



## **Persistent cloud cover over urban areas linked to surface heat release**

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Urban areas are a hotspot for interactions between the built environment, its inhabitants, and weather. Unlike the impact on temperatures through the well-known urban heat island effect, urban effects on cloud formation remain unknown. This study explores whether and to what extent cloud formation is different over cities compared to their surroundings using observations from the high resolution visible broadband channel of Meteosat Second Generation (MSG-HRV) at a resolution of  $\sim 1\text{-}2$  km, for two large metropolitan areas in Europe: Paris, France and London, UK. In addition, using a long-term dataset of ground-based remote sensing and surface flux measurements from in and around London, we are able to distinguish low, non-precipitating clouds, examine night-time clouds and identify some of the hypothesized causes of urban-rural cloud occurrence differences. Combining observations from above and below the clouds provides a more detailed picture of the interaction between the urban surface and cloud formation.

The satellite measurements show a systematic enhancement of cloud cover in the afternoon and evening over two large metropolitan areas in Europe (Paris and London). The ground based remote sensing measurements in London confirm these findings. We find during late-spring and summer, even though the atmosphere over the city is dryer, low clouds can persist longer over the urban area as vertical mixing of moisture is maintained for a longer period of time, into the evening transition.