Evolving R2O in the Era of "Big Data" Meteorology

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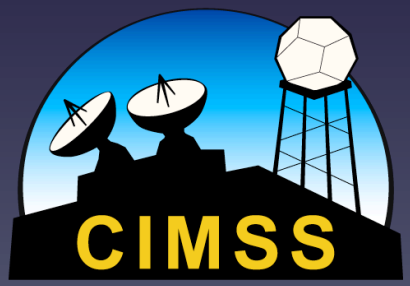

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American Meteorological Society Annual Meeting
Seventh Conference on Transition of Research to Operations
2.2 ◆ 24 January 2017

Principles for Accessible Data

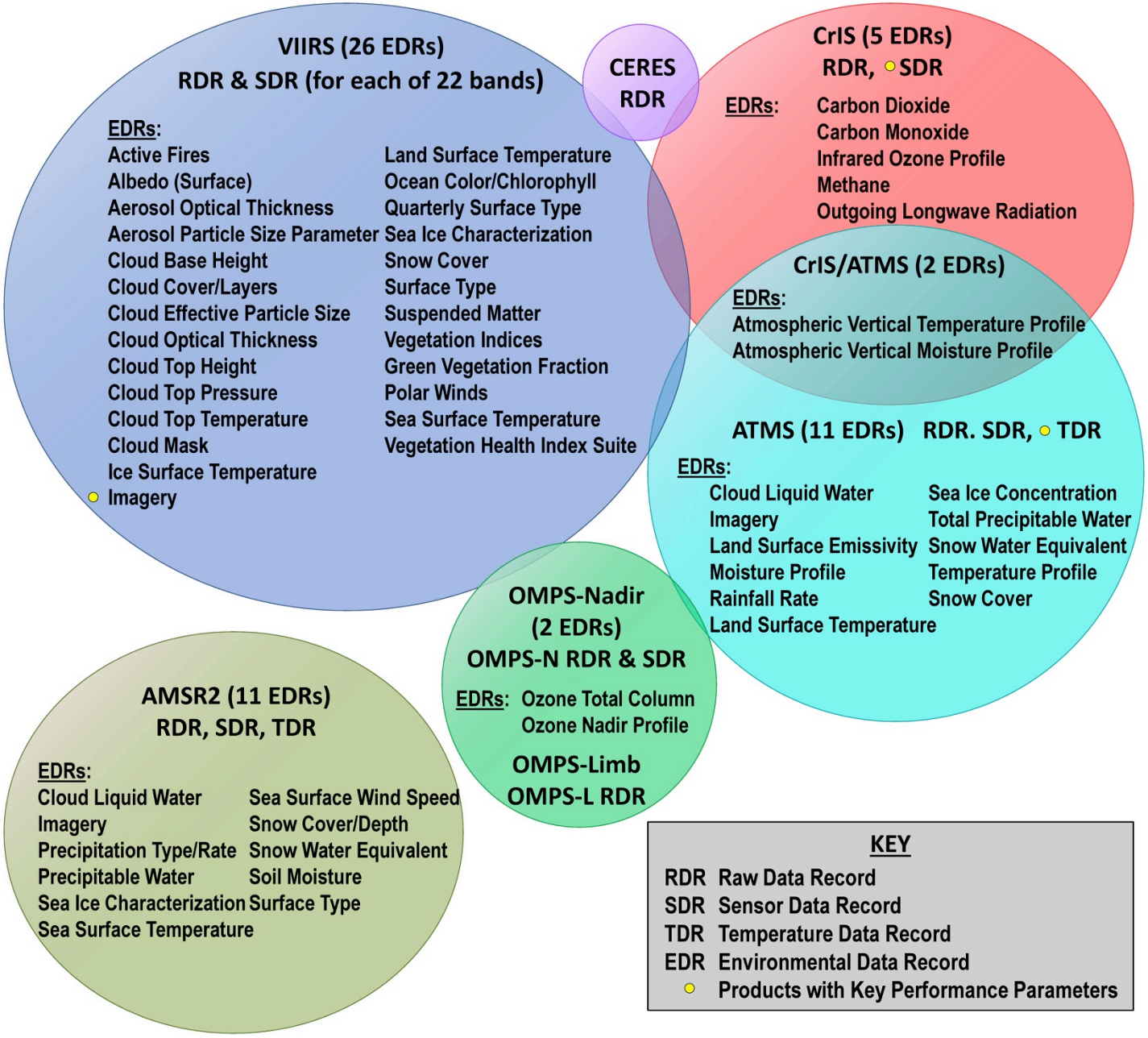
- Science benefits from more data
- Data should be reasonably accessible
- Government scientific data should be free
- Data should be managed before collection begins
- Data should be compatible over common technical platforms
- Data should be available promptly
- Data policies should encourage collaboration

Principles for Promoting Access to Federal Government-Supported Scientific Data and Research Findings through International Scientific Cooperation
Interagency Working Group on Open Data Sharing Policy, December 2016

“Big Data” Meteorology

- New environmental satellites
  - “Better, better, better”
- Improved numerical weather prediction capabilities
  - Resolution, skill, and ensembles
- Big Data = More Data
- More Data = More Science

JPSS Program Data Products

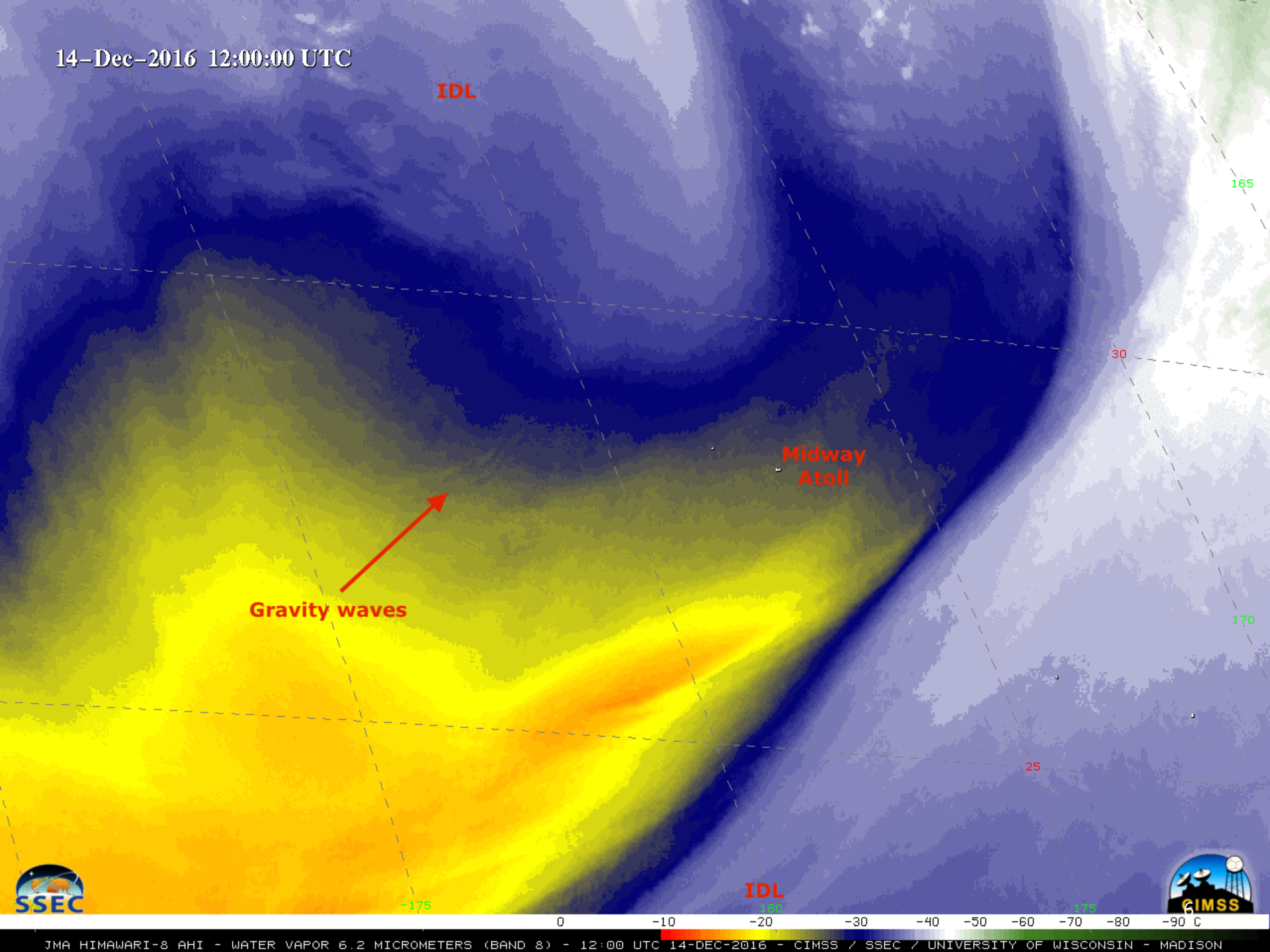


Source: STAR JPSS

Two Types of "Big Data"

"Big data" sets can be characterized as either

- similar to existing data sets, but with better coverage or resolution, or from a new observing platform,
  - More voluminous
- or unlike anything seen or used before.
  - A new method of measuring/detecting a quantity or phenomena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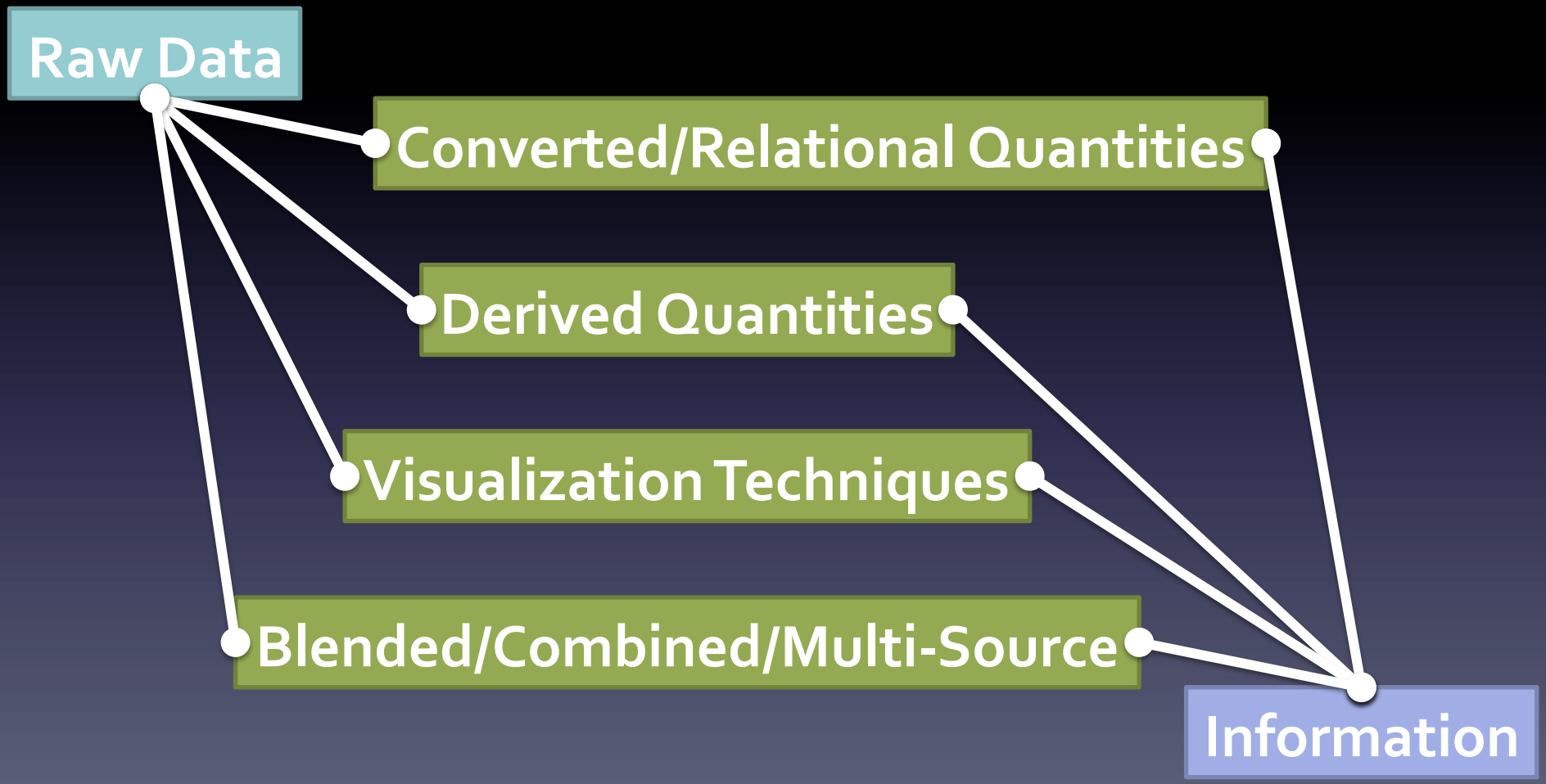
JMA HIMAWARI-8 AHI - WATER VAPOR 6.2 MICROMETERS (BAND 8) - 12:00 UTC 14-DEC-2016 - CIMSS / SSEC / UNIVERSITY OF WISCONSIN - MADISON

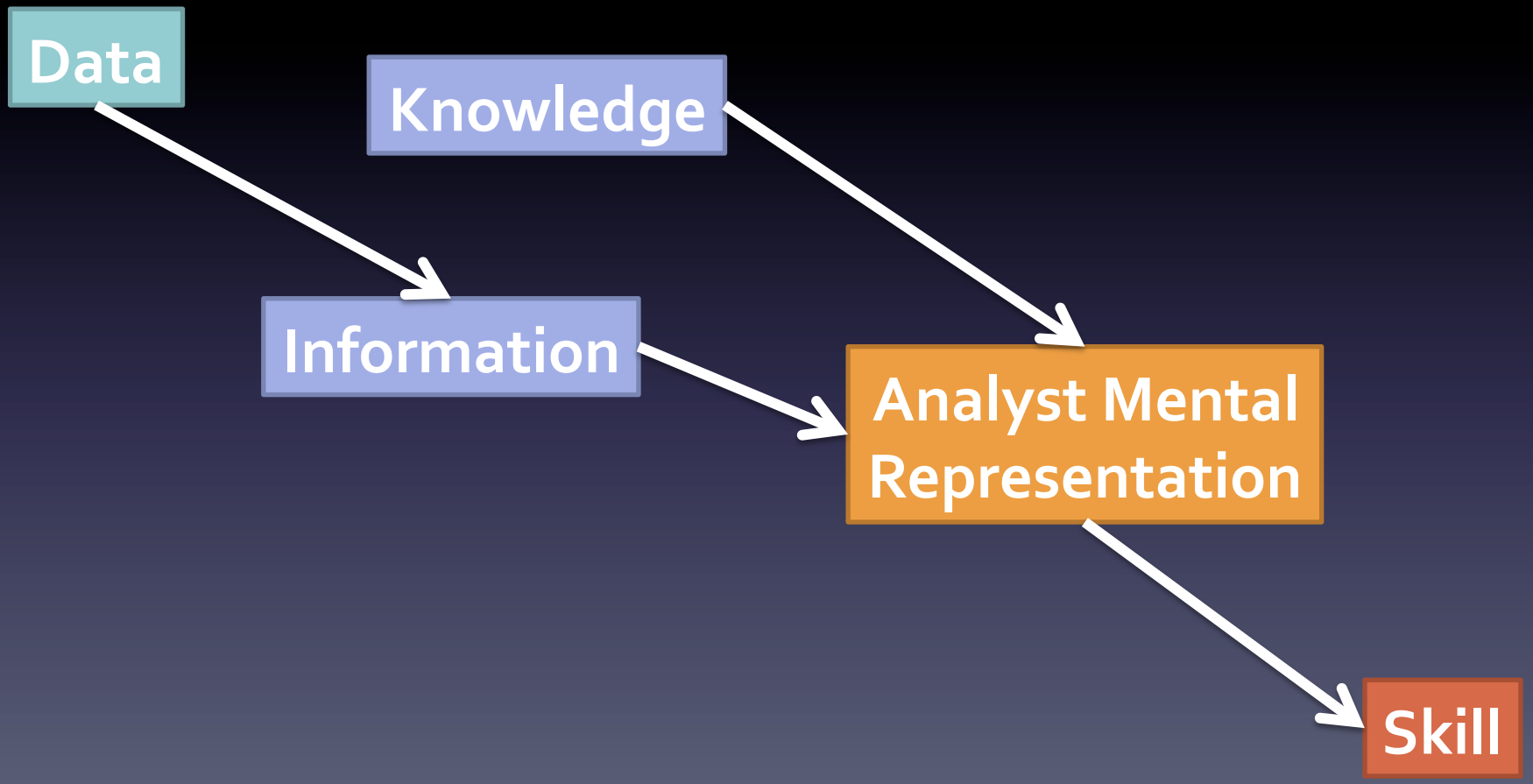
Constraints on "Big Data"

- Today's operational meteorologist has the same amount of time to consider all available data!
- Technical systems and communications bandwidth must evolve to support access and timeliness requirements.
- Determining how to present new data to the analyst and formally assessing its relative value is challenging.

Data-Information Continuum



How Data Becomes Skill



Human Data Integrator

- The operational meteorologist is still largely responsible for condensing raw data to information, and then making a decision from that information.
- The more data that is available, the more they have to review, evaluate, and compare.
- There is a risk of decreased situational awareness and solution awareness.


Personal Awareness
Situational Awareness
Solution Awareness

What Expert Forecasters Do

- Determine what aspects of the forecast are challenging
- Examine the situation with a larger lens
- Observe weather conditions directly
- Alter methods depending on the scenario
- Have a mental representation that incorporates the dynamical and physical basis for weather phenomena
- Use their mental representation to complete different deliverables

"Understanding Skilled Weather Forecasting: Implication for Training and the Design of Forecasting Tools"
Pliske et al., June 1997

Severe Storm Monitoring

Feature Monitoring

Adjacent Radar

Adjacent Radar

Lightning Networks

GOES-R GLM

GOES-R ABI

Environment Monitoring

Model Output

Model Output

Supplemental Information

Surface Obs

Severe Storm Monitoring

Feature Monitoring

Environment Monitoring

Multi-Radar
Multi-Sensor

ProbSevere

Model Blend

Historical
Analogs

Best R2O in "Big Data" Era

1. Start with a gap in the analyst mental representation.
2. Work backwards to connect the data to the gap.
3. Create integrated information from the data.
4. Determine which improvements can lead to the most sizable skill impacts through an iterative process.

Conclusions

- The use of "big data" requires better training for analysts to understand new intermediary quantities and integrate them into their mental representations.
- "Big data" must provide congruent derived products from observing systems and output fields from numerical weather prediction models.
- Focus on "use-inspired" science for the best R2O.

Conclusions

- Remember the "fit for use" value proposition. More "big data" is not necessarily better.
- Understanding the decision and the decisional inputs is critical to leveraging the value within "big data".
- R2O must stop the "big data" DRIP.
  - Data Rich, Information Poor
- We need a Weather **Data** Ready Nation.

Contact Information

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