BiLateral Operational Storm-Scale Observation and Modeling (BLOSSOM)

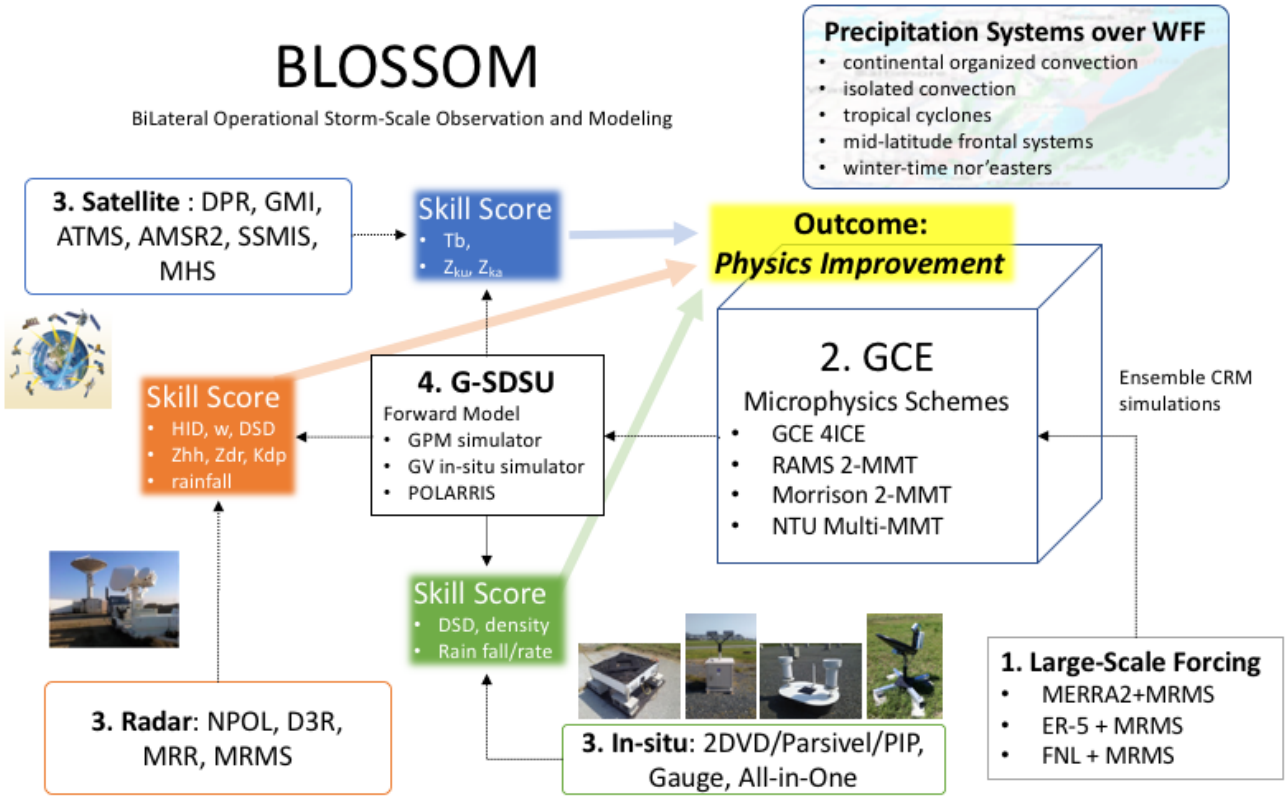
*Toshihisa Matsui[1], David B Wolff[2], Stephen Lang[3], Karen Mohr[4]

1. NASA GSFC & ESSIC UMD, 2. NASA Wallops Flight Facility, 3. NASA GSFC & SSAI, 4. NASA GSFC

Over the past several decades, cloud-resolving models (CRMs) have been advanced and utilized for many applications, such as the study of mesoscale convective systems, cloud microphysics, cloud latent heating, and cloud radiative forcing, all of which have been used to support the development of satellite algorithms for the Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurement (GPM) satellites. Yet, one of the long-standing uncertainties in CRMs is the spatial-temporal distribution of bulk hydrometeors, especially, mixed-phase and frozen precipitation. To continue to improve and advance these models in unison with the steady progression to finer grid resolutions, a robust evaluation is required that facilitates comprehensive comparisons between high-resolution, detailed cloud-process simulations and systematic routine storm-scale observations having sub-minute time-scale and sub-km spatial-scale sampling.

The NASA S-band dual-POLarimetric radar (NPOL) and Dual-frequency Dual-polarized Doppler Radar (D3R) are NASA’s signature ground-based polarimetric radars that have been deployed to many GPM ground validation (GV) sites and provide such vital storm-scale observations for CRM evaluation. Subsequent to these GV activities (https://gpm-gv.gsfc.nasa.gov/), N-POL and D3R have been operating at the NASA Goddard Space Flight Center Wallops Flight Facility (WFF) to continuously validate GPM satellite signals and retrievals over WFF sites. We briefly present concept and preliminary results of establishing routine polarimetric radar observations and cloud-process modeling at the NASA GSFC WFF inthe following project entitled “**BiLateral Operational Storm-Scale Observation and Modeling (BLOSSOM)**”. Ultimately, the following ultimate goals are envisioned with BLOSSOM:
1) Establish a long-term super site to improve understanding of cloud and precipitation physical processes, particularly for mixed-phase and frozen precipitation over the WFF site.
2) Provide routine meteorological large-scale forcing input to drive different CRMs, large-eddy simulation (LES) models, and single-column models (SCMs) for improvement of cloud microphysics and convection parameterizations.
3) *Provide routine storm-scale cloud-precipitation simulations as well as storm-scale measurements using ground-based polarimetric Doppler radar and in-situ data.*
4) Collect Precipitation Measurement Mission(PMM) satellite data along with the CRM simulations and polarimetric radar observations to generate value-added BLOSSOM BundledDatafor the community.

Keywords: polarimetric radar, cloud resolving model, super site, satellite missions, microphysics


BLOSSOM
BiLateral Operational Storm-Scale Observation and Modeling
Precipitation Systems over WFF
continental organized convection
isolated convection
tropical cyclones
mid-latitude frontal systems
winter-time nor'easters
3. Satellite : DPR, GMI, ATMS, AMSR2, SSMIS, MHS
Skill Score
Tb,
Zku, Zka
Outcome:
Physics Improvement
Skill Score
HID, w, DSD
Zhh, Zdr, Kdp
rainfall
4. G-SDSU
Forward Model
GPM simulator
GV in-situ simulator
POLARRIS
2. GCE
Microphysics Schemes
GCE 4ICE
RAMS 2-MMT
Morrison 2-MMT
NTU Multi-MMT
Ensemble CRM simulations
Skill Score
DSD, density
Rain fall/rate
1. Large-Scale Forcing
MERRA2+MRMS
ER-5 + MRMS
FNL + MRMS
3. Radar: NPOL, D3R, MRR, MRMS
3. In-situ: 2DVD/Parsivel/PIP, Gauge, All-in-One