Introduction

- The NASA Unified Weather Research and Forecasting model (NU-WRF) will be included for testing and evaluation in the forecast demonstration project (FDP) of the International Collaborative Experiment – PyeongChang 2018 Olympic and Paralympic (ICE-POP) Winter Games.
- An international array of radar and supporting ground-based observations together with various forecast and nowcast models will be operational during ICE-POP. In conjunction with personnel from NASA’s Goddard Space Flight Center, the NASA Short-term Prediction Research and Transition (SPoRT) Center is developing benchmark simulations for a real-time NU-WRF configuration to run during the FDP. ICE-POP observational datasets will be used to validate model simulations and investigate improved model physics and performance for prediction of snow events during the research phase (RDP) of the project.
- The NU-WRF model simulations will also support NASA’s Global Precipitation Measurement (GPM) Mission ground-validation physical and direct validation activities in relation to verifying, testing, and improving satellite-based snowfall retrieval algorithms over complex terrain.

NU-WRF Configuration

- Three domains (9 km, 3 km, 1 km) at 45-second time step on domain D01
- 62 vertical levels with less than 100 m grid spacing in the lower 2000 m AGL
- Goddard microphysics 4CE: Goddard short/longwave radiation physics; MYJ PBL; Noah Land surface model
- 24-h forecasts with NASA Unified Weather Research and Forecasting (NU-WRF) model
- IC & BC provided by NCEP/EMC GFS model both retroactive and future real-time
- Test case results in proton: 13 February 2016 rain changing to snow event in South Korea

Case Studies: 13 Feb 2016 Snow Event

NU-WRF depicts transition from liquid to frozen precipitation

- Fig 1a: Model output compared to Fig 1b GPM IMERG observations for domain D01
- Fig 2a: Model output compared to Fig 2b GPM IMERG observations for domain D03
- Fig 3a-10-h Rain forecast model output: Fig 3b shows T/Td above freezing; Fig 3c shows the liquid mixing ratio of the rain event; Fig 3d shows no ice mixing ratio at the lower levels
- Fig 4a-24-h Snow forecast model output: Fig 4b shows T/Td below freezing; Fig 4c shows no liquid mixing ratio; Fig 4d shows ice mixing ratio at the lowest levels

Hydrometeor Profiles:

- Fig 3c, 3d: 10UTC 13 Feb 2016; Fig 4c, 4d: 00UTC 14 Feb 2016

Table 1

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Fig 1a

Fig 2a

Fig 3a

Fig 3b

Fig 3c

Fig 3d

Fig 4b

Fig 4c

Fig 4d

Domain Configuration

Future Work

- Run NU-WRF coupled to Goddard-Satellite Data Simulator Unit (G-SDSU), for testing of process impacts on GPM passive/active remote sensing-based snowfall retrievals and verification of model processes.
- Further testing of terrain resolution impacts for NU-WRF predictability of heavy winter orographic precipitation QPE/F
- Observational validation of NU-WRF to include testing of cloud physics schemes and modeled precipitation processes (liquid, mixed phase and frozen)

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Alpensia Ski Center

The Alpensia Ski Center

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