Greenhouse gases and aerosols: A symbiotic relationship

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For remote sensing of greenhouse gases, it is essential to have good knowledge of the atmospheric aerosol concentration. This opens up new opportunities for interdisciplinary collaborations between different fields of atmospheric remote sensing, which is the subject of this contribution. With the success of greenhouse gas missions, such as JAXA's GOSAT and NASA's OCO-2 mission, the potential for space-based CO_2 and CH_4 emission monitoring became apparent, driving the demand for accurate total column observation of both trace gases. In response to this, the European Copernicus CO2M mission required measurements of the dry air column mixing ratio with an accuracy of 0.5 ppm (~0.1%) with a spatial resolution of 2×2 km^2 and global coverage within a few days. This data accuracy can only be achieved if the light path and thus the atmospheric aerosol are well known, leading to a multiangle polarimeter and a spectrometer as payload instruments of this mission. Targeted greenhouse gas missions such as the recently approved TANGO mission with a spatial resolution of <300m, aim to measure individual emission plumes using the so-called proxy retrieval approach. Here, measurements of a background gas together with prior information on its concentration are used to correct the aerosol-induced error in the measured plume. This retrieval approach works well when isolated plumes are observed, but it breaks down for more complex mixed emission scenarios, e.g., at urban scales. Here, the synergistic use of CO2M aerosol measurements with the TANGO target observation could be used to unravel the complex observation patterns on urban scales.