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High resolution climatology
- towards climate change services

Evolution of the inland vertical structure of a coastal Atmospheric Boundary Layer in the Central Mediterranean using surface and ground -based remote sensing measurements

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The understanding of the coastal atmospheric processes requires the availability of complete datasets spanning from the surface to the top of the Atmos-pheric Boundary Layer (ABL) and high resolution modelling to resolve the coastal discontinuity. To study the development of the vertical structure of the coastal flow under different meteorological situations, we carried out an intensive experimental campaign at a site located 600 m inland from the shoreline in the Central Mediterranean area during July 2009 integrating optical and acoustic ground-based remote sensing information and surface standard measurements. In this area, the sea breeze always develops but sometime is overdriven by the synoptic flow that blows from the same direction. LIDAR (LIght Detection And Ranging) and SODAR (SOnic Detection And Ranging) allow deriving the vertical profiles of wind speed and direction and of some turbulence characteristics. Furthermore, the vertical profile of the backscatter intensity of the ceilometer (LIDAR) detects the height of the boundary layer with respect to the aerosol concentration. We observed that when synoptic conditions are favourable to sea breezes development, the air masses with marine aerosols are advected over land in the early morning interacting with the nighttime boundary layer. After the onset of the sea breeze an internal boundary layer develops from the coastal dis-continuity, the height of the boundary layerdetected by the ceilometer decreases, likely due to the advection of the marine aerosols above the IBL creating a discontinuity in the aerosol concentration and size distri-bution. Later in the morning, when the breeze is well developed, convection takes over and mixes marine and continental aerosols creating a homogeneous content of aerosols filling the convective layer. During stationary synoptic flow with wind speed typically lar-ger than 4 ms-1, marine aerosols are mixed with continental aerosols and the height of the boundary layer detected by the ceilometer does not varies. During nigh-time a stable layer develops, both SODAR and Doppler LIDAR reveal the development of a low level jet.