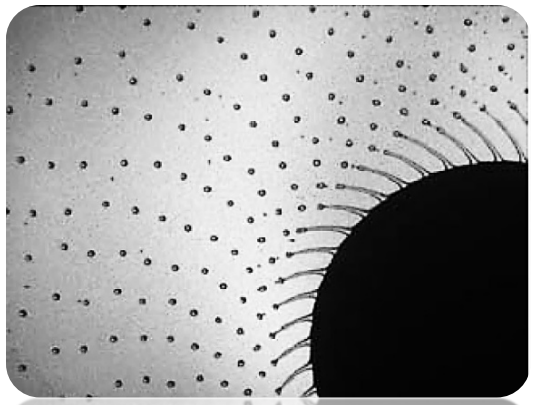
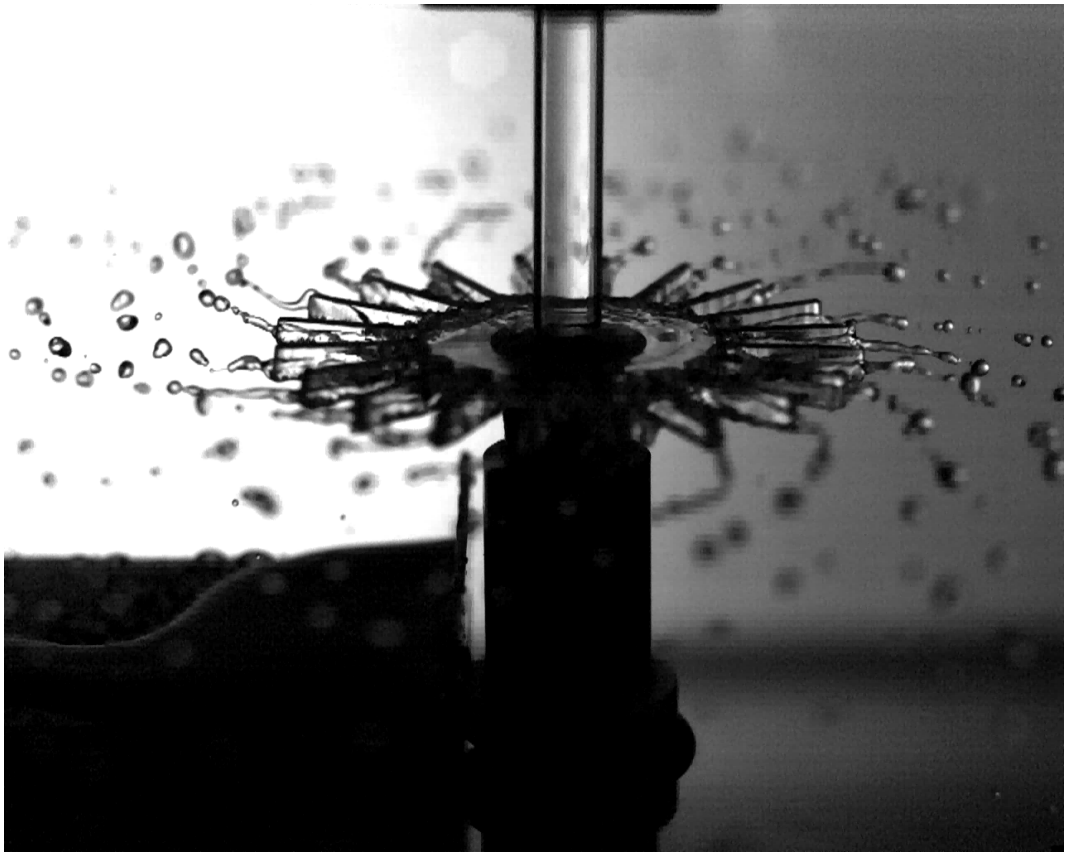
Assessment of drift potential of sprays produced from tilted shielded rotary atomizers compared to hydraulic nozzles

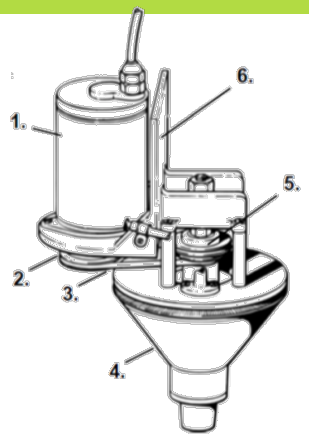
Sofiene Ouled Taleb Salah, Mathieu Massinon, Nicolas De Cock, Bruno Schiffers and Frederic Lebeau

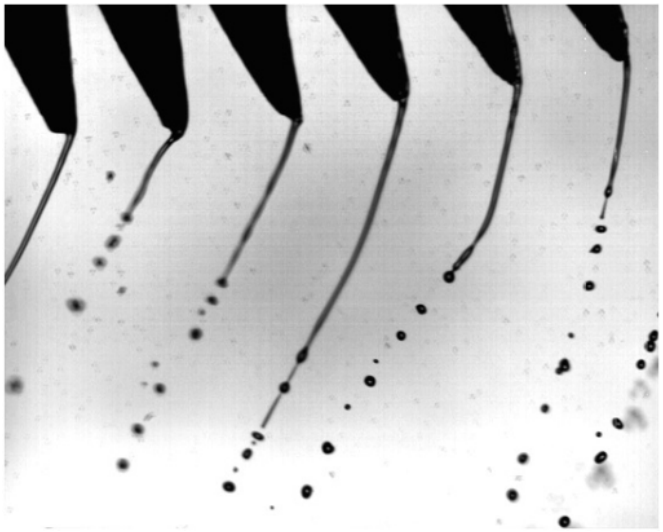
University of Liege, Gembloux Agro-Bio Tech



Controlled Droplet Application (CDA)… !





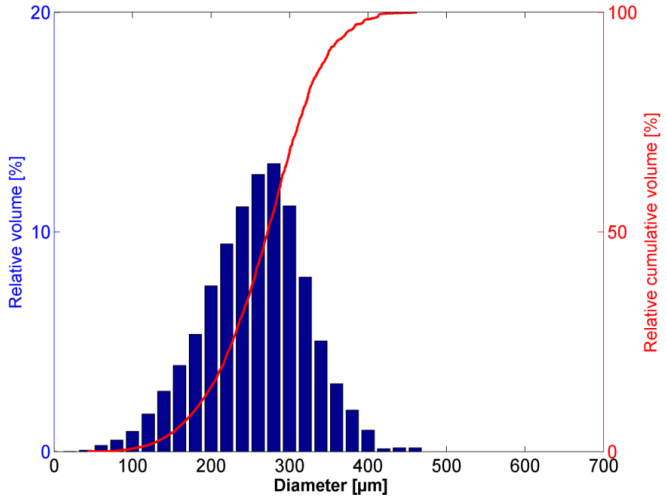


Rotary atomiser
(GRASP)

Compromise in termes of droplet sizes …

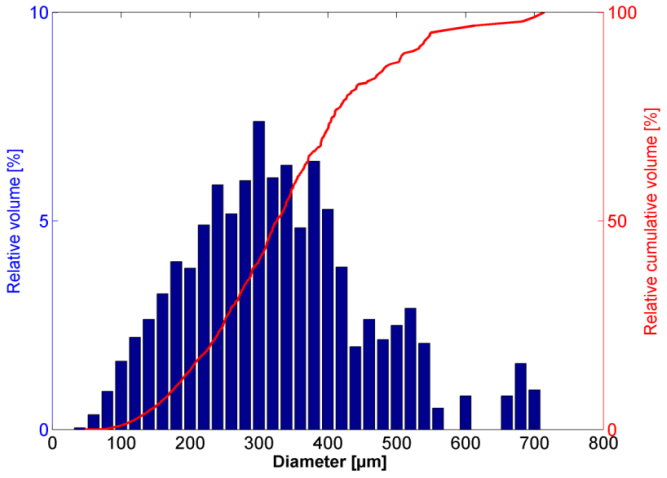
Rotary atomiser (Micromax 120)

- VMD=270
- **Span=0.6**



Anti-drift nozzle (Hardi Injet 015)

- VMD=325
- **Span=1.1**



Horizontal release of droplets

↓

Drift

Objective

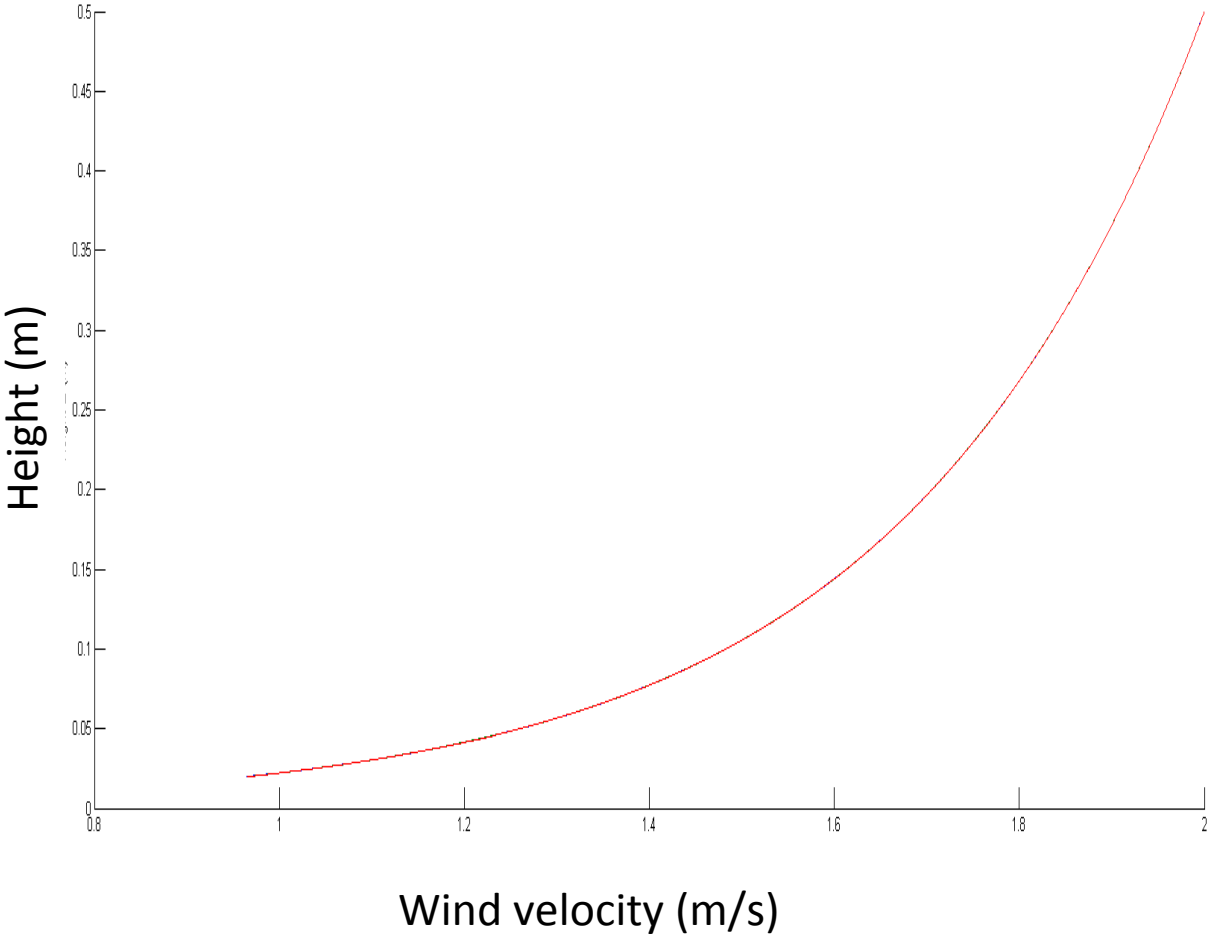
To investigate whether a tilted shielded rotary atomizer can reduce drift potential to acceptable levels.

Method

Simulating the behaviour of droplets in the atmosphere

Combined ballistic and random-walk models + Evaporation

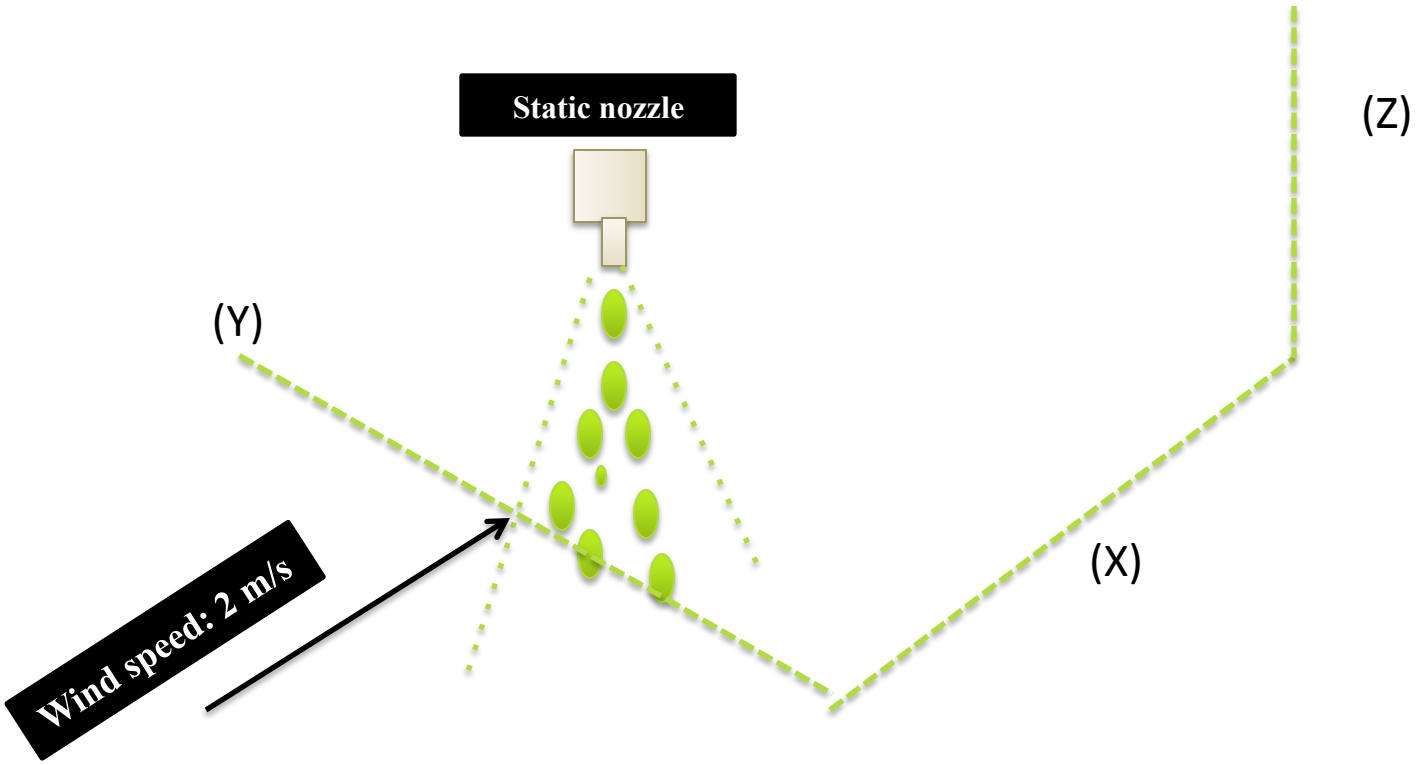
Wind profile



Initial conditions:

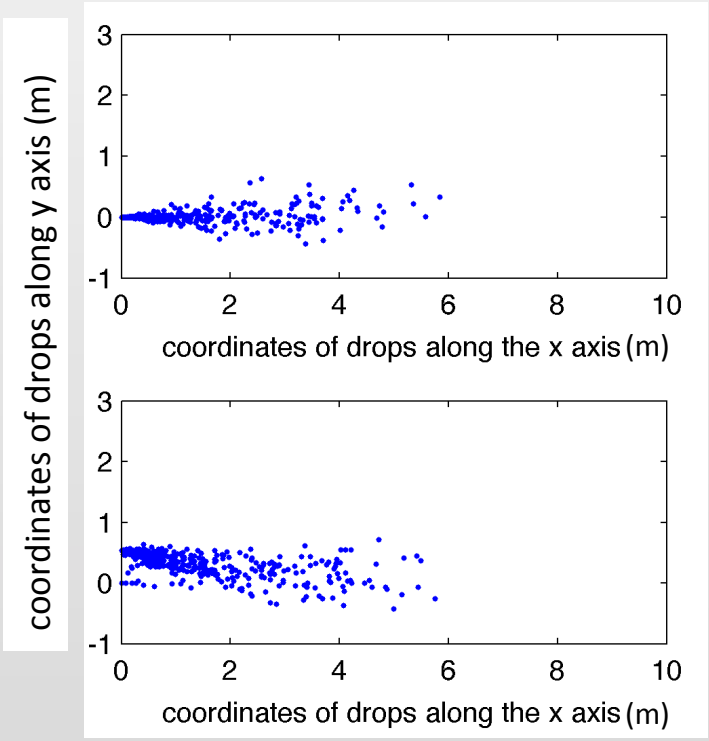
- Nozzle height= 0.5 m
- Static nozzle
- Crop height= 0.1 m
- Wind velocity= 2 m/s

Assessment of the travelled distance by driftable droplets



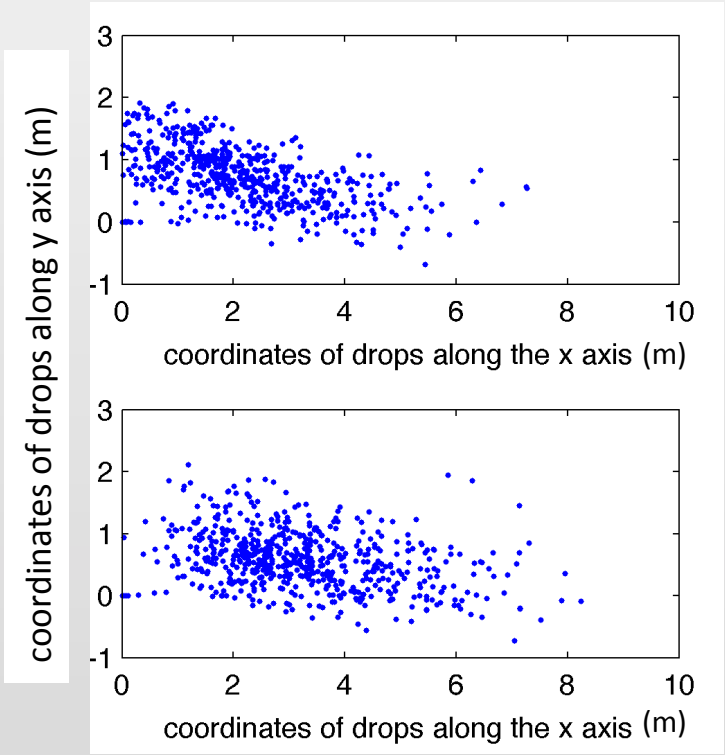
Rotary atomiser: VMD=270 µm; **Span=0.6 ; Emitted droplet velocity= 25 m/s**

0°



30°

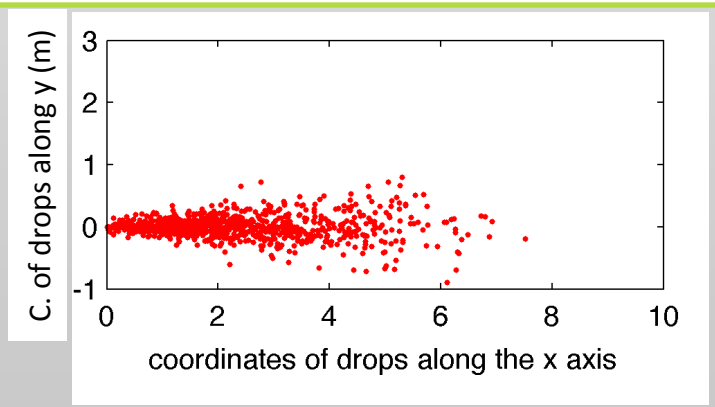
60°



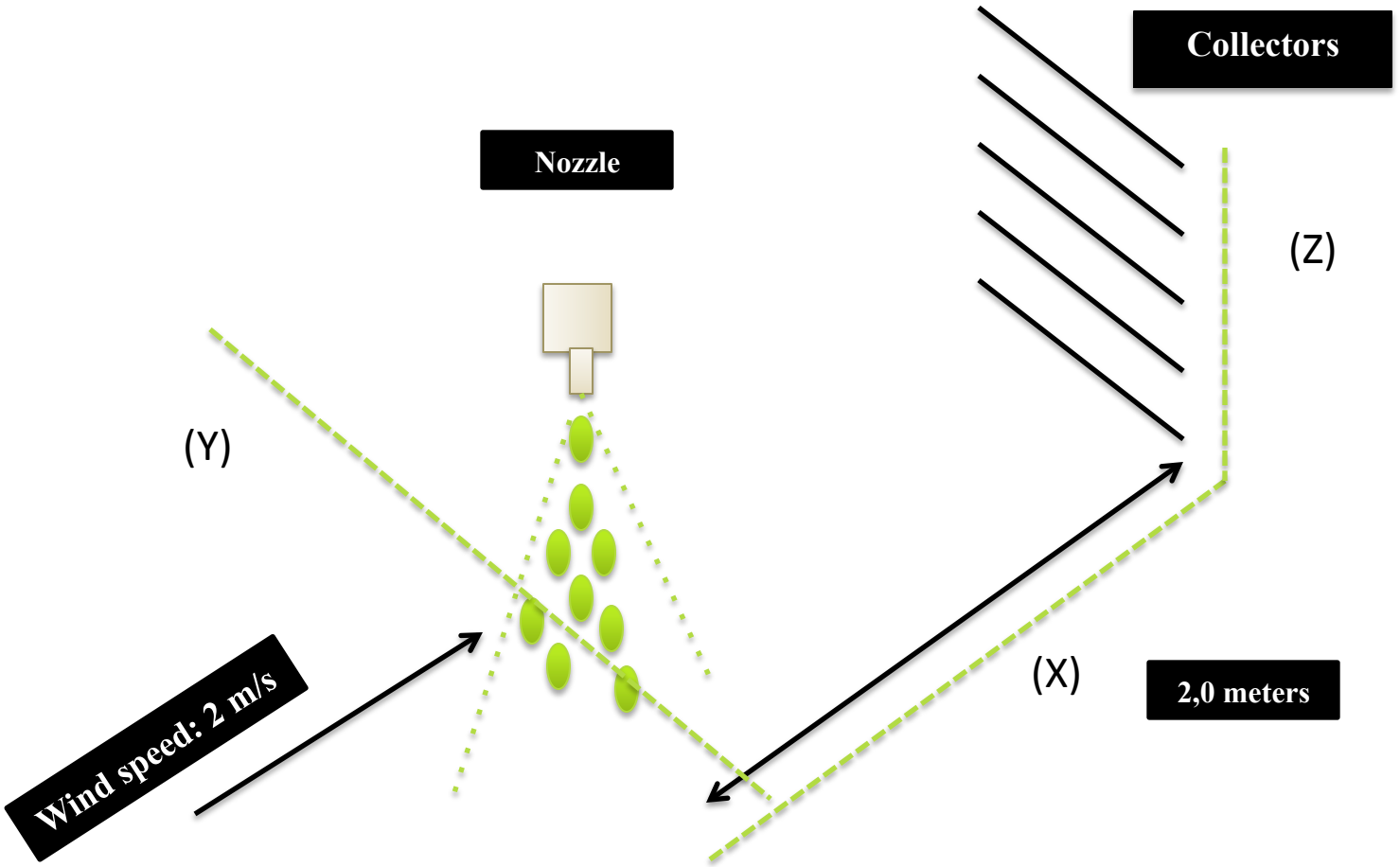
90°

Hydraulic nozzle: VMD=270 µm; **Span=1.1 Emitted droplet velocity= 10 m/s**

0°

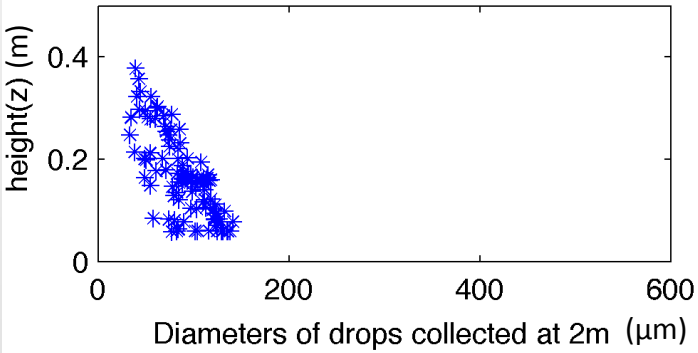


Droplet behaviour at 2.0 m from nozzle axis

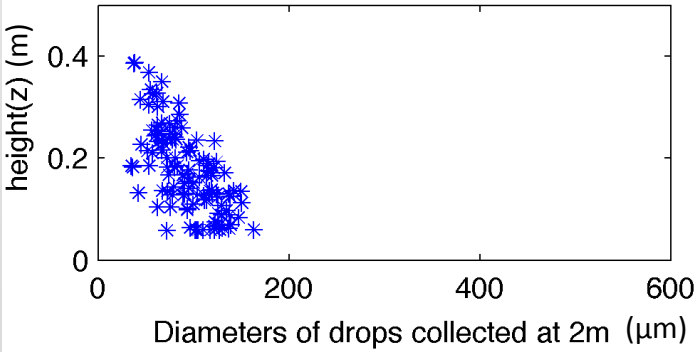


Rotary atomiser: VMD=270 µm; **Span=0.69 ; Emitted droplet velocity= 25 m/s**

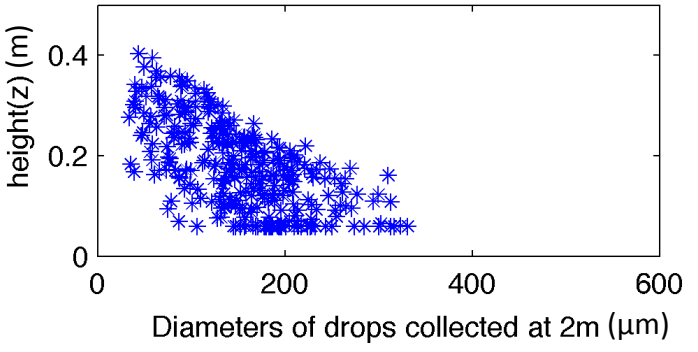
0°



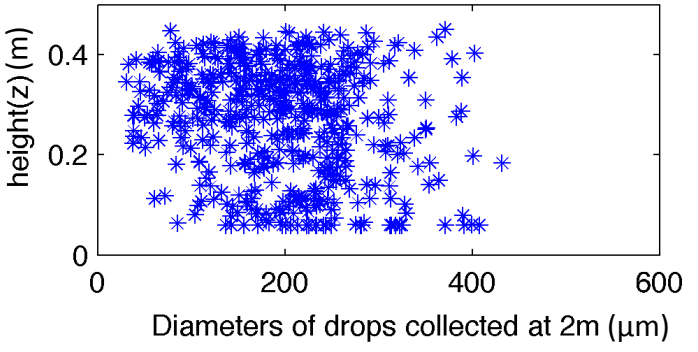
30°



60°

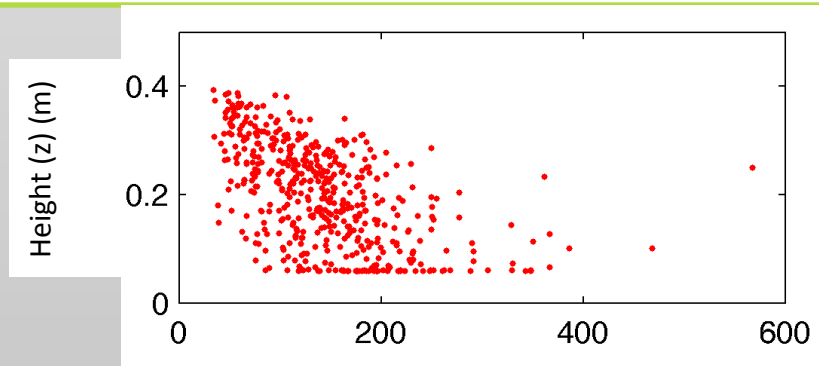


90°



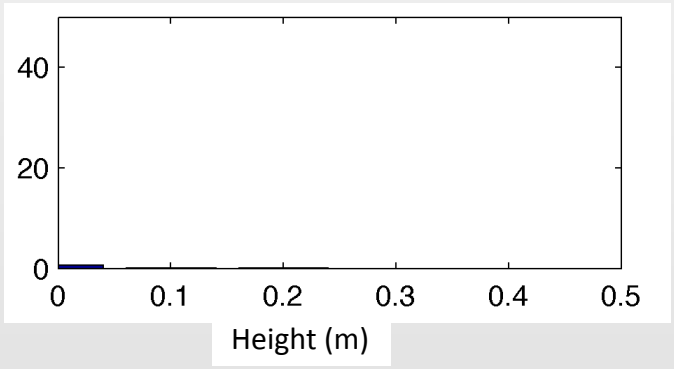
Hydraulic nozzle: VMD=270 µm; **Span=1.1; Emitted droplet velocity= 10 m/s**

0°

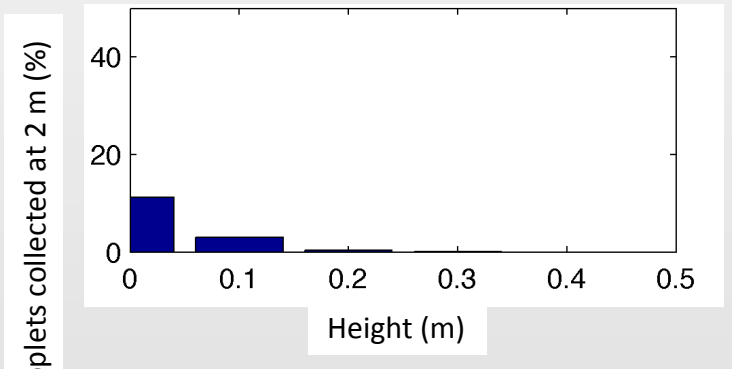


Rotary atomiser: VMD=270 ; **Span=0.69 ; Emitted droplet velocity= 25 m/s**

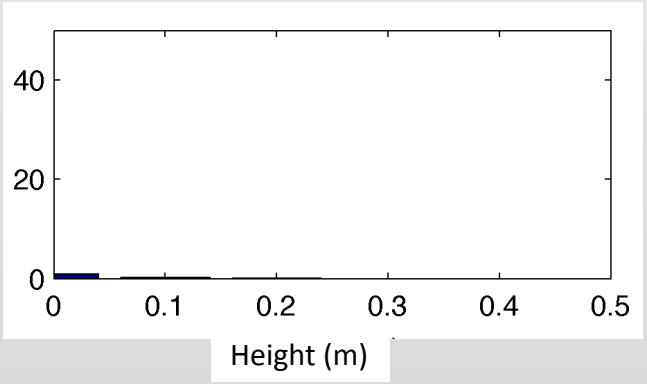
0°



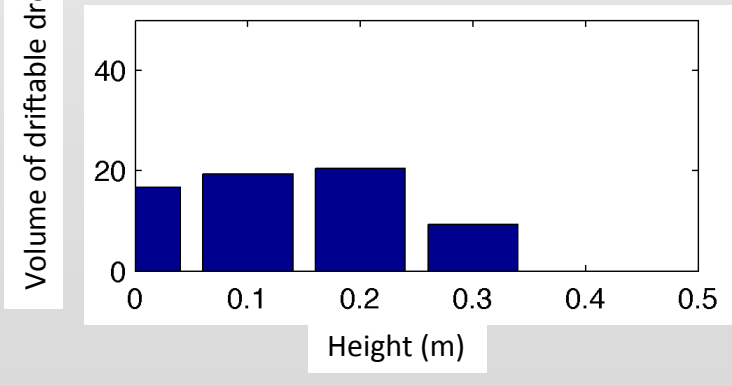
60°



30°

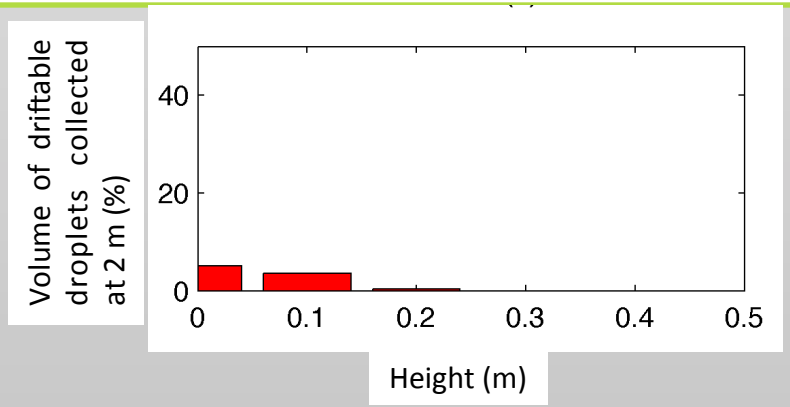


90°



Hydraulic nozzle: VMD=270; **Span=1.1; Emitted droplet velocity= 10 m/s**

0°



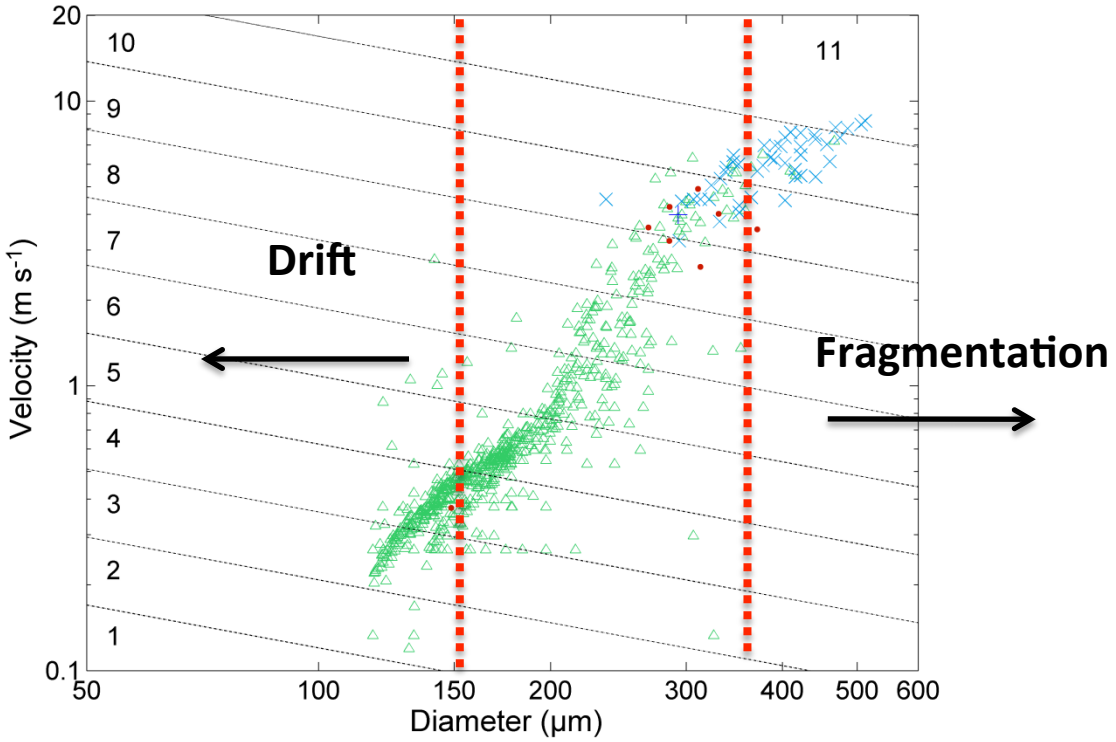
Conclusion

- Forward tilted rotary atomisers increased drift relative to vertical orientations.

- Vertical rotary atomisers with a narrow droplet size distribution centred around a VMD of 300µm reduce drift comparatively to hydraulic nozzles.

- A monodisperse droplet size distribution may avoid spray drift.

THANK YOU FOR YOUR ATTENTION



Δ adhesion, ● rebond , x fragmentation