

Model-measurement discrepancies in BC vertical profiles over the Atlantic Ocean revealed by recent flight campaigns

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Validation of simulated vertical aerosol distributions over the Atlantic Ocean has been limited by availability of aircraft measurements, but recent flight campaigns offer new opportunities. Here, we evaluate the vertical distribution of Black Carbon (BC) aerosols from the global atmospheric models OsloCTM3 and ECHAM-HAM using data from the Atmospheric Tomography Mission (ATom) 1 and 2, and assess implications for global BC lifetime. The impact on the evaluation of sampling model data on different spatial and temporal resolutions is also examined.

Results reveal distinct discrepancies between modeled and measured vertical profiles, most notably a significant overestimation at high altitudes and an underestimation of near-surface concentrations across seasons between 30N and 30S. In contrast, recent updates in the OsloCTM3 have resulted in a reduction of the high-altitude overestimation compared to measurements over the Pacific Ocean seen in previous model versions.

We further quantify the nature and origin of the modeled BC in the Atlantic Ocean region, and investigate the impact of changes to parameterizations such as wet scavenging and biomass burning injection height on the model performance.