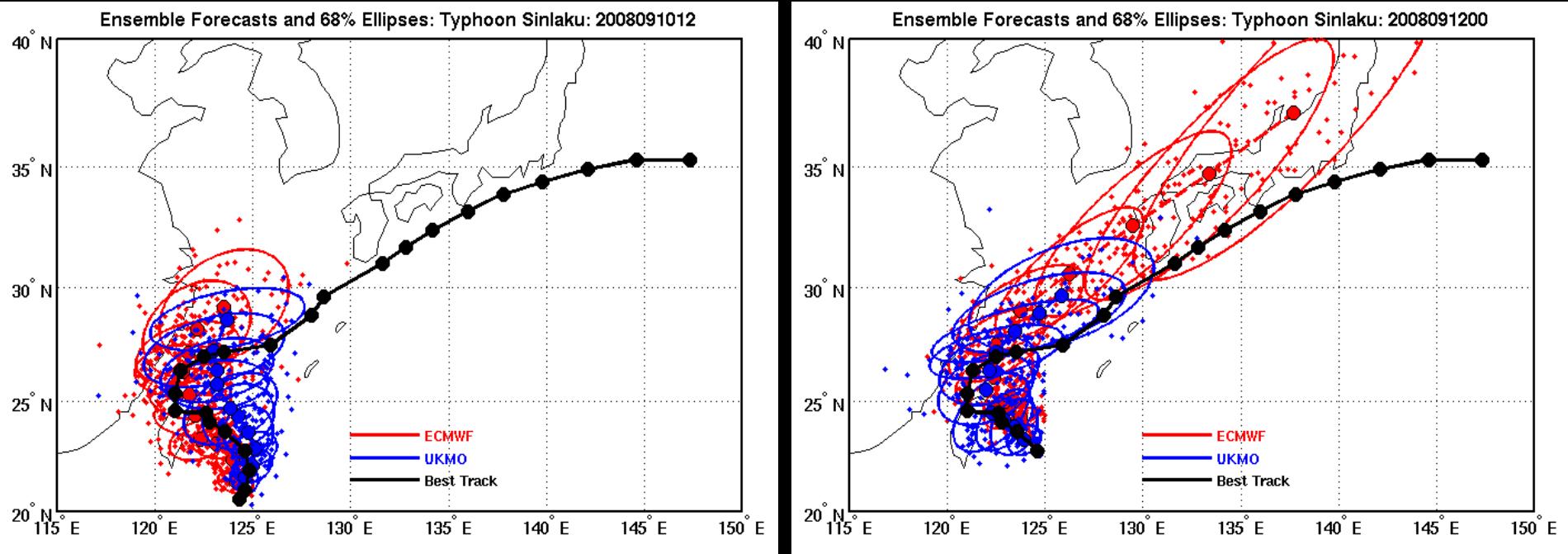


Western North Pacific Tropical Cyclone Observations with the Global Hawk: Operational Requirements, Benefits, and Feasibility

Patrick A. Harr, Naval Postgraduate School, Monterey, CA

ECMWF/UKMO Ensemble track predictions for TY Sinlaku in 2008



Forecasts obtained from the THORPEX Interactive Global Grand Ensemble (TIGGE) database

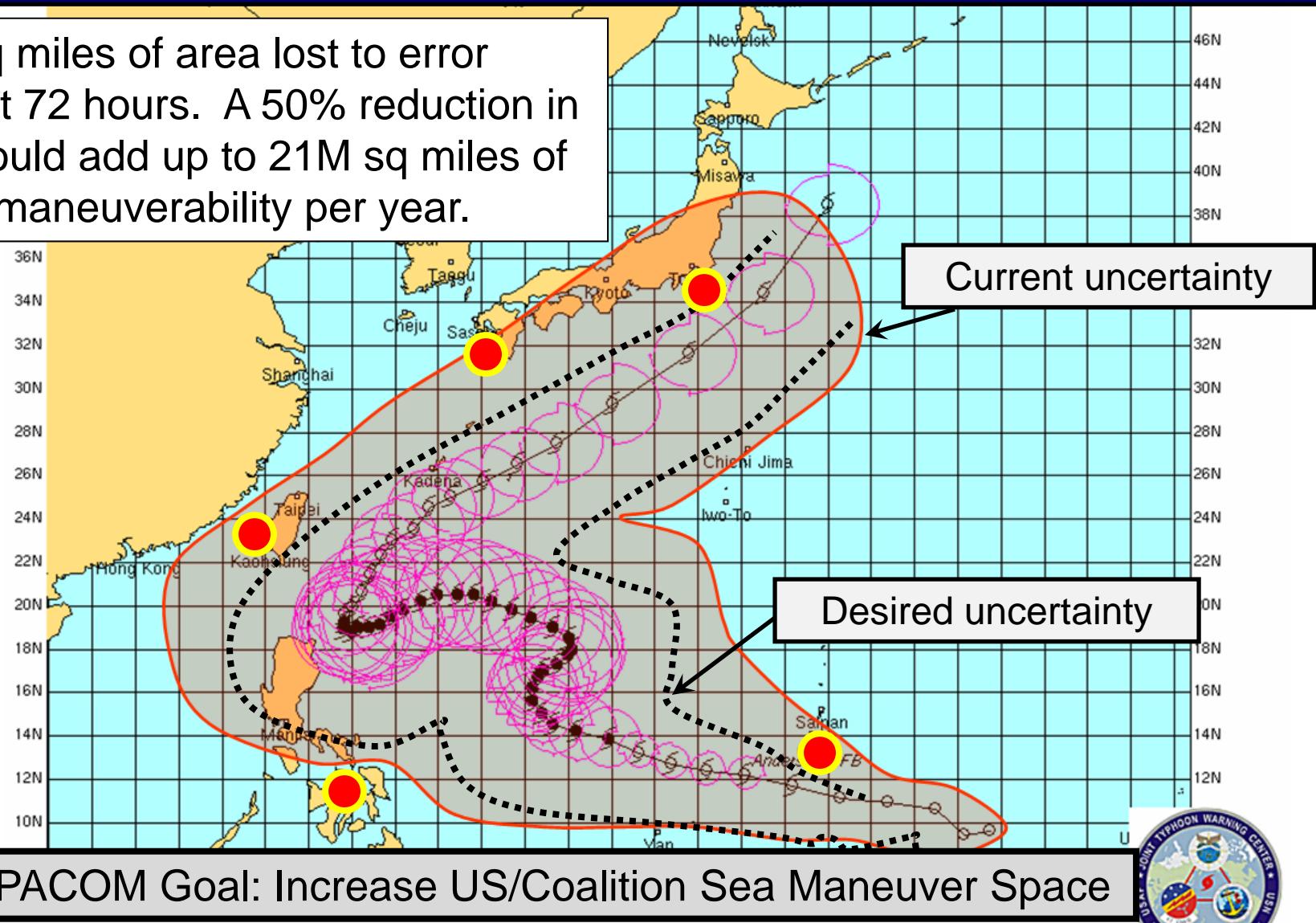
Uncertainty characteristics vary throughout the lifecycle of tropical cyclone

- Cross-track uncertainty prior to recurvature
- Along-track uncertainty after recurvature



Western Pacific: Active Area of Maneuverability

1.4M sq miles of area lost to error swath at 72 hours. A 50% reduction in error would add up to 21M sq miles of air/sea maneuverability per year.



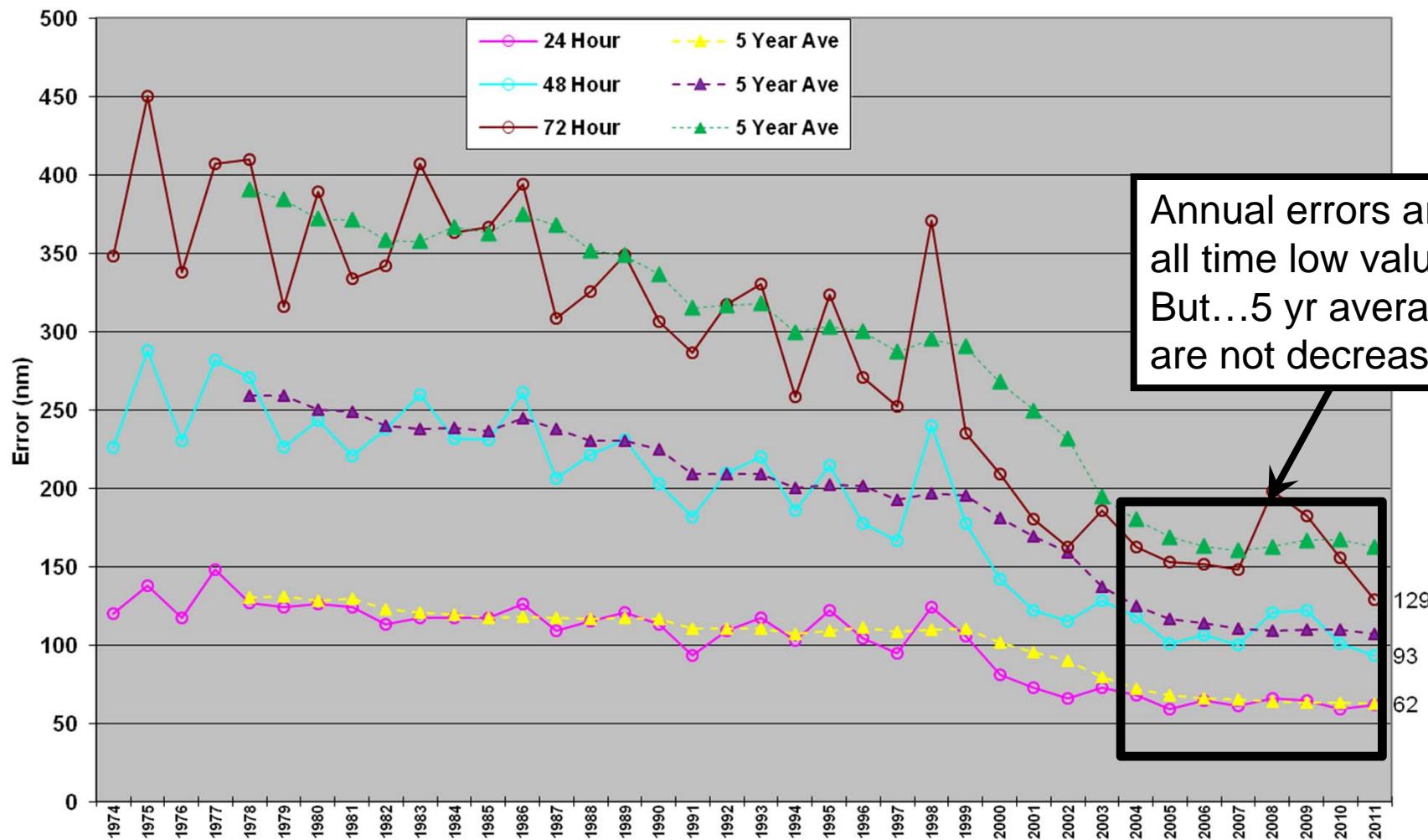
CAPT M. Angove USN (ret.)





JTWC TRACK ERRORS

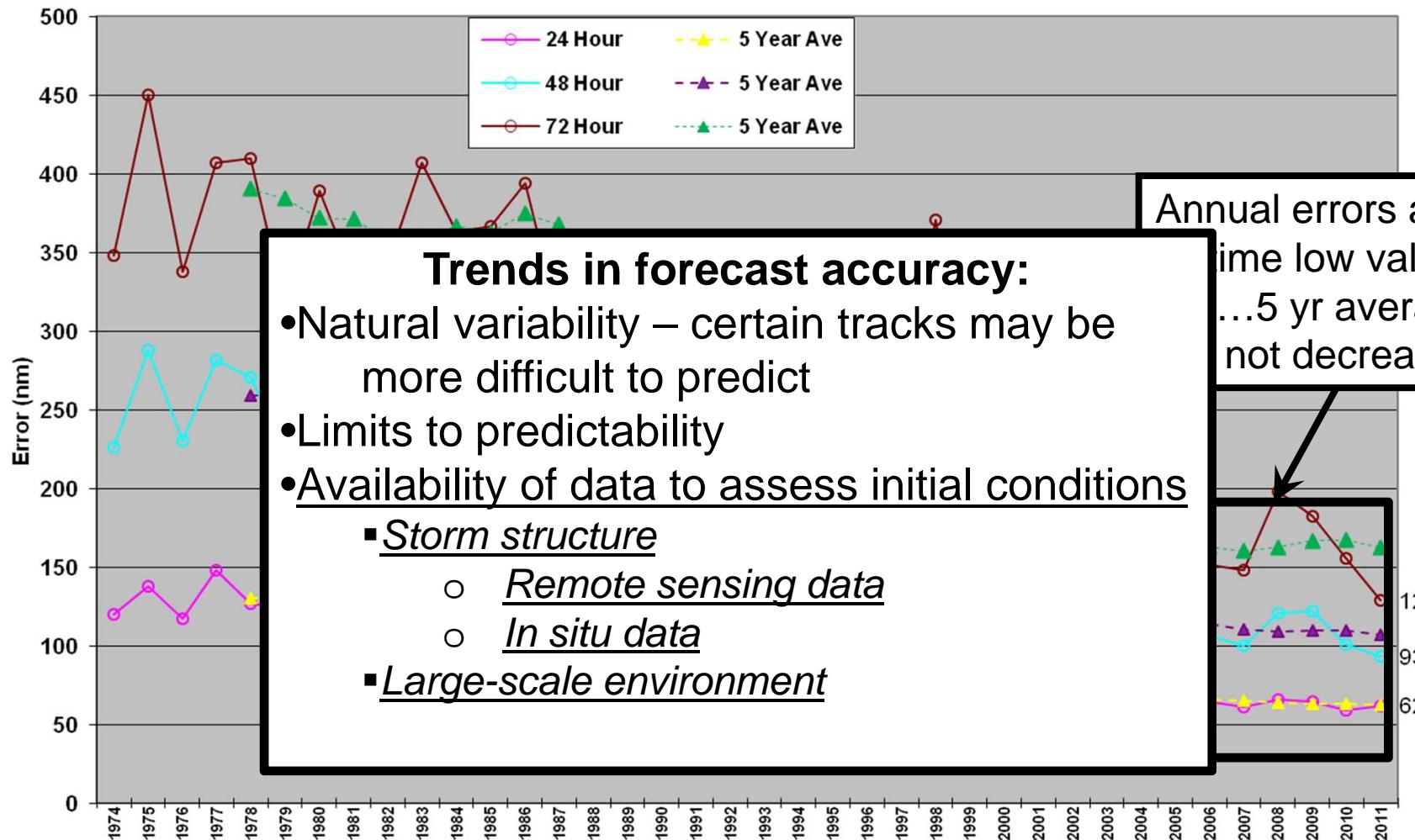
(Western North Pacific - 24-72 Hours)





JTWC TRACK ERRORS

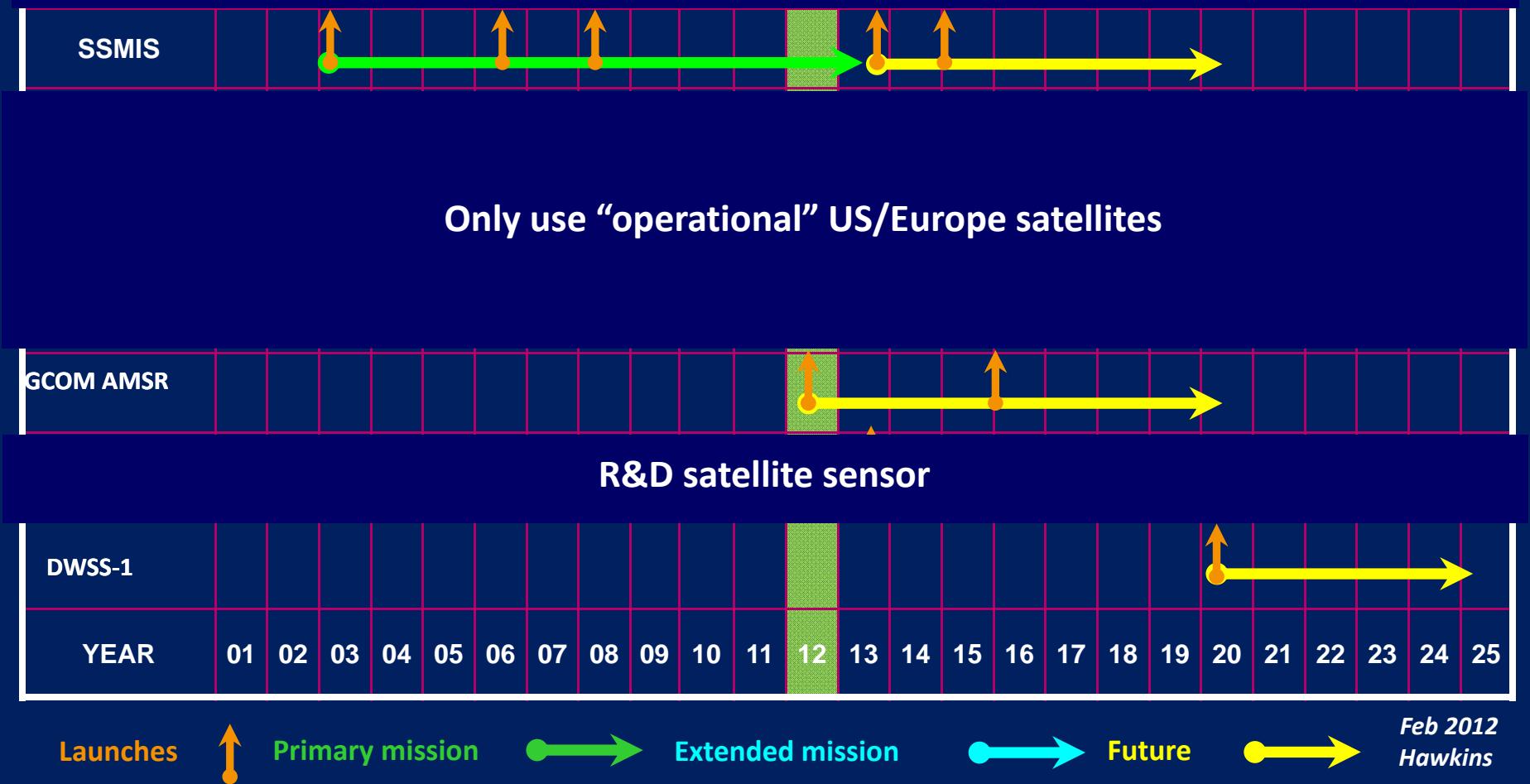
(Western North Pacific - 24-72 Hours)



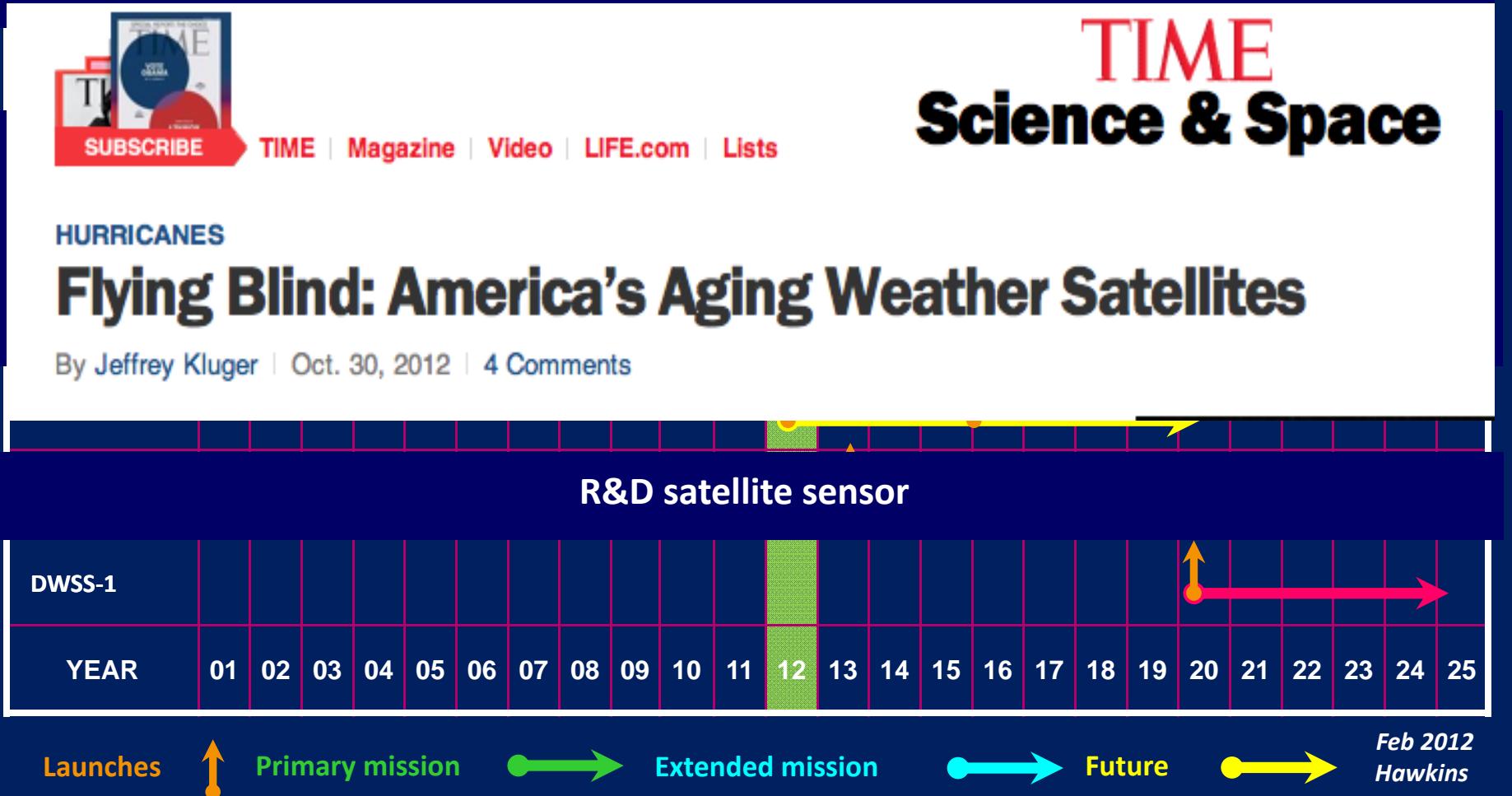
Passive Microwave Imager Missions

From Jeff Hawkins (NRL Monterey)

What's left in a few years after SSM/I and old R&D satellites fail

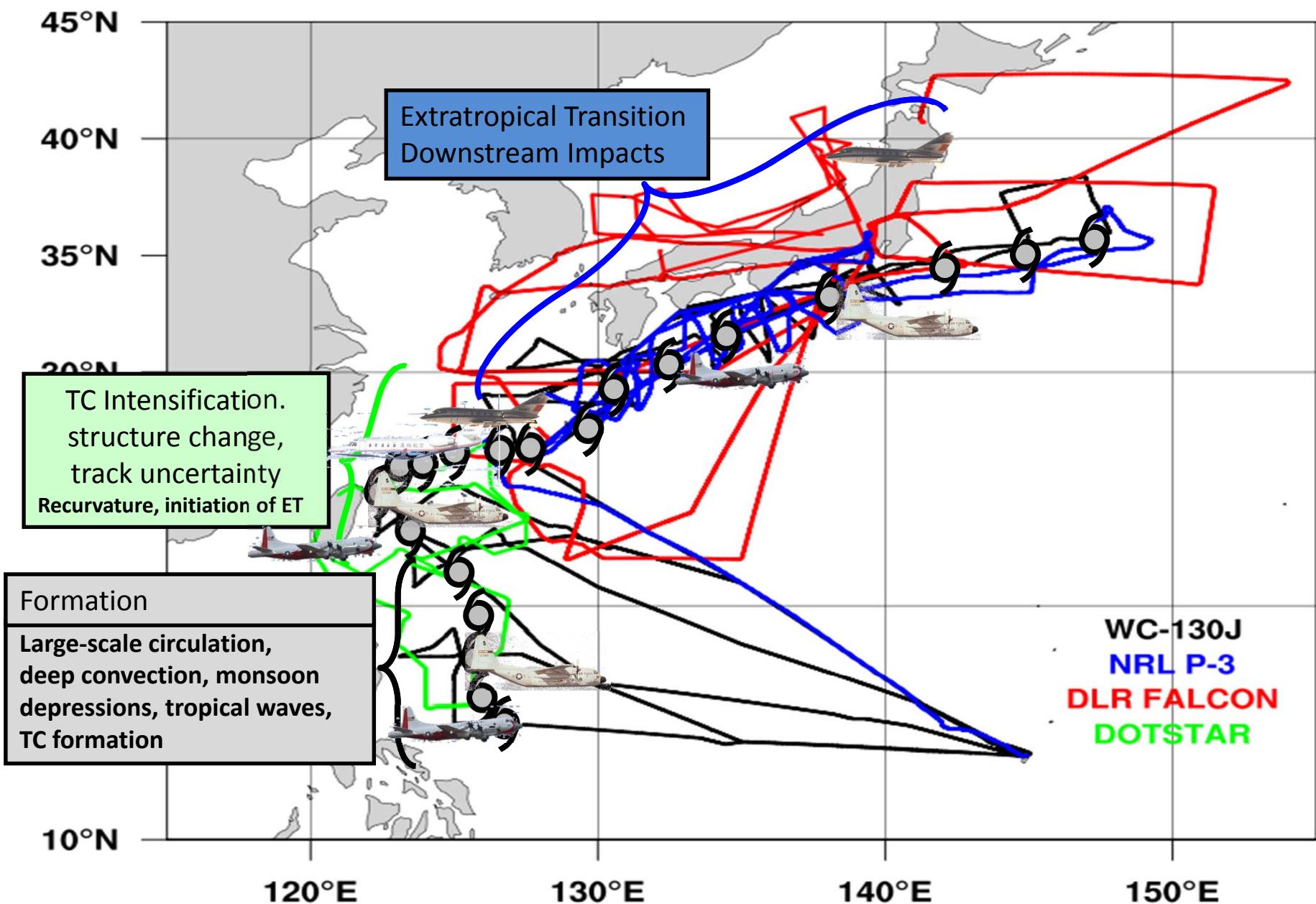


What's left in a few years after SSM/I and old R&D satellites fail

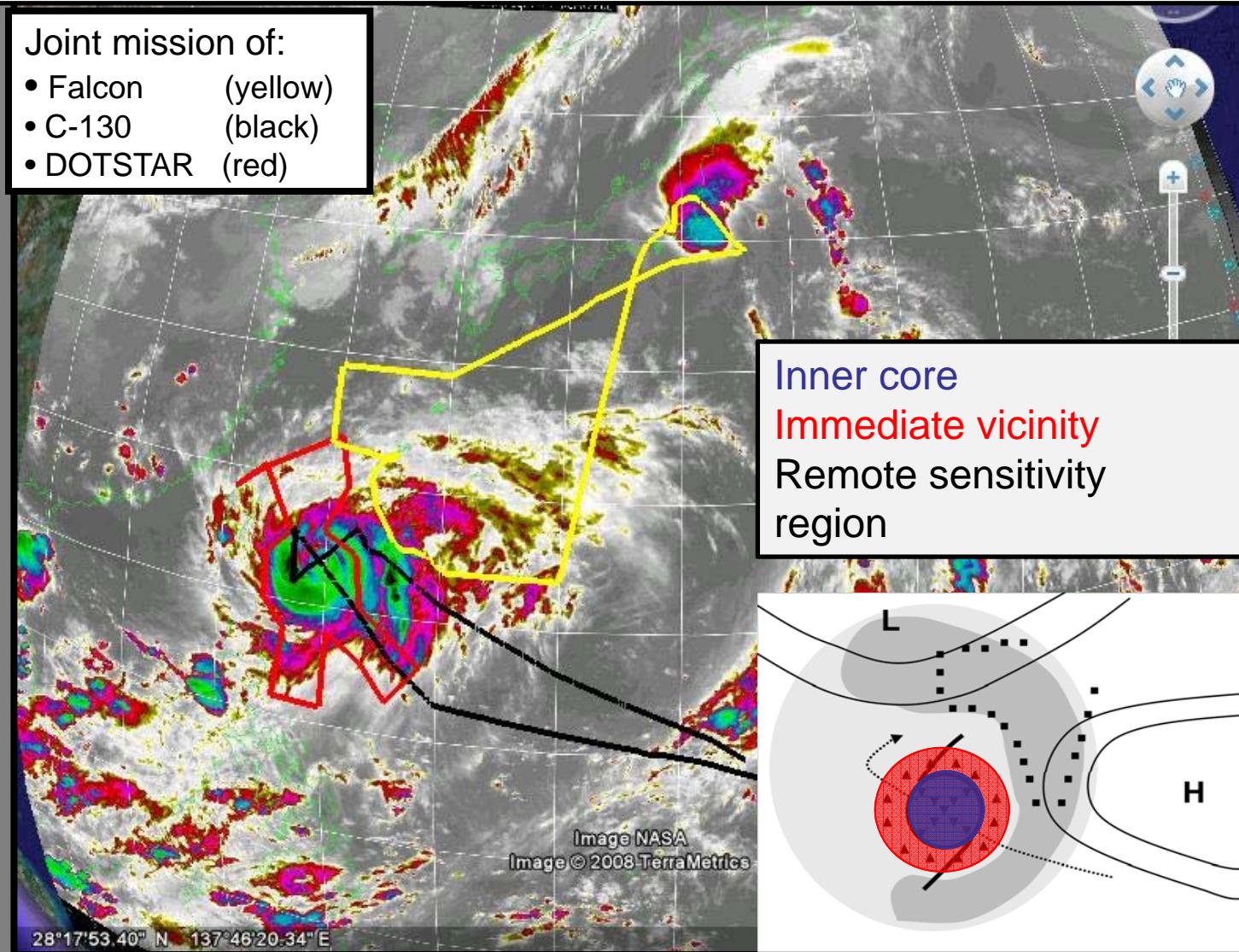


T-PARC/TCS-08

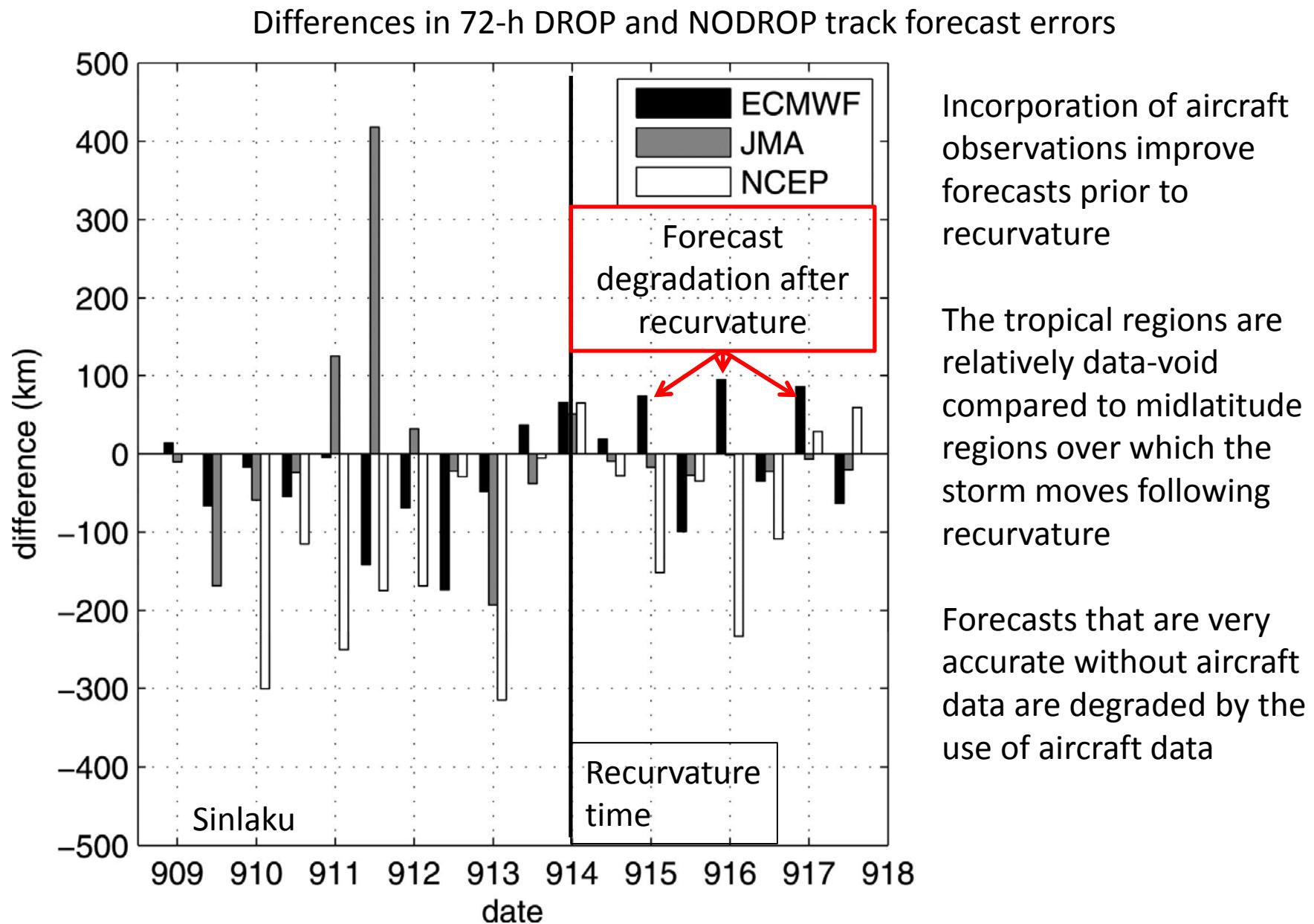
All Aircraft Flights for TY Sinlaku



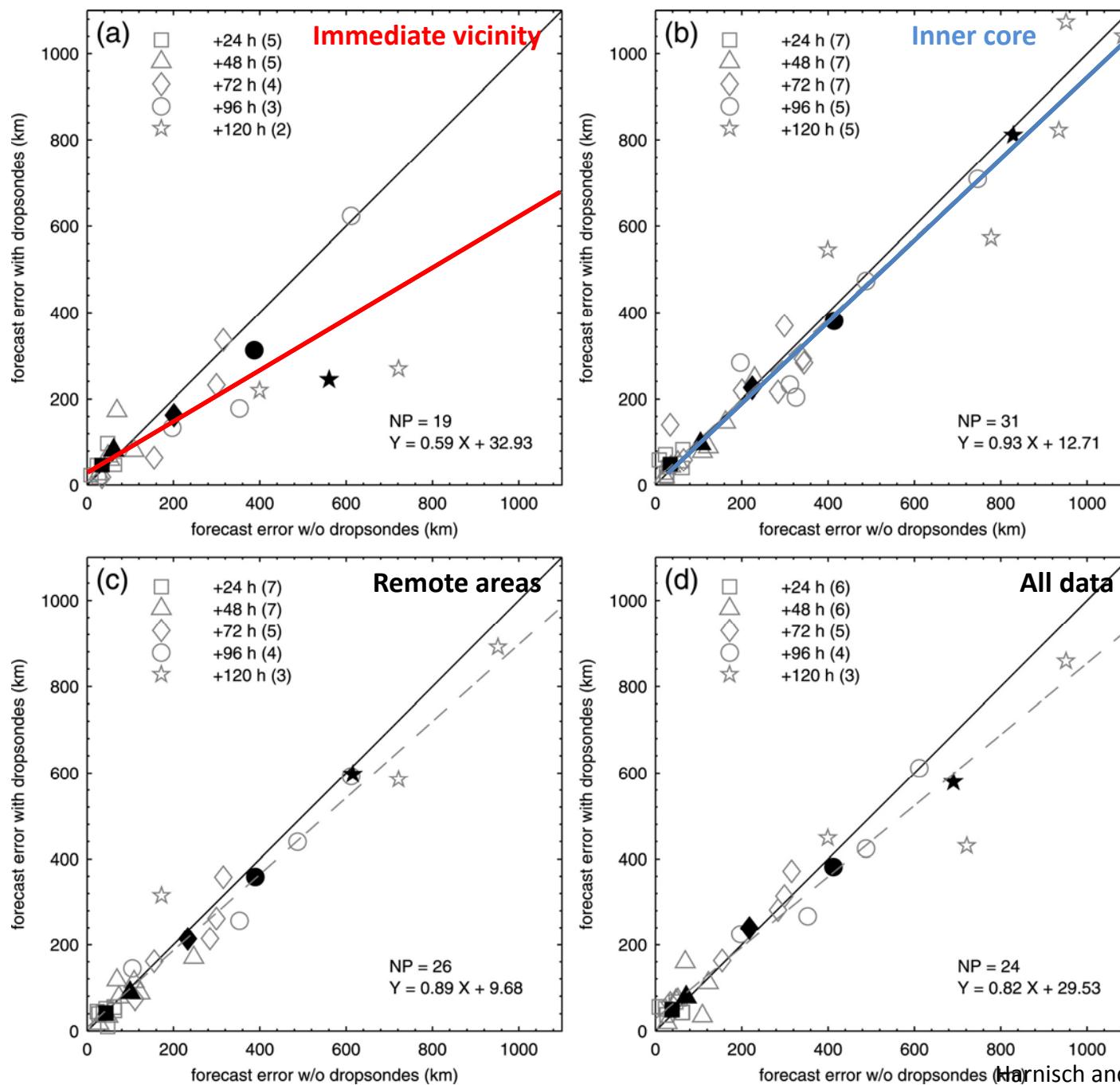
Simultaneous observations of TY-core, TY-environment and distant sensitive region associated with TY Sinlaku



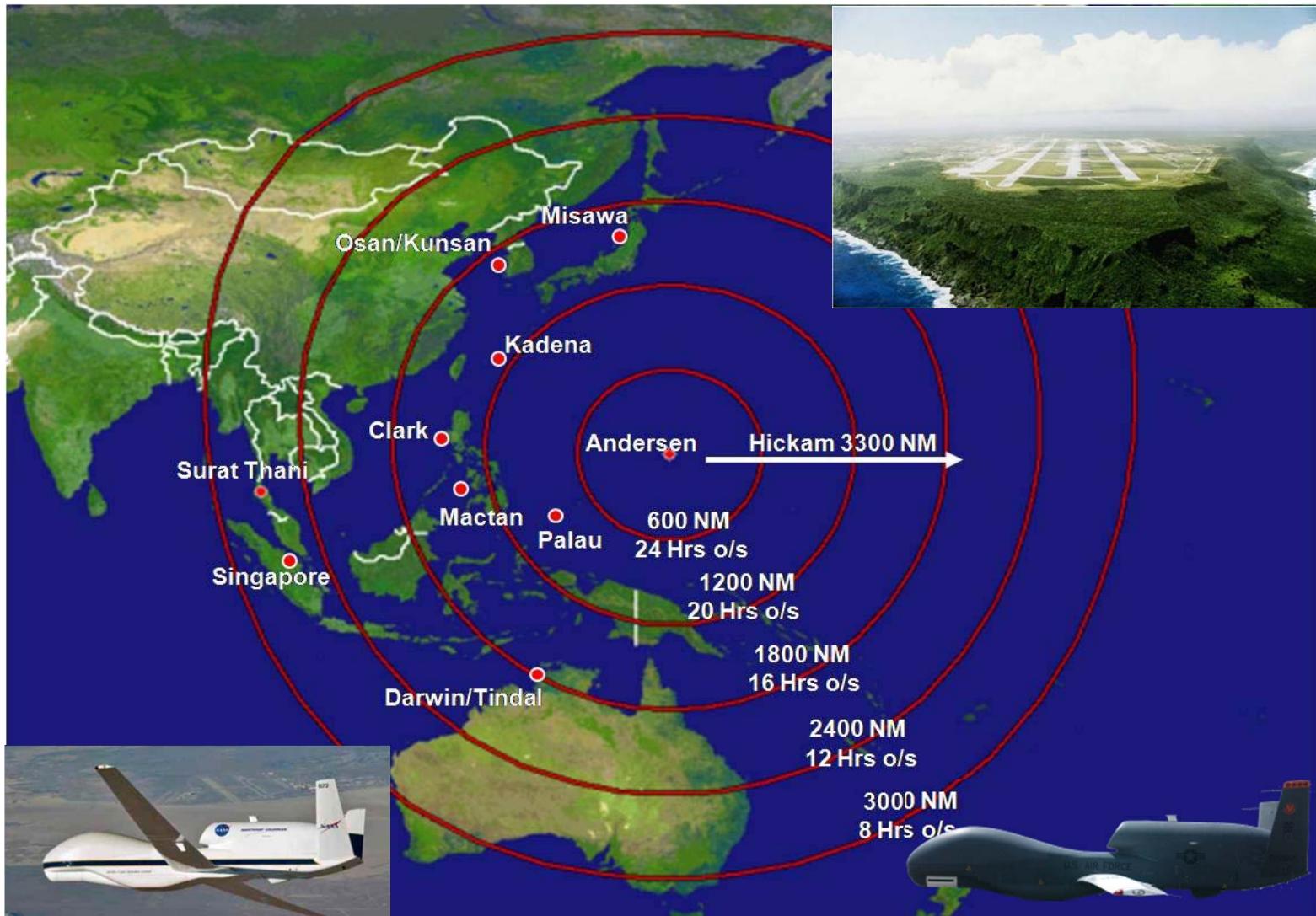
From M. Weissmann



Scatter plots of ECMWF track forecast errors using subsets of dropwindsondes versus the control run in which no dropwindsondes were used



Western North Pacific Tropical Cyclone Reconnaissance: Andersen



Lt Col Jason Patla 17th OWS/CC

Global Hawk Instrumentation

Increase understanding of basic physical processes

Improve initial conditions in numerical forecast models

- Dropwindsondes**

- Basic sensor that provides numerous profiles of the entire typhoon environment
- Intended to improve weather models used to forecast TC location and intensity

- Remote Sensing**

- Hurricane Imaging Radiometer (HIRAD)**

- Over-ocean surface wind speed
 - Over-ocean surface rain rate

- High Altitude Imaging Wind and Rain Profiler (HIWRAP)**

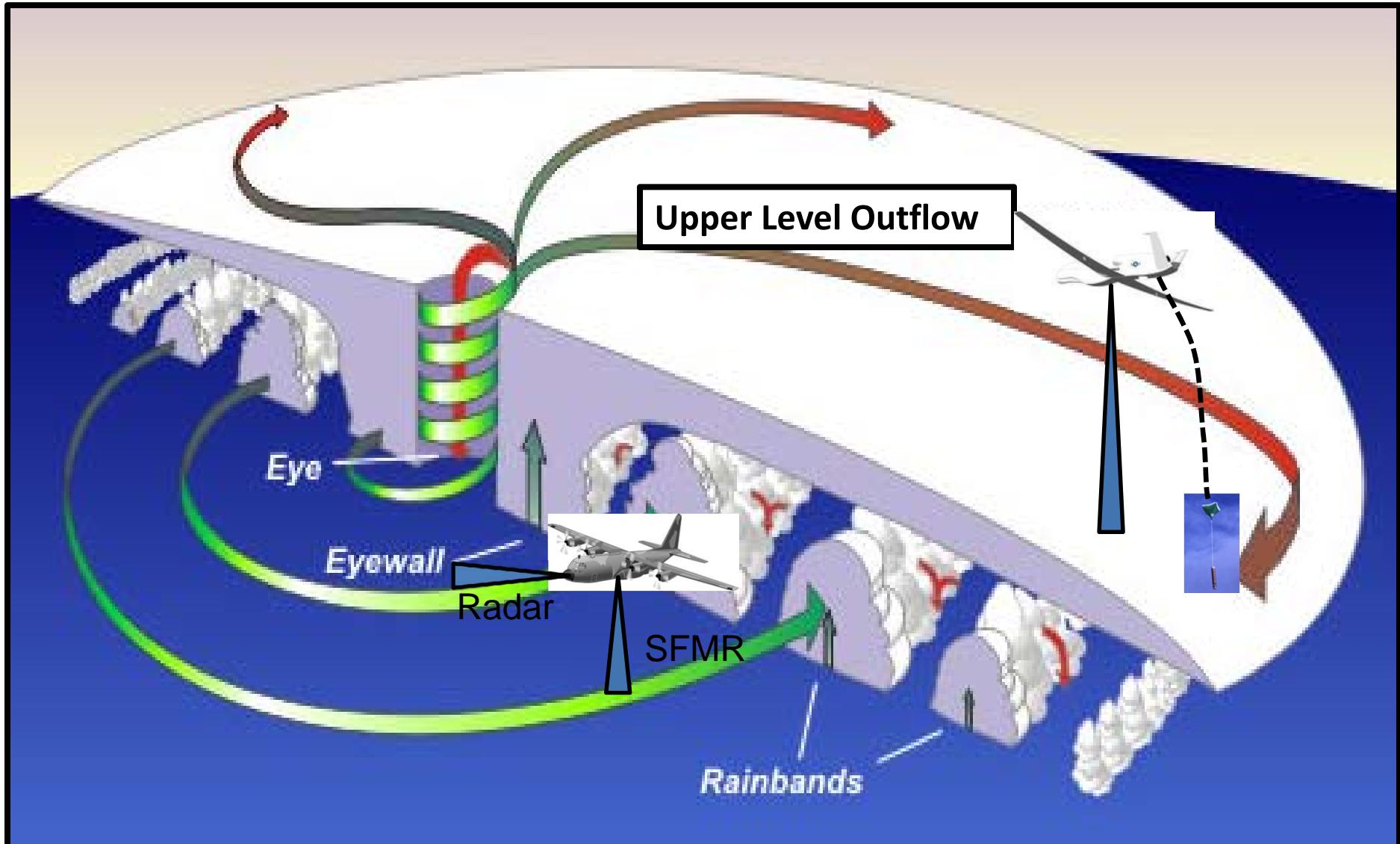
- Three dimensional profiles of winds and rain

- High Altitude MMIC Sounding Radiometer (HAMSAR)**

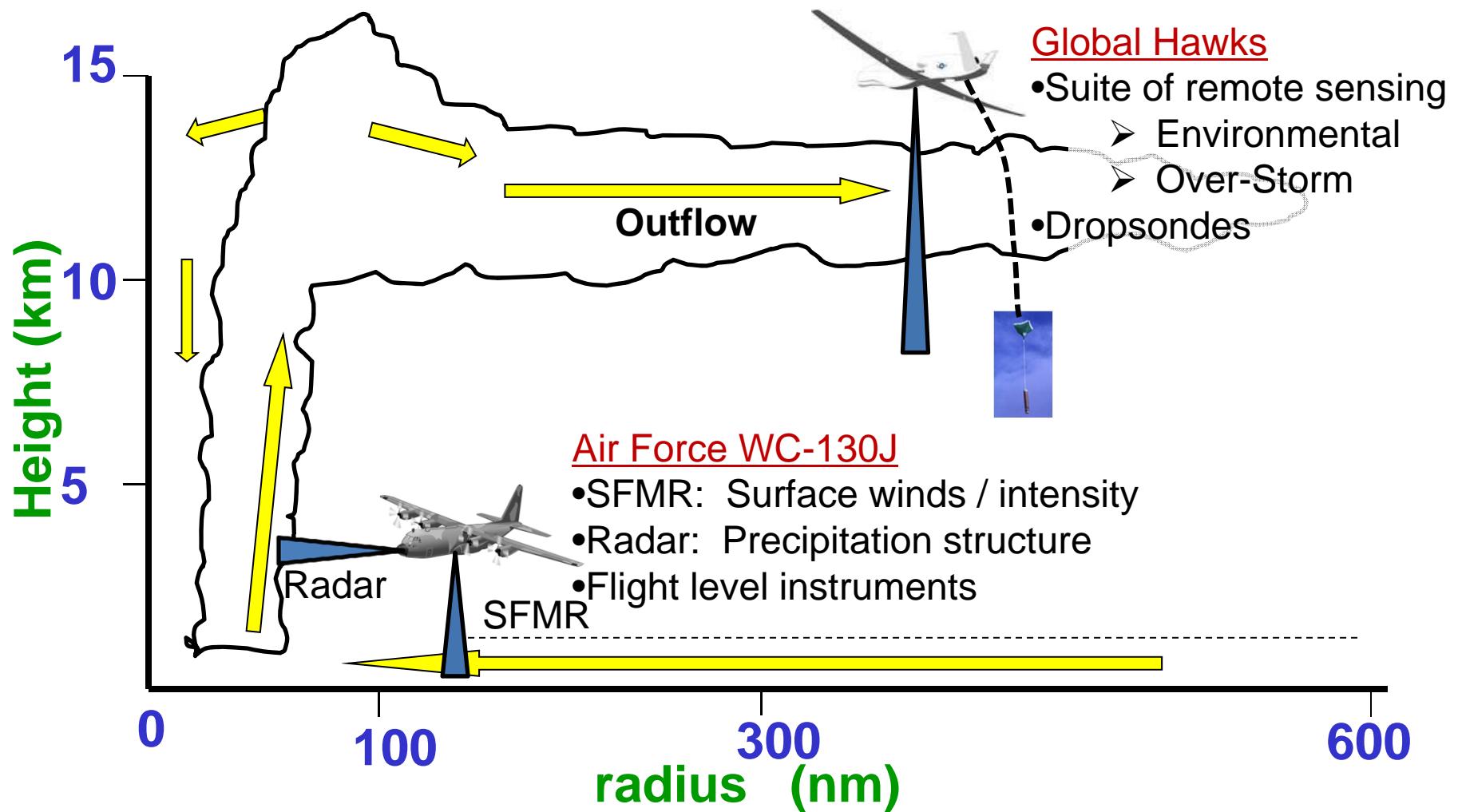
- Vertical profiles of temperature, water vapor, and liquid water

Tropical Cyclone Structure: Primary, swirling wind

Environmental Interactions are often concentrated in the outflow layer, which is above 45,000 feet.



Tropical Cyclone Structure: Secondary, in-up-out circulation



Summary

Global Hawk tropical cyclone reconnaissance and research demonstration

Minimum of a 2 month operation from Andersen AB, Guam

Coordinating Agencies/Partners

Operational USAF and USN weather commands and civilian weather facilities
(NOAA/NWS/CPHC);

Science Agencies (ONR, NOAA, NASA, NSF);

Operational reconnaissance commands;

Civilian organizations (university, laboratory, etc);

International (JMA, DOTSTAR)

Prepatory

Hurricane and Severe Storm Sentinel (HS3)

Observing system simulation experiments

Aircraft (NASA, USAF)

Management Team

