



ROSES 2009 A. 41 The Science of Terra and Aqua

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“EOS Recompete” – Overarching Objectives

- Now entitled “**The Science of Terra and Aqua**”
- Follow on from the 2006 NASA Research Announcement *Earth System Science Research using Data and Products from Terra, Aqua and ACRIMSAT Satellites* (NNH06ZDA001N-EOS in ROSES-2006)
- **use of data and derived products from two of the EOS satellites, Terra and Aqua, and their measurement sensors**
- a continuation of the research using Terra and Aqua, emphasizes new opportunities for scientists to analyze and exploit EOS data, develop new products by combining multi-sensor and multi-platform data or by developing an innovative approach to data retrievals with a focus on integrative research from these and other satellite (EOS) data to provide answers to NASA's Earth Science Research questions





Terra and Aqua – Overarching Objectives

- As Terra and Aqua continue to mature and move into the **extended mission phase**, less emphasis will be placed upon algorithm refinement, and more emphasis will be directed to **multi-sensor product development**, accompanied by active utilization of these data and products in **scientific research, modeling, synthesis, and diagnostic analysis** to answer Earth science questions





Terra and Aqua – Types of Proposals Solicited

Five types of proposals are solicited:

2.1 Multi-Platform and Sensor Data Fusion

2.2 Science Data Analysis

2.3 Algorithms – New Data Products

2.4 Algorithms – Existing Data Product Refinement

2.5 Real- or Near-Real-Time Data Algorithms

Two other topics addressed, direction given:

2.6 Requirements - Error and Uncertainty Analysis

2.7 National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) Science Team





Terra and Aqua – Types of Proposals Solicited

2.1 Multi-Platform and Sensor Data Fusion

- Studies utilizing Terra and Aqua data in conjunction with appropriate data from other sources and satellites for interdisciplinary studies of the Earth System.
- Multi-mission and multi-sensor innovative research that can be used to quantify change, characterize processes, and examine function within and among Earth's terrestrial, aquatic, atmospheric, cryospheric, and solid Earth components over time.





Terra and Aqua – Types of Proposals Solicited

2.2 Science Data Analysis

Analysis of Terra and/or Aqua data to answer **disciplinary or interdisciplinary** Earth science research questions. *Must* make scientific use of the data or products from those NASA EOS research sensors listed in **Section 4**.





Terra and Aqua – Available Data and Products

- Not all important science questions answered with Terra and Aqua.
- Other *in situ* and/or satellite data may be used in conjunction with Terra and Aqua data; data from Terra and Aqua should play primary role in answering proposal questions
- Earth Science Research Strategy as part of the NASA Science Plan (<http://nasascience.nasa.gov/about-us/science-strategy>)
- Earth System Data Records proposals should utilize Terra and Aqua with precursor instruments.
- Proposals that utilize Terra/Aqua data with those from other platforms to answer specific questions also appropriate in response to 2.1, Multi-Platform and Sensor Data Fusion
- Cost of obtaining any needed data should be included
- Info about data: Earth Observing System Project Science Office (EOSPSO) <http://eospsoc.gsfc.nasa.gov/>.
- Proposals addressing NPOESS Preparatory Project (NPP) Science will be solicited in 2010 through the NPP Science Team program element.
- MODIS, ASTER, MOPITT, MISR, CERES, ATMS/AIRS/AMSU-A; AMSR-E,
- **Direct Broadcast**
- **“Dead sensors”?: HSB**





Terra and Aqua – Types of Proposals Solicited

2.2 Science Data Analysis

- **Analysis** of Terra and/or Aqua data to answer **disciplinary or interdisciplinary** Earth science research questions. *Must* make scientific use of the data or products from those NASA EOS research sensors listed in Section 4. Terra and Aqua sensor data and/or products can be used individually for disciplinary or interdisciplinary research, or in combination with those from other Terra and Aqua sensors for disciplinary or interdisciplinary research within the Earth System.
- Proposals addressing Terra and Aqua **instrument-specific algorithm maintenance/refinement** that require research efforts for maintenance and refinement should be submitted as Science Data Analysis proposals. **Example:** One that proposed to deliver major algorithm improvements enabling new research, combined with a plan to undertake the research. In this case, the proposal would contain a **plan for improvements to the algorithm(s)** as well as clear scientific objectives.





Terra and Aqua - Types of Proposals Solicited

2.2 Science Data Analysis

- Proposals responsive to Section 2.2 Science Data Analysis that continue research on an existing algorithm *must* provide information in their budget that delineates costs and budgetary interdependencies for the components of the proposal (e.g., which part is science data analysis and which portion is supporting the algorithm maintenance).
- PIs of proposals responsive to this category *may* request to become members of one or more instrument or measurement science teams (Instrument and Science Measurement Teams detailed in Section 3 of program element).





Terra and Aqua - Types of Proposals Solicited

2.3 Algorithms – New Data Products

- a) advance a new data product that has passed through an Algorithm Theoretical Basis Document (ATBD) review to implementation as either a core or experimental EOS data product, or b) introduce a new data product/algorithm development that will yield a new ATBD for peer-review. *Detail the instrument-specific algorithm, significant science, supporting and calibration/validation (cal/val) activities, and depending on the maturity of the data product, a timeline or path to delivery of an ATBD or initial data product release to the community.*
- Calibration and validation activities – scientific justification compelling and focus of the proposed data product or algorithm, suite of algorithms or instrument(s). **New field validation campaigns are not solicited.**
- Specify the instrument or measurement science teams for membership





Terra and Aqua - Types of Proposals Solicited

2.4 Algorithms – Existing Data Product Refinement

- Maintain or modestly refine derived product for any of the currently-approved ATBD algorithms. Emphasize instrument-specific algorithms and necessary supporting calibration/validation activities.
- Proposals that require a significant research effort for maintenance and refinement are responsive to Section 2.2 on Science Data Analysis.
- Proposed supporting calibration/validation activities should be minor investments given the maturity of the existing algorithms, and may involve a single or multiple data products and/or instruments. The scientific justification for such improvements must be compelling and should be the focus of the proposed data product or algorithm, suite of algorithms or instrument(s).
- Radiative transfer theory improvements, in the form of implementation of existing, newer, or faster radiative transfer codes to replace existing Look Up Tables are welcome. Radiative transfer studies that address the development of newer or faster radiative transfer codes and new approaches in radiative transfer theory solicited in **ROSES 2009 A.24**





Terra and Aqua - Types of Proposals Solicited

2.4 Algorithms – Existing Data Product Refinement

- Specify the instrument or measurement science teams for membership
- Proposals requesting support for algorithm refinement for the current suite of Terra and Aqua sensor data products that were either initiated with an ATBD review at the start of the NASA EOS program, or new products that have successfully undergone an ATBD review since its inception, will not be solicited *after* this announcement. (Sync of SR w/Terra and Aqua call)
- NASA EOS ATBDs can be found at http://eosps0.gsfc.nasa.gov/eos_homepage/for_scientists/atbd/index.php.
- **Those activities (existing algorithm refinement and maintenance proposals for the current suite of MODIS, ASTER, MOPITT, MISR, CERES, AIRS, AMSU-A, and AMSR-E data products) will be considered for continued funding as part of the Senior Review process.** Proposals responsive to Section 2.4 of this program element will receive instruction from the Terra and Aqua Project Scientists on how to submit their components of the Terra and Aqua proposals for the Senior Review scheduled for 2011.





Terra and Aqua - Types of Proposals Solicited

2.5 Real- or Near-Real-Time Data Algorithms

- Some of the Terra and Aqua observations have been utilized for operational purposes such as emergency response and/or weather forecasting (e.g., Direct Broadcast and Land, Atmosphere Near-real-time Capability for EOS (LANCE) (<http://modaps.nascom.nasa.gov/LANCE/>))
- Proposals to enhance, refine, or develop near real time algorithms for application and operational usage will be considered.





Terra and Aqua - Types of Proposals Solicited

2.6 Requirements - Error and Uncertainty Analysis

- *All proposals submitted in response to this solicitation must quantify errors and uncertainties associated with the proposed efforts (e.g., data products, scientific data analysis, etc.). The error and uncertainty discussion must be clearly identifiable in a separate section* within the proposal body.
- Proposals to conduct rigorous estimation of error in Earth System Data Records used by NASA communities are not solicited here, but will be solicited in 2010 through the Earth System Data Records Uncertainty Analysis targeted program element





Terra and Aqua - Types of Proposals Solicited

2.7 National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) Science Team

- In 2006, NASA solicited (EOS Rec) proposals to focus on Earth System Data Records and Climate Data Records, merging EOS and National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) activities. **This ROSES 2009 program element does not include NPP Science Team activities.** There will be a call for a NPP Science Team for Climate Data Records in **ROSES 2010.**
- Strong synergies between EOS and NPP algorithm-related activities, and that the investigators proposing successor proposals for both EOS and NPP may experience difficulties in preparing stand-alone proposals in response to each opportunity.
- Proposers planning to respond to both solicitations are advised to **clearly describe each set of activities** in the appropriate proposal & document cross-cutting synergistic work/costs. **Each budget and work plan must be complete and stand alone.** Budget narratives should include statements regarding tasks, personnel time, specific costs that would change if the other proposal were also selected for funding





ATBD/Data Product Review – Rec. May 2008

- Review of algorithms for the new and alternative MODIS algorithms
 - **Current algorithms/products** – Algorithm refinement PIs to provide
 - compelling justification for the importance/utility of the algorithm and (as needed) improvements;
 - plan for transition to core production (recognizing infusion of new knowledge)
 - data product documentation broadly reviewed by user communities (web-based posting for review/comments?)
 - regular data product/algorithm reviews – maintain, refine, review as needed
 - **New algorithms/data products** – draft new proposal, documentation and requirements, follow with review and endorsement by user communities
 - Is there a need for periodic review of ATBDs/Algorithms off-cycle of the competition?





Measurement Teams

Continuing/evolving measurement streams, there will be one science team, competed periodically, that provides scientific guidance to present and future missions and for the utilization of past data sets

- Support and focus on Earth System Data Records
 - Terrestrial community white papers
- One data system to ensure a “seamless” time series
- Scientific guidance and priorities must represent broad user community
- Future MODIS Team Meetings
- NPP VIIRS continuity, DS missions, international missions





Terra and Aqua – Instrument or Measurement Teams

Additional detailed guidance for the Instrument and Science Measurement Teams are provided in program element. Proposed studies may be relevant to more than one team. Proposals should request membership on the team that, to the best of their knowledge, is most relevant to their research (No exclusion).

Measurement Teams Solicited:

- 3.1 Land Measurements Team (LCLUC)
- 3.2. Ocean Biology & Biogeochemistry Measurements Team (OCRT)
- 3.3 Cryospheric Sciences Measurement Team
- 3.4 Atmospheric Science Measurement Team
- 3.5 Geodynamics and Geohazards Research Team
- 3.6 Biodiversity and Ecological Forecasting Team
- 3.7 Sea Surface Temperature Science Team





Issues for MODIS Team

- More interdisciplinary algorithm development approaches, Terra/Aqua intersensor science
- Certain algorithm developers and validation investigators should address important deficiencies in key data products
- Algorithm developers need to represent broader community needs by working with them
- Algorithm refinement PIs need to provide compelling justification for the importance/utility of the algorithm improvements and/or new data products + plan for transition to core production (recognizing infusion of new knowledge)
- Established process for regular data product and algorithm reviews – done for three new ATBDS, but is a cycle needed off the recompute cycle? Need to maintain, evolve, refine, review as needed
- MODIS website – updated and coordinated with discipline leads, team leader, project scientists
- Sync of program element competition with Senior Review





Terra and Aqua - Schedule

- NOIs due 28 January 2010
- Five categories – 65-75 awards
- Proposals due 25 March 2010
- Panels summer 2010
- Selections September 2010
- Estimated start date ~ 1 November 2010
- Funding level of ~\$15M/yr (FY11)

