Internship project: Evaluation of aerosol properties using remote and in-situ measurements

The main objective of the internship is the evaluation of aerosol optical properties from lidar measurements with the newly developed balloon-borne backscatter sonde COBALD (Compact Optical Backscatter and Aerosol Detector). Continuous Raman lidar and ceilometer measurements are performed at the aerological station of MeteoSwiss at Payerne (Switzerland). In addition, Cobald sondes have been launched occasionally since 2009, attached to the operational radiosondes which are launched twice per day at Payerne. Another goal of this internship will be the characterization of aerosol hygroscopic properties using remote and in-situ techniques (lidar and sondes). This internship is expected to complement some important research aspects carried out within a SNF Ambizione project (AEROHYGROPRO, PZ00P2_168114, http://p3.snf.ch/project-168114).

The intern is expected to contribute to following studies:

1. Assessment of aerosol backscatter coefficient from lidars (Raman lidar and ceilometer) vesus cobald sondes.
   Aerosol backscatter coefficient profiles at 355 nm from the Raman lidar for Meteorological Observations (RALMO) and at 1064 nm from ceilometers will be evaluated using the in-situ technique of Cobald sondes. An estimation of the errors associated to remote sensing versus sondes will be carried out for different loads and types of aerosol.

2. Evaluation of aerosol hygroscopicity using remote sensing and in-situ measurements.
   The change of aerosol properties due to the water uptake by aerosol particles (aerosol hygroscopic growth) will be investigated using remote sensing (RALMO lidar) and in-situ measurements (operational radiosondes and Cobald sondes). The combination of relative humidity information and aerosol properties will be used to characterize aerosol hygroscopic properties for different types of aerosol.

3. Analysis of lidar backscatter profiles in optically thin clouds.
   One of the most challenging technical aspects of the lidar technique is its capability to provide accurate information within clouds. In this internship the accuracy of the lidar profiles within thin clouds will be evaluated by comparing with Cobald sondes.

4. Assessment of lidar overlap function.
   The incomplete overlap between the laser beam and the receiver field of view affects significantly lidar observations of particle optical properties in the near-field range. A proper study of the important exchange processes of anthropogenic pollution between the sources and the lower-most layers of the troposphere is not possible without the correction of the range-dependent overlap characteristics. In this internship an iterative procedure will be applied to calculate this overlap function. The goodness of this correction will be evaluated comparing lidar profiles in the near range with cobald sondes.

Qualifications:

- Master's degree in meteorology or closely related field
- Ability to work independently, and also as a team member
- Good programing skills (preferably in Matlab)
- Good skills in written and spoken English