The Distribution of Sea Spray Spume Particles above Actively Breaking Wind-Waves in the Laboratory

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Experimental Methods
**Data acquisition system:**

- DynamicStudio (Dantec) → PIV acquisition system
- Laser + Camera + Acquisition timing control
- Shadow imaging system
- JAI CV-MSCL 1.9 MP, 30 fps

55 x 74 x 70 mm sample volume
→ ~42 μm / pixel
→ All external sampling
Air-Sea Interaction Salt water Tank (ASIST)

18 m x 1 m x 1 m test section

Wind waves
Mechanical Waves
Open channel current
Water depth
420 mm

ASIST cross-section: 1 x 1 m

60 – 180 mm
> $5H_S$
Sampling strategy

Fresh water & Sea water

1) 36 m/s
2) 40.5 m/s
3) 45 m/s
4) 49.5 m/s
5) 54 m/s

6 – 10 collections per trial

250 images per collection

> 35,000 images sampled and analyzed

For 2 vertical levels above the MWL (60-180 mm)

Filtered sea water
95 mm above MWL
sea water

1470 x 3066 µm
\[ n \rightarrow \text{Number of discrete particles per unit air volume} \]

- Function of position, time, and droplet radius
- “Concentration function”
Results:

\( n(r,z) \)

Ortiz-Suslow et al. 2016
JAS, in press
Observed Mass Concentration [kg/m$^3$/μm]

- 36 m/s
- 45 m/s
- 54 m/s

Lower frame
Upper frame

Observed radius, $r_0$ [μm]
36 m/s
45 m/s
54 m/s

Lower frame
Upper frame

\( \times 20 \) times more mass
> 2.5x *less* "empty" space

\( r_0 [\mu\text{m}] \)
For particular radius class the concentration profile is a Power Law.

The results from the exponential profile suggest:

\[ n(\zeta, r) = n_{\zeta=1} \zeta^{-V_d/K_p} \]

\[ \zeta = \frac{z}{H_s} \]

\[ n(\zeta) \propto m \log(\zeta) \]
Results: fresh v. salt