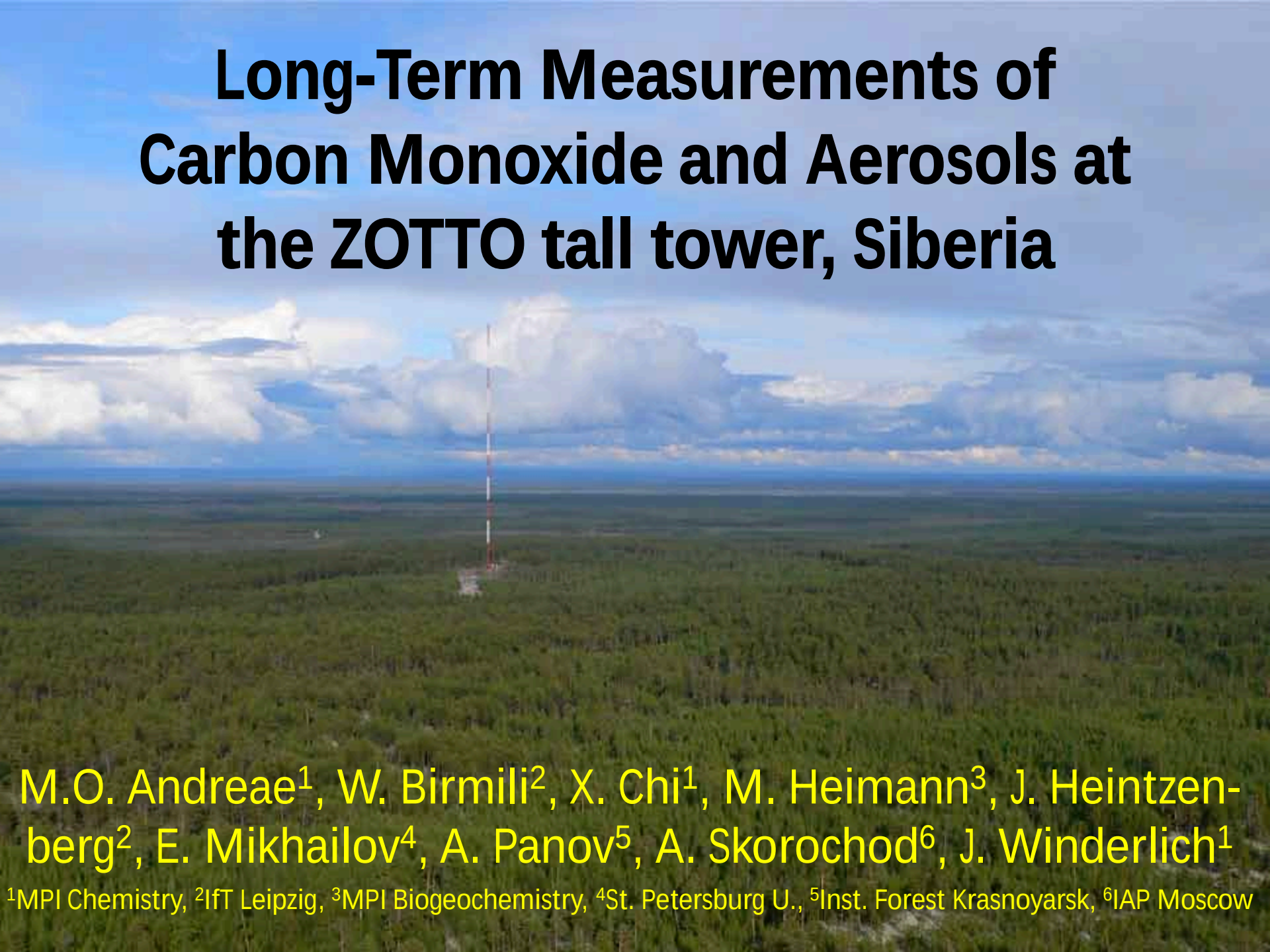
Long-Term Measurements of Carbon Monoxide and Aerosols at the ZOTTO tall tower, Siberia



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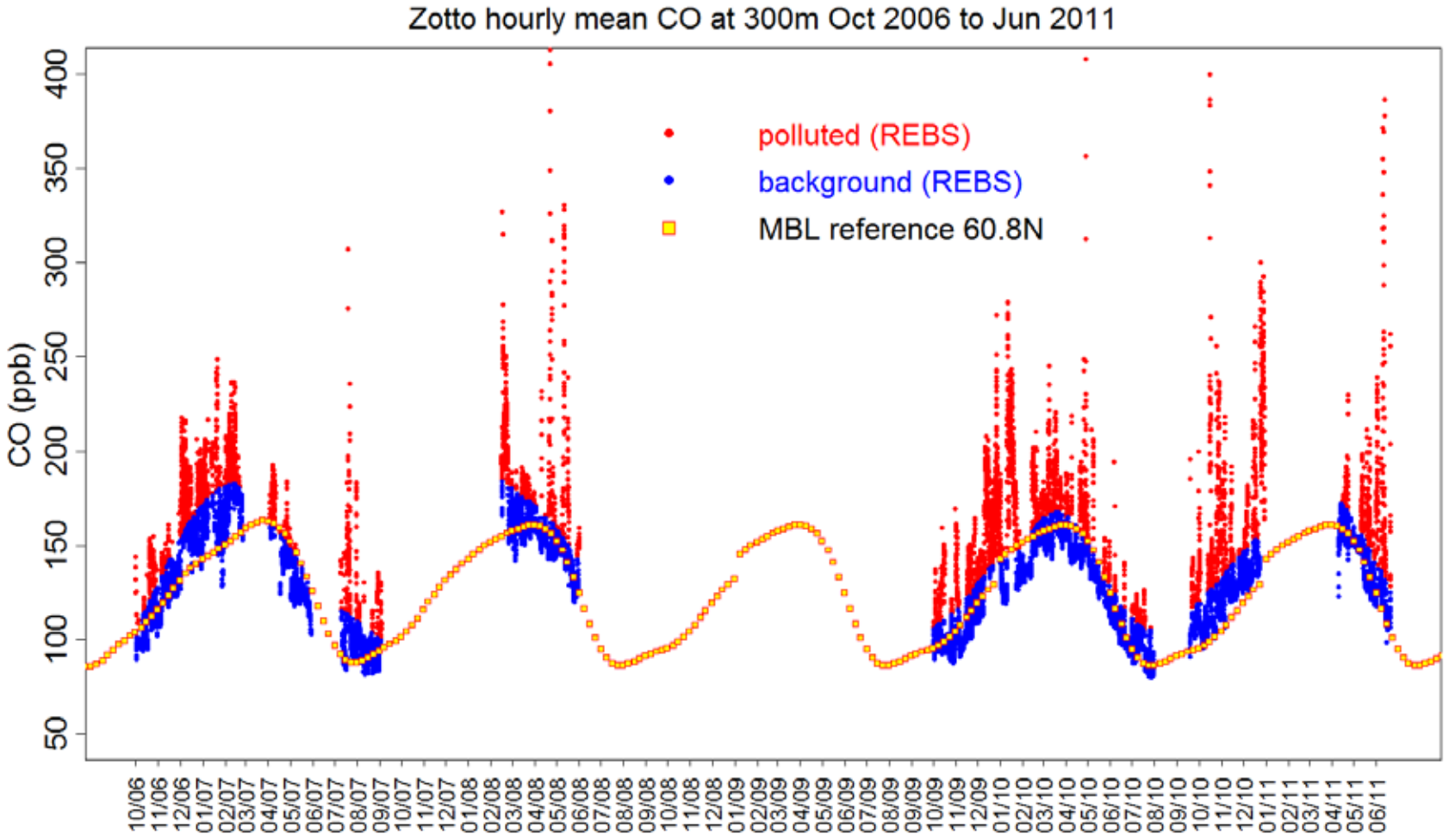
[1]MPI Chemistry, [2]IfT Leipzig, [3]MPI Biogeochemistry, [4]St. Petersburg U., [5]Inst. Forest Krasnoyarsk, [6]IAP Moscow

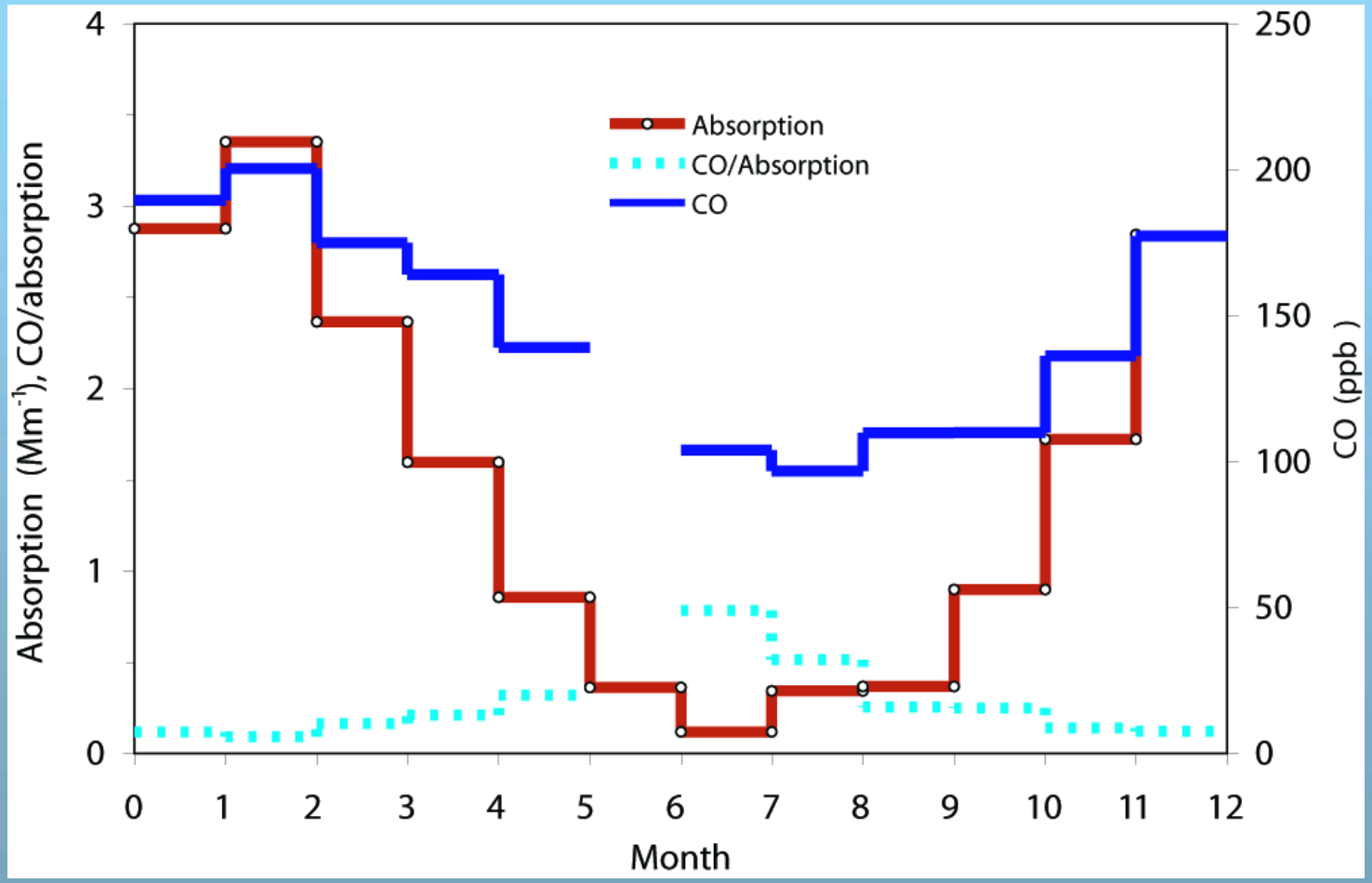
ZOTTO – Current measurement program

- *MPI Biogeochemistry, Jena:*
  - BGC-Gases, continuous concentrations: CO_2, CH_4 (N_2O, CO, O_2/N_2)
  - Flask analyses (isotopes)
  - Meteorology, carbon, heat and water fluxes
- ***MPI Chemistry, Mainz:***
  - **Continuous CO, aerosol light scattering and absorption**
- ***IFT, Leipzig:***
  - **Aerosol size spectra**
- *SIF RAS Krasnojarsk:*
  - Forest inventories, satellite remote sensing
- ***IAP RAS, Moscow:***
  - **O_3, NO_x, reactive gas chemistry**
- *St. Petersburg State University*
  - Aerosol chemistry

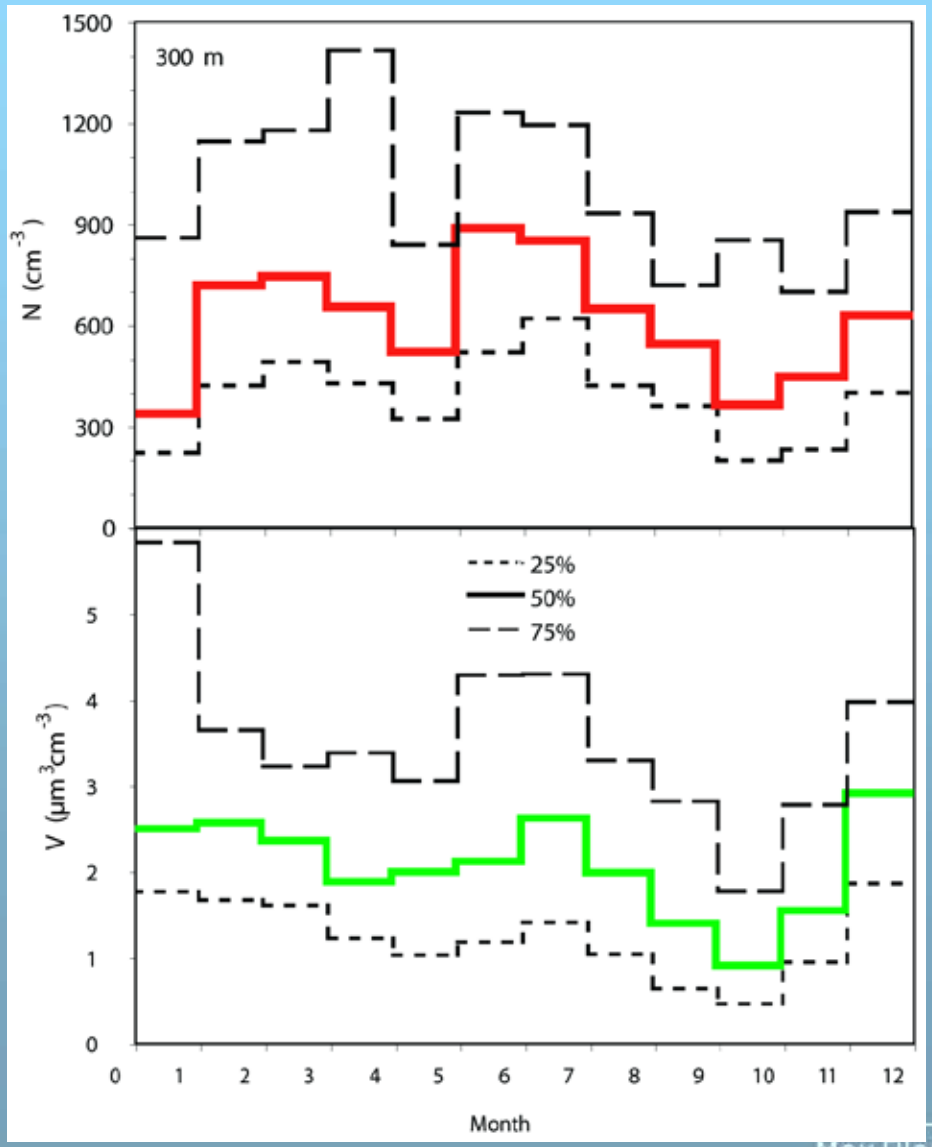
CO Time Series 2006 - 2011



Seasonal Cycles: Combustion Tracers



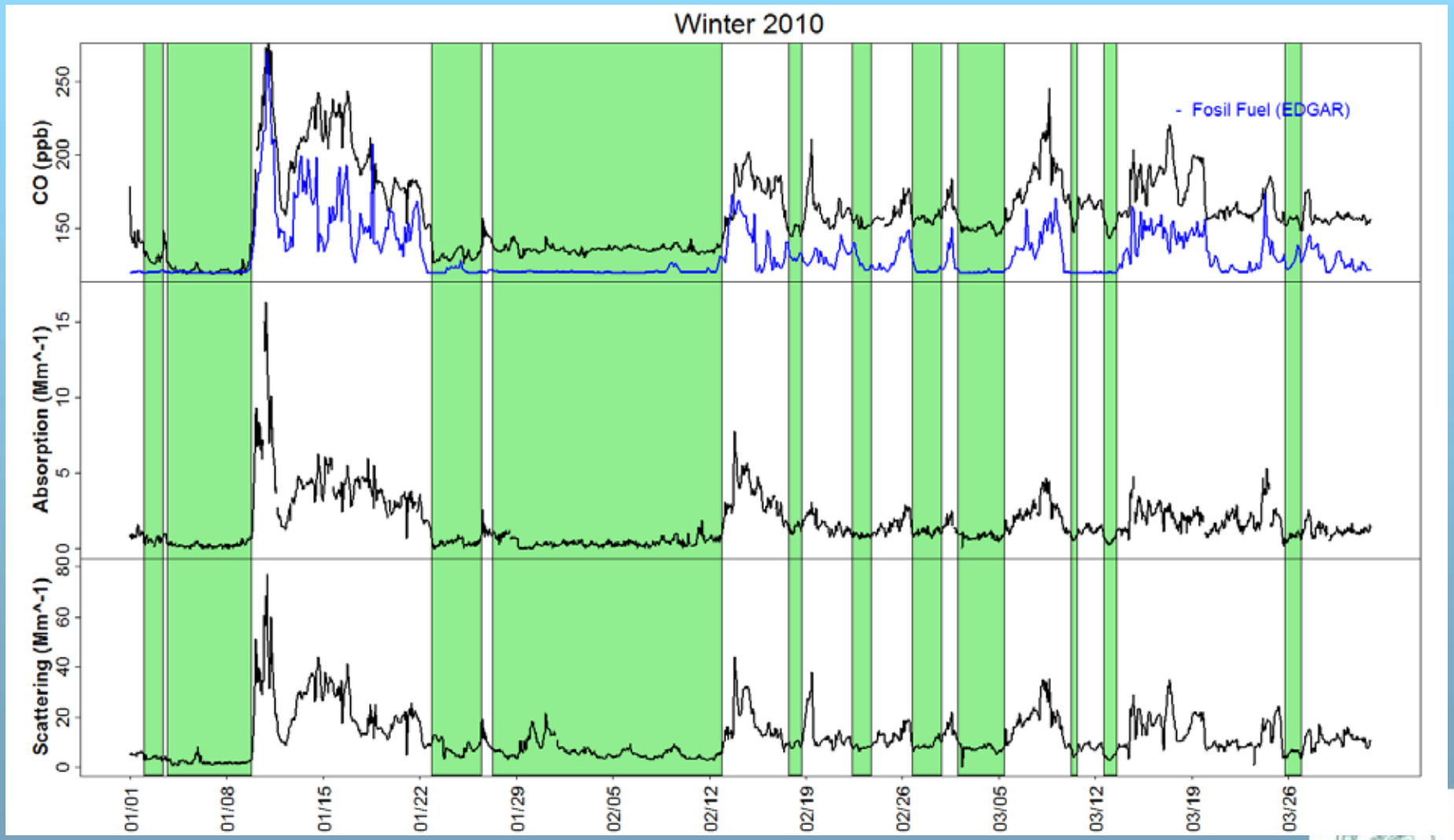
Seasonal Cycles: Total Aerosol



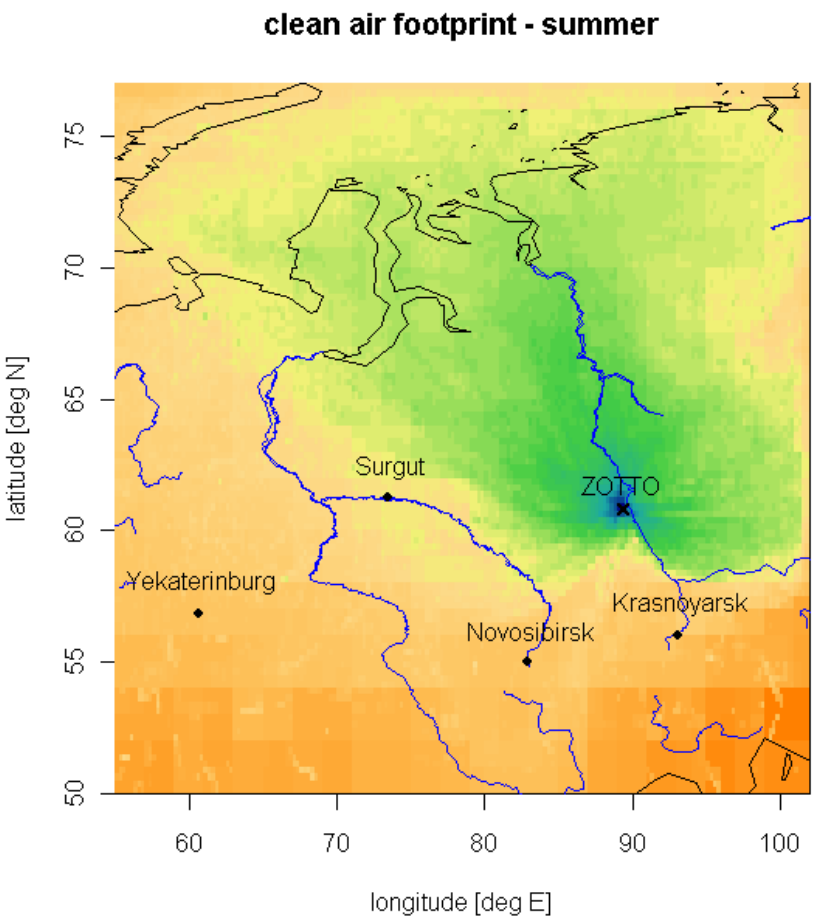
While the combustion tracers show a strong seasonal cycle, measures of total aerosol has relatively indistinct seasonality:

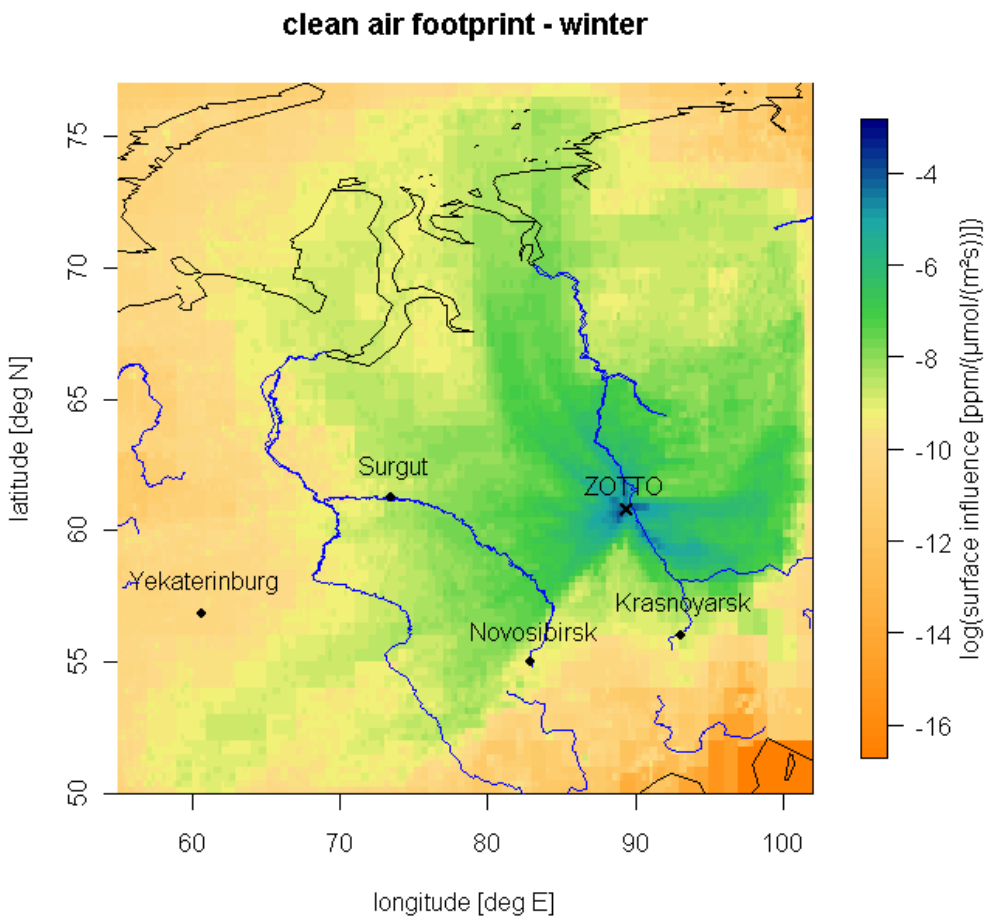
-Pollution aerosols in winter
-Biogenic aerosols in summer

An Example of Clean Air Episodes



Where does clean air come from?



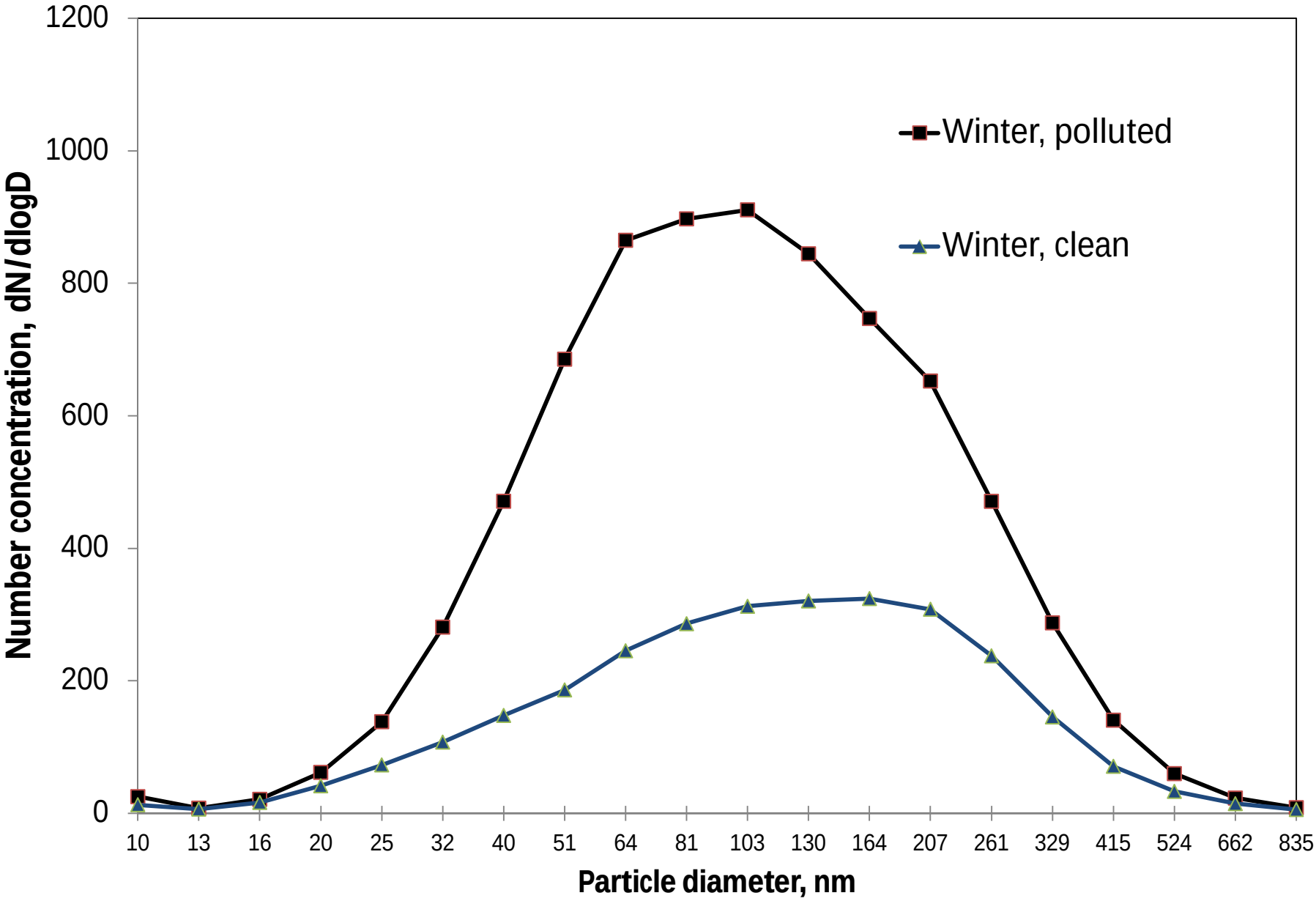


Characteristics of Clean Air at ZOTTO

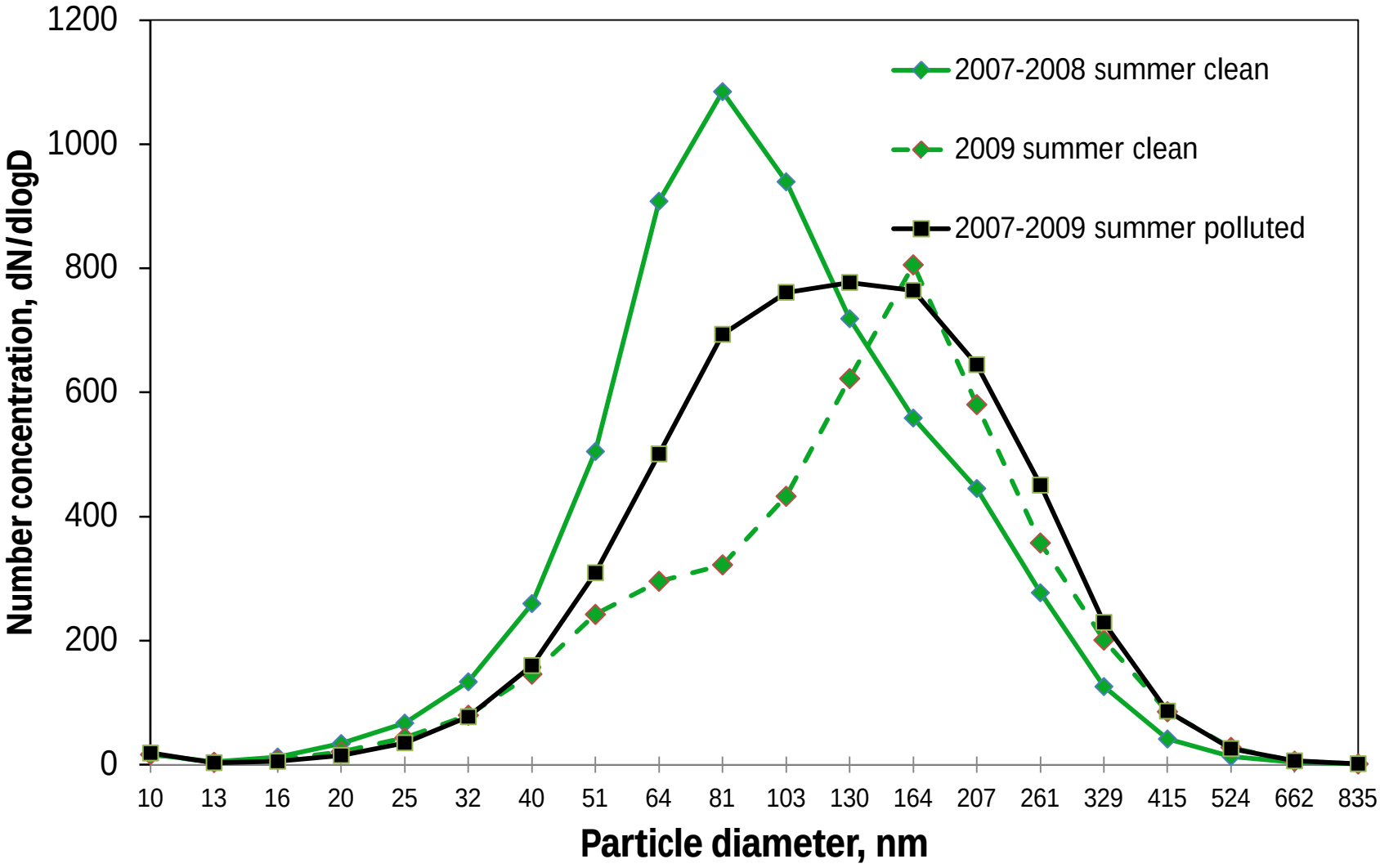
	CO	Absorption Coefficient	Scattering Coefficient	N total	N >80 nm **"CCN"**	Aerosol Volume	NO_x	O_3
	ppb	Mm^{-1}	Mm^{-1}	cm^{-3}	cm^{-3}	$mm^3\ m^{-3}$	ppb	ppb
Winter								
clean	138	0.74	7.2	340	**193**	1.45	0.78	25
polluted	171	2.70	14.5	930	475	2.90	0.96	23
Background	154±5							
Summer								
clean	87	0.09	6.2	701	**393**	1.85	0.49	21
polluted	97	0.32	13.1	691	447	2.25	0.41	21
Background	92±5							

- Pollution burdens, when present, are modest
- In summer, NCN and NCCN show no difference between "polluted" and clean
- Aerosol volume (mass) elevated during "pollution" periods

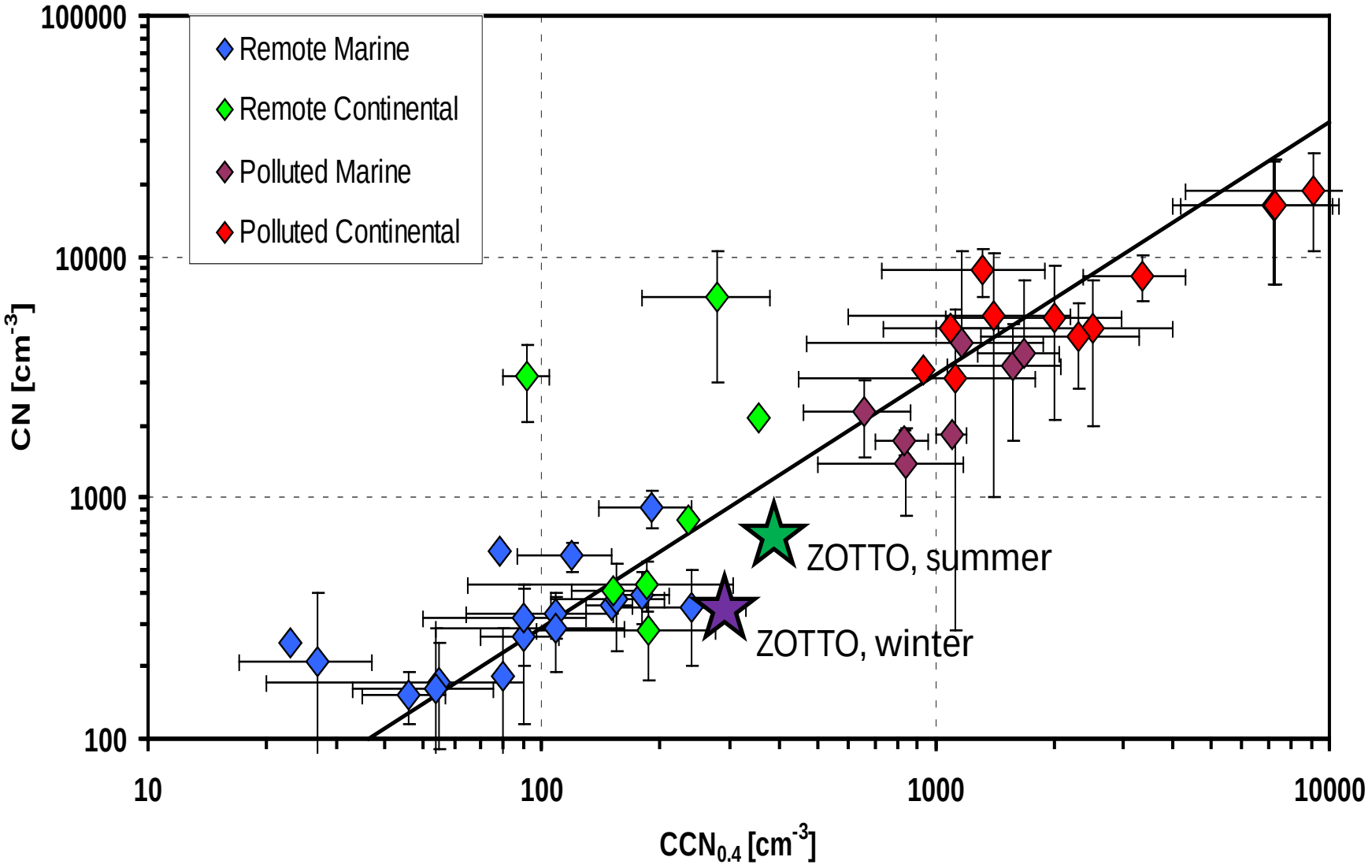
Aerosol size distributions, Winter



Aerosol Size Distributions, Summer



ZOTTO in Global Aerosol Context



Conclusions

- ZOTTO receives episodically polluted and very clean airmasses
- In winter, pollution aerosols are dominant, while in summer natural aerosols provide comparable CN and CCN numbers
- Both, pollution and biogenic particles are large, and therefore good CCN
- During summer clean periods, the presence of a mode ~60 nm suggests new particle formation
- Short observation period does not yet allow detection of trends


Thank you!