CIMMS 40th Anniversary Celebration

15 November 2018
Maintain Strengths of CIMMS

• Transition of research to operational systems, better warnings & forecasts
• Development of radar and interpretation of radar data, linkage with models of severe storms
• Hydrometeorology & Severe Storms Research & transition to operations
• Linkage between OU, NOAA, NSSL, NWC, SPC, SoM, NWS forecast office, etc.
Current Research Foci

- Weather radar research & development
- Stormscale & mesoscale modeling research & development
- Forecast improvements research & development
- Impacts of climate change on extreme weather
- Societal and socioeconomic impacts of high impact weather systems
Expand to Other High Impact Weather Events

• What are potential national threats in coming years?
  – Heat waves
  – Droughts
  – Landfalling hurricanes
  – Snowstorms
  – Floods
  – Tornadoes
  – Frequency of extreme events in changing climate

• Important Applications
  – Seasonal to sub-seasonal forecasts
  – Warn-on forecast
  – Probabilistic forecasts
  – Socioeconomic aspects of high-impact weather
  – Impacts of changing Arctic on continental United States
Strategic Goals

• Enhance diversity within CIMMS
• Expand educational activities within CIMMS
  – Established Peter Lamb Postdoctoral Fellowship
  – Increase graduate/undergraduate students
• Hold Symposia/brainstorming sessions on important topics to identify pressing science issues
  – Landfalling Tropical Cyclones: Impacts, Predictability and Forecasting
  – Arctic Weather: Forecasts, Processes and Impacts
  – Hydrometeorology
  – Seasonal to subseasonal forecasts
• Execute more field programs
  – Nor’easters (East coast snowstorms)
  – VORTEX SE
  – Impacts of ice crystals/clouds on aviation
Student Opportunities: October 2018 Sao Tome, Africa
International Collaborations

• Enhance International Stature & Reputation of CIMMS
  – Encourage more collaboration with foreign partners
  – Reinvigorate US-China MoU on Cooperative Research on Major Disastrous Weather and Climate Events
  – Enhancing Collaborations with KMA, FMI
  – More visitors to CIMMS (e.g., recent visitors from Korea, China and Israel)
Other Grand Challenges

Warn-on-Detection

Use observations to detect where tornadoes are occurring

Warn-on-Forecast

Use models to predict where tornadoes will occur
Motivation
• Create short-term (0-3 h) probabilistic forecasts of high impact weather events (tornadoes, hail, wind, flash-floods
• Use to improve severe weather watch/warning guidance

Approach
• Create a high resolution (3 km) regional numerical weather prediction system based on an ensemble data assimilation approach
• 3 h forecasts generated every 30 minutes
• Assimilate conventional, radar, and satellite observations
• Tested during 2016 and 2017 Hazardous Weather Testbeds

Key Impacts
• NEWS-e forecasts predicted high probabilities of reflectivity and updraft helicity prior to severe weather reports
• Real time forecasts showed potential for tornado warning guidance.

Website: https://www.nssl.noaa.gov/projects/wof/news-e/
Understanding Clouds

The most fundamental and complex problems in climate and weather research are our poor understanding of the basic properties of clouds and our inability to determine quantitatively the many effects cloud processes have on weather and climate.
Enhanced Observations
Phased Array Radar: Engineering Research

C. Curtis, E. Forren, S. Gregg, I. Ivić, F. Nai, D. Schwartzman, S. Torres, and D. Warde
Advanced Radar Techniques Team, CIMMS/NSSL

Motivation
Phased array radar (PAR) offers unique capabilities to improve weather surveillance. But, there are engineering challenges to transfer to operations:
• deployment cost
• high-fidelity dual polarization measurements

Approach
• Develop & operate demo systems
  • Ten Panel Demonstrator (TPD)
  • Advanced Technology Demonstrator (ATD)
• Antenna characterization/calibration
• Signal processing
• Adaptive scanning

Key Impact
Reduces risk associated with use of PAR technology for weather observations & will facilitate implementation of this
Multi-Radar/Multi-Sensor Overview

Mosaicking system that synthesizes observations from various platforms to provide frequently-updating, seamless, 3-D gridded mosaic from which present and short-range weather threats can be assessed.

External Partners
- NWS WFOs, RFCs, service centers, and CWSUs
- Radar Operations Center
- GSD (used as input/validation for HRRR/RAP)
- Salt River Power and Water
- FAA
  - NCEP/MDL
- USDA
  - NCAR
- FHWA
  - FEMA
- DoD
  - CIMSS

Scientific Branches
- Severe
- Hydrometeorology
- Hydrology
- Transportation