Title: Spatio-temporal mismatch for Aerosol profiles
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The high variability both in space and time of tropospheric aerosols is one of the main causes of the high uncertainty related to tropospheric aerosols and their interactions with clouds. Since 2006, CALIOP, the LIDAR onboard CALIPSO specifically designed for aerosol and clouds study, is providing high-resolution vertical profiles of aerosols and clouds on a global scale. How well these CALIOP measurements represent the atmospheric conditions of a surrounding area over a longer time is an important issue to be investigated. An integrated study of CALIPSO and EARLINET correlative measurements opens new possibilities for spatial (both horizontal and vertical) and temporal representativeness investigation of this set of satellite measurements. EARLINET (European Aerosol Research Lidar NETwork) is the first LIDAR network for aerosol studies on continental scale. EARLINET comprises of different instrumental setups, specifics and team expertises, it is a network of different instruments with a wide variety of instrumental specifics, so that there is not a common vertical and temporal sampling overall within the network. The comparison of EARLINET profiles and their CALIPSO counterpart is a straightforward procedure. The main aim of this work is to investigate how the horizontal smoothing impact on the uncertainty term between the satellite and the ground measurement of the aerosol layers. In a first analysis we minimize the RMSE to search for the best horizontal smoothing for CALIOP. A functional regression analysis is also performed to understand how the uncertainty term between the satellite and the ground measurement depends on the horizontal and temporal mismatch error on some other meteorological variables and which of them has a greater impact on this uncertainty.