Above is a mechanical drawing of an infrared correlation radiometer technology being developed for the GEO-CAPE mission. This project seeks to characterize the performance of a 2.3 μm infrared correlation radiometer (ICR) prototype subsystem designed specifically to measure column methane from the troposphere. The focus is on characterizing the 2.3 μm ICR subsystem, although both 2.3 μm and 4.6 μm subsystems will be required to obtain boundary layer CO. (Doreen Neil, NASA Langley Research Center)

Above are optics hardware for the Panchromatic Fourier Transform Spectrometer (PanFTS), a revolutionary new instrument that may have a major impact on remote sensing of atmospheric trace gases, aerosols and ocean color. PanFTS is designed to measure all of the trace species called out in the decadal survey for GEO-CAPE and GACR. With continuous sensitivity from 0.26 to 15 microns and high spectral resolution, PanFTS combines the functionality of separate UV, visible and IR instruments in a single package at lower cost. The PanFTS SP instrument will be a dynamically-aligned plane mirror system using an all-flexure scan mechanism. Two separate optical trains (0.26-1 micron and 1-15 micron) will share the scan and dynamic alignment systems. The output beams will drive separable two-dimensional focal plane array detectors for the spectral regions. (Stanley F. Sander, Jet Propulsion Lab)

At right is the optical bench assembly for SRAS-G, the Spaceborne Infrared Atmospheric Sounder for GEO. The SRAS-G project, which graduated from ESTO funding in 2006, had two major components: 1) to develop and demonstrate an infrared imaging spectrometer at cryogenic temperatures in a laboratory environment, and 2) to develop refined spectrometer concepts suitable for future Earth science missions. (Thomas Kampa, Ball Aerospace)

The Geostationary Spectrograph (GeoSpec) project sought to demonstrate the feasibility of future GEO missions using hyperspectral UV/VIS/NIR instrumentation. By 2007, the project team had completed testing of a fully-aligned breadboard system (shown above) as well as studies for a flight instrument concept. Below are final hybrid detector packages. (Scott Jones, Goddard Space Flight Center)

Understanding the atmospheric state and its impact on air quality requires observations of trace gases, aerosols, clouds, and physical parameters across temporal and spatial scales that range from minutes to days and from meters to more than 10,000 kilometers. The Sensor-Web Operations Explorer (SOX) project seeks to enable adaptive measurement strategies for air and ocean quality sensor webs; provide a comprehensive sensor-web system scalable with multiple sensors and multiple platforms; provide a quantitative science metrics metric that can identify where and when specific measurements have the greatest impact; and enable collaborative campaign planning processes among distributed users. (Mooilong Lee, Jet Propulsion Lab)

Additional Information Systems Projects:
- Technology Infusion for the Real-Time Mission Monitor, Michael Goodwin, NASA Marshall Space Flight Center
- Real Time and Stow-and-Forward Delivery of Unmanned Airborne Vehicle Sensor Data, Wili Wicinski, NASA Glenn Research Center
- A Smart Sensor Web for Ocean Observation: System Design, Modeling, and Optimization, Poyman Arakelian, University of Washington
- Autonomous In-situ Central and Resource Management in Distributed Heterogeneous Sensor Webs, Ahiit Tekalder, Jet Propulsion Lab
- Adaptive Skip, Michael Bart, Jet Propulsion Lab
- A Reconfigurable Computing Environment for On-Board Data Reduction and Cloud Detection, Jacqueline La Monge, NASA Goddard Space Flight Center

Above is a simple comparison of aerosol optical depth data sets derived from the MOCES (left) and MERIS (right) satellite instruments from the March 2004 high aerosol event west of the Sahara. MOCES and MERIS instruments are very similar — the MERIS aerosol product has the same spatial and temporal resolution as MOCES — but MERIS missions high aerosol events because MERIS aerosols are reported only where ocean color retrievals are made. The discrepancy between the two data sets illustrates how the lack of data provenance can produce very different results. The Multi-Sensor Data Synergy Advisor (MDSA) project seeks to help data users better understand the provenance and utility of data sets by augmenting data analysis tools with semantic web technologies and ontologies that support data inter-comparisons from different sensors or missions. (Gregory Laphish, NASA Goddard Space Flight Center)