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30 years of surface ozone measurements in Austria: long-term trends, attainment statistics, and changes in the temperature sensitivity of surface ozone production

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As the production of ozone in surface air is determined by ambient temperature and by the prevalent chemical regime, a very different temperature dependence of ozone production emerges for nitrogen oxides (NO_x) and volatile organic compounds (VOC) limited regions. In this study we evaluated the temperature sensitivity of ozone production for rural, suburban as well as urban sites in Austria on seasonal basis. The analysis is based on 30 years of observational data from Austrian monitoring networks for the time period 1990 – 2019. Reductions in precursor emissions as observed in 2020 in Austria due to the pandemic will be used to test the obtained results. Surface ozone, NO_x, daily sums of global radiation and minimum daily temperature are used as covariates in our study. The observed NO_x to VOC ratio at individual sites is variable over time due to changes in precursor emissions and/or the variability of meteorological parameters such as mixing layer height. At the site level we relate the temperature sensitivity of ozone production to the daily mean NO_x mixing ratio and the daily minimum temperature. This information allows us to determine the impact of past/future temperature changes on surface ozone abundance in the context of reductions of NO_x emissions and changing methane backgrounds.