

Lagrangian Spray Drift Ground Exposure Modeling With Wind Tunnel Droplet Size and Flux Source Data Abstract

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Abstract

The transport and deposition of pesticides applied by ground boom sprayers can be modeled using Lagrangian dispersion algorithms such as the aerial deposition AGDISP code. The initial spray source must be accurately described with respect to the droplet size spectrum and flux/ flow. Previous attempts to describe the discharged spray have focused on droplet size measurements within 50 cm of the nozzle, and velocity profiles have been estimated based on spray pressure, flow rate and nozzle discharge coefficient or measured using number flux weighted sampling systems such as Phase-Doppler analyzers. We have developed an alternative system of defining the spray source available for drift from a given nozzle and tank mix by measuring droplet size and flux under controlled conditions in a wind tunnel through a nominal 2 m x 2 m vertical window located at 2 m downwind of the nozzle. Initial measurements at 6 discrete heights within this sampling window using an Oxford Laser imaging system provided detailed spatial and temporal data on sprays which have been applied in field drift studies. Subsequent measurements have shown good correlations between this detailed information and simpler sampling approaches using laser diffraction and cylindrical collector systems. The combination of wind tunnel measurements of spray source and drift modeling using a modified AGDISP model (WTDISP) is being developed for use in a new drift reduction technology scheme in the US, Australia and New Zealand. This scheme, which builds on similar "LERAP" and "BBA" European schemes (potentially using/ extending their existing data), quantifies the relative spray drift reduction capabilities of low drift nozzles and adjuvants. The approach is also being adapted to support spray drift exposure risk assessments for pesticides applied by ground-based equipment, extending wind tunnel drift measurements from 2 - 7 m to extrapolated deposition at 100 - 500 m for field scenarios.

Key words: droplet size, spray drift, pesticide application

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