Proposals are sought for the development of \textit{in situ} measurement systems that will enhance the scientific and commercial utility of data products from the Earth Science Enterprise program and that will enable the development of new products of interest to commercial and governmental entities around the world. Technology innovation areas of interest include:

- Autonomous Global Positioning System (GPS)-located platforms (fixed or moving) to measure and transmit to remote terminals upper ocean and lower atmosphere properties including temperature, salinity, momentum, light, precipitation, and biogeochemistry;
- Dynamic stabilization systems for small instruments mounted on moving platforms (e.g., buoys and boats) to maintain vertical and horizontal alignment. Systems capable of maintaining a specified pointing with respect to the Sun are preferred;
- Small, lightweight instruments for measuring clouds, liquid water, or ice content (mass) designed for use on radiosondes, dropsondes, aerosondes, tethered balloons, or kites;
- Wide-band microwave radiometers capable of high-speed characterization of cloud parameters, including liquid and ice phase precipitation, which can operate in harsh environmental conditions (e.g., onboard ships and aircraft);
- Autonomous, GPS-located airborne sensors that remotely sense atmospheric wind profiles in the troposphere and lower stratosphere with high spatial resolution and accuracy;
- Systems for \textit{in situ} measurement of atmospheric electrical parameters including electric and magnetic fields, conductivity, and optical emissions;
- Systems to measure line- and area-averaged rain rate at the surface over lines of at least 100 m and areas of at least 100x100 m;
- Lightweight, low-power systems that integrate the functions of inertial navigation systems and GPS receivers for characterizing and/or controlling the flight path of remotely piloted vehicles;
- Low-cost, stable (to within 1\% over several months), portable radiometric calibration devices in the...
shortwave spectral region (0.3 to 3 Åµm) for field characterization of radiance instruments such as sun photometers and spectrometers;

- Miniaturized, low-power (12V DC) instruments especially suited for small boat operations that are capable of adequately resolving, at the appropriate accuracy, the complex vertical structure (optical, hydrographic, and biogeochemical) of the coastal ocean (turbid) water column. Sensors that can be easily integrated within a digital (serial) network to measure the apparent and inherent optical properties of seawater are preferred; and

- Aircraft or UAV instruments for *in situ* measurements of physical and optical properties of clouds and aerosols with instantaneous measurement volumes ranging from cubic meters up to a maximum of a cubic kilometer, the purpose being to furnish validation for satellite remote sensing at the spatial scales satellites actually provide.