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Assessing the evolution of biogenic isoprene emissions in the future and their impact on the chemical composition of the atmosphere.

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As the main source of volatile organic compounds (VOCs), the terrestrial biosphere plays a key role in tropospheric chemistry processes. Isoprene emissions, which contribute to more than half of biogenic VOC emissions, are controlled by climate conditions (temperature, radiation), vegetation characteristics (plant type, leaf area, soil moisture), as well as by the chemical composition of the atmosphere (impact of CO_2 variation on plant emission capacity, for example). In the future, changes in climate, land-use, vegetation distribution and atmospheric CO_2 concentrations are likely to affect significantly the isoprene emission level and consequently, could have strong impact on the chemical composition of the atmosphere.

In this study, a biogenic emission scheme based on the most recent knowledge is used to provide estimates of isoprene emissions for the present-day and the future (2100) using climate forcing from the Unified Model and vegetation characteristics calculated by the Sheffield Dynamic Global Vegetation Model. Global isoprene emissions reach

413 TgC/yr for the present-day and 184 TgC/yr for 2100 when changes in climate, natural vegetation distribution, land-use and atmospheric CO_2 concentrations are considered. In the future, the increase in crop surface and atmospheric CO_2 concentrations strongly affect the emissions, leading to a decrease in global isoprene emissions reaching 35% and 41% respectively, compared to the present-day. The impact of changes in isoprene emission on the chemical composition of the troposphere is then investigated using the UK Chemistry and Aerosol community model, with special attention paid to ozone production and loss.