

Title: Vertical distribution of sulfur species (SO₂+sulfate) seen in AEROCOM models

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Abstract

We analyzed the vertical distribution of two primary sulfur species, SO₂ (gas phase) and sulfate (SO₄, aerosol phase) in the UTLS from 12 AEROCOM-Phase II models. For both species, the model-to-model difference increases with altitude and with the distance away from the source regions, while SO₂ show larger differences. Comparison with MIPAS SO₂ retrievals suggested most models' simulated SO₂ is lower in the stratosphere. One possible reason for the low bias is some missing photochemical processes of sulfur species in the mid-upper stratosphere by most models. Modeled sulfur in the aerosols phase agrees better with measurements from the CARIBIC campaign over the years. We further compared the emission, wet and dry deposition from those models to estimate the possible reason for this large model-to-model divergence. We used SO₂ measurement from the 2015 VIRGAS field campaign and MERRA-2 to bridge the simulation time difference in the AEROCOM models.