Results from the P3DWL missions during TPARC and TCS08

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WG SBLW

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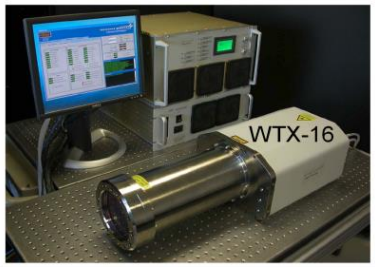
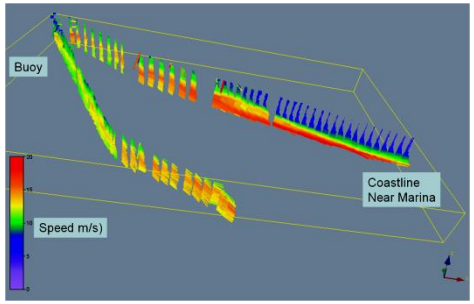
Airborne Doppler Wind Lidars In T-PARC/TCS-08 Experiment

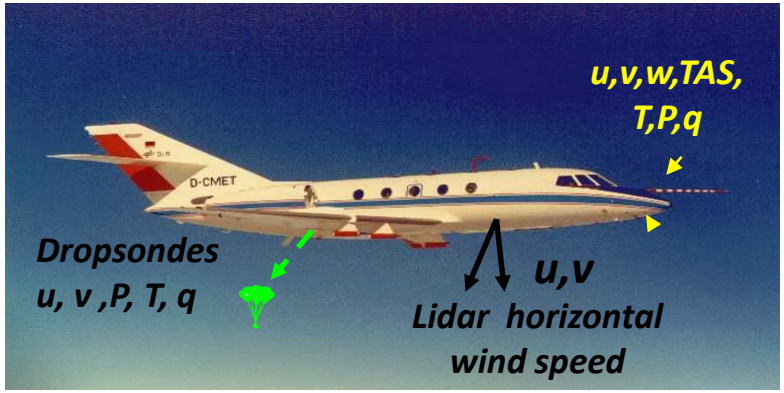
in Western North Pacific Ocean (2008) to investigate tropical cyclone formation, intensification, structure change and satellite validation

- **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

T-PARC: THORPEX Pacific Asian Regional Campaign
TCS-08: Tropical Cyclone Study 2008

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


Microsoft Virtual Earth™
Ulaanbaatar
Ulan Bator
Khabarovsk
MONGOLIA
Harbin
Sea of Japan
(East Sea)
PRIMORYE
札幌
Shenyang
Chongjin
Beijing
N. KOREA
P'yŏngyang
Hamhŭng
Taiyuan
Tianjin
Tientsin
Haeju
Seoul
日本
JAPAN
CHINA
Lanzhou
S. KOREA
東京
Xi'an
Gwangju
福岡
Jeju
大阪
Nanjing
Shanghai
Chengdu
Wuhan
Chongqing
Ningbo
Kunming
Guangzhou
Canton
Hanoi
Haiphong
MYANMAR
LAOS
South
China
Sea
Yangon
Rangoon
Đà Nang
Nakhon Ratchasima
Bangkok
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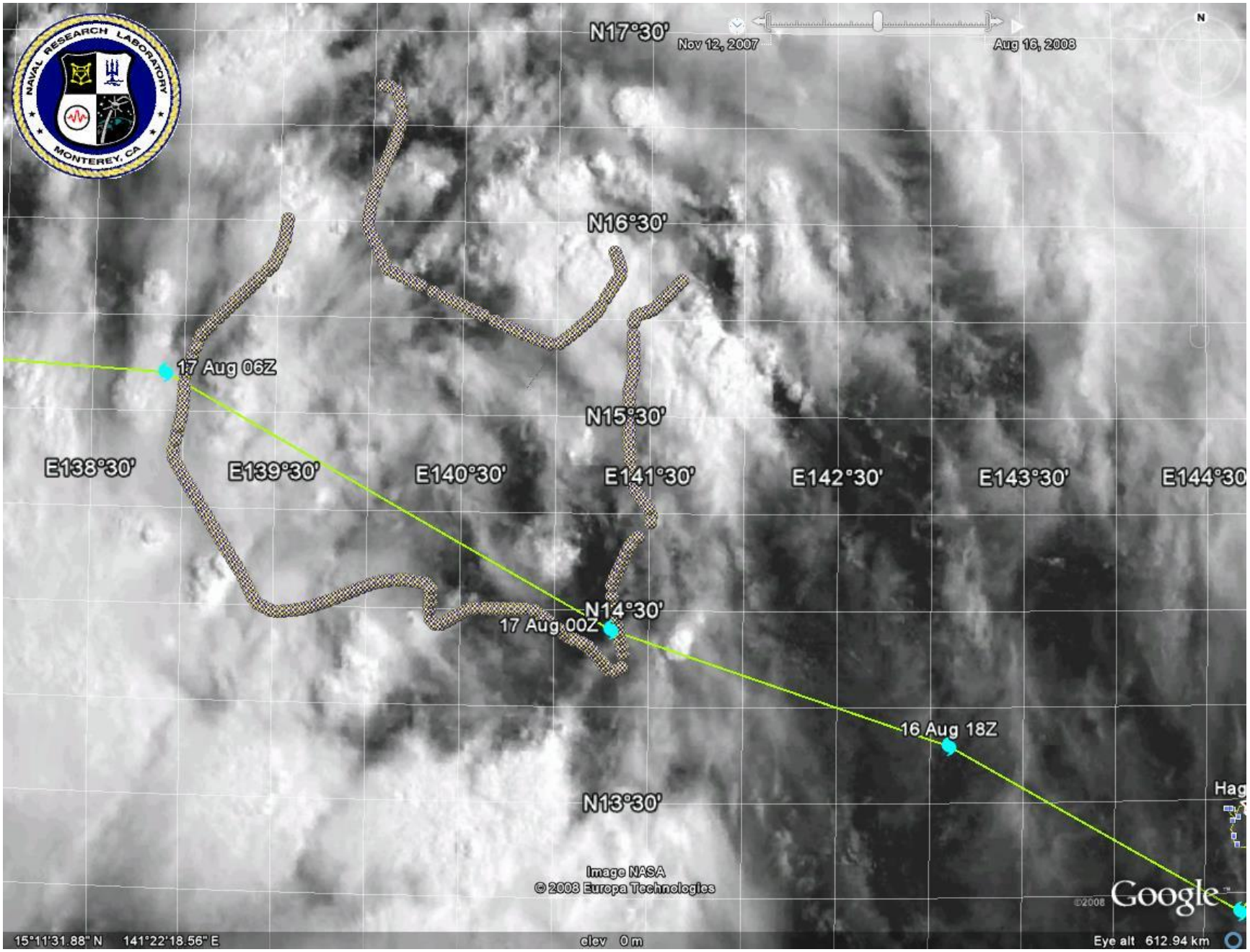
Activity Summary

- 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)


NAVAL RESEARCH LABORATORY
MONTEREY, CA
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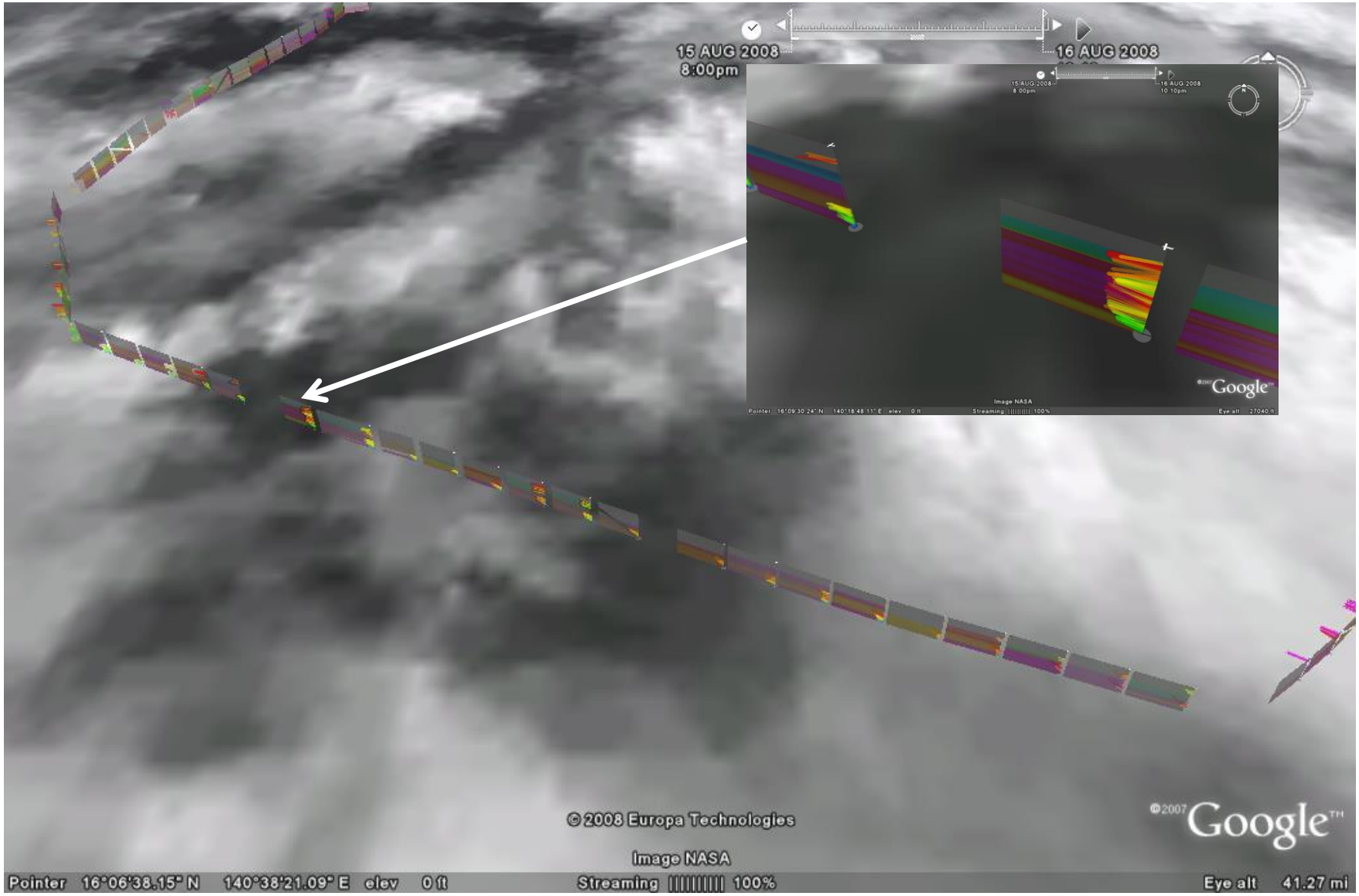
Nov 12, 2007
Aug 16, 2008
N16°30'
17 Aug 06Z
N15°30'
E138°30'
E139°30'
E140°30'
E141°30'
E142°30'
E143°30'
E144°30
N14°30'
17 Aug 00Z
16 Aug 18Z
N13°30'
Hag
Image NASA
© 2008 Europa Technologies
©2008 Google
15°11'31.88" N 141°22'18.56" E
elev 0 m
Eye alt 612.94 km


15 AUG 2008
8:00pm
16 AUG 2008
Google
© 2008 Europa Technologies
Image NASA
©2007 Google™
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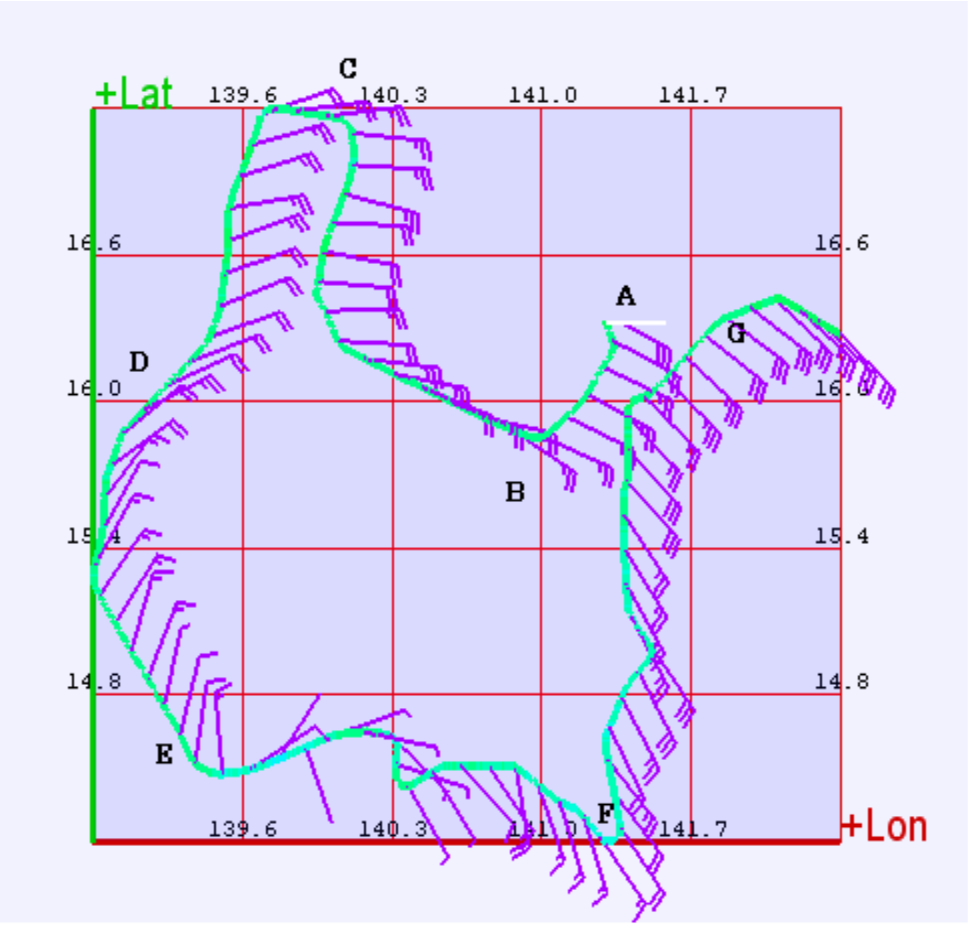
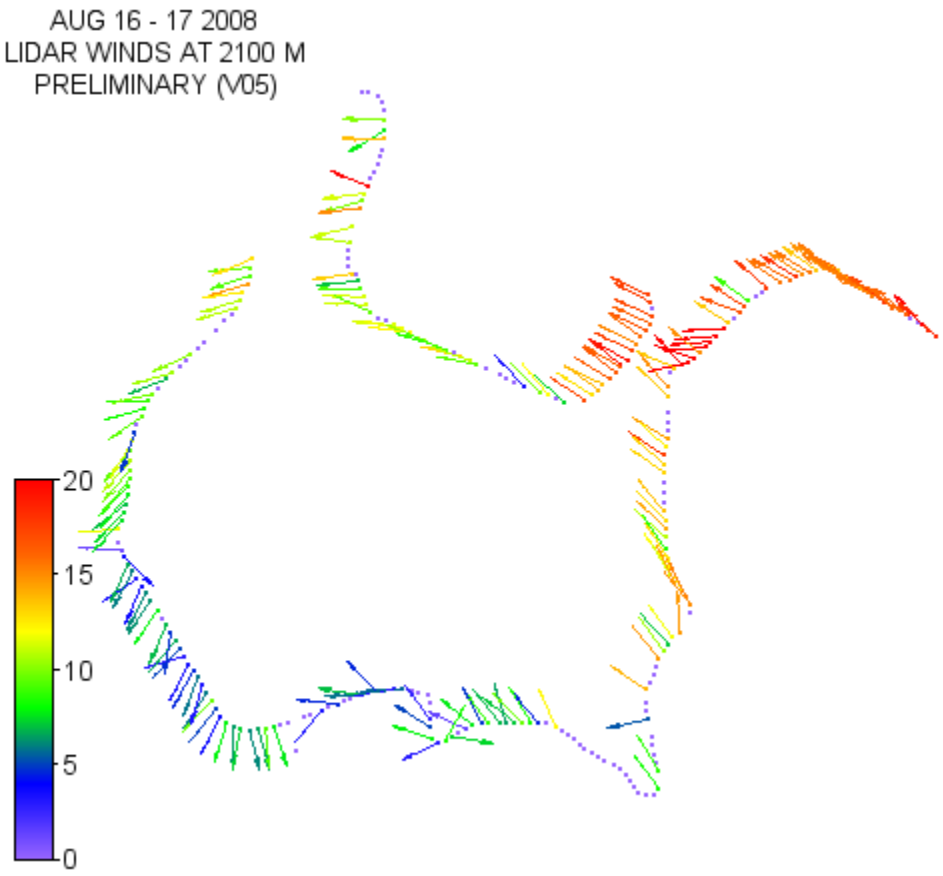
Streaming 100%
Eye alt 41.27 mi

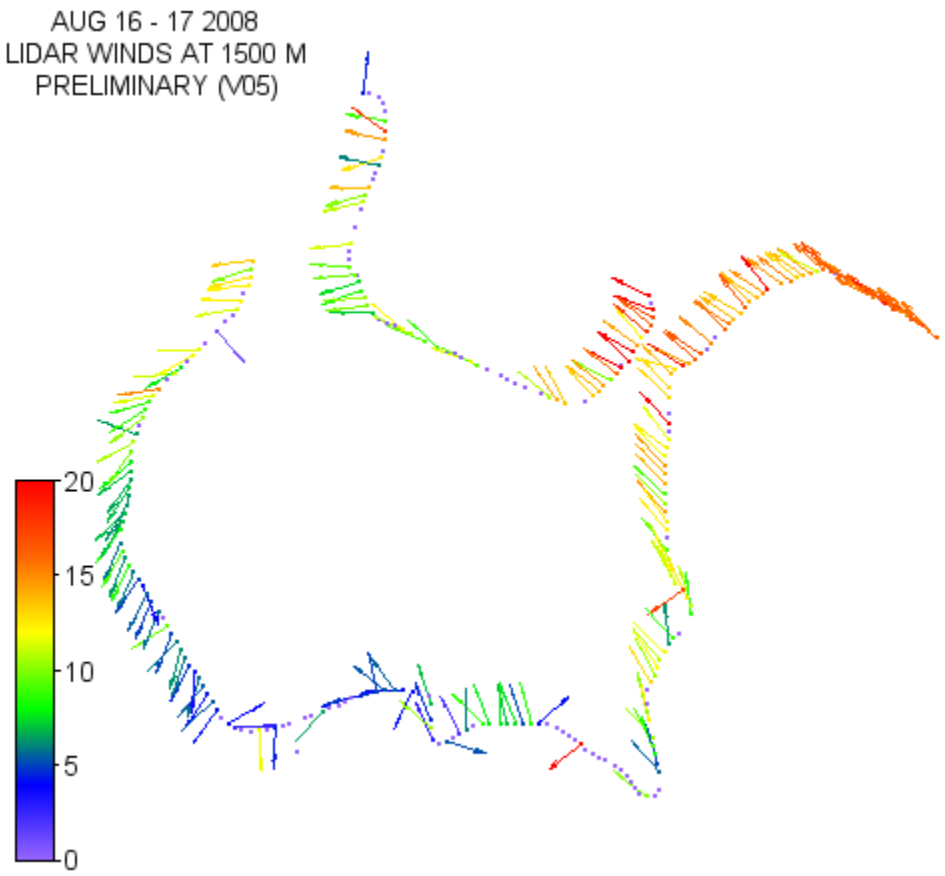
Flight level winds from P3



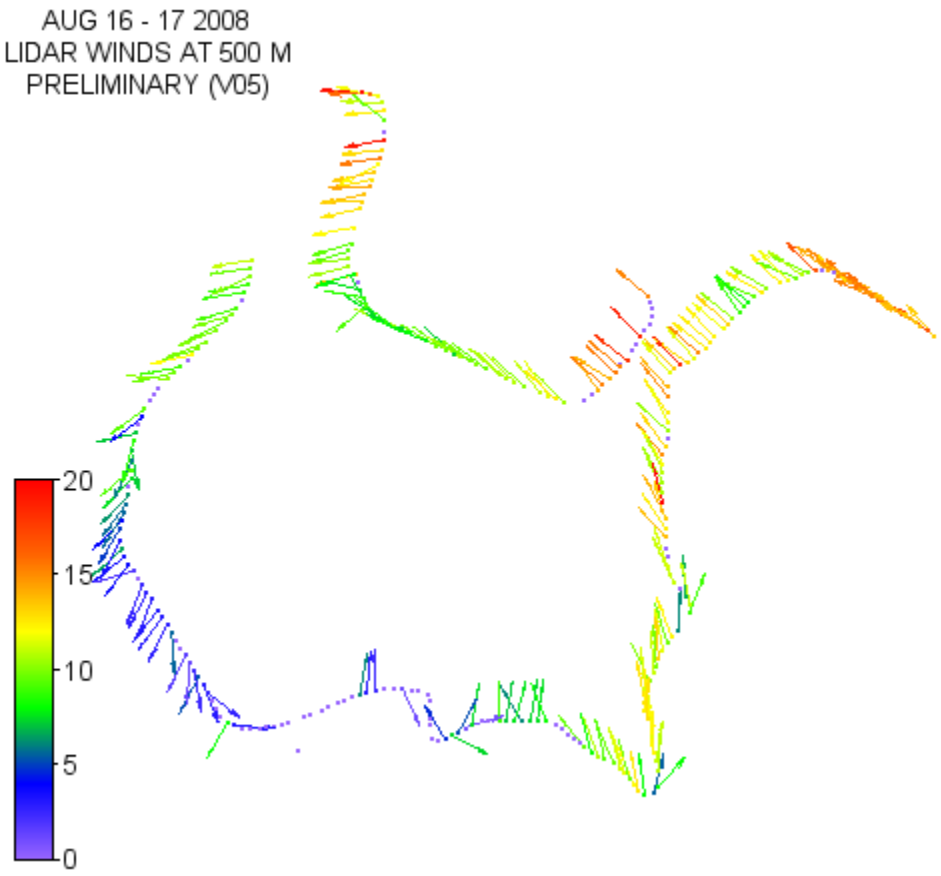
P3DWL winds at 2100 M



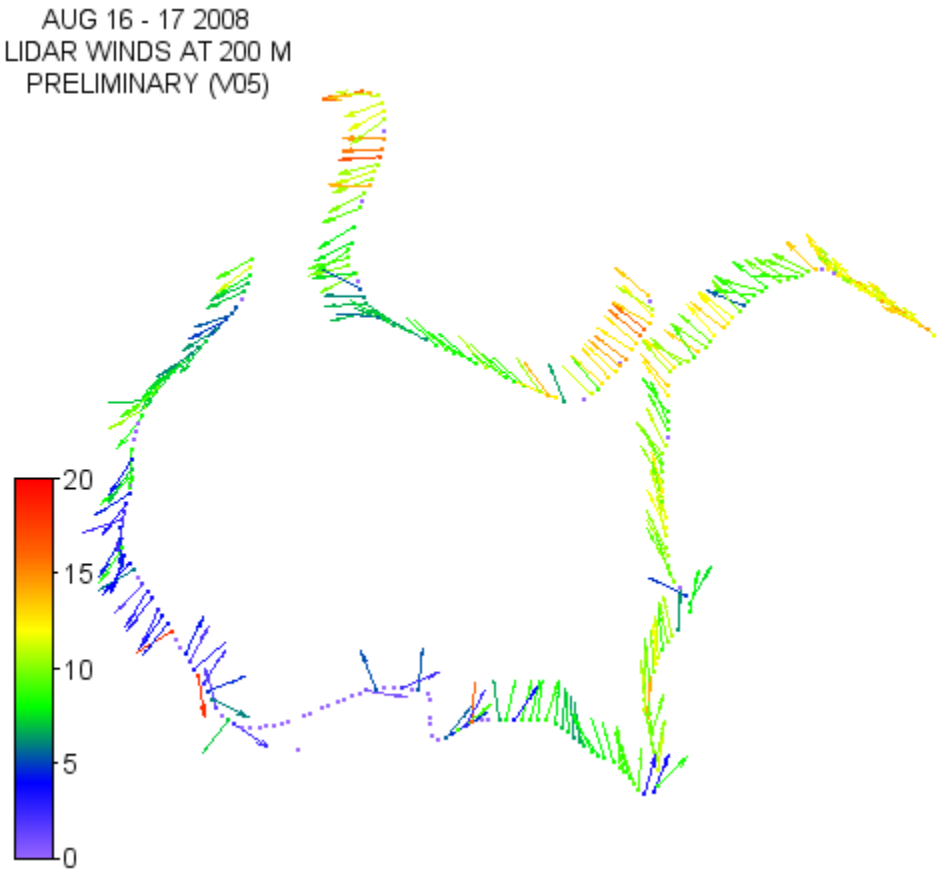
P3DWL winds at 1500 M

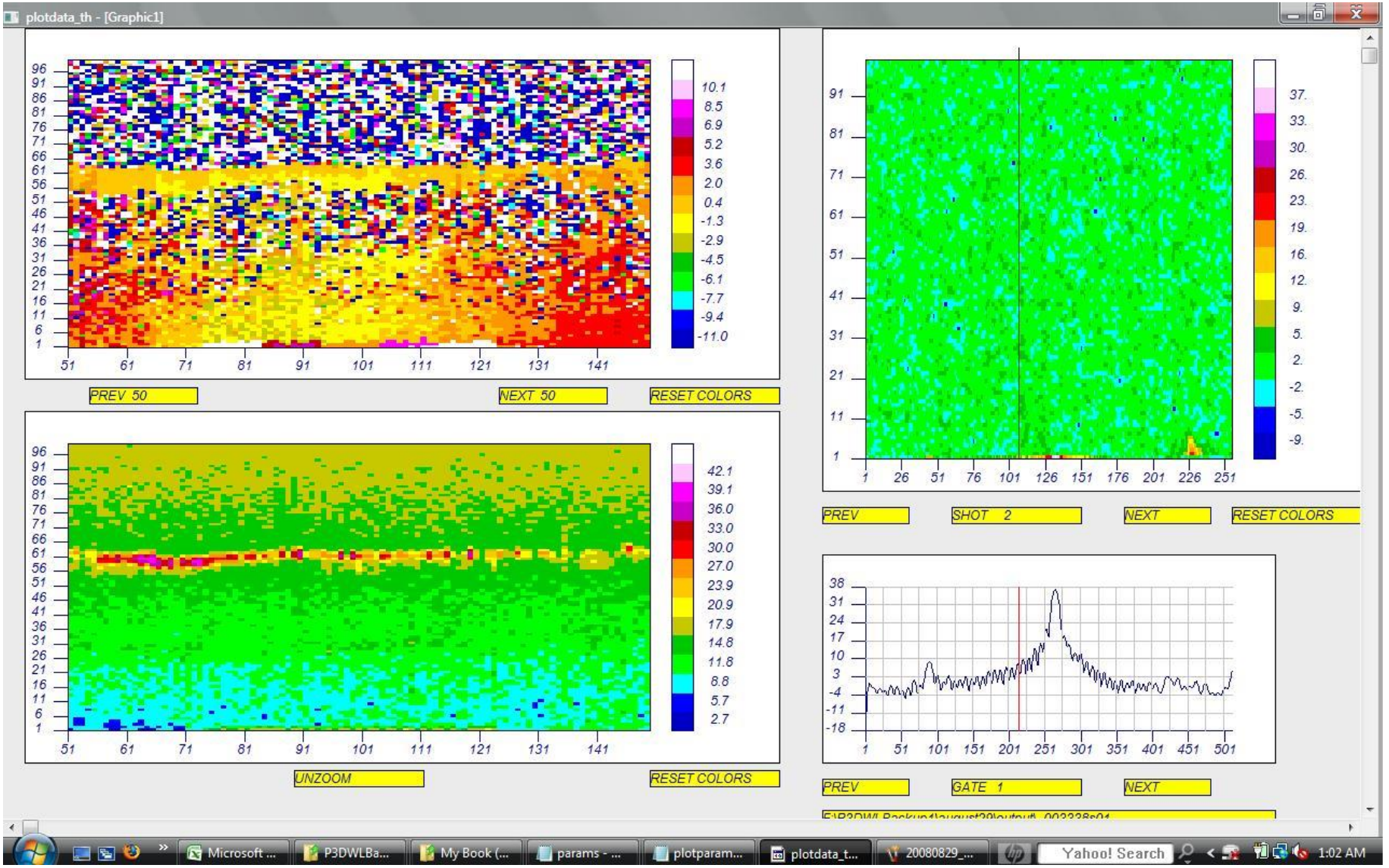


P3DWL winds at 500 M



P3DWL winds at 200 M

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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

Acknowledgements

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- Additional funds and hardware were provided by NASA and DoD.