Isoprene derived secondary organic aerosol in a global aerosol chemistry climate model

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Secondary organic aerosol (SOA) impacts earth's climate and human health. Since its precursor chemistry and its formation are not fully understood, climate models cannot catch its direct and indirect effects. Global isoprene emissions are higher than any other non-methane hydrocarbons. Therefore, SOA from isoprene-derived, low volatile species (iSOA) is simulated using a global aerosol chemistry climate model ECHAM6-HAM-SALSA-MOZ. Isoprene oxidation in the chemistry model MOZ is following a novel semi-explicit scheme, embedded in a detailed atmospheric chemical mechanism. For iSOA formation four low volatile isoprene oxidation products were identified. The group method by Nanoonlal et al. 2008 was used to estimate their evaporation enthalpies ΔH_{vap}. To calculate the saturation concentration $C^*(T)$ the sectional aerosol model SALSA uses the gas phase concentrations simulated by MOZ and their corresponding ΔH_{vap} to obtain the saturation vapor pressure $p^*(T)$ from the Clausius Clapeyron equation. Subsequently, the saturation concentration is used to calculate the explicit kinetic partitioning of these compounds forming iSOA. Furthermore, the irreversible heterogeneous reactions of IEPOX and glyoxal from isoprene were included. The possibility of reversible heterogeneous uptake was ignored at this stage, leading to an upper estimate of the contribution of glyoxal to iSOA mass.