Trend analysis of aerosol particle physical properties at Villum Research Station, Northeastern Greenland

Jakob Boyd Pernov, Henrik Skov, Daniel Charles Thomas, and Andreas Massling

Department of Environmental Science, iClimate, Arctic Research Center, Aarhus University, Frederiksborgvej 399, 4000, Roskilde, DK

Objectives

- Understanding the direction and magnitude of recent changes in the Arctic aerosol population
- Relate these changes to the changing Arctic environment (air mass history and surface characteristics)

Methods & Materials

- Villum Research Station (N 81°36’ W 16°39’)
- PNSD were measured using a Scanning Mobility Particle Sizer (SMPS) from 2010–2018.
- Mode fitting algorithm performed on hourly averaged PNSDs to characterize three modes.
  - Nucleation, Aitken, and Accumulation
  - Geometric mean diameters (GMD)
  - Number concentrations (PN)
- Daily medians were grouped into seasons and prewhitened (removal of autocorrelation) using the ‘3PW’ method (Collaud Coen et al., 2020). Trends identified and quantified using the Mann-Kendall test and Theil-Sen slope on the 90th % confidence level.
- Air mass history was probed using the HYSPLIT model (NCEP/NCAR Reanalysis Meteorological data) at hourly resolution, extending 168 h backwards.
- Air masses were classified as ‘Sea’, ‘Land’, ‘Snow’, ‘Sea Ice’, ‘Above the Mixed Layer’ using IMS Daily NH Snow and Ice Analysis (NSIDC).

Results

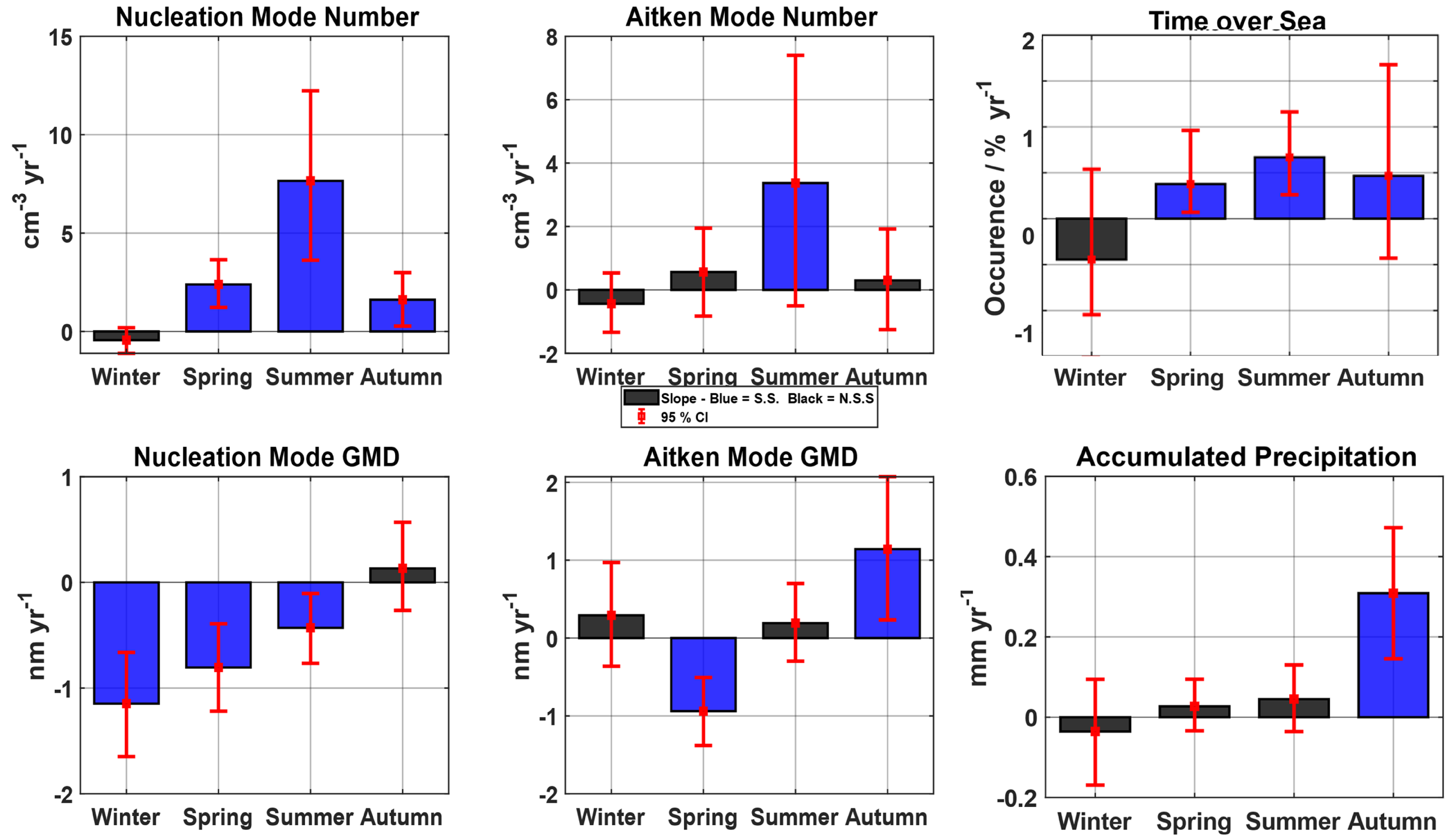

Figure 1. Trends in Mode Fitting Parameters, Time over ‘Sea’, and accumulated precipitation**.** Blue bars indicate statistical signficant trends.

Conclusions

- Nucleation and Aitken Mode PN increasing
- Nucleation Mode GMD decreasing while Aitken increasing and decreasing
- Air mass time over ‘Sea’ increasing

Acknowledgements & References

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Collaud Coen et al., Atmos. Meas. Tech., 13 (2020) 6945-6964.

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