European Aerosol Research Lidar Network:

EARLINET

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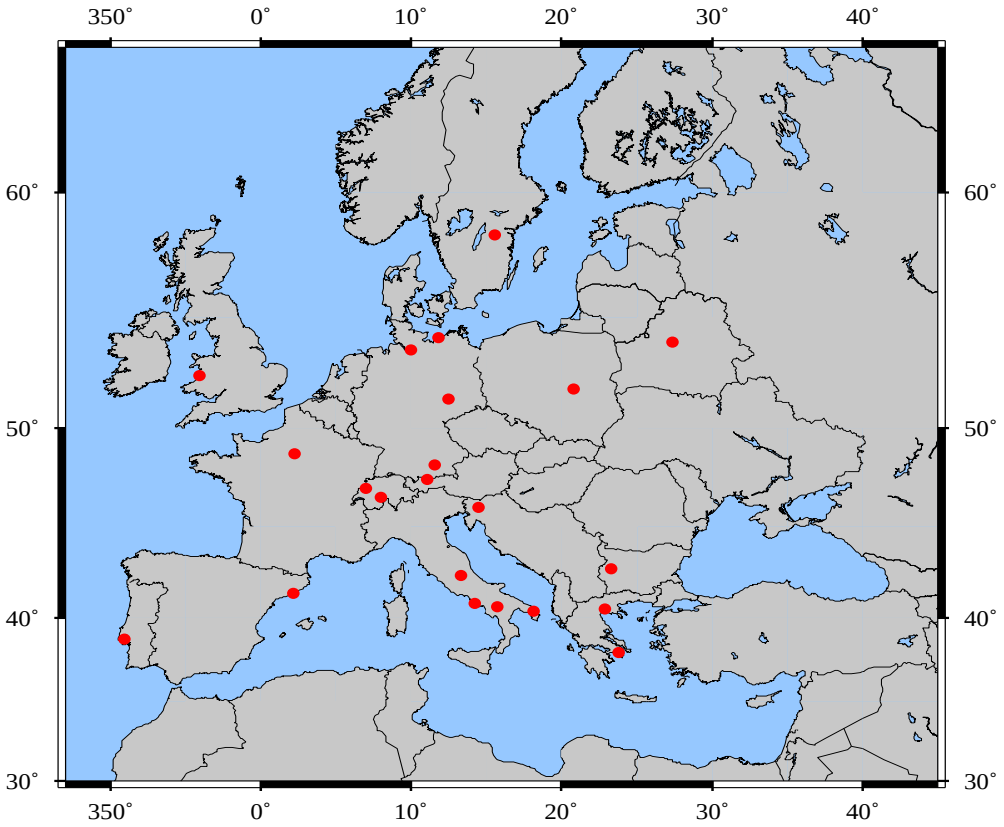
Contents

1. Objectives of EARLINET

EARLINET is a joint project of 22 lidar groups from different European countries

Main goals are to

- establish a quantitative statistically relevant data base of the vertical aerosol distribution on a continental scale
- provide a data base for further use in numerical models and for satellite validation
- investigate aerosol transport and modification over Europe

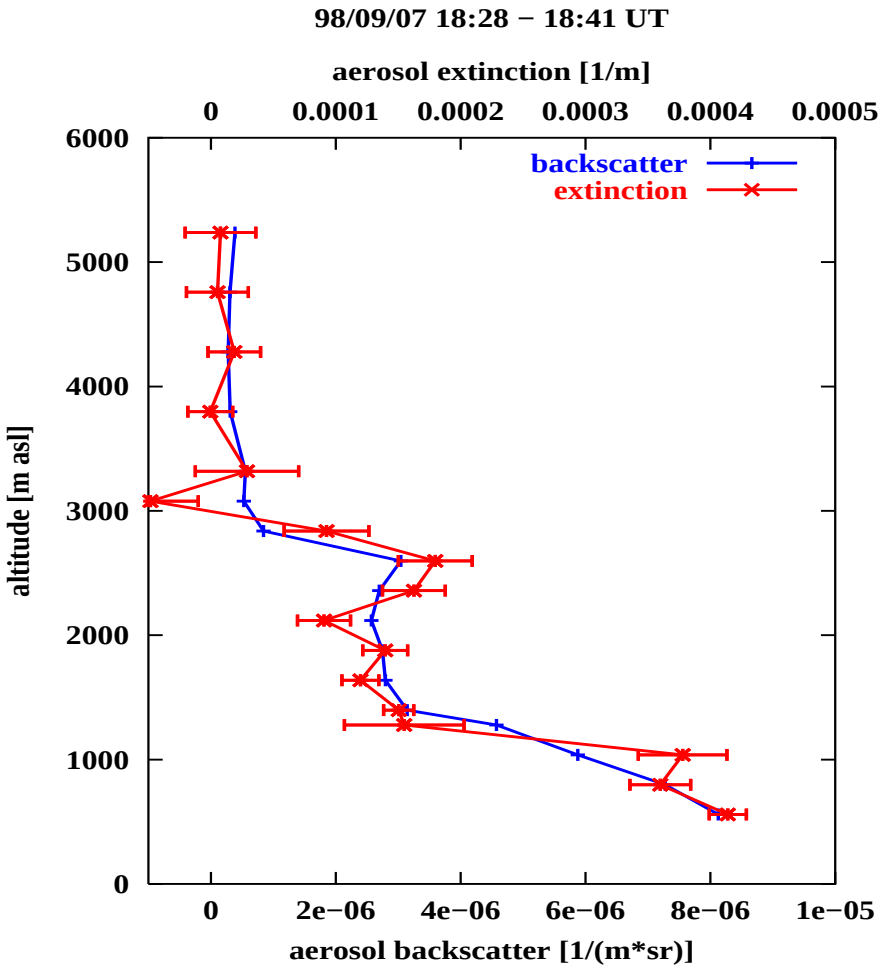


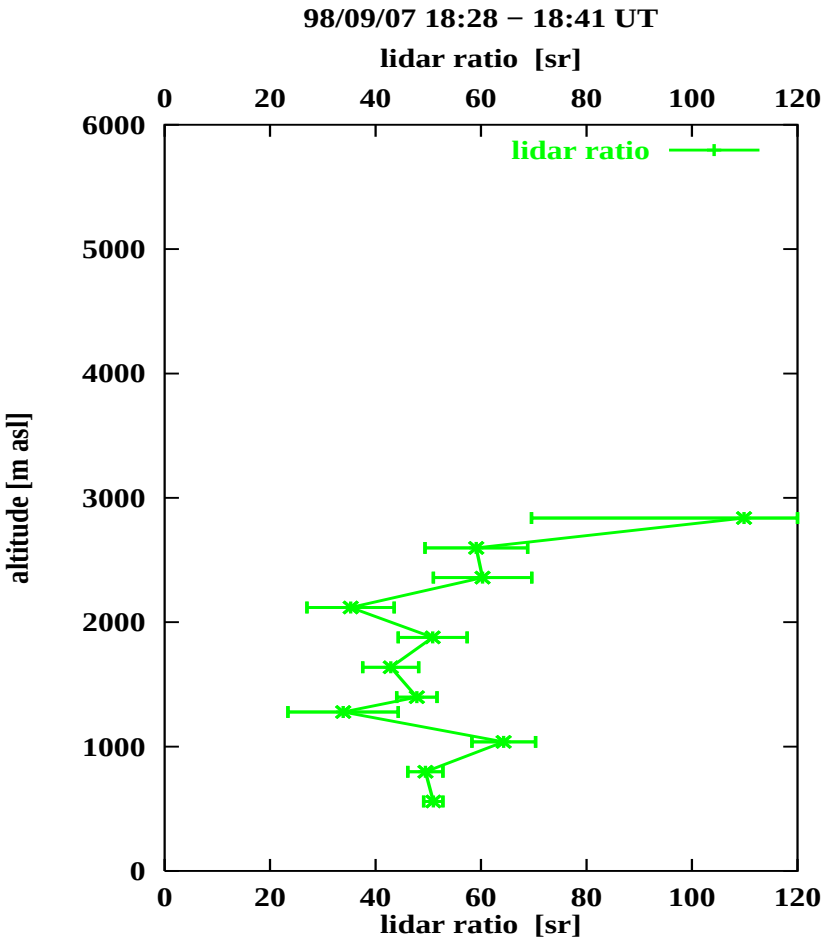
EARLINET Lidar Systems

Group	Country	elastic ch.			Raman ch.	Transportable
		355 nm	532 nm	1064 nm	355 nm	
MPI Hamburg	D	x	x	x	x	x
MI Munich	D	x	x	x		x
U Aberystwyth	GB	x			x	
NTU Athens	GR	x	x		x	
UPC Barcelona	E		x	x		x
IFU Garmisch-P.	D	x	x	x		x
EPF Lausanne	CH	x	x	x	x	
IAP Kühlungsborn	D	x	x	x	x	
U L'Aquila	I	x[(1)]			x	
INFM Lecce	I	x[(1)]			x	
IFT Leipzig	D	x	x	x	x	x
IST Lisbon	P		x	x		x
FOA Linköping	S	x				x
IPNANB Minsk	BY	x[(2)]	x	x		
INFM Napoli	I	x[(1)]			x	
OC Neuchâtel	CH	x	x	x		x
LMD Palaiseau	F		x	x		
INFM Potenza	I	x	x		x	
AU Thessaloniki	GR	x	x		x	

[(1)]: emitted wavelength is 351 nm
[(2)]: emitted wavelength is 353 nm.

Aerosol Profiles





EARLINET Data Base

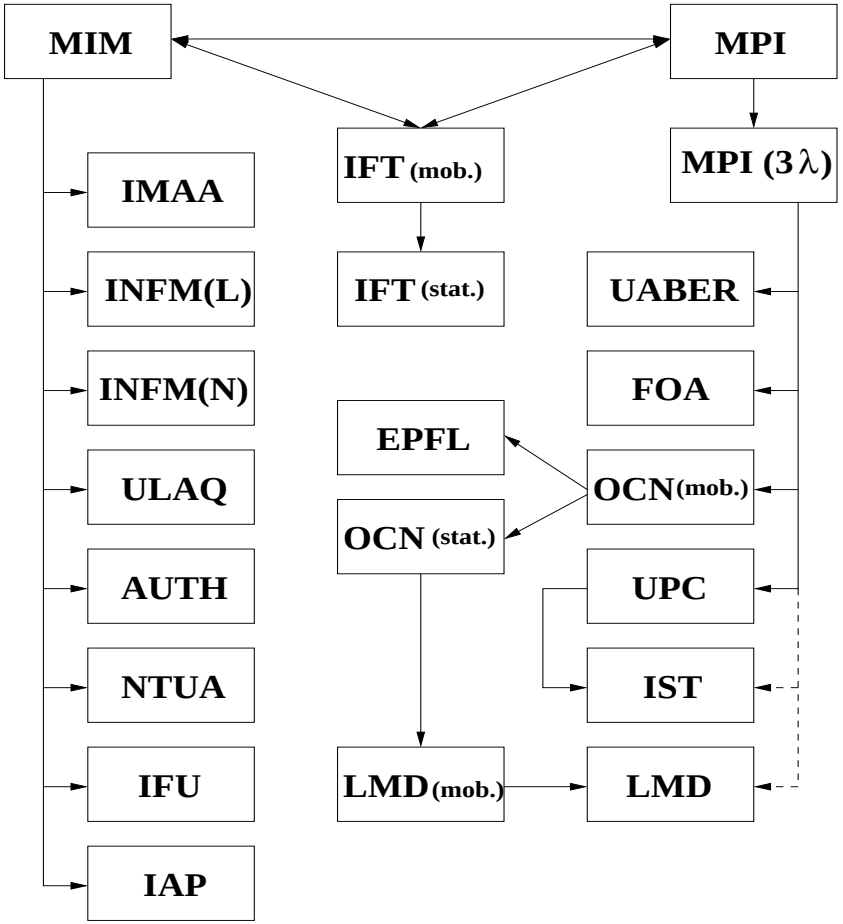
- Files are stored in NetCDF format
- More than 13000 profiles have been collected since May 1, 2000
- Lists lead to files that address special topics, e.g.
  - Saharan dust: 1985 profiles
  - Diurnal cycles: 1651 profiles
  - Forest fires: 174 profiles
  - Etna eruption: 108 profiles
- Data base is not public, but data can be used upon request (see http://lidarb.dkrz.de/earlinet or send email to boesenberg@dkrz.de)

2. Quality Assurance

For joint sudies and comparative statistics using network measurements, quality assurance (QA) is of very high importance

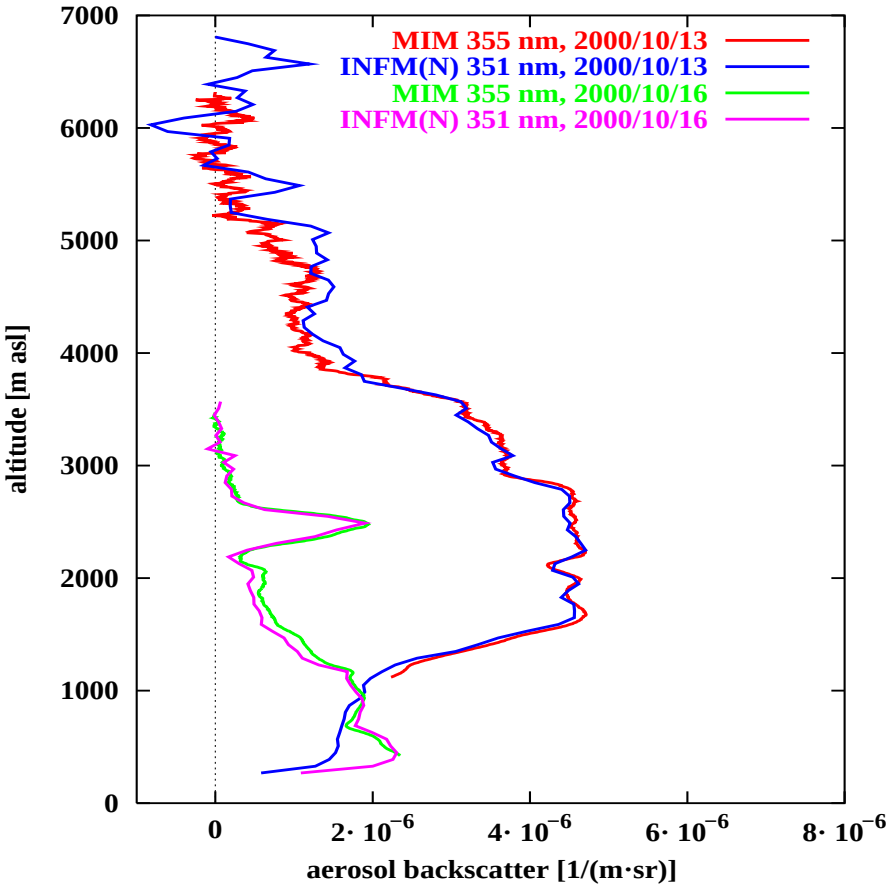
EARLINET QA procedure :

- quality criteria were predefi ned
- “standard systems” have been compared to new systems
- quality controlled systems could serve as standard systems themselves

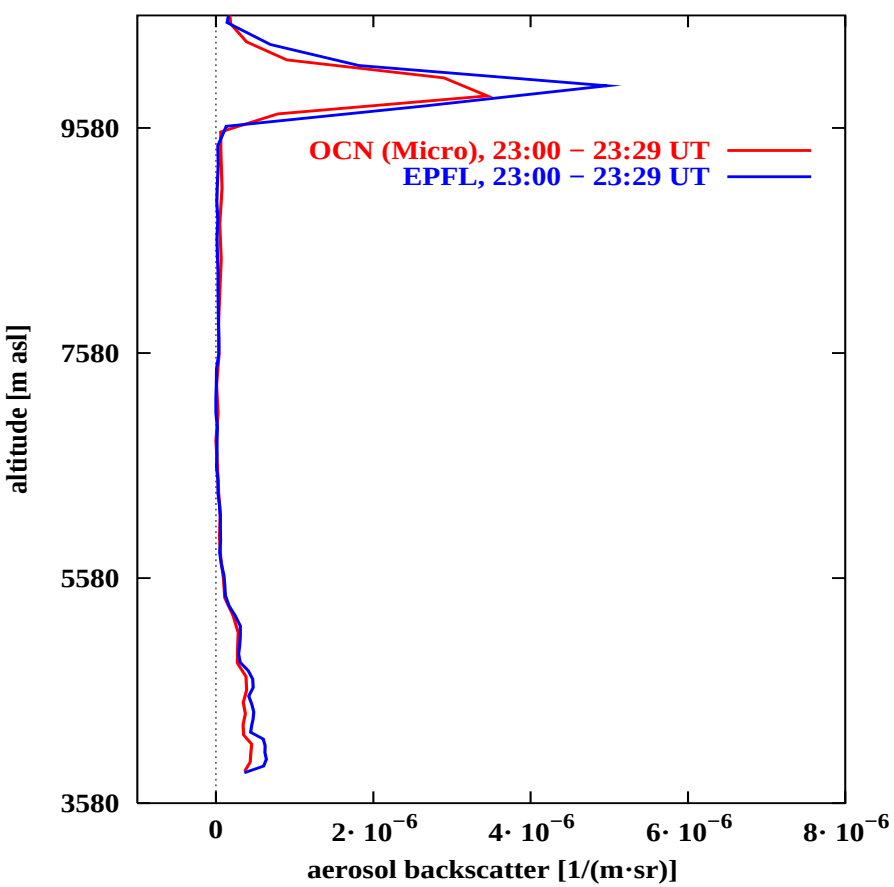


System Intercomparisons: Aerosol Backscatter

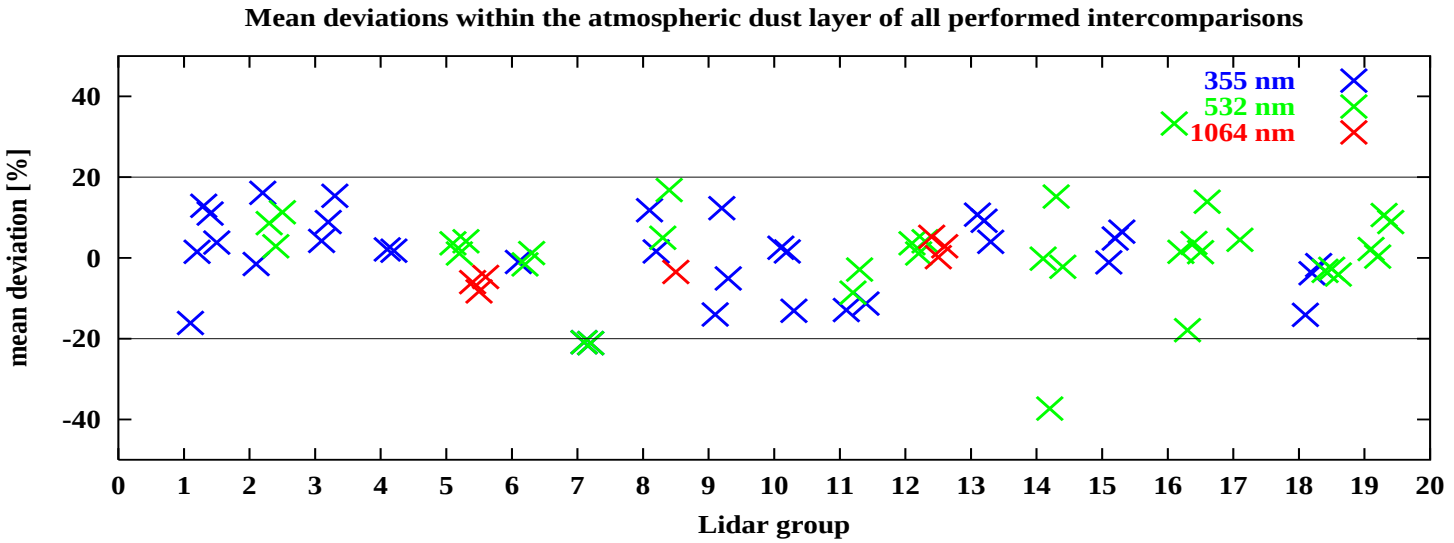
Lidar intercomparisons: MIM/INFM(N) 2000/10/13, 14:12−14:26 and 2000/10/16, 8:20 − 8:30

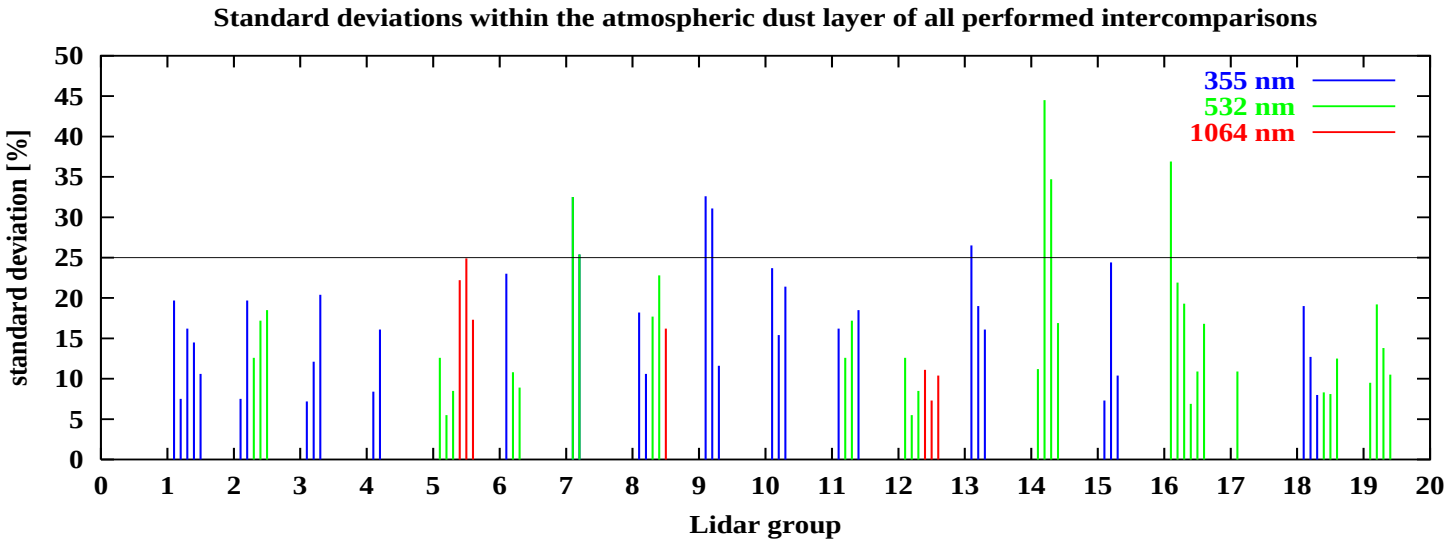


Lidar intercomparisons: OCN/EPFL 2001/05/07, 532 nm

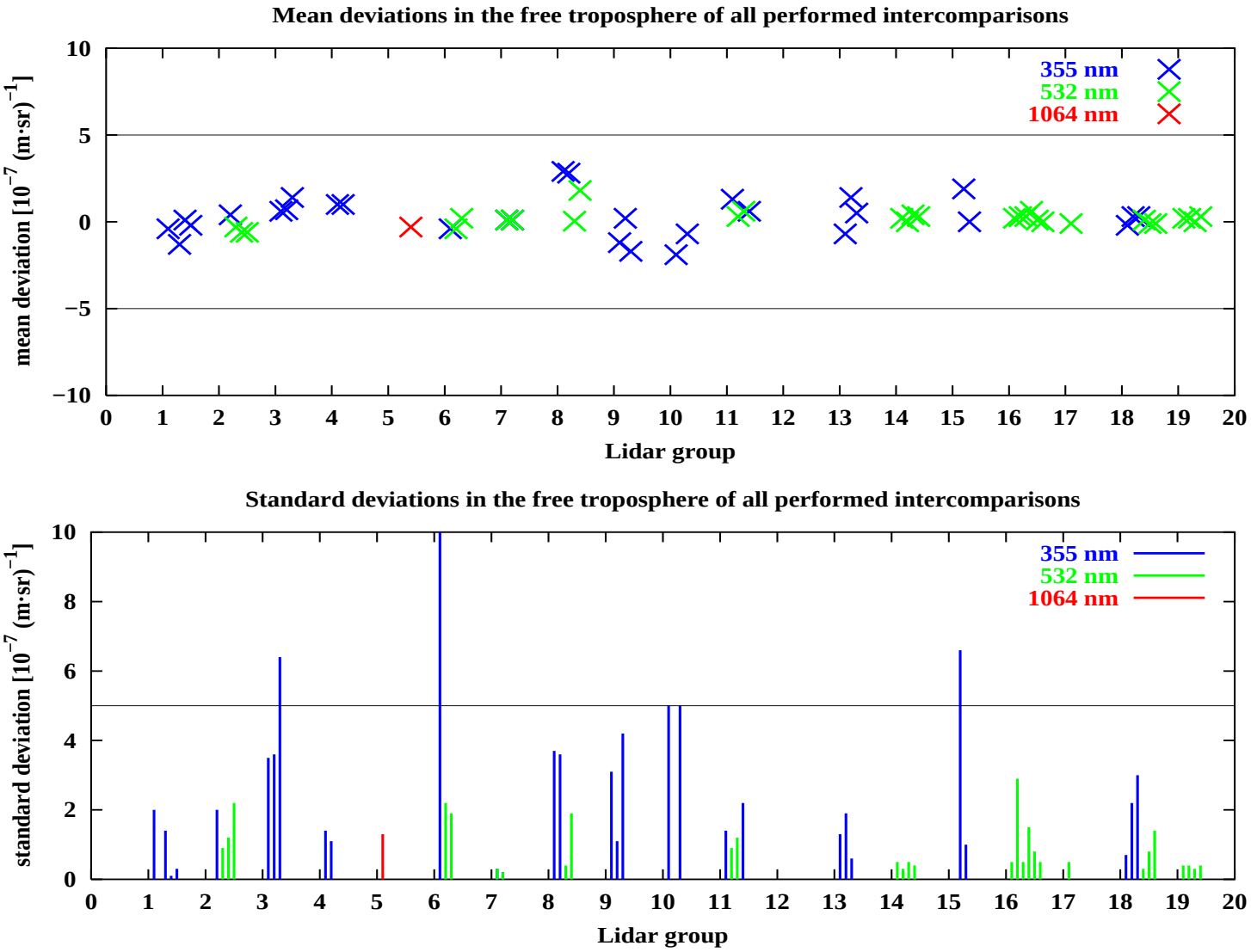


Aerosol Backscatter: Deviations in the Dust Layer

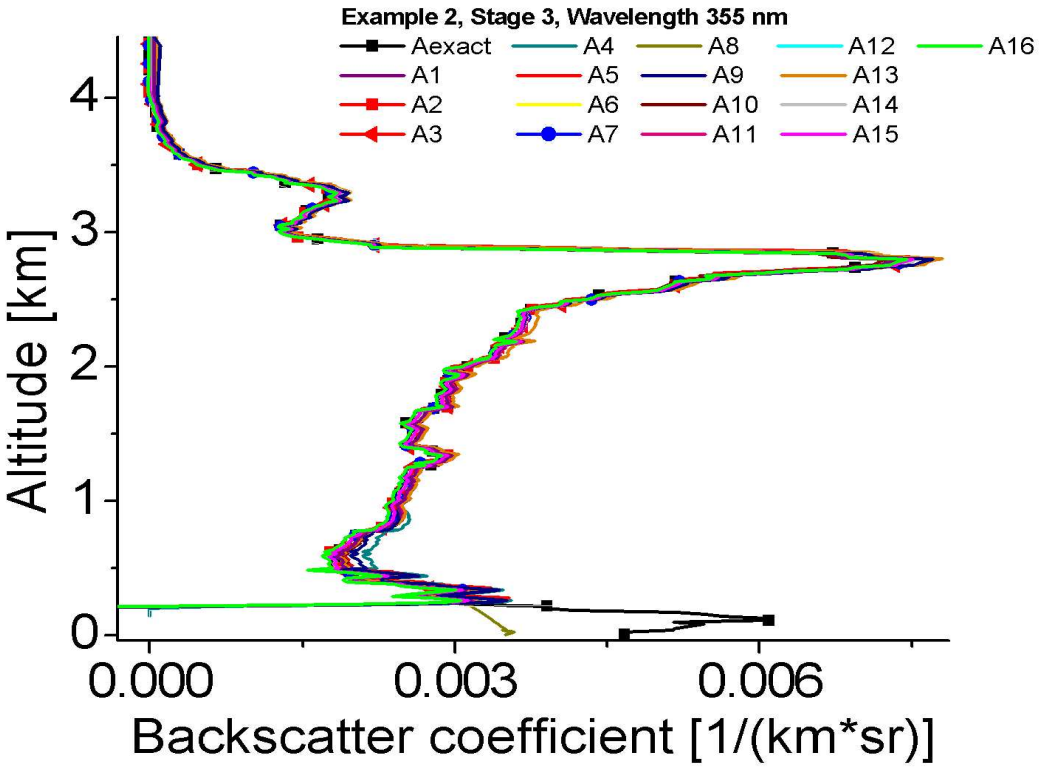


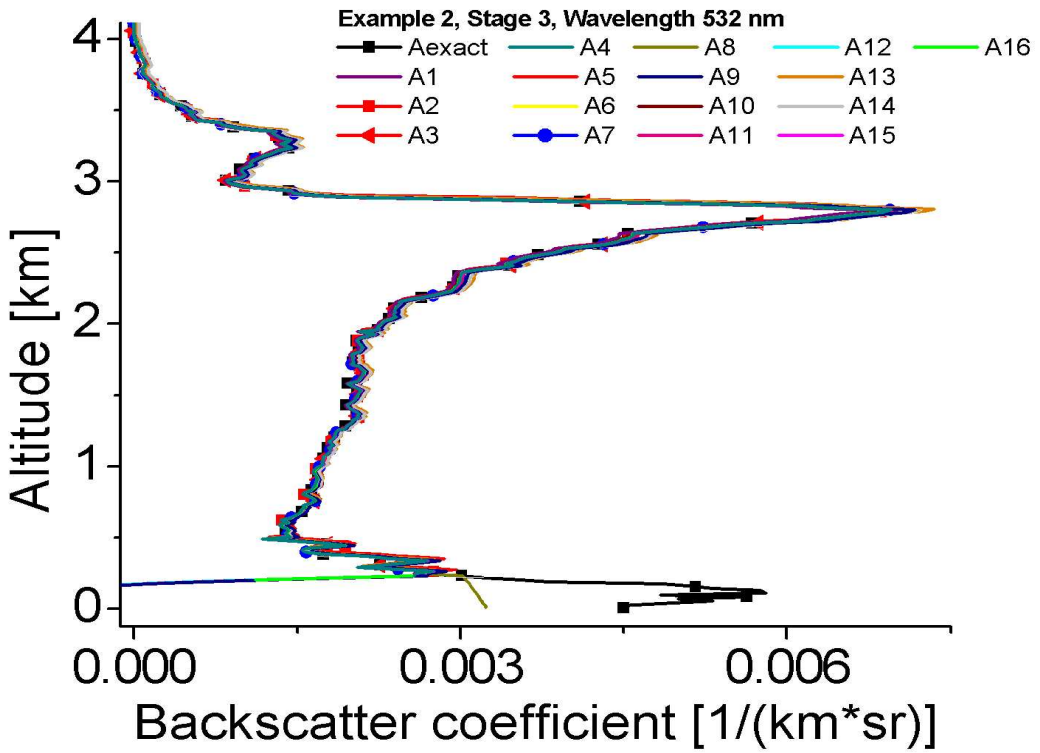


Aerosol Backscatter: Deviations in the Free Troposphere

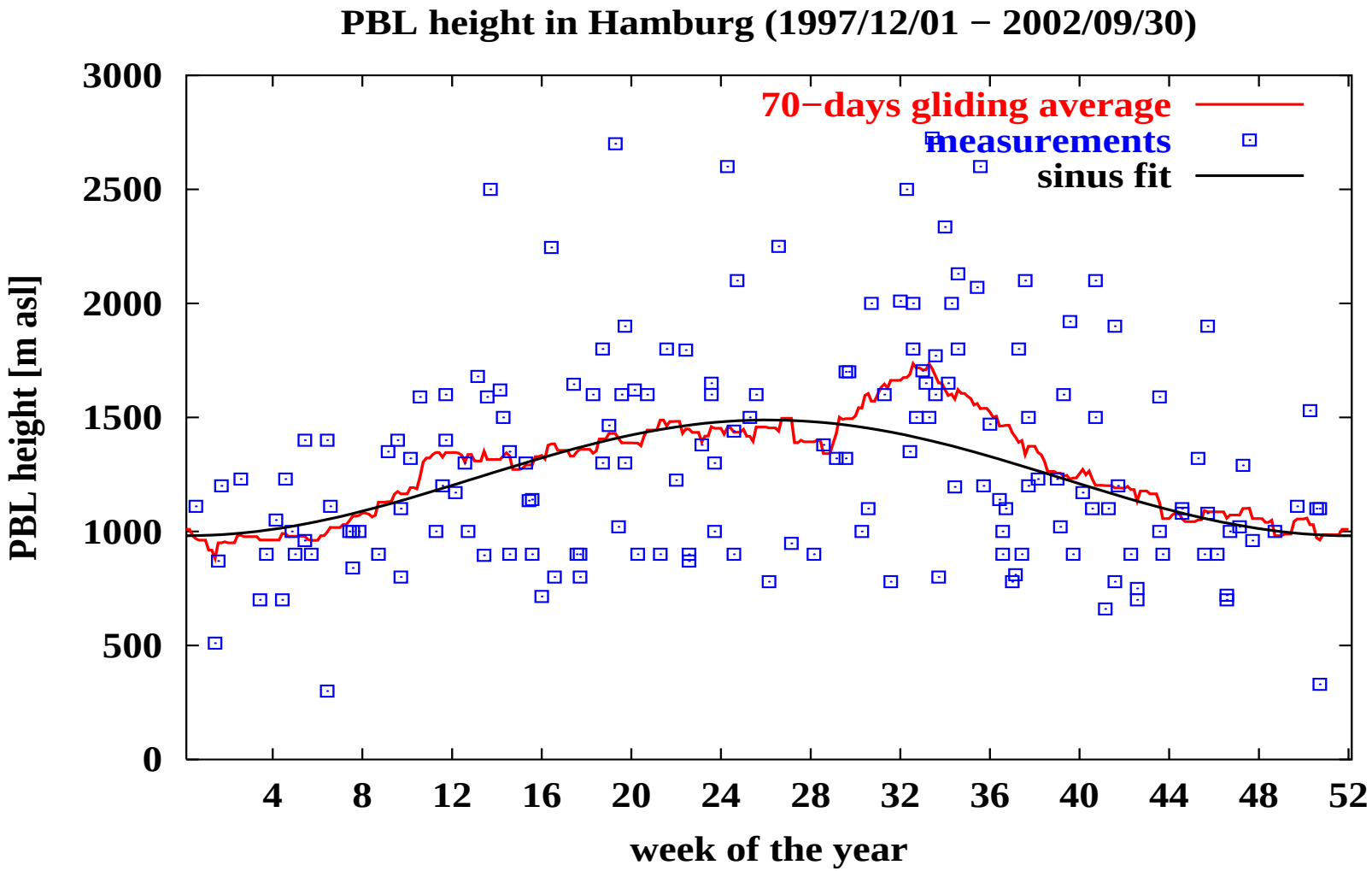


Backscatter Algorithm Intercomparisons: Case 2, Stage 3



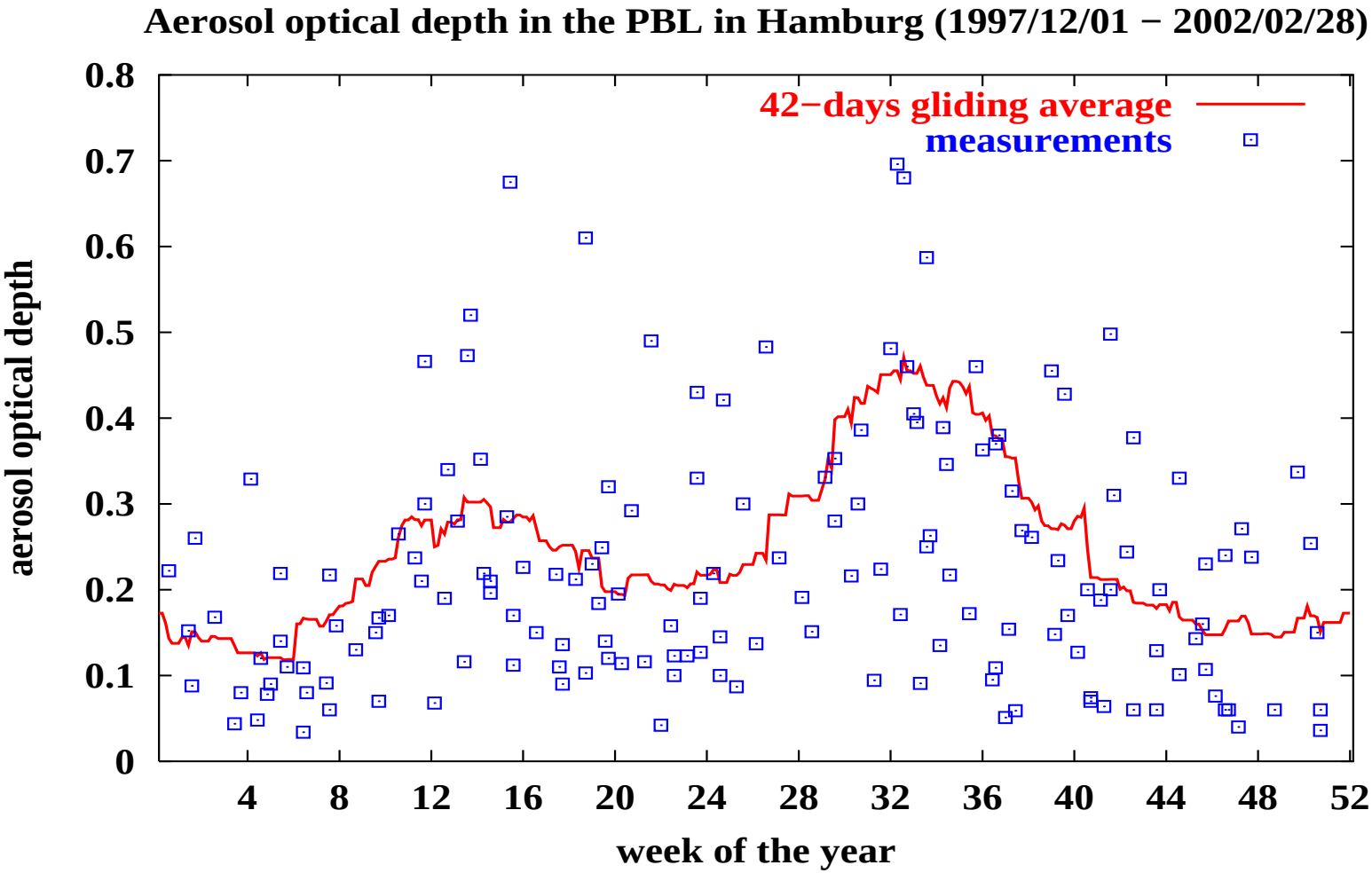


3. Station Statistics

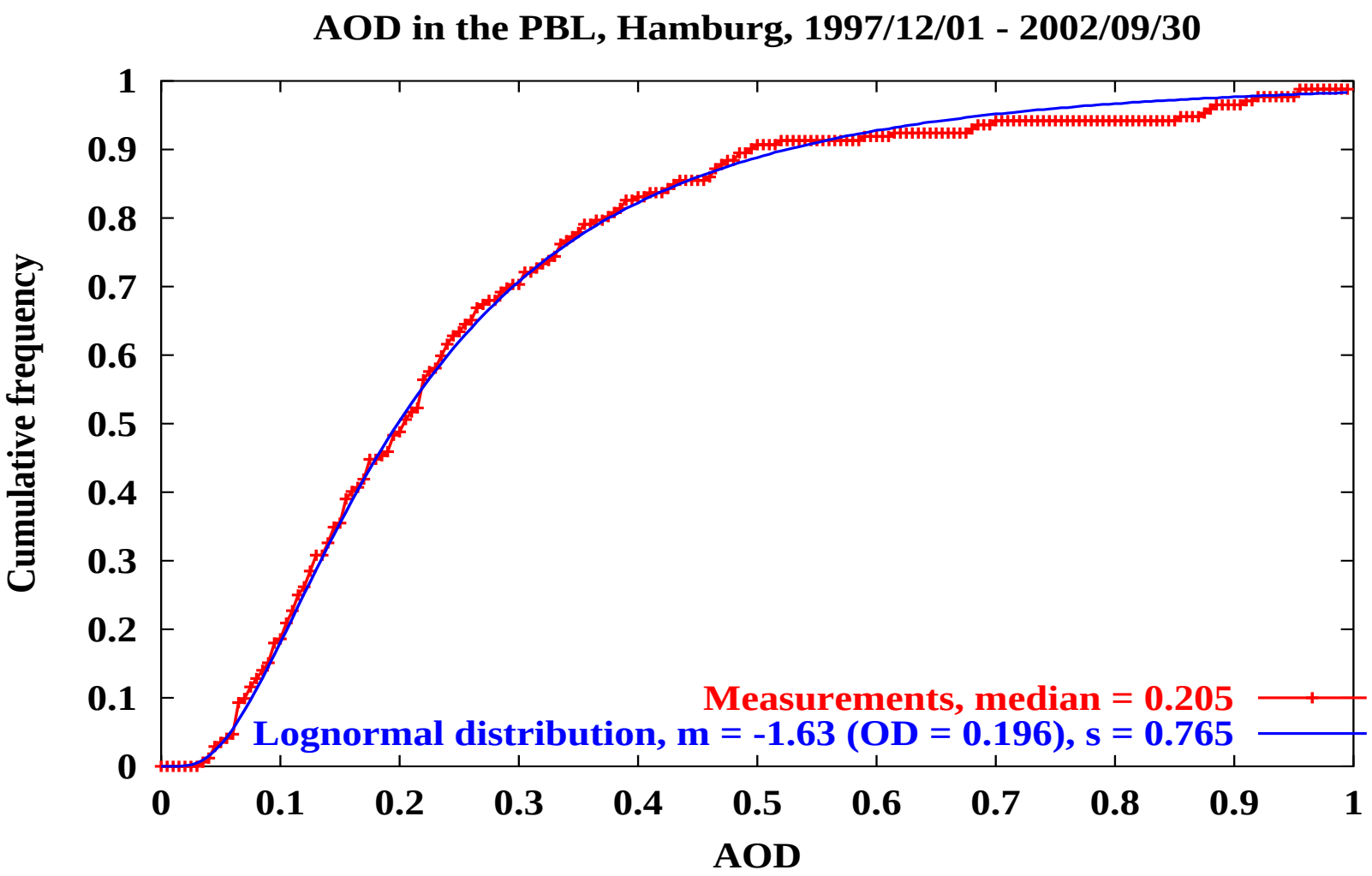


Aerosol optical depth in PBL in Hamburg

mean AOD 0.26 $\pm$ 0.22 (355 nm), skewness 1.84

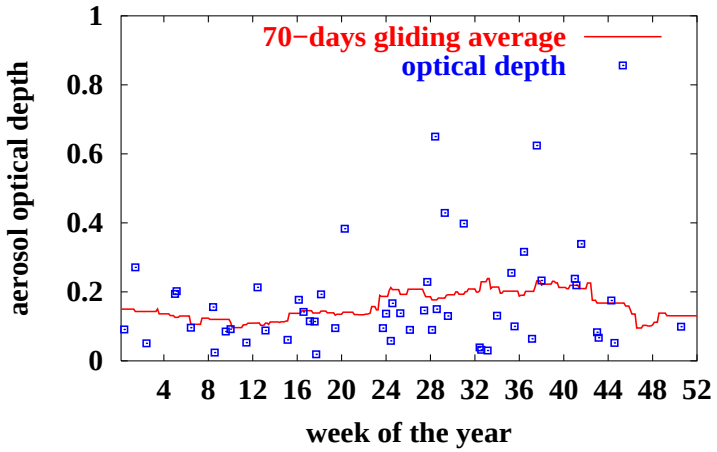


Cumulative frequency distribution of the AOD in the PBL in Hamburg

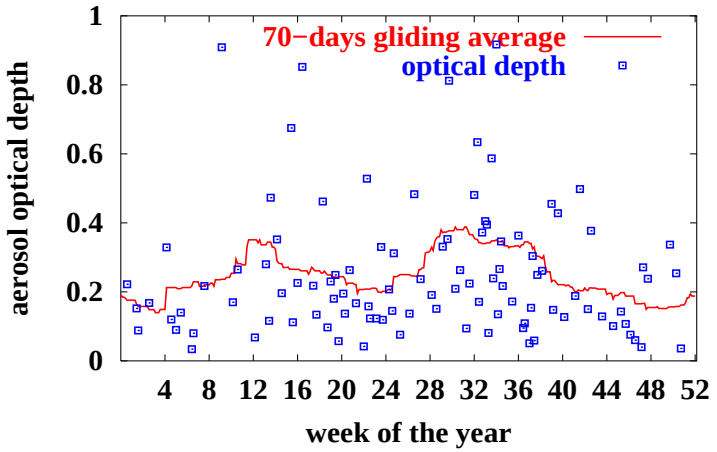


Comparison of the annual cycle of the AOD in the PBL (1)

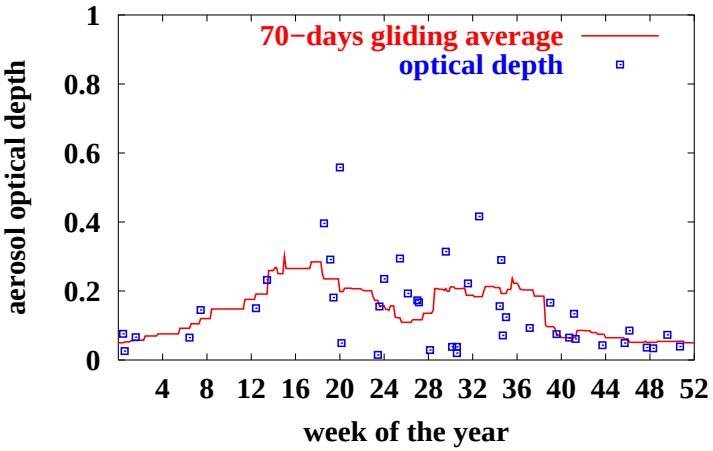
Aberystwyth (05/2000 − 10/2002): AOD = 0.16 ± 0.13



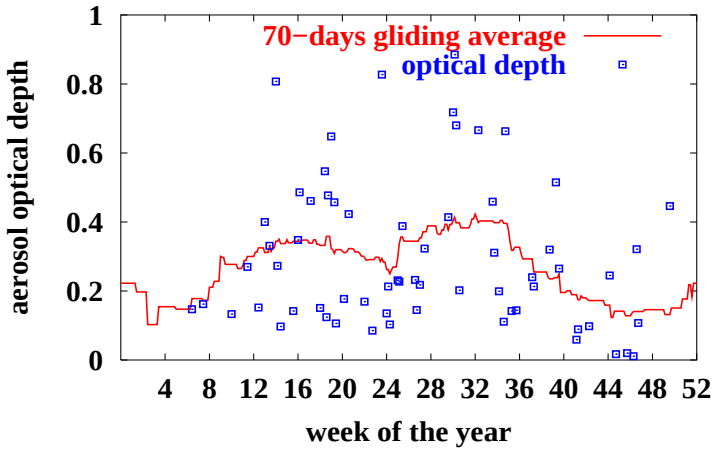
Hamburg (05/2000 − 09/2002): AOD = 0.26 ± 0.21



Kühlungsborn (05/2000 − 09/2002): AOD = 0.15 ± 0.19

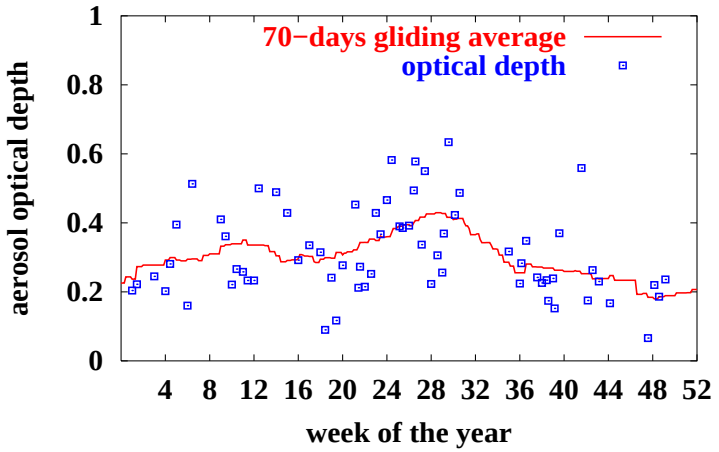


Leipzig (05/2000 − 07/2002): AOD = 0.29 ± 0.22

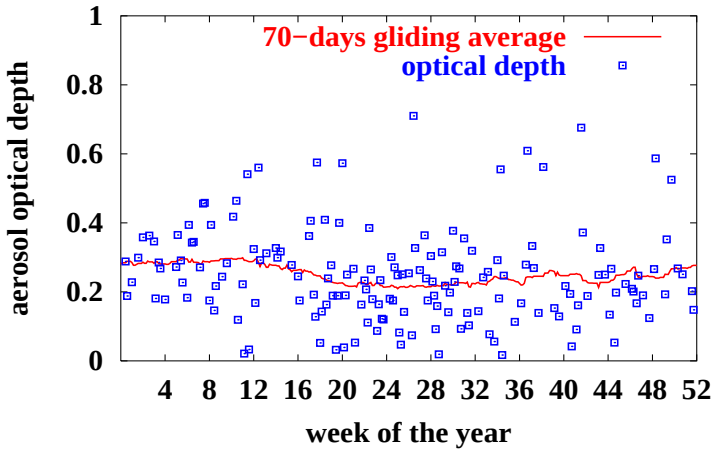


Comparison of the annual cycle of the AOD in the PBL (2)

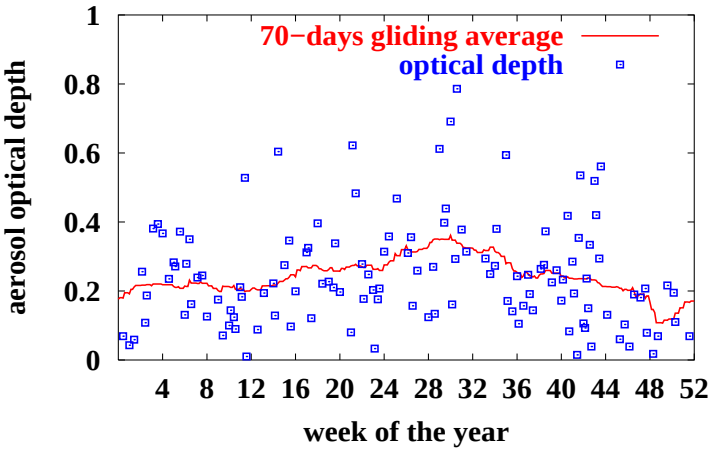
L'Aquila (05/2000 − 09/2002): AOD = 0.31 ± 0.13



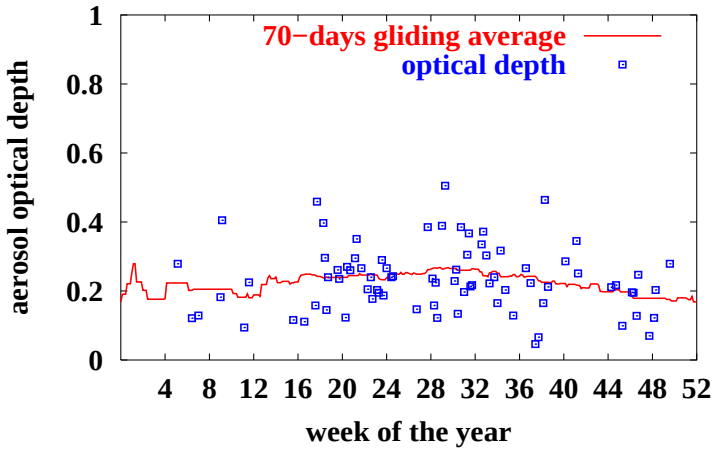
Lecce (05/2000 − 08/2002): AOD = 0.25 ± 0.13



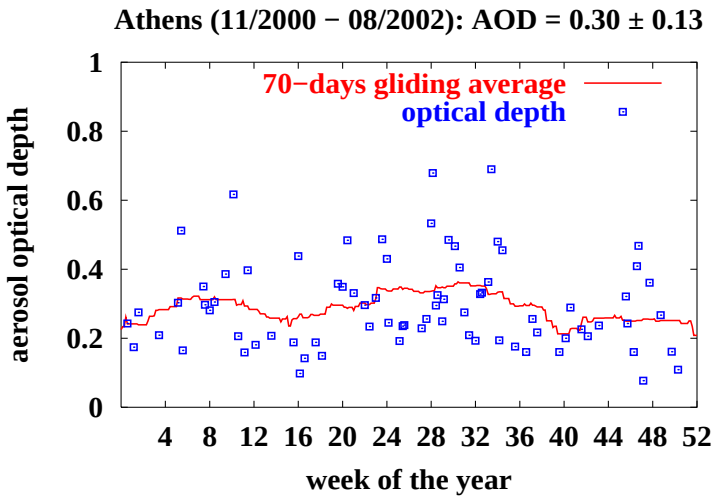
Naples (10/2000 − 10/2002): AOD = 0.25 ± 0.15

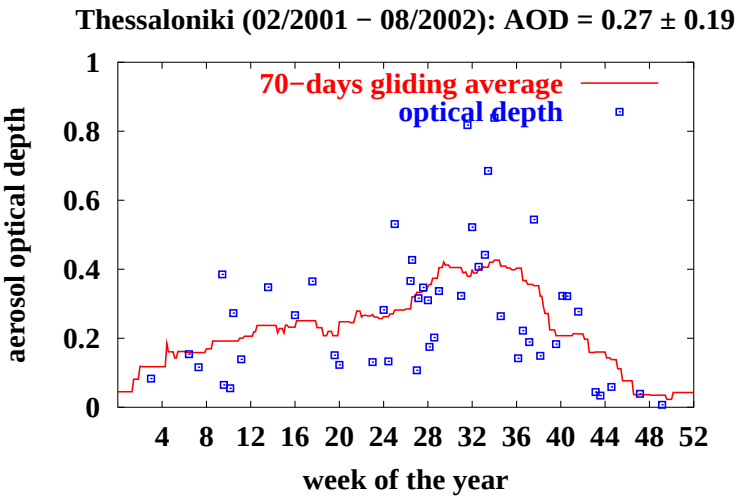


Potenza (05/2000 − 09/2002): AOD = 0.23 ± 0.10

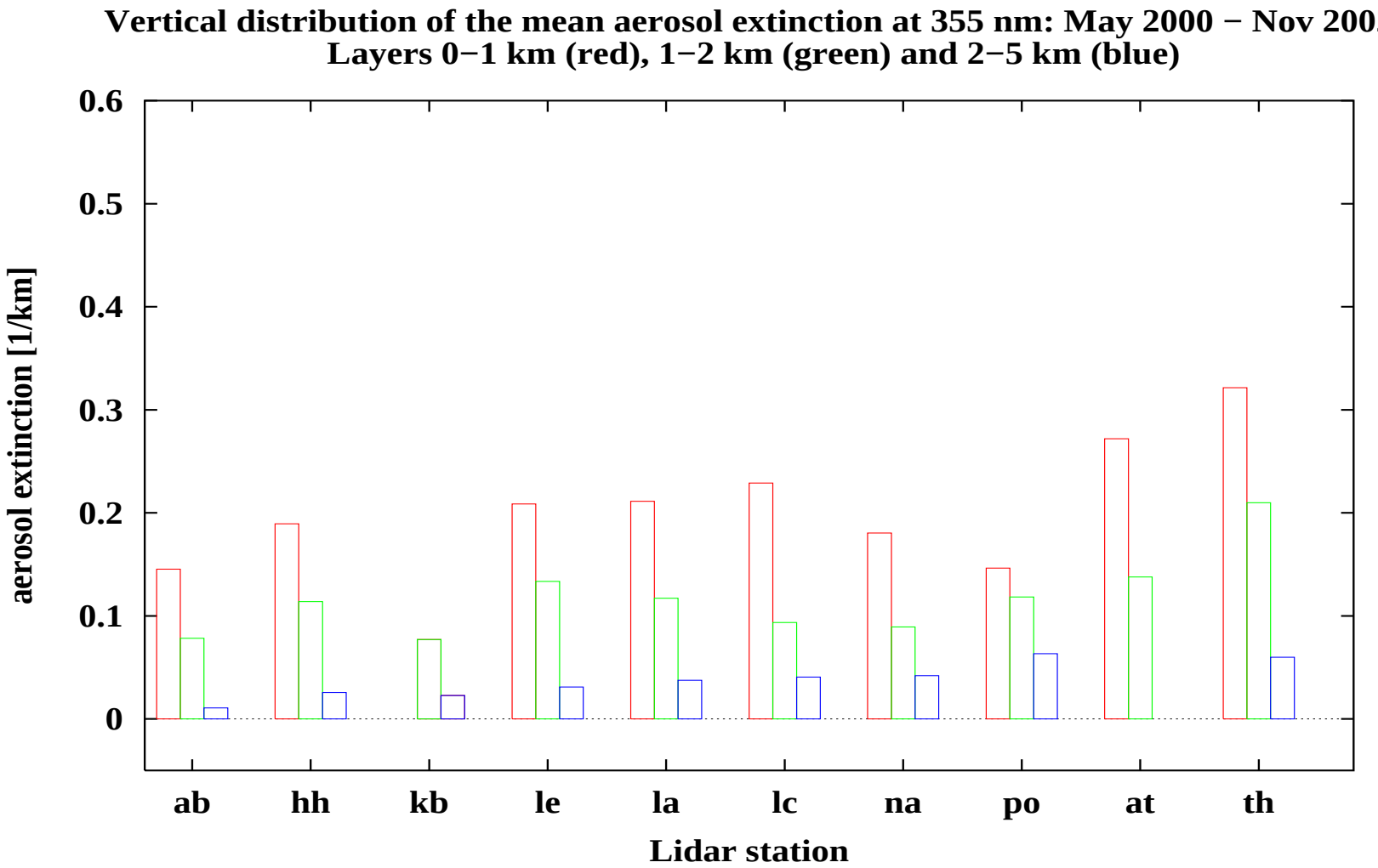


Comparison of the annual cycle of the AOD in the PBL (3)

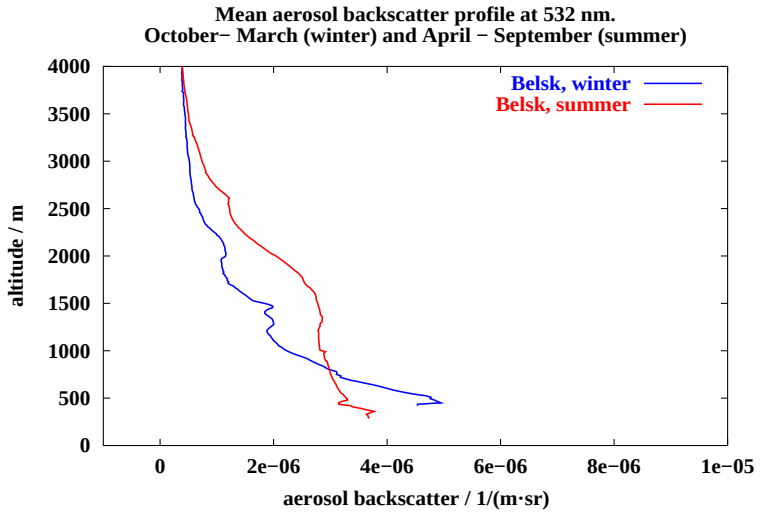


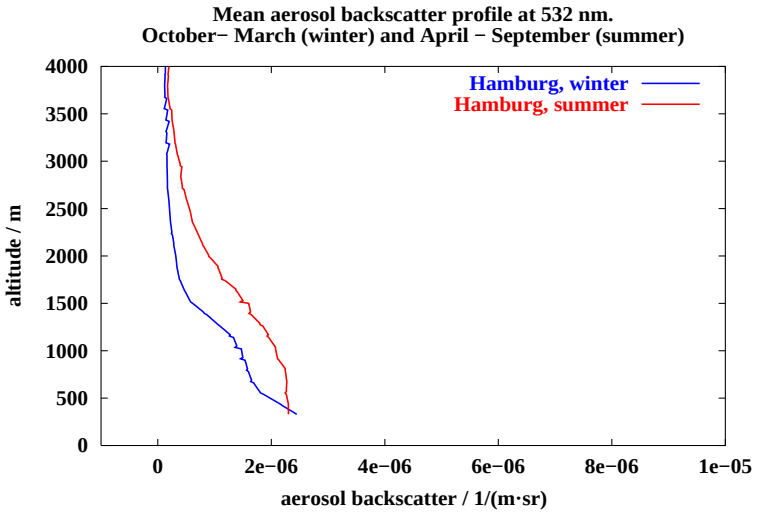


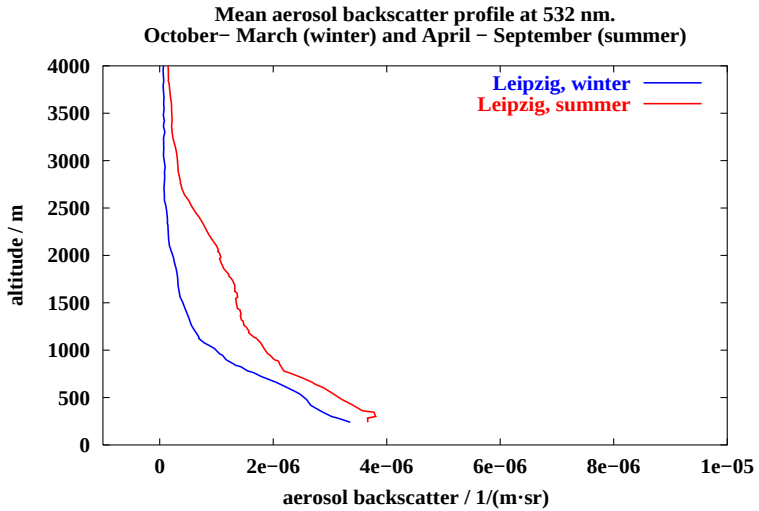
Vertical distribution of the aerosol extinction

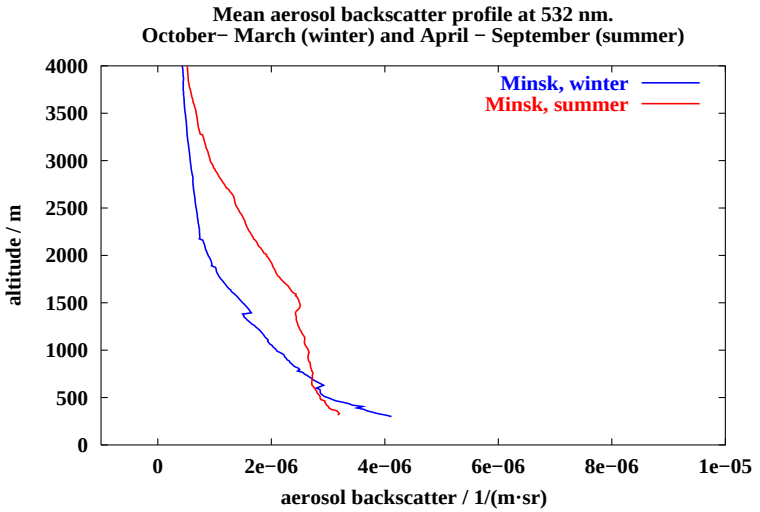


Comparison of aerosol backscatter profiles (532 nm) (Seasonal averages)





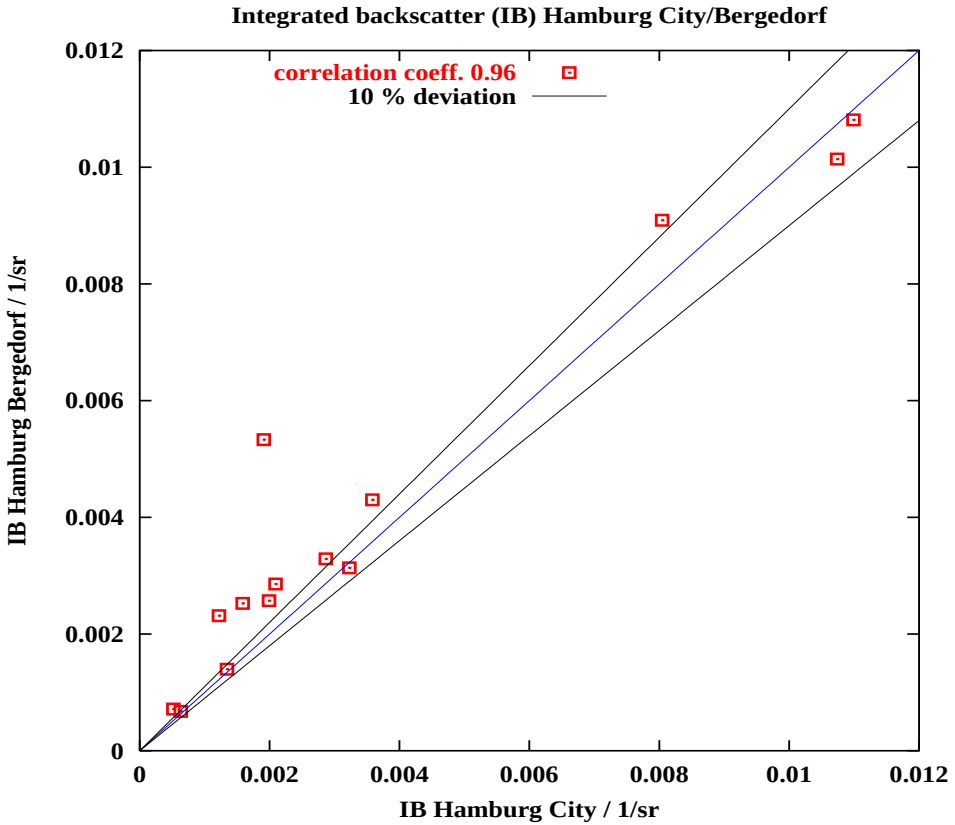




4. Correlation Studies

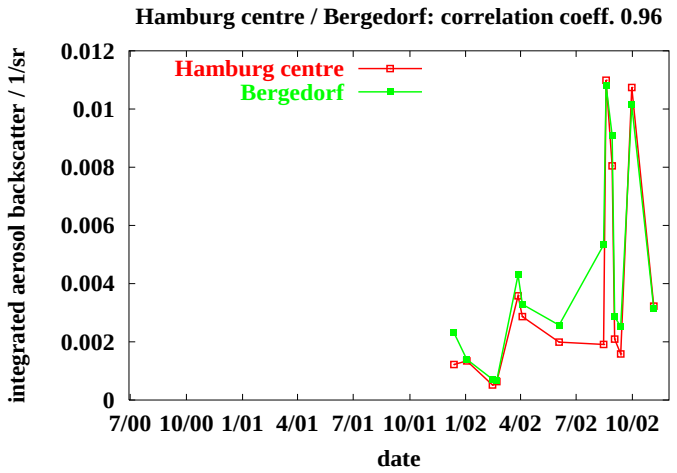
Comparison of Hamburg-City and Hamburg-Bergedorf Data

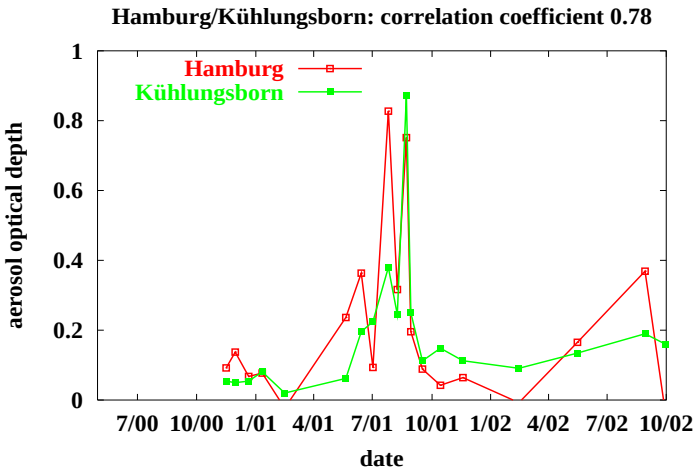
Date	IB City [10^{-3} sr^{-1}]	IB Bergedorf 10^{-3} sr^{-1}]	Trajectory 19 UT
01/12/13	1.22	2.31	SE
02/01/03	1.34	1.40	SE
02/02/14	0.52	0.71	E
02/02/21	0.63	0.67	NW
02/03/28	3.58	4.30	SE
02/04/04	2.87	3.29	E
02/06/03	1.99	2.57	SE
02/08/15	1.91	5.33	N
02/08/19	10.99	10.81	SE
02/08/29	8.05	9.09	NW (950hPa) SW (850hPa)
02/09/02	2.09	2.86	E
02/09/12	1.58	2.53	E
02/09/30	10.74	10.14	SW
02/11/05	3.23	3.13	SE
mean	3.62	4.22	

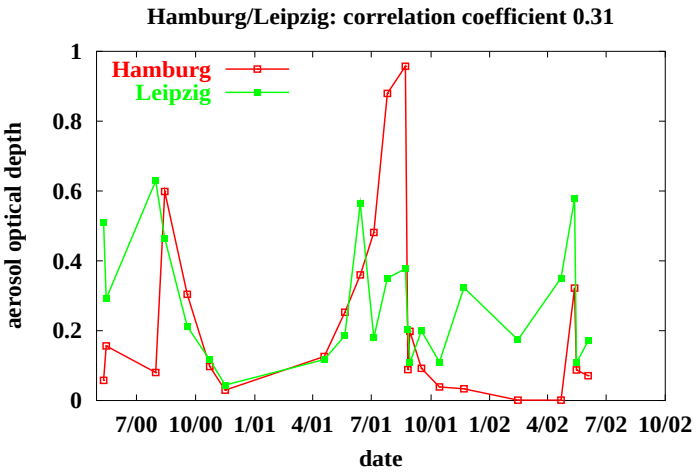


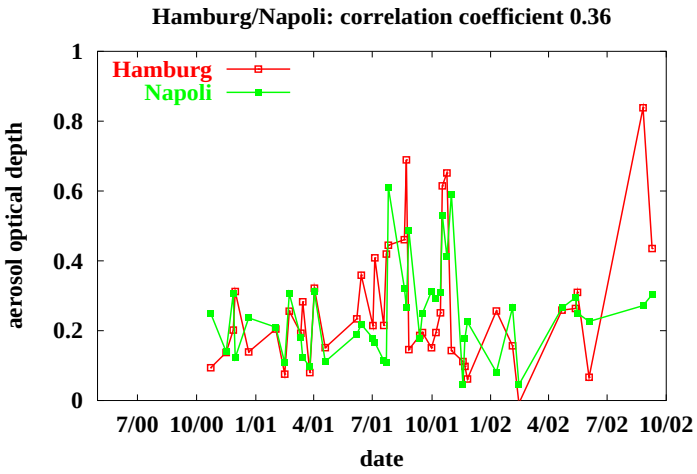
Correlation of AOD at different sites

Assumptions: Only common days and common height ranges have been taken









5. Summary and Outlook

- EARLINET provides vertical profi les of aerosol extinction and backscatter on a regular basis
- EARLINET data has passed QA for instruments and algorithms
- Statistical evaluations show:
  - PBL-height and AOD show large variability at all stations
  - AOD in the PBL follows a lognormal distribution
  - Vertical distribution shows main diiferences at higher altitudes
- High correlation of AOD for distances of a few tens of km have been found
- Measurements are continued at several stations after the end of the project
- New funds are necessary to maintain the regular operation of the EARLINET stations

Acknowledgements

EARLINET has been funded by European Commission under grant no. EVR1-CT-1999-40003