



TUAT Fluid Dynamics Seminar

How the growth of lake and sea ice depends on the fluid dynamics underneath



Lecturer:

Dr. Chao Sun

Date: Wednesday, 6th December, 2023

Time: 13:30 - 14:30

Place: Building 6 - Room201

Abstract

Landscapes resulting from ice-water interactions coupled with solidification/melting are ubiquitous in nature. We study the coupling dynamics of the growth of lake and sea ice with the fluid motion underneath. In the first work, we investigate the solidification of freshwater, considering phase transition, water density anomaly, and the real physical properties of ice and water phases, which we show to be essential for correctly predicting various qualitative and quantitative behaviors. Despite the complex interaction between the ice front and fluid motions, remarkably, the average ice thickness and growth rate can be well captured with a theoretical model. In the second study, we experimentally investigate the complete freezing process of water with dissolved salt. We identify possible modes of heat transport and emphasize the role of the presence of brine convection through the mushy ice in influencing icing dynamics.

Biography

Chao Sun is a Professor and New Cornerstone Investigator at Tsinghua University in China, holding positions at the Center for Combustion Energy, the Department of Energy and Power Engineering, and the College of Aerospace Engineering. Additionally, he serves as a part-time professor at the University of Twente in the Netherlands. Between 2009 and 2015, he was a faculty member at the University of Twente, after which he assumed a full professor role at Tsinghua University in 2015. His research interests encompass multiphase flows, turbulence, bubbles and droplets, as well as heat and mass transfer. He has authored over 170 publications in refereed scientific journals, including two review articles for Annual Reviews. Chao Sun was a plenary lecturer for the 10th International Conference on Multiphase Flow and a keynote speaker for the 15th European Turbulence Conference. He is a fellow of the American Physical Society and a recipient of the Xplorer prize and New Cornerstone Investigator Program. He also serves as an associate editor of the International Journal of Multiphase Flow, and an editorial member of Physical Review Fluids, Acta Mechanica Sinica, and several other journals. Additionally, he is a governing board member of the International Conference on Multiphase Flow and a committee member for the APS-DFD Frenkiel Award.