

Headquarters U.S. Air Force

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AF Weather Update to the 2014 IHC



**Colonel John Egentowich
Acting Air Force Director of Weather**

March 2014

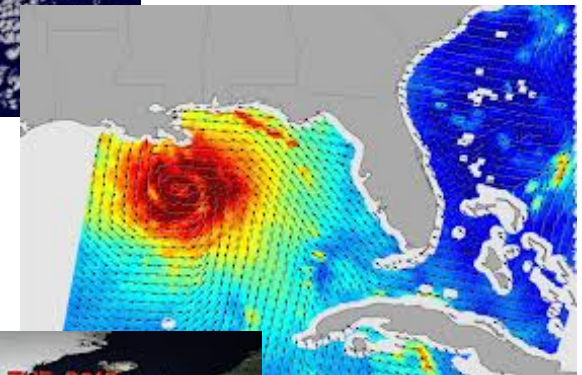
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Overview

- Partnerships
- JTWC Operations
- R2O Focused Initiatives
- Operational Initiatives
- Conclusion



AFW Focused on Supporting Joint Warfighters

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Partnerships

■ **Mission Partners**

- **NHC** – Great support for DoD ops in CONUS & GOM / Caribbean
- **JTWC** (Air Force/Navy) – 54 years supporting DoD/DoC/DoS & Nations
- **CPHC** – ATCF, fixes, personnel & tech exchange
- **53 WRS Hurricane Hunters** – Vital ops for the NHC & global research support

■ **Centers and Numerical Modeling**

- **NWS, NESDIS** – TC fixes, numerical models (GFS/GEFS/H-WRF), training, funding advocacy
- **FNMOCC** – TC imagery, numerical models

■ **Research**

- **UW-CIMSS & CIRA RAMMB** – TC diagnostic and forecasting tools
- **OAR, ONR, NRL, FNMOCC, NASA, NPS, AFIT** – ATCF, TC imagery, numerical models, TC data collection (RQ-4) & research and R2O initiatives
- **COPC, NUOPC, JCSDA, ESPC** – Joint TC research, data assimilation and operations efforts

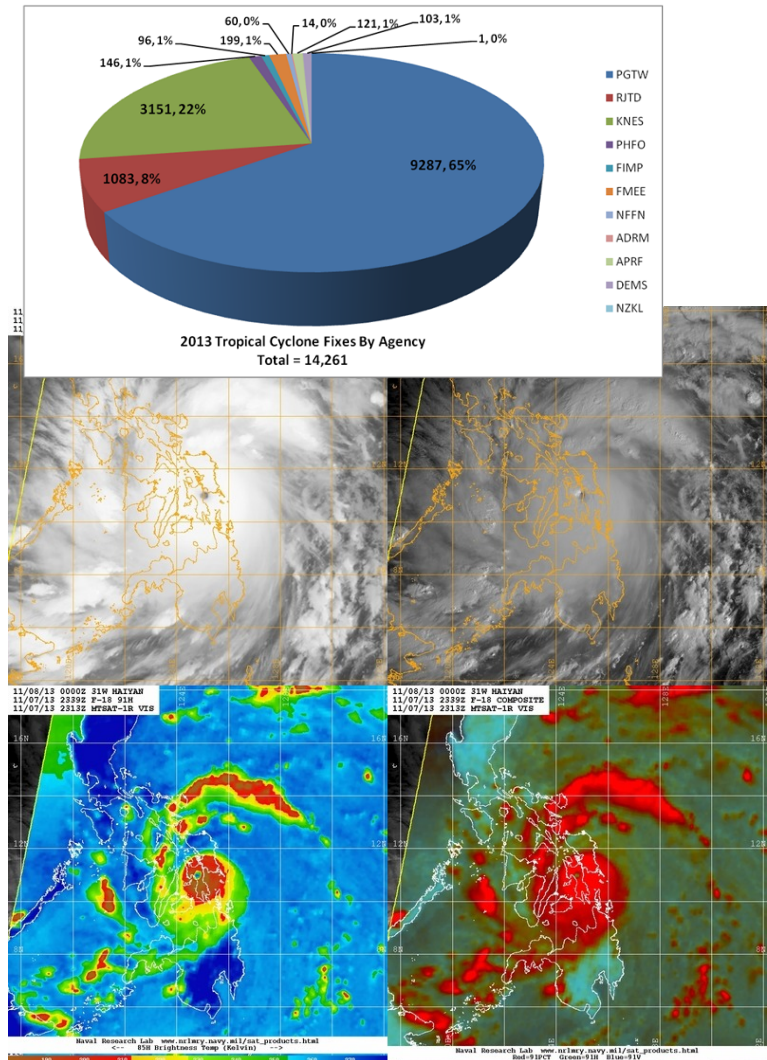
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JTWC Operations

- **AF Satellite TC Reconnaissance**
 - Some of the busiest tropical analysts in the world
 - Produced 65% of ALL fixes in PACOM AOR east of the IDL in 2013
- **Techniques Development Team**
 - Collaborated with AFWA modeling team to implement MEPS for TC forecasting
 - Coordinated evaluation of TC genesis research efforts at UH, ASU, and NPS
- **Automated wx software**
 - Improving analysis and forecast operations
 - Improving data fusion and integration onto single workstation



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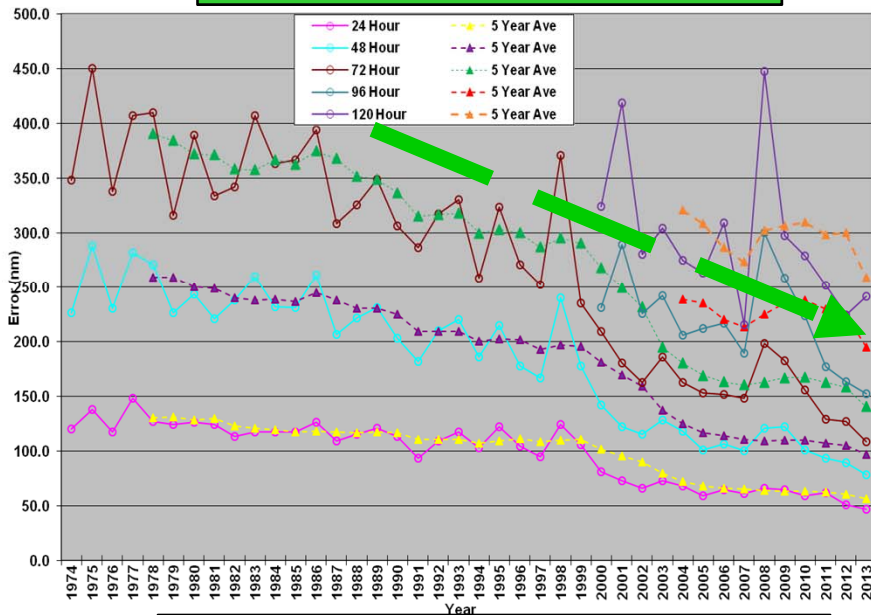


JTWC Operations

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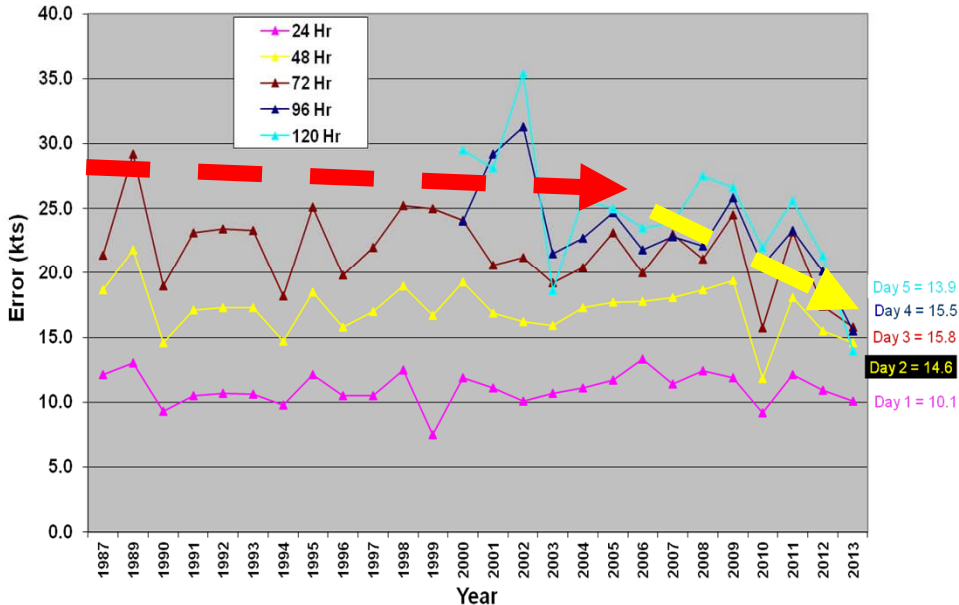
- Progress thus far ... 35+ years of focused R&D and T2
 - Produced incremental track forecast improvement – record setting western North Pacific
 - Demonstrated improved capability for intensity forecasts over the last decade

WPAC Track Error



54% (127nm) improvement at 72 Hours since 1999

WPAC Intensity Error



Nearing 50% improvement in 3-5 day intensity forecast



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Ongoing Efforts Consistent with 2007 Plan

- JCSDA
- NUOPC
- ESPC
- AF Research



2007 Plan: 4 key areas vital to the tropical cyclone forecast/warning program:

- **Advanced observations**
- **Advanced data assimilation technologies**
- **Advanced NWP models**
- **Investment in human and infrastructure resources**

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R20 Focused Initiatives

■ Current JCSDA Initiatives:



Internally Directed Efforts

Assimilation of microwave sensor data (NASA/GSFC)	Improving the use of SSMI/I data within GSI
Assimilation of satellite-derived winds (NASA/GSFC)	Collaboration with NRL on data selection for satellite-derived winds
Achieving Superior Tropical Cyclone Intensity Forecasts by Improving the Assimilation of High-Resolution Satellite Data into Mesoscale Prediction Models (NRL)	Quantify how best to utilize multiple satellite datasets in applications to TC structure/intensity prediction, using advanced data assimilation and high-resolution forecast models
Develop an initial capability for directly assimilating SSMIS radiance data (AFWA/NCAR)	Develop an operator for SSMIS radiance data assimilation and perform seasonal verification testing

External Research Efforts

CIMSS Participation in the Utility of GOES-R Instruments for Hurricane Data Assimilation & Forecasting	University of Wisconsin
Utility of GOES-R Instruments for Hurricane Data Assimilation & Forecasting	Colorado State University

- Advanced data assimilation technologies

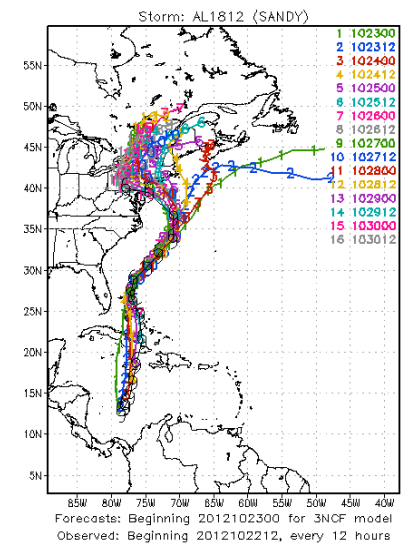


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R20 Focused Initiatives

- **National Unified Operational Prediction Capability (NUOPC)**
 - Operational (2011)
 - Multi-model global ensemble which can be leveraged for TC forecasts
- **Earth System Prediction Capability (ESPC)**
 - Will leverage Hurricane Forecast Improvement Project (HFIP)
 - Planned TC Threat Demonstration - likelihood, track, and intensity

NUOPC Ensemble Mean
NCEP+CMC+FNMO
60-members



- *Advanced NWP*

- *Investment in human resources*

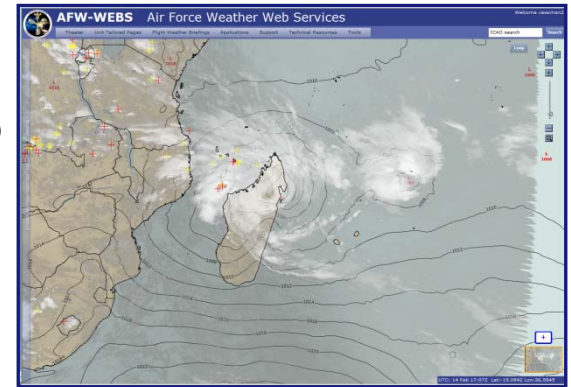


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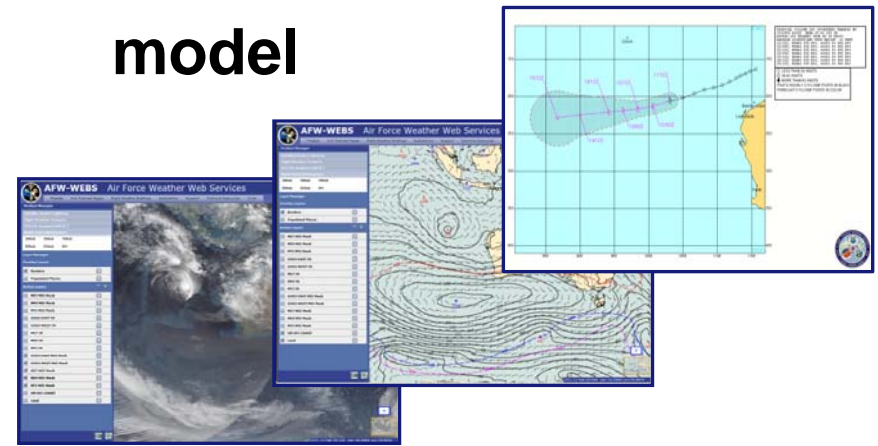
Operational Initiatives

AFWA

- Run UKMO UM to initialize WRF:
 - Uses 4DVAR initialization fields from UKMO
 - 25km horiz res, 70 vert levels
 - 4x/day to 240hrs, 3hr increments
- Future – UM global ensemble (~50km) to add to AFWA’s global ensemble product suite
- UM provides additional output for AFW forecasters supporting AF/Army global operations



UM with Satellite & Spherics Overlay



model

I n t - Advanced NWP models

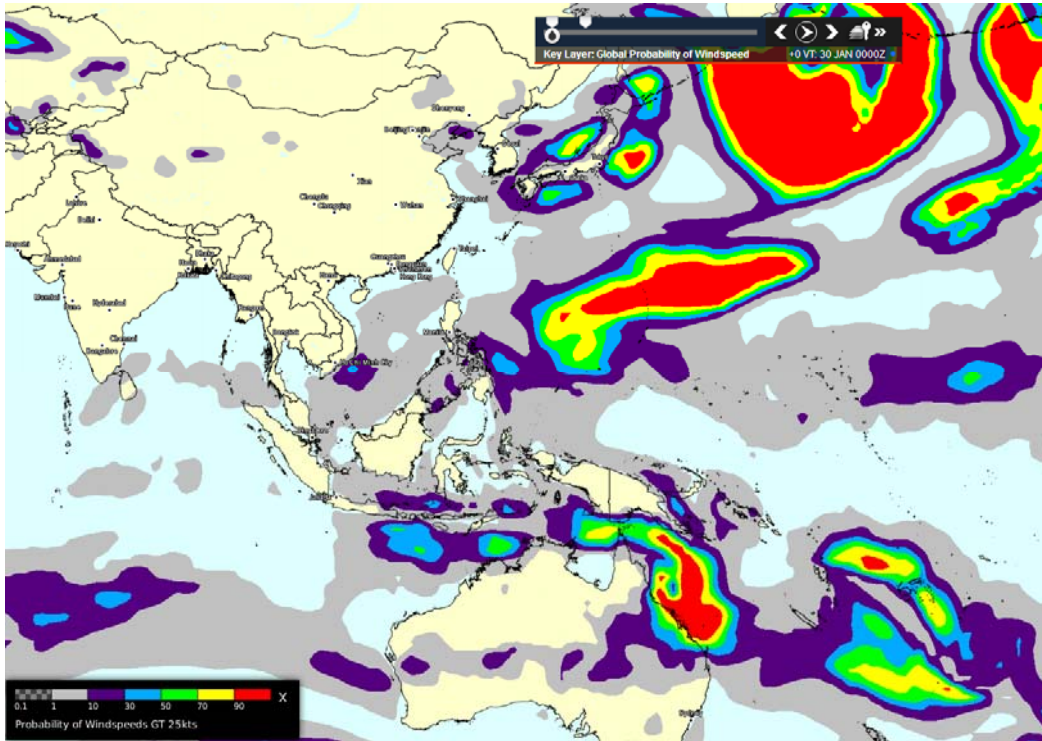
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Operational Initiatives

AFWA



GEPS surface wind plot on AFW-WEBS:

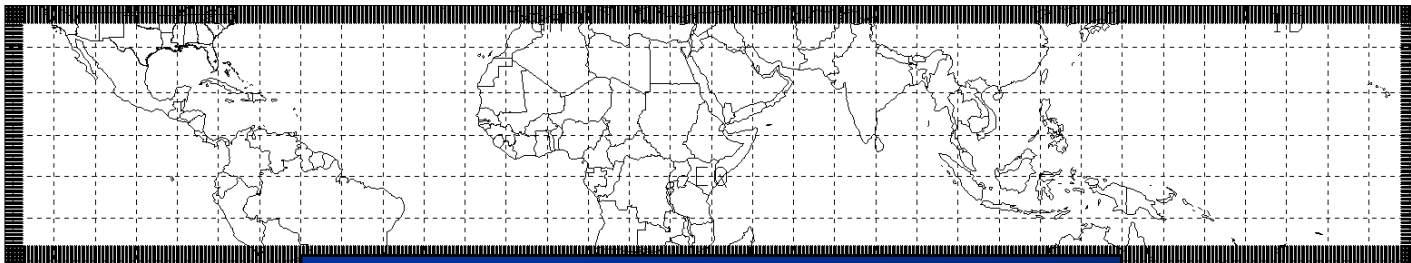
- **Global Ensemble Prediction Suite (GEPS)**
 - 62-member multi-model inputs (GFS, GEM, NOGAPS)
 - 2x/day (00z & 12z)
 - Forecasts to 240 hr

- *Advanced NWP models*



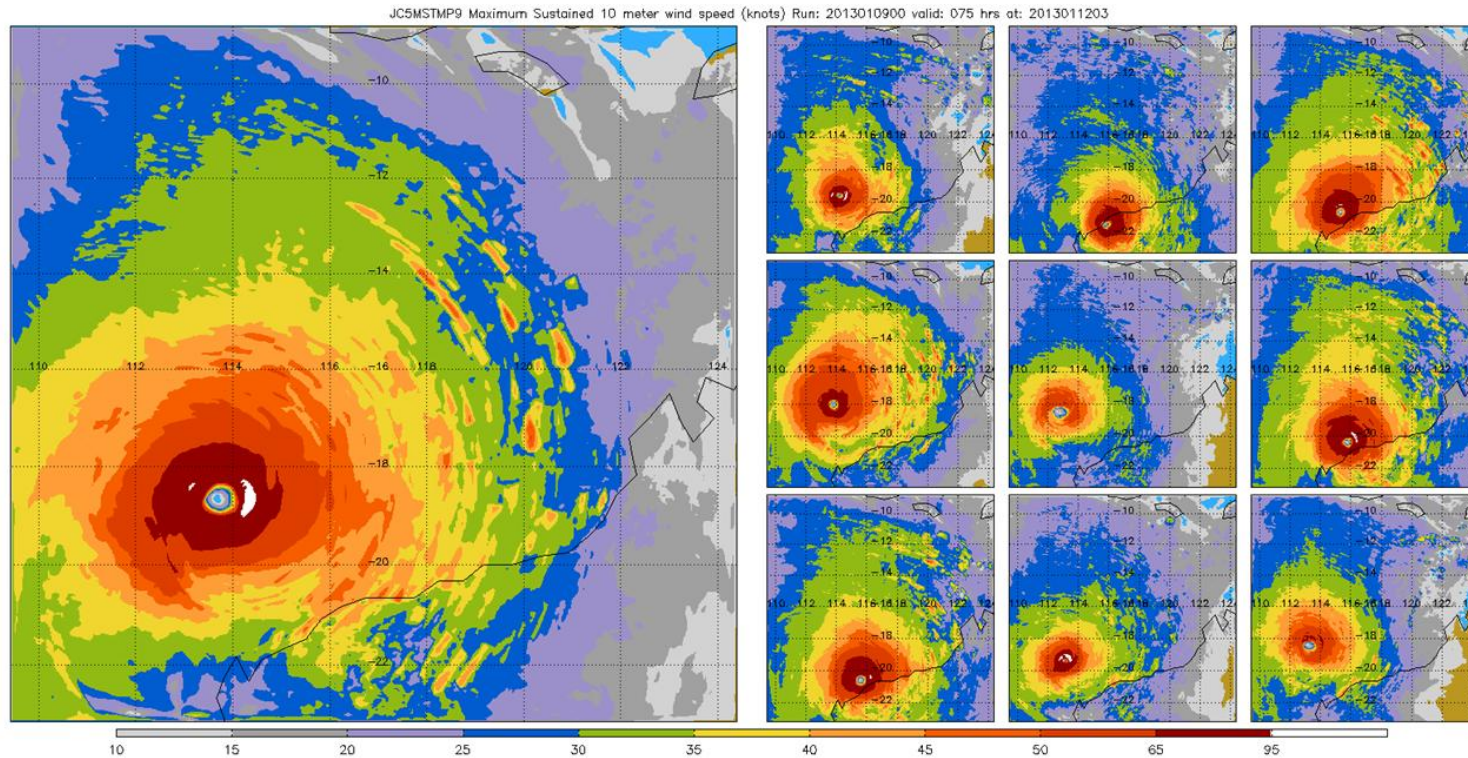
■ Mesoscale Ensemble Prediction Suite (MEPS)

- 10 member set of WRF-ARW w/unique physics configurations
- Initial conditions are deterministic UM, GFS, and GEM (with LIS and Navy SST for land surface)
- 20 km tropical stripe domain to 144 hours run at 06Z/18Z with inline aerosols
- 4 km domains once per day to 72 or 84 hours
 - Several re-locatable 4 km domains including 2 dedicated for JTWC forecasters out to 84 hours
- Tracker bulletins for each ensemble member for each storm





- Sample 4 km MEPS re-locatable domain stamp chart for TC Narelle (75-hour forecast)





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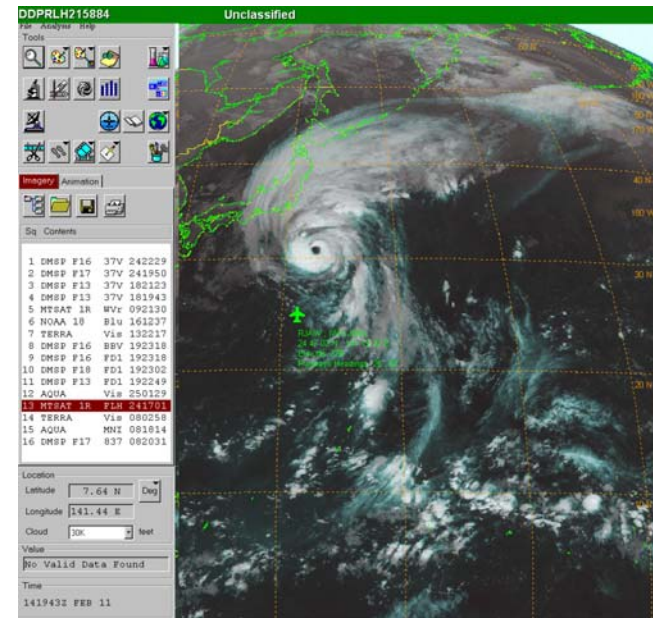
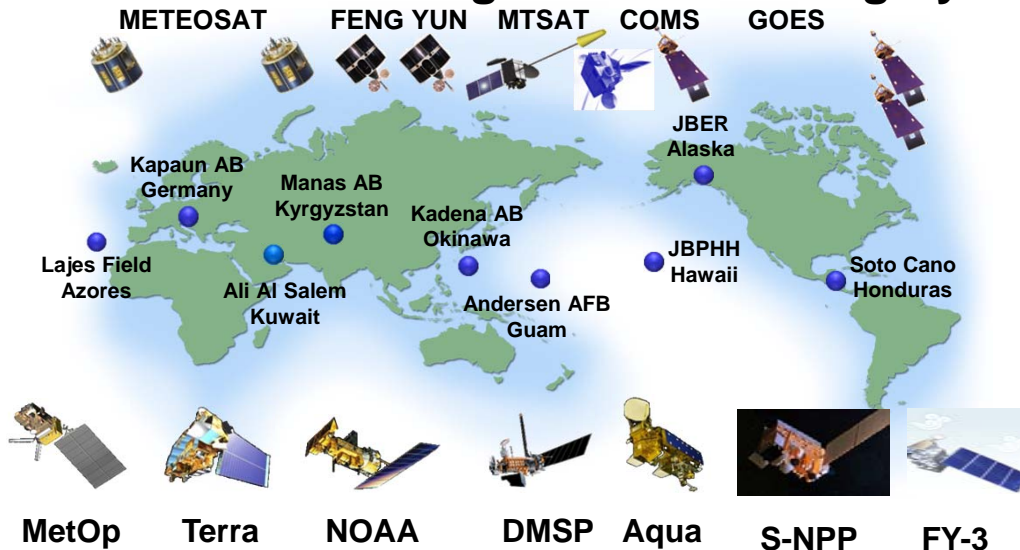
AF Operations

Mark IVB

■ Mark IVB

- X-Band Capabilities now include S-NPP data!
- Global Geostationary Coverage
 - Working closely with NESDIS on Himawari data access and awaiting on MET-7 de-orbit and EUMETSAT decision on replacement

■ Real-time High-Res Polar Imagery



- Advanced observations

- Investment in infrastructure resources

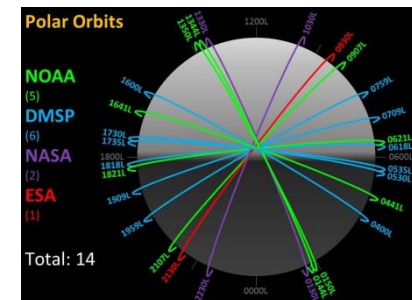
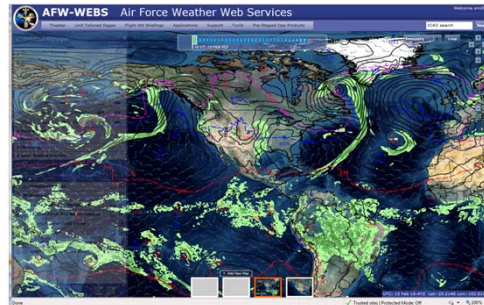
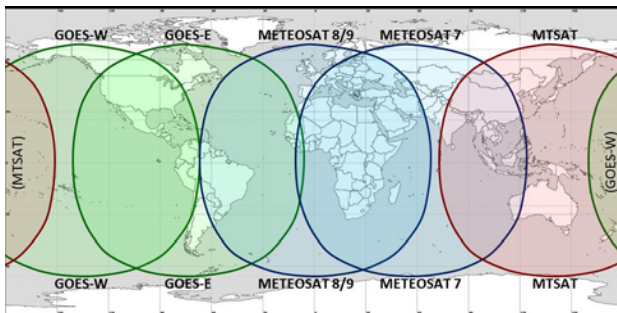


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Operational Initiatives

Other AF METSAT Contributions

- Established DMSP Stored Data Readout at McMurdo
 - Reduced data latency for descending orbits by ~50%
- AFWA “bent-piping” S-NPP data to FNMOC & NAVO
- Working to provide DoD acquisition of future Himawari data
- Provide GIS overlays w/ AFW-WEBS – simultaneously fuse METSAT, model, and observed data together for a complete picture of the atmosphere



- Advanced observations

- Investment in infrastructure resources



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Bottom Line

- Tropical cyclone reconnaissance & warning capability critical to resource protection, operations and saving lives!
- Must continue to work *JOINTLY* to improve analysis and forecast capability...we need significant improvement to intensity forecasts
- Thanks to everyone for the great work!



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