Multi-resolution Nested Dust Forecast System Feasibility Study

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Project Background

✧ Public Health Applications

- Adding NASA Earth Science Results to EPHTN via the NM/EPHT System (ENPHASYS - NASA DECISIONS): 2008-2011

✧ Interoperability Development & Testing

Goals

✧ Work with existing modeling cores (DREAM ETA-8, DREAM NMM)
✧ Modify model pre- and post-processors to support OGC and REST data transfer
✧ Develop algorithm for automated generation of dust forecast area(s) of interest
✧ Evaluate and report on performance characteristics of the nested model system
Earth System Models
- DREAM Eta 4-bin Model
- DREAM Eta 8-bin Model
- DREAM NMM

Earth Observations
- Historic and Current
  - Terra/Aqua: MODIS
  - Land Cover, NDVI
  - SRTM C-Band Elevation Model
- Planned Missions
  - NPP, NPOESS: VIIRS
    - Land Cover, NDVI

Predictions/Forecasts
- Daily 72-hour low-resolution dust concentration forecasts for a large model domain (i.e. southwestern US)
- Daily 72-hour high-resolution dust forecasts for local regions (i.e. 1-degree blocks) for which the low-resolution model run indicates an important dust event

Observations, Parameters & Products

Decision Support System
- SYRIS, NM EPHTS
  - Analyses
    - Linkage between PM2.5 and PM10 dust concentrations and measures of public health (i.e. hospital admissions, school absences, etc.)
    - Location and severity of recent dust events within the model domain
  - Decisions/Actions
    - Evaluation and treatment of patients in the context of additional dust concentration information available to clinicians
    - Alerts to sensitive populations in anticipation of important dust events

Value and Benefits to Society
- Timely delivery of improved information about predicted dust events to public health officials, clinicians, and the general public
- Enhanced understanding of the linkage between public health measures and modeled dust concentrations

Partnership Area

Inputs
- NASA / UNM / U of A / GMU

Outputs
- New Mexico DOH / CDC / Lubbock HD / Texas R1

Outcomes

Impacts

Integrated System Solution Diagram

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- DREAM Eta 8-bin Model
- DREAM NMM

Earth Observations
- Historic and Current
  - Terra/Aqua: MODIS Land Cover, NDVI
  - SRTM C-Band 1-km Model

- Planned Missions
  - NPP, NPOESS: VIIRS Land Cover, NDVI

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Systems Integration
Systems Integration

EDAC

GMU
Systems Integration

Global Forecast System (GFS) Data
Systems Integration

EDAC

GMU

Global Forecast System (GFS) Data

DREAM ETA-8 Bin Data
Systems Integration

EDAC

Global Forecast System (GFS) Data

DREAM ETA-8 Bin Data

Area of Interest Data and Processing Queue

GMU
Systems Integration

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DREAM NMM Data

GMU

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Systems Integration

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Global Forecast System (GFS) Data

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Preprocessor

DREAM ETA-8 Core

Postprocessor
Systems Integration

EDAC

Global Forecast System (GFS) Data
DREAM ETA-8 Bin Data
Area of Interest Data and Processing Queue
DREAM NMM Data

GMU

Preprocessor
DREAM ETA-8 Core
Postprocessor
Preprocessor
DREAM NMM Core
Postprocessor

EDAC

GMU
Systems Integration

EDAC

- Global Forecast System (GFS) Data
- DREAM ETA-8 Bin Data
- Area of Interest Data and Processing Queue
- DREAM NMM Data

GMU

- Preprocessor
  - DREAM ETA-8 Core Postprocessor
- Preprocessor
  - DREAM NMM Core Postprocessor
Systems Integration

EDAC

Global Forecast System (GFS) Data

DREAM ETA-8 Bin Data

Area of Interest Data and Processing Queue

DREAM NMM Data

GMU

WCS

Preprocessor

DREAM ETA-8 Core

Postprocessor

Preprocessor

DREAM NMM Core

Postprocessor

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Systems Integration

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GMU

Global Forecast System (GFS) Data

DREAM ETA-8 Bin Data

Area of Interest Data and Processing Queue

DREAM NMM Data

WCS

REST

Preprocessor

DREAM ETA-8 Core

Postprocessor

Preprocessor

DREAM NMM Core

Postprocessor
Systems Integration

EDAC

Global Forecast System (GFS) Data

DREAM ETA-8 Bin Data

Area of Interest Data and Processing Queue

DREAM NMM Data

GMU

WCS

WCS

Preprocessor

DREAM ETA-8 Core

Postprocessor

Preprocessor

DREAM NMM Core

Postprocessor

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Systems Integration

EDAC

Global Forecast System (GFS) Data
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Area of Interest Data and Processing Queue
DREAM NMM Data

WMS, WCS, WFS

GMU

Preprocessor
DREAM
ETA-8 Core
Postprocessor
Preprocessor
DREAM
NMM Core
Postprocessor

Users

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Feasibility Testing

✦ Systems Integration

✓ Model pre- and post-processor implementation
✓ Data management and storage
✓ Appropriateness of implemented service standards

✦ Performance

✓ Comparison of performance (time-to-delivery) of nested model vs. dedicated large domain/high-resolution model runs
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