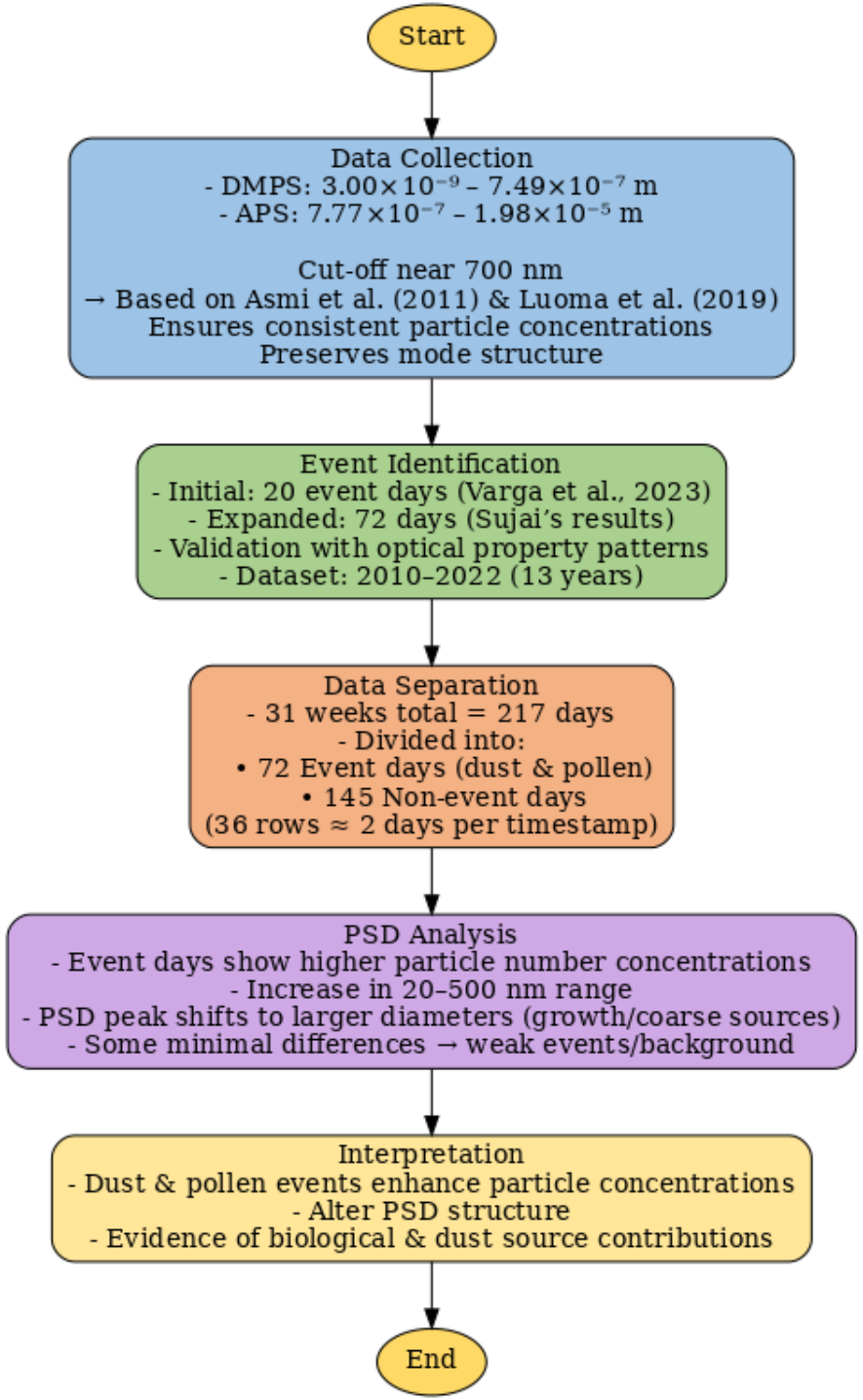
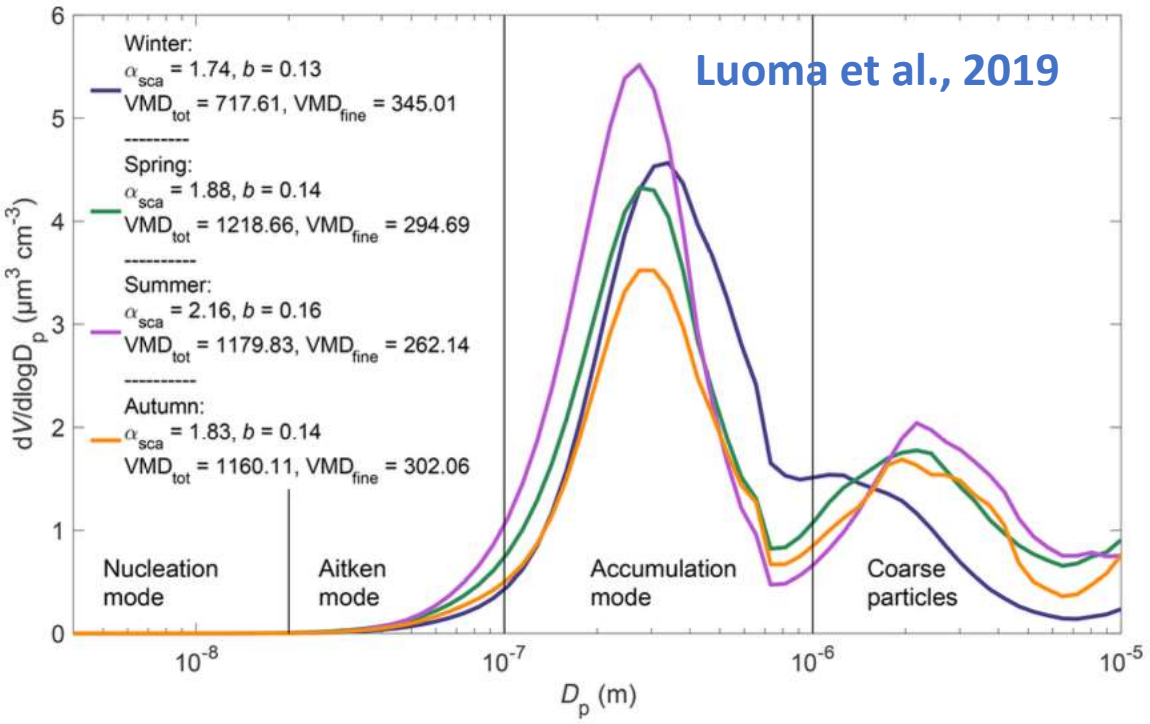

Start
Data Collection
- DMPS: 3.00×10⁻⁹ – 7.49×10⁻⁷ m
- APS: 7.77×10⁻⁷ – 1.98×10⁻⁵ m
Cut-off near 700 nm
→ Based on Asmi et al. (2011) & Luoma et al. (2019)
Ensures consistent particle concentrations
Preserves mode structure
Event Identification
- Initial: 20 event days (Varga et al., 2023)
- Expanded: 72 days (Sujai's results)
- Validation with optical property patterns
- Dataset: 2010–2022 (13 years)
Data Separation
- 31 weeks total = 217 days
- Divided into:
• 72 Event days (dust & pollen)
• 145 Non-event days
(36 rows ≈ 2 days per timestamp)
PSD Analysis
- Event days show higher particle number concentrations
- Increase in 20–500 nm range
- PSD peak shifts to larger diameters (growth/coarse sources)
- Some minimal differences → weak events/background
Interpretation
- Dust & pollen events enhance particle concentrations
- Alter PSD structure
- Evidence of biological & dust source contributions
End

Notes

1. We combined **DMPS** data (**3.00×10^{-9} m – 7.49×10^{-7} m**) with **APS** data (**7.77×10^{-7} m – 1.98×10^{-5} m**), using a cut-off near 700 nm. This approach, based on earlier literature (**Asmi et al., 2011**) and **Luoma et al., 2019**, ensures consistent particle number concentrations and preserves mode structure.
2. Plots with **72 Pollen & Dust events** (2010–2022, 13 years) showed **higher particle size distributions (PSD)** compared to data without these event days, **as expected**.
3. **Mean diurnal PSD analysis** showed that PSD values were lower in both the 13-year dataset and the 31-week dataset without the 72 pollen & dust events, while these 72 event days exhibited markedly **higher particle concentrations**, especially in the **20–200 nm** size range, persisting through most of the day.
4. We separated the **31 weeks** (217 days) containing the 72 pollen & dust events into **72 event days** and **145 non-event days**. The weekly PSD comparison shows that **event days (red)** consistently have **higher particle number concentrations**than **non-event days (blue)**, with the most notable increases in the **20–500 nm** range. In many cases, the PSD peak during event days also **shifts toward larger diameters**, indicating particle growth or influence from coarse biological/dust sources. A few weeks show minimal differences, likely due to weaker event intensity or prevailing background aerosol conditions. Overall, the separation highlights that pollen and dust events significantly enhance particle concentrations and alter size distribution patterns.

36 row each time stamp is approximately equal to 2 days.



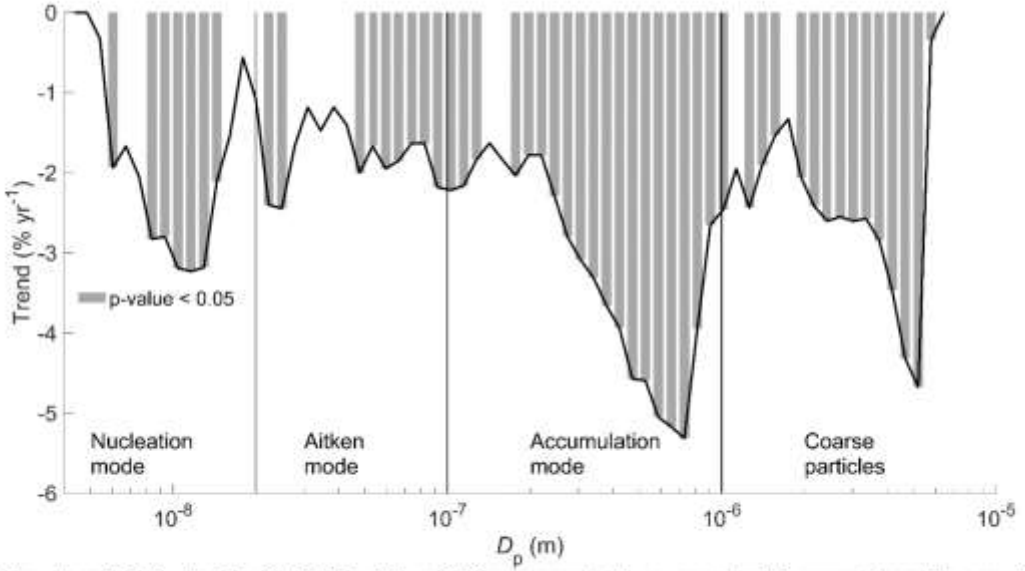


Figure S4: Trend analysis for the size distribution. The solid line represents the average trend in percentages. The gray bars mark the size ranges, in which the trend was statistically significant (p-value < 0.05). The typical borders of the nucleation, Aitken, accumulation and coarse particle modes are marked with vertical lines.

Over a 10-year record of aerosol optical properties at SMEAR II

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Full length article

Saharan, Aral-Caspian and Middle East dust travels to Finland (1980–2022)

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Measurement Report: Optical properties of supermicron aerosol particles in a boreal environment

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Notes

Average vs trend: A few event days don't move the **average** much, but they can tilt the **trend**. Because many big events happened earlier, taking them out makes the long-term decline **less steep**.

Robust but event-sensitive: Coarse particles are **declining either way**. Including the event days makes the drop look **steeper**; excluding them makes it **smaller**, since those big days weren't evenly spread over the years.

Episodes are rare yet seasonally dominant. They drive **spring–summer peaks**; annually, they contribute a **disproportionate** (not majority) share.

Impact is size-specific. Events mainly inflate **coarse (>1 µm)**; effects on **accumulation** are smaller; **Aitken/nucleation** show little consistent change.

Consistent with PM literature. PM_{10} fell largely via **fine-PM** reductions; near-flat $PM_{1–10}$/super-PM_{10} can **mask** a subtle background coarse decline when a few event days are very large.

Key takeaway. A small number of intense days shape seasonal extremes and risk.

31 Weeks (Event and Non Event days Chart)

WEEKS	YEAR	M	T	W	T	F	S	S
WEEK 1	2011	11	12	13	14	15	16	17
WEEK 2	2011	18	19	20	21	22	23	24
WEEK 3	2011	2	3	4	5	6	7	8
WEEK 4	2011	9	10	11	12	13	14	15
WEEK 5	2011	16	17	18	19	20	21	22
WEEK 6	2011	23	24	25	26	27	28	29
WEEK 7	2012	16	17	18	19	20	21	22
WEEK 8	2012	7	8	9	10	11	12	13
WEEK 9	2012	14	15	16	17	18	19	20
WEEK 10	2012	21	22	23	24	25	26	27
WEEK 11	2012	11	12	13	14	15	16	17
WEEK 12	2012	18	19	20	21	22	23	24
WEEK 13	2012	25	26	27	28	29	30	1
WEEK 14	2013	27	28	29	30	31	1	2
WEEK 15	2014	12	13	14	15	16	17	18
WEEK 16	2014	19	20	21	22	23	24	25
WEEK 17	2014	26	27	28	29	30	31	1
WEEK 18	2014	2	3	4	5	6	7	8
WEEK 19	2015	23	24	25	26	27	28	29
WEEK 20	2016	15	16	17	18	19	20	21
WEEK 21	2018	9	10	11	12	13	14	15
WEEK 22	2018	16	17	18	19	20	21	22
WEEK 23	2019	22	23	24	25	26	27	28
WEEK 24	2021	22	23	24	25	26	27	28
WEEK 25	2021	17	18	19	20	21	22	23
WEEK 26	2021	21	22	23	24	25	26	27
WEEK 27	2022	14	15	16	17	18	19	20
WEEK 28	2022	21	22	23	24	25	26	27
WEEK 29	2022	27	28	29	30	1	2	3
WEEK 30	2022	11	12	13	14	15	16	17
WEEK 31	2022	15	16	17	18	19	20	21

Additional Plots

We combined DMPS data (3.00×10^{-9} m – 7.49×10^{-7} m) with APS data (7.77×10^{-7} m – 1.98×10^{-5} m), using a cut-off near 700 nm.

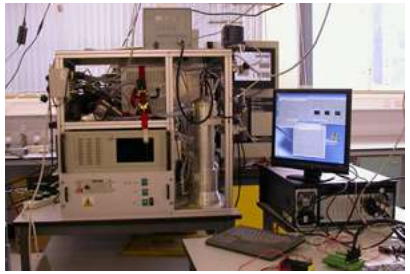
This approach, based on earlier literature (Asmi et al., 2011) and Luoma et al., 2019, ensures consistent particle number concentrations and preserves mode structure.

NAIS

(~ **2 nm – 40 nm** (measures small ions, neutral clusters, and freshly nucleated nanoparticles)

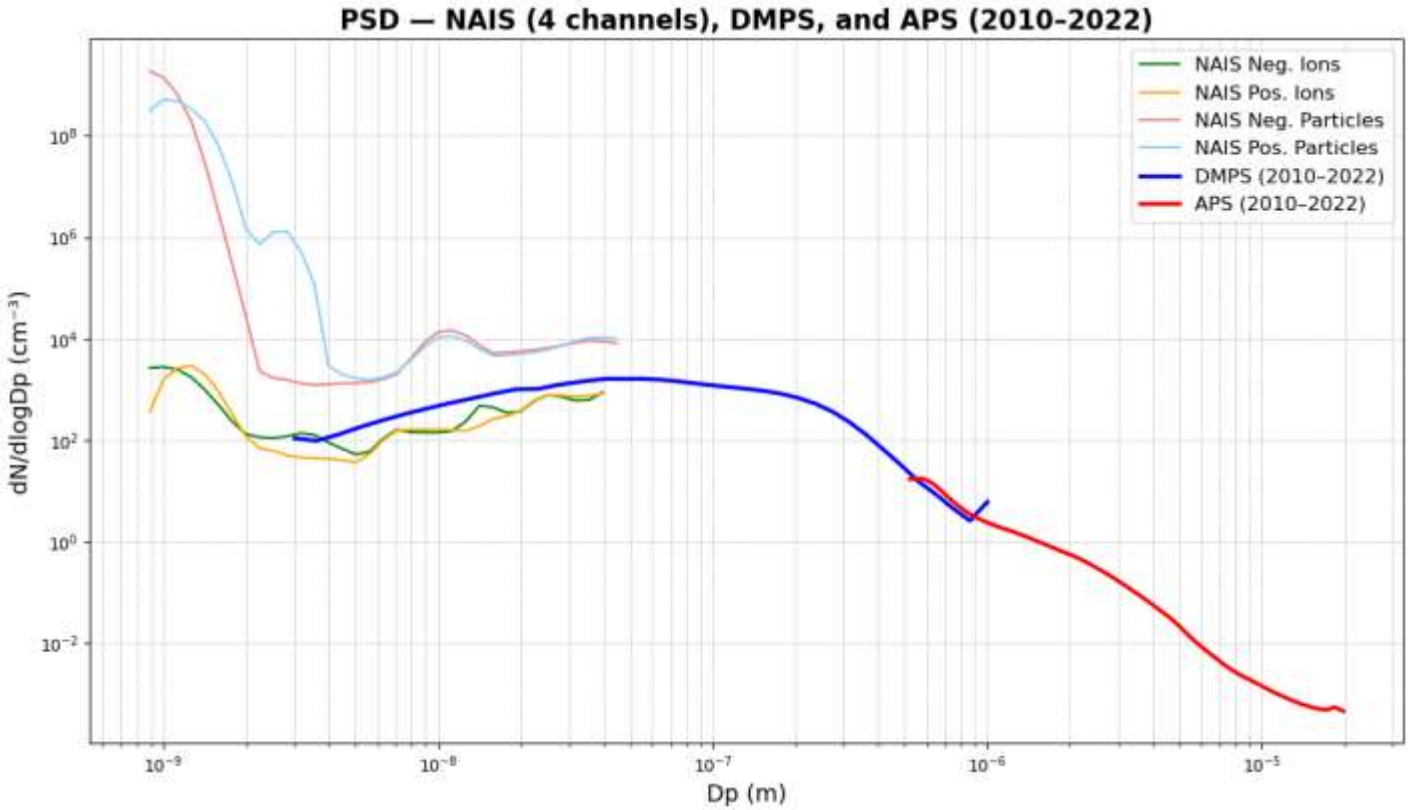
DMPS

(~ **3 nm – 800 nm** (covers nucleation, Aitken, and part of the accumulation mode, depending on setup).



APS

(~ **0.5 µm – 20 µm** (measures larger accumulation mode and coarse particles)



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Measurement report: New particle formation and aerosol properties at a newly founded atmospheric observatory at the Finnish Baltic Sea coast

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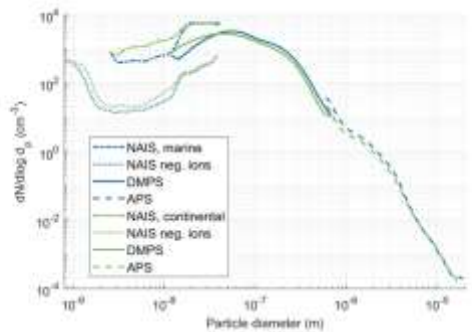

Figure 5. Average size distribution from all instruments when DMPS data is available (22 May 2023 to 29 June 2023 and 1 February 2024 to 24 June 2024). All blue lines are for the marine wind sector and all the green lines for the continental wind sectors whereas the different line styles are for different instruments as indicated by the legend.