Multi Radar Multi Sensor
NextGen Weather Program

Presentation materials sourced from:
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• Multiple Radar Multi Sensor System (MRMS) is the world’s most advanced weather ‘research soon to be operational’ radar processing system.

• The MRMS system (formally known in the AWRP project plans as NMQ) exists today as a result of FAA and NOAA R&D investments leveraged over the last decade.
MRMS - Multiple-Radar / Multiple-Sensor

**Multiple-Radar:** Exploits the overlapping coverage of the WSR-88D, TDWR, Canadian networks and the base level real-time data feeds to build a seamless rapidly-updating high-resolution three-dimensional cube of radar data (moments).

**Multiple-Sensor:** Objectively blends data from the multiple-radar 3D sources with surface, upper air, lightning, satellite, rain gauges, and NWP environmental data, to produce highly-robust decision support products.
Integrated multiple sensor approach to high resolution rendering of storms and weather
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Mosaic3D Reflectivity
Vertical Cross Section - Composite Along West-East Line

Valid At: Long West/East
06/06/2010 03:20:00 UTC

[Graph showing Mosaic3D Reflectivity with height and reflectivity values]
MRMS Domain

- ~140 WSR-88D
- 31 Canadian
- 15 TDWR
- 1 TV station radar
The weather and climate enterprise has been utilizing MRMS products, in some form, for well over a decade.

NCEP uses the radar mosaics at the Storm Prediction Center, the Aviation Weather Center, and the Weather Prediction Center for real-time hazardous weather forecasting and post-event data analysis.

MRMS 3D products are used to initialize and verify high-resolution storm-scale models such as the RR and HRRR.

The MRMS system is a component of a larger, multi-agency effort to create a new, state-of-the-art 3D storm-scale analysis capability.
MRMS Transition to NWS Operations

- Approval of the MRMS as an official NOAA Line Office Transition Project (December 2010)
- Transition managed by NextGen Weather Program office (May 2013)
- MRMS transition charter signed (August 2013)
Program Phase/Milestone End

- Finalize plan for MRMS product dissemination 06/2014
- Establish Subversion MRMS source code repository at NCEP 01/2014
- Test MRMS on primary NCEP compute farm 01/2014
- Install and test MRMS IOC products on WJHTC MRMS System 03/2014
- Install and test MRMS IOC system on primary NCEP compute center 07/2014
- Verify MRMS test products are received at remote test sites 08/2014
- MRMS IOC at College Park with products available operationally 09/2014
- Refine performance and make adjustments to product creation/dissemination 11/2014
- MRMS FOC - Entails installing software on backup compute center (Boulder) 04/2015
• **Provides**, seamless, high resolution data sphere of integrated radar and sensor data for multiple agencies

• Improves depictions of convective initiation, structure, and evolution for warnings, forecasts, air traffic routing

• **Provides** framework for research and development for aviation related products via WJHTC MRMS system

• Will provide an analysis of record to more robustly understand severe weather and precipitation climatologies nationwide

• Will strengthen existing and establish new partnerships with multiple development and operational agencies

• Will save lives, property, aviation delays/accidents
Questions
Current MRMS R&D

• **QC study of the Canadian radar and other candidate radar networks.** Data quality issues associated with non-WSR-88D radar networks require continued research and development for optimum quality assurance for the data to be fully integrated into the seamless 3D mosaic and derivative products. This effort benefits those forecast capabilities that rely on high fidelity radar imagery as an input (HRRR, CIP, GTG, CoSPA).

• **Utilize polarimetric radar techniques to further improve radar data quality control.** The polarimetric radar variables have shown to provide more accurate identification of anomalous propagation, sea clutter, biological scatterers, and chaff echoes than using single-polarized radar variables. Better identification and removal of non-weather echoes will increase airspace capacity.

  DELIVERED

• **Integrate polarimetric radar variables with atmospheric environmental data and develop robust algorithms to identify different cloud and precipitation types** (e.g., liquid vs. frozen, supercooled water vs. ice crystals, etc.). Accurate delineation of different hydrometeor regions could be beneficial to the TAIWIS and In Flight Icing PDTs.
• Evaluating performances of the polarimetric radar hydrometeor classification algorithm (HCA) for different seasons and different geographical areas, and develop strategies for seamless mosaicing of the HCA products for the CONUS domain. A high-resolution 3D national mosaic of cloud hydrometeor types (e.g., rain droplets, hail, ice crystal, etc) will be very useful for en route air traffic controllers. Further, the 3D HCA mosaic will be helpful for validation and improvements of various microphysical schemes used in numerical weather prediction models.

• Continue supporting the MRMS system at the WJHTC and develop new techniques and products based on requirements from the aviation community. Continue to provide MRMS products to other AWRP PDTs and develop new techniques and products based on requirements from other AWRP PDTs.