The Science Mission Directorate strives to understand the Sun, heliosphere, and the Earth's system of land, oceans, geology, and atmosphere and the complex interactions of all these systems as a single, connected, end-to-end system. The Directorate's mission is to reap the benefits of Earth and Sun exploration for society by providing accurate, objective scientific data and analysis to help policy makers, businesses, and citizens achieve economic security and to promote environmental stewardship. In this topic, the Directorate wants innovative companies to propose technology and techniques to assist the Directorate in achieving a portion of the mission in the shortest timeframe that is practical. The topic goal is to accelerate the deployment of Sun-Earth science data and understanding into operational decision support tools used by managers concerned with stewardship of the Earth's resources. This goal addresses the development of innovative technology solutions that simplify the processing, analysis, interpretation, and visualization of science data that will allow the routine use of Earth science results in automated decision support tools already in use by a broad user community. Management decision support tools of interest are used daily in management of land/biota, air, water, and emergency issues.

Subtopics

S7.01 Geospatial Data Analysis Processing and Visualization Technologies

Lead Center: SSC
Participating Center(s): GSFC

Proposals are sought for the development of advanced technologies in support of scientific, commercial, and educational applications of Earth Science and other remote sensing data. Focus areas are to provide tools for processing, analysis, interpretation, and visualization of remotely sensed data sets. Earth Science data needs to be benchmarked for practical use of NASA-sponsored observations from remote sensing systems and predictions from scientific research and modeling. Specific interest exists in the development of technologies contributing to decision support systems, and model development and operation. For more information on decision support models under evaluation, please visit [http://science.hq.nasa.gov/strategy/index.html](http://science.hq.nasa.gov/strategy/index.html). Areas of specific interest include the following:

- Unique, innovative data reduction, rapid analysis, and data exploitation methodologies and algorithms of information from remotely sensed data sets, e.g., automated feature extraction, data mining, etc.;
- Algorithms and approaches to enable the efficient production of data products from active imaging systems, e.g., multipoint data resampling, digital elevation model creation, etc.;

- Data merge and fusion software for efficient production and real-time delivery of digital products of ESE Mission and other remote sensing data sets, e.g., weather observation and land use and land cover data sets;

- Innovative approaches for incorporation of GPS data into *in situ* data collection operations with dynamic links to spatial databases including environmental models;

- Image enhancement algorithms for improving spatial, spectral, and geometric image attributes;

- Innovative approaches for the querying and assimilation of application-specific datasets from disparate and distributed databases from government, academic, and commercial sources into a common framework for data analysis;

- Innovative approaches for querying of application-specific data sets from disparate, distributed databases in government, academic, and commercial data warehouses into a common framework for data analysis; and

- Innovative visualization technologies contributing to the analysis of data through the display and visualization of some or all of the above data types including providing the linkages and user interface between the cartographic model and attribute database.

---

**S7.02 Innovative Tools and Techniques Supporting the Practical Uses of Earth Science Observations**

**Lead Center:** SSC  
**Participating Center(s):** MSFC

Technical innovations and unique approaches are solicited for the development of new technologies and technical methods that make Earth science observations both useful and easy to use by practitioners. This subtopic seeks proposals that support the development of operational decision support tools that produce information for management or policy decision makers. Proposed applications must use NASA Earth Observations (see [http://science.hq.nasa.gov/](http://science.hq.nasa.gov/)). Other remote sensing data and geospatial technologies may also be employed in the solution.

This subtopic focuses on the systems engineering aspect of application development rather than fundamental research. Offerors are, therefore, expected to have the documented proof-of-concept project in hand. Topics of current interest to the Applied Science Directorate may be found at [http://www.asd.ssc.nasa.gov/](http://www.asd.ssc.nasa.gov/). Innovation in processing techniques, include, but are not limited to, automated feature extraction, data fusion, and parallel and distributed computing which are desired for the purpose of facilitating the use of Earth science data by the nonspecialist. Ease of use, fault tolerance, and statistical rigor and robustness are required for confidence in the product by the nonspecialist end user.

Promotion of interoperability is also a goal of the subtopic, so Federal data standards, communication standards, Open Geographic Information Systems (GIS) standards, and industry-standard tools and techniques will be strongly favored over proprietary 'black-box' solutions. Endorsement by the end user of both system requirements and the proposed solution concept is desirable. While the proposed application system may be specific to a particular end user or market, techniques and tools that have broad potential applicability will be favored. An
objective assessment of market value or benefit/cost will help reviewers assess the relative potential of proposed projects.

S7.03 Wireless Technologies for Spatial Data, Input, Manipulation and Distribution

Lead Center: SSC

Technical innovation is solicited for the development of wireless technologies for field personnel and robotic platforms to send and receive digital and analog data from sensors such as photography cameras, spectrometers, infrared and thermal scanners, and other sensor systems to collection hubs. The intent of this new innovation is to rapidly, in real time, ingest data sequentially from a variety of input sensors, provide initial field verification of data, and distribute the data to various nodes and servers at collection, processing, and decision hub sites. Data distribution should utilize state-of-the-art wireless, satellite, land carriers, and local area communication networks. The technology's operating system should be compatible with commonly available systems. The operating system should not be proprietary to the offeror. The innovation should include biometric capability for password protection and relational tracking of data to the field personnel inputting the data and/or sensors and platforms sending information. The innovation should contain technologies that recognize multiple personnel and other sources (robotics) so that several personnel and platforms can use the same unit in the field. Biometric identification can be fingerprint, retina scans, facial, or other methods. The innovation should include geospatial technologies to use digital imagery and have Global Positioning System (GPS) location capabilities. The innovation should be able to display, with sufficient size and resolution, the rendering of vector and raster data and other sensor data for easy understanding. The field capability of the innovation must be fully integrated end to end with computing capabilities that range from mobile computers to servers at distant locations. Field personnel and robotic platforms providing information and support to science investigations, resource managers, and community planners will use the innovative wireless technology. First responders to natural, human-made disasters and emergencies will also be users of this innovation.