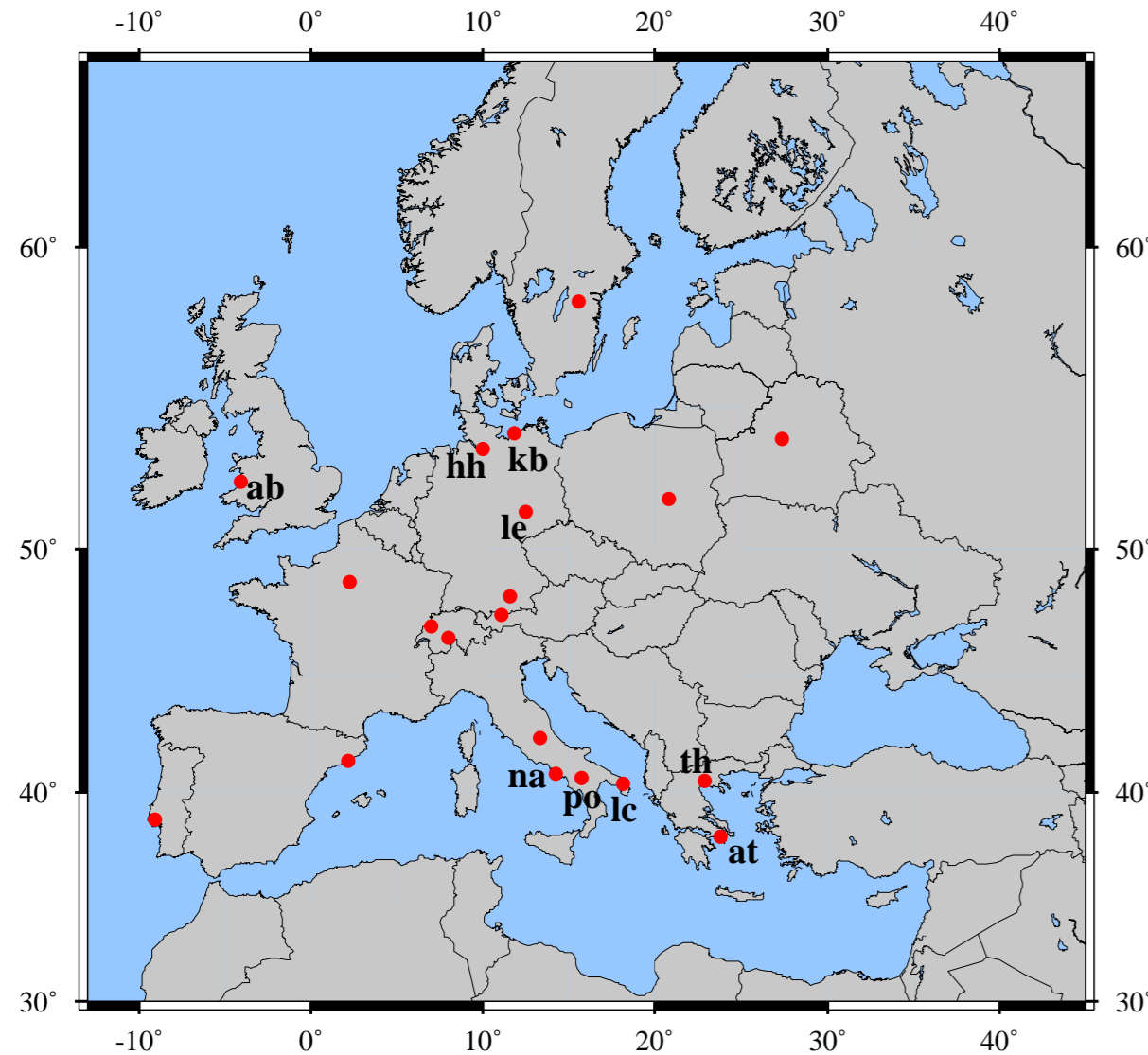


Comparative Statistics of Aerosol Extinction in EARLINET

V: Matthias¹, D. Balis, F. deTomaso, R. Eixmann, L. Komguem, I. Mattis, A. Papayannis, G. Pappalardo, X. Wang

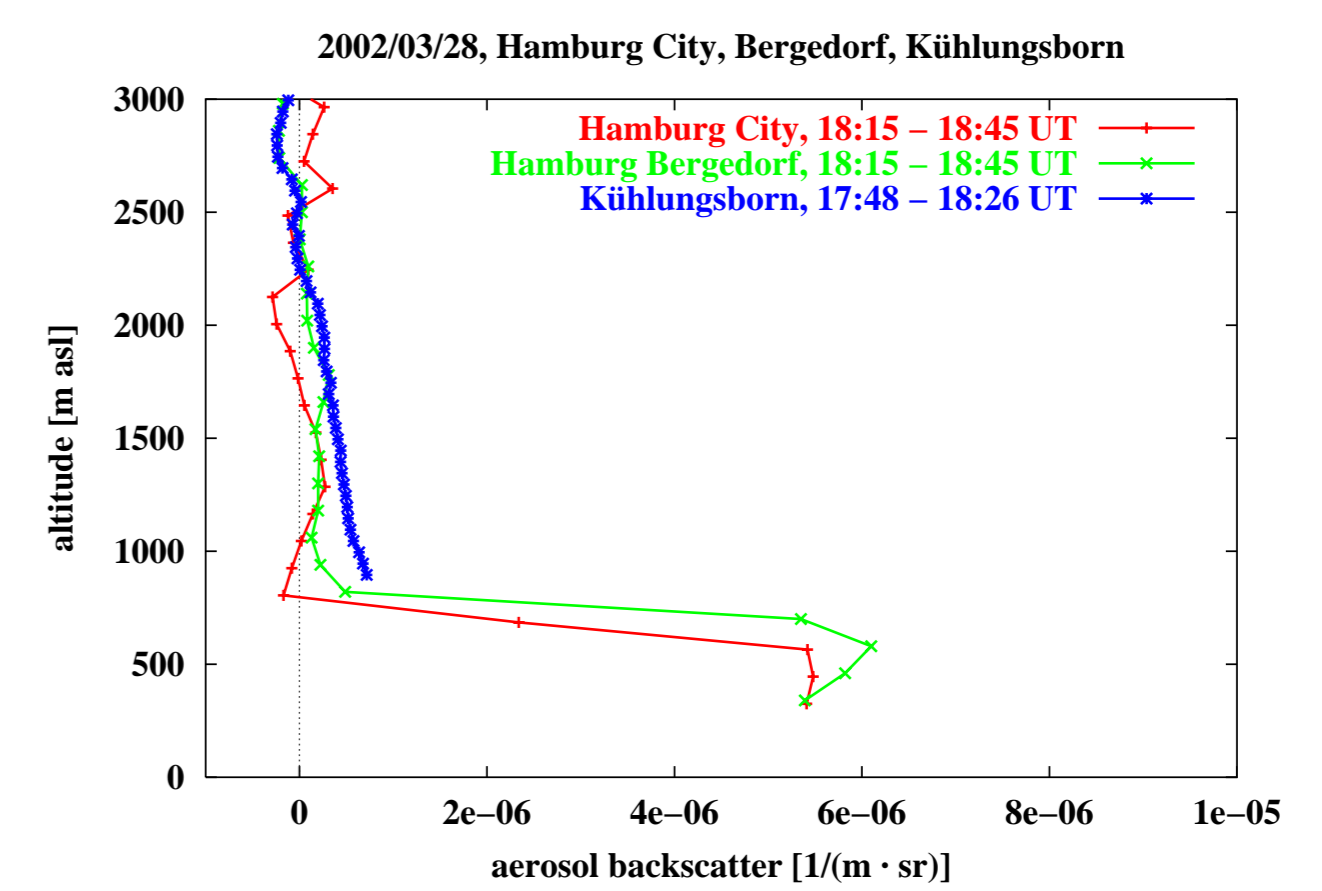
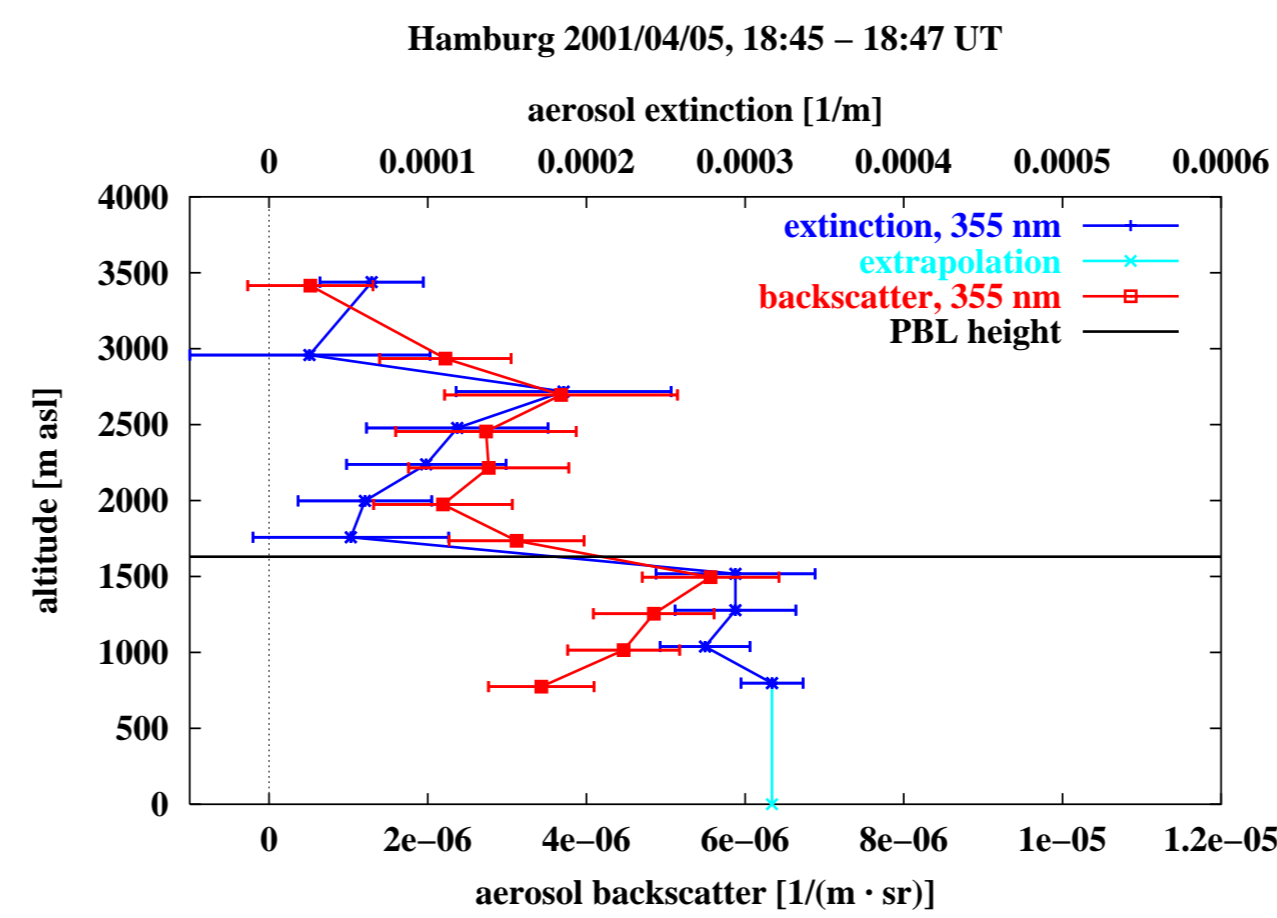
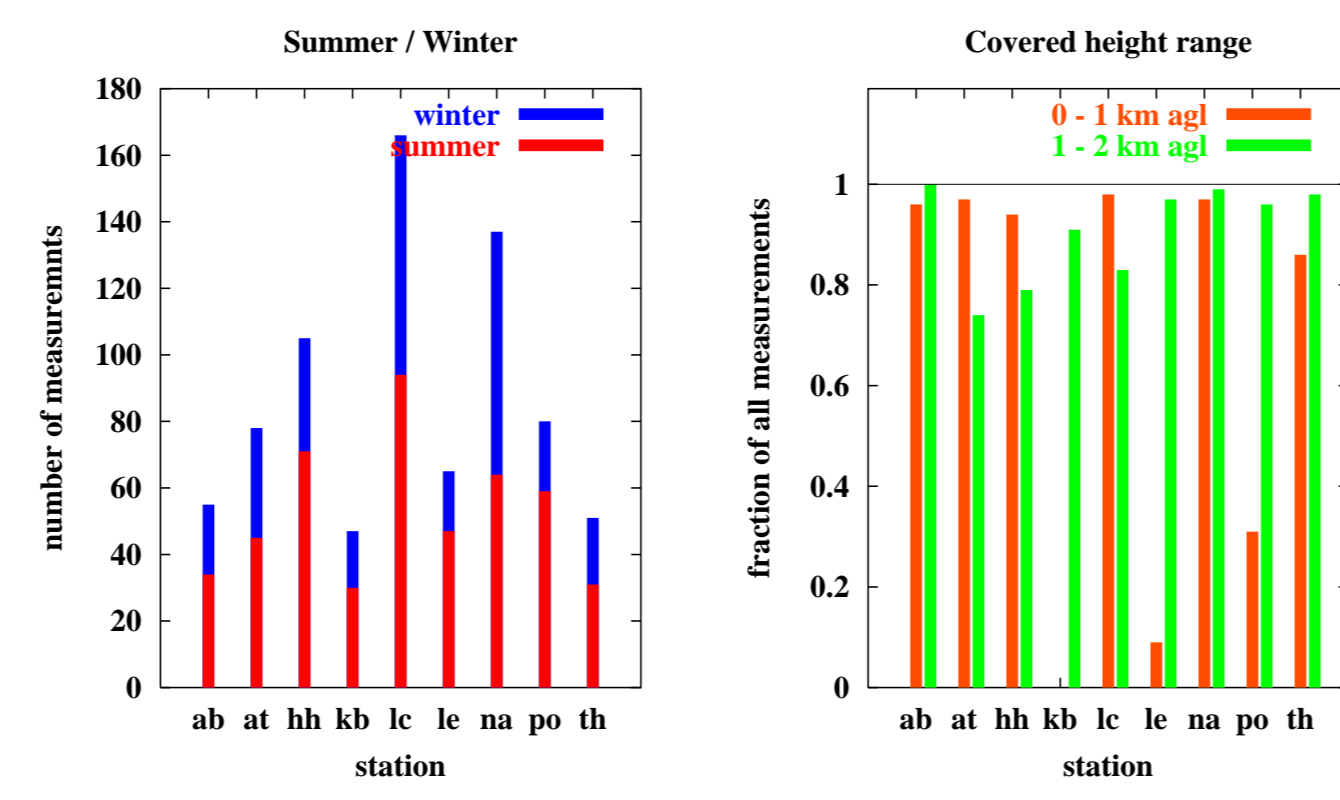
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EARLINET



Aerosol extinction profiles covering more than one year of measurements are provided by nine of the EARLINET stations. The groups are from Aberystwyth (ab), Hamburg (hh), Kühlungsborn (kb), Leipzig (le), Napoli (na), Potenza (po), Lecce (lc), Thessaloniki (th) and Athens (at).

Methods



The extinction profiles are determined with the Raman lidar technique at either 351 nm or 355 nm. The seasonal coverage of aerosol extinction measurements is quite different at the individual stations. Also the number of profiles differs significantly depending on weather conditions and technical details of the systems like the lowest measurement height.

Aerosol optical depth has been derived by integrating the aerosol extinction profiles in height. The profiles have been extrapolated to ground assuming well mixed conditions with height constant aerosol extinction in the lowest part of the atmosphere. The height of the planetary boundary layer (PBL) is defined by the steepest gradient in the aerosol distribution.

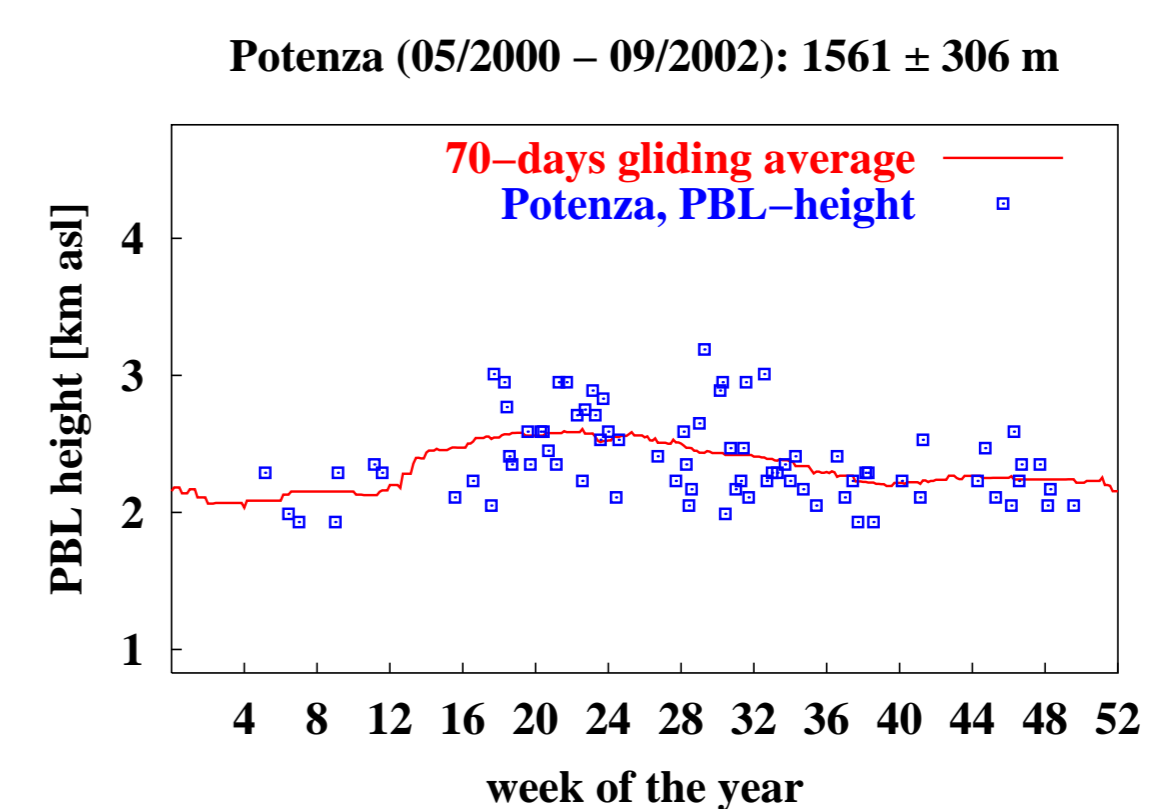
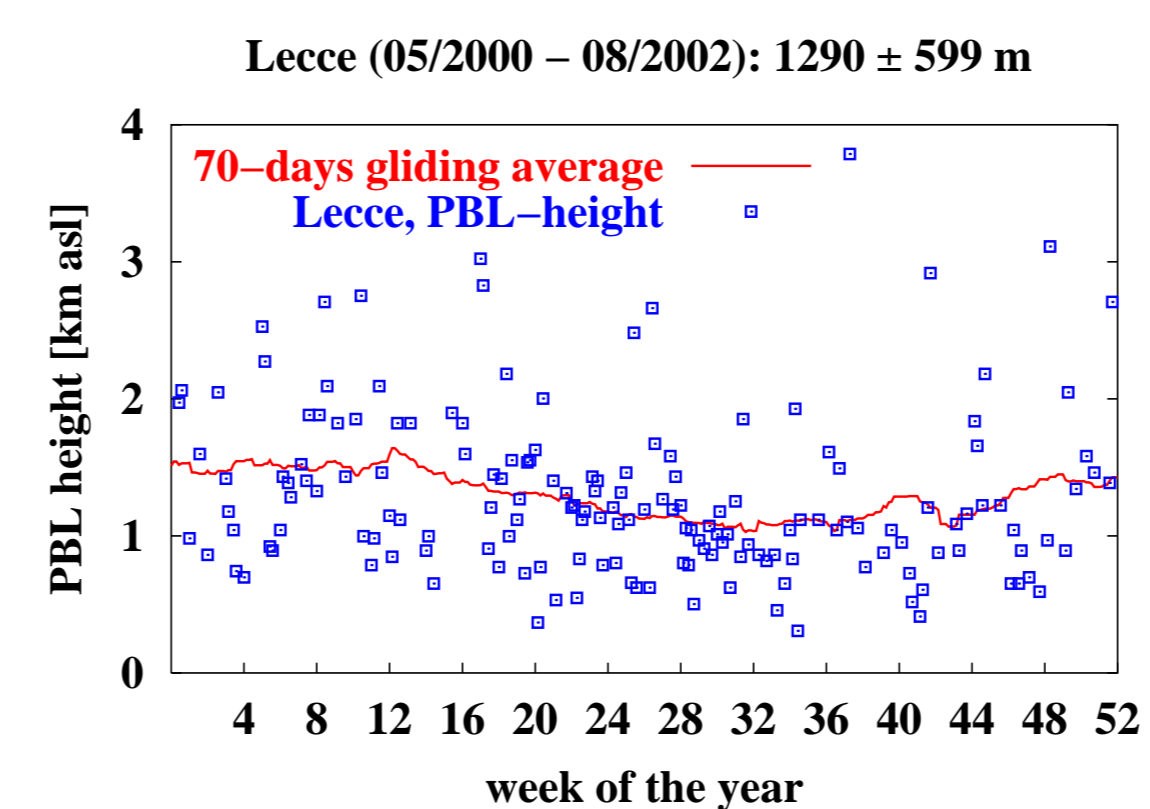
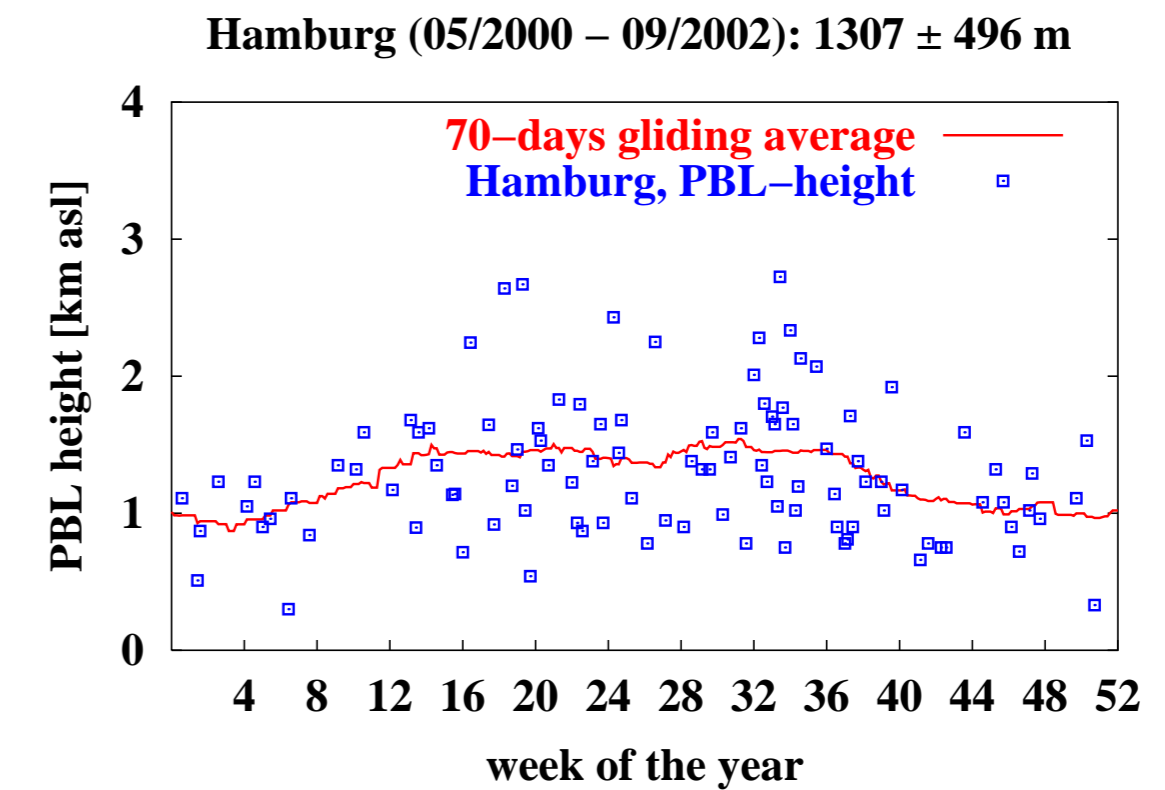
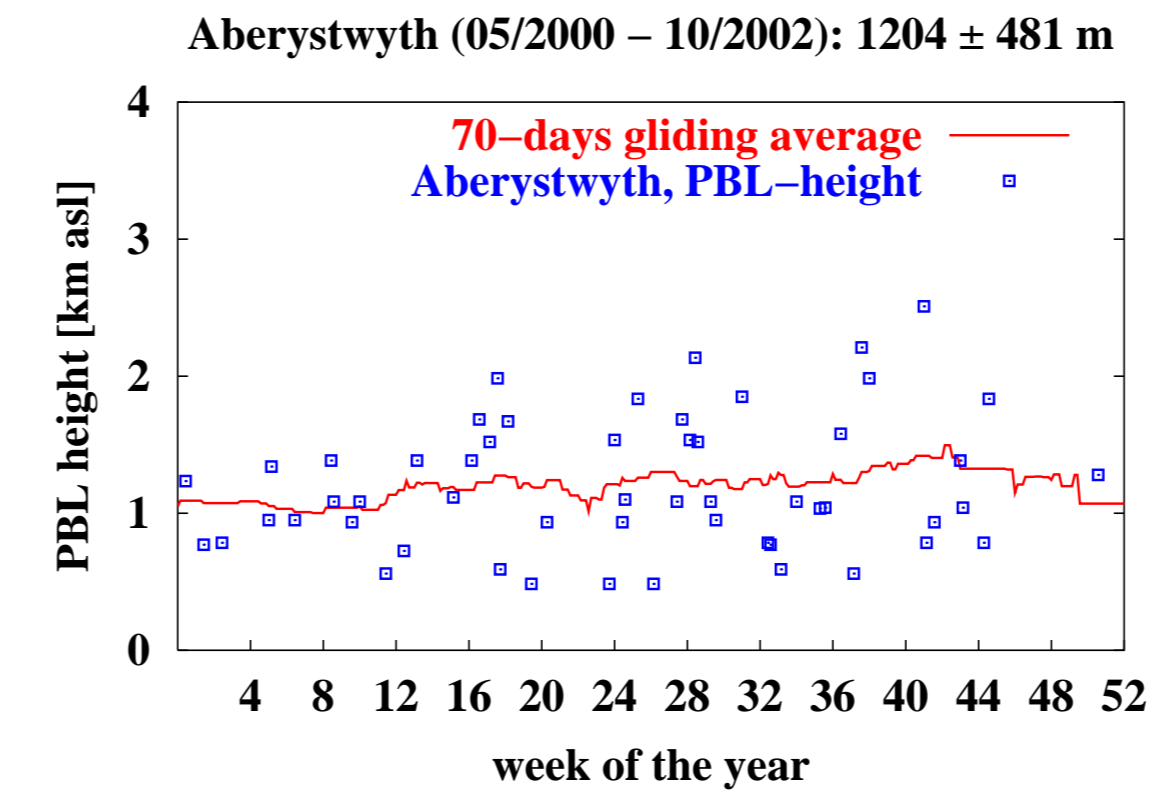
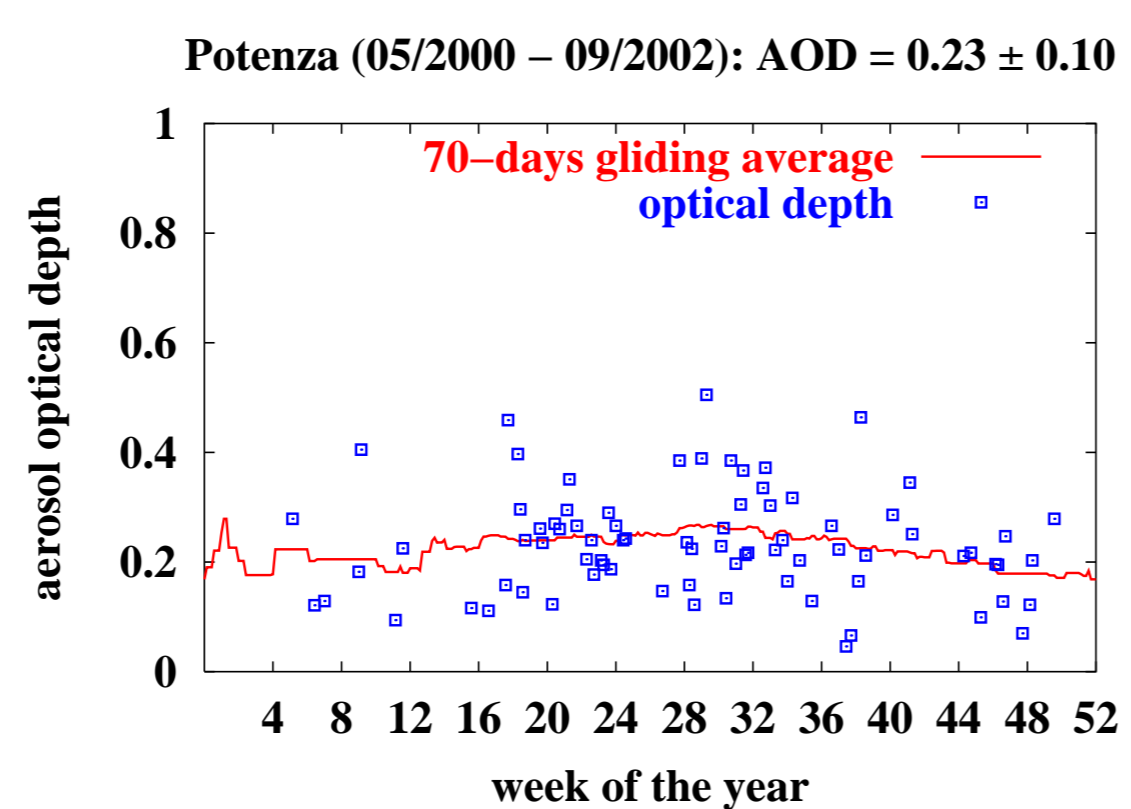
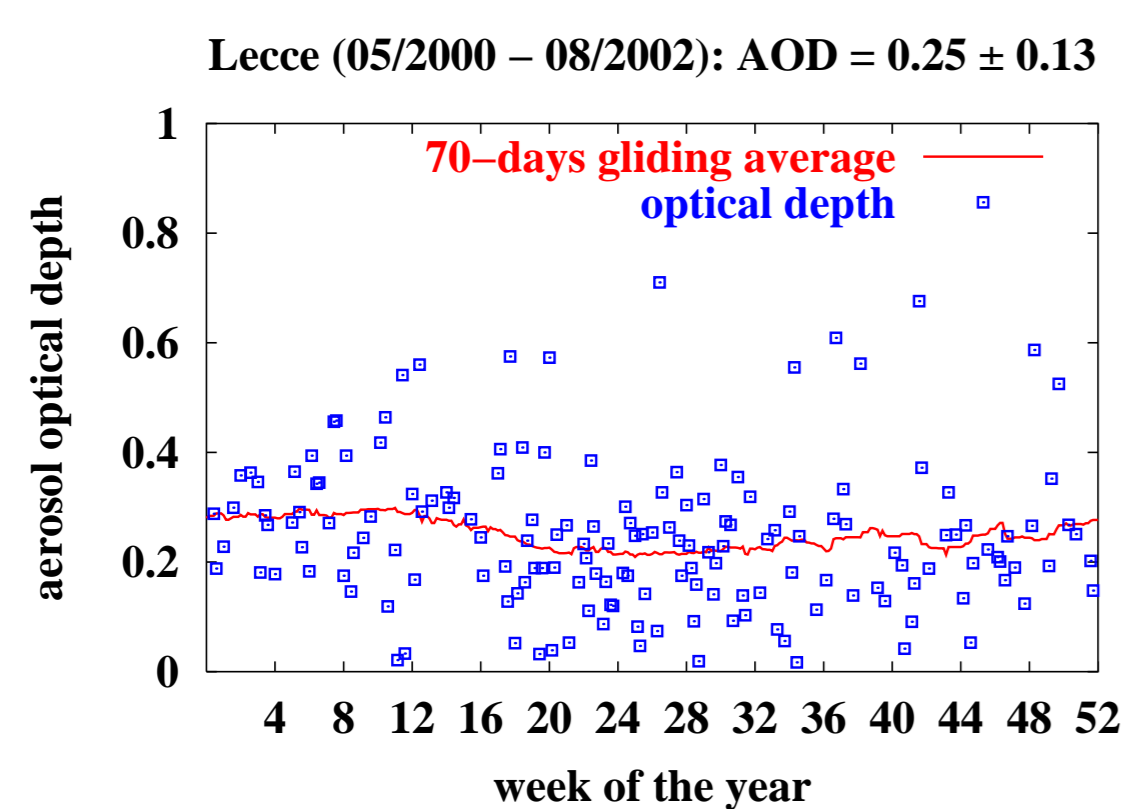
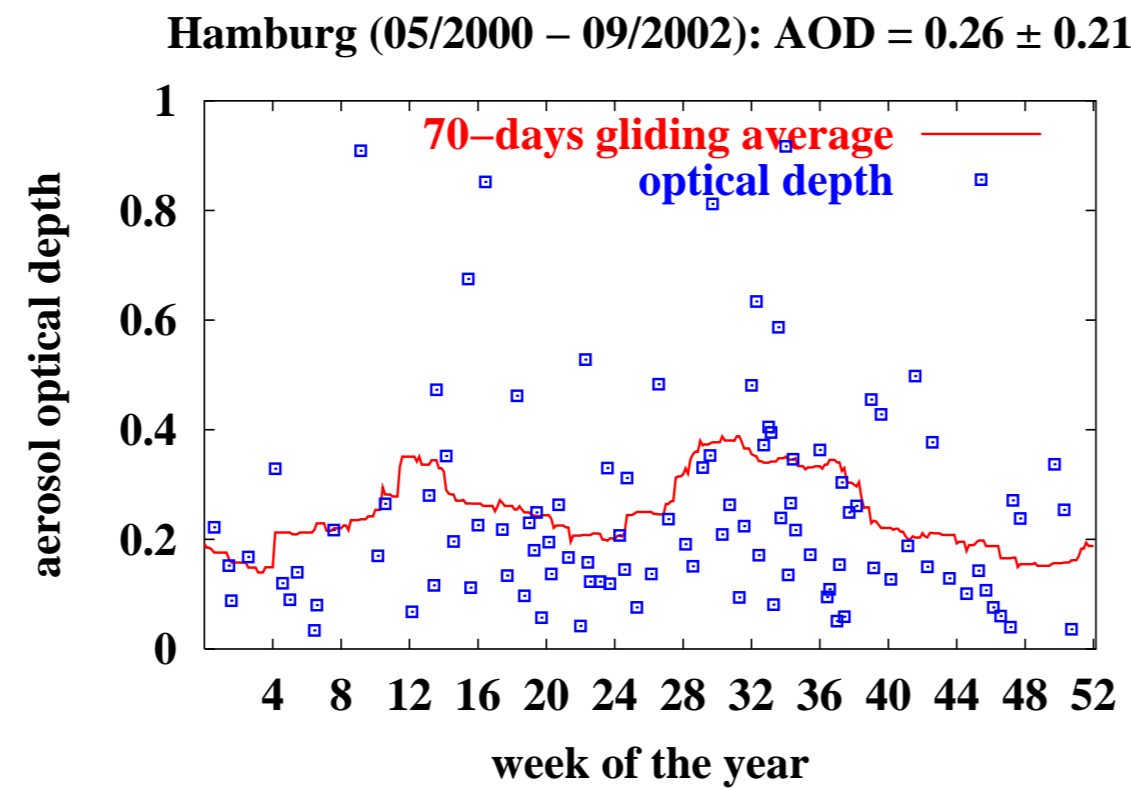
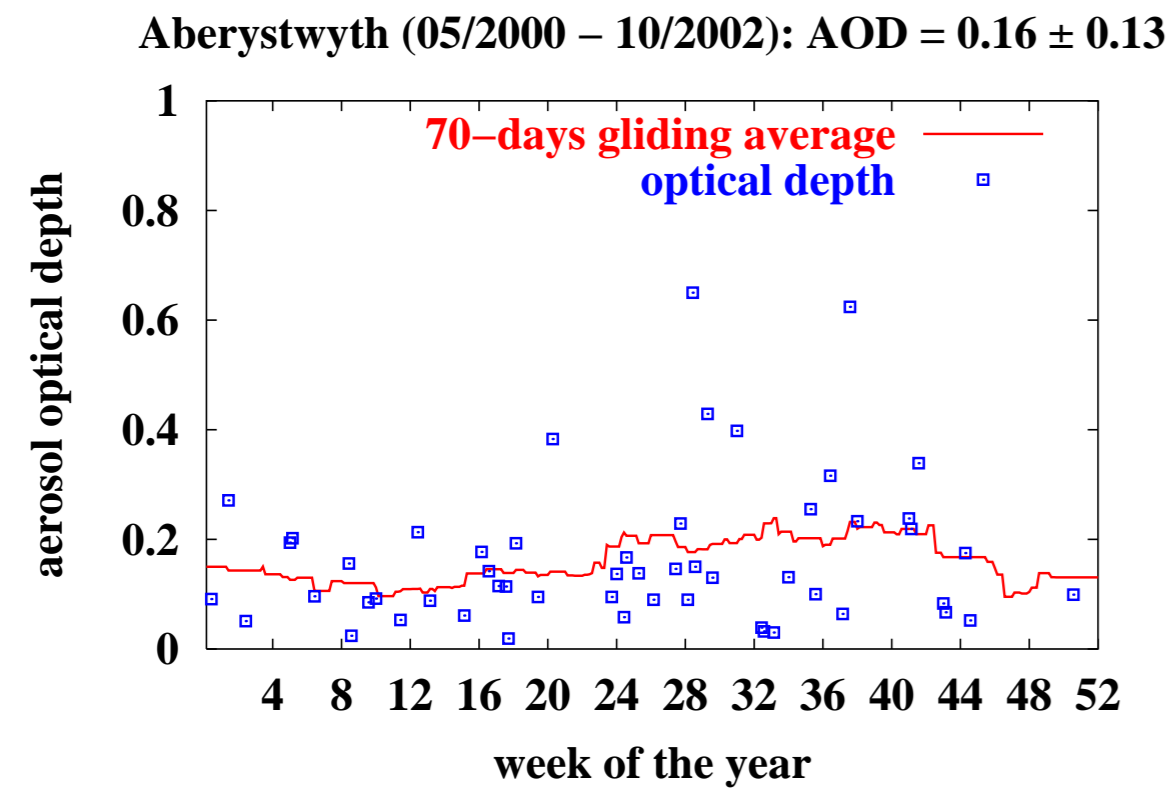
Due to the optical setup of some of the systems aerosol extinction data cannot be provided in the lowest 1000 m of the atmosphere. This leads to problems in the comparability of the statistics from different sites, because the aerosol containing PBL is not covered in many cases.

Aerosol Optical Depth

The aerosol optical depths at the four selected stations show moderate seasonal cycles. Hamburg and Aberystwyth have highest values in late summer/early fall, in Lecce surprisingly high values have been derived in winter. Mean values are similar in Hamburg, Lecce and Potenza, in Aberystwyth lower values were found. The variability, represented in the standard deviation of the mean, is higher for the Northern stations, reflecting typical weather conditions.

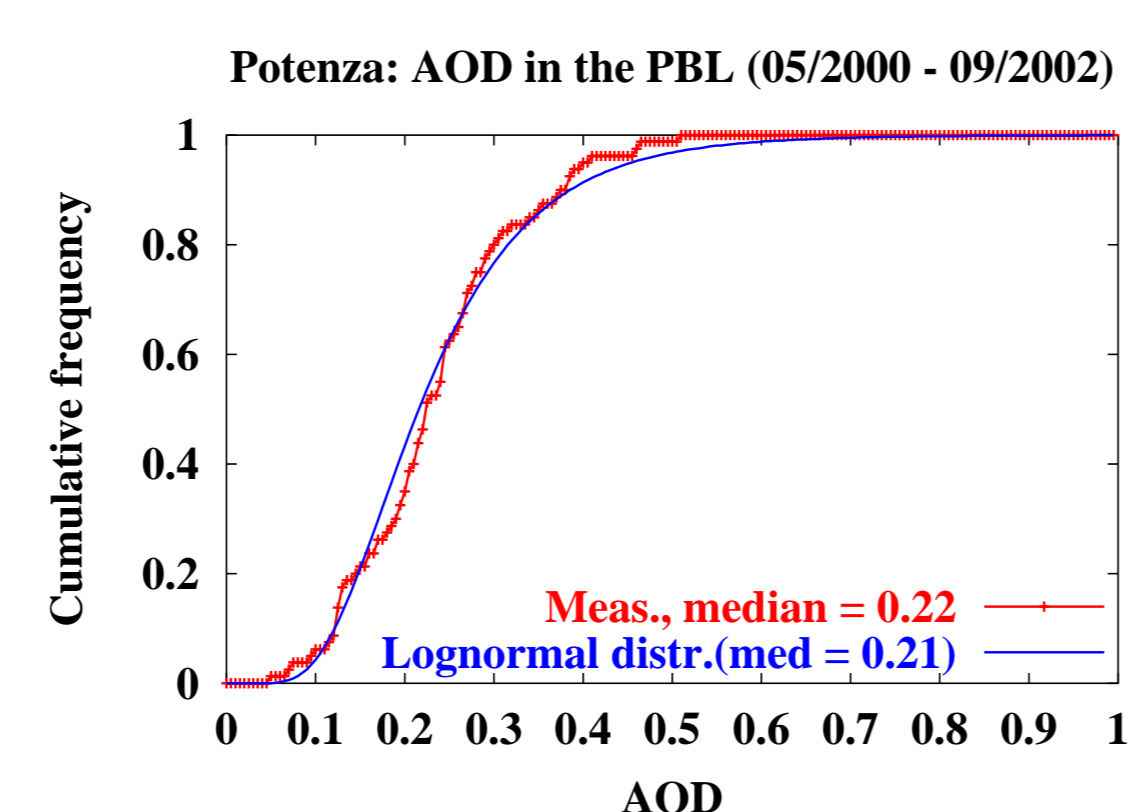
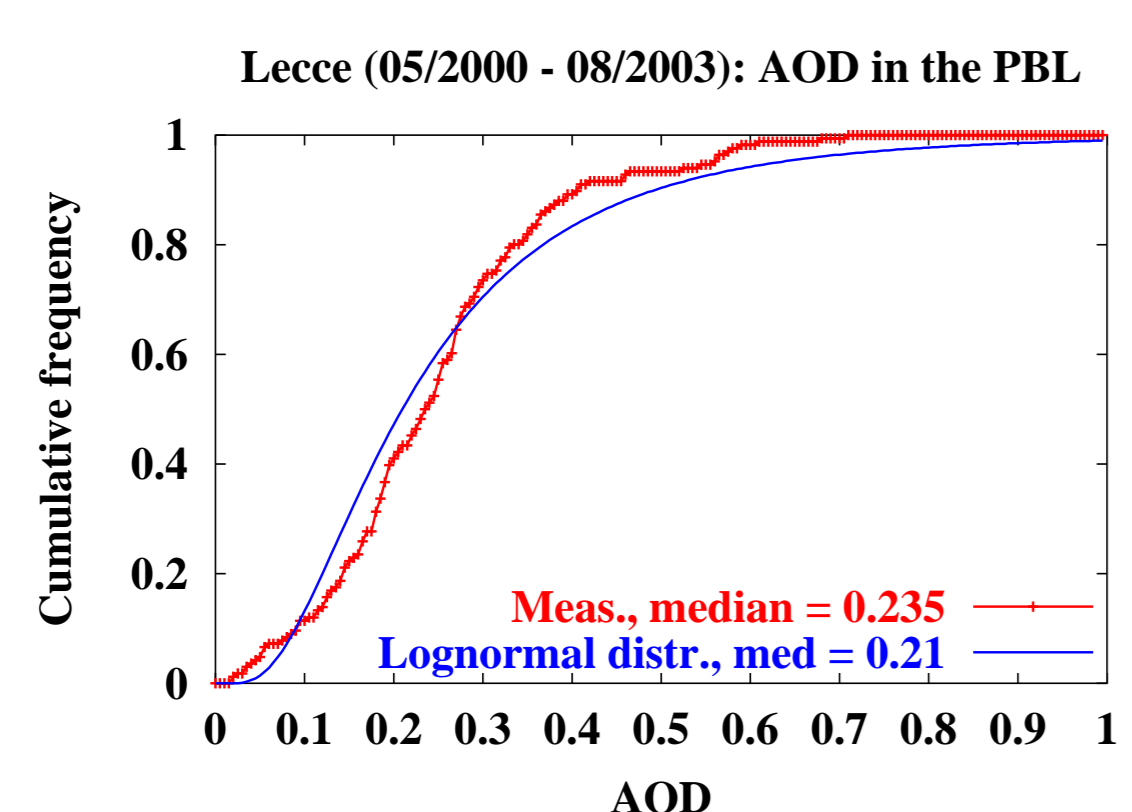
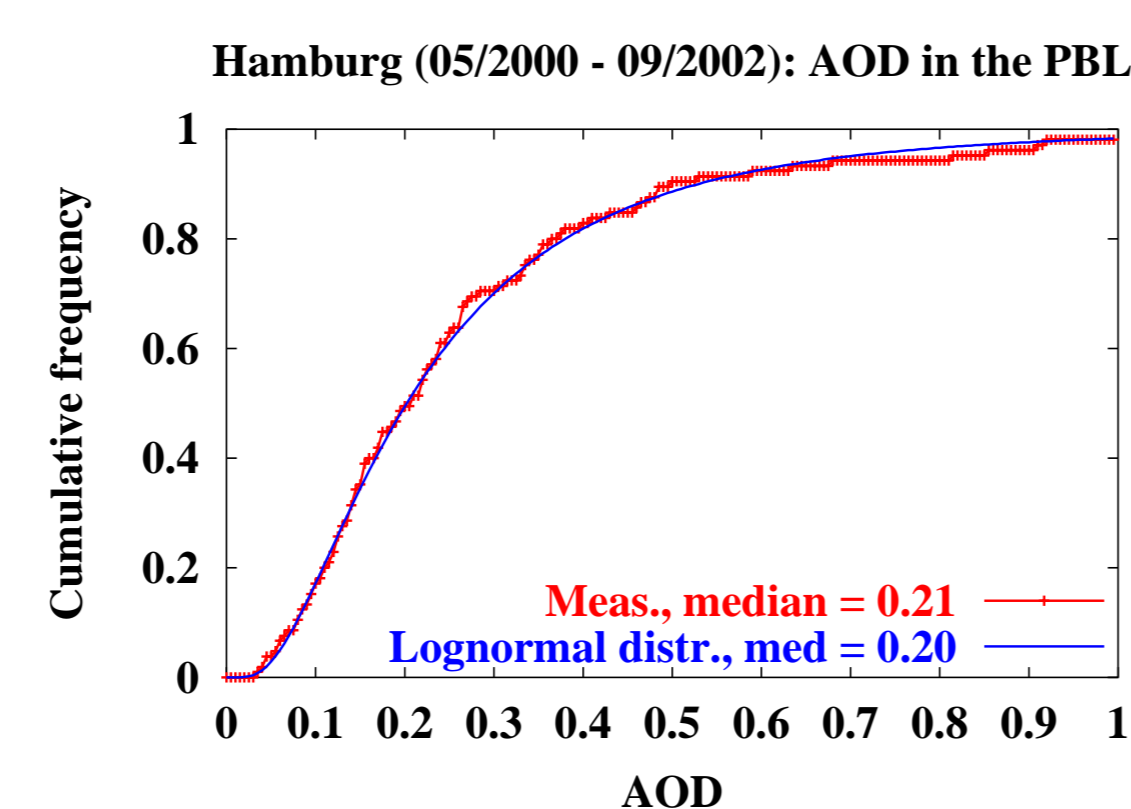
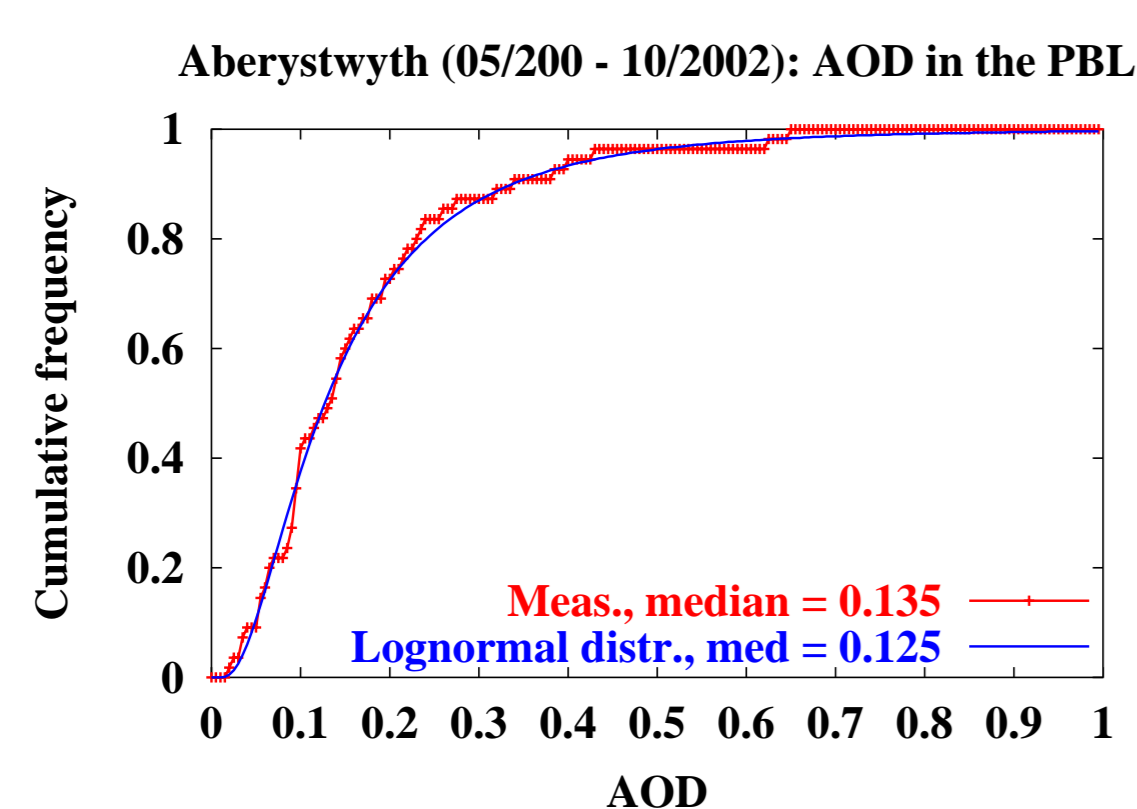
PBL height

At three of the stations PBL heights are higher in summer than in winter, as it could be expected because the PBL development is a thermally driven process. The different behaviour in Lecce is still under investigation. Possibly local sea breeze effects influence the results. Mean values of the PBL height are similar at Aberystwyth, Hamburg and Lecce. Potenza is at 820 m asl and the determined PBL heights are significantly influenced by the topography.



Cumulative Frequency Distribution

The cumulative frequency distribution of the AOD follows a lognormal distribution. This could be verified for all selected stations by applying a χ^2 -test and a Kolmogorov-Smirnov test to the fitted distribution. The median of the measured curve is very well reproduced by the fit. It represents the aerosol optical depth at the lidar site much better than the mean does.



Correlations

To derive the correlation of the AOD between Hamburg and three other lidar sites, only profiles from common days have been taken. The optical depth has been calculated in common height intervals to reduce the effect of the different height coverage of the lidars. For comparison, also the correlation of the backscatter profiles measured in the center of Hamburg and at the border (Hamburg-Bergedorf) have been considered. Even for a nearby station like Kühlungsborn, only parts of the time series show high correlation.

