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Aerosol effects on cloud properties in the vicinity of megacities

Rotem Bar-Or and Chien Wang

Massachusetts Institute of Technology, Earth, Atmospheric and Planetary Sciences, Cambridge, MA, United States (baror@mit.edu)

Urbanization processes may significantly modify the atmospheric properties in the city area by changing the surface albedo, altering the surface heat conductivity, and increasing both heat and anthropogenic aerosol emissions. These factors are suggested to significantly affect cloud coverage and properties, resulting in climatic changes due to radiative forcing and variations in precipitation.

In this study, the effect of aerosol emission enhancement on cloud coverage is estimated in selected urbanized areas, for different cloud types. Using the recently introduced MISR Cloud Fraction by Altitude (CFbA) and the Aerosol Optical Depth (AOD) products, a 12 years record of the coverage of low clouds is analyzed, considering the corresponding observed aerosol concentration. Additionally, trends in atmospheric temperature profiles and surface temperatures for these regions are extracted from radiosonde data, in attempt to estimate the relative contribution of aerosol concentration variations to the observed cloud coverage changes. Finally, we use the Community Earth System Model (CESM) to estimate the sensitivity of low cloud coverage and properties to extensive urbanization scenarios in selected regions.