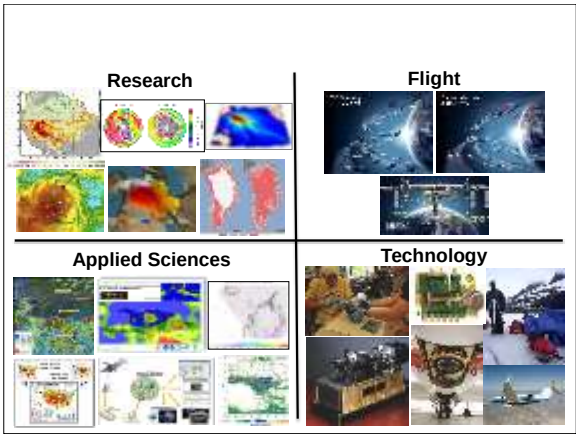
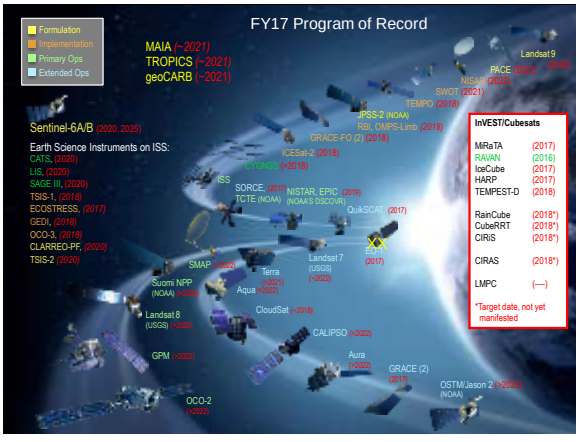

NASA Earth Science Division Overview
AMS Washington Forum
Mayl 4, 2017


Research
Flight
Applied Sciences
Technology


FY17 Program of Record
Formulation
Implementation
Primary Ops
Extended Ops
MAIA (~2021)
TROPICS (~2021)
geoCARB (~2021)
Sentinel-6A/B (2020, 2025)
Earth Science Instruments on ISS:
CATS, (2020)
LIS, (2020)
SAGE III, (2020)
TSIS-1, (2018)
ECOSTRESS, (2017)
GEDI, (2018)
OCO-3, (2018)
CLARREO-PF, (2020)
TSIS-2 (2020)
Landsat 9
PACE (2022)
NISAR (2021)
SWOT (2021)
TEMPO (2018)
JPSS-2 (NOAA)
RBI, OMPS-Limb (2018)
GRACE-FO (2) (2018)
ICESat-2 (2018)
ISS
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TCTE (NOAA)
NISTAR, EPIC (2019)
(NOAA'S DSCOVR)
QuikSCAT (2017)
SMAP (~2022)
Terra (~2022)
Aqua (~2022)
Landsat 7 (USGS) (~2022)
ICESat-2 (2017)
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CloudSat (~2018)
Landsat 8 (USGS) (~2022)
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(NOAA)
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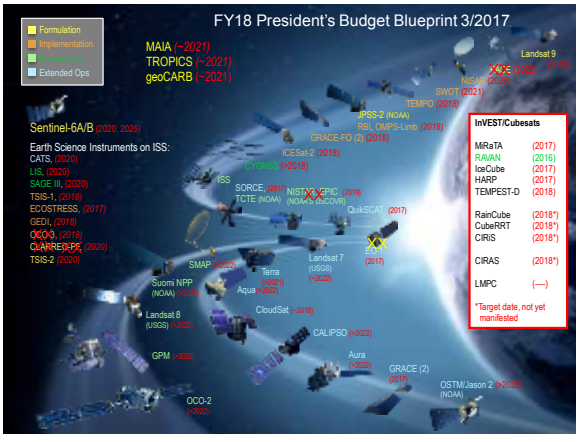
MiRaTA (2017)
RAVAN (2016)
IceCube (2017)
HARP (2017)
TEMPEST-D (2018)
RainCube (2018*)
CubeRRT (2018*)
CIRiS (2018*)
CIRAS (2018*)
LMPC (---)
*Target date, not yet manifested


FY18 President's Budget Blueprint 3/2017
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LMPC (---)
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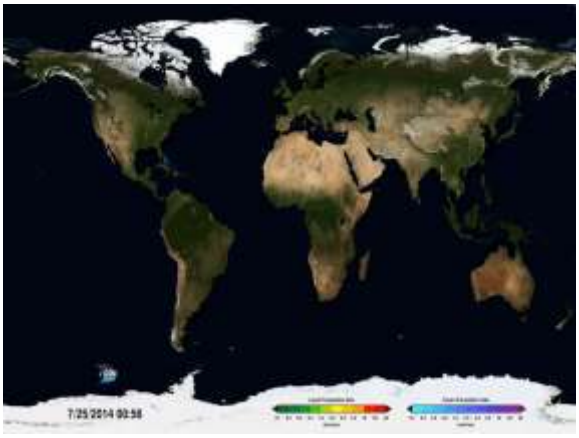
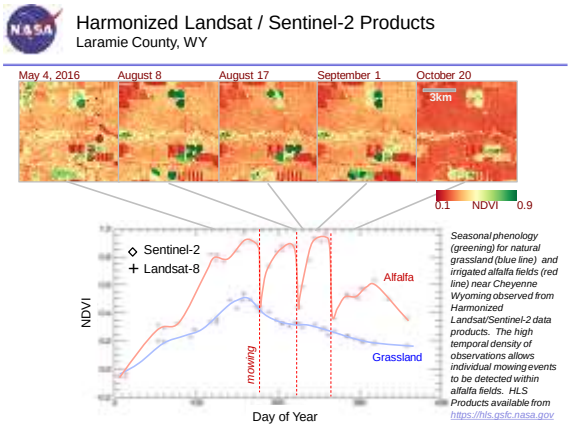
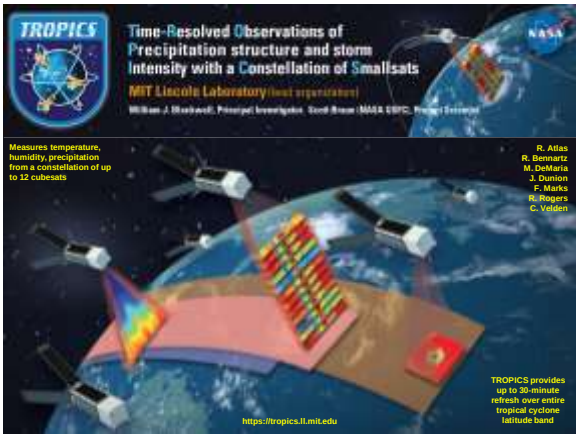
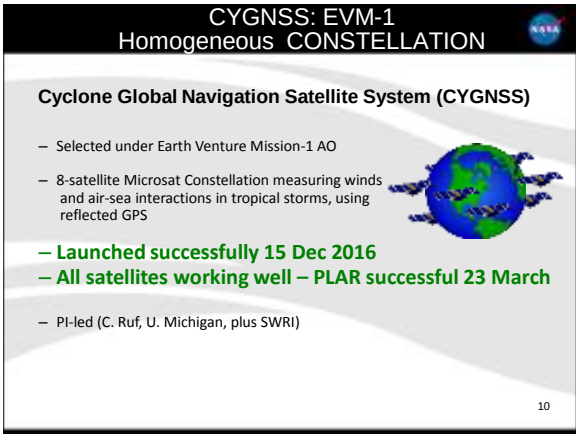
NASA Earth Science Research Missions


NASA Observing System INNOVATIONS




Harmonized Landsat / Sentinel-2 Products
Laramie County, WY
May 4, 2016
August 8
August 17
September 1
October 20
3km
0.1
NDVI
0.9
Sentinel-2
Landsat-8
Alfalfa
Grassland
mowing
NDVI
Day of Year
Seasonal phenology (greening) for natural grassland (blue line) and irrigated alfalfa fields (red line) near Cheyenne Wyoming observed from Harmonized Landsat/Sentinel-2 data products. The high temporal density of observations allows individual mowing events to be detected within alfalfa fields. HLS Products available from
https://hls.gsfc.nasa.gov


TROPICS
Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats
MIT Lincoln Laboratory
Measures temperature, humidity, precipitation from a constellation of up to 12 cubesats
R. Atlas
R. Bennartz
M. DeMaria
J. Dunion
F. Marks
R. Rogers
C. Velden
TROPICS provides up to 30-minute refresh over entire tropical cyclone latitude band
https://tropics.ll.mit.edu


CYGNSS: EVM-1
Homogeneous CONSTELLATION
Cyclone Global Navigation Satellite System (CYGNSS)
– Selected under Earth Venture Mission-1 AO
– 8-satellite Microsat Constellation measuring winds and air-sea interactions in tropical storms, using reflected GPS
– Launched successfully 15 Dec 2016
– All satellites working well – PLAR successful 23 March
– PI-led (C. Ruf, U. Michigan, plus SWRI)
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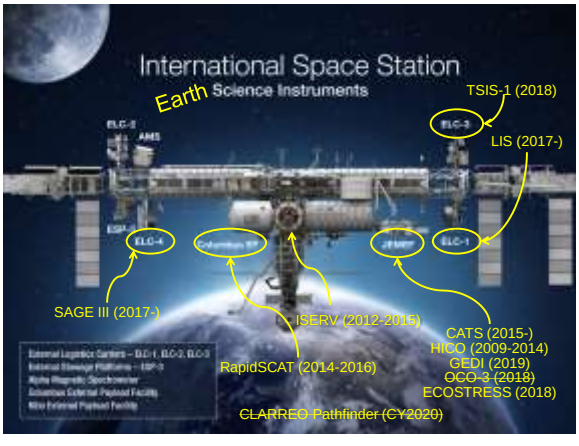
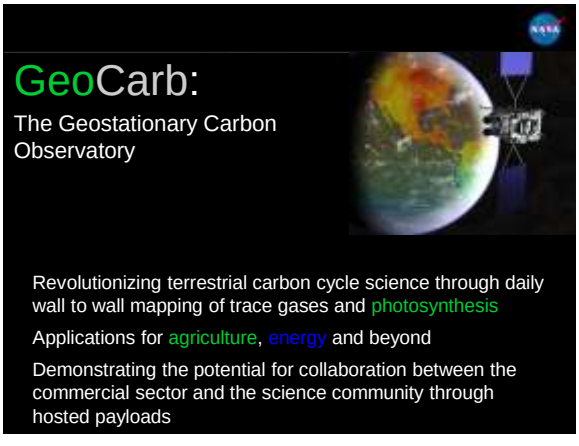
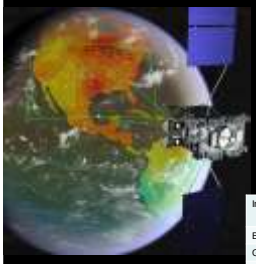

International Space Station
Earth Science Instruments
TSIS-1 (2018)
LIS (2017-)
SAGE III (2017-)
ISERV (2012-2015)
RapidSCAT (2014-2016)
CATS (2015-)
HICO (2009-2014)
GEDI (2019)
~~OCO-3 (2018)~~
ECOSTRESS (2018)
~~CLARREO Pathfinder (CY2020)~~


GeoCarb:
The Geostationary Carbon Observatory
Revolutionizing terrestrial carbon cycle science through daily wall to wall mapping of trace gases and photosynthesis
Applications for agriculture, energy and beyond
Demonstrating the potential for collaboration between the commercial sector and the science community through hosted payloads

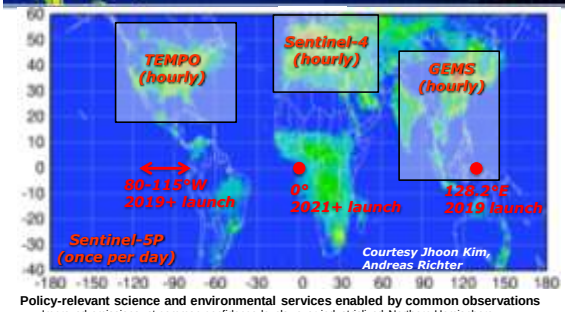
The GeoCarb Mission: Measuring Carbon Trace Gases and Vegetation Health from Space



Principal Investigator	Berrien Moore, Univ. of Oklahoma
Technology Development	Lockheed Martin Advanced Tech. Center
Host S/C & Mission Ops	SES Government Solutions

Instrument	Single slit, 4-Channel IR Scanning Littrow Spectrometer
Bands	0.76m, 1.61m, 2.06m and 2.32m
Gases	O_2, CO_2, CO, CH_4 & Solar Induced Fluorescence
Mass	138 kg (CBE)
Dimensions	1.3 m x 1.14 m x 1.3 m
Power	128W (CBE)
Data Rate	10 Mbps
Daily Soundings	~10,000,000 soundings per day; CONUS > once/day 5-10 km spatial resolution

Global pollution monitoring constellation:
Tropospheric chemistry missions funded for launch 2016-2021



Policy-relevant science and environmental services enabled by common observations

- Improved emissions, at common confidence levels, over industrialized Northern Hemisphere
- Improved air quality forecasts and assimilation systems
- Improved assessment, e.g., observations to support United Nations Convention on Long Range Transboundary Air Pollution

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2017 EARTH SCIENCE & APPLICATIONS DECADAL SURVEY

The Decadal Survey remains on track for completion in late December, 2017

- Addresses NASA, NOAA, and USGS
- Likely to recommend science priorities rather than named missions with specific capabilities
- Anticipate NASA road-mapping studies for several years to define the realistic resulting mission suite and partnerships


2007


2010


2012

15

AUGUST 21, 2017: First total solar eclipse visible in the contiguous United States in 38 years and the first across the entire U.S since 1918!

This map shows the path of the moon's umbral shadow—in which the sun will be completely obscured by the moon, called totality—during the total solar eclipse of Aug. 21, 2017. Outside the path of totality, the rest of the continental U.S. will be within the moon's penumbral shadow, where the moon only partially blocks the sun and creates a partial solar eclipse. The partial eclipse begins in the continental U.S. near Lincoln City, Oregon, at 9:05 a.m. PDT, and totality begins in this location at 10:16 a.m. PDT. The total eclipse will end in Charleston, South Carolina, at 2:48 p.m. EDT, and the partial eclipse ends in the continental U.S. in this location at 4:09 p.m. EDT. You can search online for eclipse times in your area or with this map. https://svs.gsfc.nasa.gov/4512

2017 ECLIPSE ACROSS AMERICA
Through the Eyes of NASA

OBSERVING EARTH DURING THE ECLIPSE


Credit: NASA/NOAA

- NOAA's Deep Space Climate Observatory (DSCOVR) will collect images every 15 minutes and provide them within the next 1-2 days at http://epic.gsfc.nasa.gov
- By late June 2017, the International Space Station will know if it is in a position to observe the moon's umbral, or inner, shadow during the eclipse on August 21, 2017.


Credit: NASA/ISS

- TERRA, AQUA, SNPP, LANDSAT 7 & 8 may also see the moon's shadow if they pass over the U.S. at the right time.

https://eclipse2017.nasa.gov/observations

2017 ECLIPSE ACROSS AMERICA
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