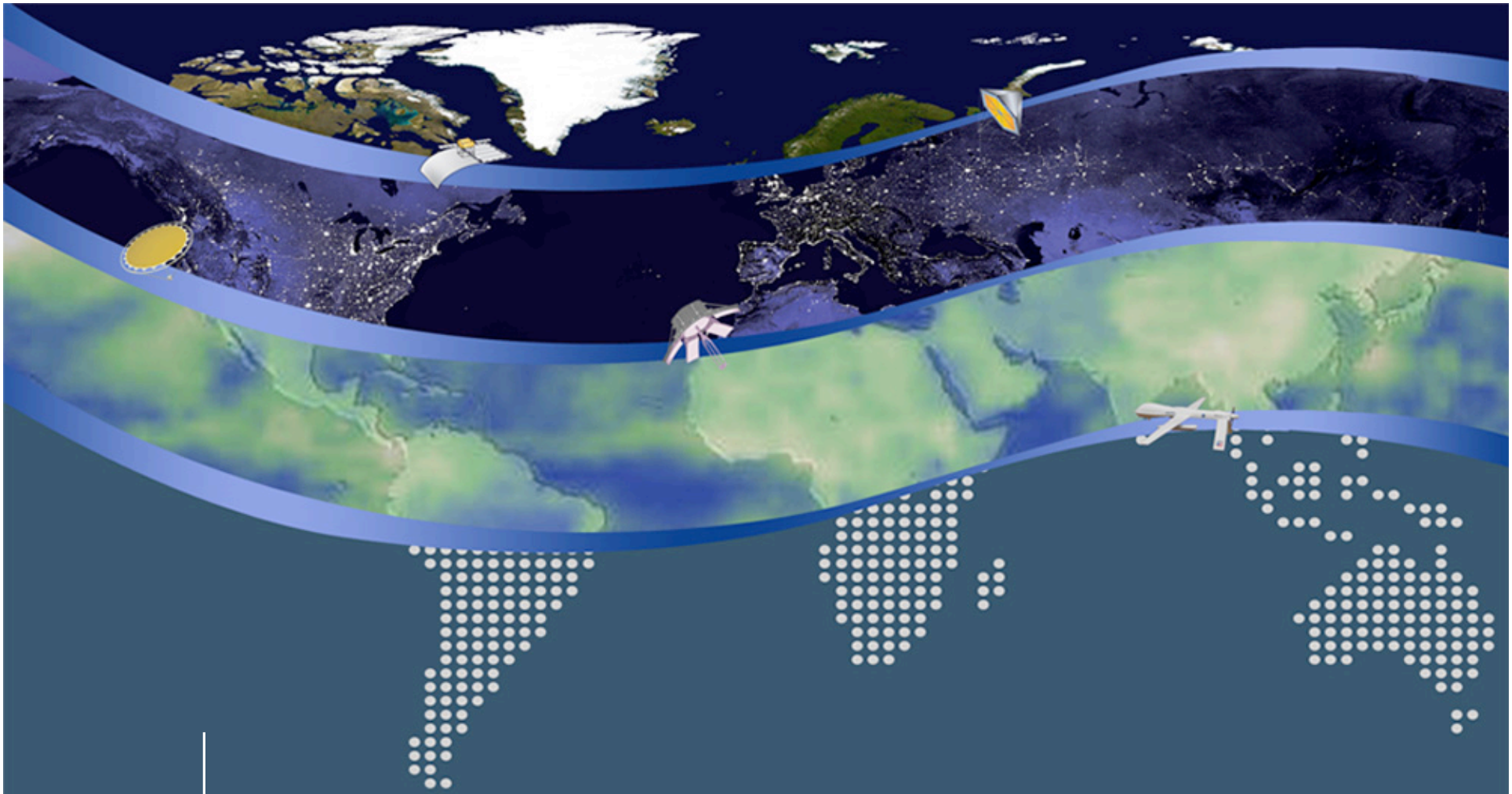


NASA Earth Science Technology Office (ESTO)

Decadal Survey Technology Investments

January 7, 2009

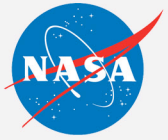
Overview: Earth Science Technology Office

Science Driven, Competed, Actively Managed, and Dynamically Communicated

- Competitive, peer-reviewed proposals enable selection of best-of-class technology investments
- Risks are retired before major dollars are invested: a *cost-effective approach* to technology development and validation

Since the Earth Science Decadal Survey was published in 2007, ESTO has focused its Instrument, Component and Information Technology solicitations on Decadal Survey measurements

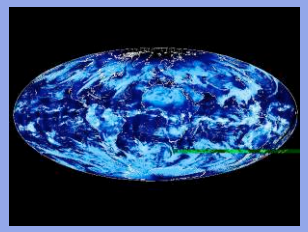
This has resulted in the award of 57 technology projects representing an investment of over $105M directly related to the Earth Science Decadal Survey.

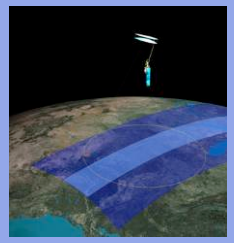


NASA Earth Science Decadal Survey Missions

Tier I

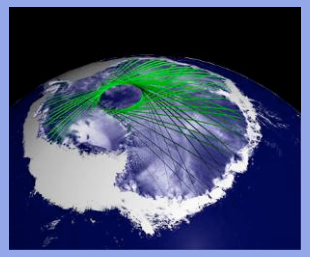
Climate Absolute Radiance and Refractivity Observatory **(CLARREO)**





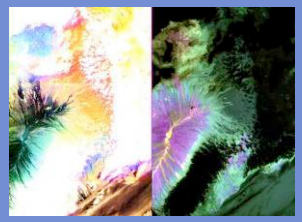
Soil Moisture Active Passive **(SMAP)**

Ice, Cloud,and land Elevation Satellite II **(ICESat-II)**



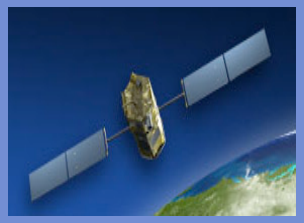
Deformation, Ecosystem Structure and Dynamics of Ice **(DESDynI)**

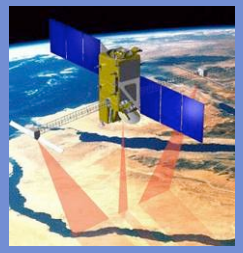
Tier II



Hyperspectral Infrared Imager **(HYSPIRI)**

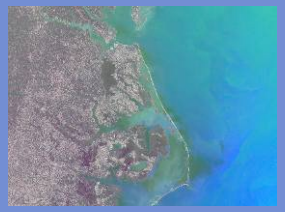
Active Sensing of CO2 Emissions **(ASCENDS)**

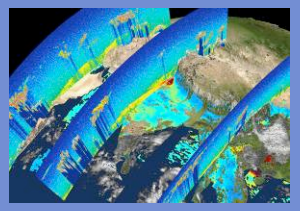




Surface Water and Ocean Topography **(SWOT)**

Geostationary Coastal and Air Pollution Events **(GEO-CAPE)**

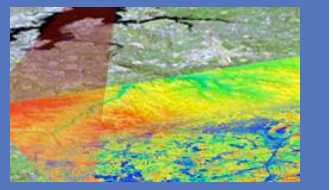




Aerosol - Cloud - Ecosystems **(ACE)**

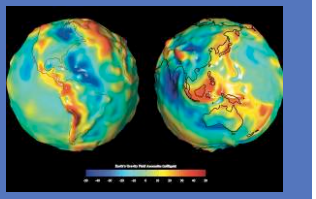
Tier III

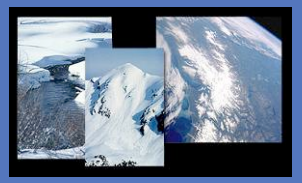
LIDAR Surface Topography **(LIST)**



Precipitation and All-Weather Temperature and Humidity **(PATH)**

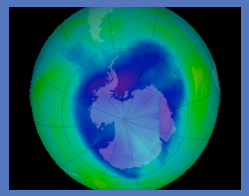
Gravity Recovery and Climate Experiment - II **(GRACE - II)**





Snow and Cold Land Processes **(SCLP)**

Three-Dimensional Winds from Space Lidar **(3D-Winds)**



Global Atmospheric Composition Mission **(GACM)**

Instrument Awards vs. DS Missions

2007 Instrument Incubator Awards versus Decadal Survey Missions	CLARREO	SMAP	ICESat-II	DESDynI	HyspIRI	ASCENDS	SWOT	GEO-CAPE	ACE	LIST	PATH	GRACE-II	SCLP	GACM	3D-WINDS	CLARREO-NOAA	GPSRO	XOVWM
Abshire/GSFC - column CO2, lidar						■												
Diner/JPL - aerosols and clouds, polarimetric imager									■									
Durden/JPL - clouds and precipitation, profiling radar									■									
Folkner/JPL - time-varying gravity, laser frequency stabilization												■						
Fu/JPL - surface water and ocean topography, interferometric SAR							■											
Grund/Ball - tropospheric winds, Doppler lidar															■			
Hackwell/Aerospace - mineral and gas, TIR spectrometer					■													
Heaps/GSFC - column CO2, lidar						■												
Hook/JPL - mineral/water resources, hyperspectral TIR spectrometer					■													
Kavaya/LaRC - tropospheric winds, Doppler lidar															■			
Kopp/CU - radiation balance, UV-SWIR hyperspectral imager	■																	
Lambrigtsen/JPL - T, water vapor, precipitation; microwave sounder											■							
McClain/GSFC - ocean color, UV-SWIR radiometer									■									
Mlynczak/LaRC - radiation balance far-IR spectrometer	■																	
Neil/LaRC - boundary laser CO, gas correlation radiometer								■										
Papapolymerou/GT - snow-water equivalent, X-band phased array													■					
Revercomb/UWM - radiation balance, SI-traceable IR calibration	■																	
Sander/JPL - air pollution and coastal imaging, panchromatic FTS								■										
Stek/JPL - atmospheric composition, microwave limb sounder														■				
Weimer/Ball - vegetation canopy, steerable lidar				■														
Yu/GSFC - topography and vegetation structure, swath-mapping lidar										■								

■ IIP07 Awards

Instrument Awards: Airborne Components

2007 Instrument Incubator Awards versus Decadal Survey Missions	CLARREO	SMAP	ICESat-II	DESDynI	HyspIRI	ASCENDS	SWOT	GEO-CAPE	ACE	LIST	PATH	GRACE-II	SCLP	GACM	3D-WINDS	CLARREO-NOAA	GPSRO	XOVWM
Abshire/GSFC - column CO2, lidar																		
Diner/JPL - aerosols and clouds, polarimetric imager																		
Durden/JPL - clouds and precipitation, profiling radar																		
Folkner/JPL - time-varying gravity, laser frequency stabilization																		
Fu/JPL - surface water and ocean topography, interferometric SAR																		
Grund/Ball - tropospheric winds, Doppler lidar																		
Hackwell/Aerospace - mineral and gas, TIR spectrometer																		
Heaps/GSFC - column CO2, lidar																		
Hook/JPL - mineral/water resources, hyperspectral TIR spectrometer																		
Kavaya/LaRC - tropospheric winds, Doppler lidar																		
Kopp/CU - radiation balance, UV-SWIR hyperspectral imager																		
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Mlynczak/LaRC - radiation balance far-IR spectrometer																		
Neil/LaRC - boundary laser CO, gas correlation radiometer																		
Papapolymerou/GT - snow-water equivalent, X-band phased array																		
Revercomb/UWM - radiation balance, SI-traceable IR calibration																		
Sander/JPL - air pollution and coastal imaging, panchromatic FTS																		
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Weimer/Ball - vegetation canopy, steerable lidar																		
Yu/GSFC - topography and vegetation structure, swath-mapping lidar																		

IIP07 Awards
IIP07 Airborne Awards

Component Awards vs. DS Missions

2008 Advanced Component Technology Awards versus Decadal Survey Mission	CLARREO	SMAP	ICESat-II	DESDynI	HyspIRI	ASCENDS	SWOT	GEO-CAPE	ACE	LIST	PATH	GRACE-II	SCLP	GACM	3D-WINDS	CLARREO-NOAA	GPSRO	XOVWM
Dobbs/ITT - corrugated mirror telescope array for lidar			■	■		■			■	■				■	■			
Fang/JPL - large deployable reflector for Ka- and W-band									■									
Hoffman/JPL - thermal packaging for RF hybrids, radar				■			■											
Illing/Ball - polarization scrambler, spectroscopy					■			■	■					■				
Janz/GSFC - visible NIR blind GaN focal plane array, hyperspectral								■										
Krainak/GSFC - NIR optical receiver, lidar			■	■		■			■	■					■			
Marx/GSFC - hybrid doppler wind lidar transceiver															■			
McGill/GSFC - detector technology for cloud aerosol lidar									■						■			
Meehan/JPL - RF ASIC for digital beamforming, GNSS															■		■	
Mlynczak/LaRC - FIR detectors for Earth radiation	■																	
Phillips/LockMart - CO2 laser absorption spectroscopy						■												
Reising/Colo. St. Univ.- radiometer for wet-tropospheric correction							■											
Rider/JPL - analog to digital converter from UV to mid-IR					■			■	■					■				
Siqueira/Univ. Mass. - low power, high BW receiver, Ka-band							■											
Taylor/Composite Tech. Dev. - large aperture, deployable reflector		■					■				■		■					■
Thomson/JPL - deployable Ka-band reflect array							■											

■ ACT08 Awards

Information Systems Awards vs. DS Missions

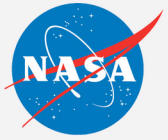
2008 Advanced Information Systems Technology Awards versus Decadal Survey Mission	CLARREO	SMAP	ICESat-II	DESDynI	HysplRI	ASCENDS	SWOT	GEO-CAPE	ACE	LIST	PATH	GRACE-II	SCLP	GACM	3D-WINDS	CLARREO-NOAA	GPSRO	XOVWM	Broad App.
Bock/Scripps, UCSD – Solid Earth – Data fusion				■															
Braverman/JPL – Carbon/eco – Data fusion						■													
Donnellan/JPL – Solid Earth – Cloud computing				■															
Flatley/GSFC – Broad app. – On-board data/signal processing									■										
French/USC/ISI – Broad app. – On-board data & signal processing		■																	
Goodman/MSFC – Climate – Data manipulation								■											
Ivancic/GRC – Atm. comp. – Sensor web enablement																			■
Leptoukh/GSFC – Atm. Comp. - Ontology								■											
Lou/JPL – Solid Earth – On-board data & signal processing				■															
Mandl/GSFC – Carbon/eco – Data manipulation					■														
Moghaddam/U. Mich – Water/energy – Mission simulation & design		■																	
Nemani/ARC – Carbon/eco – Mission management		■																	
Norton/JPL – Climate – On-board data & signal processing									■										
Peters-Lidard/GSFC – Water/energy – Algorithms & modeling		■																	
Rosen/JPL – Climate – Algorithms & modeling				■															
Schneider/U. Florida – Weather – Data manipulation															■				
Seablom/GSFC – Climate – Mission management															■				
Shen/UMBC – Weather – High-performance computing	■																		
Tanelli/JPL – Climate – Mission/system simulation & design									■										
Von Allmen/JPL – Solid Earth – Algorithms & modeling				■															

■ AIST08 Awards

In Summary…

ESTO continues to invest in innovative remote sensing instrument systems, subsystems and information systems that are enabling a new series of advanced observation satellites.

ESTO has investments in all the Decadal Survey missions

ESTO investments build technologies, hardware, software and future PI's

ESTO is working with the DS teams to communicate available technologies and understand technology needs.