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Ozone deposition to bare soil: analysis of the dependence of the soil resistance on the surface relative humidity for different soil types

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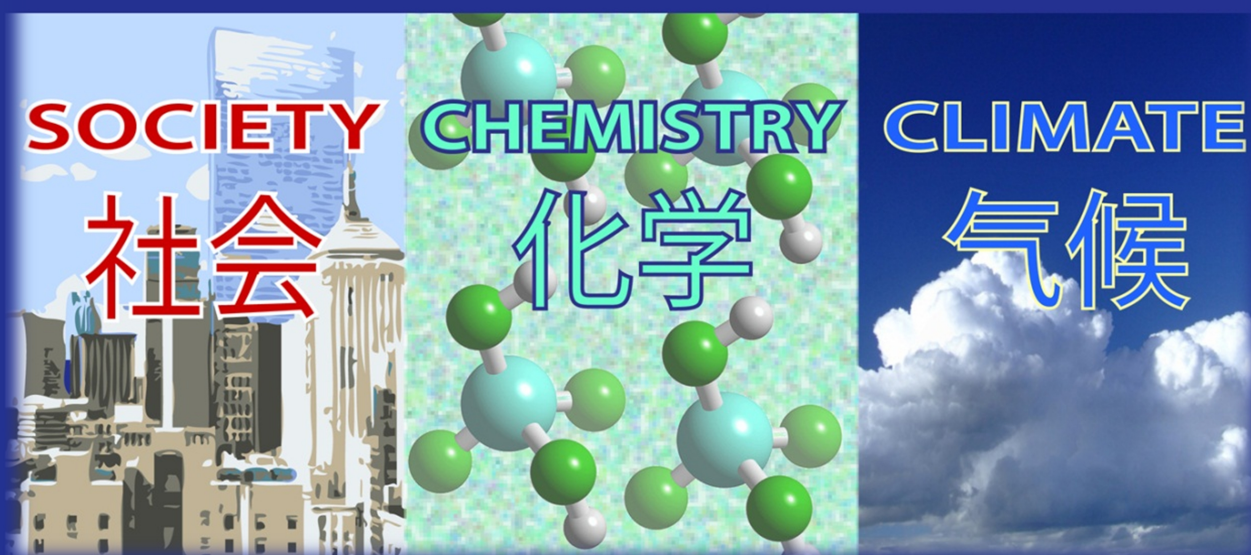
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POC time series and the organic matter enrichment in sea spray that cannot be justified by the aerosol transport time and that, likely, is related to the timescale of the biological processes responsible for the production of transferable organic materials during the bloom evolution. This time delay should be taken into account when modeling the production of primary organic aerosols from the oceans based on satellite data, even though it is not clear if this result holds also for other oceanic regions.

A new relationship describing the organic enrichment of sea spray aerosol, as a function of both wind speed and sea surface Chl-a concentration, to be implemented in large scale models, is proposed as a conclusion of this study.

P-5-008 Ozone deposition to bare soil: analysis of the dependence of the soil resistance on the surface relative humidity for different soil types

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Key words

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Tropospheric ozone (O_3) is mainly formed by photochemical reactions involving nitrogen oxides (NO_x) and volatile organic compounds (VOCs). It is a well known greenhouse gas responsible for positive radiative forcing, a key compound of atmospheric chemistry and a harmful pollutant responsible for damages on plants, materials and human health.

Deposition to the Earth' surface represents the only net sink for O_3 . Since O_3 is hardly soluble in water, it is deposited mainly through dry deposition to terrestrial ecosystems, and not to oceans or lakes. Despite this knowledge, the strength of this dry deposition sink is highly uncertain, with current estimates ranging between 530 and 1470 Tg O_3 y^{-1} . It is well established that deposition to terrestrial ecosystems occurs through three pathways: stomatal uptake by plants, cuticular deposition and soil deposition. The environmental parameters controlling stomatal and cuticular pathways are reasonably identified and parameterisations to model these pathways are available. However, the soil pathway is still not fully understood: only few studies dealt with O_3 deposition to soil and current parameterisations of soil resistance to O_3 assume a constant resistance at the weekly or monthly scale.

However, this pathway cannot be neglected, especially for agricultural ecosystems, for which we recently showed that soil deposition could account for 25% of the total O₃ deposition when crops were fully developed (data obtained from an agricultural field near Paris, France). In addition, we observed that O₃ deposition during bare soil periods was of the same magnitude as O₃ deposition over fully developed canopies.

In this study, we explore the parameters controlling the soil resistance to O₃ deposition. Ozone fluxes as well as heat fluxes, standard meteorological conditions (e.g. air temperature, air relative humidity) and soil parameters (e.g. texture, porosity) were measured at four different sites in France with contrasting soil types. The soil resistance to ozone, deduced from measured deposition velocity and estimated aerodynamic and quasi-laminar boundary layer resistances, was expressed as a function of relative humidity at the soil surface (RH_{surf}) for each dataset as $R_{soil} = R_{soilmin} \times e(k \times RH_{surf})$, where $R_{soilmin}$ (s m⁻¹) is the soil resistance without water adsorbed at the surface (i.e. at RH_{surf} = 0%) and k is an empirical coefficient of the exponential function. The link between the soil properties and the two parameters $R_{soilmin}$ and k is then explored.

Our results show that (i) ozone deposition to soil decreases when relative humidity increases and (ii) the parameterisation of R_{soil} depends on soil properties. A possible underlying process is the adsorption of water at the soil surface which decreases the surface available for ozone deposition. To establish a parameterisation of R_{soil} that could be used for any site, it is necessary to take into account this phenomenon in a mechanistic way. This study is the first step to achieve this goal. We will also attempt to expand our analyses to other locations.

P-5-009 Long-term historical inventory of isoprene emissions over Asia : interannual variability, trends and evaluation against flux measurements

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We build a 32-year (1979-2010) inventory of isoprene emissions over east Asia at a resolution of 0.5 degree between 1979 and 2010 based on the Model of Emissions of Gases and Aerosols from Nature (MEGAN, Guenther et al., Atmos. Chem. Phys., 2006) version 2 and the Model for Hydrocarbon Emissions by the Canopy (MOHYCAN, Muller et al., Atmos. Chem. Phys., 2008) used to determine leaf temperature and the radiation fluxes dependence on the canopy height. MEGAN uses the latest compilation of basal emission factors for isoprene. The canopy model is driven by meteorological fields for air temperature, cloud cover, downward solar radiation, wind speed, and soil moisture provided by the ERA