
Sensitivity of the assessment of the urban effect on precipitation to the methodology and to the urban specificities

Morgane Lalonde^{*1,2}, Sophie Bastin¹, and Ludovic Oudin²

¹SPACE - LATMOS – Laboratoire Atmosphères, Milieux, Observations Spatiales – France

²Milieux Environnementaux, Transferts et Interactions dans les hydrosystèmes et les Sols – Ecole Pratique des Hautes Etudes, Institut National des Sciences de l'Univers, Sorbonne Université, Centre National de la Recherche Scientifique – France

Résumé

The presence of urban areas modifies the interactions between the surface and the atmosphere through the modifications of energy and water budgets inducing the urban heat island effect, an increased surface roughness, and anthropogenic aerosols emissions. Several studies investigated the impact of these urban areas on precipitation with various conclusions. However, the current state of the art on this subject is facing two interrelated challenges, (i) the lack of general reach of the conclusions and the need to move from single-city analyses to multi-cities analysis, and (ii) the unclear impact of the multiple methodological choices to quantify the urban effect on precipitation. In our study, we have selected 37 cities in the United States of America, and we explore how the methodological choices affect the quantification of the urban effect on several precipitation characteristics. The methodologies vary in the wind pressure level selected and vary in the definition of upwind, downwind, and urban areas. Afterward this sensitivity analysis, we relate the variations of effects between cities to the urban specificities: urban heat island intensity, surface roughness, the averaged aerosol concentration, and the size of the city.

Mots-Clés: precipitation, surface, atmosphere interaction, wind, UHI, aerosols, surface roughness, USA

*Intervenant