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C-FOG Field Campaign for Coastal Fog: Emphases on Microphysics versus Dynamics

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The objective of C-FOG (Toward Improving Coastal Fog Prediction) is to advance understanding of fog formation, development, and dissipation over coastal environments to improve fog predictability. The field campaign was taken 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 are known to play an important role for late season's fog formation. Visibility (Vis) and 3D-wind (Uw) are the most critical weather-related parameters affecting marine transportation and aviation operations over sea platforms. During C-FOG field campaign, observations obtained from ground based in-situ, remote sensing, airborne (e.g., balloons) and shipborne platforms as well as data from numerical models were collected. Instruments were located at a supersite (Ferryland, NL) and four satellite sites, as well as on the research vessel Hughes R. Sharp. The instruments measured Uw and turbulence, microphysics, radiation, aerosol, and thermodynamic properties of the fog environment and their profiles. Special sensors were developed for fog microphysics investigation, including a Gondola carrying microphysical sensors such as CDP (Cloud droplet probe) and BCP (backscatter cloud probe) for droplet size range from 1-75 micron. A LPM (laser precipitation monitor) from 100 micron to mm size ranges and an OPC (optical particle counter) above 0.3 micron at 20 spectral channels provided information for fog and drizzle discrimination. Remote sensing platforms (e.g. microwave radiometer, ceilometer, lidar), meteorological towers, tethered balloons, and GOES-R products (e.g. fog coverage and droplet size) provided fog information over horizontal and vertical directions. Preliminary results suggest that fog microphysical parameterizations are related to dynamical processes such as strong moisture advection, turbulent mixing, and ocean surface conditions. The outcome of this project will be used to improve numerical model predictions of fog and develop new microphysical parameterizations applicable marine environments. Overall, C-FOG measurements will be used to evaluate prediction challenges related to fog microphysics, dynamics, and aerosols properties.

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