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Experiments to Quantify Aerosol Transport from Sprinkler Irrigation and to Assess in Field Sampling Methods

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Abstract— Sprinkler irrigation with treated wastewater (TWW) is widely practiced throughout the world but may enhance hazards relative to the dispersion of inhaling pathogens such as enteric viruses or toxic contaminants. Transport of aerosol induced by sprinkler irrigation of TWW is a complex phenomenon due to the combined effect of several parameters, among others: i) proportion of droplets inferiors to 100–150 μm , which can evaporate completely, and can rise to aerosol under moderate humidity conditions, ii) wind that plays a major role for the transport of droplets. Therefore, the objective of the present study is to evaluate the effect of meteorological parameters on the mechanisms of dispersion of aerosols in field conditions. An impact sprinkler with pressure of 3.5 bar and dual nozzle (2.5 & 1.8mm nozzle diameters) was installed at a height of 1m from the ground. This sprinkler and pressure combination was selected to maximize transport and evaporation due to the relatively small drop size distribution. The distribution of aerosols was measured downwind vertically (1–10m from the ground) and horizontally within a perimeter equivalent to 4 times the sprinkler range (20–40m) by injecting a fluorescent dye (Acid Brilliant Flavine) into the water. The dye was rinsed from the PVC strings and Petri dishes, respectively. Besides, the performance of two active samplers, SKC Biosampler and AGI-4 was evaluated at a distance of 50m from the sprinkler. The primary results show that for an almost constant wind speed of 2.5m/s, rising the air temperature increases the volume captured by collectors at altitude below 6m. Regardless of the mounting height of the impingers, the AGI-4 performs better than the SKC Biosampler for collecting ABF dyed aerosols. Such data will be used to estimate a dispersion model in order to forecast transport.

Keywords— Aerosols, Sampling methods, Sprinkler irrigation, Transport,

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