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Investigation of the European summer 2018 air pollution episode using novel satellite data and modelling

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Satellite measurements of multiple tropospheric trace gases (e.g. ozone-O_3, nitrogen dioxide-NO_2, and formaldehyde-HCHO) show a strong degradation in European air quality (AQ) during the summer of 2018. State-of-the-art satellite retrievals of lower tropospheric O_3 (0-6 km) from the Global Ozone Monitoring Experiment-2 (GOME-2) show a significant enhancement in summer-time O_3 concentrations of up to 50% and 25% over north-western Europe and the Mediterranean in comparison to 2017. However, summer 2018 enhancements in tropospheric column NO_2 and HCHO occurred over north-western Europe and Scandinavia, respectively, with negligible changes over the Mediterranean. Therefore, multiple processes (e.g. anthropogenic/biogenic emissions, photochemistry, meteorological dynamics and stratospheric O_3 intrusion) appear to be driving the widespread tropospheric O_3 enhancements in different regions of Europe. Here, we present a range of modelling sensitivity experiments, using the TOMCAT global 3-D offline chemistry transport model (CTM), to investigate which governing process are responsible for the European O_3 enhancements and how this impacts on surface AQ. Initial model simulations, using fixed chemical emissions, suggest dynamics and stratospheric intrusion contribute significantly to O_3 enhancements over the Mediterranean.