Toward Formulation of a Semi-Permanent Supersite for Cloud, Convection, and Precipitation Processes at Wallops Flight Facility -2nd Year Progress-

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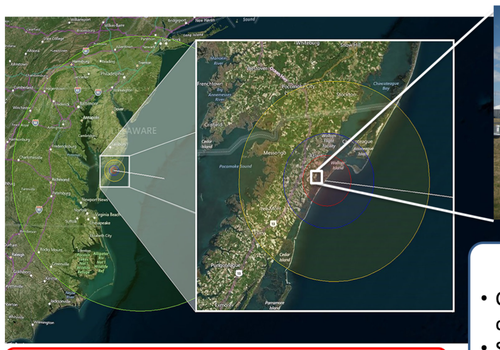
GOALS

1. *Establish a long-term super site to improve understanding of physical processes of cloud-convection and precipitation (CCP) and to support satellite missions.*
2. *Provide meteorological large-scale forcing input to drive different CRMs, large-eddy simulation (LES) models, and single-column models (SCMs) for improvement of CCP parameterizations.*
3. *Provide routine storm-scale GCE simulations to bridge remote sensing observations and CCP processes (shallow-deep precipitating convection).*
4. *Bundle ground-based observations, process modeling, and NASA satellite data over the WFF site to generate value-added BLOSSOM Bundled Data.*

NASA Wallop Flight Facility (WFF)



Precipitation Systems
- Continental and maritime organized convection
- Sea-breeze-driven convection
- Mid-latitude frontal systems
- Winter-time nor'easters
- Tropical cyclones

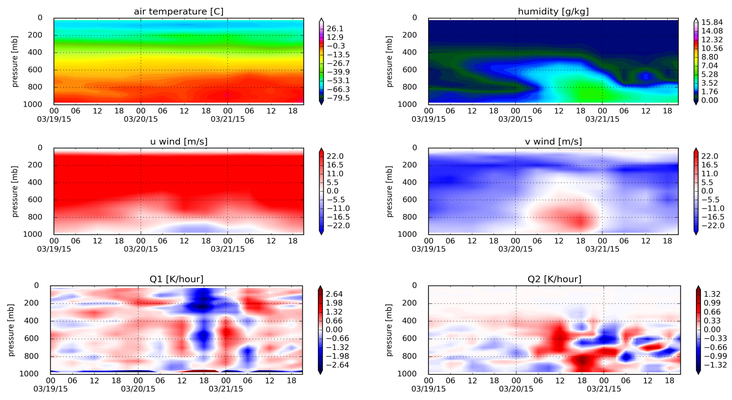
World-Class CCP instruments
- **Radar**: NPOL, D3R, MRR
- **In-situ**: 2DVD/Parsivel/PIP, Gauge, All-in-One
- **Satellites**: GPM, GOES-R, Terra/Aqua/Suomi
- **Trailers (TBD)**: SMART, COMMIT, and ACHIEVE

Large-Scale Forcing and Case Study

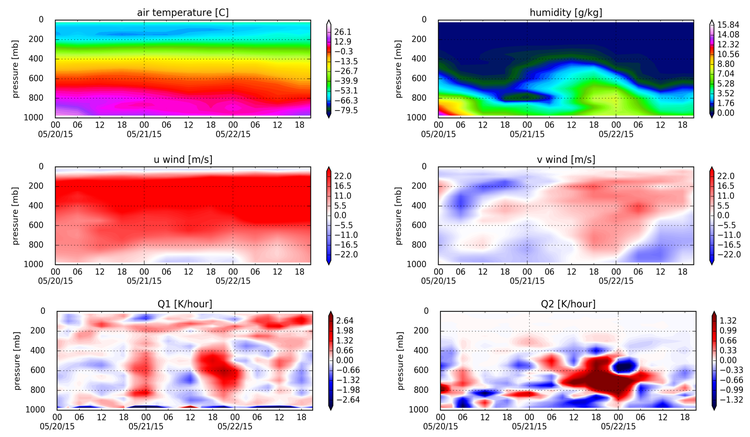
Large-scale forcing are developed for driving SCM and LES from the NASA Modern-Era Retrospective analysis for Research and Applications Version 2 (**MERRA2**) through VARiational ANAlysis (**VARNAL**) approach (Zhang and Lin 1997, Zhang et al. 2001), wherein data are collected and adjusted based on vertical integration of the atmospheric mass, moisture (q), dry static energy (s), and momentum budget equations. For further constraining the heat budget, we will utilize hourly atmospheric radiation budgets from the Clouds and the Earth's Radiant Energy System (**CERES**) (Wielicki et al. 1996) SYNoptic product (SYN1deg), and surface precipitation rate from **multiradar, multisensor system (MRMS) precipitation** data from the NOAA National Severe Storms Laboratory (NSSL, Zhang et al. 2016).

In order to demonstrate the full system of BLOSSOM, three unique cases are identified, including winter snowfall (case1), spring mixed-phase rainfall (case 2), and summer-time deep convection (case 3). MERRA-based large-scale forcing has been completed for all three cases, and plan to drive a cloud-resolving model.

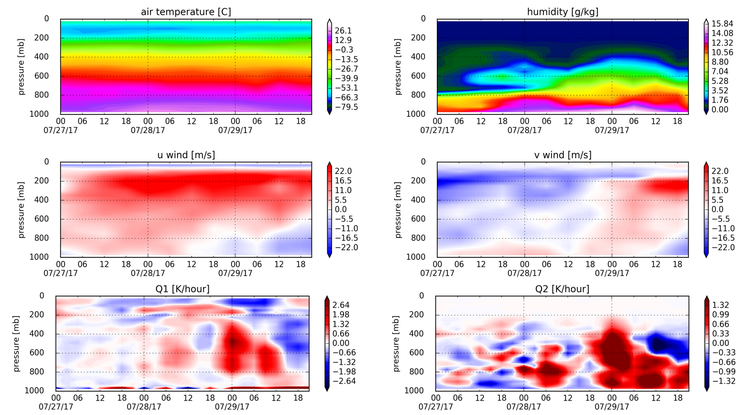
Case 1 (Winter Snowfall)



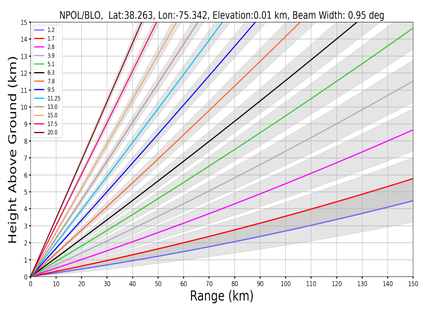
Case 2 (Mixed Phase Light Rain)



Case 3 (Mixed Phase Light Rain)



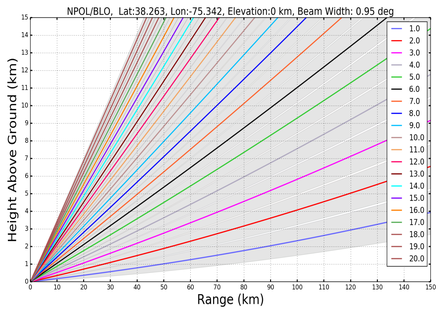
Default PPI Scan

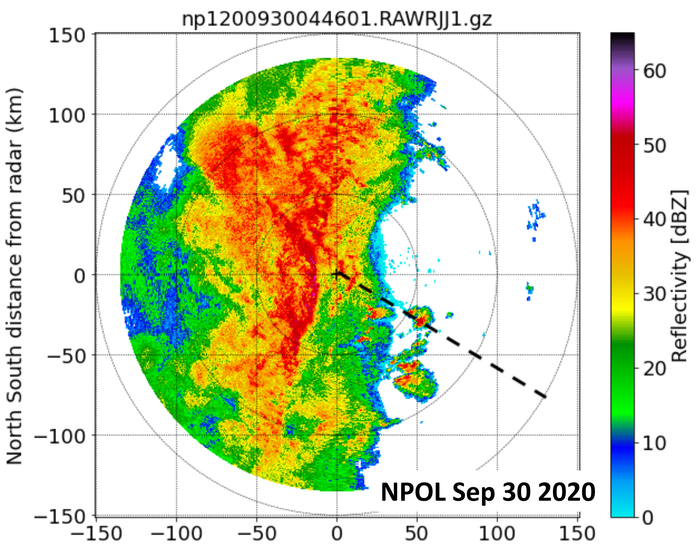


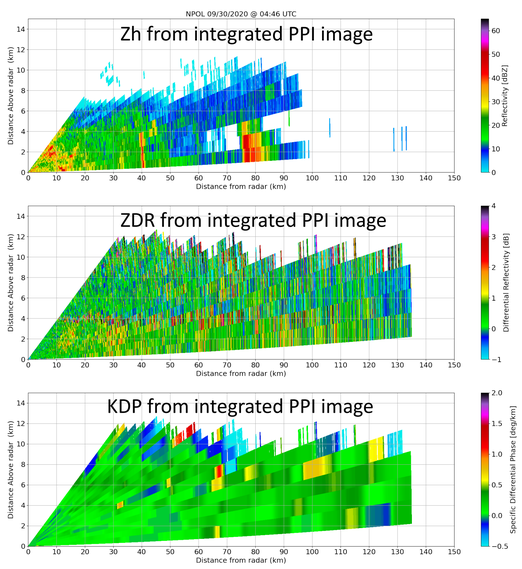
NPOL BLOSSOM Scan

The 20-tilt PPI (rather than default is 13-tilt PPI) with the BB (2 rotations) and RHI (3 angles), the total time is 10 min 51 sec (11-min repeat cycle), close to the 10min CRM output frequency. New 20-tilt PPI can sample upper-storm microphysics better than the default 13-tilt PPI [Oue et al. 2019]. This BLOSSOM scan started from Oct 2020, excepting the time windows of GPM scan during the GPM Core satellite overpass.

BLOSSOM PPI Scan





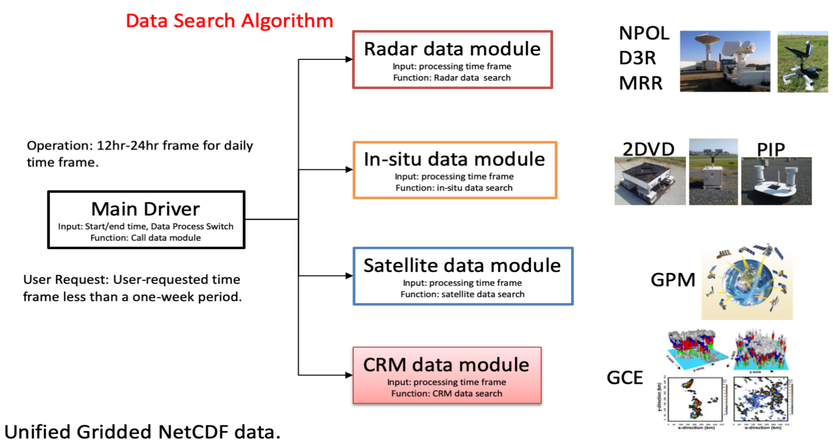


Python-based Data Retrieval System

A series of python codes have been developed to retrieve radar, disdrometer, and satellite data. The package bundles data and outputs to NetCDF. Additionally a number of user products are also developed such as gridded radar data, hydrometeor ID, and time series of DSD variables. We will further develop the code to construct time-integrated statistics information, such as histograms and contoured frequency of altitude diagram (CFADs). All WFF data will be publicly available via HTTPS via NASA servers.

BLOSSOM Data Processing System

-Main Driver-



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