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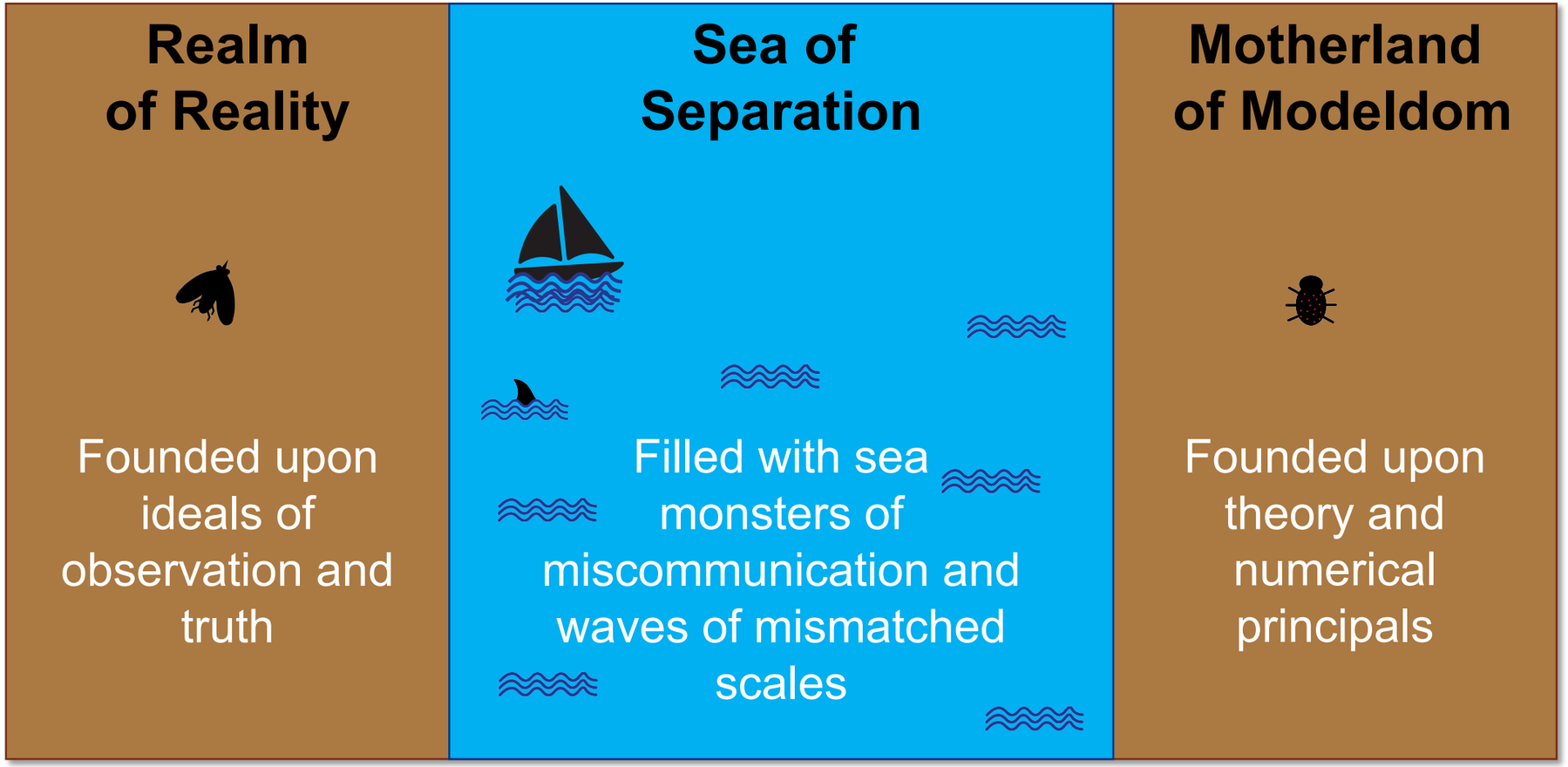
Experiences with LASSO & CMDV-MCS for Bridging the Observation–Model Divide

William I. Gustafson Jr.

Advancing the Use of ARM Observations for Large-Scale Earth System Model Development Breakout Session,
2019 ARM/ASR PI Meeting, 13-Jun-2019

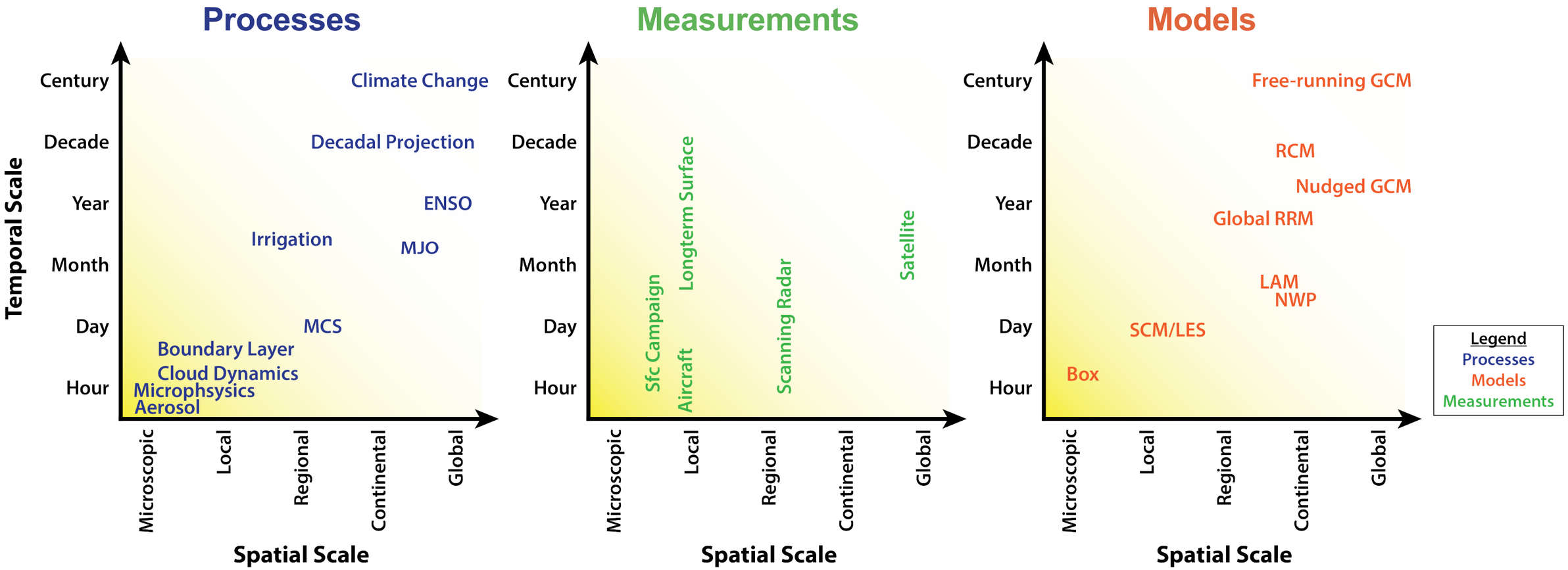
The pessimist's view of the research world



Difficulties to overcome to successfully work together as observationalists and modelers

- Avoid miscommunication about what is needed and available
- Mutual understanding regarding scales of comparison
- Acceptance of limitations and ingenuity to work around them

Scale mismatches often blur possibilities



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Finding matches across time scales

- Short-term simulations need case-specific observations
  - Realistic forcings are required to hold model close to reality
  - Detailed observations are much more useful, especially for process-related studies
  - Long-term climatologies are only minimally helpful, e.g., monthly averages

- Long-term simulations need observed distributions and climatologies
  - Free-running simulations cannot do time-specific comparisons
    - ✓ Caveat: Nudged simulations are sorta constrained to reality
  - Observed case studies are only minimally helpful due to meteorological variability
  - Biases from many processes get mixed together and require more intuition to understand

Finding matches across spatial scales

- Small-scale models are more directly comparable to observations
  - Typically run for specific dates
  - Grid spacings are closer to the observed scales

- Large-scale models require careful sampling for fair comparisons with obs.
  - Can be run for specific cases, but running a global model for a specific location is inefficient
  - Comparing to multiple obs. datasets from different regions often requires running the global model multiple times since the times do not overlap
  - RRMs require setting up refinement coincident with the field campaign(s)

Finding the right connection takes time and effort

- Communicating what is needed and can be used, combined with what can be obtained and is available, is a two-way interaction
  - Takes patience
  - Have to look past the obvious limitations and find creative ways to advance the science

Need: clear communication of data quality and proper use

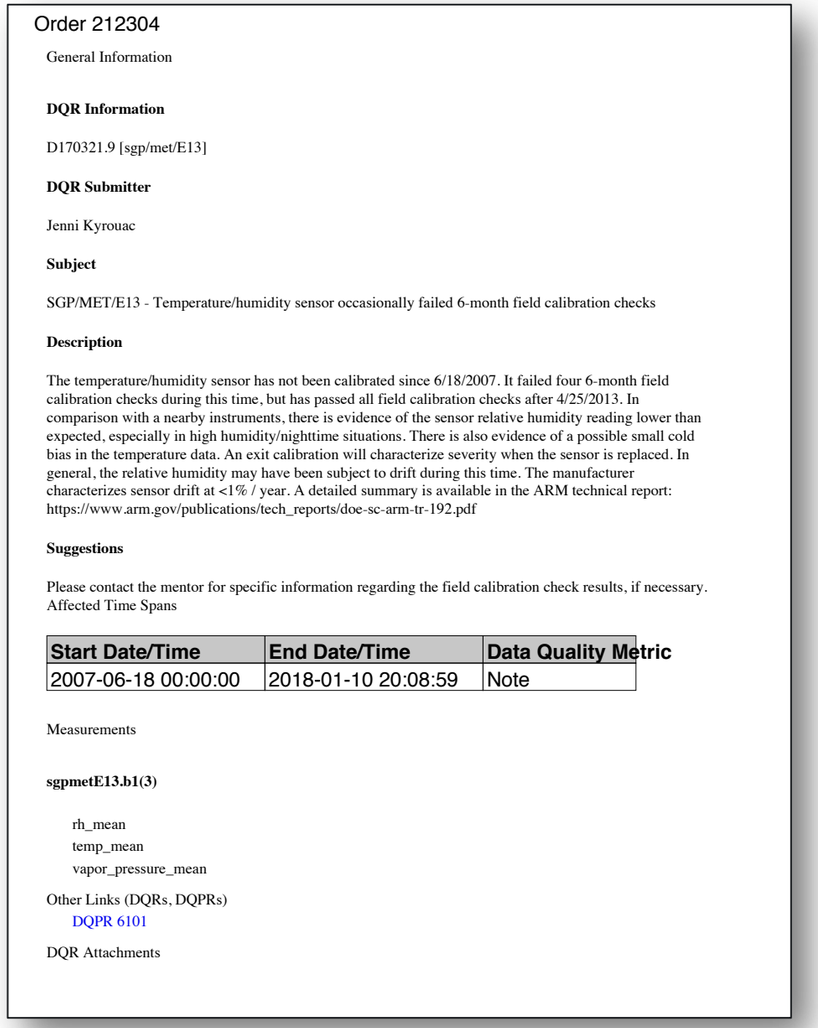
- We need to encourage more question asking by modelers to ensure proper use of the observations

- Understanding uncertainty is important
  - Typically thought of as finding a way to quantify obs uncertainty
  - Communicating how much uncertainty is tolerable by a user is also important—obs folks do not need to waste time going into every corner of uncertainty if it will not matter

- How can we communicate questionable data points/periods and important changes to instrumentation?
  - DQRs are ineffective for large studies, and so are color coded bars in Data Discovery
  - Overwhelming to check all datastreams when many are used, particularly over long time periods

We need a better way than DQRs for modelers

- 20 pages for just ~2 years of data for one location with the simplest measurement ARM takes, sgpmetE13
- DQRs have been designed for detail-oriented instrument maintainers
- DQR process is also slow—a replaced instrument in Jan. 2018 is still not noted as of Jun. 2019
- QC flags in data files do not always reflect issues noted in DQRs



Order 212304

General Information

DQR Information

D170321.9 [sgp/met/E13]

DQR Submitter

Jenni Kyrouac

Subject

SGP/MET/E13 - Temperature/humidity sensor occasionally failed 6-month field calibration checks

Description

The temperature/humidity sensor has not been calibrated since 6/18/2007. It failed four 6-month field calibration checks during this time, but has passed all field calibration checks after 4/25/2013. In comparison with a nearby instruments, there is evidence of the sensor relative humidity reading lower than expected, especially in high humidity/nighttime situations. There is also evidence of a possible small cold bias in the temperature data. An exit calibration will characterize severity when the sensor is replaced. In general, the relative humidity may have been subject to drift during this time. The manufacturer characterizes sensor drift at <1% / year. A detailed summary is available in the ARM technical report: https://www.arm.gov/publications/tech_reports/doe-sc-arm-tr-192.pdf

Suggestions

Please contact the mentor for specific information regarding the field calibration check results, if necessary.
Affected Time Spans

Start Date/Time	End Date/Time	Data Quality Metric
2007-06-18 00:00:00	2018-01-10 20:08:59	Note

Measurements

sgpmetE13.b1(3)

rh_mean
temp_mean
vapor_pressure_mean

Other Links (DQRs, DQPRs)
DQPR 6101

DQR Attachments

How do we make progress integrating observations and models?

- We require “scientist liasons” that speak in the tongues of both observationalists and modelers
  - This is an awkward middle ground—these folk may not be perceived as experts in either realm because they must focus on both
  - Projects need to prioritize this role

- True collaboration takes time but can generate more significant long-term successes
  - Back-and-forth efforts are often needed to understand each other and project needs
  - Education is important—don’t assume everybody understands one another
  - Project planning and funding needs to take this into account