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Modeling global organic aerosol formation and growth

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A computationally efficient framework for the description of organic aerosol (OA)-gas partitioning and chemical aging has been developed and implemented into the EMAC atmospheric chemistry-climate model. This model simulates the formation of primary (POA) and secondary organic aerosols (SOA) from semi-volatile (SVOC), intermediate-volatile (IVOC) and volatile organic compounds (VOC). POA are divided in two groups with saturation concentrations at 298 K 0.1, 10, 1000, 100000 μg m-3: OA from fossil fuel combustion and biomass burning. The first 2 surrogate species from each group represent the SVOC while the other surrogate species represent the IVOC. Photochemical reactions that change the volatility of the organics in the gas phase are taken into account. The oxidation products from each group of precursors (SVOC, IVOC, and VOC) are lumped into an additional set of oxidized surrogate species (S-SOA, I-SOA, and V-SOA, respectively) in order to track their source of origin. This model is used to i) estimate the relative contributions of SOA and POA to total OA, ii) determine how SOA concentrations are affected by biogenic and anthropogenic emissions, and iii) evaluate the effect of photochemical aging and long-range transport on OA budget over specific regions.