Unmanned Aerial Pesticide Application System Task Force update on off-target movement studies conducted globally

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Background

- The Organisation for Economic Co-operation and Development (OECD) Working Party on Pesticides (WPP) was formed in 1992.
- One of its goals is to harmonize data and methods used to test and assess pesticide risks.
- In 2019, OECD Working Party on Pesticides (WPP) formed a Drone/UASS Subgroup, which published a 'State of the Knowledge' report on pesticide application using UAVs
- Multiple recommendations in the report, but one specifically focused on
  - ***"…a clear and urgent need for a set of standard testing protocols to be agreed upon for the assessment of UASS," in order to ensure that any new data generated to describe spray drift is of sufficient quality to draw conclusions on UAV applications***".
- Pesticide registrant industry formed the UAPASTF to support OECD efforts

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Task Force Objectives

Member Company	*Administrative Committee*	*Technical Committee*
BASF Corporation	Rebecca Willis	**Frank Donaldson (Chair)**
Bayer CropScience LP	**Sarah Hovinga (Vice-Chair)**	Jane Tang
Corteva Agriscience	**Travis Bui (Chair)**	**Rajeev Sinha (Vice-Chair)**
Gharda Chemicals Inc Int.	Ram Seethapathi	Frank Sobotka
Gowan Company LLC	Raymond Layton	Jason A. McDonald
FMC Corporation	Hector Portillo	Roberto Barbosa
NuFarm Americas Inc.	Patti Turner	Tyler Gullen
Syngenta Crop Protection LLC	Nestor Algarin	Jo Davies
Valent U.S.A. LLC	Leslie Garcia	Frank Carey
Task force managers	*Rhonda Bichsel*	*Eric Bruce*

https://uapastf.com

- Engage with regulatory agencies (e.g., US-EPA/CAN-PMRA/AU-APVMA/UK CRD) to support UAV use for application of crop protection products
- Develop study protocol to ensure high quality data generation
  - Generate/submit regulatory data on drift
  - 9 GLP field studies completed across 5 regions in 2023 (5) and 2024 (4)
- Contribute toward evaluation of existing (or development of new) UAV drift models for regulatory purposes

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Global Off-target Movement Trials (GLP)

- Off-target movement trials conducted globally by the same contract research organization
- Utilized the same UAV platform and the pilot
- Presence of representatives from regional regulatory agencies visited most of the trials

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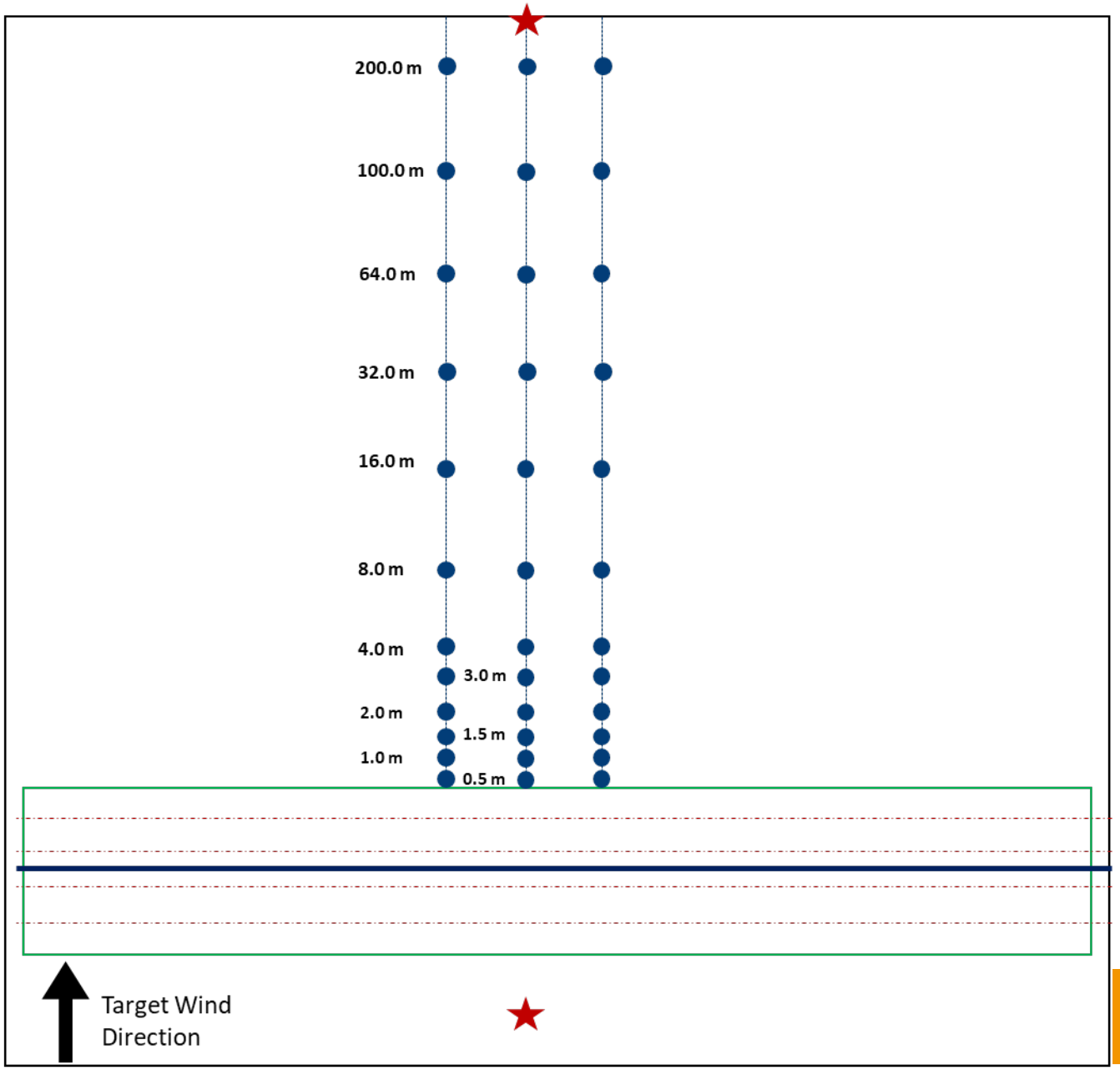
Trial details

- Based on “Recommendations for Conducting UAV Field Drift Trials – Proposed Field Study Protocol Guidance”, available at https://uapastf.com

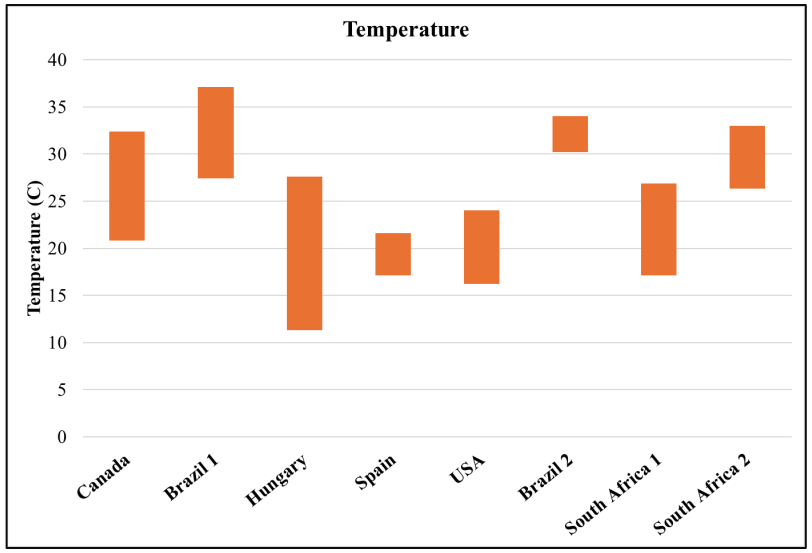
Item	Details
UAV Platform	DJI Agras T30
Benchmark	Ground Boom Sprayer
Nozzles (hydraulic)	Fine, Medium & Coarse categories (ASABE S572.1)
Analyte	PTSA Dye
Release heights	3 m (UAV), 0.5 m (ground)
Weather	Anemometers at 2 heights; upwind and downwind
Sampler	Mylar cards (ground drift)
Sampling	Up to 200 m downwind from edge of the spray area
Replications	3 transects/drift lines per run replicated three times
Passes	3-4 for UAVs and 1-2 for Ground Sprayer
Treatment Sequence	UAV treatments followed by Ground Sprayer

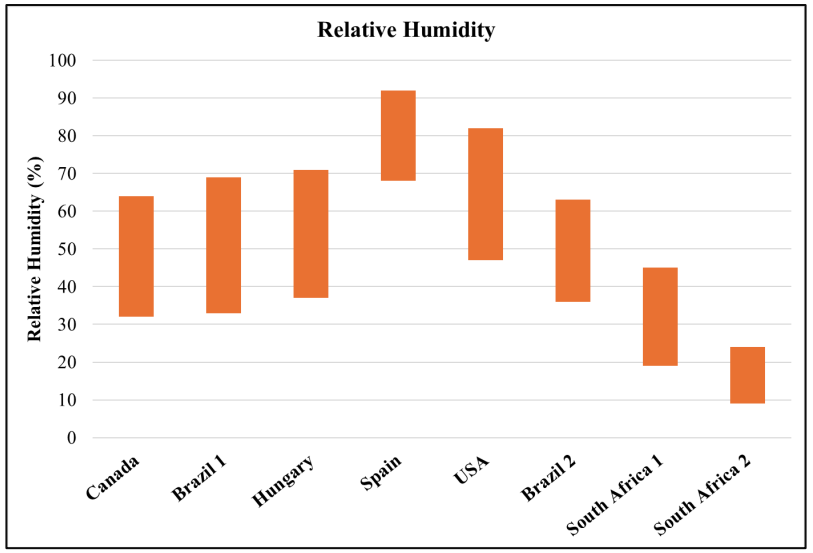
Plot layout

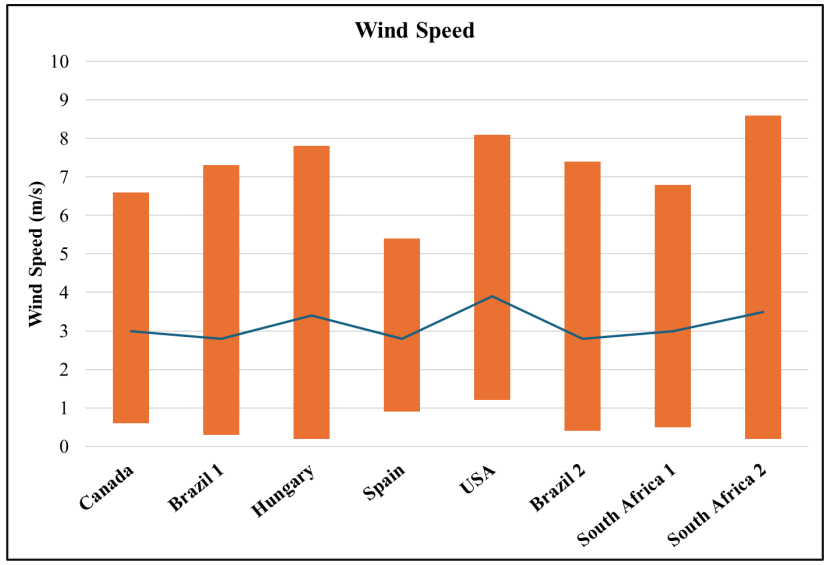


Spray Area
Weather Station
Mylar card samplers
UAV Flight Pass
Ground Sprayer Pass

Results: weather (excl. Australia)

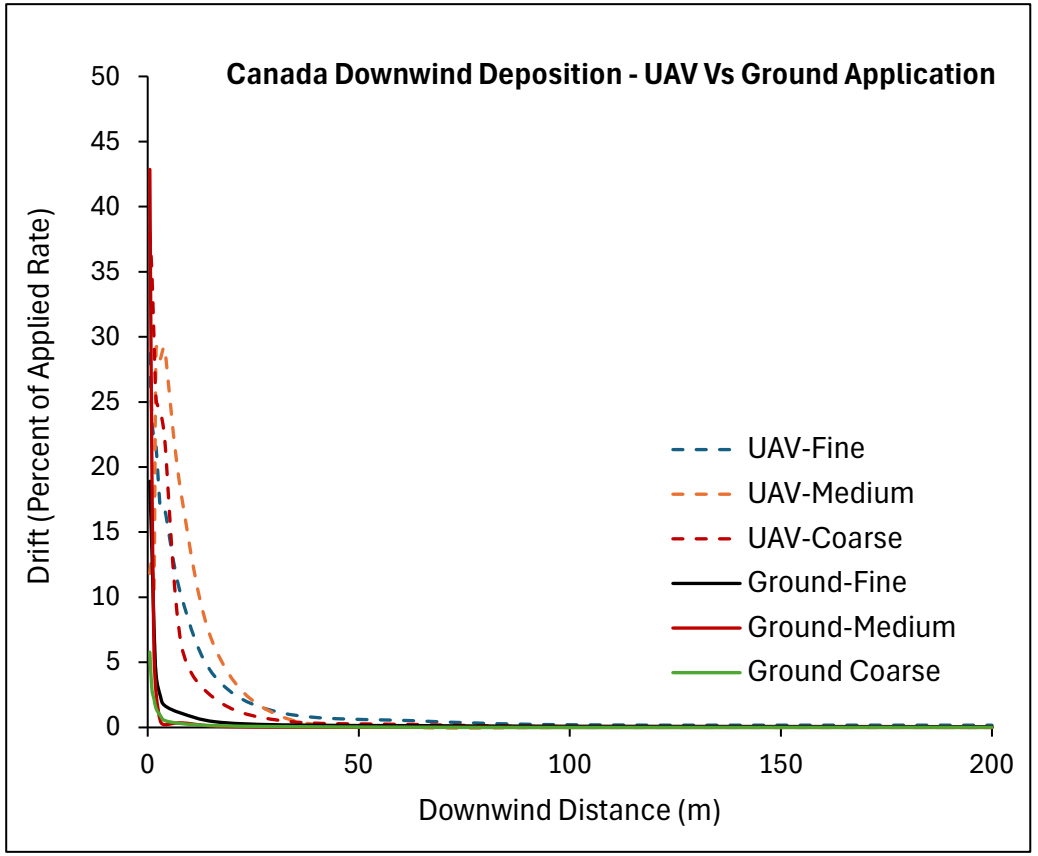


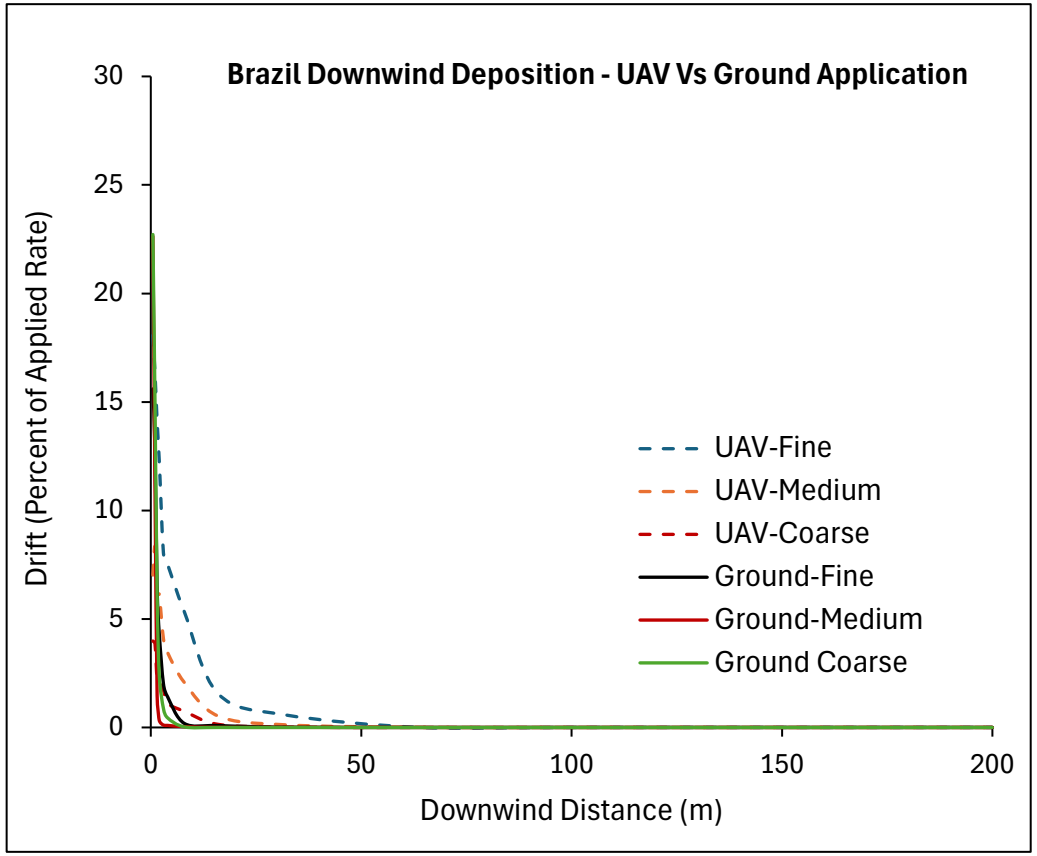




- Temperature range 11 – 37 °C
- RH range 9 – 92 %
- Wind speed range 0.6 – 8.6 m/s (averages generally within target range 2-5 m/s)

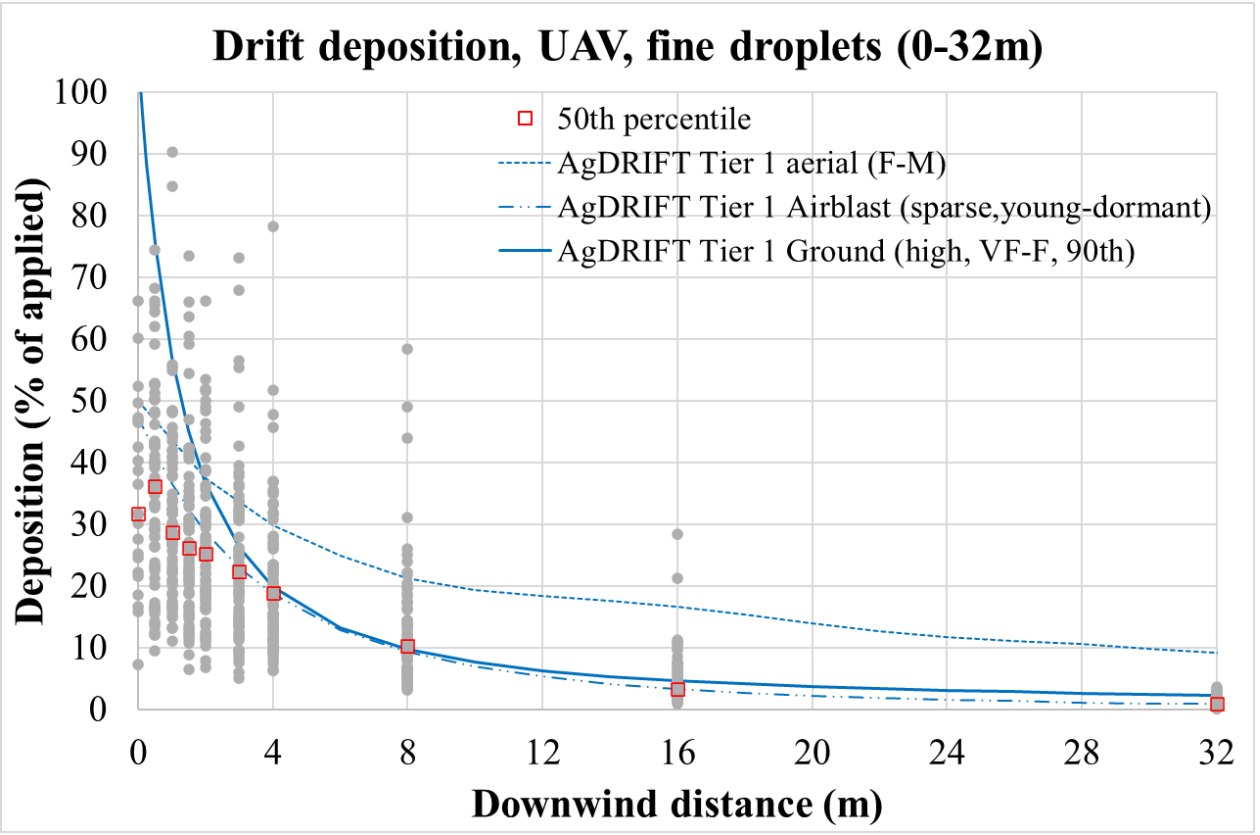
Results: off-target movement UAV versus ground application

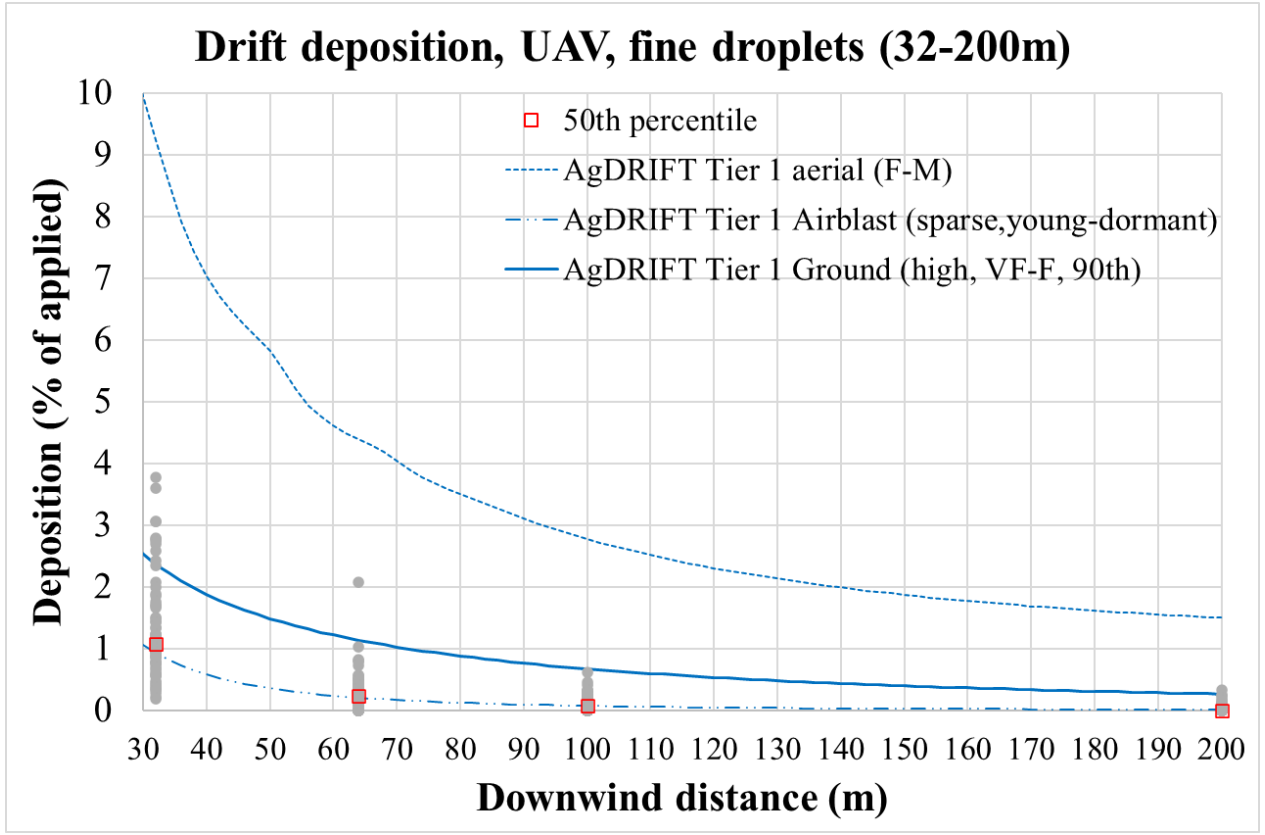




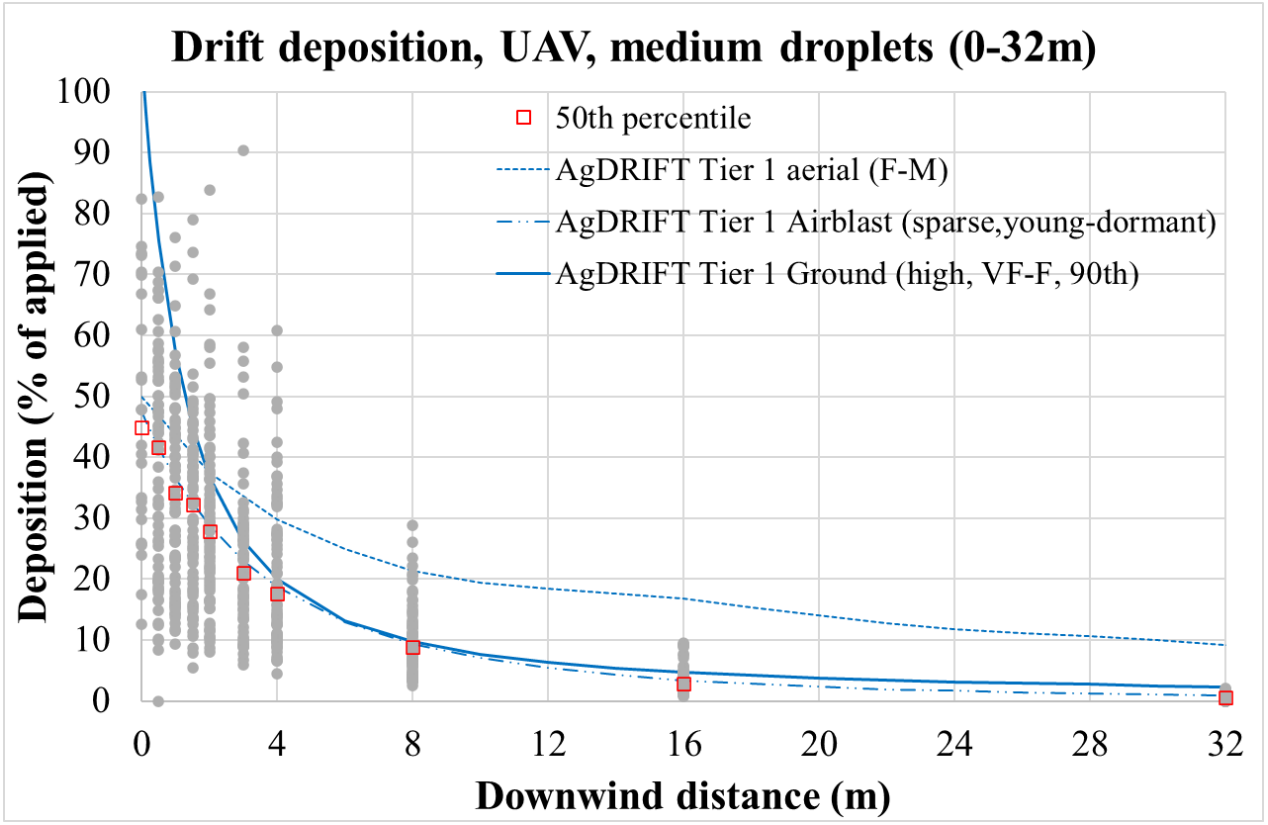
- Statistical analysis is currently being conducted to derive the range of downwind distances where significant differences occur between the two application scenarios

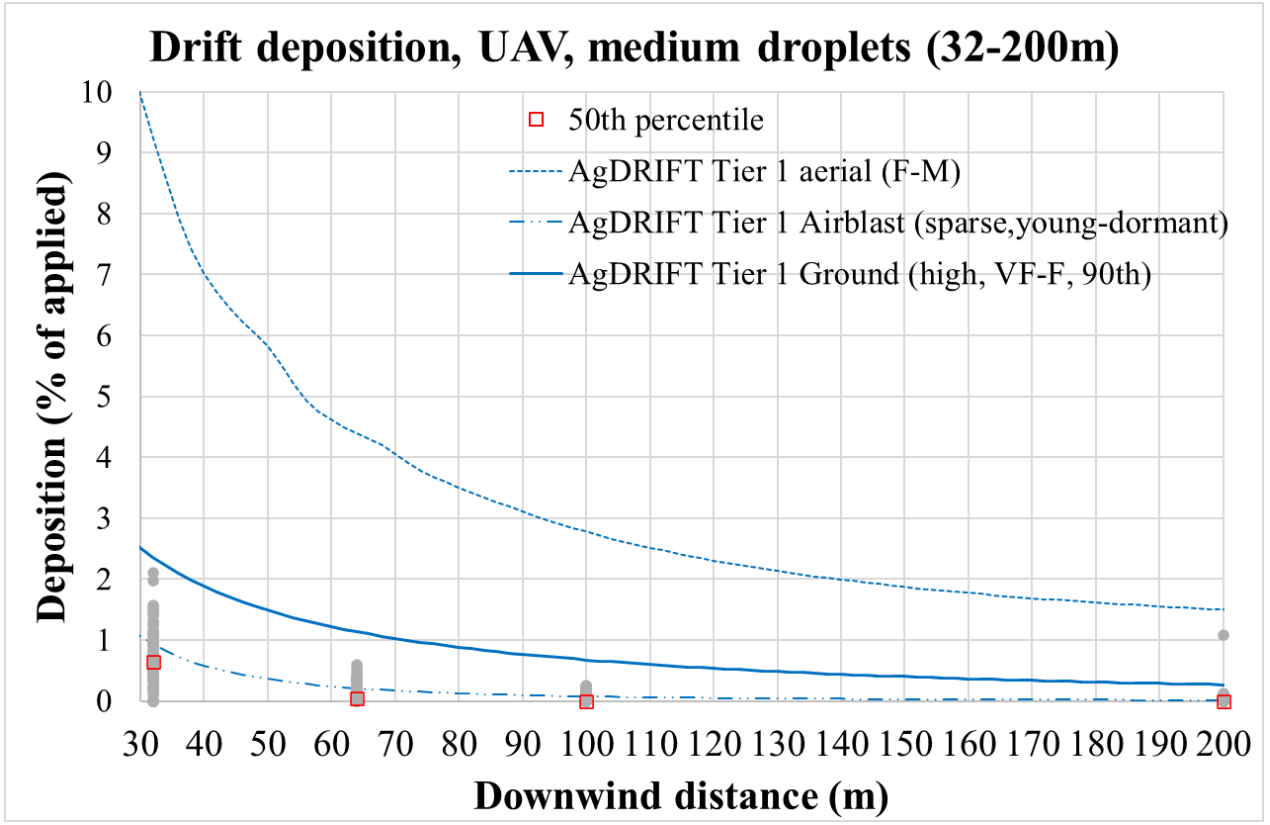
Results: Off-target movement (fine droplets)



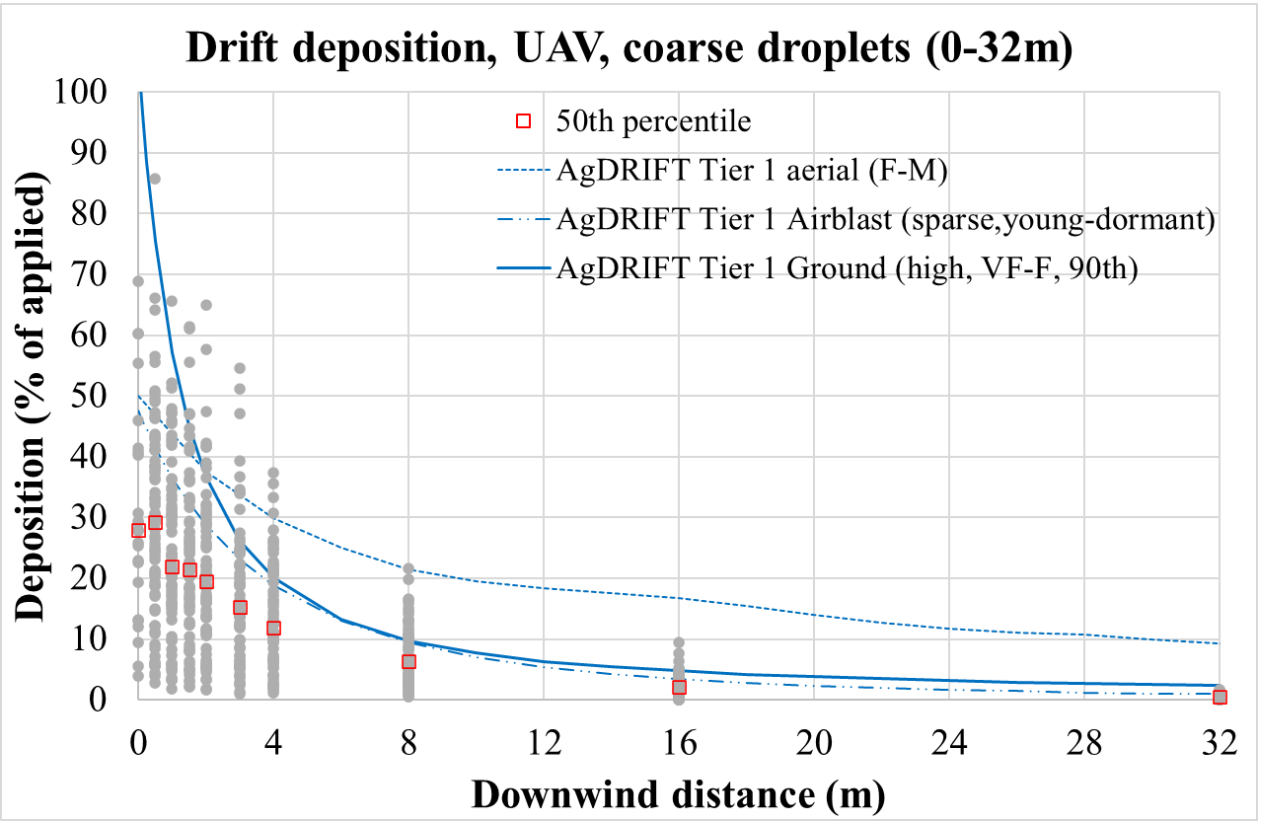


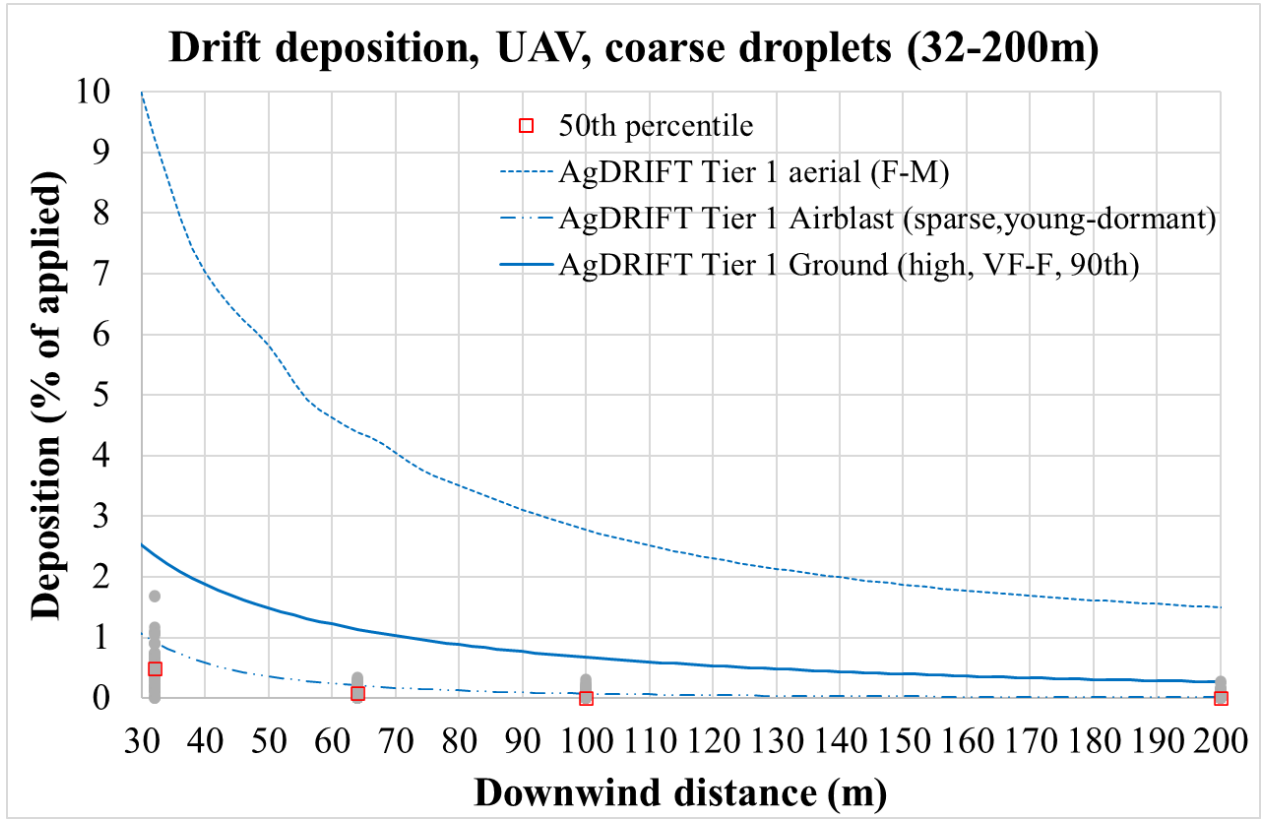
Results: Off-target movement (medium droplets)



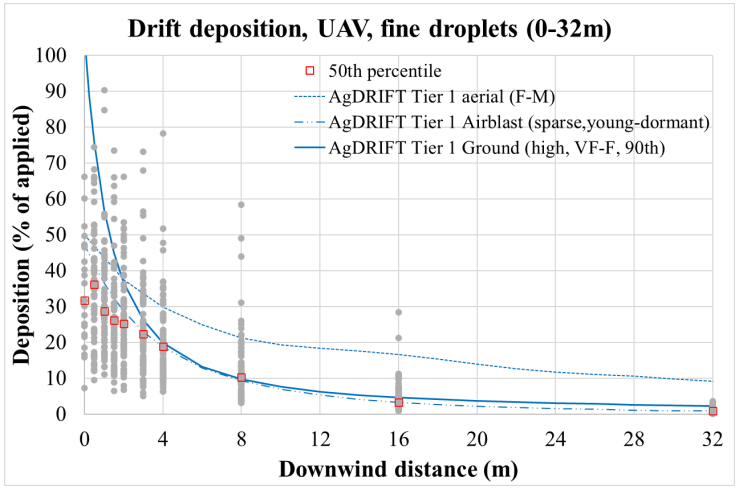


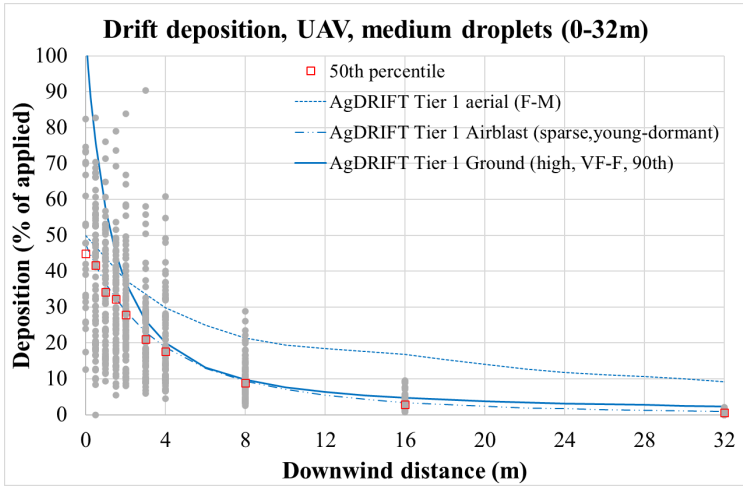
Results: Off-target movement (coarse droplets)

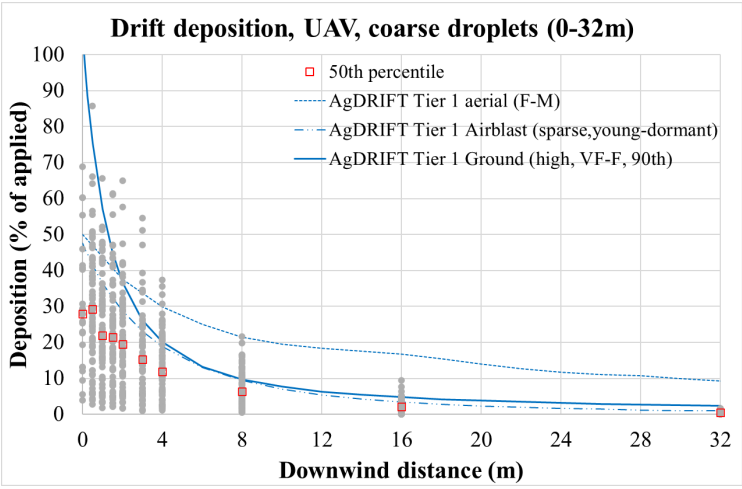




Discussion: off-target movement

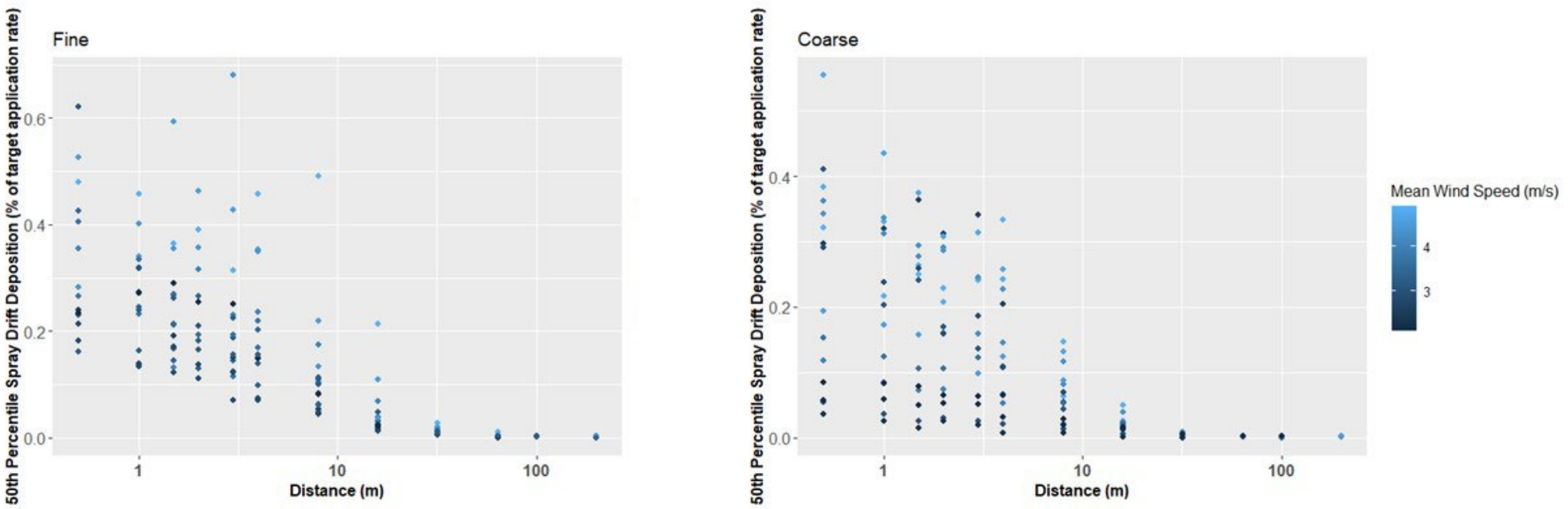






- Aggregated deposition data from eight GLP field trials (bare ground)
  - > 90% deposition within 16 m
  - 97-99% deposition within 32 m
  - >99% deposition within 64 m
- Deposition data routinely below regulatory drift curves for aerial applications (best visually approximated by airblast drift curves)
- High variability for all droplet categories at near edge-of-field
  - Beyond 8 m, deposition similar for all droplet categories

Discussion: off-target movement (wind speed)



- The effect of wind speed appears to be minimal after *ca.* 10 m
  - Multivariate analysis on all relevant environmental and agronomic variables in progress

Concluding remarks and next steps

- **General conclusions**
- High quality bare ground drift dataset developed in 2023-2024
  - Range of temperature and relative humidity
  - Range of wind speed

- Drift potential of a UAV may be higher than a ground application, lower than conventional aerial and comparable with an airblast sprayer

- Ongoing analysis to further quantify the differences between UAV and ground applications, evaluate weather effects, develop regulatory drift curves suitable for UAV

- **Next steps**
- Submission of all GLP data and study reports to regulatory authorities by end 2025
- Non-GLP summary report with regulatory drift curves submitted to regulatory authorities by end of 2025
- Off-site movement database development
- Drift modeling support/efforts to increase through 2026

- Non-dietary exposure “Job Steps Survey” 2025 in the US

- Nozzle technology exploratory efforts to being 2025

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