Emerging Needs – Hydrometeorological Forcings

From an IWRSS/NWC Perspective

Notes/Goals for this section:

• Brief overview of:
  – The Integrated Water Resources Science and Services (IWRSS)
  – The National Water Center (NWC)

• Describe the vision of what we are working towards, and some high level requirements

• Touch on the perceived role of GPM
IWRSS & the National Water Center

MOU Signed May 11, 2011
- NOAA – USGS – USACE
- Designed to expand

**A new business model**
- A framework to align multiple agencies with complementary water-related missions to accomplish operational goals
- Share technology, information, models, best practices

**National Water Center (Tuscaloosa, AL)**
- NWC will serve as the catalyst to achieve these objectives
- Completion expected late FY2013; Green Building: LEED Gold
- Size: 65,000 sq. ft.; Staff at Full Operating Capacity: 175

**IWRSS Crosscutting Themes**
- Human Dimensions
- Operational Science
- Information Technology/Systems
IWRSS Vision (Scope)

Provide summit to sea, bedrock to boundary layer, high-resolution (goal: half hour; half km) gridded water resource information for the United States & *North America* and globally (at lower resolution); derived from observations and model output:

- Analysis of Record
  - -30 to -50 yrs
  - (National Water Census)

- Analysis
  - Now

- Forecast
  - Mins.–Hours–Days

- Climate Projection
  - Weeks–Months–Decades
IWRSS/NWC Development Path – Short Term

**IWRSS Interagency Projects (Teams)**
- IWRSS Governance Board
  - To provided executive oversight
- Systems Interoperability & Data Synchronization
  - Underway
- Flood Inundation Mapping
  - Underway
- National Water Modeling System
  - Near future
- eGIS
  - Future

**NWC IOC Preparatory Projects**
- Data Service
  - Basic Hydrologic and Meteorological Data
  - Parameter Data
  - Forcing Data
- Evaluation Service
  - Analytics and Diagnostics
  - Baseline Current Performance; Evaluate New
- Exploratory integrated/coupled modeling projects
  - Expanded Land-Surface Modeling Capabilities
  - Earth System Modeling
  - High Performance Computing

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Initial Operating Capacity (IOC)

Now to 2 Years

Baseline Operating Capacity (BOC)

2 to 5 Years

Full Operating Capacity (FOC)

5 to 10 Years
Hydrometeorological Forcings: Working Towards an Ideal

**Operational Imperatives for IWRSS**

**Scope**
- Priorities: U.S., North America, Global
  - Summit to sea
  - Bedrock to boundary layer
  - Anywhere, anytime

**Scale**
- Grided Information
  - “High resolution”
  - NWC Initial Goal: 0.5 km; 0.5 hour

**Qualities**
- Continuous Record: Past – Present – Future
  - Internally consistent
  - Best possible (we want it all: observations; models)
  - Interoperable: e.g. NOAA AOR & USGS Water Census

**Fields**
- Hydrologic Forcings
  - Precipitation (Amount, Type, & Density); 2m Air Temperature, Pressure, Humidity; 10 m Vector Winds; Radiation
  - Support State Parameters: e.g. Soil Moisture; ET; etc.
Emerging Needs
Water Now, Next & Future

Modeling
- Reanalyses & Forecasts
- High resolution
- Coupled/integrated

Assimilation
- Intelligent integration of observations and models
- Direct (nudging); variational; sequential (EnKF)
- Conservative (close the water cycle budget)
- Atmospheric, LSMs; hydrology models

Observations
- High quality, long-term, accurate metadata
- Validation
- Process studies/physics
- Optimal network design (OSSEs/OSEs)

Downscaling
- Low density of observations
- High spatial & temporal variability of phenomena
- Statistical, physical, climatological
A Conceptual Model of Data Fusion

*Continuity – Consistency - Parsimony*

“Cone of uncertainty…”

Analysis of Record

- “Gage Era”
- “Satellite Era”
- “Radar Era”
- “GPM Era”

- ~50 yrs
- ~30 yrs
- ~20 yrs
- ~0 yrs

Weather

Wx-Climate

Climate
Some Provisional Thoughts on GPM & the NWC...

• Provides uniform global coverage & situational awareness
• Provides critical information in data sparse regions
  – e.g. high latitudes; some parts of the interior west; Central America; the Caribbean
• Better NWP through assimilation
• Independent source of data
  – Constrains retrospective “best estimates”
  – Validation (the tables are turned...)
• However... our view is that the greatest strength/benefit of GPM is via inclusion in a ‘data-fusion system’
  – i.e. bring the best of all data/information into one framework: radar (surface-based) + gages + satellite + model + ...