



NASA SBIR 2011 Phase I Solicitation

S1.08 In Situ Airborne, Surface, and Submersible Instruments for Earth Science

Lead Center: GSFC

Participating Center(s): ARC, JPL, KSC, LaRC, MSFC, SSC

New, innovative, high risk/high payoff approaches to miniaturized and low cost instrument systems are needed to enhance Earth science research capabilities. Sensor systems for a variety of platforms are desired, including those designed for remotely operated robotic aircraft, surface craft, submersible vehicles, balloon-based systems (tethered or free), and kites. Global deployment of numerous sensors is an important objective, therefore cost and platform adaptability are key factors.

Novel methods to minimize the operational labor requirements and improve reliability are desired. Long endurance (days/weeks/months) autonomous/unattended instruments with self/remote diagnostics, self/remote maintenance, capable of maintaining calibration for long periods, and remote control are important. Use of data systems that collect geospatial, inertial, temporal information, and synchronize multiple sensor platforms are also of interest.

Priorities include:

- Atmospheric measurements in the troposphere and lower stratosphere: Aerosol Optical and Microphysical Properties, Cloud Properties and Particles, Water, Chemical Composition, i.e., Carbon Dioxide ($^{12}\text{CO}_2$ and $^{13}\text{CO}_2$), Carbon Monoxide, Methane, Nitrogen Dioxide, Hydrogen Peroxide, Formaldehyde, Bromine Oxides, Ozone, and Three-dimensional Winds and Turbulence.
- Oceanic, coastal, and fresh water measurements including inherent and apparent optical properties, temperature, salinity, currents, chemical and particle composition, sediment, and biological components such as nutrient distribution, phytoplankton, harmful algal blooms, fish or aquatic plants.
- Hyperspectral radiometers for above water (340 -1400 nm) and shallow water (340 - 900 nm) profiling: high frequency measurements of sky-radiance, sun irradiance, water leaving radiance, and bidirectional reflectance, with solar-tracking and autonomous operation.
- Instrument systems for hazardous environments such as volcanoes and severe storms, including

measurements of Sulfur Dioxide, Particles, and Precipitation.

- Land Surface characterization geopotential field sensors, such as gravity, geomagnetic, electric, and electromagnetic.
- Urban air-quality profiler: ground based, compact, inexpensive, (laser based) systems suited for unattended measurement (e.g., ozone) profiles of the troposphere.

Instrument systems to support satellite measurement calibration and validation observations, as well as field studies of fundamental processes are of interest. A priority is applicability to NASA's research activities such as the Atmospheric Composition and Radiation Sciences programs, including Airborne Science support thereof, as well as the Applied Sciences, and Ocean Biology and Biogeochemistry programs. Support of algorithm development for the Geostationary Coastal and Air Pollution Events (Geo-CAPE) mission is also a priority. Development of instruments that will provide near-term benefit to the NASA science community is a priority - working prototypes delivered by the completion of Phase II are desired.