Real-time spray flux measurement on fish farms

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Past attempts

Tabata, 1969

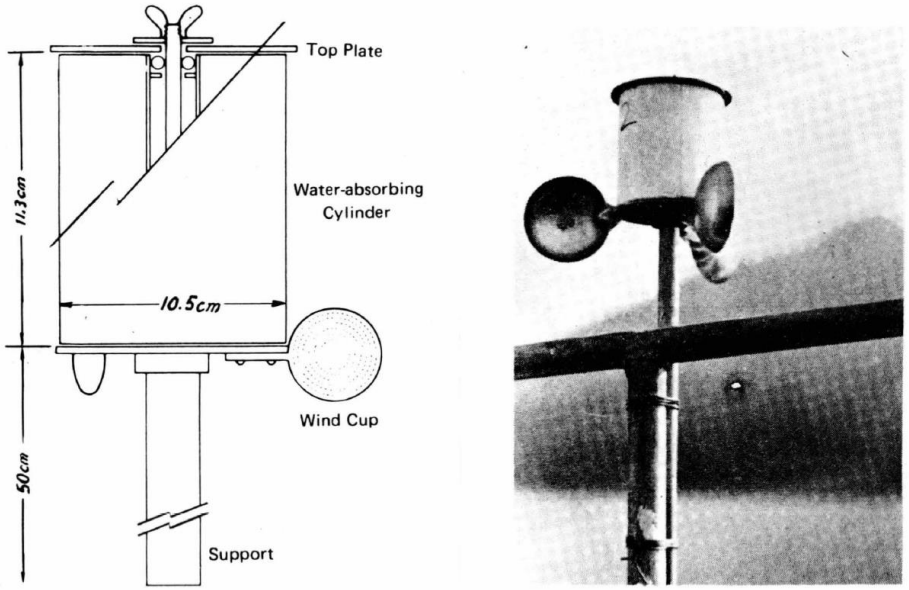


Figure 10. Sea spray collector. (Tabata 1969) (Copyright, T. Tabata; reprinted by permission.)

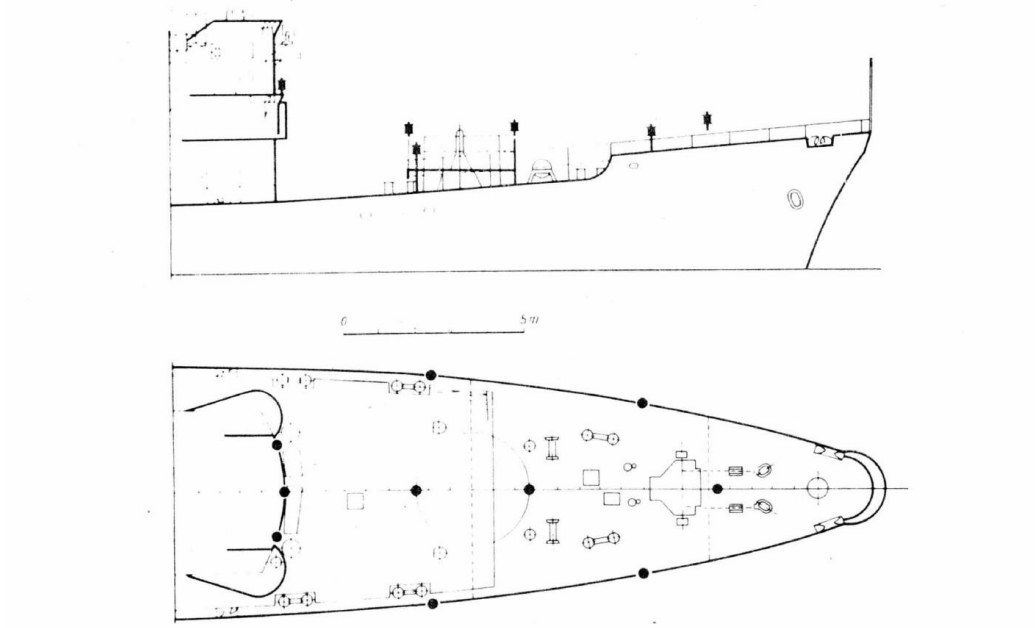


Figure 11. Distribution of sea spray collectors on board ship. (Tabata, 1969) (Copyright, T. Tabata; reprinted by permission).

Mentioned in K. ltagaki (1977)

Past attempts

1973, February on the "MV Narva"(length 39.5 m) in the Sea of Japan

Droplet size: droplets were hitting an immersion oil-covered plate located inside a box

Speed of propagation of the spray cloud: High camera

Liquid Water content (LWC): Special traps designed by the Leningrad Polytechnic Institute

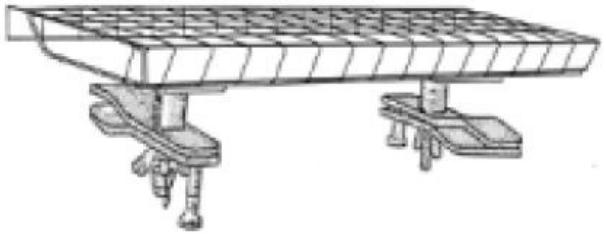
About 50 samples were collected

Borisenkov et al. (1975)

Past attempts

Measurements for ICEMOD (Jorgensen,1984, 1985, 1986)

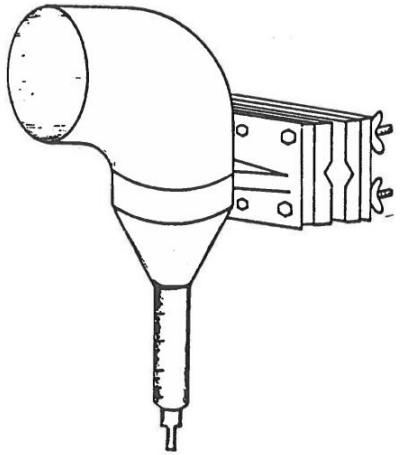
On offshore structure “Edda” and “Treasure Scout”



Baby diapers

Horjen et al. (1986)

Ships Troms Tjeld, Tender Turbot and Tender Trout and Endre Dyrøy

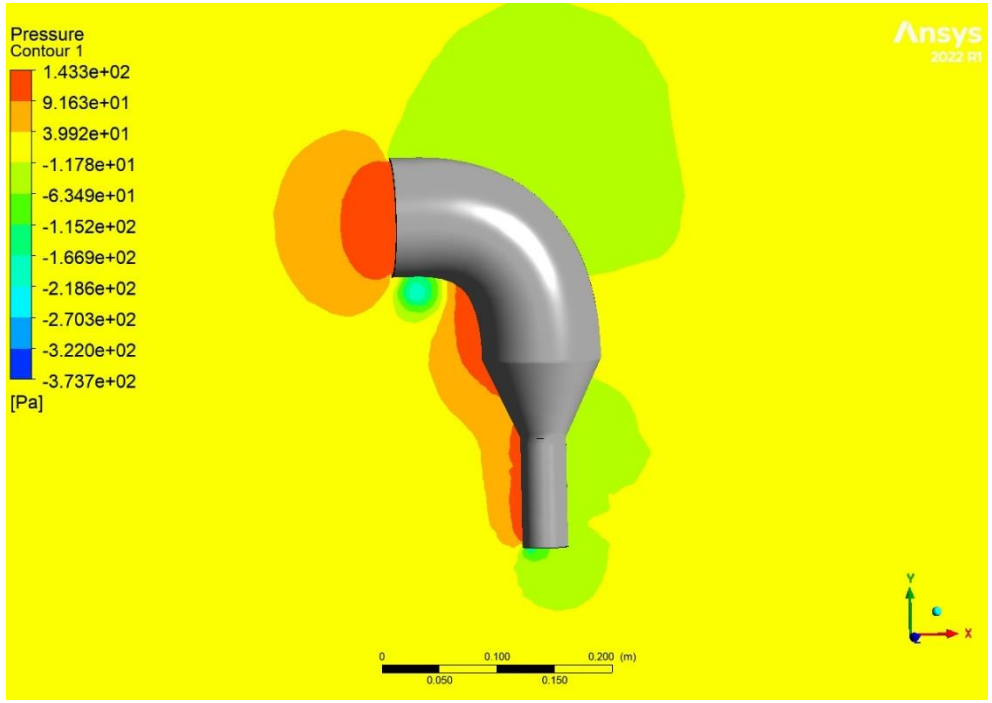


10 cm diameter bend pipe

Past attempts

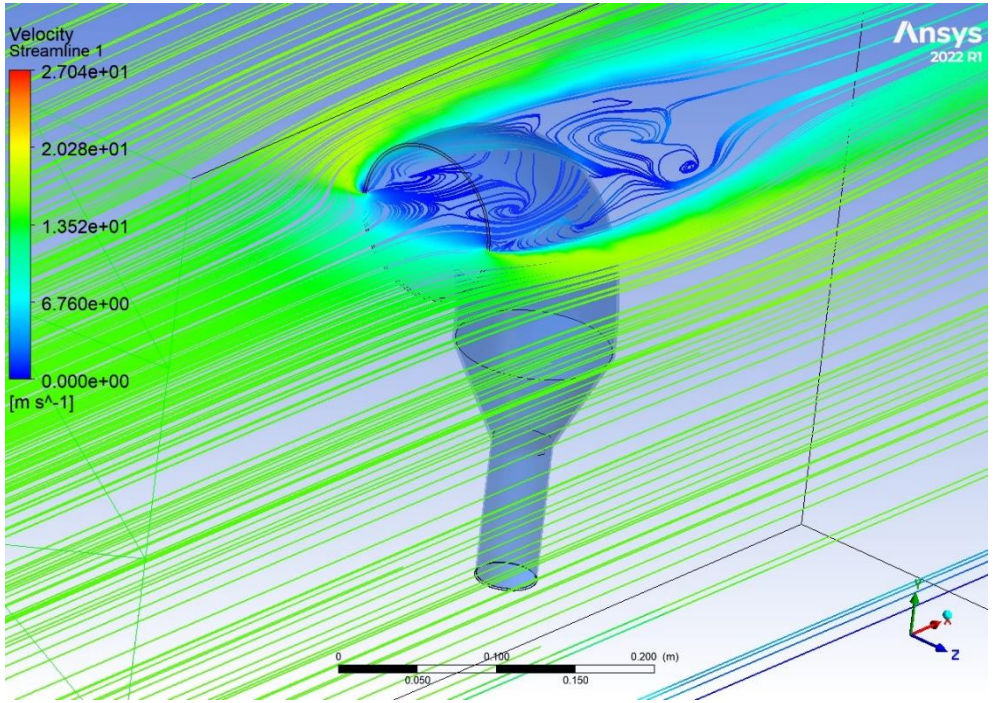
Measurements for ICEMOD (Jorgensen,1984, 1985, 1986)

On offshore structure “Edda” and “Treasure Scout”



Horjen et al. (1986)

Ships Troms Tjeld, Tender Turbot and Tender Trout and Endre Dyrøy



Past attempts

Measurements for RIGICE (Muzik, 1991)

Tarsuit Island, an artificial caisson-based island in the Beaufort Sea

45-gallon drums

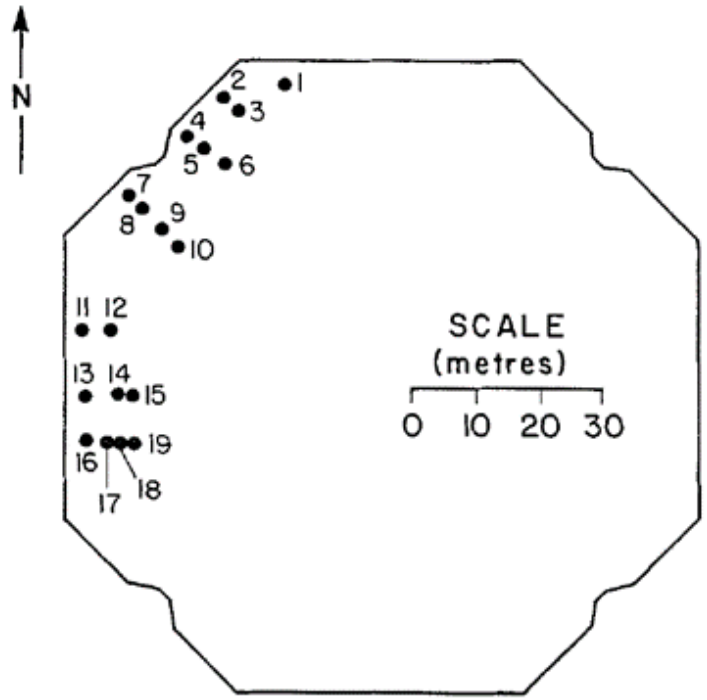
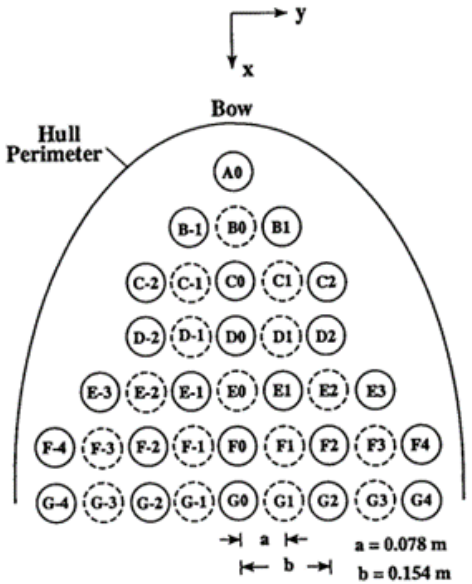


FIG. 5. Plan view of typical drum layout for the field study.

Past attempts

Zandberg model test (Chung,1998)



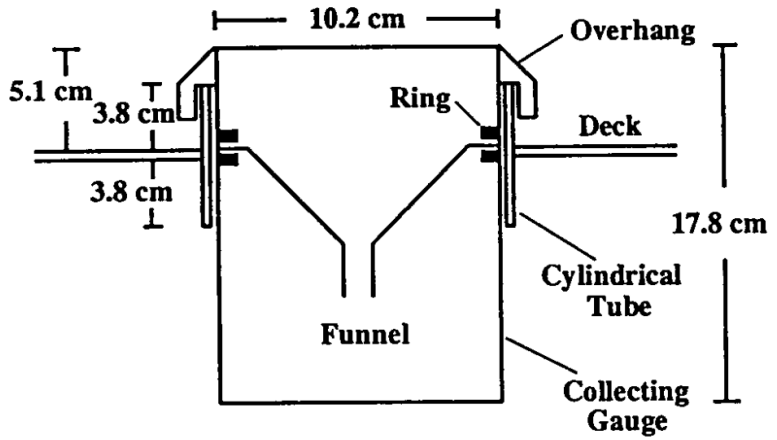


Fig. 2 Schematic of a collecting gage and its installation on deck

Model of stern trawler Zandberg length of 3.83 m

Past attempts

Sea Spray Generation at a Rocky Shoreline (Andreas, 2016)



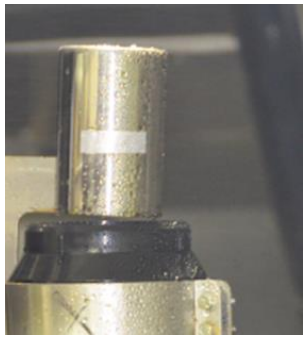
FIG. 2. The DMT CIP and the Gill sonic anemometer/thermometer mounted on the foghorn platform on Mount Desert Rock.

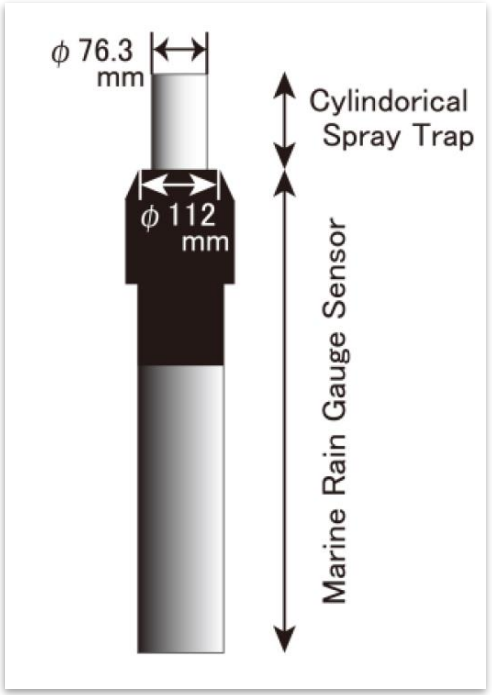
Cloud imaging probe for wind-generated spray

Quotation: 226,390.00 USD

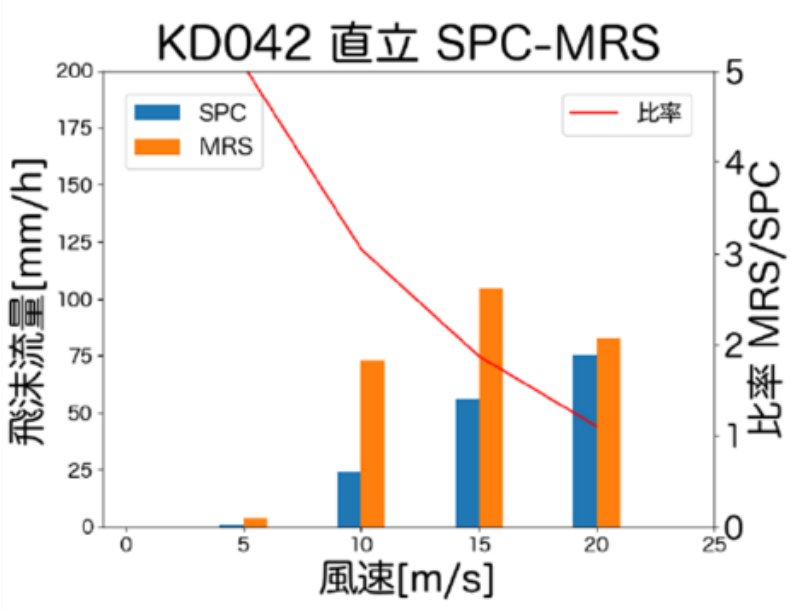
Past attempts

Ozeki (2016)









Counts spray particles 100 to 1,000 μm in diameter 14 to 7700 μm (Ryerson,1995)

Past attempts

RigSpray design (Teigen et al., 201

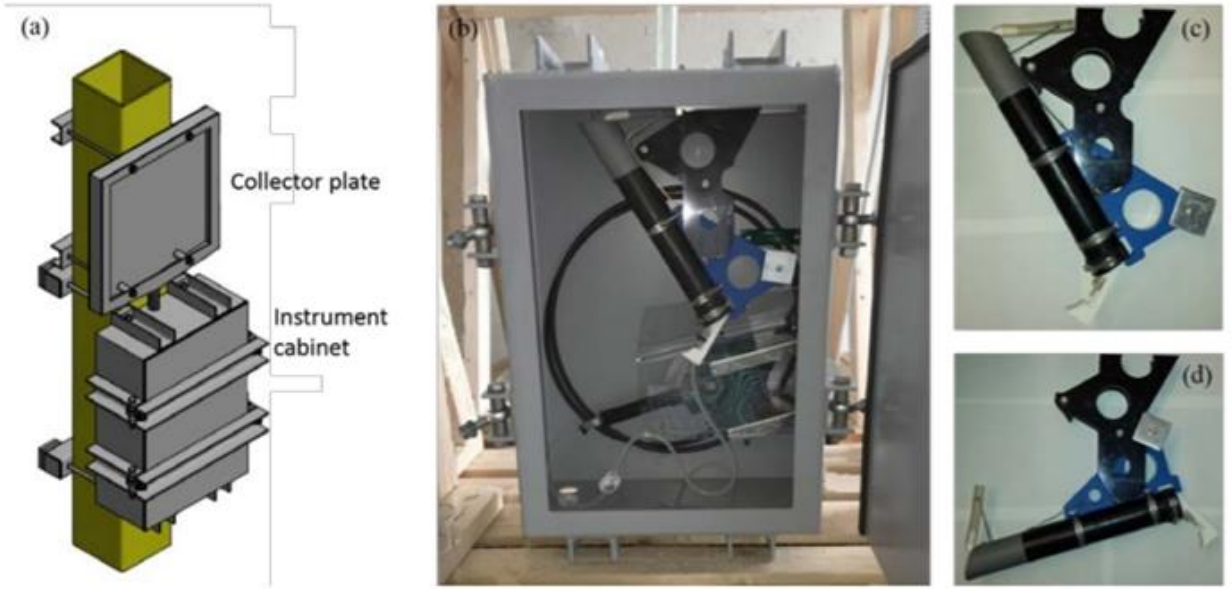
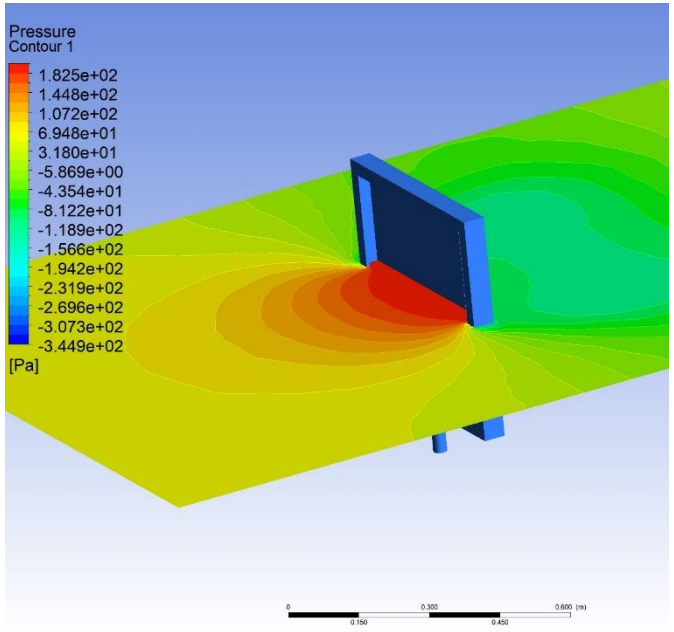
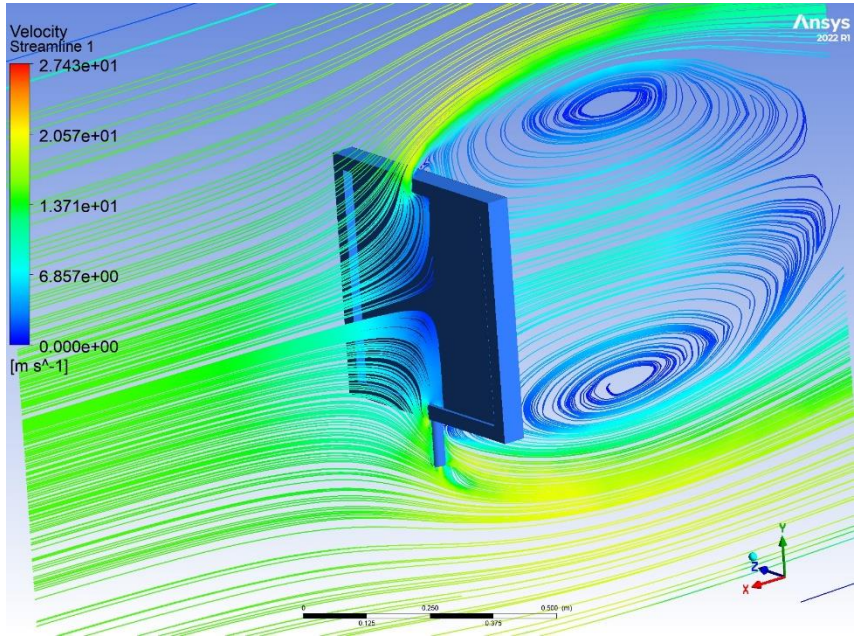
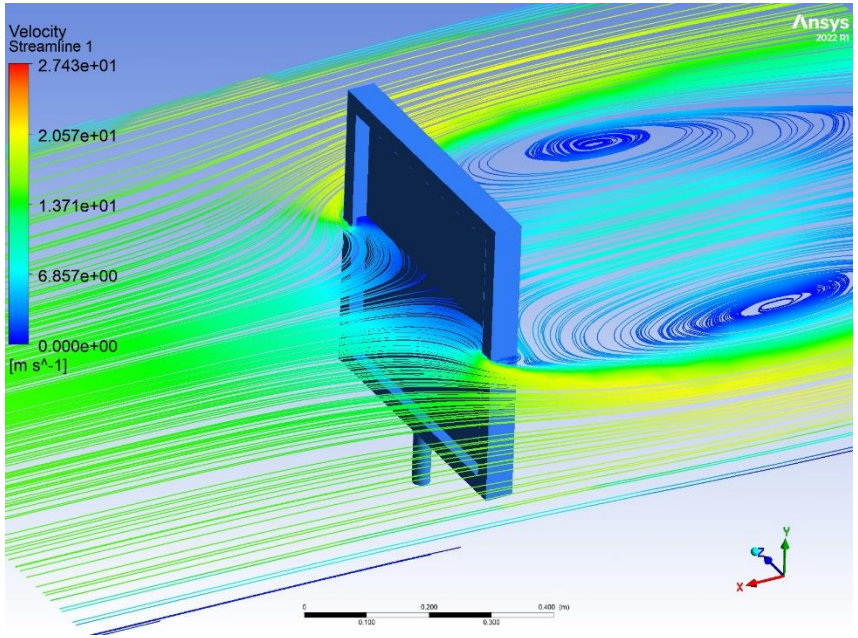


Figure 3. (a) Technical drawing of the collector plate and instrument cabinet assembly mounted on a vertical column, (b) Internal view of the instrument cabinet, (c) Close-up of tipping bucket in upright position, (d) Close-up of tipping bucket in tilted position.

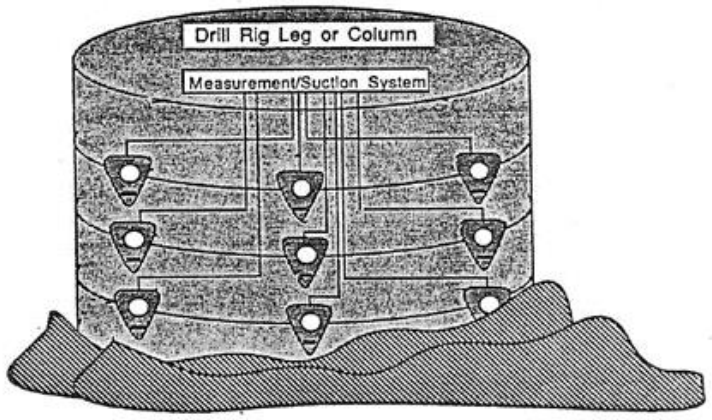




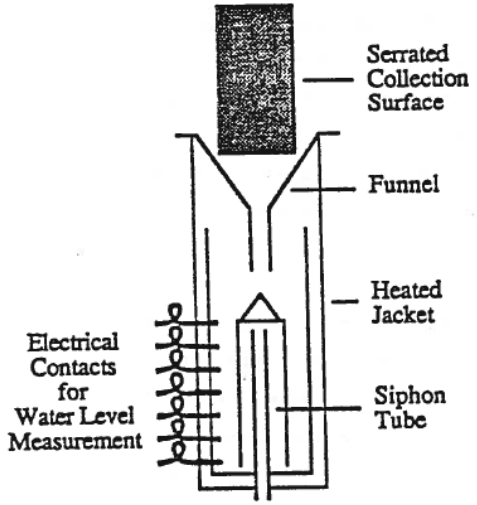


Past attempts

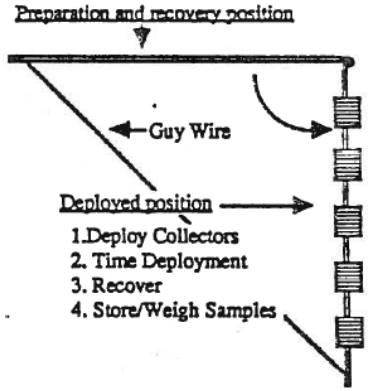
Previous suggestions



(c) Spray Measurement System suggested by Zakrzewski (1987).



(a) Water Level Measurement System.



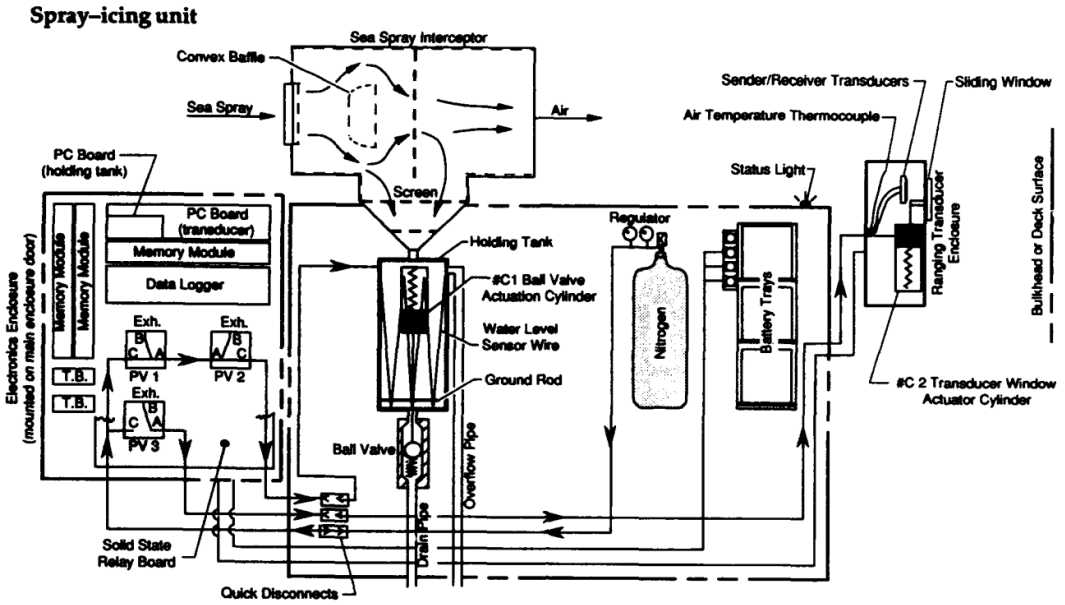
(b) Spray Profiling System

Zakrzewski (1987)

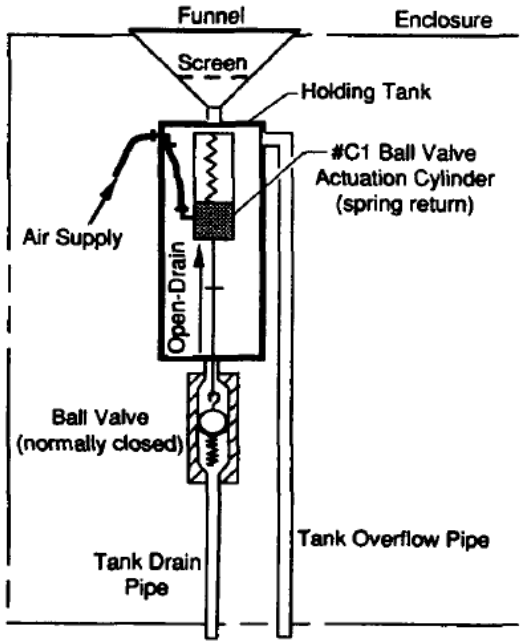
Past attempts



Ryerson 1992 Midgett



Horizontal spray collector



a. Cutaway view.

Figure 3. Vertical spray collector.

Walsh (1992)

Past attempts

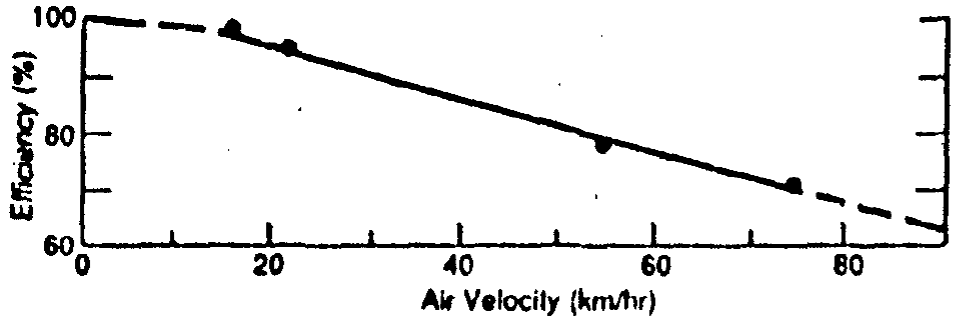
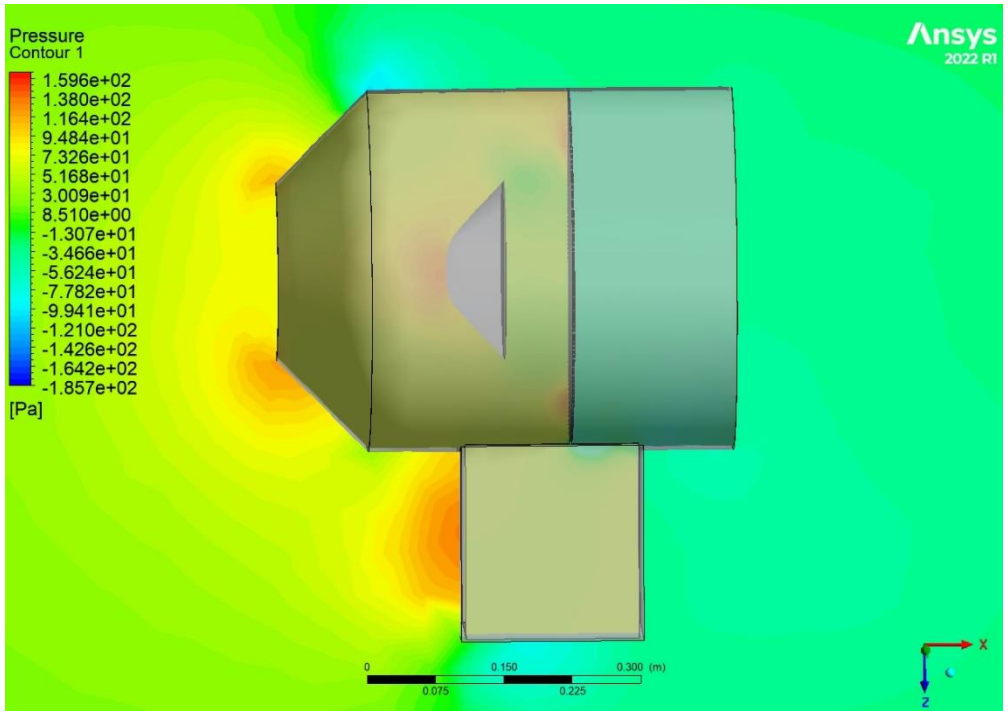
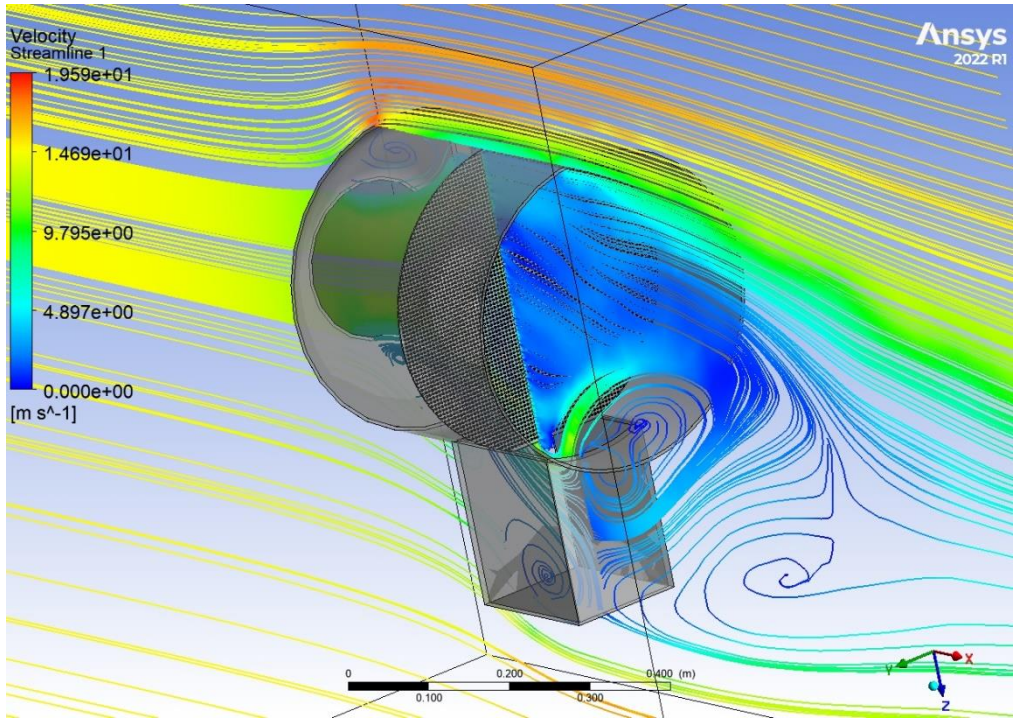


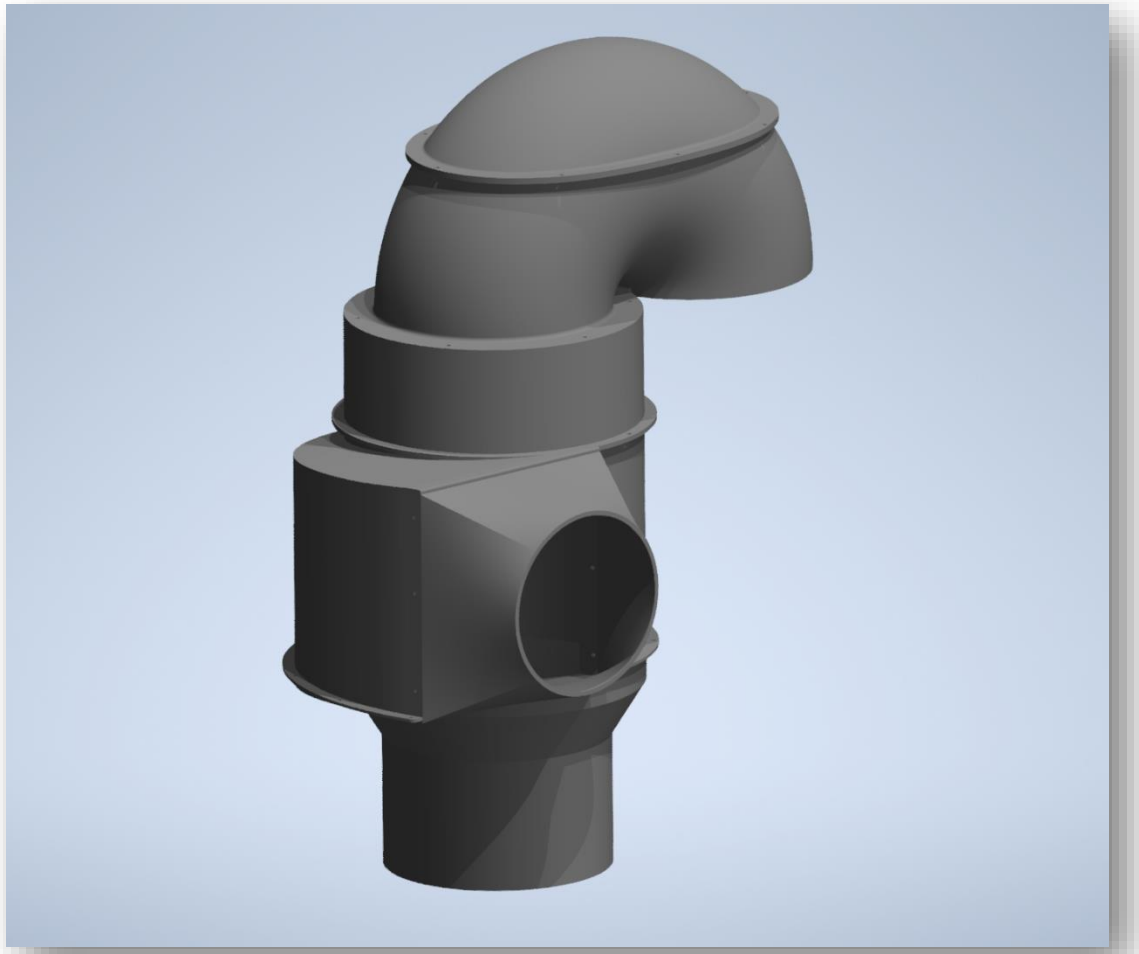
Figure 25. Efficiency curve for horizontal collector droplet interception (from Walsh et al. 1992).

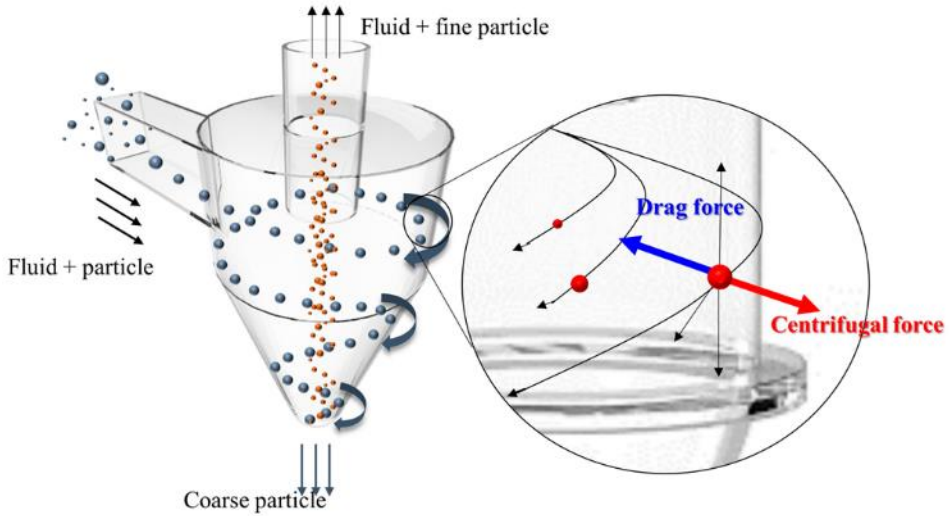
Ryerson 1992 Midgett



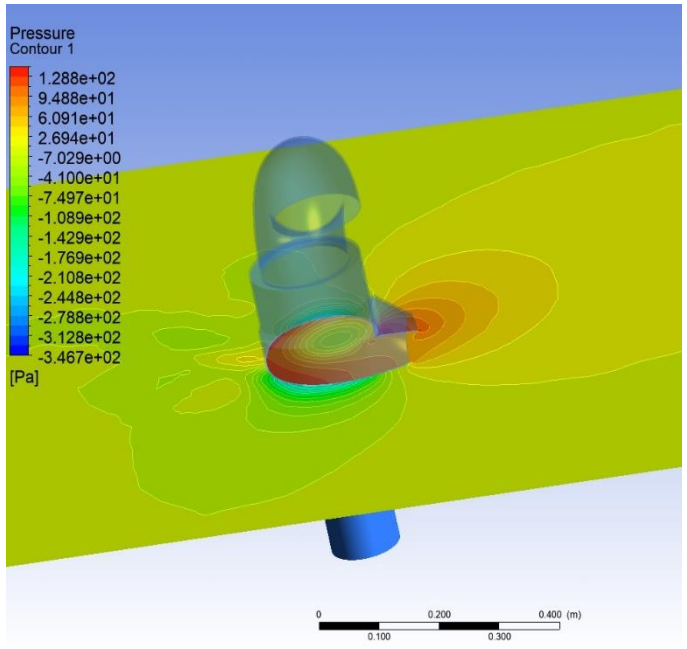


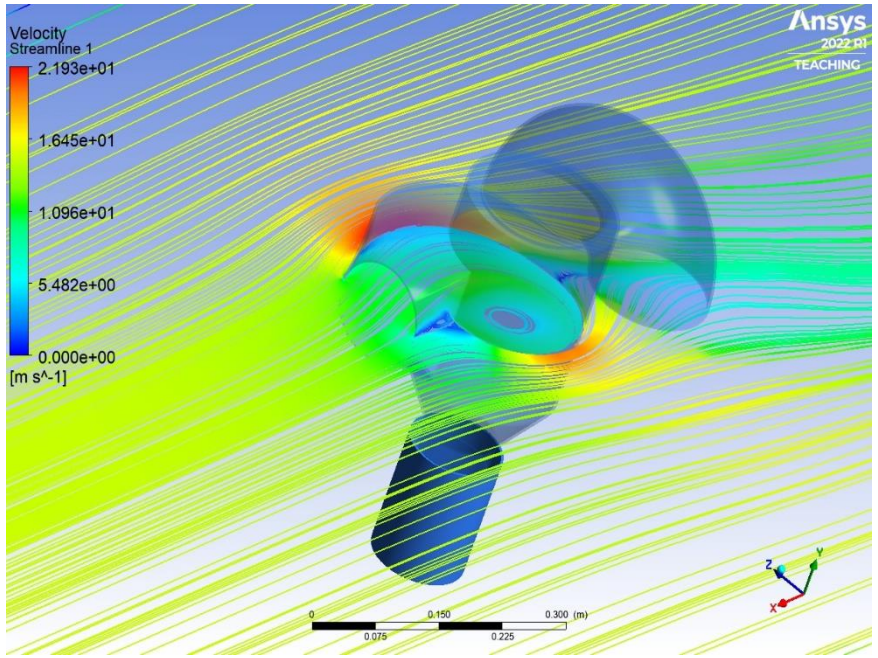
SPRICE spray collector

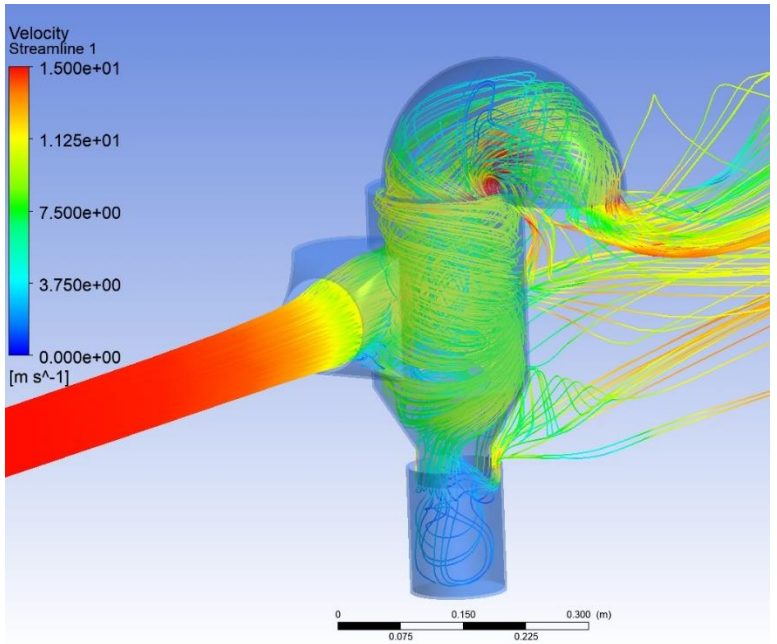


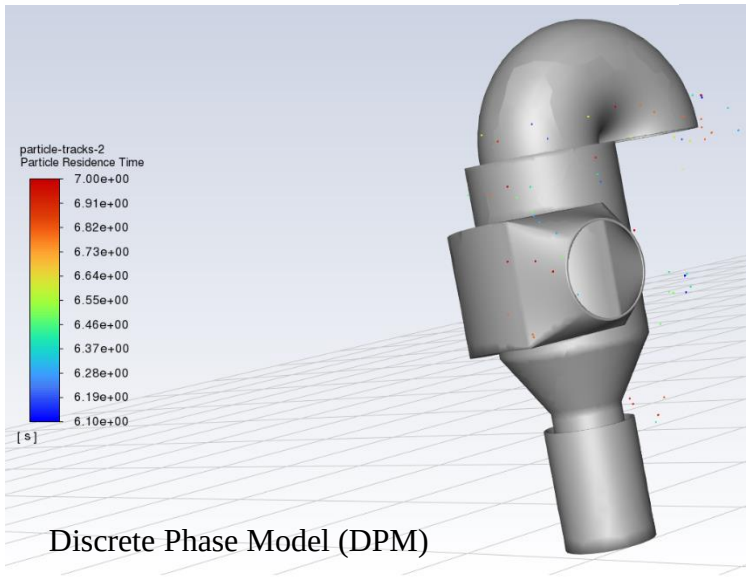


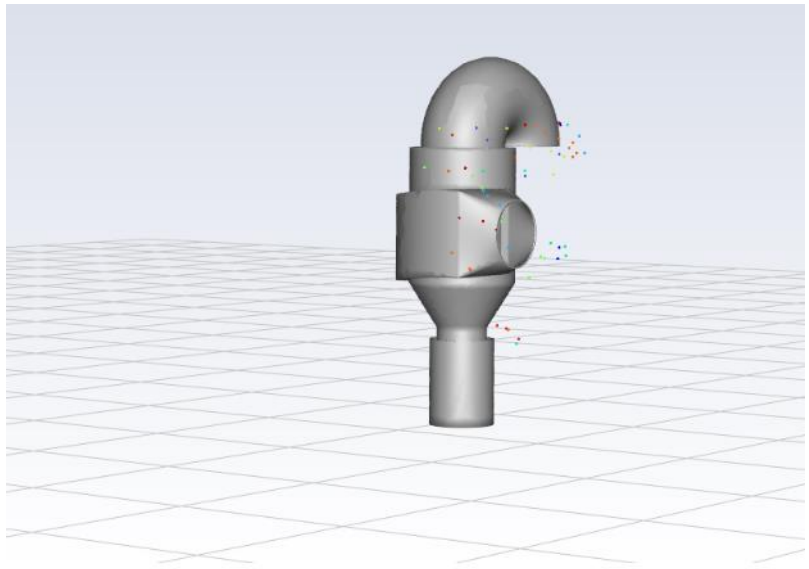
SPRICE spray collector

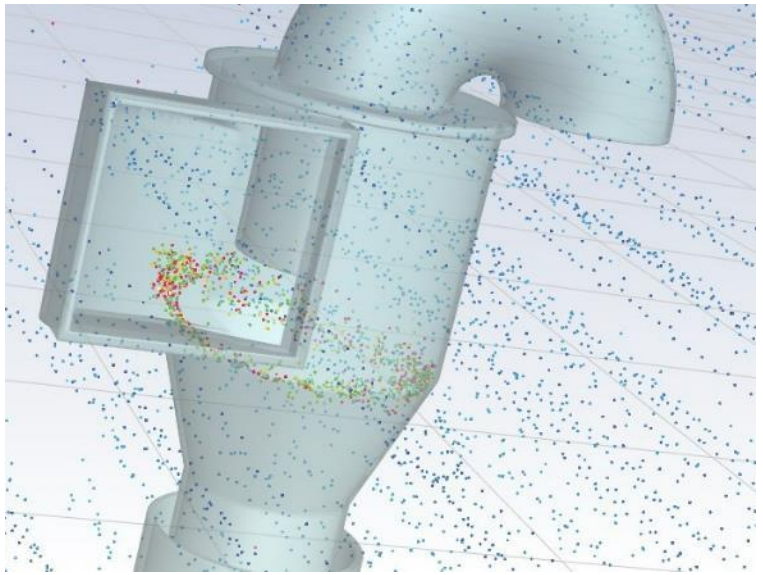












Discrete Phase Model (DPM)

SPRICE spray collector



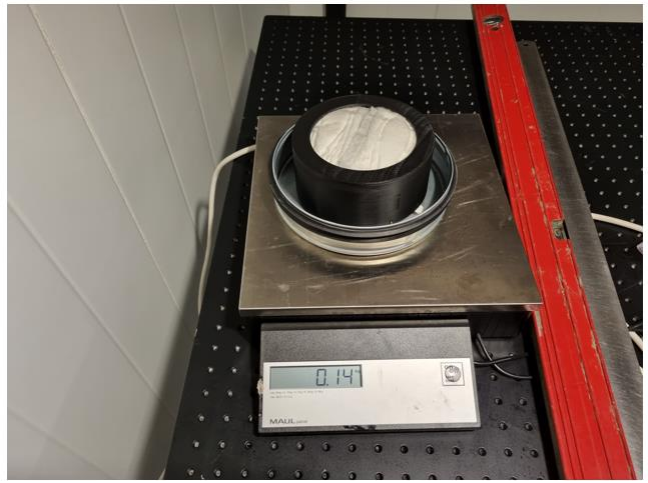


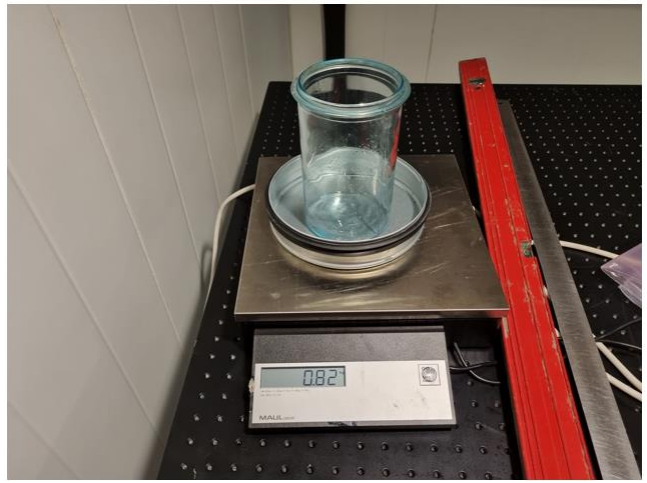
SPRICE spray collector



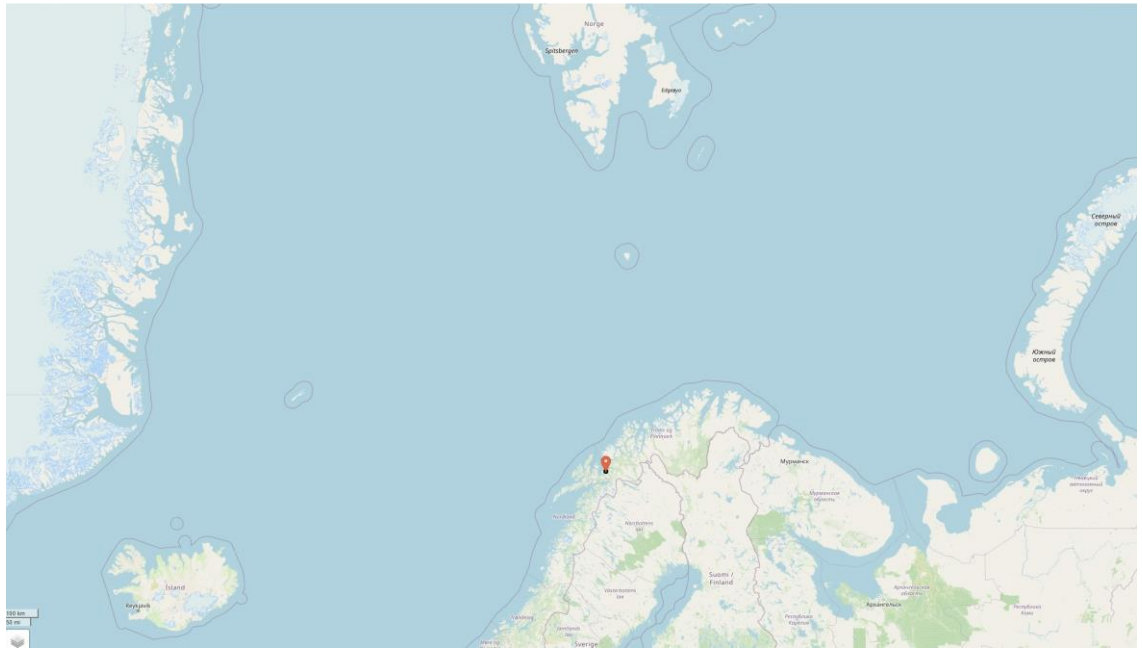


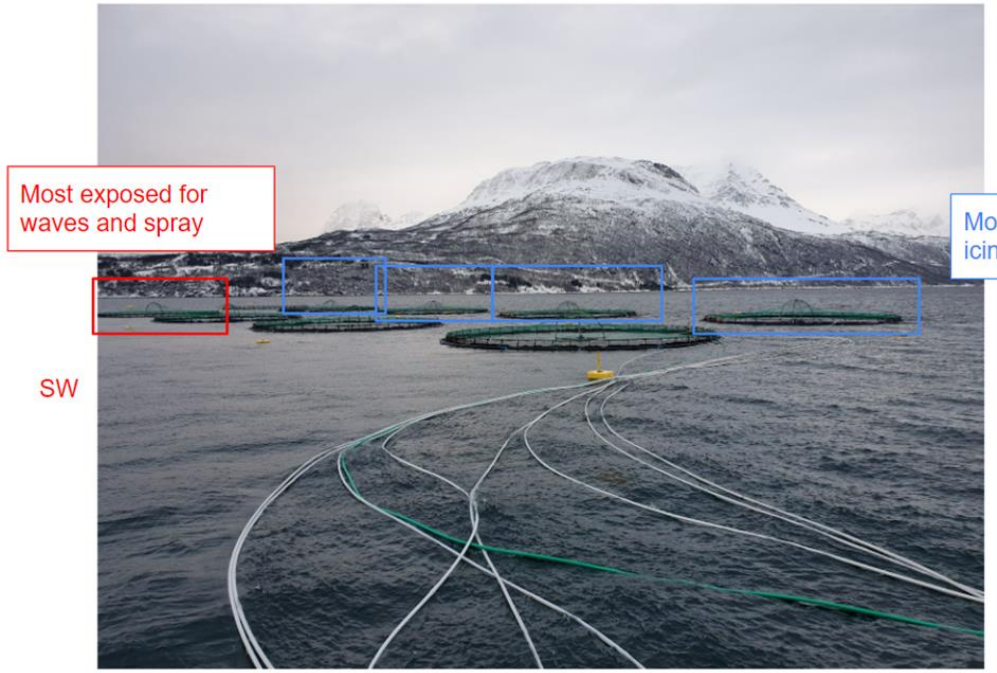






Field deployment



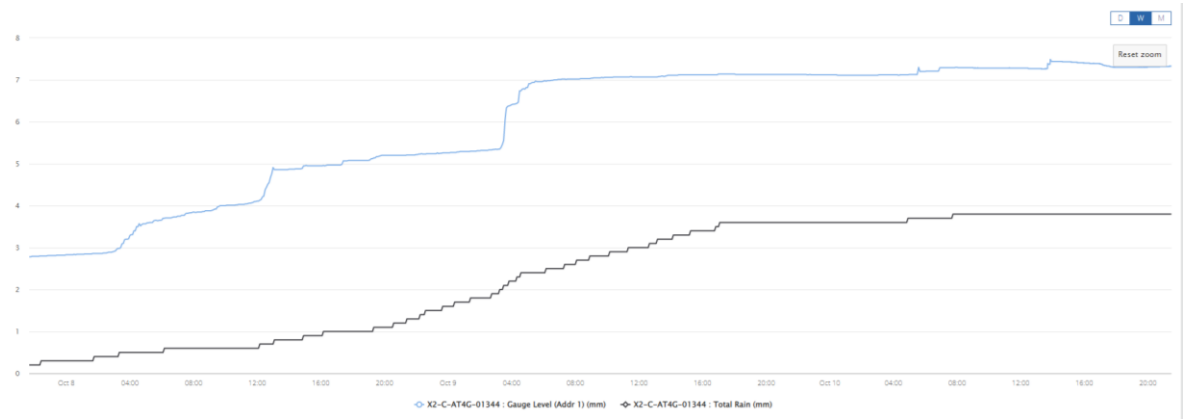


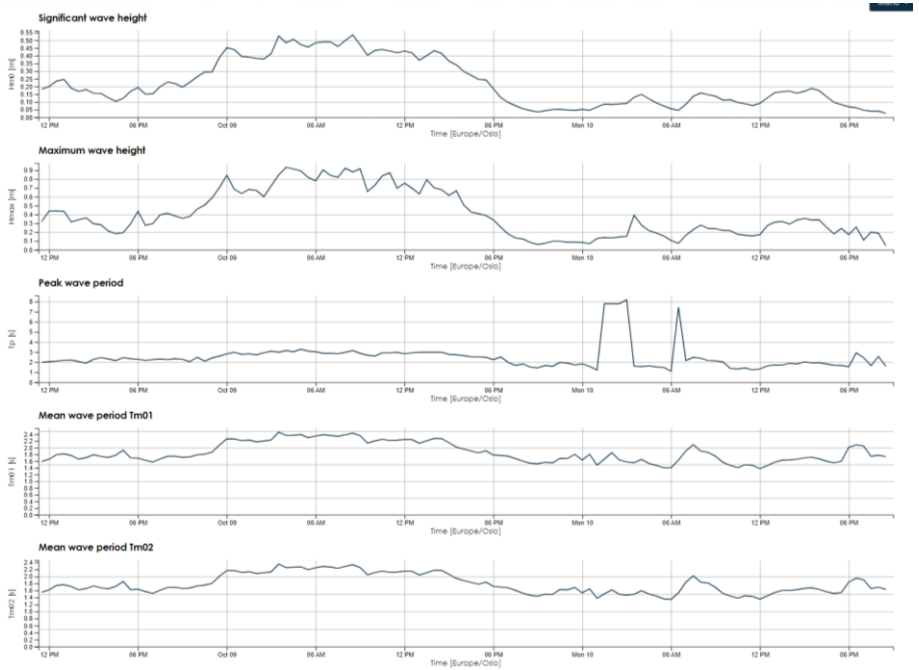
Gratanglaks

Field deployment









Next field deployment…..



Spray flux prototype

1. Spray sensor (Spray Duration and Frequency Measurement)
2. IMU 9 Degree of freedom
3. Air Pressure
4. Temperature air
5. Temperature water
6. LiDAR

Next …

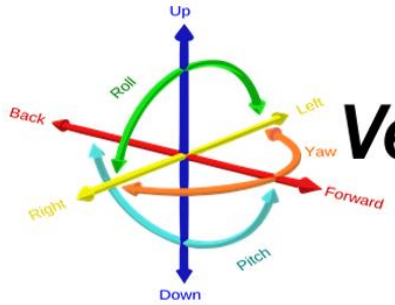
to build spray flux model



Radiometer



Temperature, humidity and Precipitation



Vessel motion

Spray Measurement



Wave Parameters



3D Wind

Thank You for listening