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Fog Analysis during SOFOG3D Experiment

Pragya Vishwakarma[1,2], Julien Delanoë[1], Christophe Le Gac[1], Fabrice Bertrand[1], Jean-Charles Dupont[3], Martial Haeffelin[3], Pauline Martinet[4], Frédéric Burnet[4], Christine Lac[4], Alistair Bell[4], Damien Vignelles[2], Felipe Toledo[2,3], Susana Jorquera[1], and Jean-Paul Vinson[1]
[1]LATMOS, IPSL/University de Versailles Saint-Quentin-en-Yvelines (UVSQ), Guyancourt, France
(pragya.vishwakarma@latmos.ipsl.fr)
[2]METEOMODEM, France
[3]LMD-IPSL, France
[4]CNRM, france

Transportation especially aviation sector all around the world is severely hindered due to Fog and hence observations and specific research for fog is necessary. The SOFOG3D (SOuth west FOGs 3D) experiment took place in South-West of France which is particularly prone to fog occurrence, during the period between November 2019 to March 2020 with primary objective to advance our understanding of fog processes and to improve fog forecast. Simultaneous measurements from various remote sensing instruments like BASTA: a 95 GHz cloud radar with scanning capability, HATPRO Microwave radiometer (MWR), doppler lidar, and balloon-borne in-situ measurements were collected to characterize the spatio-temporal evolution of Fog. On the supersite, detailed measurements of meteorological conditions, aerosol properties, fog microphysics, water deposition, radiation budget, heat, and momentum fluxes are collected to provide 3D structure of the boundary layer during fog events. The improvement in the retrieval of fog parameters and understanding of fog dynamics based on cloud radar and microwave (MWR) synergy will be addressed. We will present our work on the retrieval of key fog parameters like dynamics and microphysics using a combination of cloud radar and MWR observations. The retrievals will be validated with the tethered-balloon and radio-sounding observations. In-situ measurements and remote-sensing retrievals of fog microphysical properties will be compared. We will show a detailed analysis of retrieved LWP derived from BASTA radar only with LWP derived from HATPRO microwave radiometer, considering instrumental uncertainty and sensitivity. A closer analysis of the in-situ data (measured by granulometer) will be presented in order to assess and improve the retrieval derived with cloud radar in vertically pointing mode. Radar attenuation will be quantified by measuring the backscattered radar signal on well-known calibrated reflectivity metallic targets installed at the top of 20 m mast. The integrated attenuation along the radar beam path will be measured by the cloud radar and used as a new constraint to improve the microphysical properties.