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Dust aerosol optical properties using ground-based and airborne lidar in the framework of FENNEC

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The FENNEC program aims to improve our knowledge of both the role of the Saharan Heat Low (SHL) on the West African monsoon and the interactions between the African continent and the Mediterranean basin through the Saharan dust transport. The Saharan desert is the major source of mineral dust in the world and may significantly impact the air quality over the Western Europe by increasing the particular matter content. Two lidar systems were operated by the French component of the FENNEC project: an airborne lidar which was flown aboard the French Falcon 20 research aircraft and a ground-based lidar which was located in the southeastern part of Spain, close to Marbella. The presence of dust in the Saharan atmospheric boundary layer has been easily highlighted using the lidars and confirmed by ground-based sunphotometer and observations from both MODIS and SEVIRI spaceborne instruments. The simultaneous use of the sunphotometer-derived Angstrom exponent and the lidar-derived backscatter to extinction ratio is appeared to be a good approach to separate the optical contribution of dust from local aerosols for the coastal site. Over Spain, the dust layer was mainly located above the planetary boundary layer with several kilometers thick. Over the tropical Atlantic Ocean and the Mauritania the airborne lidar shows a high planetary boundary layer ($\sim$5 km above the mean sea level) associated to strong aerosol optical thickness (> 0.8 at 532 nm). The airborne lidar data have been inverted using both MODIS and SEVIRI-derived aerosol optical thickness. The differences between dust optical properties close to and remote from the sources will be discussed.