



College of Agricultural &
Environmental Sciences
UNIVERSITY OF GEORGIA

Optimization of Spray Parameters to Maximize Application Efficiency of a UAV Sprayer

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Background

- Use of Unmanned Aerial Vehicles (UAV) have been increasingly rapidly in agriculture
- Increased interest in aerial application of pesticides using UAV due to availability of multiple platforms
- Limited information is available on selection of optimal parameters for maximizing spray deposition (e.g. speed, height, etc.)



Objective

To test and evaluate spray coverage at different parameters in order to optimize pesticide application efficiency from a UAV sprayer.

Methods and Materials

Location:

- Hort Hill Farm, UGA Tifton Campus (Tifton, GA)
- A weather station (Davis Instruments 6250) was installed on-site to collect data (wind speed, temp., humidity, etc.) during testing



Methods and Materials

UAV:

- M4E, TT Aviation Technology Co. (Beijing)

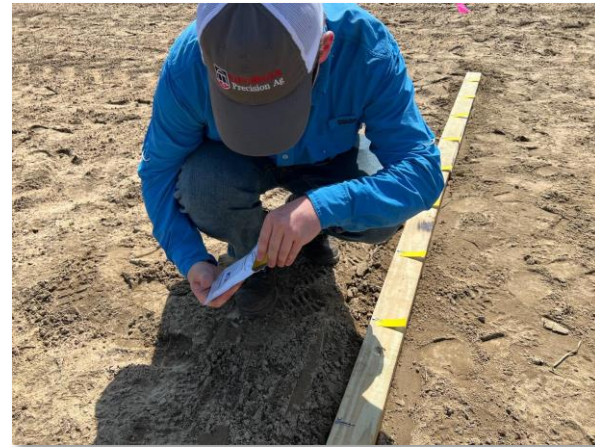
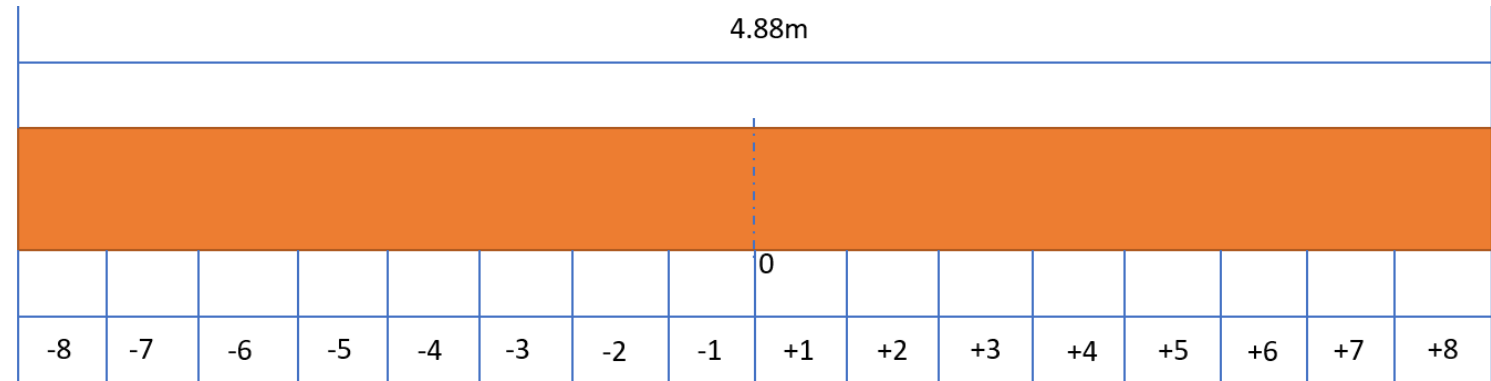
Testing Parameters:

- Three Heights (swath)
 - 2.0, 2.5 and 3.0 m
- Three Nozzles (droplet sizes)
 - XR (M), AIXR (VC) and TTI (UC)
- Five speeds (to target different GPA's)
 - 2.0, 2.5, 3.4, 5.0 and 8.0 m/s



Data Collection & Analysis

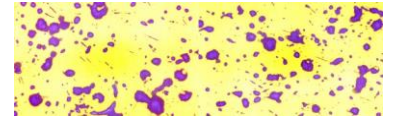
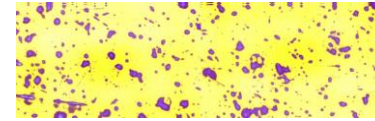
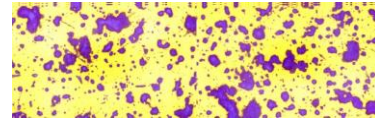
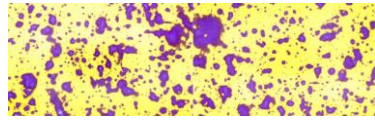
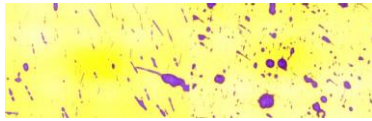
- Water sensitive paper placed along the swath at 0.3 m increments starting from centerline up to 3.5 m
- WSP collected after each pass and analyzed using the SprayX Dropscope instrument for spray deposition



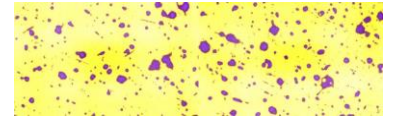
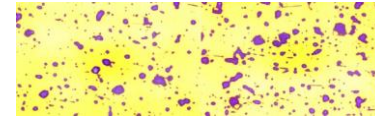
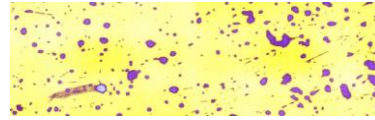
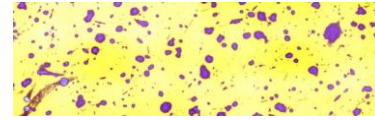
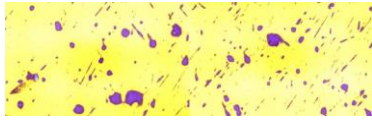
Results

Spray Height = 2.0 m

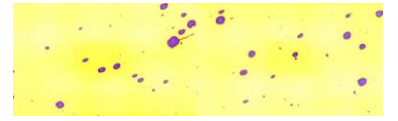
2.0m/s



3.4m/s



8.0m/s



-2

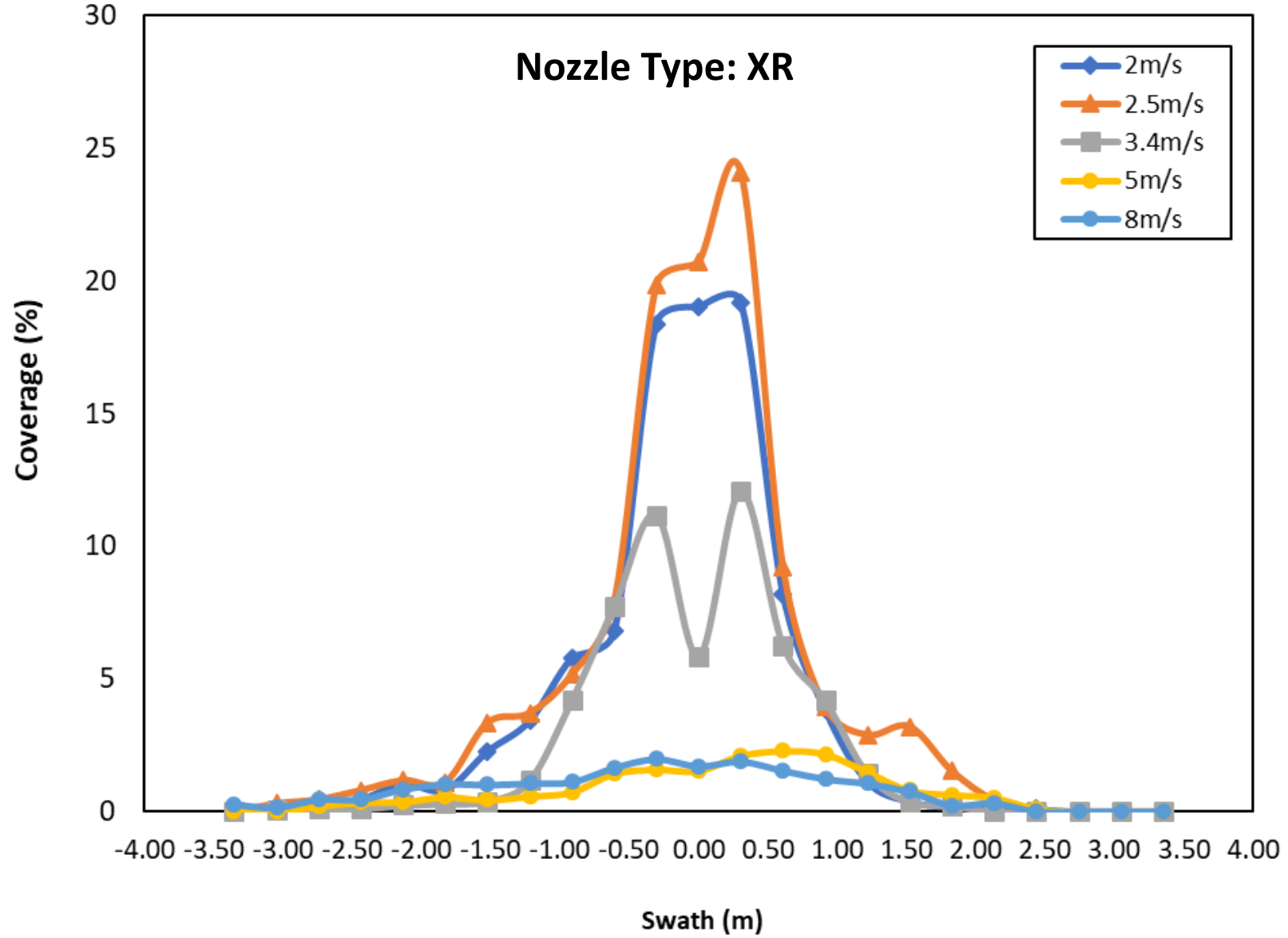
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0

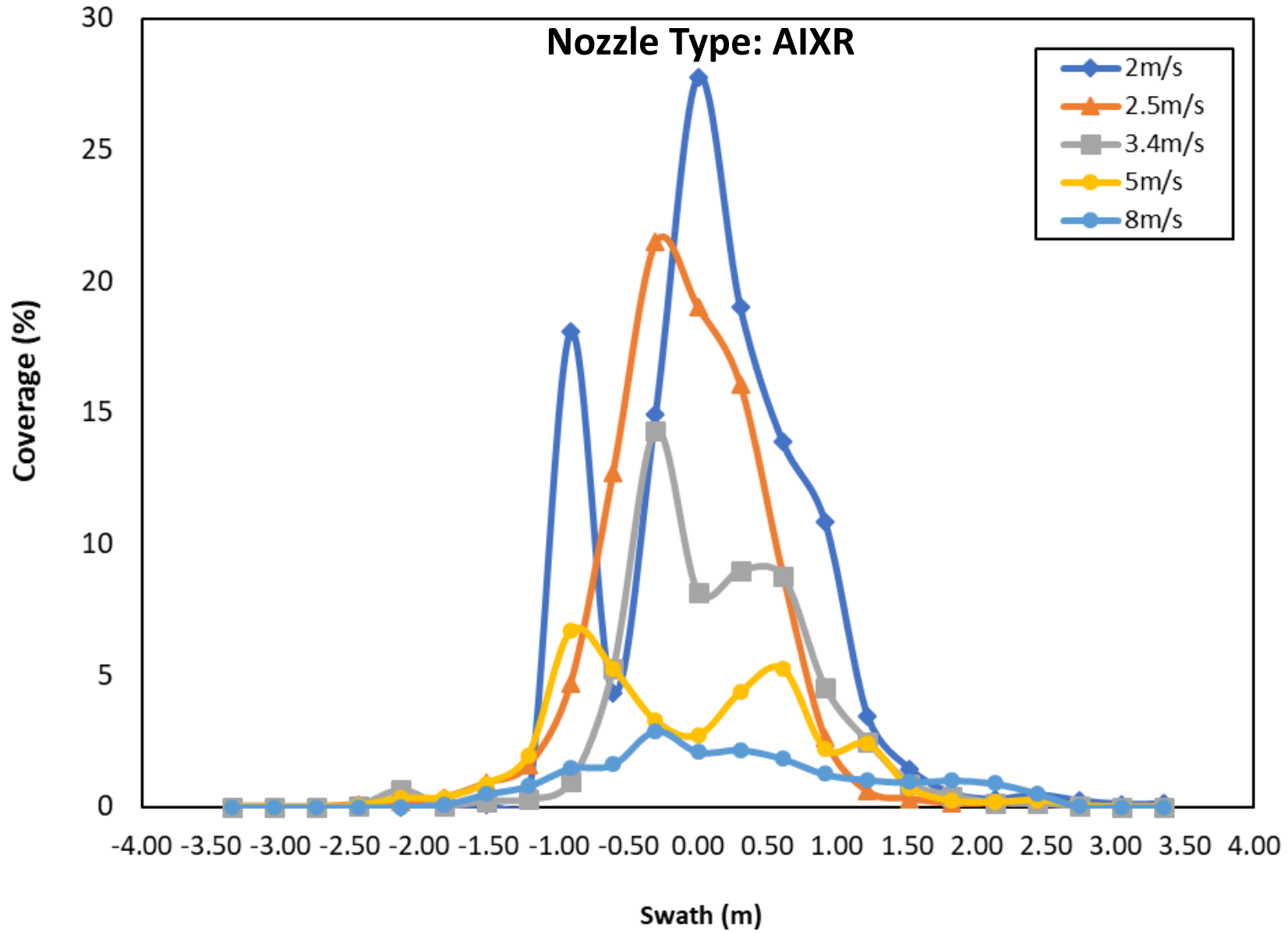
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2

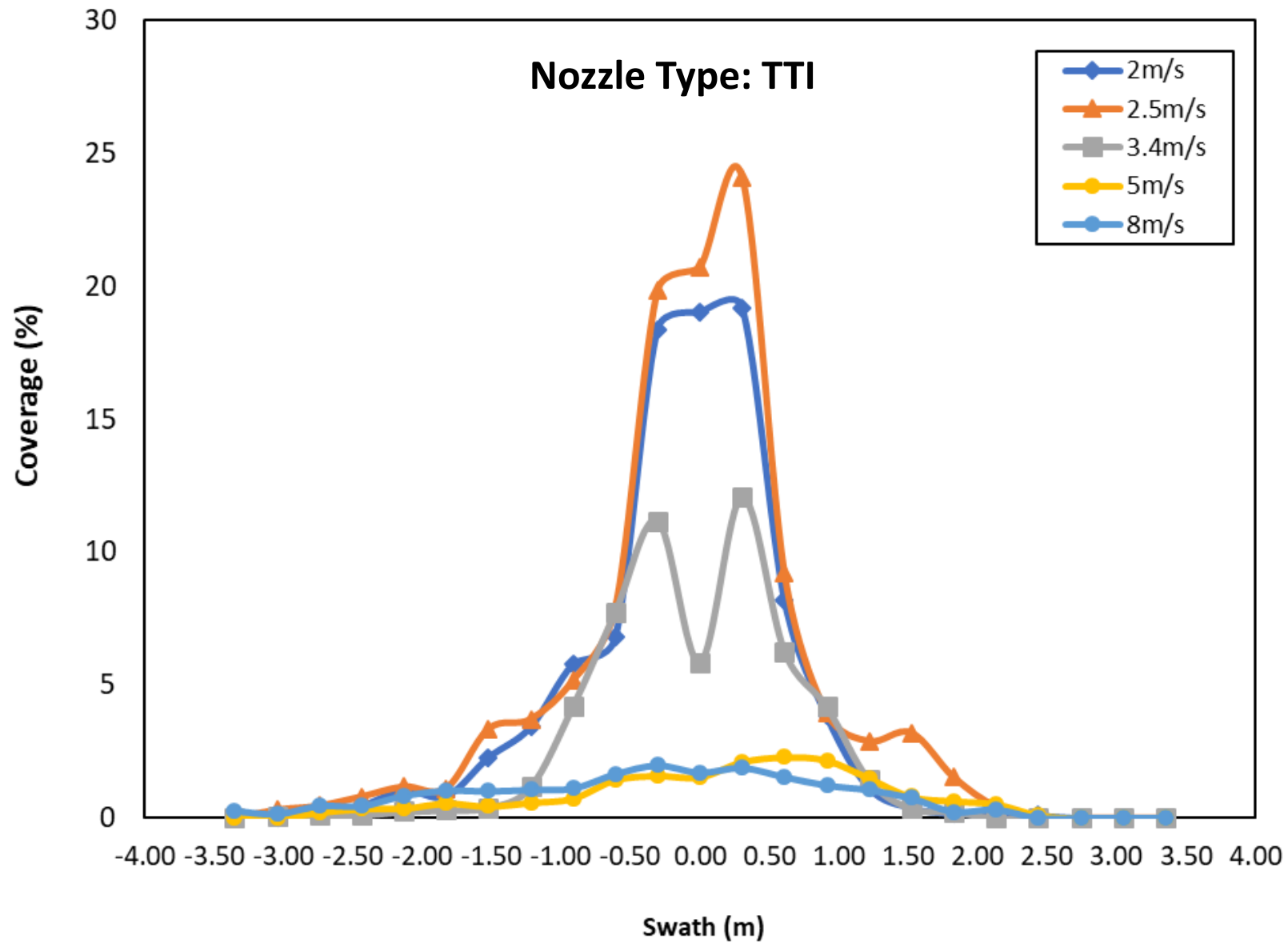
Spray Height: 2.0 m



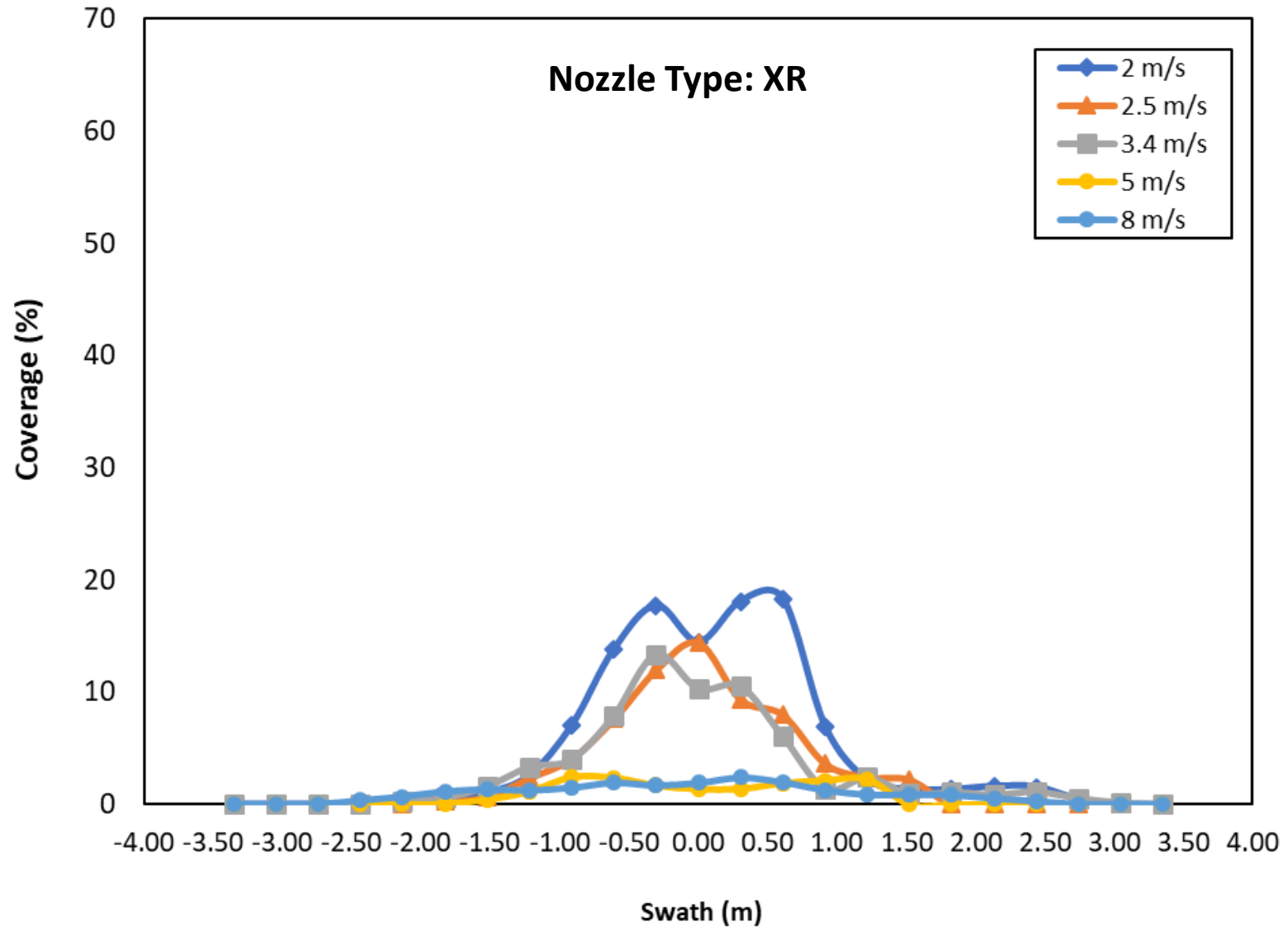
Spray Height: 2.0 m



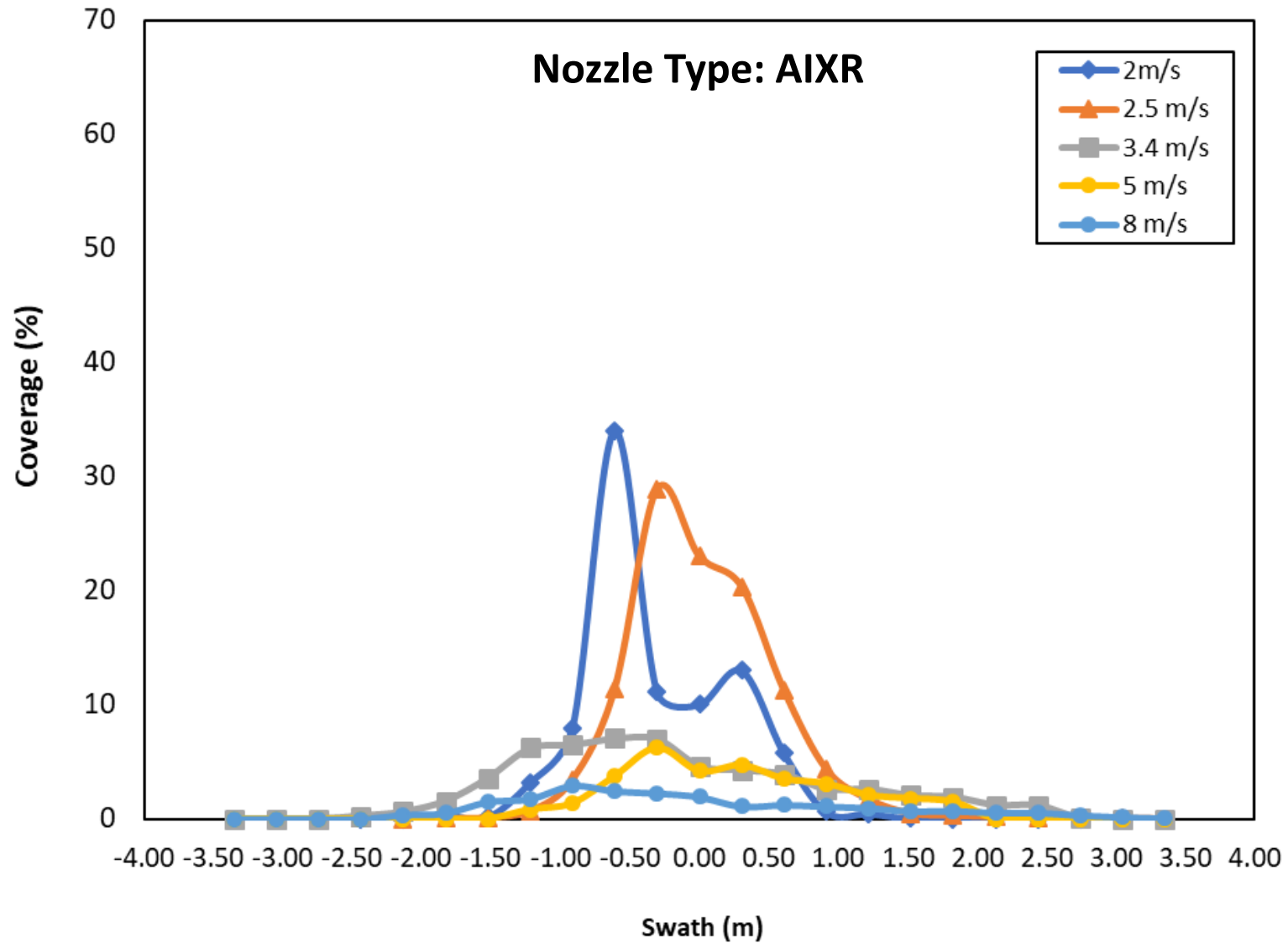
Spray Height: 2.0 m



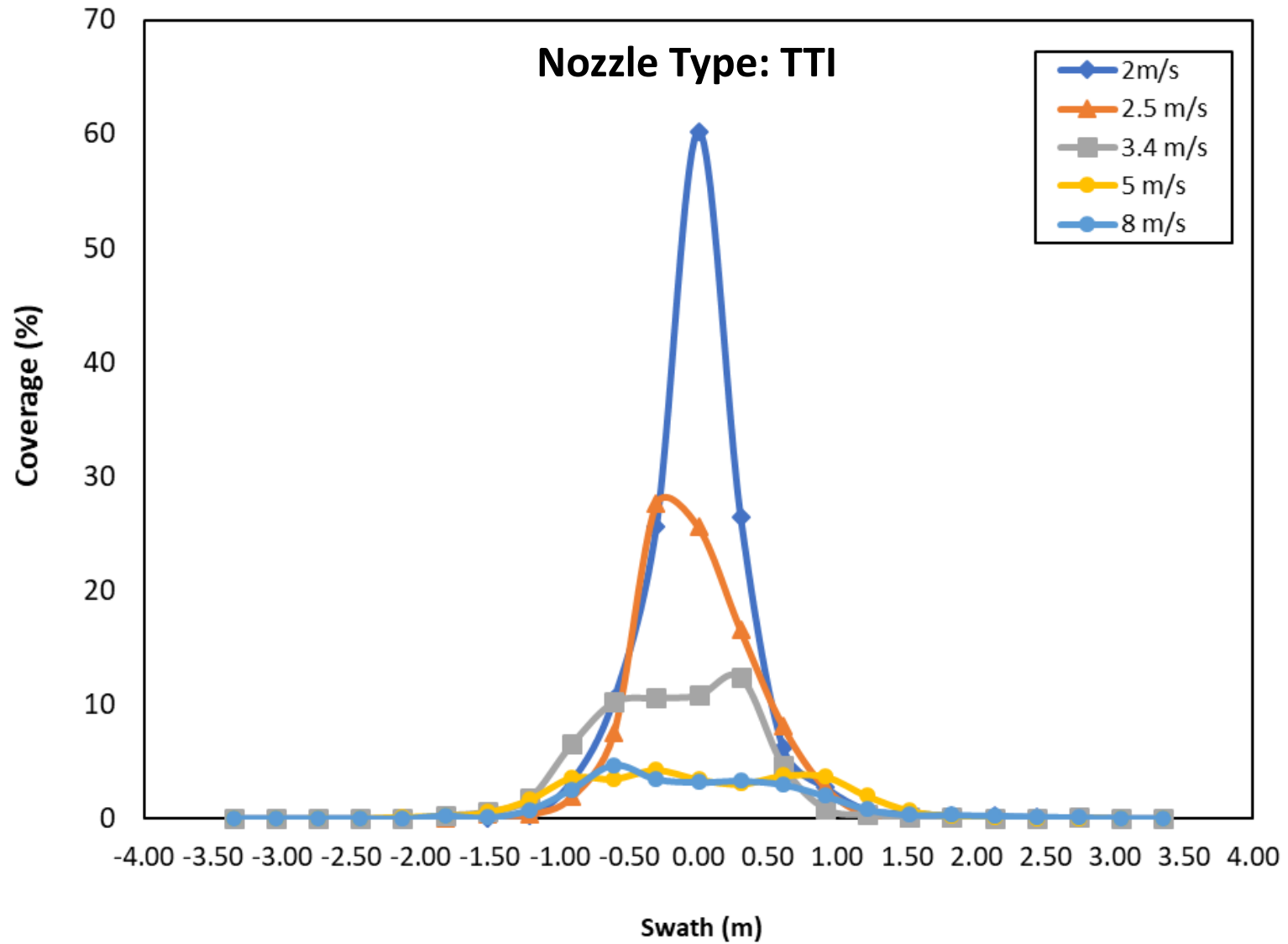
Spray Height: 2.5m



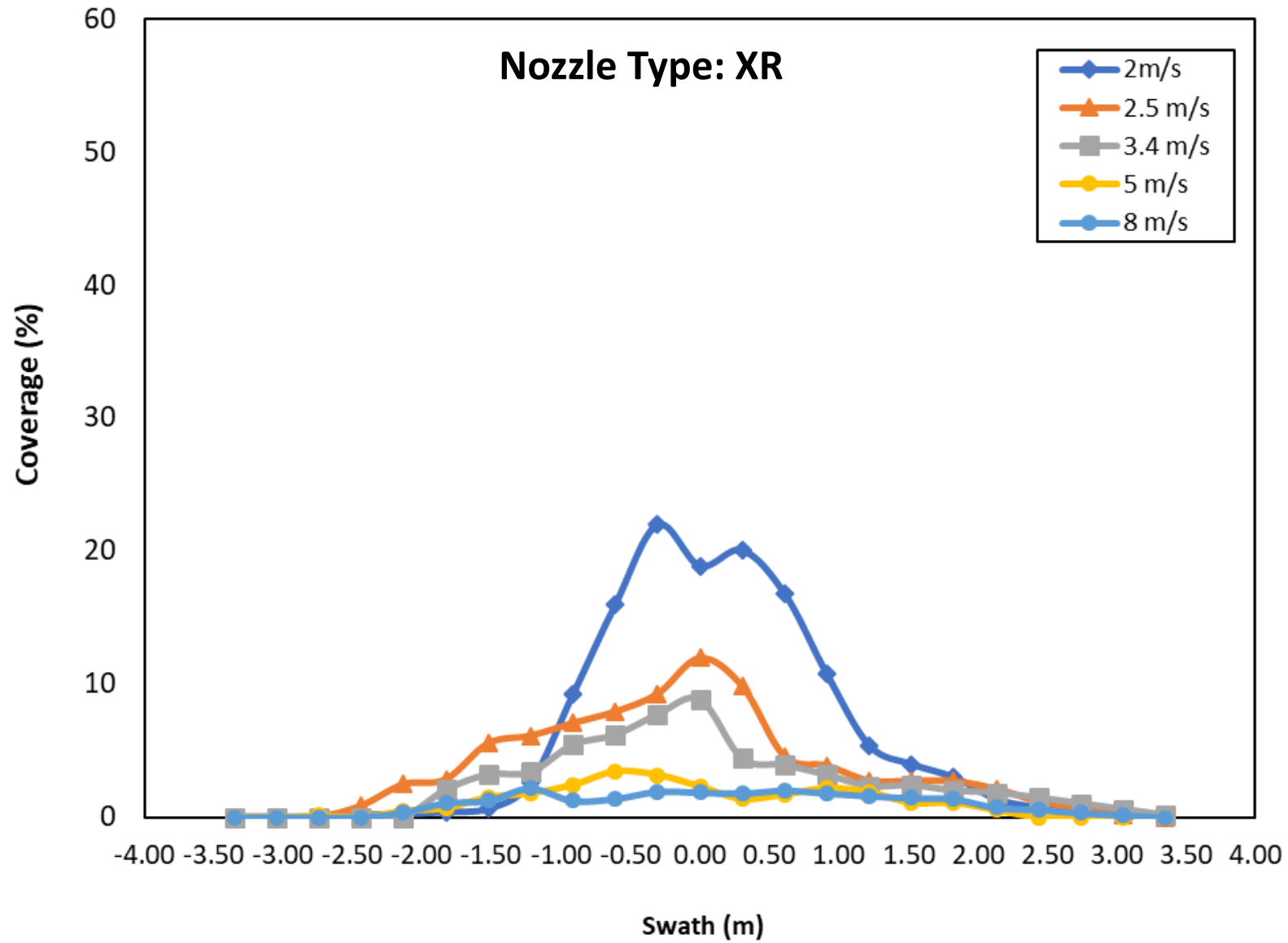
Spray Height: 2.5m



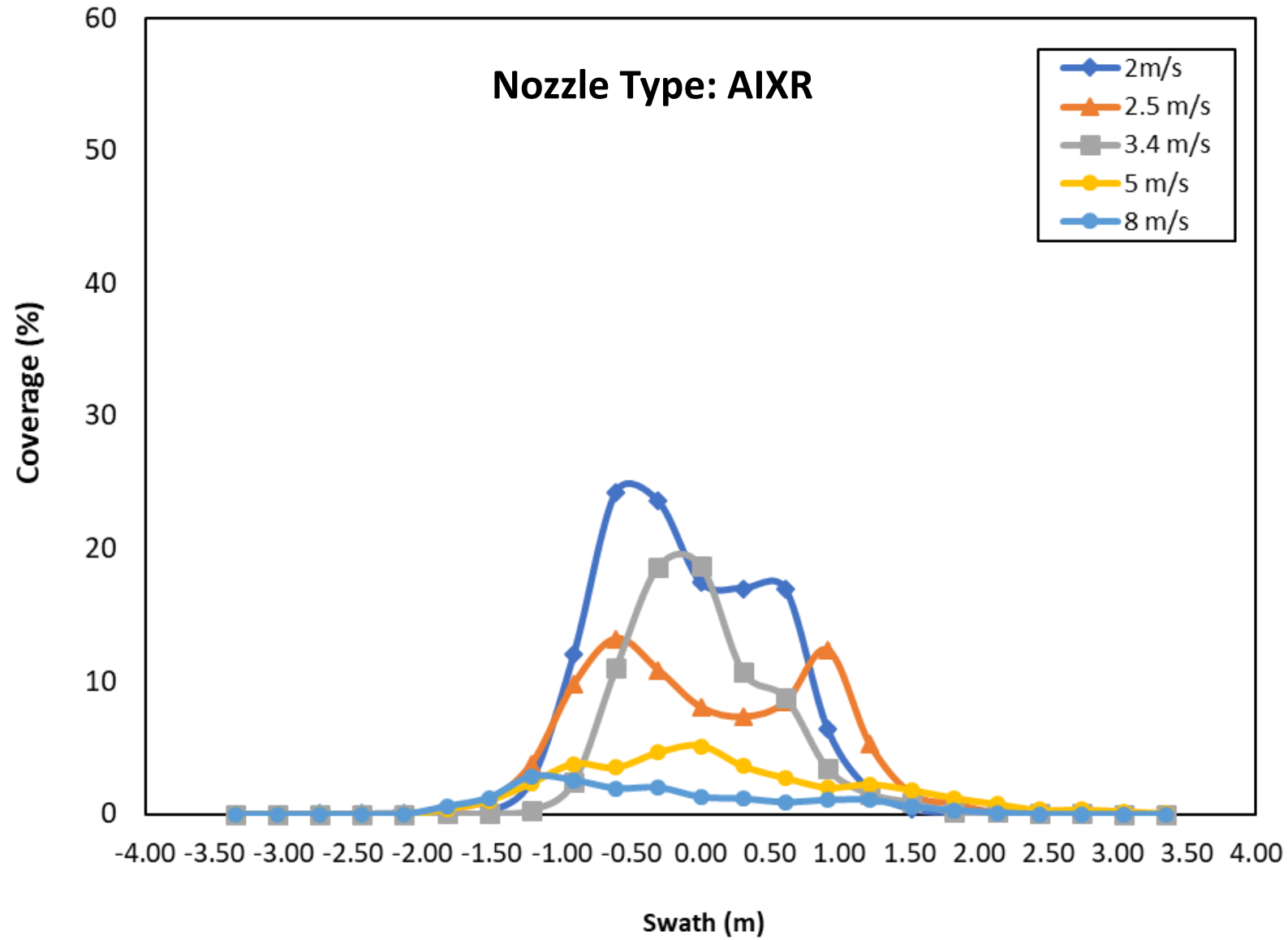
Spray Height: 2.5m



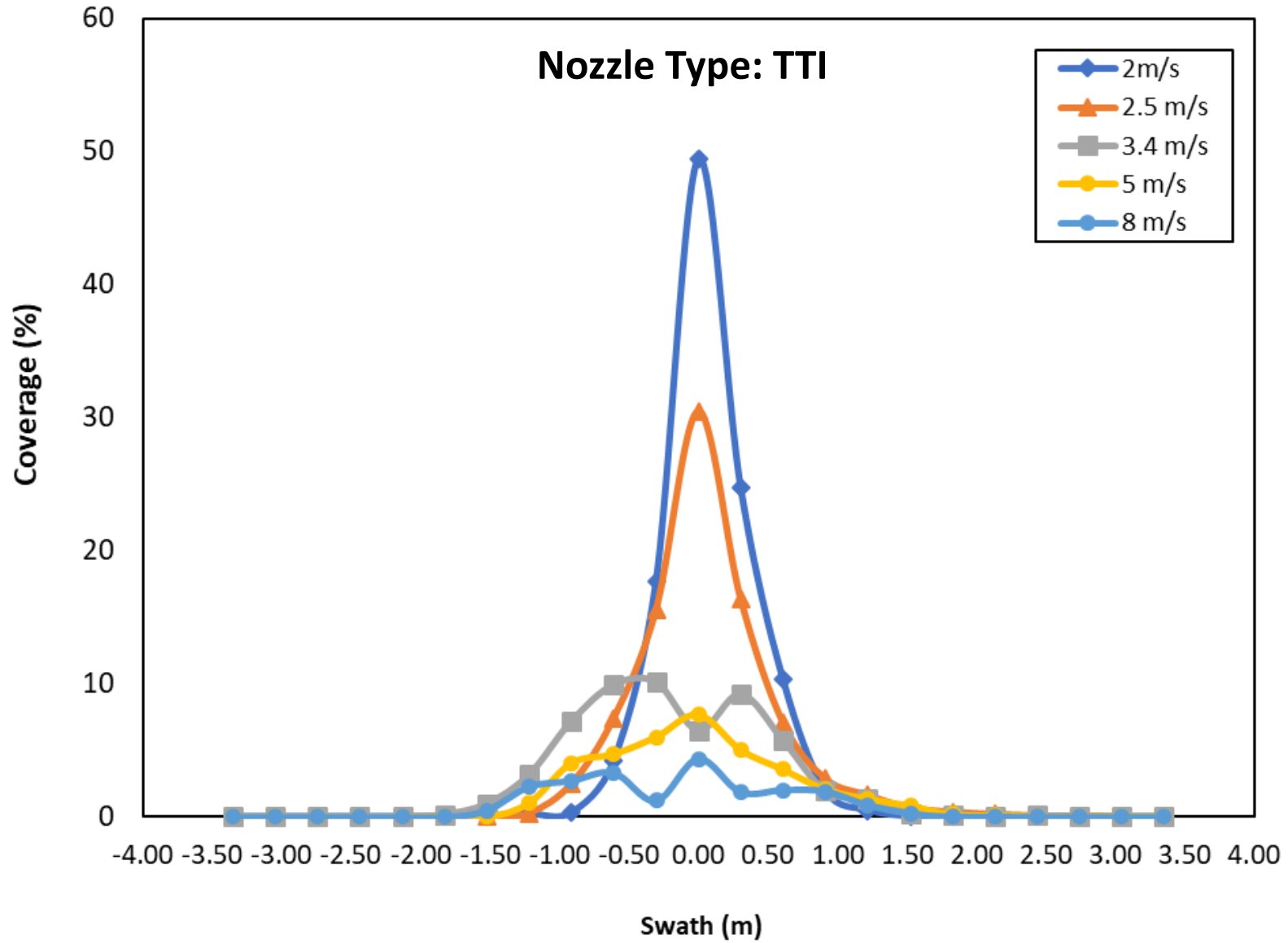
Spray Height: 3.0 m



Spray Height: 3.0 m



Spray Height: 3.0 m



Summary

- ❑ An increase in the UAV speed decreased coverage across all nozzle types and spray heights (due to decrease in applied rate, gallons per acre).
- ❑ Spray coverage did not vary considerably across the swath at different spray heights. Most spray deposition was limited to ± 3.0 m for all treatments.
- ❑ Spray coverage varied among the nozzle types directly under the nozzles, especially at slower speeds.

Future Research:

Investigate further variables such as wind conditions on application coverage and test alternative UAS spray systems.

Thanks!

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