Results from the P3DWL missions during TPARC and TCS08

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Airborne Doppler Wind Lidars
In T-PARC/TCS-08 Experiment

in Western North Pacific Ocean (2008) to investigate tropical cyclone formation, intensification, structure change and satellite validation

- ONR-funded P3DWL (1.6 um coherent)
- PI is Emmitt (SWA)
- Will co-fly with NCAR’s ELDORA and dropsondes
- Wind profiles with 50 m vertical and 1 km horizontal resolution

- Multi-national funded 2 um DWL on DLR Falcon
- PI is Weissmann (DLR)
- Will fly with dropsondes

Data will be used to investigate impact of improved wind data on numerical forecasts
P3DWL for TPARC/TCS-08

1.6 um coherent WTX (ARL/LMCT)
10 cm bi-axis scanner (NASA)
P3 and other parts (NRL)
Analyses software (SWA/CIRPAS)
Mission Plan

• Study of tropical cyclogenesis, intensification, transition and weakening
• Based out of Guam (P3)
• Other aircraft include USAF C130 and DLR Falcon
  – P3: dropsondes, ELDORA and P3DWL
  – C130: dropsondes
  – Falcon: dropsondes, DWL, DIAL
• Use ferry flights to collect long curtains of wind soundings to test data impact on NWP.
  – Pax River to West Coast
  – West Coast to Hawaii
  – Hawaii to Guam
Activity Summary

• P3DWL in the field from August 4 to October 8, 2008
• Total data (ground and airborne) = 171 hours
• Flew 18 missions with Tropical Cyclones as target
  – 118 hours of data
• Additional flights:
  – Calibration of other instruments
  – Ferry flights between bases
  – Ferry flights USA – Guam – USA (> 20000 km)
Example of P3DWL observations near a Typhoon

- Tropical cyclone Nuri
- August 16 - 17, 2008 flight
- Flight level ~3000 meters
- Downward scanning for wind profiles (VAD plus nadir dwell)
Flight level winds from P3
AUG 16 - 17 2008
LIDAR WINDS AT 2100 M
PRELIMINARY (V05)
P3DWL winds at 1500 M

AUG 16 - 17 2008
LIDAR WINDS AT 1500 M
PRELIMINARY (V05)
P3DWL winds at 500 M

AUG 16 - 17 2008
LIDAR WINDS AT 500 M
PRELIMINARY (V05)
Summary

• Using airborne Doppler wind lidar to study the atmosphere began in the mid 1970’s.
• Today there are still fewer than 5 aircraft worldwide equipped with scanning DWLs
• The data from the latest 2 um systems promises to transform the way in which we validate and initialize NWP models on the mesoscale.
• NASA is funding the next generation of airborne lidars based upon the hybrid technology approach. These lidars will be ~ 10 -20 X more sensitive than current airborne systems
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