A Climate Perspective on Data Continuity

Presented to the Committee on a Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space

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Continuity

- **Different meanings for the climate and weather communities**
  - Weather: data flow without a gap
  - Climate: data flow without a gap plus overlapping data to evaluate and correct any temporal biases introduced by new system, (e.g., CERES, MODIS, VIIRS, Ozone)
    - Requires either
      - Overlap between old and new observing systems
      - Or overlapping independent measurements of the same quantity with equal or better quality
      - Or simultaneous highly correlated measurements
    - With a well-coordinated verification and validation period

Identify Methodologies

- **Objective methods to evaluate and correct temporal biases should include signal to noise experiments**
  - Identify requirements for detecting a time rate of change (e.g., a particular signal or trend) of a given magnitude
  - Make use of past data to quantify higher frequency variability
  - Develop probabilities of detecting biases of various overlapping time periods using seeded biases of known form and magnitude, e.g., Monte Carlo simulations
  - If available, use independent measurements in the analysis (e.g., a multivariate simulation) to reduce the time of overlap needed to minimize undetected biases and/or reduce overlap time.

Which measurements should be continued?

- **Priority**
  - Continue measurements that are best measured from space
    - E.g., very few reliable methods to measure top of the atmosphere irradiance
  - Lower priority given to measurements that can be obtained by other means
    - E.g., various ways to derived tropospheric temperature
  - Consideration given to measurements that are obtained from a single instrument (reduces risk)
- **Other Considerations**
  - Length, quality, and metadata for existing climate records

  Value judgment with respecting to weighting

What gaps are acceptable?

- **Less egregious when**
  - Other observing systems are measuring physically linked quantities which can drive models (or algorithms) proven to accurately estimate the missing variable
    - E.g., Sea level and tide gauges, SSTs (numerous observing systems)
  - Records are of short duration
    - E.g., single-mission or experimental.

Prioritize relative importance of measurements

Importance = f(I, L, C, V)

I = irreproducibility

L = length of record

C = Cost of measurements

V = value of measurement to society

(a judgment call)

Questions?