2018 Workshop on Autonomy for Future NASA Science Missions

October 10-11, 2018

Earth & Heliophysics Science Design Reference Missions

Mike Little

NASA Earth Science Technology Office

Earth and Helio Science DRM Team

Name
Marge Cole
Mike Little
Jacqueline LeMoigne-Stewart
Matthew Tarascio
Joel Johson
Philip Koopman
James Donlon
Eric Frew
Lisa Callahan
Martyn Clark
Sujay Kumar
Gerald Bawden

Name
Mike Seablom
Mahta Moghaddam
Graeme Smith
Lena Braatz
Catherine Pavlov
Mark Cheung
Andrew Sabelhaus
Steve Chien
Steve Kepko
Tom Wagner
Barry Lefer
Jared Entin

Earth and Helio Science Reference Missions

ID	Name	Description
ES-1 (line 8)	Demand-driven Observing	A multi-vantage point (in situ, airborne, satellite platforms) observing system responds to requests for observations from multiple research projects, instrument science teams, cal-val encounters.
ES-2 (line 9)	Model-driven Observing (Operational)	As forecast skill degrades, an operational model requests specific observations (parameters, locations, range, timing), selecting from all available sensors and instruments (in situ, airborne and remote sensing from space).
ES-3 (line 10)	Phased Array	A constellation of satellites creates a phased array. Increasing the amount of observed signal for a specific event, the nodes need station keeping and the beam-forming requires coordination among nodes.
ES-4 (line 11)	String of Observations	Sequential Observations of selected phenomenon/ event. A string of steerable instruments in a satellite train lengthens the remote sensing observation of transient or transitional phenomena (such as hurricane rapid intensification or the life span of a tornado).
ES-5 (line 12)	Intelligent Observation Strategies (Research)	Intelligent Observation Strategies or Autonomous optimization of measurement acquisition. Combine onboard data processing, real-time access to other spacecraft, in-situ data and ground prediction data, and autonomous planning and scheduling of observations.
HS-1 (line 15)	React to Space Weather Events	Interconnected sensors throughout the heliosphere improve forecast quality and alerts to space weather events. Ground networks on other planets (e.g. radiation sensors on mars), instruments on human spacecraft (both commercial and NASA), all autonomously connected to predictive capabilities. System can autonomously decide to launch 'spacecraft on demand,' then rapidly commission and pull data from spacecraft on line, assimilate into space weather predictive models. Autonomous monitoring of solar active regions, coupled with models of solar eruptive events, to provide lead time.