The potential of LIRIC to validate the vertical profiles of the aerosol mass concentration estimated by an air quality model

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Vertical profiles of the aerosol mass concentration derived by a retrieval algorithm that uses combined sunphotometer and LIDAR data (LIRIC) were used in order to validate the mass concentration profiles estimated by the air quality model CAMx. LIDAR and CIMEL measurements of the Laboratory of Atmospheric Physics of the Aristotle University of Thessaloniki were used for this validation.The aerosol mass concentration profiles of the fine and coarse mode derived by CAMx were compared with the respective profiles derived by the retrieval algorithm. For the coarse mode particles, forecasts of the Saharan dust transportation model BSC-DREAM8bV2 were also taken into account. Each of the retrieval algorithm's profiles were matched to the models' profile with the best agreement within a time window of four hours before and after the central measurement. OPAC, a software than can provide optical properties of aerosol mixtures, was also employed in order to calculate the angstrom exponent and the lidar ratio values for 355nm and 532nm for each of the model's profiles aiming in a comparison with the angstrom exponent and the lidar ratio values derived by the retrieval algorithm for each measurement. The comparisons between the fine mode aerosol concentration profiles resulted in a good agreement between CAMx and the retrieval algorithm, with the vertical mean bias error never exceeding 7 μgr/m3. Concerning the aerosol coarse mode concentration profiles both CAMx and BSC-DREAM8bV2 values are severely underestimated, although, in cases of Saharan dust transportation events there is an agreement between the profiles of BSC-DREAM8bV2 model and the retrieval algorithm.