Home
Online Library ACP
- Recent Final Revised Papers
- Volumes and Issues
- Special Issues
- Library Search
- Title and Author Search

Online Library ACPD
Alerts & RSS Feeds
General Information
Submission
Review
Production
Subscription
Comment on a Paper

Volumes and Issues | Contents of Issue 21

Atmos. Chem. Phys., 7, 5675-5694, 2007
www.atmos-chem-phys.net/7/5675/2007/

Secondary organic aerosol in the global aerosol – chemical transport model Oslo CTM2

C. R. Hoyle, T. Berntsen, G. Myhre, and I. S. A. Isaksen
Department of Geosciences, University of Oslo, Norway

Abstract. The global chemical transport model Oslo CTM2 has been extended to include the formation, transport and deposition of secondary organic aerosol (SOA). Precursor hydrocarbons which are oxidised to form condensible species include both biogenic species such as terpenes and isoprene, as well as species emitted predominantly by anthropogenic activities (toluene, m-xylene, methylbenzene and other aromatics). A model simulation for 2004 gives an annual global SOA production of approximately 55 Tg. Of this total, 2.5 Tg is found to consist of the oxidation products of anthropogenically emitted hydrocarbons, and about 15 Tg is formed by the oxidation products of isoprene. The global production of SOA is increased to about 69 Tg yr^{-1} by allowing semi-volatile species to partition to ammonium sulphate aerosol. This brings modelled organic aerosol values closer to those observed, however observations in Europe remain significantly underestimated. Allowing SOA to partition into ammonium sulphate aerosol increases the contribution of anthropogenic SOA from about 4.5% to 9.4% of the total production. Total modelled organic aerosol (OA) values are found to represent a lower fraction of the measured values in winter (when primary organic aerosol (POA) is the dominant OA component) than in summer, which may be an indication that estimates of POA emissions are too low. Additionally, for measurement stations where the summer OA values are higher than in winter, the model generally underestimates the increase in summertime OA. In order to correctly model the observed increase in OA in summer, additional SOA sources or formation mechanisms may be necessary. The importance of NO_3 as an oxidant of SOA precursors is found to vary regionally, causing up to 50%–60% of the total amount of SOA near the surface in polluted regions and less than 25% in more remote areas, if the yield of condensible oxidation products for β-pinene is used for NO_3 oxidation of all terpenes. Reducing the yield for α-pinene and limonene oxidation in line with recent measurements reduces the global fraction of SOA formed from NO_3 oxidation products from 27% to about 21%. This study underscores the need for SOA to be represented in a more realistic way in global aerosol models in order to better reproduce observations of organic aerosol burdens in industrialised and biomass burning regions.

Final Revised Paper (PDF, 5117 KB) Discussion Paper (ACPD)

Citation: Hoyle, C. R., Berntsen, T., Myhre, G., and Isaksen, I. S. A.: Secondary organic aerosol in the global aerosol – chemical transport model Oslo CTM2, Atmos. Chem. Phys., 7, 5675-5694, 2007. Bibtex EndNote Reference Manager

Copernicus Publications
The Innovative Open Access Publisher

Search ACP
Library Search
Author Search

News
- Sister Journals AMT & GMD
- Financial Support for Authors
- Journal Impact Factor
- Public Relations & Background Information

Recent Papers
01 | ACP, 23 Dec 2008: Measurement of glyoxal using an incoherent broadband cavity enhanced absorption spectrometer

02 | ACPD, 23 Dec 2008: Single particle characterization using a light scattering module coupled to a time-of-flight aerosol mass spectrometer

03 | ACP, 23 Dec 2008: Corrigendum to "Modeling the effect of plume-rise on the transport of carbon monoxide over Africa with NCAR CAM" published in