

船体着氷研究

2020年度 低温室における飛沫着氷試験
—単純形状/直径の違いによる着氷形状と着氷量—

北海道教育大学

海上技術安全研究所

工学院大学

尾関俊浩・松田裕太・布川大暉

松沢孝俊

金野祥久・徳富大樹

Ship icing research

- Sea-spray icing is a major problem for vessels.
- Even today, deicing continues to be a manual operation that usually involves the use of a hammer.

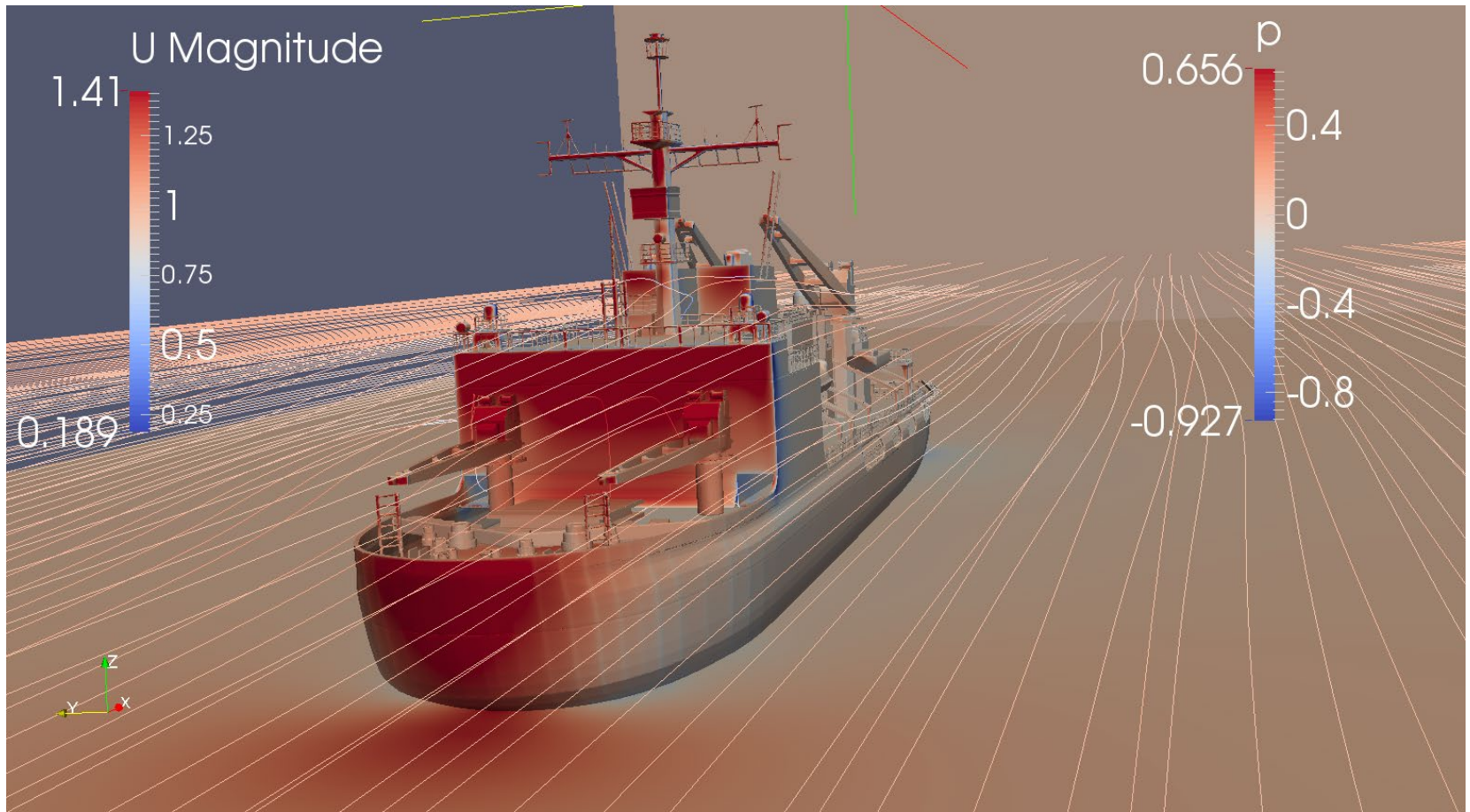
This research

To solve this problem, we investigated the wet growth patterns of water spray ice through laboratory experiments.



Teshio: Photo by JCG

For estimation of sea spray icing distribution on ship by
simulation (trajectory of spray particles and ice accretion)

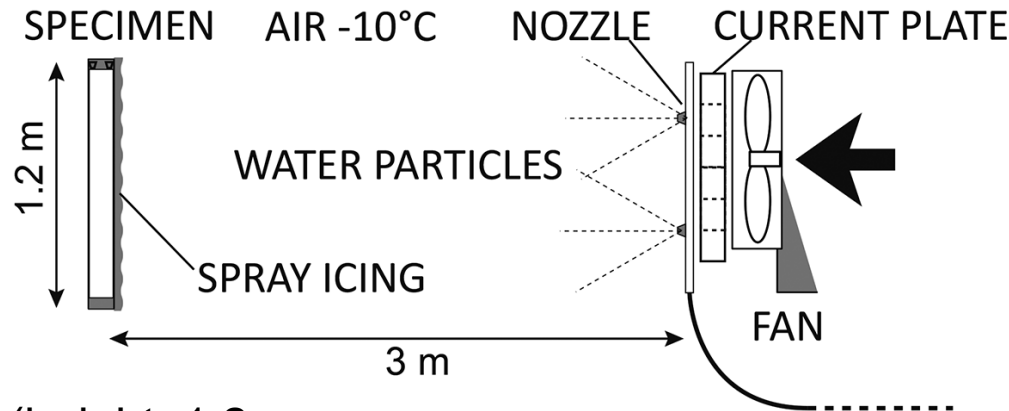


Icebreaker Shirase 10 knot

Obtain basic data in laboratory experiment

Laboratory experiment

Apparatus on an ice model basin.



(height: 1.2 m;
diameter: 500mm)

Temperature: -10 °C

Wind speed :

High about 10 m/s

Middle about 7.5 m/s

Urea water : 20 ‰.

Salt water



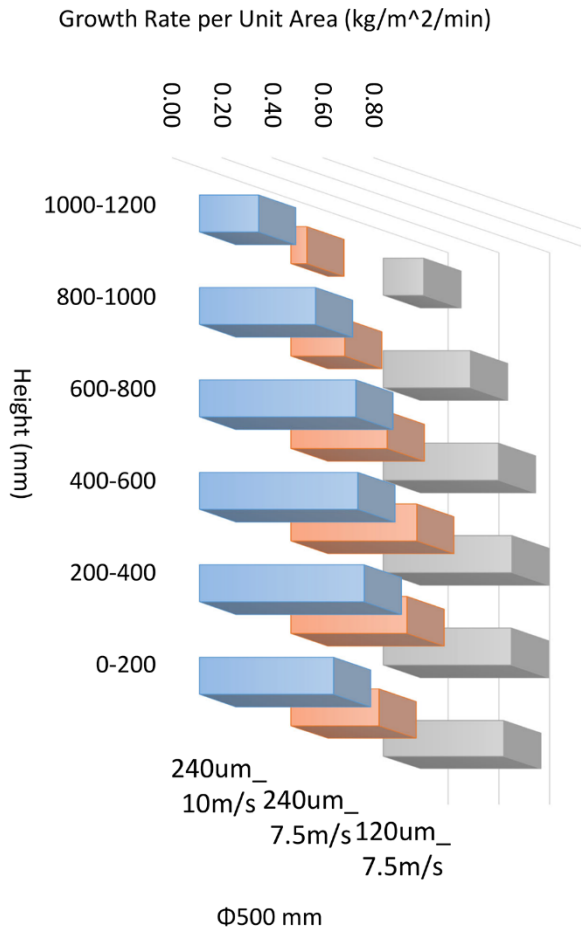
- The experimental apparatus was set up on an ice model basin at the Institute of Japan Marine United (JMU).

We carried out 5 series of spray icing experiments

- Small **water particles** with a diameter of about **240 μm** and **120 μm** were supplied by dual spray nozzles and were drifted to a specimen.
- The experiments were carried out using cylindrical specimens at **diameter** of **500 mm** and **150 mm**.

Specimen	120 μm droplets		240 μm droplets	
	10 m/s	7.5 m/s	10 m/s	7.5 m/s
$\Phi 500$ mm		#	#	#
$\Phi 150$ mm		#		#
$\Phi 50$ mm				

Comparison of differences in icing rates in the three experiments



10 m/s
240 µm droplets



7.5 m/s
240 µm droplets

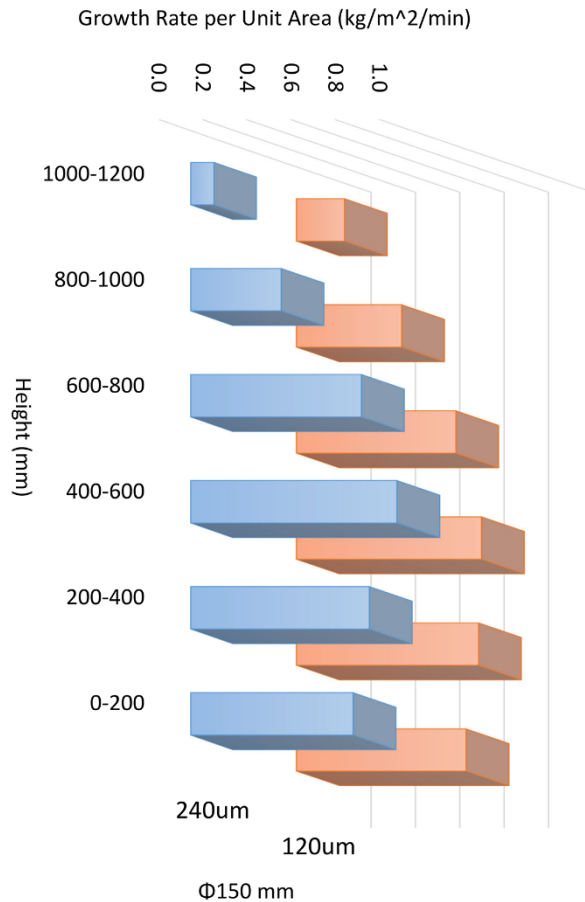


7.5 m/s
120 µm droplets

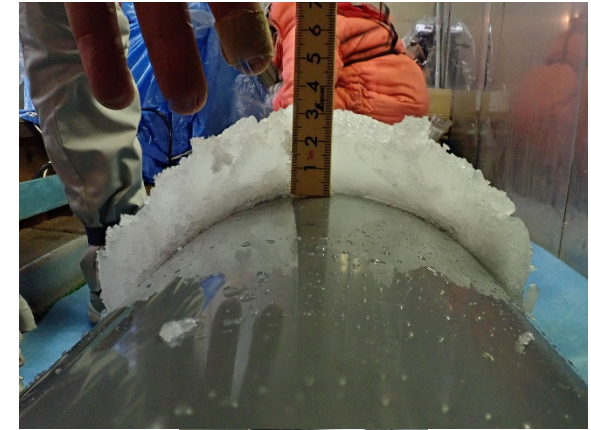
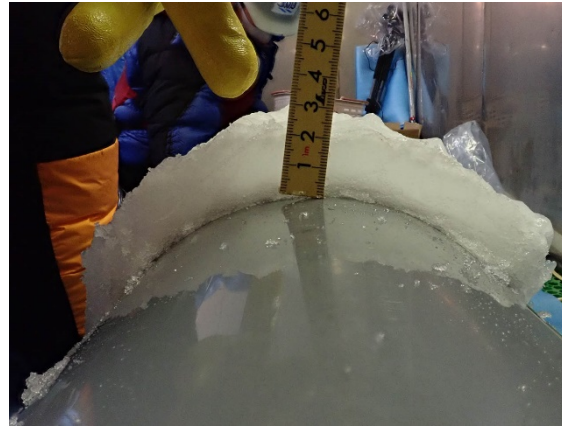
Temperature: $-10\text{ }^{\circ}\text{C}$

Cylinder diameter **500**
mm

Next: Cylinder diameter 150 mm



Comparison of differences in icing rates in the two experiments



Temperature: $-10\text{ }^{\circ}\text{C}$

Cylinder diameter 150 mm

7.5 m/s
240 μm droplets

7.5 m/s
120 μm droplets

2020年度 まとめ

- スプレー径と風速, 円筒の直径を変えた試験.
- 試験体への飛沫の衝突量の分布を計測した.
- 着氷の形状と, 着氷量を計測し, 比較した.
- 今回の5つの試験では, 大きな差は無かった.

次年度の課題

- ・しぶき計のデータも飛沫着氷分布の解析に活用
- ・低温室内試験の実施(風速、形状、室温)と活用