



# **Health and Air Quality Applied Sciences Team Meeting**

***John A. Haynes, MS  
Program Manager, Health and Air Quality***

***Applied Sciences Program  
Earth Science Division  
Science Mission Directorate  
NASA  
Washington, DC USA***

***[jhaynes@nasa.gov](mailto:jhaynes@nasa.gov)***



Launch of JPSS-1 on November 18, 2017, from  
VAFB.



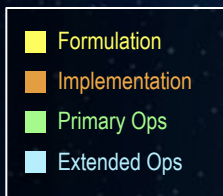
# Earth Science Missions

## ISS Instruments

CATS, LIS, SAGE III  
TSIS-1, OCO-3, ECOSTRESS, GEDI  
CLARREO-PF, TSIS-2

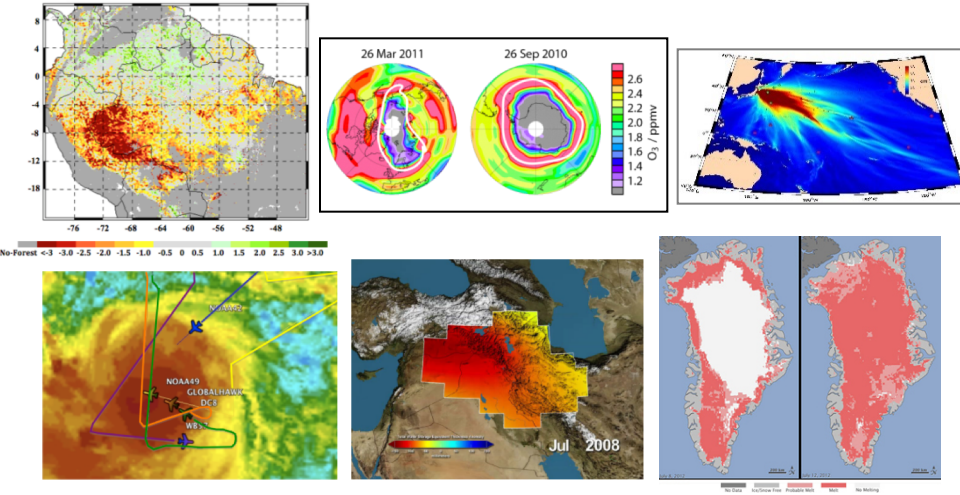
## JPSS-2 Instruments

RBI, OMPS-Limb

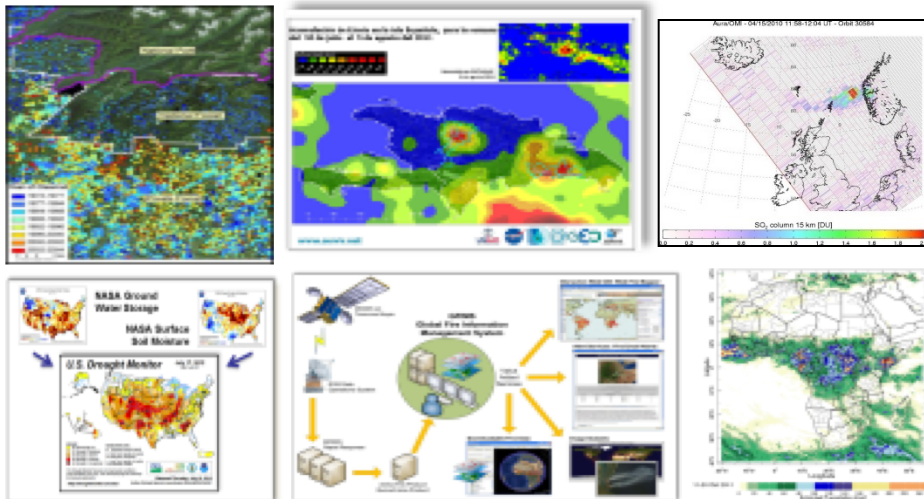


# NASA's Earth Science Division

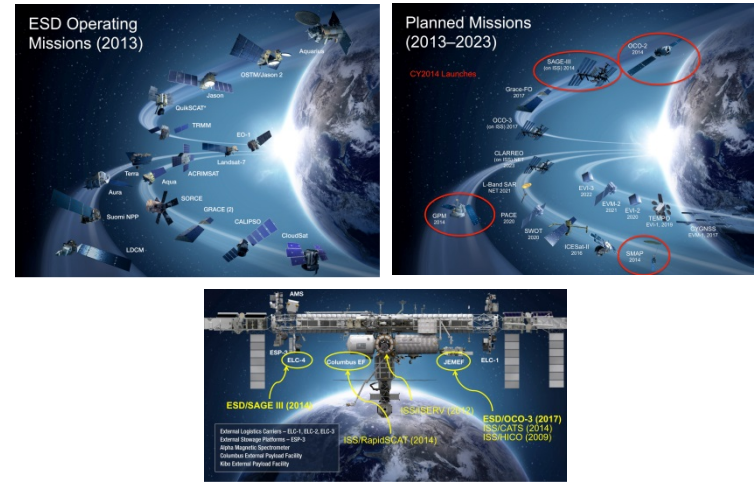
# Research



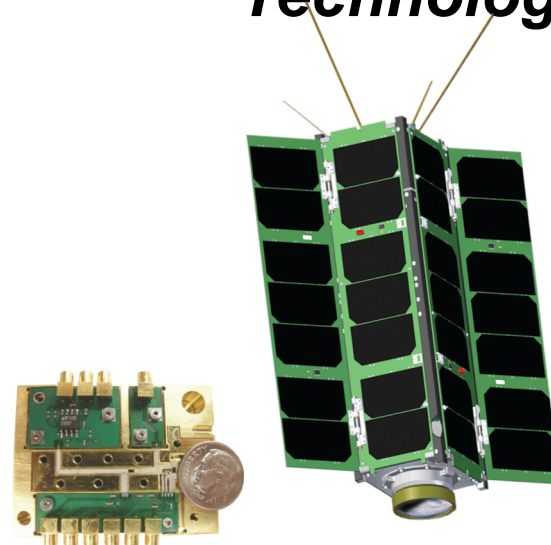
# Applied Sciences



# Flight



# Technology





***Discovering and demonstrating innovative and practical uses of Earth observations in organizations' policy, business, and management decisions.***



***<http://AppliedSciences.NASA.gov>***

## ***Applications***

Prove-out, develop, and transition applications ideas for sustained uses of Earth obs. in decision making.

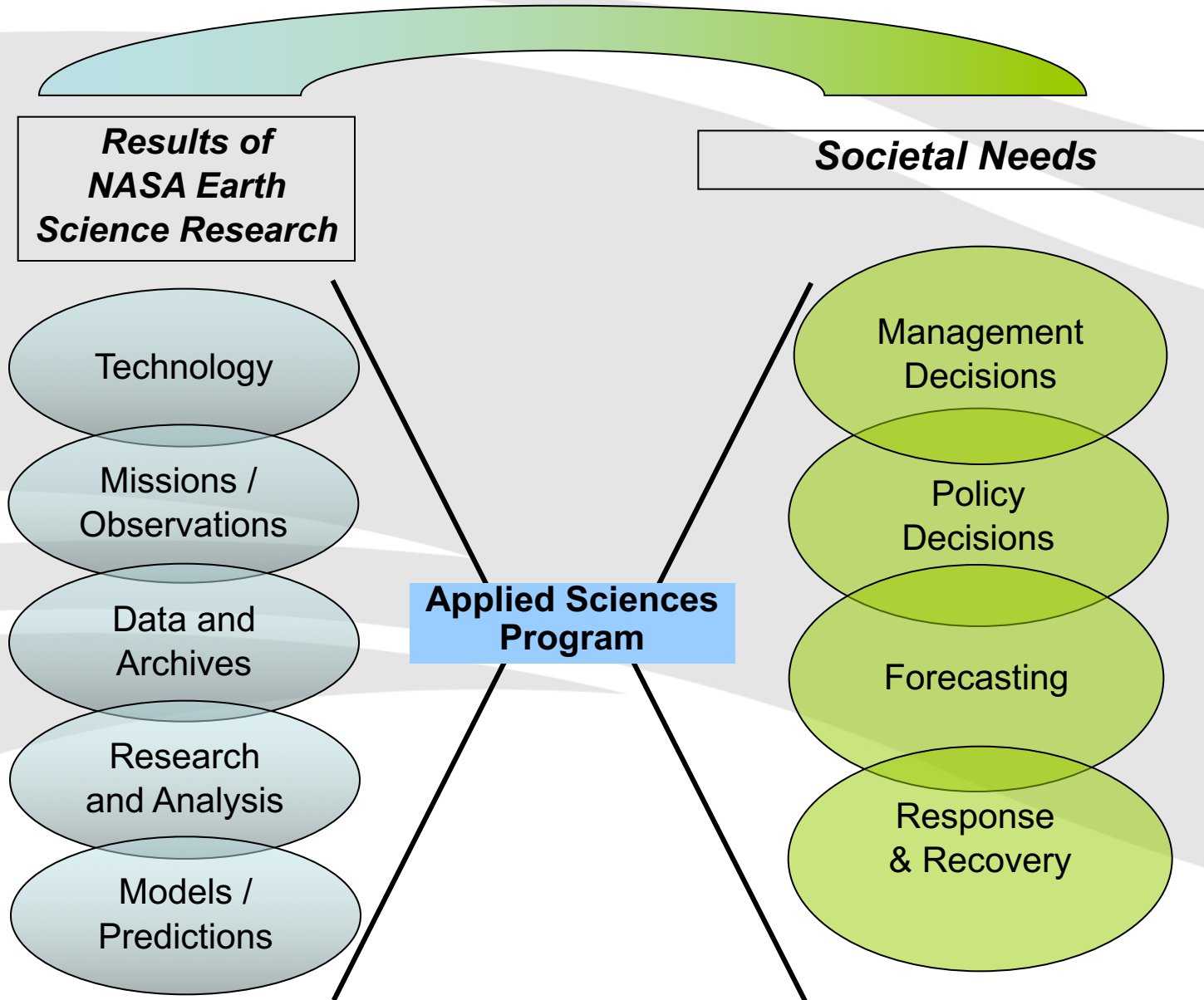
## ***Capacity Building***

Build skills and capabilities in US and developing countries to access Earth observations to benefit society.

## ***Mission Planning***

Identify applications early in mission lifecycle and integrate end-user needs in mission design and development.

# NASA Applied Sciences Architecture





## ***Applications Areas***

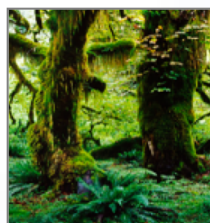
### **Emphasis in Applications Areas**



**Health &  
Air Quality**



**Water  
Resources**



**Ecological  
Forecasting**



**Disasters**



**Agriculture /  
Food Security**



**Wildland Fires  
(through 2017)**

**NASA  
Earth Science**

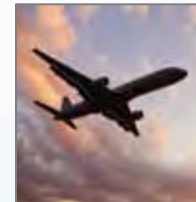
***Support opportunities  
in  
additional areas***



**Energy**



**Urban  
Development**



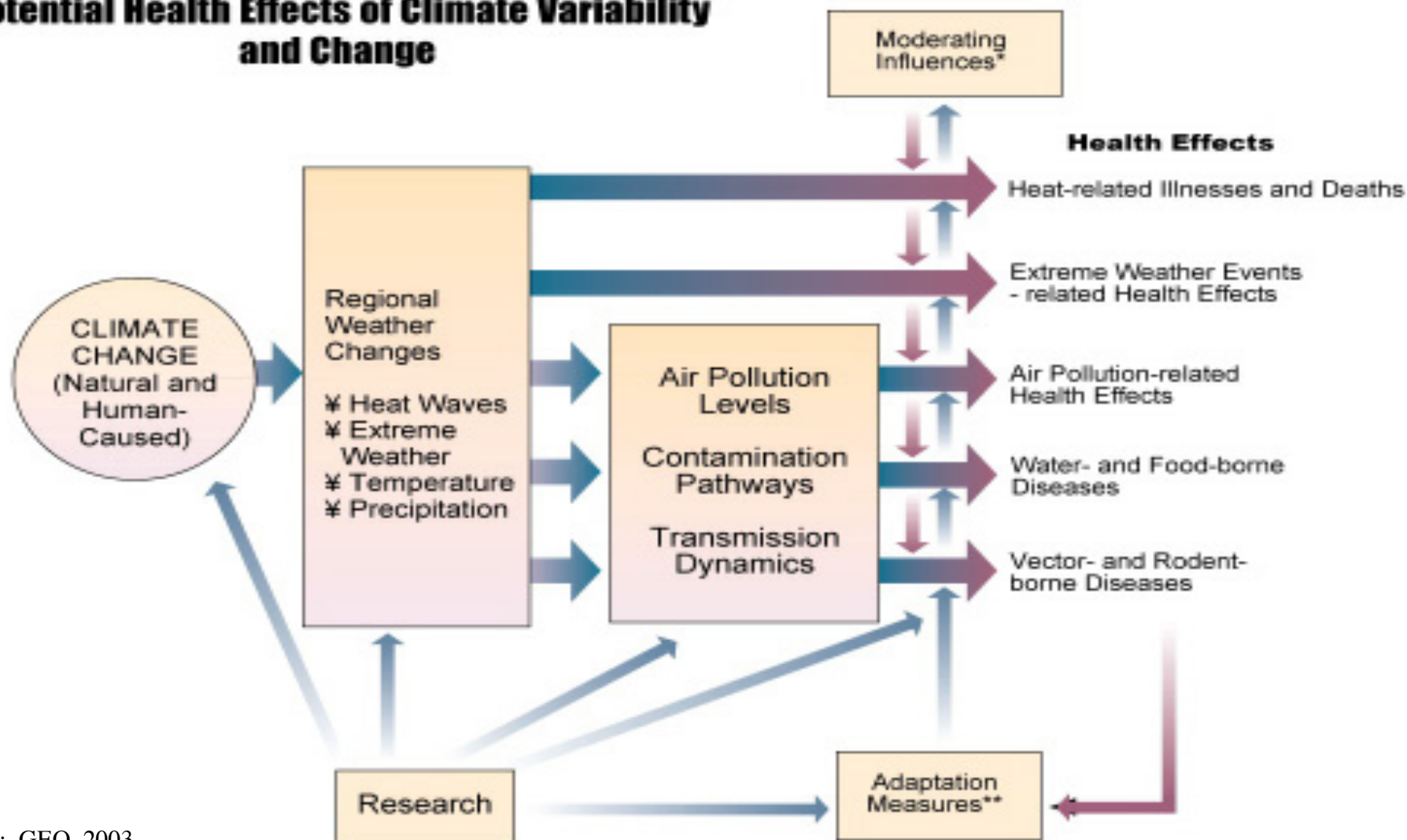
**Transportation  
/  
Infrastructure**

*Wildfires will be covered in Eco.Fore & Disasters after FY17; climate & weather play into all areas*

# Why Health & Air Quality?

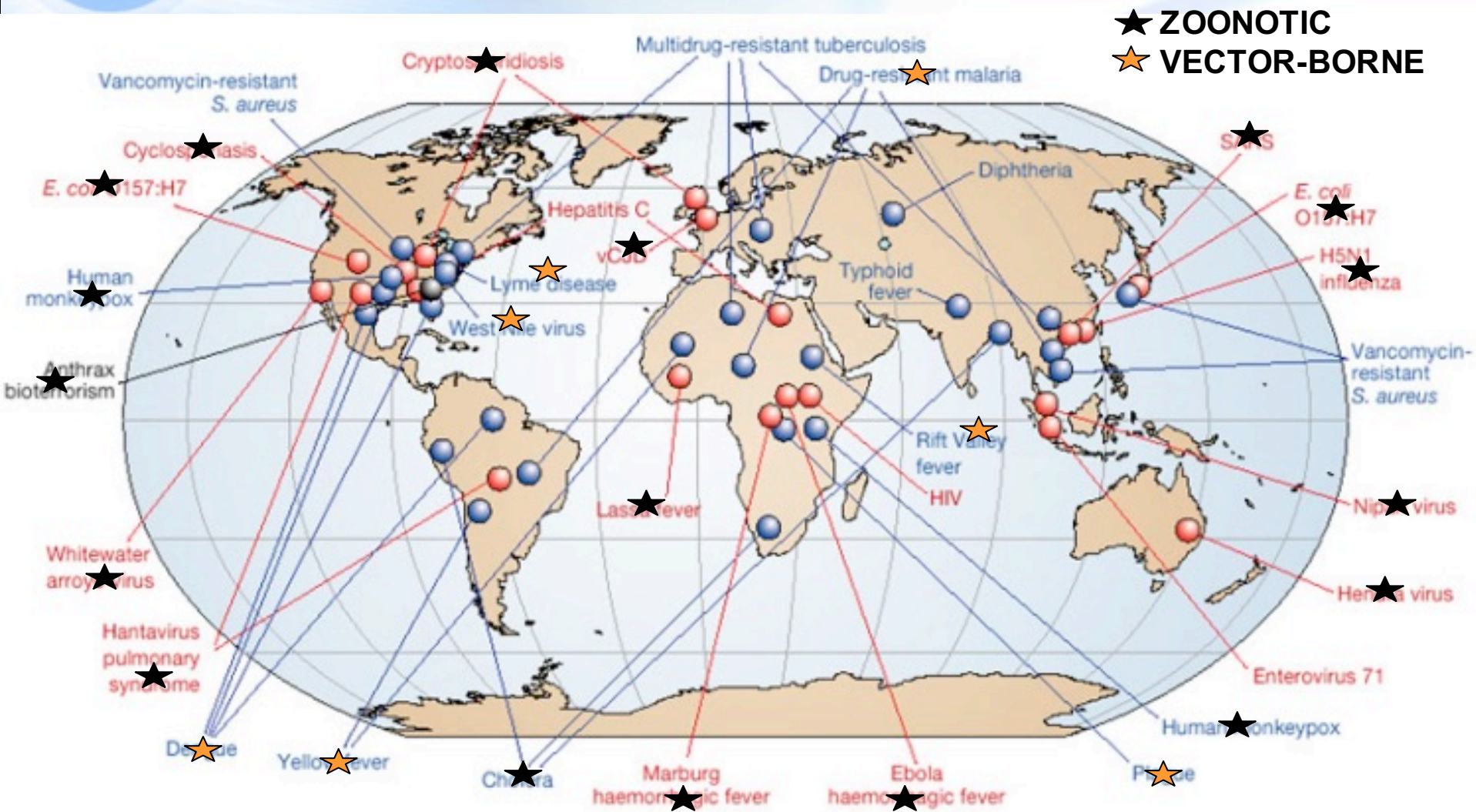


## Potential Health Effects of Climate Variability and Change





# Global Emerging Diseases\*



**EMERGING**  
**RE-EMERGING**

\* Modified from Morens et al. 2004 *Nature* 430:242



# New Environmental Threats



This visible image of the Gulf oil slick was taken on May 9, 2010, at 19:05 UTC (3:05 p.m. EDT) from MODIS aboard NASA's Aqua satellite. Crude oil brings volatile organic compounds into the air which can react with nitrogen oxides to produce ozone.



## Objectives:

- NASA's Health & Air Quality Applications Area supports the use of Earth observations in air quality management and public health, particularly regarding **infectious disease and environmental health** issues.
- The area addresses issues of toxic and pathogenic exposure and health-related hazards and their effects for risk characterization and mitigation.
- The area promotes uses of Earth observing data and models regarding **implementation of air quality standards, policy, and regulations** for economic and human welfare.
- The Health & Air Quality Applications Area also addresses **effects of climate change on public health and air quality** to support managers and policy makers in their planning and preparations.



Technical		Budget/Cost		Schedule		Performance		Overall	
Prev	This	Prev	This	Prev	This	Prev	This	Prev	This
Review	Review	Review	Review	Review	Review	Review	Review	Review	Review
G	G	Y	Y	G	G	G	G	G	G

## Technical:

- The portfolio is technically performing very well.

## Budget/Cost:

- Portfolio has a relatively high burden of uncoded funds. Associates are working diligently with PIs to uncover issues at their particular institutions. Many times this appears to be an issue of “invoice lag” between NASA and the institution. Particularly egregious cases of mis-match between institutions and NASA records were identified at the team meeting in September. However, significant progress has been made – FY16 uncoded funds are down ~70% from a year ago.

## Schedule:

- Overall the portfolio has a good track record for remaining on schedule, with NCEs mainly occurring in a few AQUEST projects.

## Performance:

- Overall performance of the portfolio meets or exceeds expectations.

## Overall:

- The Health and AQ program is performing satisfactorily.



## Project Portfolio – 12 Active Projects\*\*

Nov. 2017

ARL 1-3: 0 projects

ARL 4-6: 8 project

ARL 7-9: 4 projects

Mean: ARL 6.1

Median: ARL 6

Mode: 6

0

ARL 9

—

2

ARL 8

—

2

ARL 7

—

4

ARL 6

—

3

ARL 5

—

1

ARL 4

—

0

ARL 3

—

0

ARL 2

—

0

ARL 1

## Performance since Nov. 2016:

92% of projects increased by at least 1 ARL. 42% of projects increased by 2 ARL.

\*\*13 additional projects are HAQAST, which are not currently reporting ARLs.



# Major News Items in the ESD/ASP

- » Rep. Jim Bridenstine (Oklahoma) nominated to be next NASA Administrator.
- » HAQAST had first two meetings and began Tiger Team activities (<http://haqast.org>). Second round of TTs approved!
- » 2016 NASA ASP Annual Report published:  
[https://appliedsciences.nasa.gov/system/files/docs/NASA\\_Applied\\_Sciences\\_2016\\_report.pdf](https://appliedsciences.nasa.gov/system/files/docs/NASA_Applied_Sciences_2016_report.pdf)
- » TEMPO instrument delivery scheduled for 2018; MAIA passes KDP-B in August 2017.
- » GEO Plenary IX: October 23-27, 2017, in Washington, DC. Several health related side events conducted, including a meeting of the GEO Health Community of Practice (<http://www.geohealthcop.org/>).
- » ROSES 2016 A.50 (GEO Work Programme) selections announced October 2017. Four selections in “EO4HEALTH.”
- » ROSES 2017 A.39 (Health and AQ Applications) proposals were due on November 17, 2017.
- » Continued ARSET Health Trainings in 2016-17.
- » New HAQAST and Applied Sciences Videos:
  - Satellite Data and Energy Analysis: [https://www.youtube.com/watch?v=vtqU\\_y70I5E](https://www.youtube.com/watch?v=vtqU_y70I5E)
  - Satellite Data and Air Quality Management: [https://www.youtube.com/watch?v=4VFm\\_00kGdE](https://www.youtube.com/watch?v=4VFm_00kGdE)
  - Mosquito Meets MODIS: <https://www.youtube.com/watch?v=ag-Zo0izSNg>
  - Satellite Data and Models: <https://www.youtube.com/watch?v=qFnQV6QPv6E>
  - Using NASA Satellite Data to Predict Malaria Outbreaks: <https://youtu.be/c6g2ILL--Rw>

## • Personnel

- George Komar (Director, ESTO) retired at the end of September 2017.
- AAAS S&T Policy Fellow Shobhana Gupta’s term of service ended in August 2017. Helena Chapman will continue her legacy as a AAAS S&T Policy Fellow.

## • NASA Health/AQ Sessions at the following conferences:

- ATS Annual Meeting (May 2017)
- AWMA Annual Meeting (June 2017)
- NCAR/CDC Climate and Health Workshop (July 2017)
- APHA Annual Meeting (November 2017)
- Upcoming at AGU and AMS!

Two key points to remember:

- Earth observations and Earth science data are objective, transparent, and policy-neutral.
- NASA Earth Science (and by extension HAQAST) doesn't develop or prescribe policy. Other agencies and organizations use the data and scientific results in their policy analysis and development.



# *Flight Projects & Applications: New Directive and Guidance*

NASA  
Earth Science



Establish the guidelines for implementing a Project Applications Program for a Flight project. Propose a *project-specific applications program* in accordance with ESD guidelines.

*“Proposed project specific applications programs will be presented to ESD for approval in conjunction with Key Decision Point for Phase B, KDP-B.”*

*Guidance Manager (new):  
Vanessa Escobar*

The guidelines may be tailored to accommodate the project focus, community interest and funding or schedule considerations.

All activities should be focused on developing and encouraging project-specific  
Community of Practice and  
Community of Potential

» Awareness, engagement development, participation, idea generation, contribution, anticipation, preparation, advocacy

# FY18 President's Budget Request



## Fiscal Year

### Notional

Actual

Enacted

Request

2016

2017

2018

2019

2020

2021

2022

Budget Authority (\$ in millions)

<b>NASA Total</b>	<b>19,285.0</b>	<b>19,653.3</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>
<b>Science</b>	<b>5,584.1</b>	<b>5,764.9</b>	<b>5,711.8</b>	<b>5,728.7</b>	<b>5,728.7</b>	<b>5,728.7</b>	<b>5,728.7</b>
Earth Science	1,926.6		1,754.1	1,769.1	1,769.1	1,769.1	1,769.1
Planetary Science	1,628.0		1,929.5	1,921.4	1,916.4	1,911.4	1,911.4
Astrophysics	762.4		816.7	1,045.8	1,153.2	1,200.6	1,200.4
James Webb Space Telescope	620.0		533.7	304.6	197.2	149.8	150.0
Heliophysics	647.2		677.8	687.8	692.8	697.8	697.8
<b>Aeronautics</b>	<b>633.8</b>	<b>660.0</b>	<b>624.0</b>	<b>624.4</b>	<b>624.4</b>	<b>624.4</b>	<b>624.4</b>
Space Technology	686.4	686.5	678.6	679.3	679.3	679.3	679.3
<b>Exploration</b>	<b>3,996.2</b>	<b>4,324.0</b>	<b>3,934.1</b>	<b>4,259.7</b>	<b>4,513.3</b>	<b>4,437.9</b>	<b>4,449.9</b>
Exploration Systems Development	3,640.8	3,929.0	3,584.1	3,739.7	3,898.2	3,771.5	3,762.3
Exploration Research and Development	355.4	395.0	350.0	520.0	615.1	666.4	687.6
<b>Space Operations</b>	<b>5,032.3</b>	<b>4,950.7</b>	<b>4,740.8</b>	<b>4,532.8</b>	<b>4,279.2</b>	<b>4,354.6</b>	<b>4,342.6</b>
Space Shuttle	5.4	--	--	--	--	--	--
International Space Station	1,436.4	--	1,490.6	1,561.3	1,611.4	1,616.5	1,635.2
Space Transportation	2,667.8	--	2,415.1	2,118.7	1,811.4	1,868.6	1,808.9
Space and Flight Support (SFS)	922.7	--	835.0	852.7	856.4	869.4	898.5
<b>Education</b>	<b>115.0</b>	<b>100.0</b>	<b>37.3</b>				
<b>Safety, Security, and Mission Services</b>	<b>2,772.4</b>	<b>2,768.6</b>	<b>2,830.2</b>	<b>2,859.4</b>	<b>2,859.4</b>	<b>2,859.4</b>	<b>2,859.4</b>
Center Management and Operations	1,987.6	--	1,992.5	2,036.8	2,036.8	2,036.8	2,036.8
Agency Management and Operations	784.8	--	837.7	822.6	822.6	822.6	822.6
<b>Construction and Environmental Compliance and Restoration</b>	<b>427.4</b>	<b>360.7</b>	<b>496.1</b>	<b>368.6</b>	<b>368.6</b>	<b>368.6</b>	<b>368.6</b>
Construction of Facilities	352.9	--	408.2	280.7	280.7	280.7	280.7
Environmental Compliance and Restoration	74.5	--	87.9	87.9	87.9	87.9	87.9
<b>Inspector General</b>	<b>37.4</b>	<b>37.9</b>	<b>39.3</b>	<b>39.3</b>	<b>39.3</b>	<b>39.3</b>	<b>39.3</b>
<b>NASA Total</b>	<b>19,285.0</b>	<b>19,653.3</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>	<b>19,092.2</b>

# FY18 President's Budget Request

## NASA Earth Science



Budget Authority (in \$ millions)	Actual FY 2016	Enacted FY 2017	Request FY 2018	FY 2019	Notional FY 2020	FY 2021	FY 2022
Earth Science Research	477.7	--	406.7	435.1	441.1	459.7	477.8
Earth Systematic Missions	914.6	--	778.0	787.1	755.0	708.7	680.4
Earth System Science Pathfinder	233.6	--	264.5	243.8	256.0	271.5	268.3
Earth Science Multi-Mission Operations	192.4	--	196.5	194.1	200.7	208.6	218.6
Earth Science Technology	60.7	--	60.4	59.7	63.6	65.9	67.8
Applied Sciences	47.6	--	47.9	49.3	52.8	54.7	56.3
<b>Total Budget</b>	<b>1926.6</b>	<b>--</b>	<b>1754.1</b>	<b>1769.1</b>	<b>1769.1</b>	<b>1769.1</b>	<b>1769.1</b>

- Maintains a robust program of competed Venture-class missions
- Supports formulation and development of ICESat-2, GRACE-FO, SWOT, NISAR, Landsat 9, Sentinel-6, TSIS-1, TEMPO, GEDI, MAIA, ECOSTRESS, OMPS-L, TROPICS, and GeoCarb.
- Multi-Decadal Sustainable Land Imaging (SLI) program provides Land Imaging Technology and System Innovation.
- Supports initiatives to use smaller, less expensive satellites and/or public- private partnerships to advance science in a cost-effective manner, including cubesats and small satellite constellations.
- Operates 18 additional missions, and the Airborne Science
- NASA will receive a new Earth Science Decadal Survey later this year.
- Proposes termination of Carbon Monitoring System and proposes reductions in funding for Earth science research grants.
- Proposes termination of five Earth Science missions—PACE, RBI, OCO-3, DSCOVR Earth-viewing instruments, and CLARREO Pathfinder.
- Proposed terminations are due to budget priorities and the need to adjust the Agency's budget to match the nation's current fiscal position.



# FY18 President's Budget Request

*\*CR through December 8, 2017*

NASA  
Earth Science



SMD/Earth Science Division - Applied Sciences											
Budget FY12-FY22 (in millions)											
Applied Sciences Program Budget	Enacted						FY18 President's Request				
							FY19-22 Notional				
	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
	\$36.4	\$32.5	\$35.0	\$40.4	\$47.6	–	\$47.9	\$49.3	\$52.8	\$54.7	\$56.3

*Note: FY13 budget reduced from \$34.6M to \$32.5M based on sequestration.*

*Note: NASA Operating Plan change increased FY15 by \$4M to \$40.4M.*

## Costing

Additional attention to costing in FY17 identified significant amount to harvest in FY17 to spread across FY18-20. OpPlan being prepared for OMB & Congress (Approved August 2017).

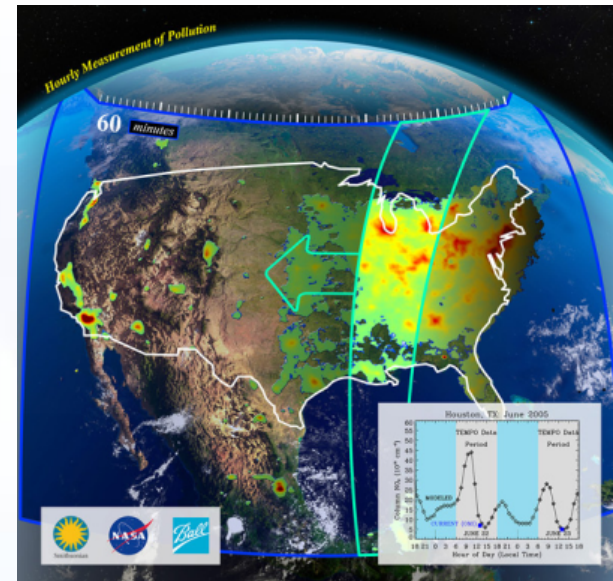
- » Incremental funding
- » Rephase to new fiscal year
- » Commit \$ earlier in Fiscal Year
- » Additional selections
- » Costing language in ROSES

# Earth Venture Instrument-1:

## Tropospheric Emissions: Monitoring of Pollution (TEMPO)



- **TEMPO is a pathfinder to using hosted commercial payloads from GEO**
- Tropospheric pollution observations from Geostationary Orbit
  - Ozone, NO<sub>2</sub>, and CH<sub>2</sub>O.
- Forms a global Air Quality constellation in GEO with EU Copernicus - Sentinel 4 and Korean GEMS.
- EPA and NOAA are part of the science team.
- Instrument delivery in 2018; Launch NLT 2021



**PI:** Kelly Chance, Smithsonian Astrophysical Observatory

**PE:** Betsy Edwards; **PS:** Barry Lefer **PA:** John Haynes

**Instrument Development:** Ball Aerospace

**Project Management:** LaRC

**RY\$:** 93.2M

**Orbit requirements:** *Geostationary Orbit*. Hosted on a commercial communication satellite

# Earth Venture Instrument-3

MAIA

## Multi-Angle Imager for Aerosols

Associating airborne particle types with adverse health outcomes

### Salient Features:

MAIA is PI-led NASA Earth Ventures Instrument (EVI-3 selection)

Category 3 mission per NPR 7120.5E

Risk Classification C per NPR 8705.4

Cost capped at \$100.1M

Host platform: TBD, to be provided by ESSP Program

Payload delivery: December 2019

Orbit: 370-830 km, 50-130° inclination, sun-synch preferred

Launch: Ready for 2020 launch on TBD launch vehicle

Nominal Mission: 3 yr baseline; 2 yr threshold after 90-day IOC

Principal Investigator: Dr. David Diner (JPL)

Project Manager: Kevin Burke (JPL)

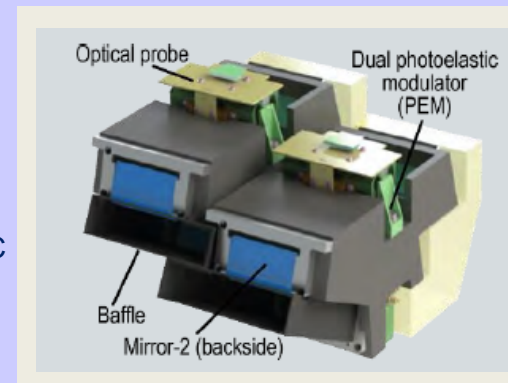
ESSP Program Manager: Greg Stover, Msn Mgr: Diane Hope

JPL Program Manager: Dr. Steven Bard, Deputy: Amit Sen

Program Scientist: Dr. Hal Maring, NASA HQ

Program Executive: Betsy Edwards, NASA HQ

Program Applications: John Haynes, NASA HQ

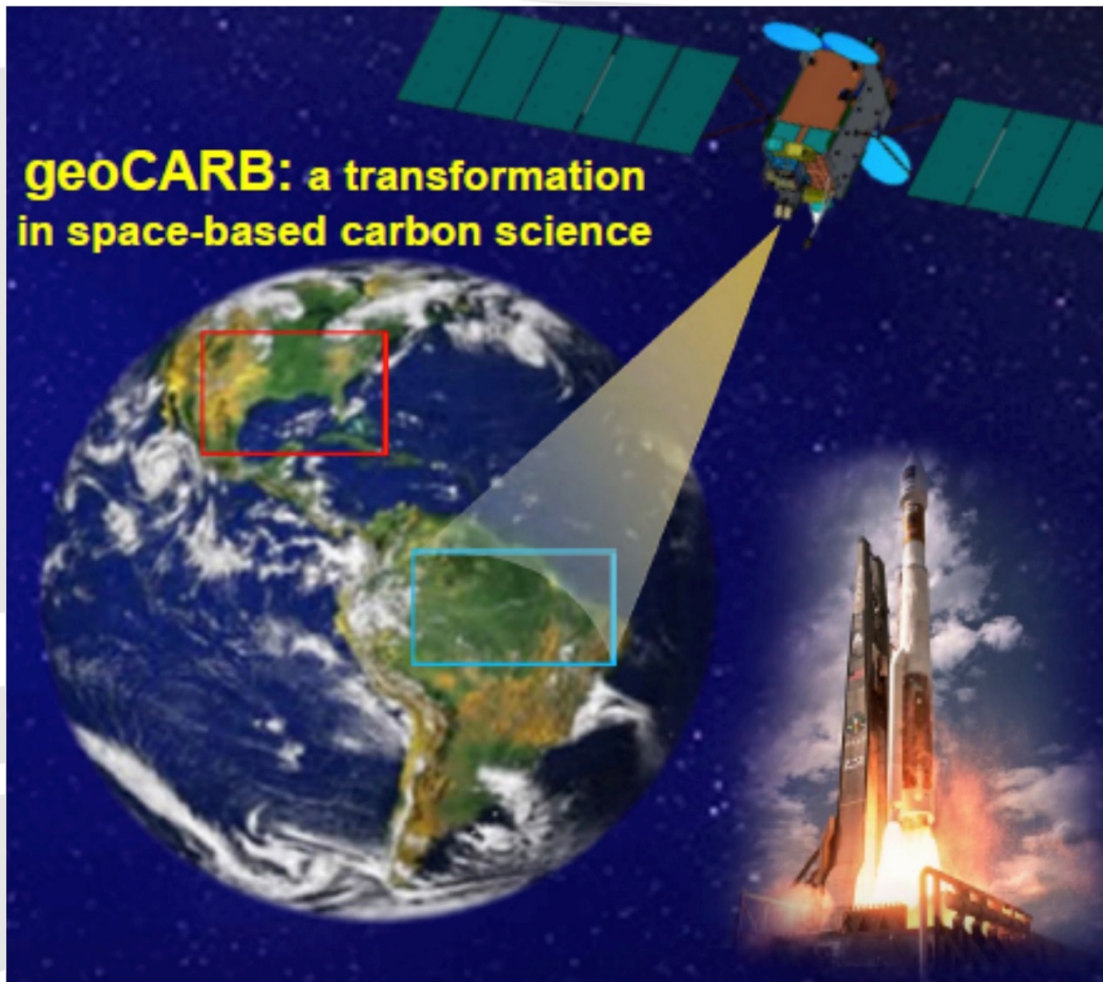


**Mission Objectives:** Assess linkages between different airborne particulate matter (PM) types and adverse birth outcomes, cardiovascular and respiratory disease, and premature deaths.

**Instrument:** Multi-angle spectropolarimetric imaging instrument for operation in a sun-synchronous Earth orbit to measure the particle types, sizes, concentrations, and geolocation of atmospheric aerosols.



# GeoCARB Selected for Earth Venture Mission-2



**Berrien Moore, PI**  
**University of Oklahoma**

- First geostationary measurements of CO<sub>2</sub>, CO, CH<sub>4</sub>, and Solar Induced Fluorescence; 5-10 km resolution
- Hosted payload on an SES commercial communication satellite (PI-arranged hosting)
- Lockheed Martin Advanced Technology Center (Palo Alto);  
Colorado State University (Fort Collins); ARC; GSFC; JPL

National Aeronautics and  
Space Administration



***Questions:***

**John Haynes, Program Manager  
Health & Air Quality Applications  
NASA Headquarters / Earth Science  
JHaynes@nasa.gov**

***<http://AppliedSciences.NASA.gov>***