8th International Conference on Fog, Fog Collection and Dew
Taipei, Taiwan, 14–19 July 2019
IFDA2019-39

C-FOG Project for Marine Fog

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Abstract
The objective of the C-FOG (Toward Improving Coastal Fog Prediction) project is, using in-situ observations and numerical weather prediction models, to improve fog predictability over coastal environments. This project took place over Eastern Canada (Nova Scotia, NS and the Island of Newfoundland, NL) coastlines and open water environments during August-October of 2018 where environmental conditions play an important role for late-season fog formation. The C-FOG field campaign was designed optimally measure fog variability in time and space, with tools including ground, airborne, and shipborne in-situ instruments, remote sensing platforms, as well as numerical models. Visibility and winds are the most critical weather-related phenomena affecting marine and aviation transportation; they contribute is to more than 70% of weather-related delays.

In-situ and remote sensing instruments were located at a supersite (Ferryland, NL) and four satellite sites, as well as on a research sea vessel. These instruments measure high-frequency wind, gust, and turbulence, droplet and aerosol microphysics, radiation, and thermodynamic properties of the environment. Special platforms were developed for fog microphysics investigation, including a gondola carrying sensors such as CDP (cloud droplet probe) and BCP (backscatter cloud probe) for droplets ranging in size from 1-75 μm. A LPM (laser precipitation monitor) measured hydrometeors from 100 μm to mm in diameter and an OPC (optical particle counter) covered particles larger than 0.3 micron in 20 spectral channels, providing information for fog and drizzle discrimination. Remote sensing platforms (e.g. MWR (microwave radiometer), Ceilometer, Lidar), meteorological towers, tethered balloons, UAV platforms, and GOES-R products (e.g., fog coverage and droplet size) provided fog information over short time and space scales. These data are used for fog parameterization development, with a focus on moisture advection and turbulent mixing. The outcome of this project is to validate and improve numerical model predictions of fog and to develop fog monitoring systems. Investigators will use observations to evaluate the role of dynamical conditions on fog life cycles, and to develop integrated observing systems utilizing model predictions. Overall, C-FOG measurements will be used to evaluate prediction challenges and emphasize the importance of current work.

This research was funded by the Office of Naval Research Award # N00014-18-1-2472 entitled: Toward Improving Coastal Fog Prediction (C-FOG).