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Added value of a geostationary thermal infrared and visible instrument to monitor ozone for air quality

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Air quality concerns the atmospheric composition of the lowermost troposphere between the ground and 500 m; it depends on chemical and transport processes and emissions. Air quality has a strong impact on human health, and protecting society from its adverse effects has a high cost (Lahoz et al., 2012). It is thus important to monitor species that are key for air quality – these include ozone, carbon monoxide, NO_x and aerosols. In this study we focus on ozone, and compare the capability of two instrument configurations onboard a geostationary (GEO) satellite to sense ozone in the lowermost troposphere (surface and 0-1 km column): 1) in the thermal infrared (GEO TIR), and 2) in the thermal infrared and the visible (GEO TIR+VIS). We consider one week during the Northern Hemisphere summer simulated by the chemical transport model MOCAGE, and use the two GEO instrument configurations to measure ozone. The GEO TIR instrument is described in Claeyman et al. (2011a, b). The GEO TIR+VIS instrument is the GEO TIR instrument with an additional visible Chappuis band to improve the sensitivity of the instrument in the lowermost troposphere. We compare these configurations against each other, and against an ozone reference state and a priori ozone information, to evaluate the benefit of the TIR+VIS in comparison to the TIR in the lowermost troposphere. The results from this work will inform an Observing System Simulation Experiment (OSSE) performed to quantify the added value of the GEO TIR+VIS configuration for forecasting air quality conditions.