AFV: Arctic Fog Variability in a Warming Arctic and Its Impact on Maritime Human Activities

Call: Arctic Observing and Research for Sustainability
Type of Project: Type 3 - Research Grant
Lead PI: Xianyao Chen, Ocean University of China, Qingdao, China
Co-Leads:
David Atkinson, University of Victoria, Victoria, BC, Canada
Peiqing Guo, Ocean University of China, Qingdao, China
William Perrie, Bedford Institute of Oceanography, Dartmouth, NS, Canada (and Dalhousie University, Halifax, NS, Canada)
Francesco Tampieri, Institute of Atmospheric Science and Climate, Italian National Research Council, Bologna, Italy

Ka-Kit Tung, University of Washington, Seattle, WA, USA
Jinping Zhao, Ocean University of China, Qingdao, China

The rapid retreat of sea ice in the last two decades has led to increased extent and duration of the open-water season, and has opened up the possibility of a summertime ice-free Arctic by the middle of this century. Increased water vapor arising from enhanced evaporation, together with low surface temperature, drives possible associated changes in the occurrence of fog. An enhanced fog regime presents scientific and operational challenges: it complicates analysis of climate feedback mechanisms because of its strong effect on near-surface radiation balance; it also complicates the anticipated rush to increased trans-polar commercial shipping activity. Previous studies have suggested that fog events are related to regional and larger-scale meteorological processes. However the current limited availability of observational surface/satellite data and our limited understanding of fog-sea ice interactions hinder accurate forecasting of fog. This project will undertake a multi-pronged investigation of fog occurrence that includes field missions, modeling, and analysis of historical records. The region of focus encompasses the marginal ice zone of the Chukchi Sea, Canada Basin, and the seas around Svalbard. A primary objective is to improve fog-sea ice feedback understanding, leading to the development of better simulation capacity for future fog patterns in these regions. Continuous observations of fog in the Arctic require international collaboration; this project includes participants from four nations. An anticipated legacy of this project is the expected scientific guidance to support potential Arctic shipping activities. This project also serves as an antecedent to the "Multidisciplinary drifting Observatory for the Study of Arctic Climate" (MOSAiC), an international effort to harness "sustained observations to understand climate-relevant processes of the Arctic Ocean climate system."