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Unmanned Aerial Pesticide Application System Task Force Report on Off-target Movement Studies Conducted Globally

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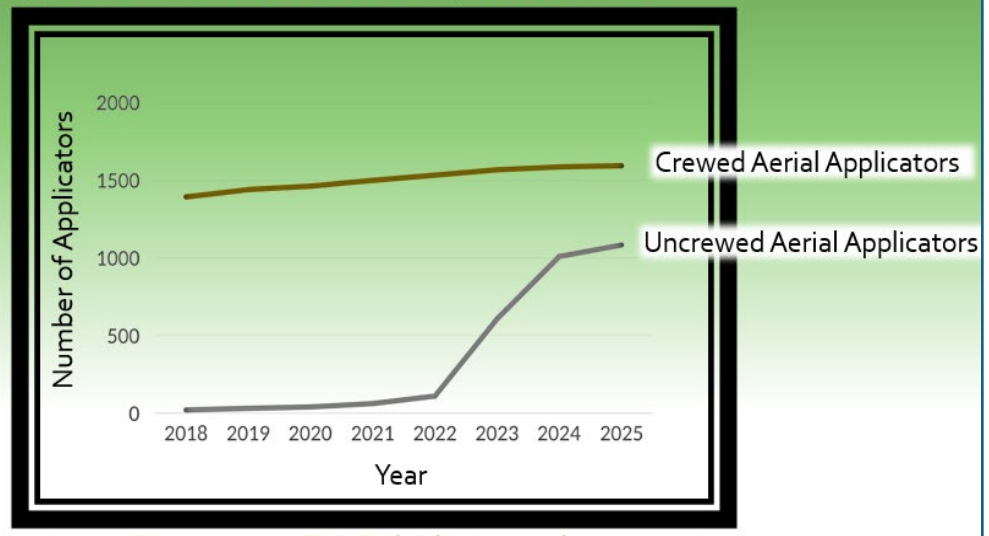
Using Agricultural Drones for Pesticide Application Continues to Increase

From 2018-2024, crewed aerial applicators have increased by 18%, while uncrewed aerial applicators have increased by over 7000%



AviationDB.net sourcing FAA (Federal Aviation Administration) and NTSB (National Transportation Safety Board) data

Uncrewed Applicator Numbers are Increasing in the United States

Spraying Drone Imports (Accumulated Values)

Total number of spray drones is 7.6 times of total number of aircrafts in Brazil

UAPASTF

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
- Pesticide registrant industry formed the Unmanned Aerial Pesticide Application System Task Force (UAPASTF) in 2021 to support OECD efforts

OECD “State of the Knowledge” Report

https://www.oecd-ilibrary.org/environment/report-on-the-state-of-the-knowledge-literature-review-on-unmanned-aerial-spray-systems-in-agriculture_9240f8eb-en

Drift/offsite Movement

Operator Exposure and Best Practices

Crop Residue

UAPASTF

Unmanned Aerial Pesticide Application System Task Force (UAPASTF), LLC.

https://uapastf.com

- Based in the US - but **global** in its work / focus
- UAPASTF global core mission is to supply regulatory data / information to inform the potential use of UAV-based pesticide application
  - Where appropriate, the UAPASTF will focus on generating data for submission to pesticide regulatory authorities to inform estimates for **off-site movement**, determine **operator/handler exposure**, and assess **crop residue** contributions.
  - This data will be used to conduct human and environmental risk assessments and inform the regulatory approval processes
- UAPASTF interacts with OECD Drone/UASS Subgroup of WPP, regulatory agencies, CropLife, EUPAF & other stakeholders to develop & provide information / data
  - UAPASTF alignment with work of the OECD WPP Drone/UASS Subgroup critical to success
  - Established and seeking collaborative and confidentiality agreements with **UAV-application companies and experts** (e.g., additional UAV-application companies in other world areas, UAV manufacturers)

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*

Parties interested in the work of, or registrants interested in joining the UAPASTF should contact:
Dr. Travis Bui, Chair, UAPASTF Administrative Committee travis.bui@corteva.com +1 317-431-7892
And/or Rhonda Bichsel, UAPASTF Manager, rhondab@johnsonmgt.com

UAPASTF

UAPASTF making progress toward stated goals

- **'Recommendations for conducting UAV off-site movement studies' released** (uapastf.com)
- **Nine GLP off-site movement studies in 7 countries on 5 continents**
  - Five studies conducted in 2023 submitted to EPA (US),PMRA(Canada),APVMA (Australian) and CRD (UK)
  - Data analysis from UAPASTF field study program / database ongoing
- **Best Management Practices for Safe and Effective Application of Pesticides Using Unmanned Aerial Spray Systems (UASS) [Version 1.0]** (uapastf.com)
- **Work on nondietary / occupational exposure has been initiated**
  - UAPASTF & UK CRD collaboration

- **Field crop residue program (with input from PMRA & UAPASTF on study protocol) implemented by Ag and AgriFood Canada & PMC**
  - Preliminary review of results demonstrate equivalency of ground & UAV applications

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Field Drift Studies – Data Generation

Globally focused Good Laboratory Practice (GLP) program

- Repeatable experiment to compare drift behavior across locations
- Same CRO & UAV pilot/consultant at each location
- Presence of representatives from regional regulatory agencies visited most of the trials

Location	Timing
USA (non GLP) (Robstown, Texas)	February 2023
Canada (GLP) (Saint-Jean-Sur-Richelieu, Quebec)	May 2023
Brazil #1 (GLP) (Santa Helena de Goiás, Goiás)	September 2023
Hungary (GLP) (Bugac)	October 2023
Spain (GLP) (Oropesa)	November 2023
USA (GLP) (Robstown, Texas)	December 2023
Brazil #2 (GLP) (Castro, Parana)	March 2024
Australia (GLP) (Clifton, Queensland)	April 2024
South Africa #1 (GLP) (Delmas, Mpumalanga)	September 2024
South Africa #2 (GLP) Hertzogville, Free State	September 2024

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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 deposition)
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

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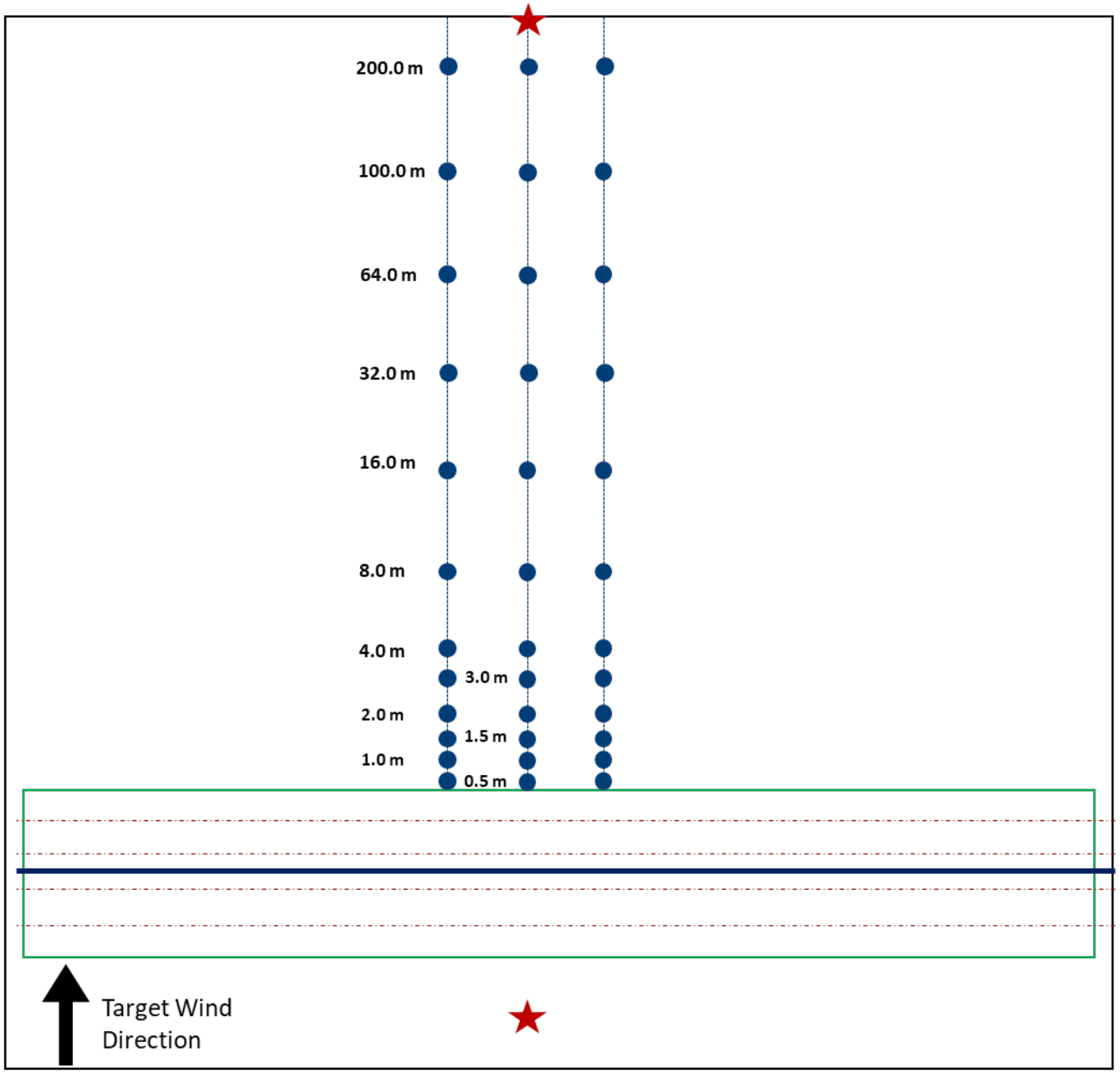
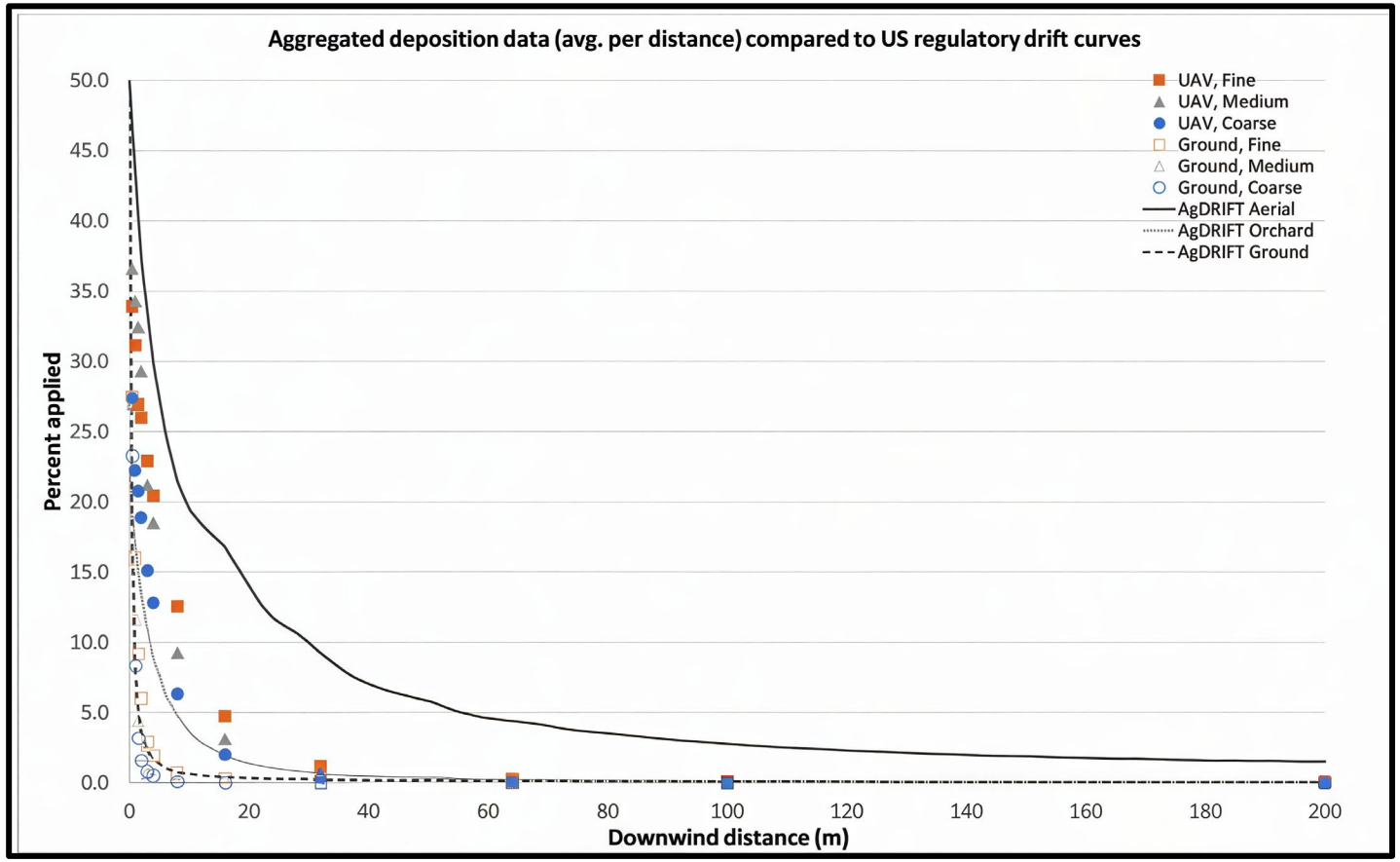
Plot layout



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

Downwind Deposition Data (aggregated, US drift curves)

- UASS Deposition Results
  - Follow expected trend by droplet size
  - 90% ground deposition within 16 m
    - 99% ground deposition observed by 32 m
  - **UASS data fall between regulatory drift curves for ground and aerial applications**



Studies conducted in 2023

AgDRIFT curves used:
Tier 1 Aerial, Fine-Medium Droplets
Tier 1 Orchard Airblast
Tier 1 Ground, 50th percentile, low boom, fine-medium coarse

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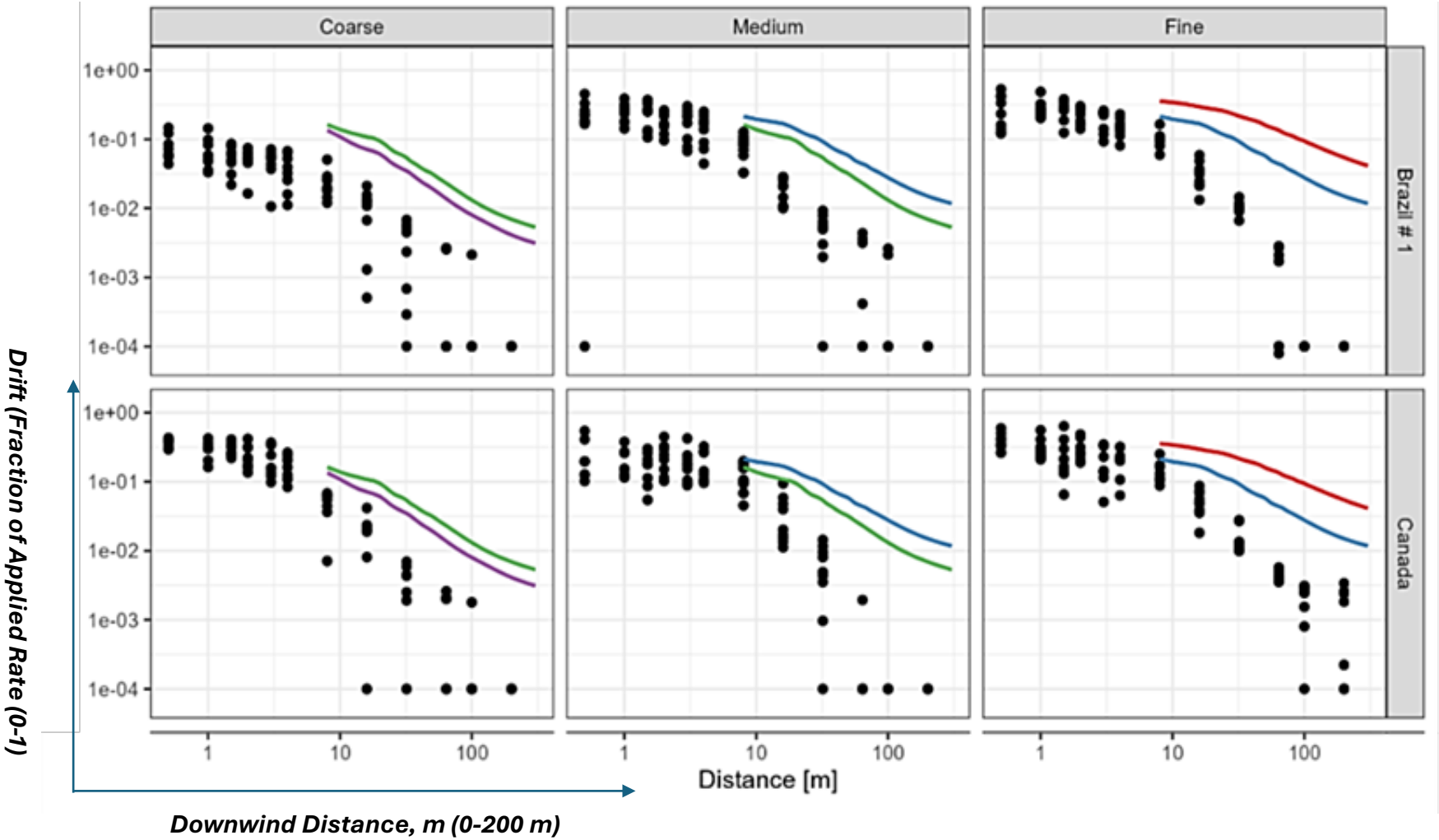
Example Results: *Off-target Movement Compared with USEPA Aerial Standard Deposition Curves*



AgDrift Aerial Drift Curves

- Very Fine to Fine
- Fine to Medium
- Medium to Coarse
- Coarse to Very Coarse

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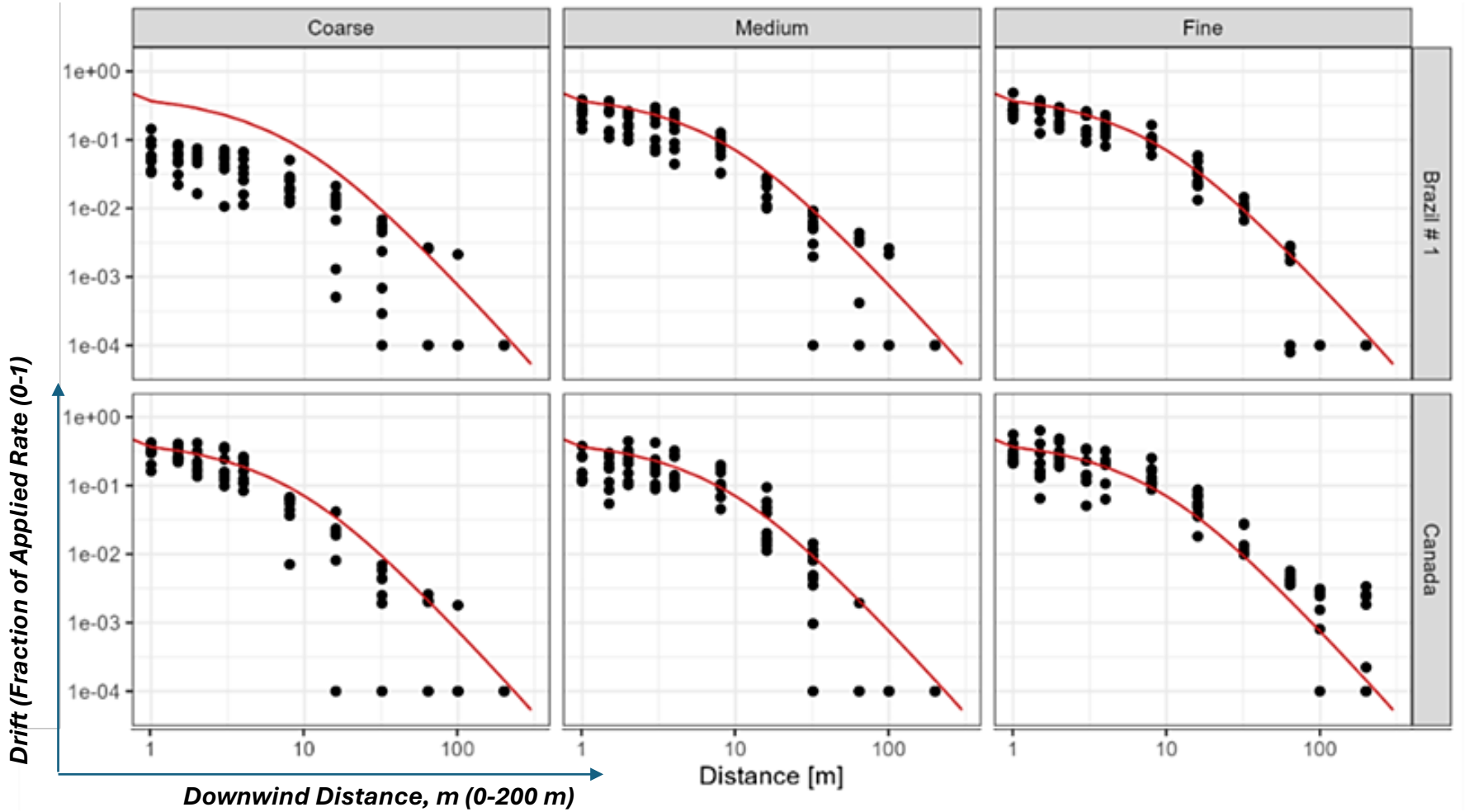
Example Results: *Off-target Movement Compared with USEPA Orchard Standard Deposition Curves*



AgDrift USEPA Orchard Standard Deposition Curves

Sparse (EPA Default)

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Concluding Remarks on Spray Drift Study

- High quality bare ground drift dataset developed in 2023-2024
- **Data supports that drift potential of a UAV is 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

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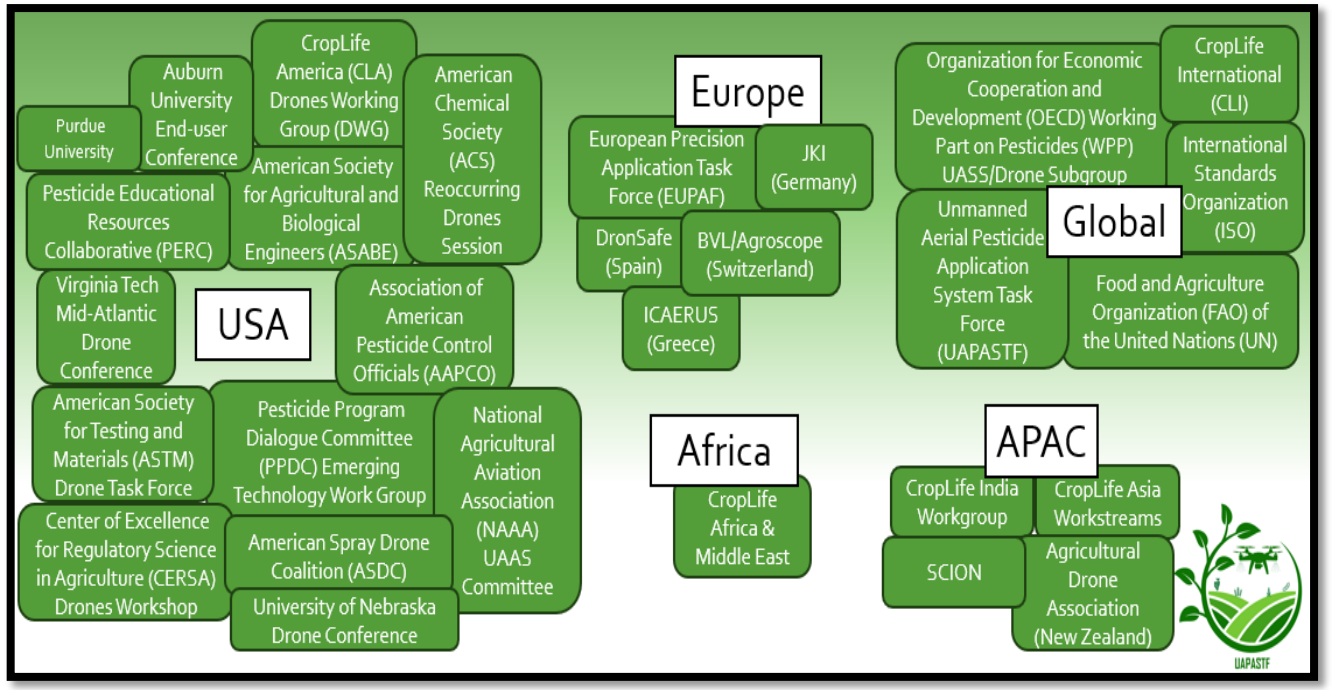
Next Steps of UAPASTF

- **Regulatory Submissions**
  - Submission of all GLP data and study reports to regulatory authorities by end 2025
- **Building an off-site movement database**
  - Work to begin 2025 (impact of atomization type; hydraulic vs rotary)
  - Looking for tripartite opportunities to develop empirical / mechanistic exposure models for regulatory exposure / risk assessment
- **Initiate Non-Dietary Exposure Survey**
- **Potential Additional Regulatory Considerations**
  - UAV Platforms
  - Nozzle parameters
  - Labeling



And…Continued Connection & Collaboration with Working Groups

OECD WPP, EUPAF, CropLife orgs, etc.

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LATAM Technical Support Team

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Unmanned Aerial Pesticide Application Task Force

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