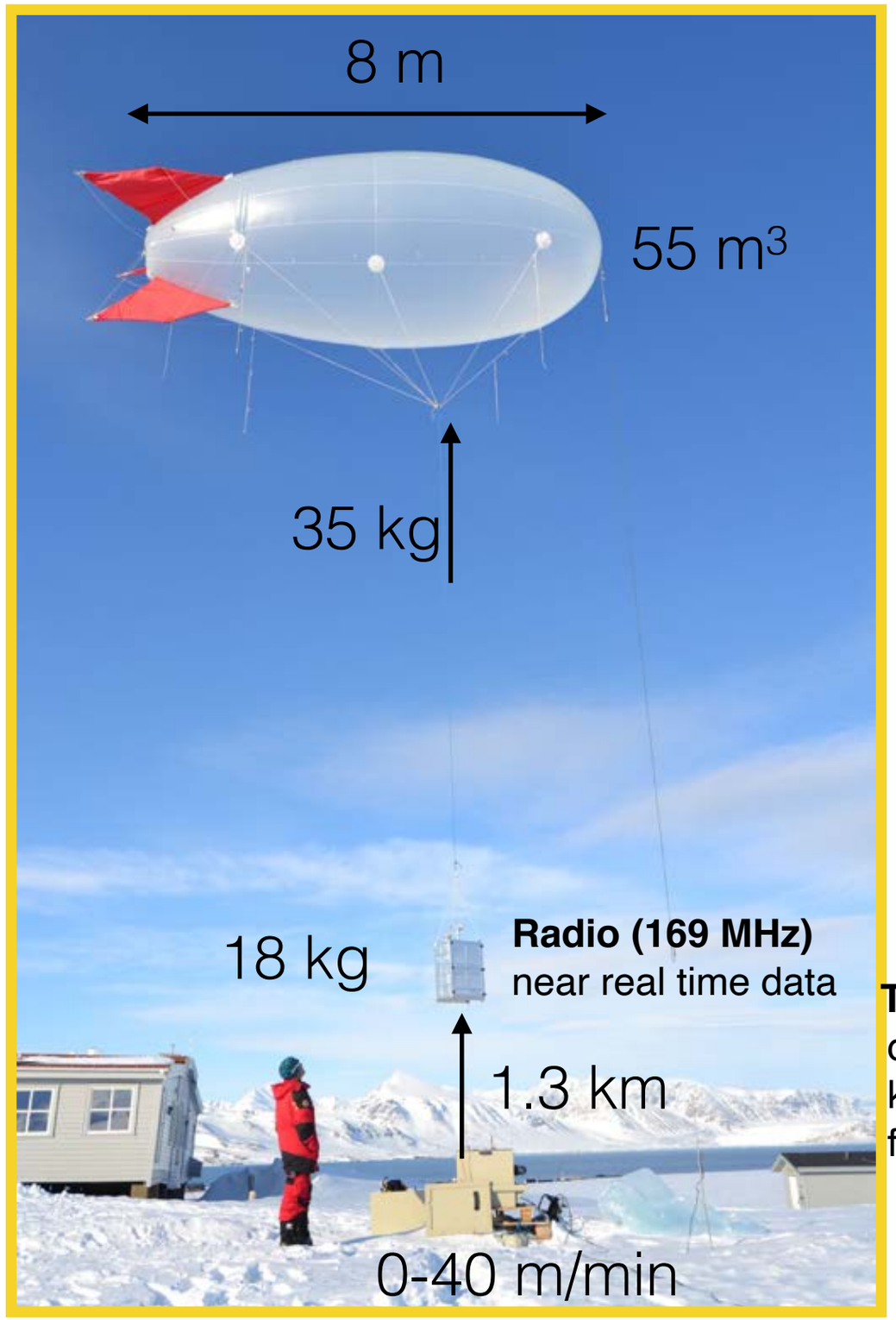
vertical

spring 2019

(SSG)

horizontal

praxes: vertical profiles

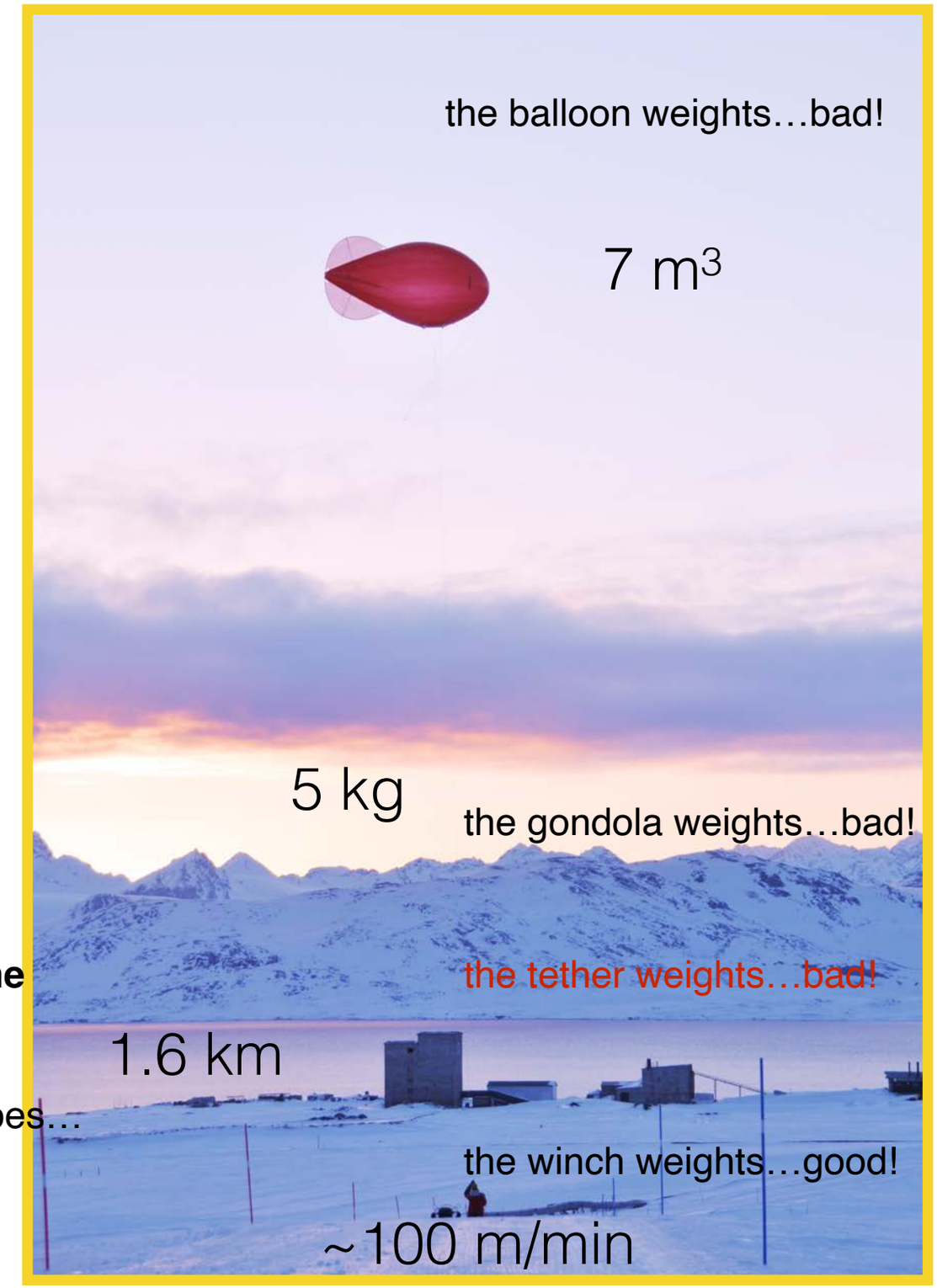


Balloon
spherical
“kytoon"
shaped

Payload

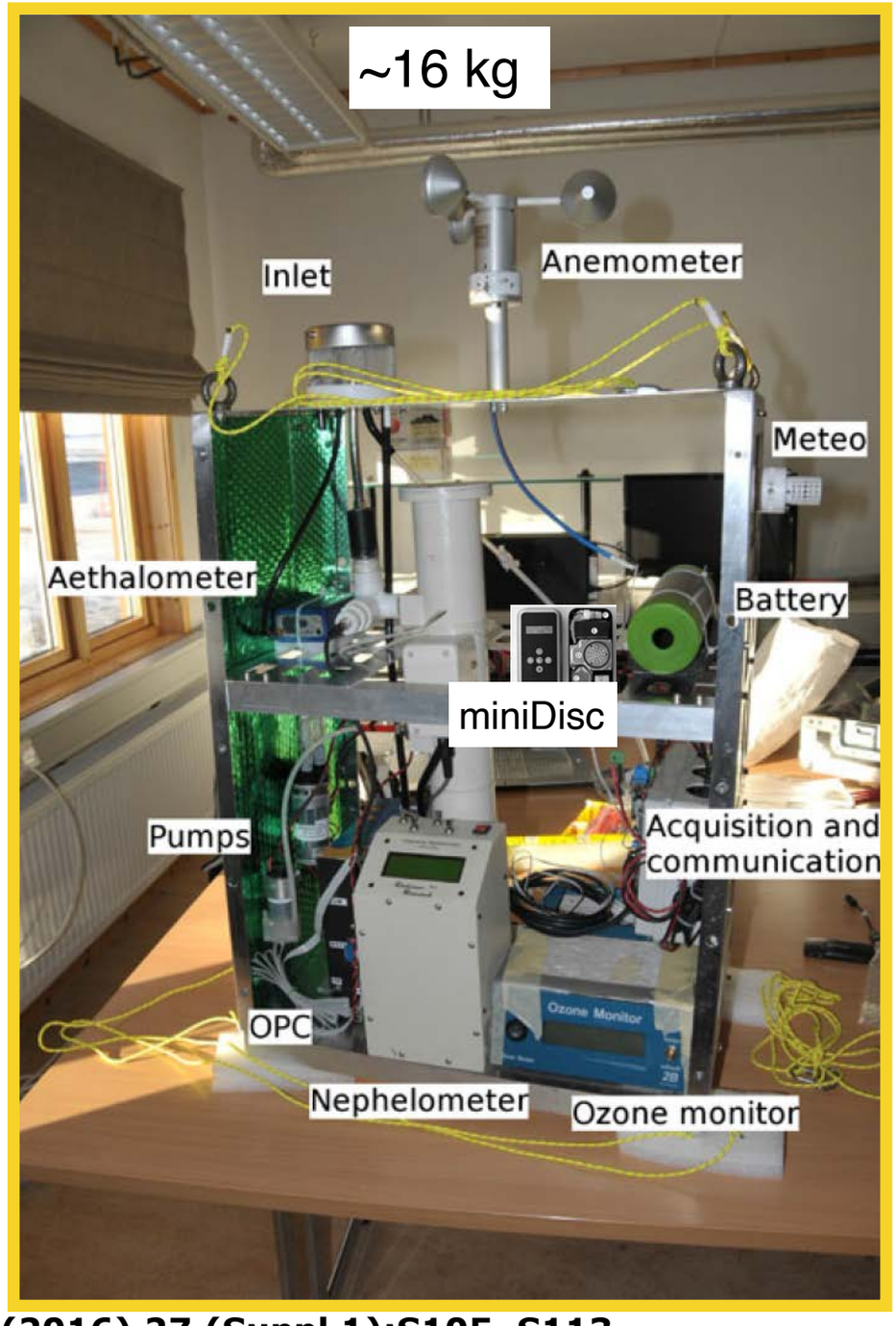
Tether Line
dynema
kevlar
fishing ropes…

Winch



instrumental payload (since 2014)

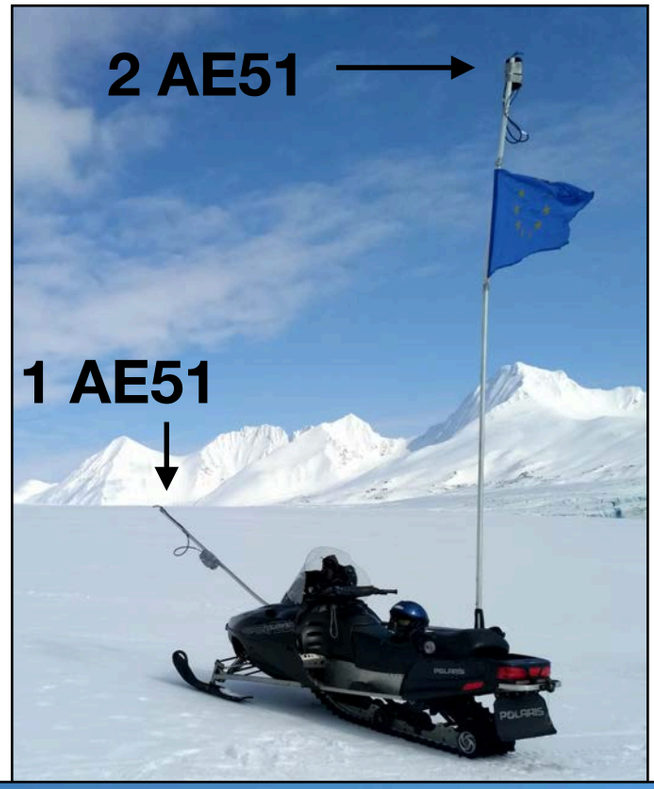
real time data transmission @169 MHz



AGAP: an atmospheric gondola for aerosol profiling **Rend. Fis. Acc. Lincei (2016) 27 (Suppl 1):S105–S113**
DOI 10.1007/s12210-016-0514-x

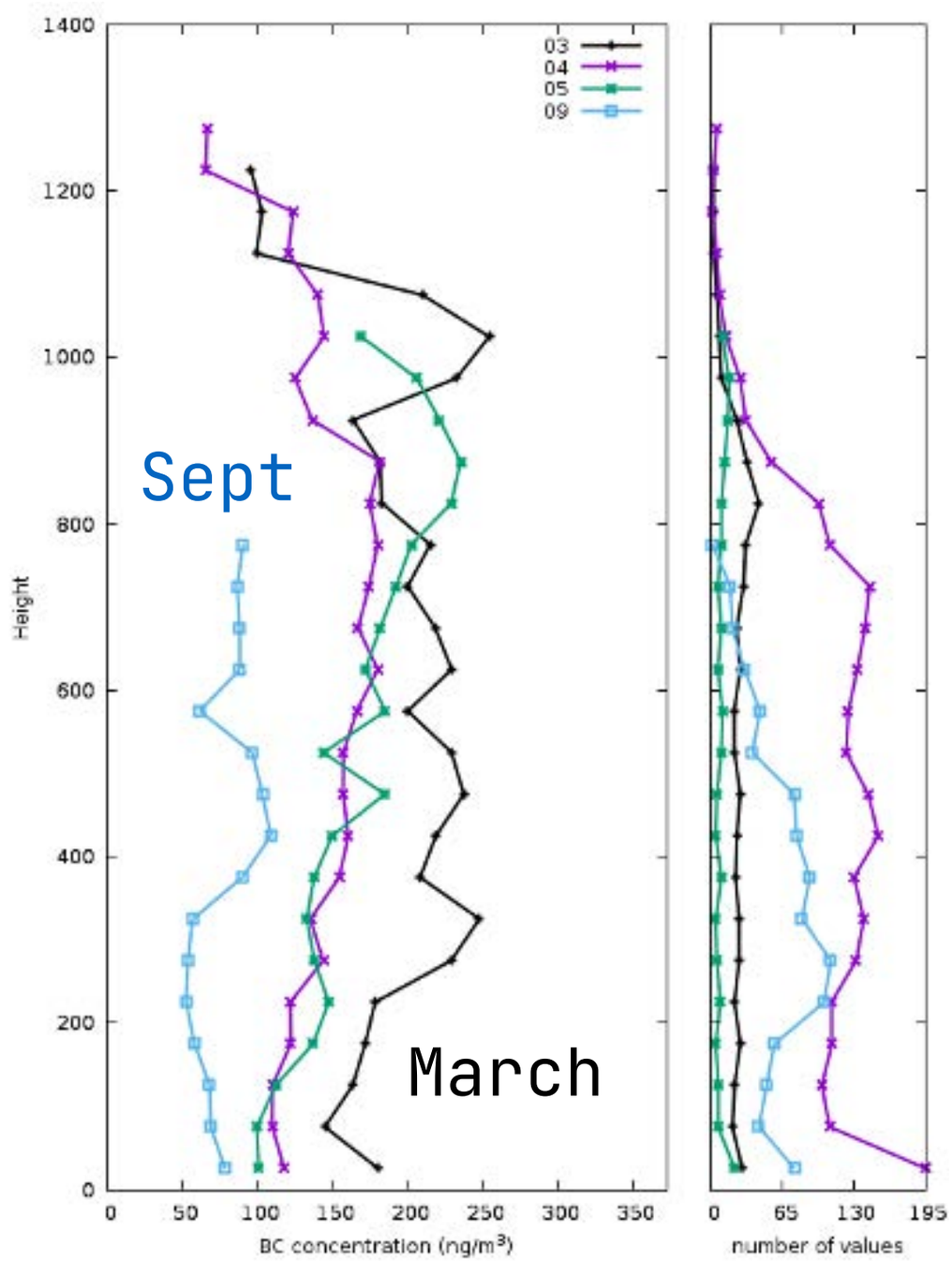
praxes: horizontral profiles (the BC-3D project)

Spatial distribution of BC and mineral dust in air and snow surface layers upon Svalbard glaciers



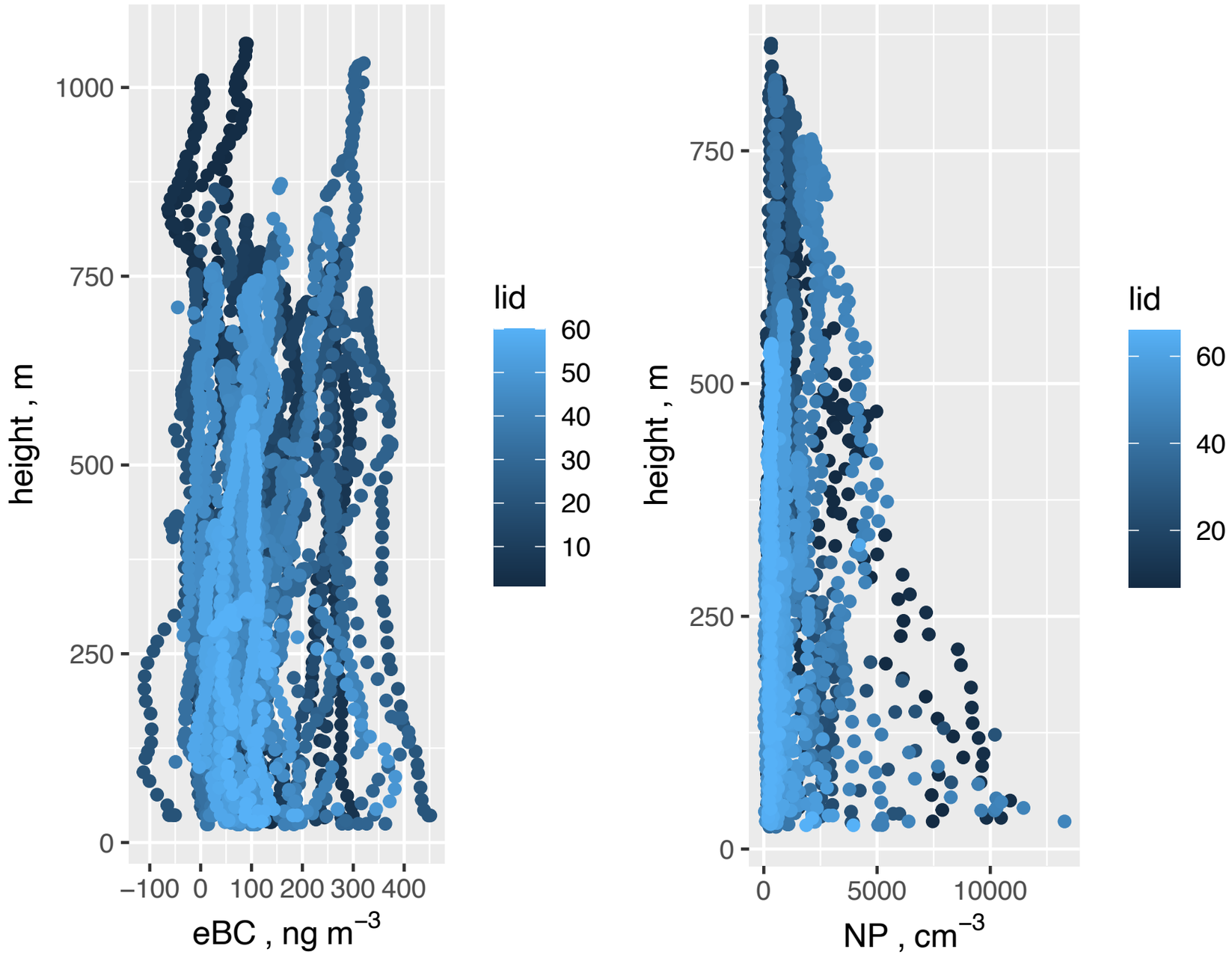
vertical profiles: Ny Alesund (2011-2019)

seasonal trends



vertical profiles: Longyerbyen (2018)

summer intensive campaign



summary

- 2011-2018 ~ 500 aerosol profiles available (mostly in spring)
- the "Ny Alesund column" complex (orography, wind shear,…)
- high daily variability
- springtime dominated by BC transport typically at h>500 m.
- evidences that NPF may play a role (both at ground and above 500 m.
- summertime neutral profiles + impact of ship emissions
- evidences that aerosol chemistry (optical properties, INP,…) may change greatly along the profile
- Inhomogeneous deposition of BC along glacier profiles

current-future work

1. Production of a comprehensive 2011-2019 homogenised dataset (CNR, Uni-Warsaw, Uni-Perugia, Uni-MiB)
2. integration of TBS-Lidar-Moon photometry datasets (2019 winter measurements)
3. Aerosol-clouds interactions

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AMIS project

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- Norwegian research council (SSG)
- CNR