

Applications of Future NASA Decadal Missions for Observing Earth's Land & Water Processes

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Delta II



Launch ~2019
Vehicle TBD



Launch ~2023
Vehicle TBD

Phase

Phase C/D entered ~12/2012

Design and Development - This phase involves building the hardware and software, testing and verification, and ends with the launch of the satellite.

Phase A

Definition - The project creates a preliminary design and proof of concept specifying instrument design, orbit, altitude, ground data systems and other details. The publication of the preliminary costing plan marks the completion of Phase A.

Phase A

Preliminary Analysis - The project creates a preliminary design and proof of concept specifying instrument design, orbit, altitude, ground data systems and other details. The publication of the preliminary costing plan marks the completion of Phase A.

Mission Objective

To collect altimetry data of the Earth's surface optimized to measure ice sheet elevation change and sea ice thickness, while also generating an estimate of global vegetation biomass.

The PACE mission will make global ocean color measurements that are essential for understanding ocean ecology and biogeochemistry. PACE measurements will extend ocean climate data records collected since the 1990s to document changes in the function of aquatic ecosystems as they respond to human activities and natural processes over short and long periods of time. These measurements are pivotal for differentiating natural variability from anthropogenic climate change effects and for understanding the interactions between these processes and various human uses of the ocean.

A global mission to study the world's ecosystems and provide information on natural disasters such as volcanoes, wildfires and drought. HyspIRI will be able to identify the type of vegetation that is present and whether the vegetation is healthy. The mission will provide a benchmark on the state of the world's ecosystems against which future changes can be assessed. It will also assess the pre-eruptive behavior of volcanoes and the likelihood of future eruptions as well as the carbon and other gases released from wildfires.

Applications

NASA Applications Program Areas:

Ecological Forecasting, Water Resources, Agriculture, Climate, Oceans

Applications: Ice mapping for navigation, Monitoring sea level changes, Elevation of water surface for reservoir storage estimates, Forest canopy heights & biomass, Forest insect outbreaks, Determination of fuel loading in forests to accurately model/predict forest fire behavior.

NASA Applications Program Areas:

Oceans-Coasts-Great Lakes, Ecosystems & Human Health, Disasters, Ecological Forecasting, Health & Air Quality, Water Resources, Climate

Applications: Fisheries- monitoring productivity & biodiversity, climate change impacts, monitoring/modeling/forecasting toxic Plankton outbreaks, Human impacts on coastal zones, water quality monitoring, oil spill monitoring, Air quality measurements of particulate matter (pm), volcanic ash.

NASA Applications Program Areas:

Disasters, Ecological Forecasting, Health & Air Quality, Water Resources, Agriculture, Climate, Oceans

Applications: Scheduling irrigation, monitoring the extent & condition of coral reefs, monitoring the environmental factors important in the distribution & life cycle of disease vectors, land use & productivity, monitoring volcanic activity & outgassing, determining forest health, coastal waters productivity.

Applications Community Building Activities

Early adopter product & application workshops, Applications Traceability Matrix. Engage the community of decision makers who will benefit from incorporating mission products into their decision support systems. Early Adopter applied research presented, Mini focus groups feedback loops and articles in thematic journals. Publication of test. Data feedback and results. Large Policy workshop to discuss the decision making process of existing Early Adopter research.

Website establishment and database of user community individual begins. Application Plan written, has been posted to website, and was included in mission (Science Definition Team) SDT Report. Newsletters, articles, conference presentations of applications of data and other communication strategies to expand the community of potential users. Early Adopters Identified, description of the intersection of mission requirements and needs of potential applications has been provided.

Website establishment and database of user community individual begins. Application Plan written and posted to website. "important society decisions that will be made with mission science products". Early Adopters Identified, Call for Proposals and collaboration with test data. Thematic groups are created and Focus groups are planned.

Partners/Decision Support Systems

National Ice Center, US Forest Service, US & State Departments of Agriculture, US Coast Guard,

Environmental Protection Agency (EPA), NOAA, the US Geological Survey (USGS)-Water Resources, Federal Aviation Administration, the US Navy

Sebal North America, Western Governors Association, NOAA's Center for Coastal Monitoring & Assessment, Pan American Health Organization, USDA,

Mission Application Representatives & Mission Website

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References:

- Brown, Molly E., Vanessa M Escobar, Josef Aschbacher, María Pilar Milagro-Pérez, Bradley Doorn, Molly K Macauley, and Lawrence Friedl. 2013. "Policy for Robust Space-Based Earth Science, Technology and Applications." *Space Policy* 29 (1) 76–82
- PACE NASA Mission Science Definition Team, 2012, "A Report of the Pre-Aerosol, Clouds, and ocean Ecosystem (PACE) Mission", 271 pp. http://dsm.gsfc.nasa.gov/pace_documentation/PACE_SDT_Report_V8_9-04-2012-2.pdf