

Headquarters U.S. Air Force

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USAF

Tropical Cyclone Support Challenges and Strengths



**Air Force Director
of Weather**

5 March 2012

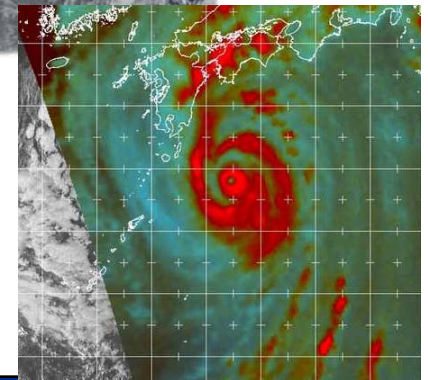
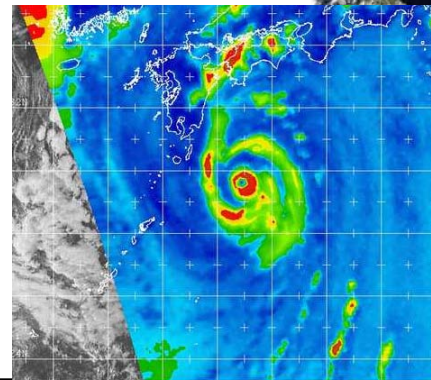
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Overview

- Tropical Cyclone Support
- Challenges and Priorities
- Strengths for the Future
- Community Teamwork



AFW Focused on Supporting the Joint Warfighters

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USAF Tropical Cyclone Support ***The Warfighter Need***

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- **Cyclones are a continuing threat to all air, ground and naval operations**
- **Cyclones are destructive threat to U.S. Government facilities**
- **Coordinated and concentrated effort necessary to meet operational needs**
 - **Increased operating space for Joint and Coalition Forces near cyclones**
 - **Improved operational planning for disaster response / force protection**
 - **Improved resource protection decision making through better forecasts**



2011 TROPICAL CYCLONES - 54



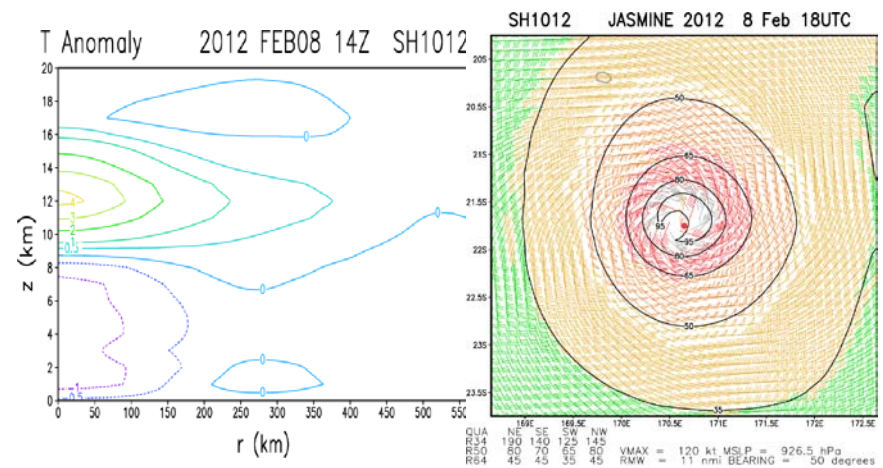
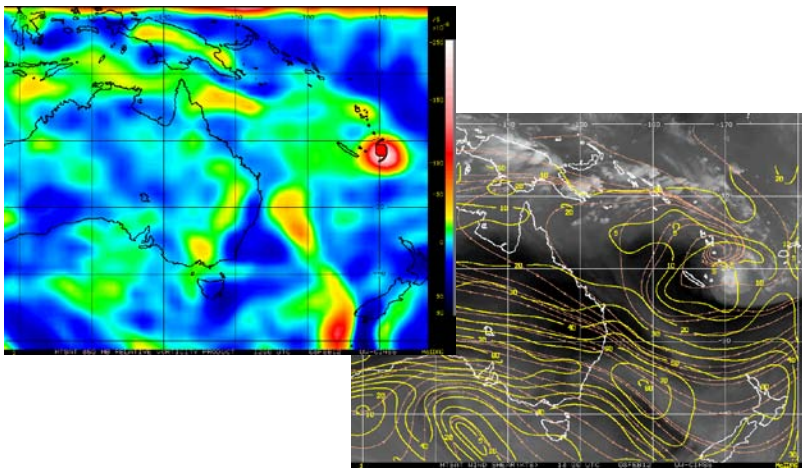
USAF Tropical Cyclone Support

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Thank You for Your Continued Efforts!

Partnerships

- AFRC – Mission critical ops for cyclone fixes by the 403rd Wing/53rd WRS Hurricane Hunters
- NHC – Great support for DoD operations in CONUS & GOM / Caribbean
- JTWC (Air Force/Navy) – 53 years supporting DoD/DoC/DoS & Nations
- NHC, CPHC, JTWC Cooperation – ATCF, Fixes, Personnel & Tech Exchange
- NOAA: NWS, NESDIS, OAR – TC Fixes, Training, Funding Advocacy
- UW-CIMSS & CIRA RAMMB – TC Diagnostic and Forecasting Tools
- Plus more....



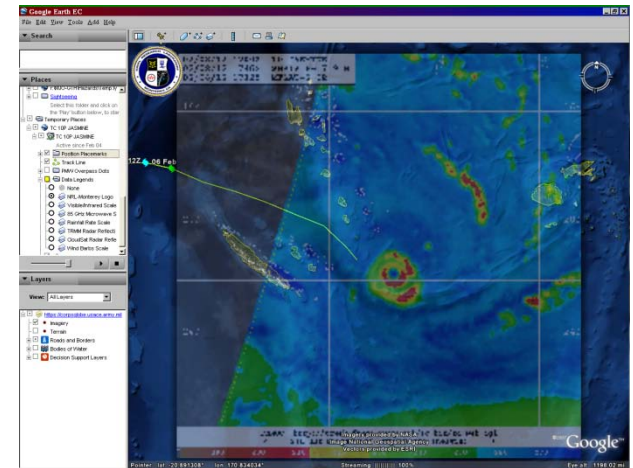
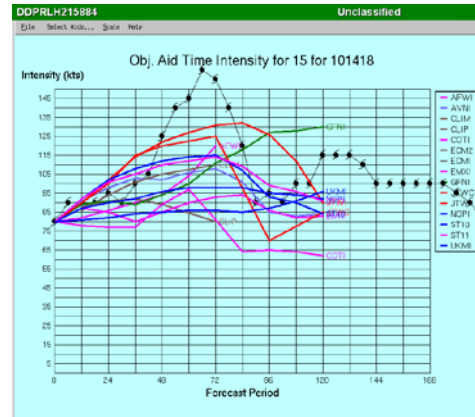
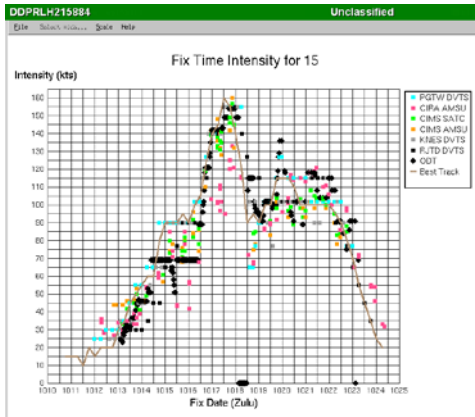
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USAF Tropical Cyclone Support JTWC Challenges and Operational Priorities

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- Top priority is intensity/structure ... we need to improve:
 - Satellite-based intensity/structure estimates – especially microwave
 - Cyclone intensity and rapid intensification guidance
 - Specification of cyclone structure (wind strength and distribution)
- Tropical Cyclone genesis determination
- Continue to enhance forecaster tools



We Need Continued Support from the Research Community

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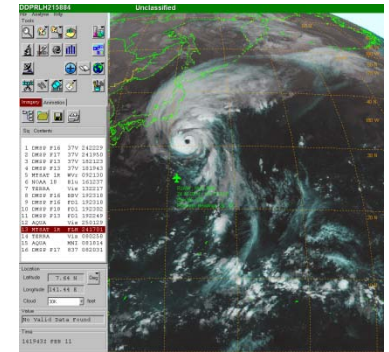


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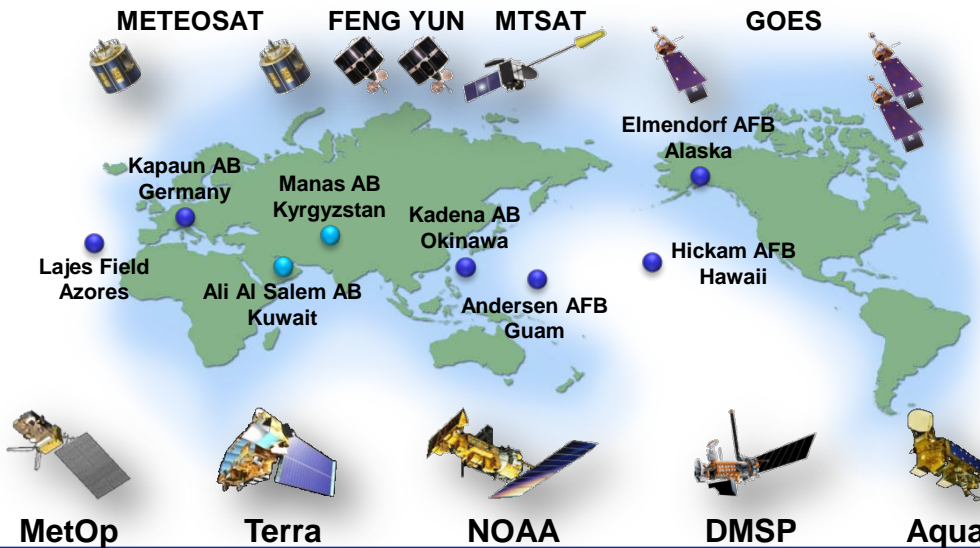
Strengths Now and for the Future

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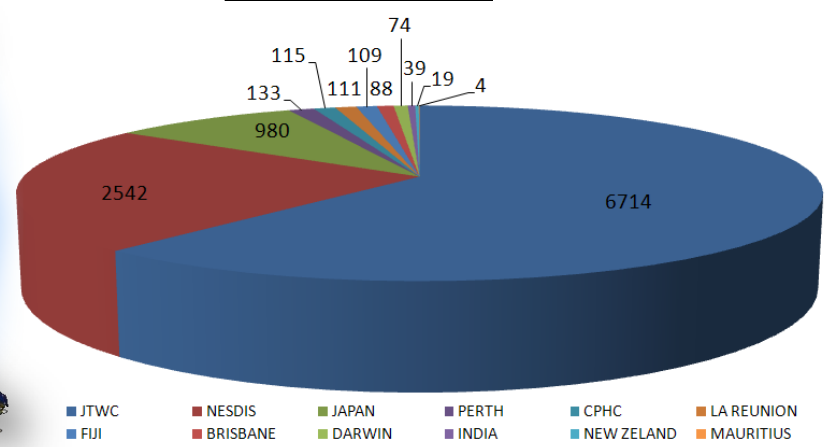
- Continued test/transition mature research to operations
- Data (fixes, tracks, models) available for research
- USAF Mark IVB
 - X-Band Upgrade adds EOS capability (Aqua & Terra)
 - Projected Completion May 2012



- Global Geostationary Coverage
- Real-time Polar Imagery



2011 Fix Totals By Agency





USAF Tropical Cyclone Support

Strengths Now and for the Future

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■ WSR-88D

- Kadena AB Okinawa and Andersen AFB Guam
- Super Typhoon Songda destroyed Kadena radar but scheduled for replacement in time for 2012 WPAC storm season

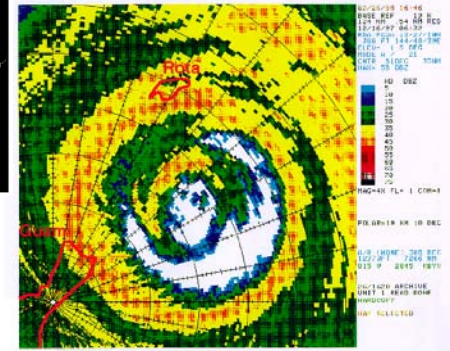
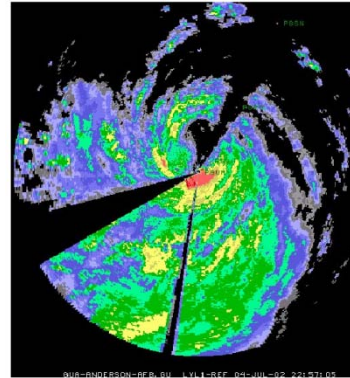


Figure D-2 Same as Fig D-1, except zoomed in.

■ Hurricane Hunters – WC130J

- AFRC environmental recon mission corrects/validates satellite interrogation techniques



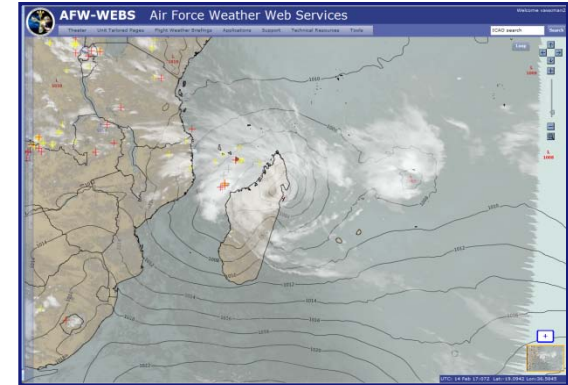


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Strengths Now and for the Future

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- **AFWA is currently running UKMO UM:**
 - Uses 4DVAR initialization fields from UKMO
 - 20km horiz. res., 70 vert. levels
 - 3x/day to 240hrs, 1x/day to 384hrs,
 - 00-42hr (hourly), 45-240hr (3-hourly), 246-384 (6-hourly)
- **Future – UM global ensemble (~50km) to add to AFWA’s global ensemble product suite**
- **UM provides an additional asset along with GFS / NOGAPS for AFW forecasters supporting DoD global ops**



UM with Satellite & Spherics Overlay





USAF Tropical Cyclone Support

Strengths Now and for the Future

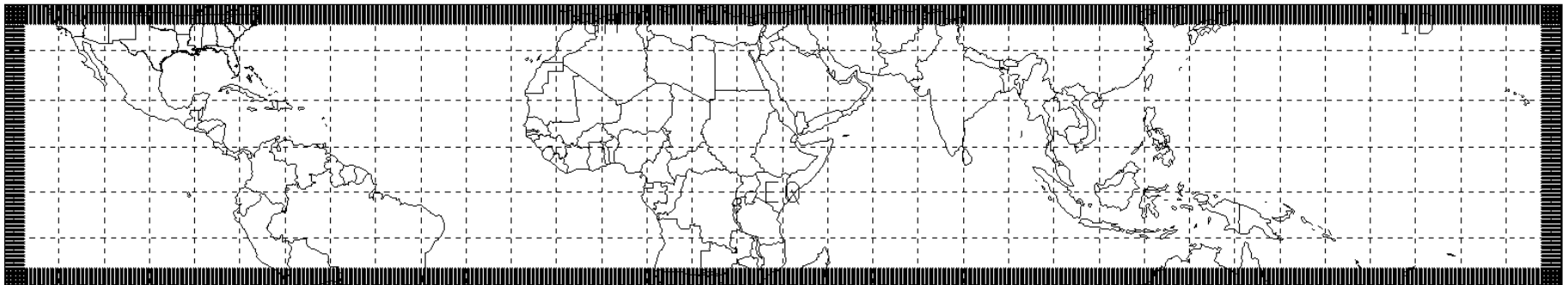
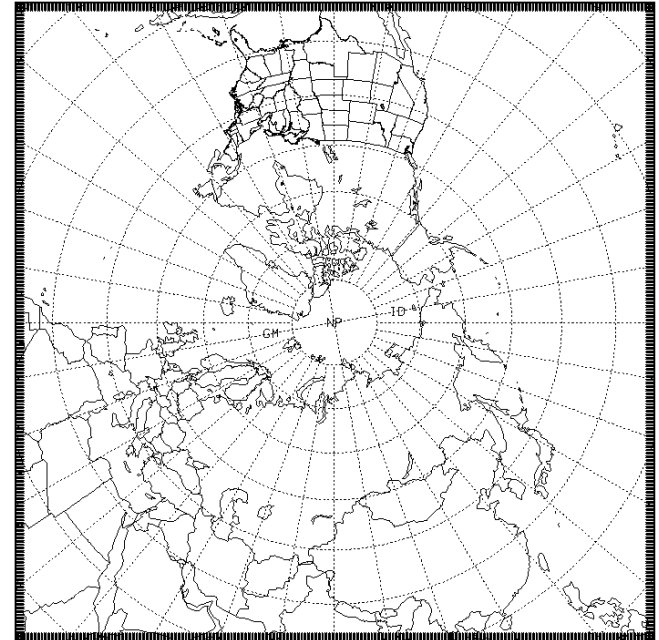
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■ AFWA's near future mesoscale ensemble

- UM, GFS, NOGAPS & GEM used for initial and lateral boundary conditions
- ~20km resolution, 2x/day to 144 hours
- "Global" Coverage
 - N. Hemisphere & Tropical stripe initially
 - S. Hemisphere added later
- High-Res 4km contingency ensemble
 - User defined grid box

■ Tropical ensemble domain...

- ...supports DoD regional operations
- ...provides an added, extended-range modeling tool for tropical storm forecasters



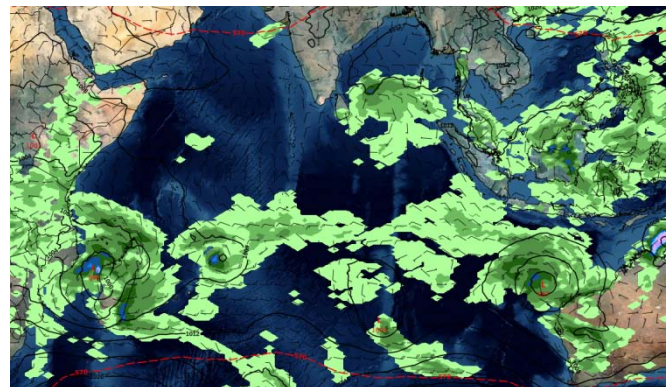
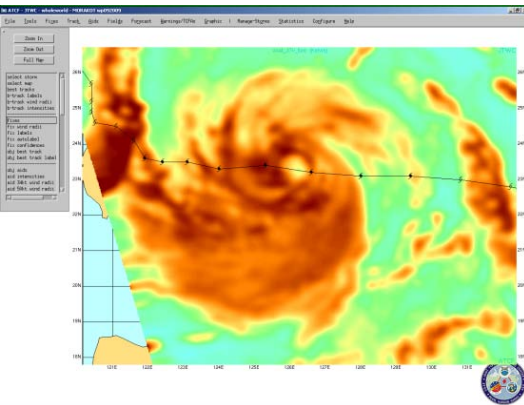
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USAF Tropical Cyclone Support Community Teamwork

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- Operations guiding research decisions
- Communications and interoperability
- National and international collaboration
 - Knowledge Sharing & Data exchange
 - Space-based sensing
 - Numerical Weather Prediction
- Global Hawk
 - Potential operations from Andersen AFB



Taiwan Central Weather Bureau
DOTSTAR Aircraft Dropsonde Data
during Super Typhoon Megi



Bottom Line

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- Tropical cyclone reconnaissance and warning capability critical to warfighters... important to operations and saving lives!
- Must continue to work *JOINTLY* to improve analysis and forecast capability... we need significant improvement to intensity forecasts by 2015!!
- This is a **TEAM SPORT** ... Thanks to everyone for the great work!



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Questions?



AFW...Supporting Joint Warfighters...24x7!

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Backups

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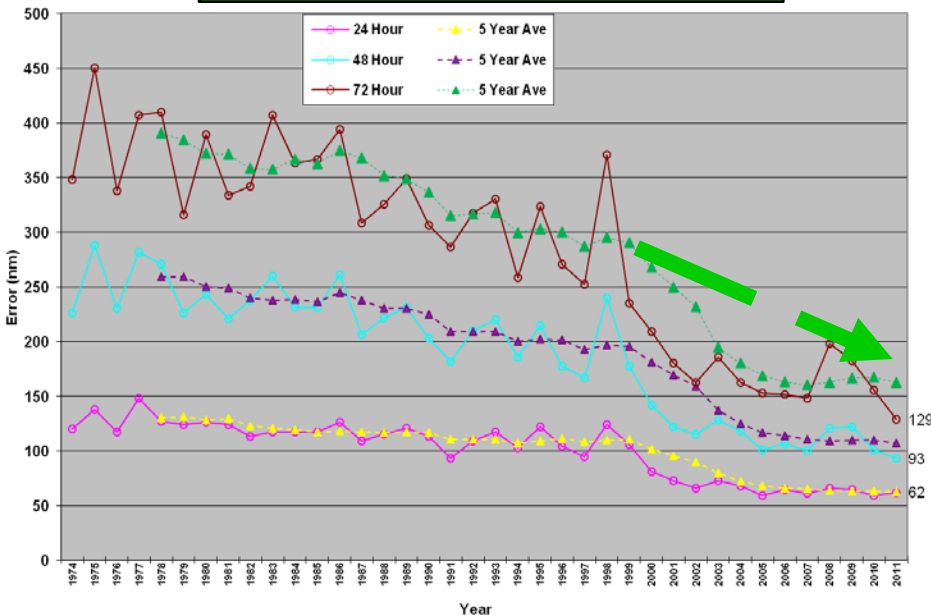


USAF Tropical Cyclone Support JTWC Challenges and Operational Priorities

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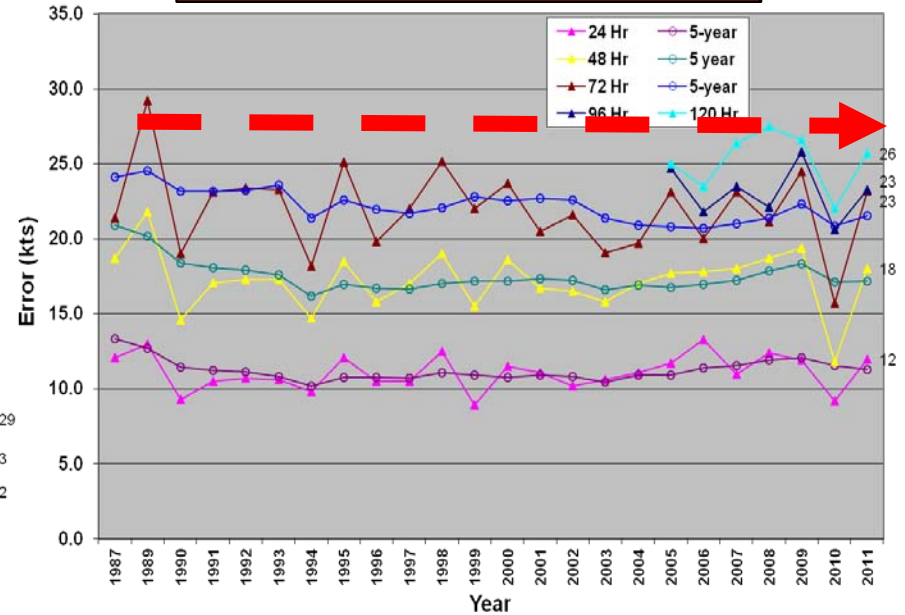
Progress thus far ... 35+ years of focused R&D and T2

WPAC Track Error



**Significant gains since 1999
42% improvement at 72 Hours**

WPAC Intensity Error



**Continues to be a Challenge
We must work this by 2015**