# Vertical profiles of aerosol optical properties and wavelength dependent absorption at Maldives Climate Observatory Hanimaadhoo

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Aerosol radiative forcing is strongly dependent on the vertical distribution of aerosol. Especially, aerosol particle number and size distribution, particle optical properties and chemical composition are important features for calculating the radiative forcing (Kinne et al., 2006). Satellite based as well as surface based remote sensing instruments like Aeronet sun photometers can provide information about amongst other things columnar aerosol optical depth (AOD) and single scattering albedo (SSA). In addition, surface based as well as space borne lidar measurements can provide profiles of atmospheric backscatter and extinction. Meanwhile vertical in situ aerosol measurements are rare but also necessary to obtain actual particle concentrations and particle size information.

One focus of contemporary in situ aerosol measurements is the quantification of surface as well as vertically resolved carbonaceous aerosol (CA). CA consists mainly of black carbon (BC) and organic material (OM). BC, a product of incomplete combustion processes, is a main absorber of solar radiation and hence plays an important role in the climate system (Bond et al., 2012). Hence, it is important to incorporate BC properly in models. A good parameterization based on actual aerosol data leads to reducing uncertainty in model estimations of aerosol radiative forcing.

We will here present data from Cloud Aerosol Radiative Forcing Dynamics EXperiement (CARDEX) at Maldives Climate Observatory in Hanimaadhoo (Maldive Islands) in February and March 2012. This time of year is part of the dry monsoon season with arriving polluted air masses from the Asian continent. Thus air with high BC loading can be investigated. During CARDEX, aerosol profile measurements with lightweight unmanned aerial vehicles (UAVs) were performed. Amongst other instruments, a condensation particle counter (CPC), aethalometer and optical particle counter (OPC) were installed on board. Furthermore, surface instrumentation included a ground based lidar, nepholometer, aethalometer, CPC and an Aeronet sun photometer were in use.

Surface and vertical measurements from the CARDEX field campaign are used to calculate particle scattering, absorption as well as extinction profiles as functions of total particle concentration and relative humidity. A comparison between calculated profiles and measured absorption values from the on board aethalometer as well as from the lidar results will be presented. Reasons for potential discrepancies will be discussed. Figure 1 shows an example of calculated and measured vertical profiles of scattering, extinction and absorption on a day with an elevated aerosol layer present above the boundary layer.

Determined AOD and absorption AOD (AAOD) from vertically integrated extinction and absorption profiles respectively will also be compared to sun photometer based AOD results. Furthermore wavelength dependent AOD and AAOD will be analysed to separate the influence of dust, biomass and fossil fuel burning products (Chung et al, 2012).

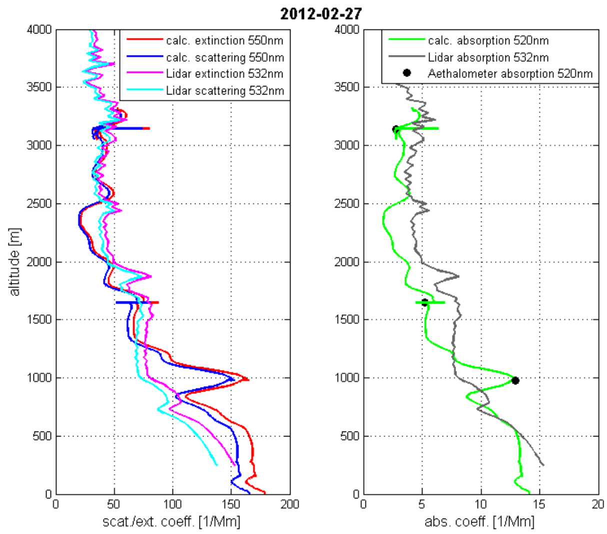


Figure 1: Calculated and measured vertical profiles of scattering, extinction and absorption. The calculated profiles (red, blue, green) and the measured absorption from an on board aethalometer (black) are results from a downward flight on Feb.27th 2012 between 10:00 and 11:00 local time. The lidar profiles (magenta, cyan, grey) are determined the same day at 10:00 local time.

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