Overview of Operations

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Chief Science Officer
N34 – AOPS, Models & Data

Supercomputing Excellence for Fleet Safety and Warfighter Decision Superiority...
FNMOC Mission

• Mission – We produce and deliver weather, ocean, and climate information for Fleet Safety, Warfighting Effectiveness, and National Defense

• Numerical Weather Prediction is the core of our business
  – Global and Regional Operational Models
  – Scheduled and On-Demand Products
Organizational Profile

- Highly technical, educated, and warfare experienced workforce consisting of military, civilians, and contractors
  - 23 Officers
    - 48% with MS Degree
    - ~22% will attend NPS next tour
    - wardroom includes: 1 x UK PEP, 1 x USAF PEP (deployed to Afghanistan), 1 x OIC, FNMOD Asheville
  - 24 Enlisted
    - 63% with Advanced Navy Specialty Training
    - includes 2 x IA, 1 x TAD to BHR
  - 140 FTE and ~10 Contractors:
    - Predominantly Physical Science and IT specialties (Meteorology, Oceanography, Computer Sciences)
    - PhD – 5, MS Degree - 23%, BS Degree - 34%

- $26.4M annual TOA
Operations? What’s That?

• What does operational mean?
  – Directly supports Naval operations (deployed forces)
    • Information assured
    • High levels of reliability and availability
    • 24 hours a day, every day
  – Paid for by operations & maintenance funding
    • No research and development funding
  – Automation is essential
  – Latency is key
Models and Applications Points

- NOGAPS/NAVDAS-AR foundation of production cycle
- Models and applications are interconnected
  - Medium-term plan is to directly incorporate aerosol predictions into NOGAPS framework
- Wide range of capabilities are supported by the modeling cycle
Models and Applications

Global Model

- Ocean Acoustic Forecasting
- Aircraft Routing
- Visibility/Dust Forecasts
- Electro-Optical Forecasts
- Search and Rescue
- CEEMS
- WRIP
- Long-Range Planning

- Ensemble Model
  - Aerosol Model
  - Mesoscale Model

- Wave Model
- Optimum Track Ship Routing
- Automated High Seas / Wind Warnings

- Target Weapon Systems
- Ice Forecasts
- Tropical Cyclone Forecasts
- Ballistic Wind Computations

Supercomputing Excellence for Fleet Safety and Warfighter Decision Superiority
NOGAPS in the OPSRUN

- NOGAPS is run three times for each of four valid times per day.
  - Prelim provides BCs for tropical cyclone model and early mesoscale runs
    - Obs latency 0-4 hrs
  - Realtime obs latency 0.5-6.5 hrs
  - Posttime obs latency 5-11 hrs
- Data from late in the obs window has more impact than data from early in the obs window
- Job initiation is event-driven so that each job starts only when prerequisite jobs have completed
Current A2 Operational Run

ATMOSPHERIC MODELS

NOGAPS

COAMPS

ET CETERA...
OPSRUN Points

• Major peak in activity +4 - 6 hrs each watch
• Peak pushes the limits
  – Changes that require additional resources must be managed very carefully
  – 10% increase in run time can be too much
Normal OPAL OPS Run

Opal Nodes Used - Ops/Betaops Jobs 00/12Z 5 May 09 (Daily Average = 33%)
Observation Counts Points

- About 1 million observations are exploited in the data assimilation each cycle.
Observation Counts from Innovation Files

NOGAPS assimilates ~ 1 million observations per run
Data Sources Points

- We get every type of data that we are in a position to exploit
- All data processing must be automated and robust
Ship Weather Reports
Buoy Observations
RADIOSONDE Observations
AIRCRAFT Reports

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AIRCRAFT Coverage
2007050100 late

AMAR
Canadian AMAR
count ---- 9234 count ---- 2923 count ---- 11459
locations ---- 8197 locations ---- 2793 locations ---- 9925
DMSP Polar SSMI/S
(Water Vapor, Rain Rate, Wind Speed)
Geostationary Satellite Winds
AMSU-A Coverage

AMSU Radiance Scan Locations Coverage
2008091200 late

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ASCAT METOP Coverage
## ATOVS Coverage

### ATOVS Soundings Coverage

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AVHRR Polar Feature Track Winds

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WINDSAT Total Precipitable Water & Winds
Summary

• Automation and low latency are important for operations
• Desired latency is 0.5 – 6.5 hours, depending on when the observation occurs
• Maximum latency is 5 – 11 hours
• New capabilities that require additional computer resources must be managed very carefully
Questions ?