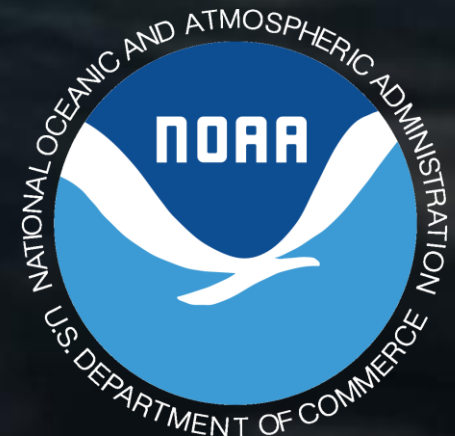# Operational Need Summary

L5 Consortium Meeting 2015

Dr. Thomas Berger
Director

National Weather Service

Operational Need Summary

Primary driver is customers! They need:

- Better forecasts of flares, radiation storms, and geomagnetic storms.

  - Increased lead time and accuracy.

Event	Watch	Warning	Accuracy
Flare	0	0	--
Radiation	0	~10 min	--
Geomagnetic Storm	15—72 hr	15—30 min	Fair

Current capabilities of space weather forecasting

- Power grid customer wish list: "18/18/18" 18 days, 18 hours, 18 minutes for watch, warning, and alert with accurate *local* dB/dt magnitudes.

- Aviation wish list: >500 MeV proton fluxes in real-time and neutron monitor-based model runs for post-facto information dissemination.

- "Environmental Intelligence" for societal benefit.

National Weather Service

Operational Need Summary

- We need: better Decision Support Services

  - The ability to supply real-time information on the state of the heliosphere, magnetosphere, radiation belts, and ionosphere continuously for 2—3 days during a major event.

  - Information must be Accurate, *Actionable*, Relevant, and Timely

  - Quotes of the meeting:

  "Forecasting is a necessary but not sufficient condition for success."
  Sir Mark Walport, UK Chief Science Advisor

  "There is no value in a forecast. There is only value in how a forecast is used."
  Tim Palmer, Royal Society Research Professor, Oxford

National Weather Service

3

Operational Need Summary

- The minimum that L5 ~~can~~ *must* give us:
  - Increased accuracy of CME (geomagnetic storm) arrival time
  - Decreased rate of geomagnetic storm surprises (eg. St. Patrick's day)
  - Increased accuracy of CME speed (storm magnitude)
  - Better inputs to heliospheric models (incl. data assimilation?)
  - Increased lead time on AR magnetic evolution/complexity (flares)
  - Increased lead time on coronal hole HSS and CIR events
  - Increased lead time on SEP events

- I.e., better forecasts of solar-driven space weather events.
- If we can show definitively that this is the case, the likelihood of mission approval increases significantly.

National Weather Service

Operational Need Summary

- L5 alone is not enough!
  - We need platforms at L1 and L5 acting as a synergistic observation system to provide the necessary inputs to better forecasts/models.
  - Similar or identical instrumentation (where applicable) to avoid calibration/interpretation problems.

- We need research support to take forecasting to the next level
  - Physics-based models of AR evolution and eruption (eg. Mackay's model on a large AR scale with data assimilation).
  - MHD models of CME propagation in the heliosphere.
  - Improvement/evolution of existing *operational* models to keep up with latest physics and tools.
  - Validation of new instrument/observation/platform strategies.

National Weather Service