An evaluation of the aerosol vertical distribution in global transport models through comparison against CALIOP layer products

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The CALIOP Layer Product 3.01 is used to evaluate the aerosol vertical distribution simulated by eleven global aerosol models as part of AeroCom phase II experiment. For this purpose, a 3D global gridded dataset of aerosol extinction profiles has been built over the 2007-2011 period. It is applied to the assessment of the performance/improvement of 11 global aerosol models in simulating the aerosol profiles, in preparation of the 5th IPCC Assessment Report (AR). The simulated and CALIOP-derived mean aerosol profiles are compared over 12 selected regions representative of industrial, dust and biomass burning pollution, or located downwind from the continental source regions. Results show that the aerosol vertical dispersion, at least in the lower troposphere up to 6 km, is captured well by most of the models. From our characteristic extinction height diagnostic Z_α (km), some models improved while others degraded since their AR4 version in their ability in reproducing the inter-regional diversity that is characterized by a Z_α increase from marine and industrial to dust and biomass burning regions. The performance of the models in capturing the latitudinal variability of different mean extinction height diagnostics, along with its seasonality, both over land and ocean, is also investigated. A better agreement with observations is generally obtained over ocean than over land.