The sensitivity of aerosol data assimilation to vertical profiles: case study of dust storm assimilation with LOTOS-EUROS v2.2

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This is the supplementary for the manuscript "The sensitivity of aerosol data assimilation to vertical profiles: case study of dust storm assimilation with LOTOS-EUROS v2.2"

1. Himawari-8 bias correction

To remove the fine-mode non-dust AOD in total AOD, an empirical function concerning Ångström exponent ($Å$) is used to calculate the sub-micron fraction (SMF) [1, 2]. Then the dust optical depth (DOD) can be obtained by the SMF.

$$SMF = -0.0512 \times Å^2 + 0.5089 \times Å + 0.02 \tag{S1}$$

$$DOD = AOD \times (1 - SMF) \tag{S2}$$

Furthermore, threshold of $Å \leq 1$ is set to exclude the fine-mode dominant observations.

2. AOD assimilation
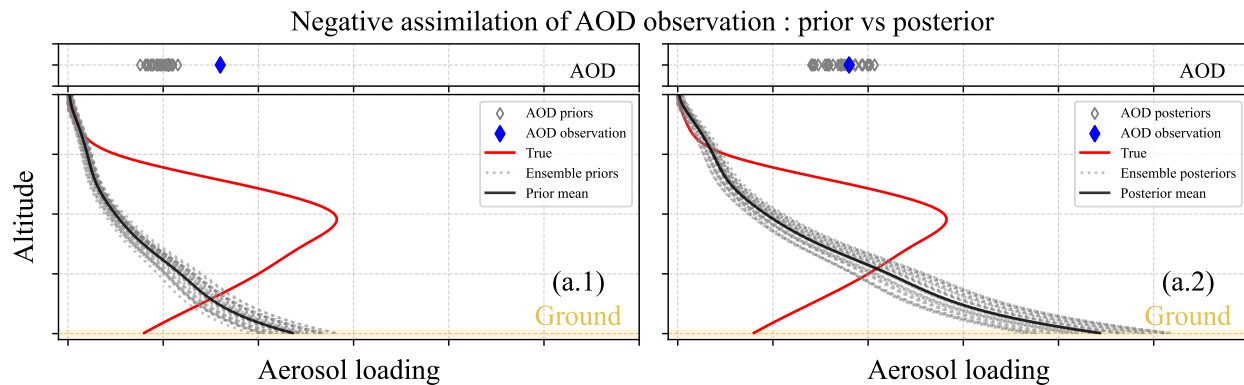
Fig. S1. Another schematic diagram of the sensitivity of AOD data assimilation to aerosol vertical structure. Assimilation of AOD observation under negative condition with AOD priors (gray hollow diamond), AOD observation (blue solid diamond) in upper box and true profile (red line), ensemble priors (gray dash line), prior mean (black line), ground observation (blue star) in lower box (**a.1**). Figure on the right are for the posteriors (**a.2**).

References

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