



# A Three-dimensional SPH Simulation of Iceberg Calving generated Waves

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## ➤ SPH method

$$\begin{cases} \frac{d\rho_i}{dt} = \sum_{j=1}^N m_j (\mathbf{v}_i - \mathbf{v}_j) \cdot \nabla_i W_{ij} \\ \frac{d\mathbf{v}_i^\alpha}{dt} = -\sum_{j=1}^N m_j \left( \frac{P_i}{\rho_i^2} + \frac{P_j}{\rho_j^2} + \Pi_{ij} \right) \cdot \nabla_i W_{ij} + \mathbf{g}^\alpha \end{cases}$$

## ➤ Simulation setup

Water :  $W \times L \times h = 140 \times 70 \times 25 \text{ m}^3$   
Iceberg :  $w \times s \times l = 12 \times 8 \times 10 \text{ m}^3$   
Iceberg velocity = 7.05 m/s  
Total SPH particles  $\approx 1.29$  billion

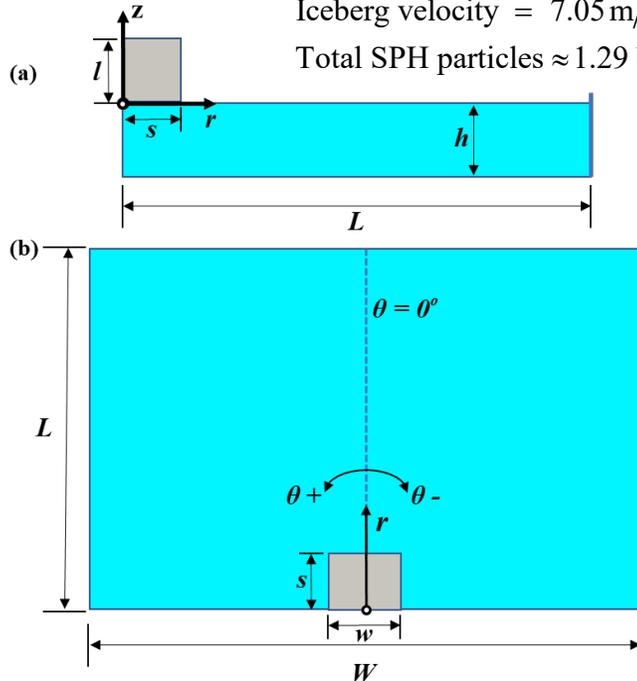


Fig.1 Sketch of the physical model: (a) side view, (b) plan view.

## ➤ Results

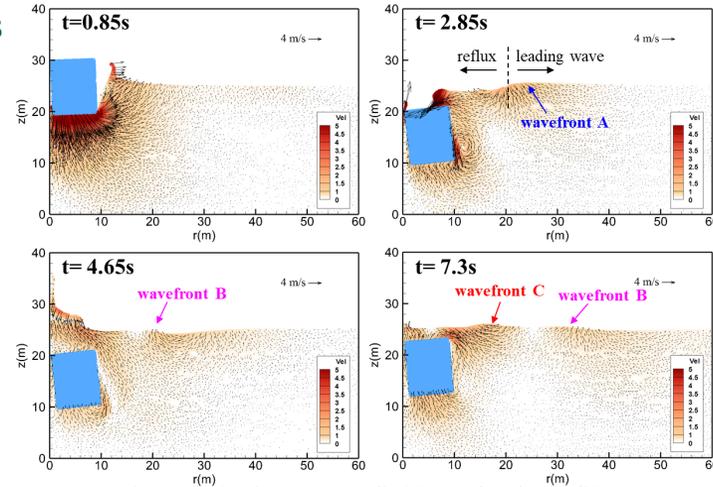


Fig.2 Velocity vector fields at  $\theta=0^\circ$  profile.

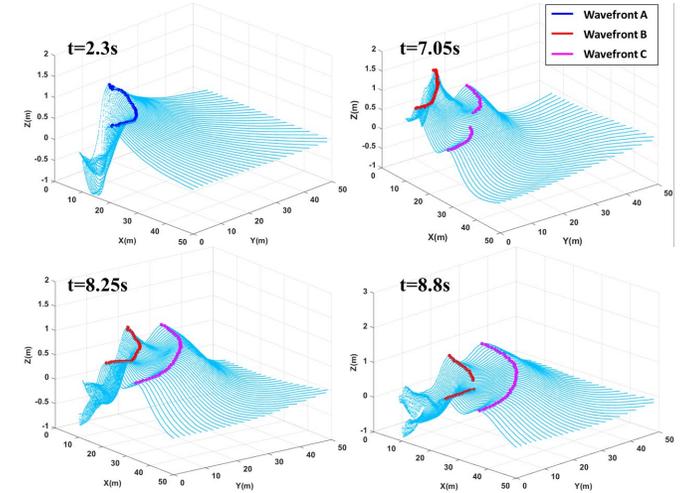


Fig.3 Spatial distribution of three wavefronts.

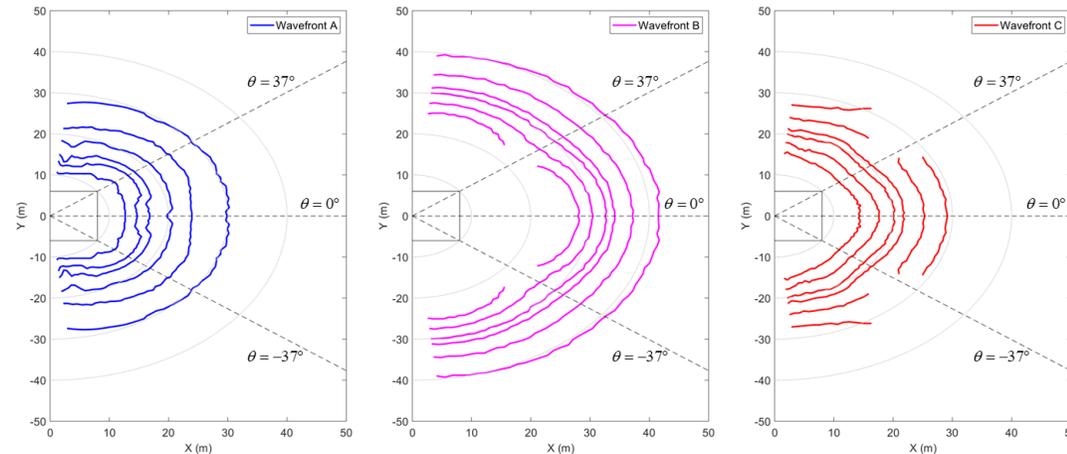


Fig.4 Distribution and evolution of three typical wavefronts with time order from inside to outside.

## ➤ Conclusions

The shape of the wavefronts outlined by the leading wave and the tailing waves are closely related to the iceberg geometry in the near field. However, as the wave propagates farther, the wavefront gradually develops into a semicircle independent of the iceberg geometry. The appearance of wavefront B is also related to iceberg geometry and iceberg water-entry velocity.