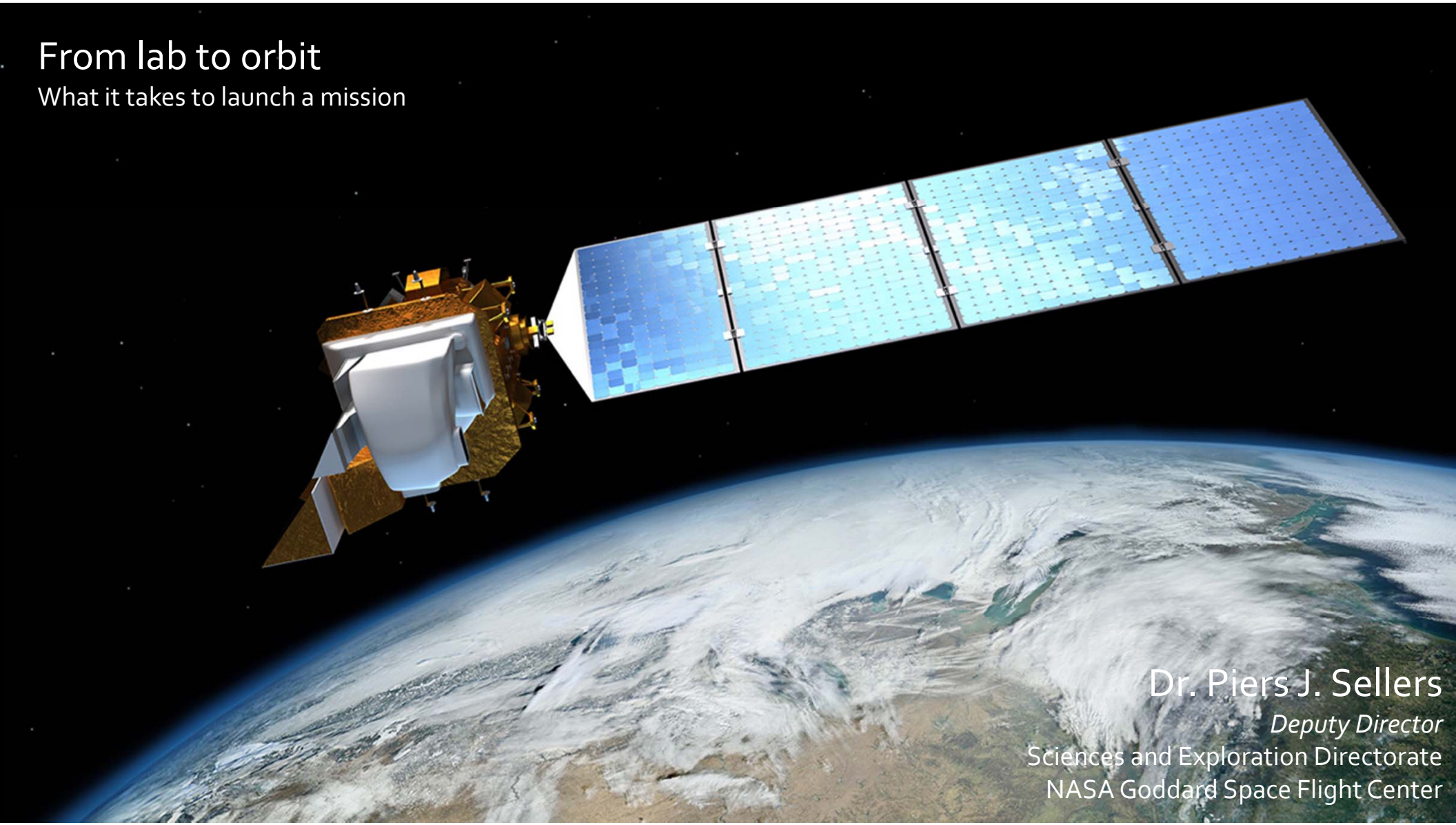
From lab to orbit

What it takes to launch a mission



Dr. Piers J. Sellers
Deputy Director
Sciences and Exploration Directorate
NASA Goddard Space Flight Center

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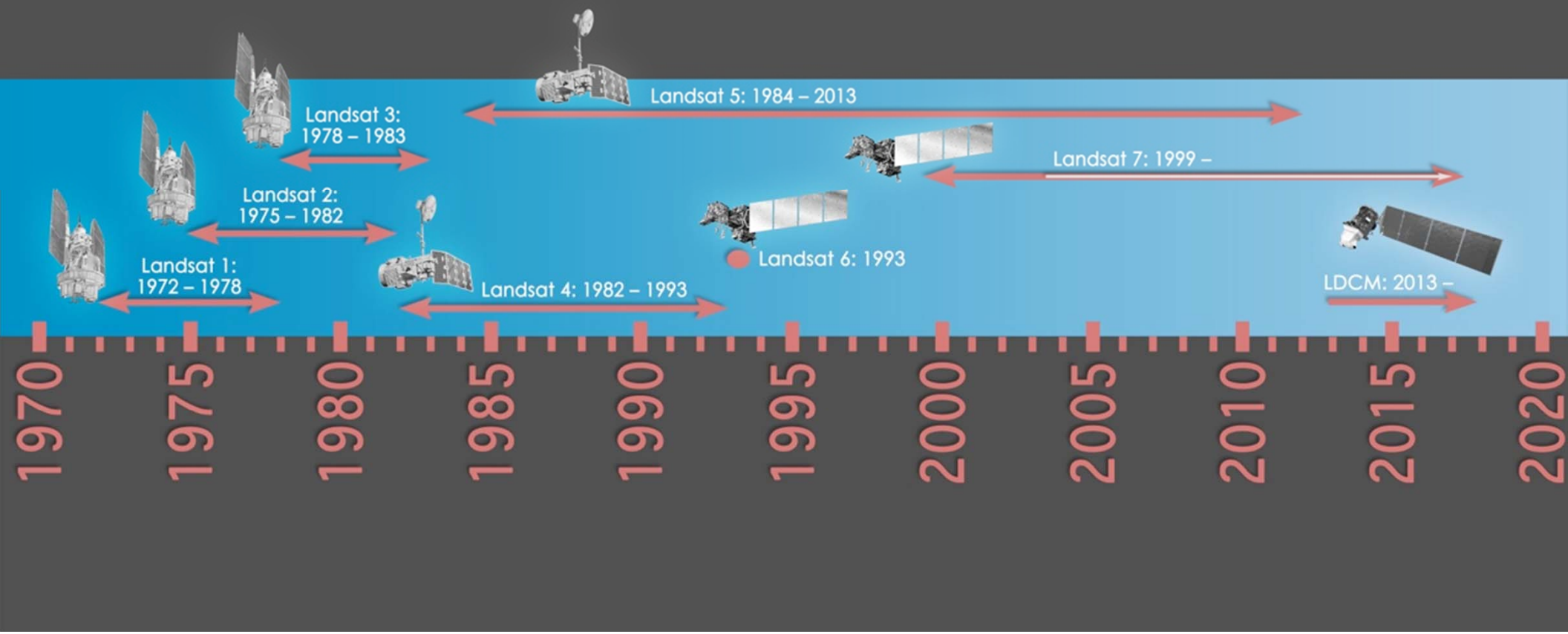
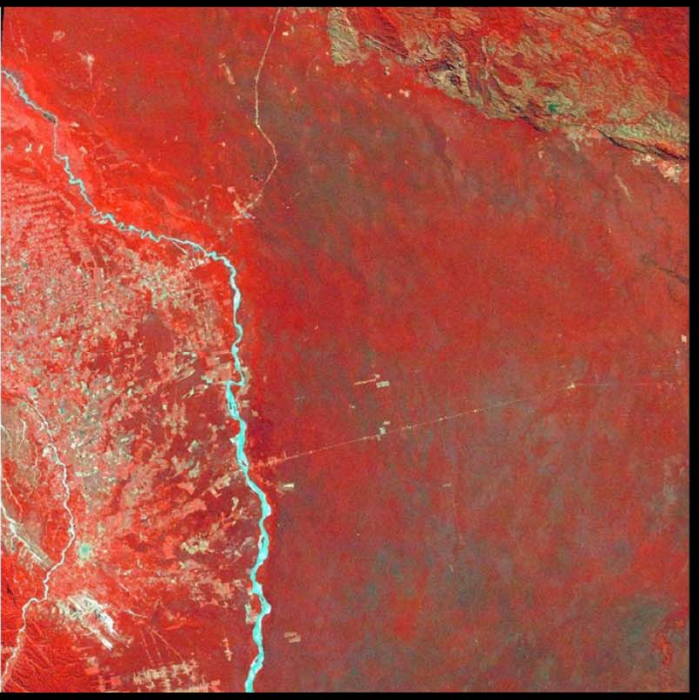
NASA

NASA
Goddard
Space Flight Center

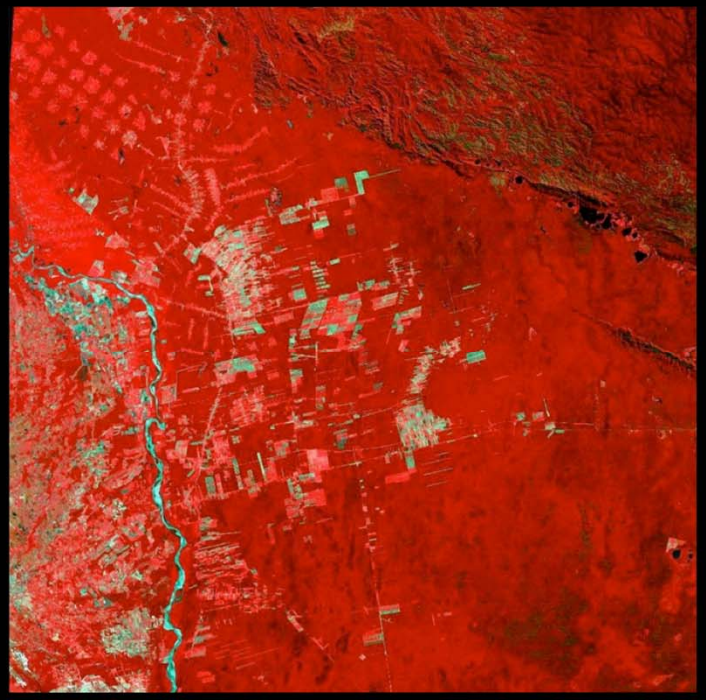
40 Years of Global Observations



Bolivian Deforestation



Landsat 2, MSS
June 17, 1975



Landsat 4, TM
July 10, 1992

Landsat 7, ETM+
August 1, 2000

The Vanishing Aral Sea

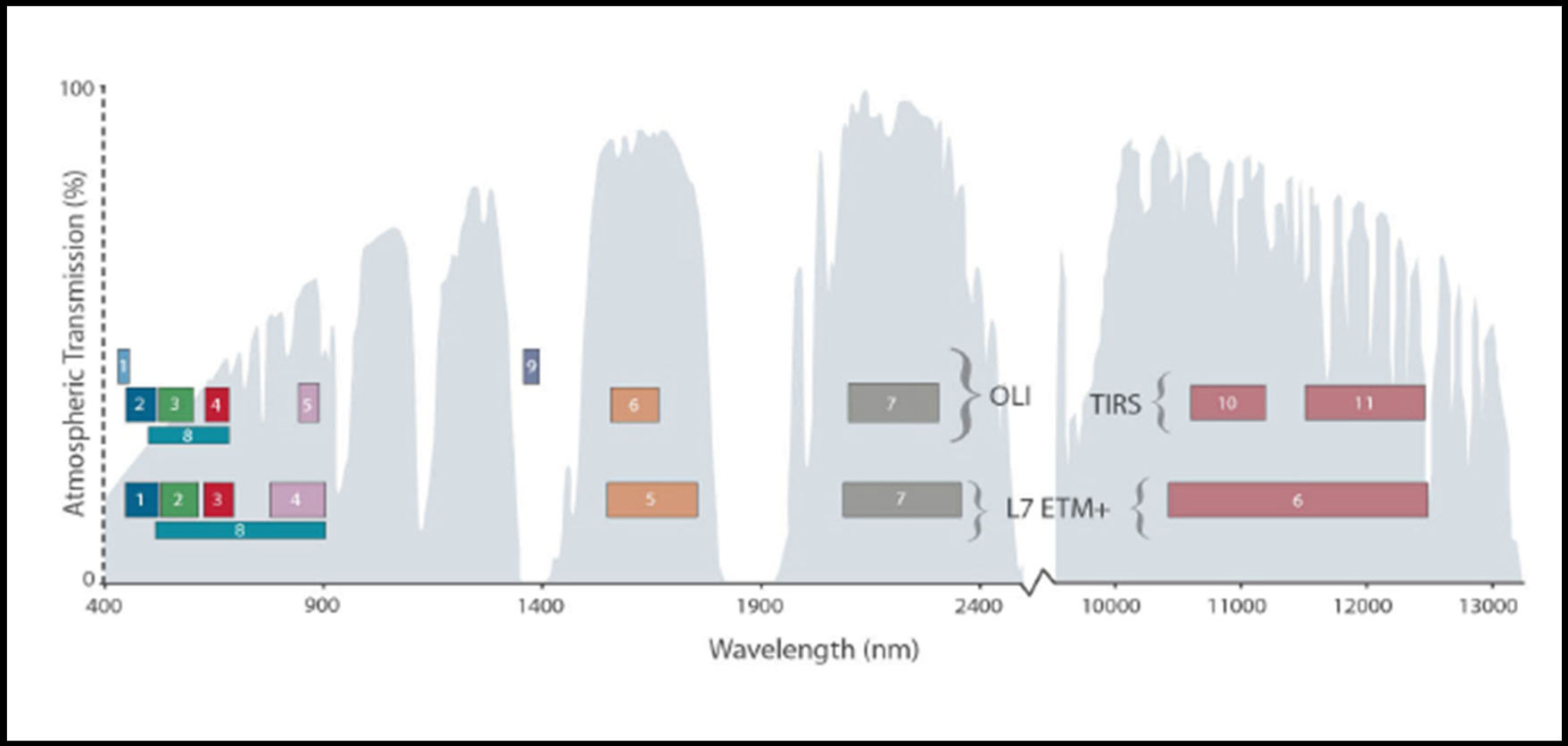
Landsat 2, June 4, 1977

Landsat 5, September 17, 1989

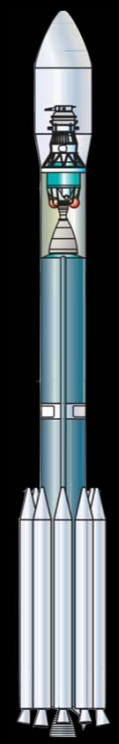
Landsat 7, May 27, 2006

Landsat 7, June 3, 2009

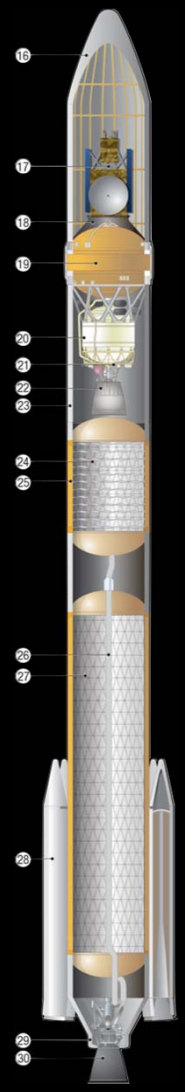
Landsat 7 vs. Landsat 8



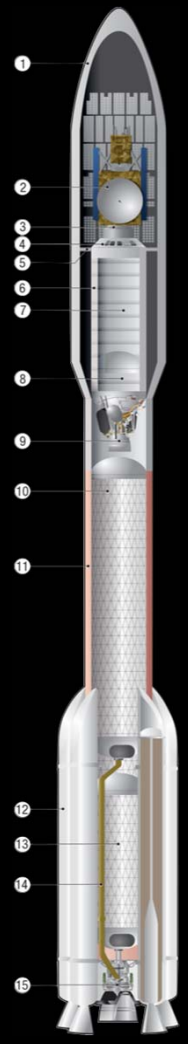
Current Launch Vehicles



Delta II



Delta IV



Atlas V

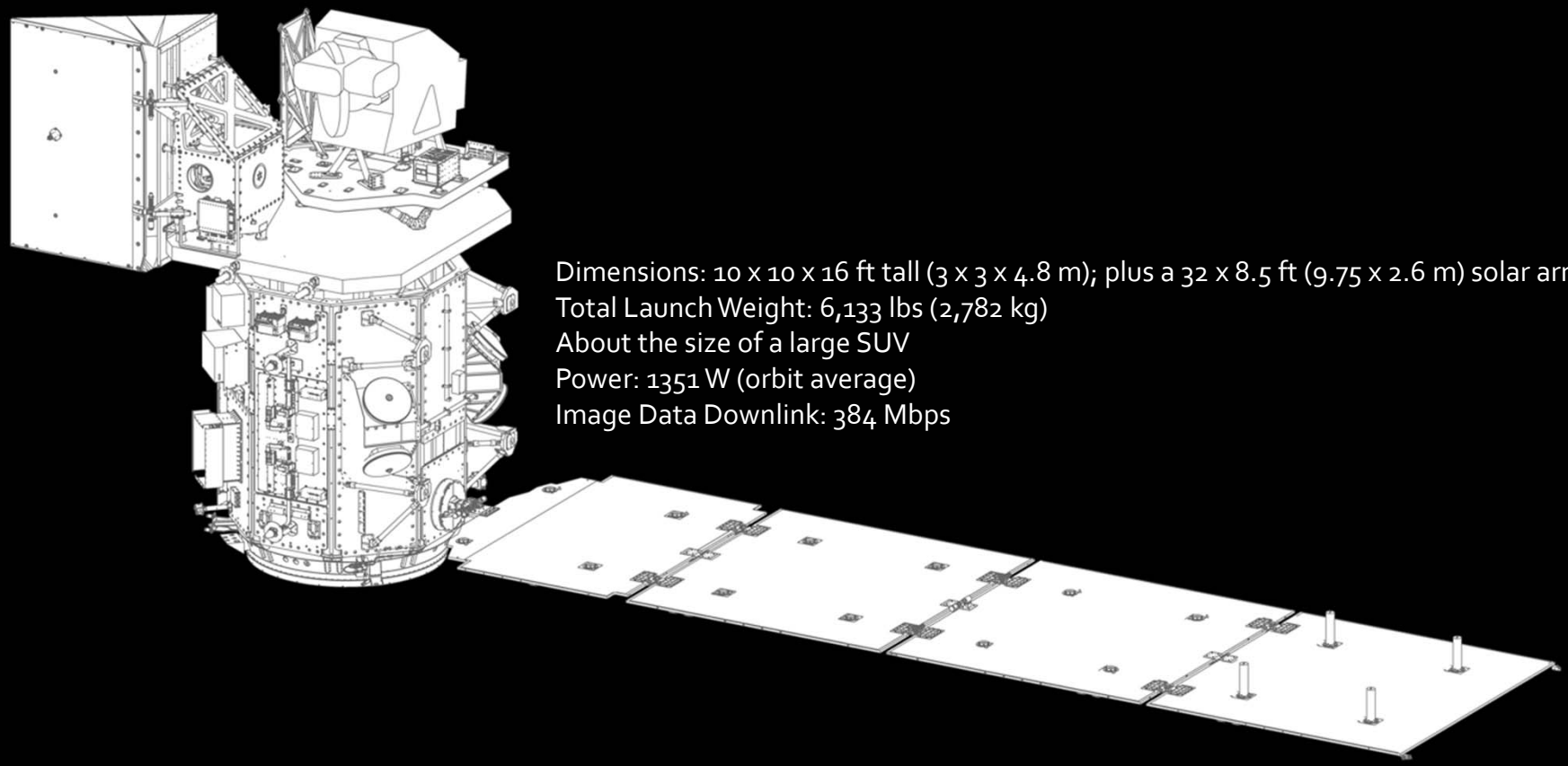
United Launch Alliance

Antares

Taurus XL

Orbital
Innovation You Can Count On®

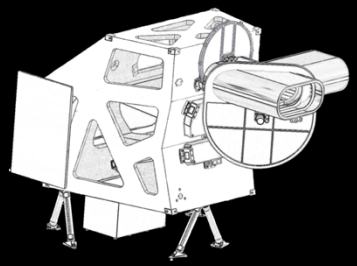
Pegasus

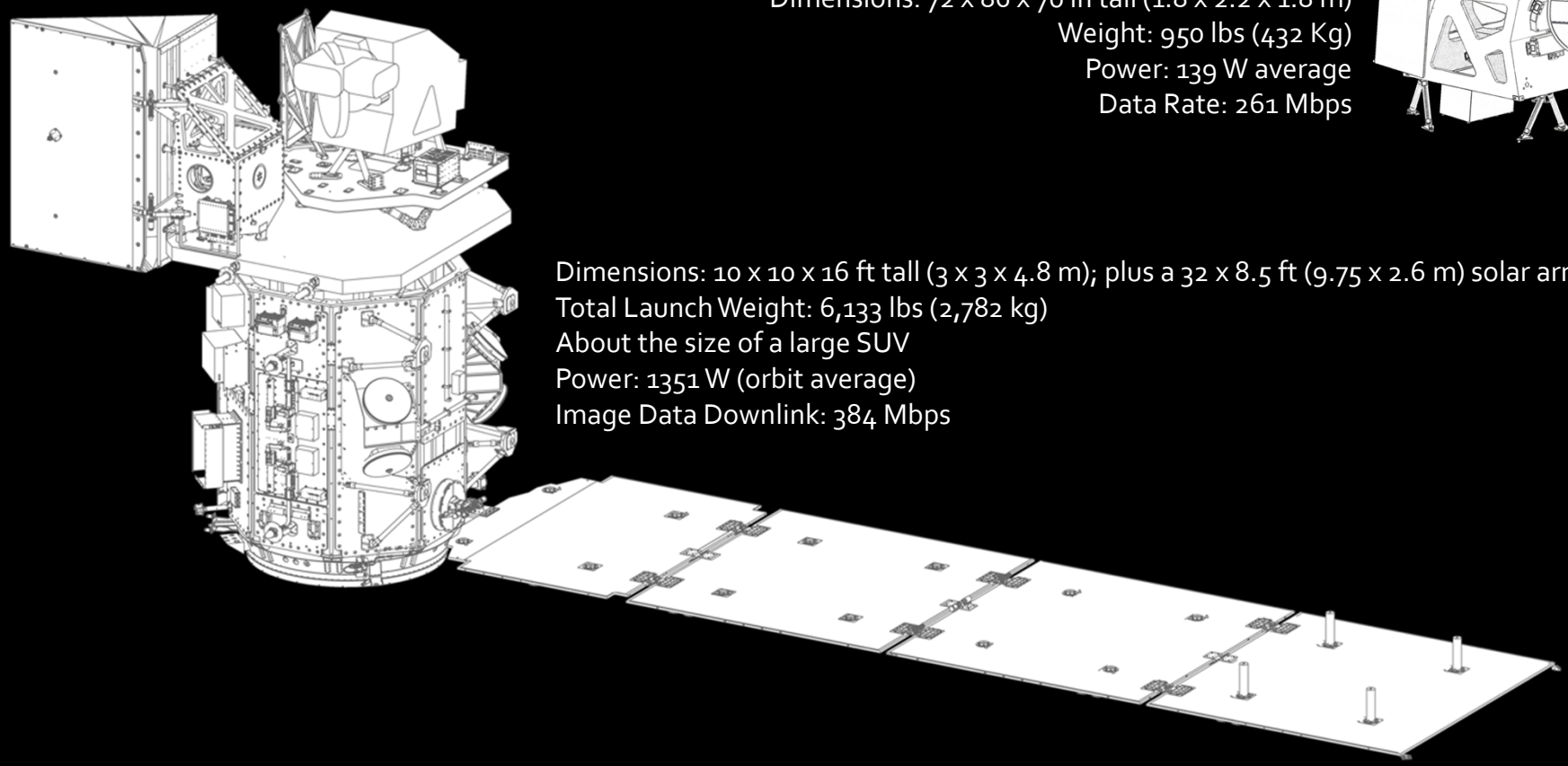


Dimensions: 10 x 10 x 16 ft tall (3 x 3 x 4.8 m); plus a 32 x 8.5 ft (9.75 x 2.6 m) solar array
Total Launch Weight: 6,133 lbs (2,782 kg)
About the size of a large SUV
Power: 1351 W (orbit average)
Image Data Downlink: 384 Mbps

Operational Land Imager

Dimensions: 72 x 86 x 70 in tall (1.8 x 2.2 x 1.8 m)
Weight: 950 lbs (432 Kg)
Power: 139 W average
Data Rate: 261 Mbps





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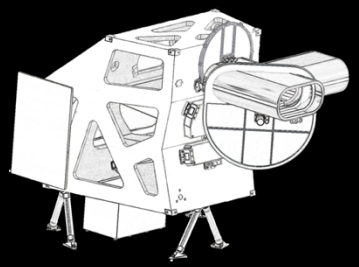
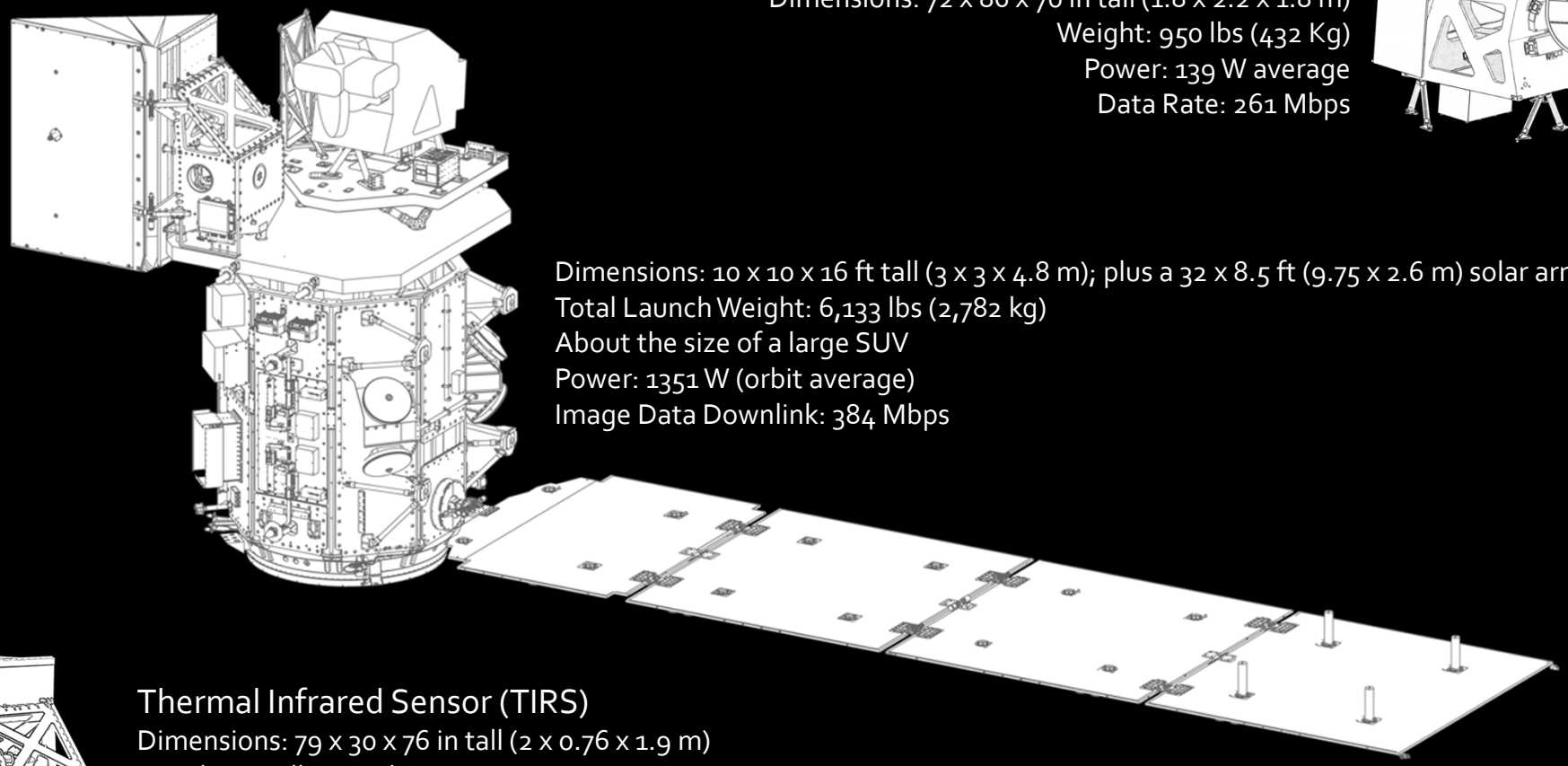
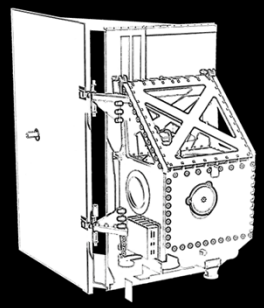


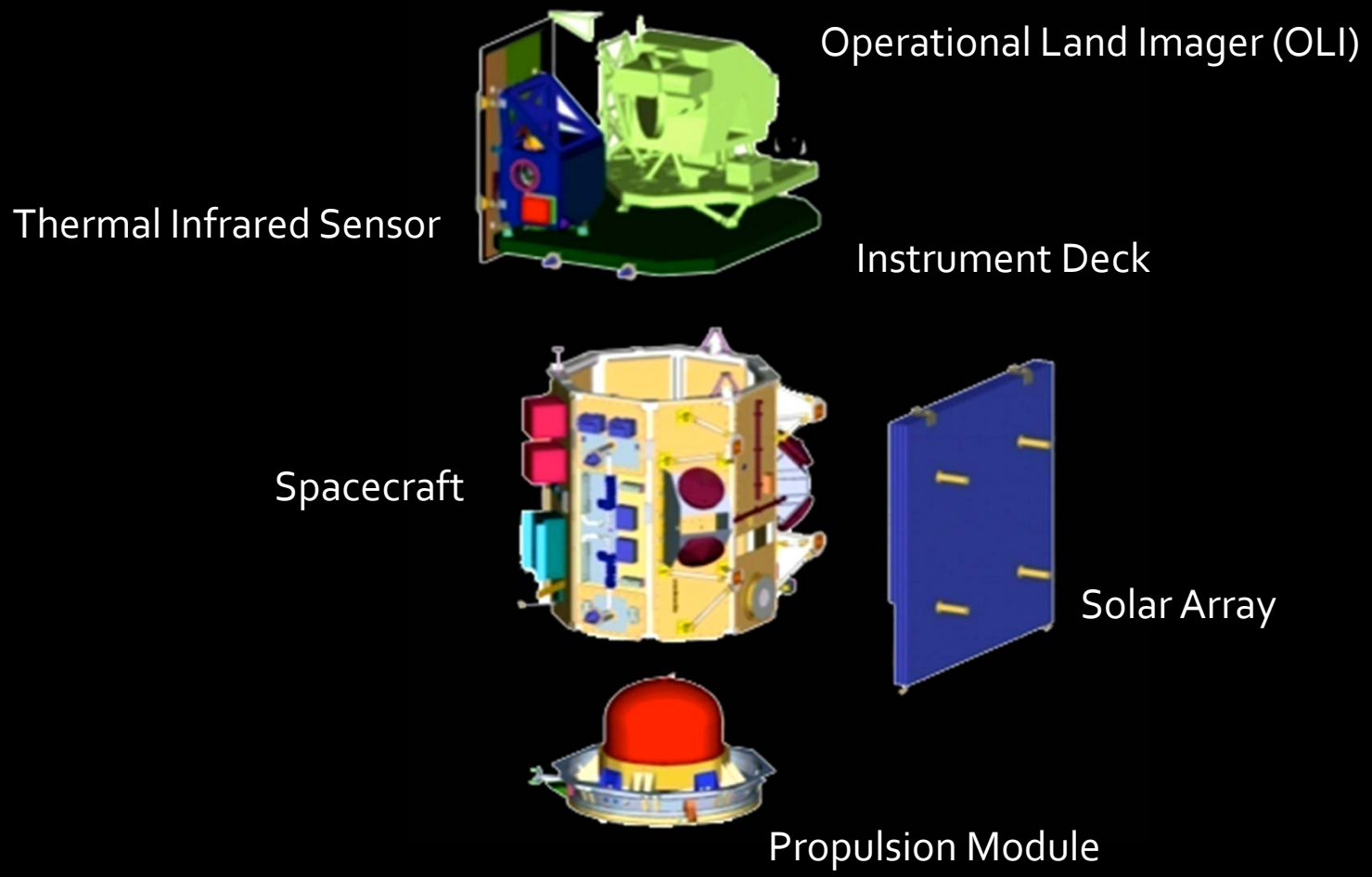


Dimensions: 10 x 10 x 16 ft tall (3 x 3 x 4.8 m); plus a 32 x 8.5 ft (9.75 x 2.6 m) solar array
Total Launch Weight: 6,133 lbs (2,782 kg)
About the size of a large SUV
Power: 1351 W (orbit average)
Image Data Downlink: 384 Mbps



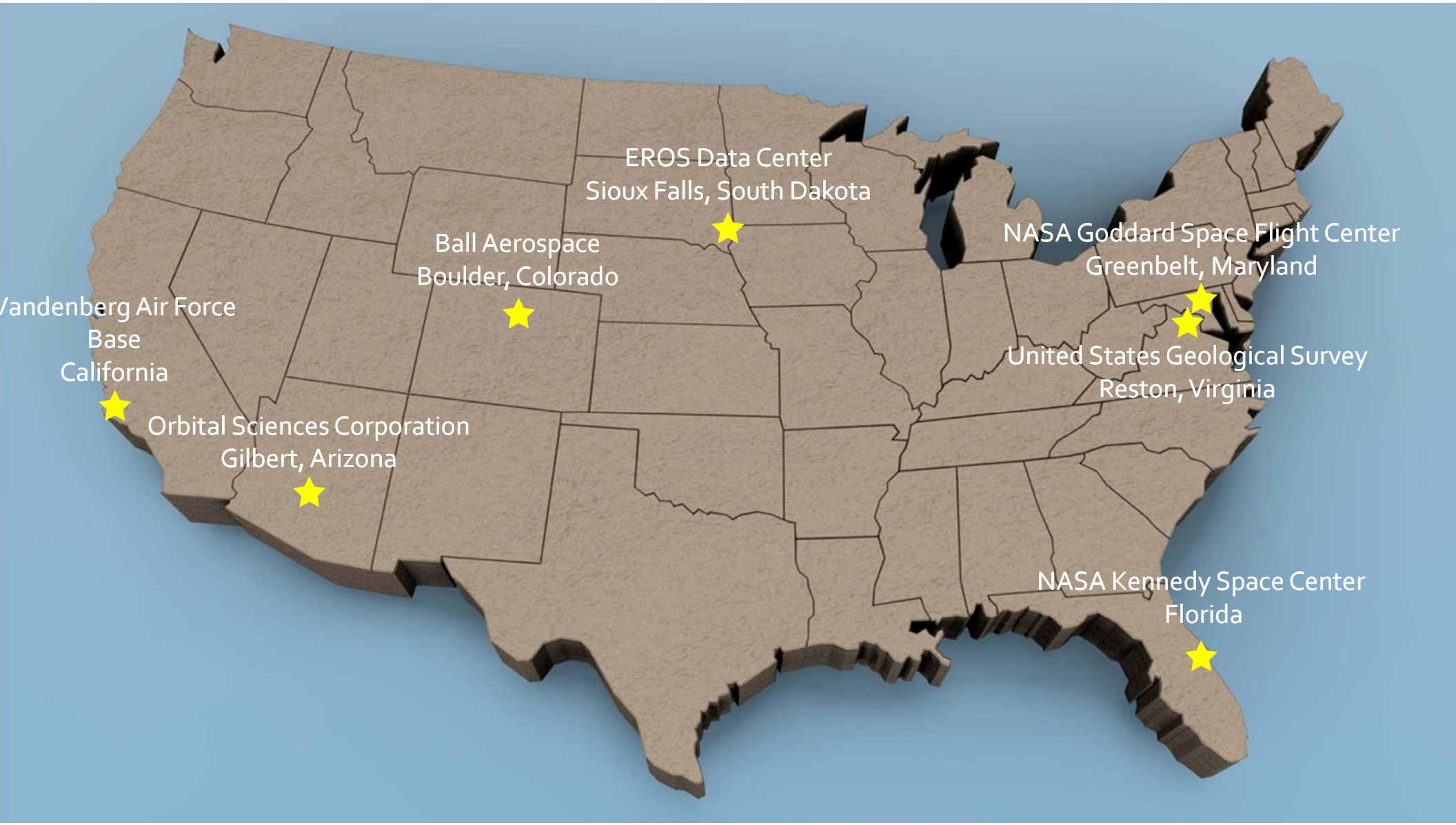
Thermal Infrared Sensor (TIRS)

Dimensions: 79 x 30 x 76 in tall (2 x 0.76 x 1.9 m)
Weight: 495 lbs (225 kg)
Power: 180 W average
Data Rate: 26 Mbps

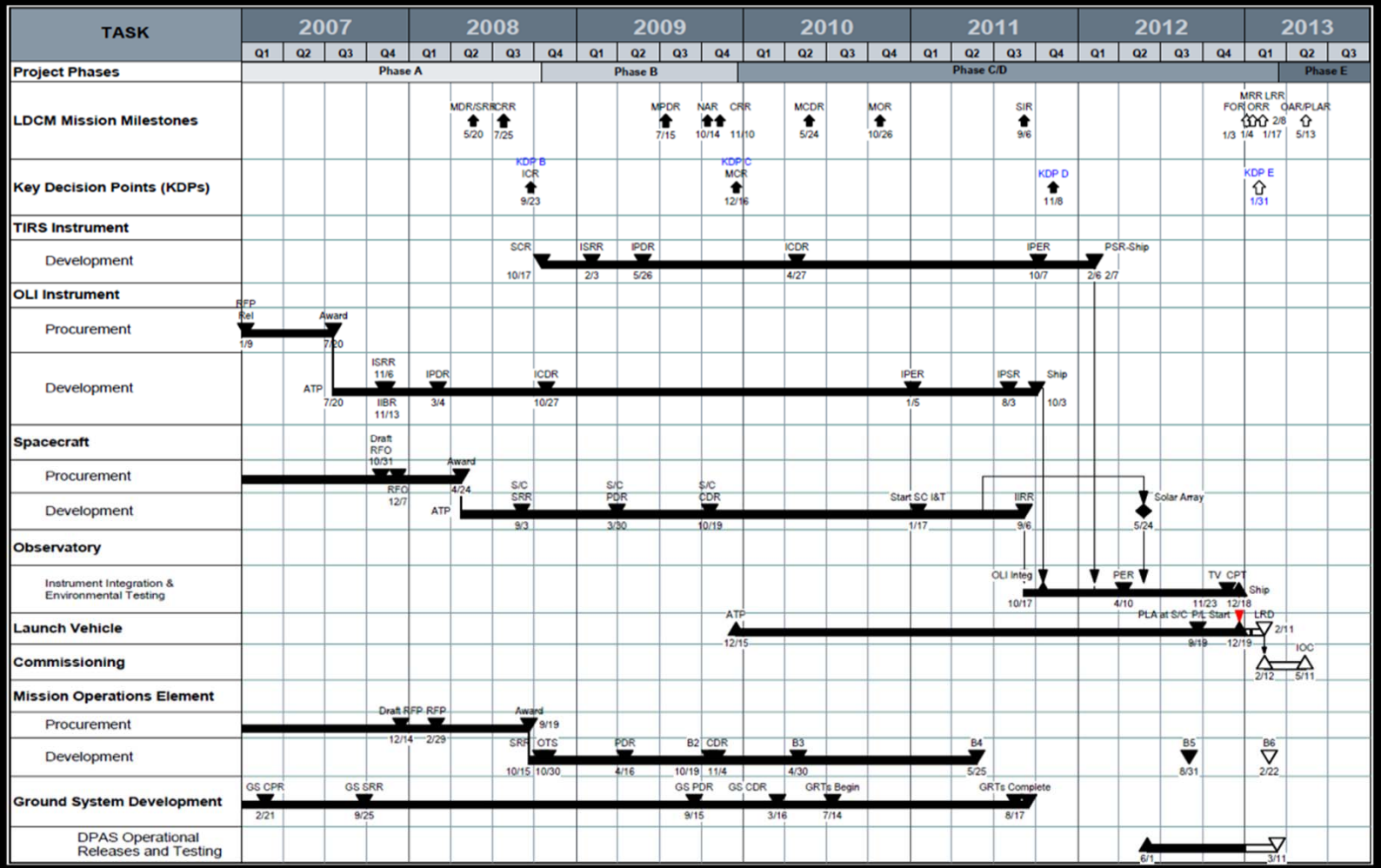

Operational Land Imager (OLI)
Thermal Infrared Sensor
Instrument Deck
Spacecraft
Solar Array
Propulsion Module

OLI @ Ball Aerospace

TIRS @ NASA GSFC


EROS Data Center
Sioux Falls, South Dakota
Ball Aerospace
Boulder, Colorado
Vandenberg Air Force
Base
California
Orbital Sciences Corporation
Gilbert, Arizona
NASA Goddard Space Flight Center
Greenbelt, Maryland
United States Geological Survey
Reston, Virginia
NASA Kennedy Space Center
Florida

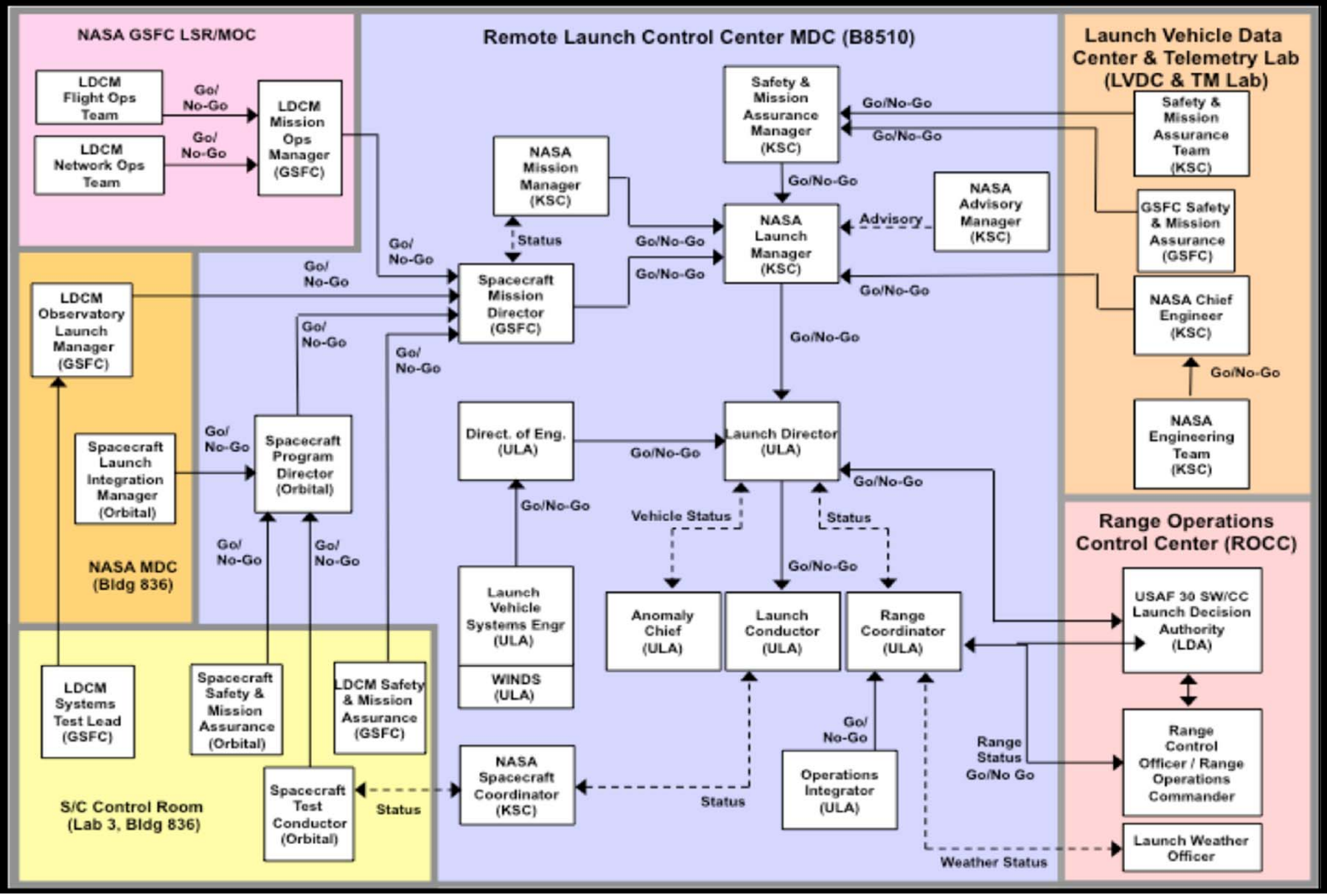
Master Schedule



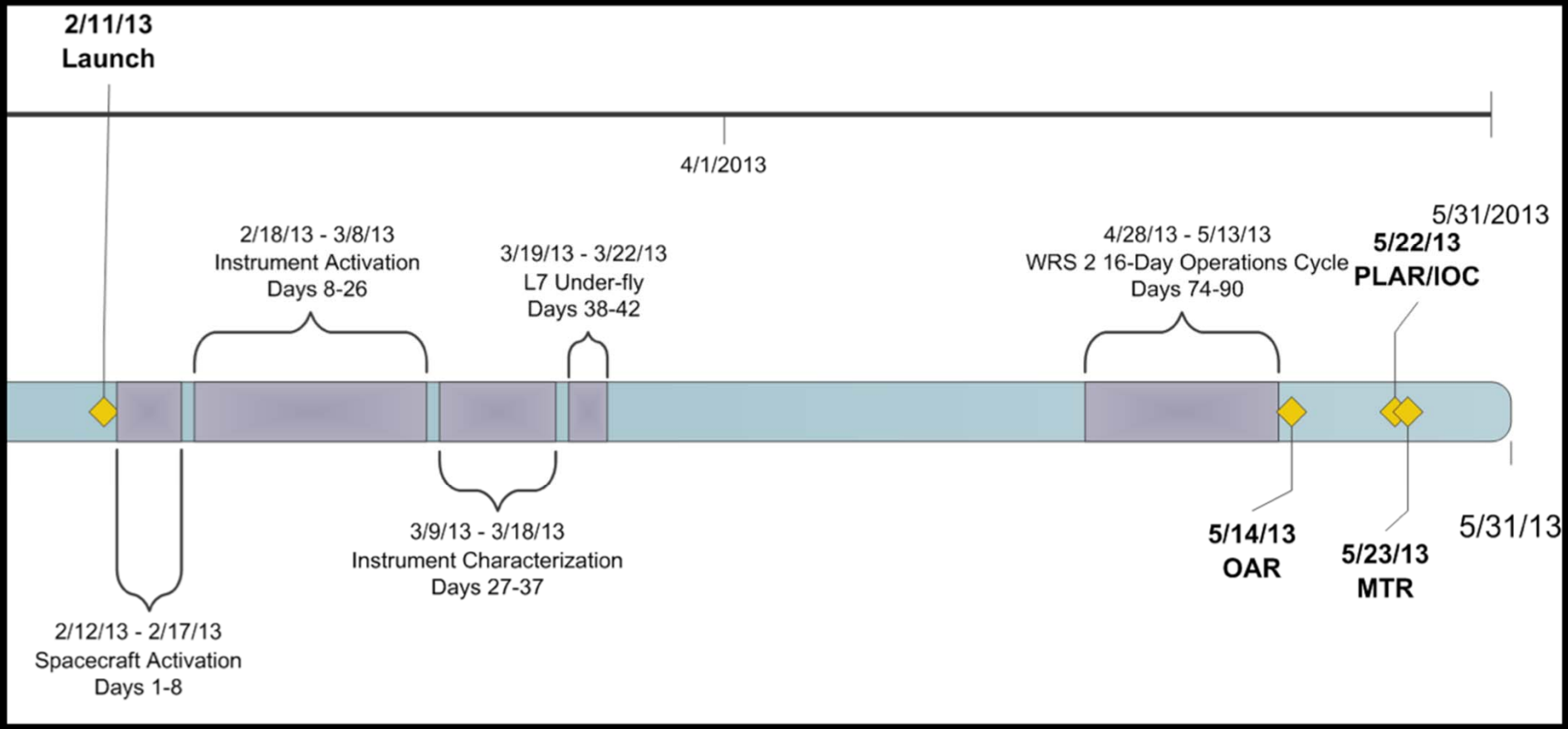
Risk Matrix

	Consequence						
	1	2	3	4	5		
Very High						5	Likelihood
High						4	
Medium						3	
Low	5					2	
Very Low	6,7,8,9,10,11	3,4	1,2			1	
Mission Impact	No impact to fully meeting baseline requirements.	Minor impact to fully meeting baseline requirements.	Moderate impact to fully meeting baseline requirements. Threshold requirements achievable with margin.	Major impact to fully meeting baseline requirements. Threshold requirements achievable.	Threshold requirements not achievable.		

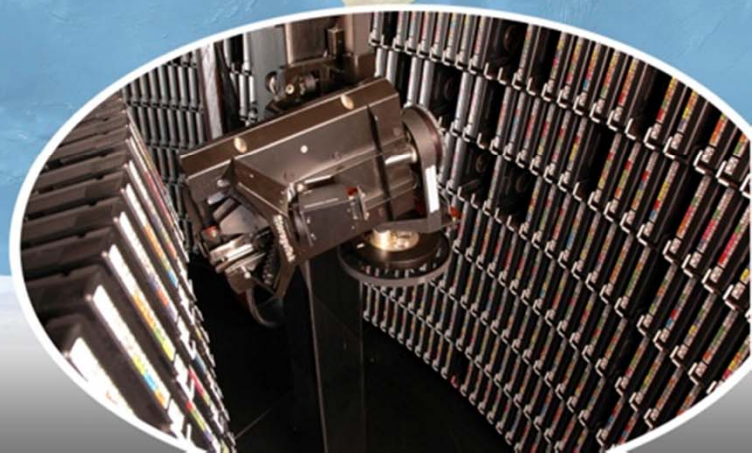
Launch Decision Flow



Integrated Mission Timeline

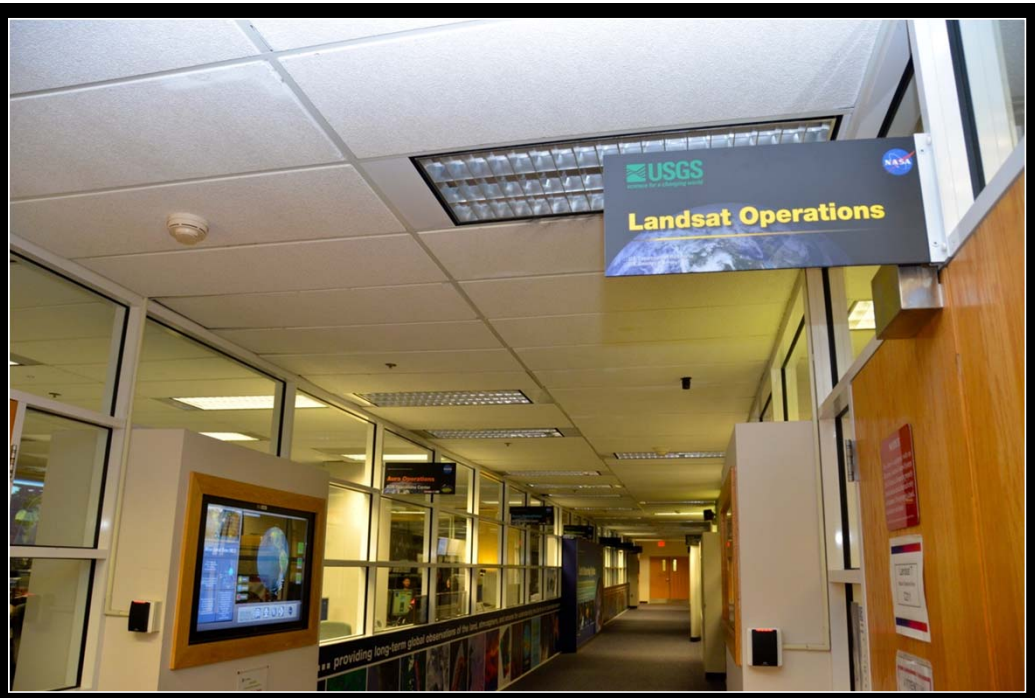


Landsat data is downlinked from the satellite, processed, stored, and managed by the Earth Resources Observation and Science (EROS) Center in Sioux Falls, South Dakota.

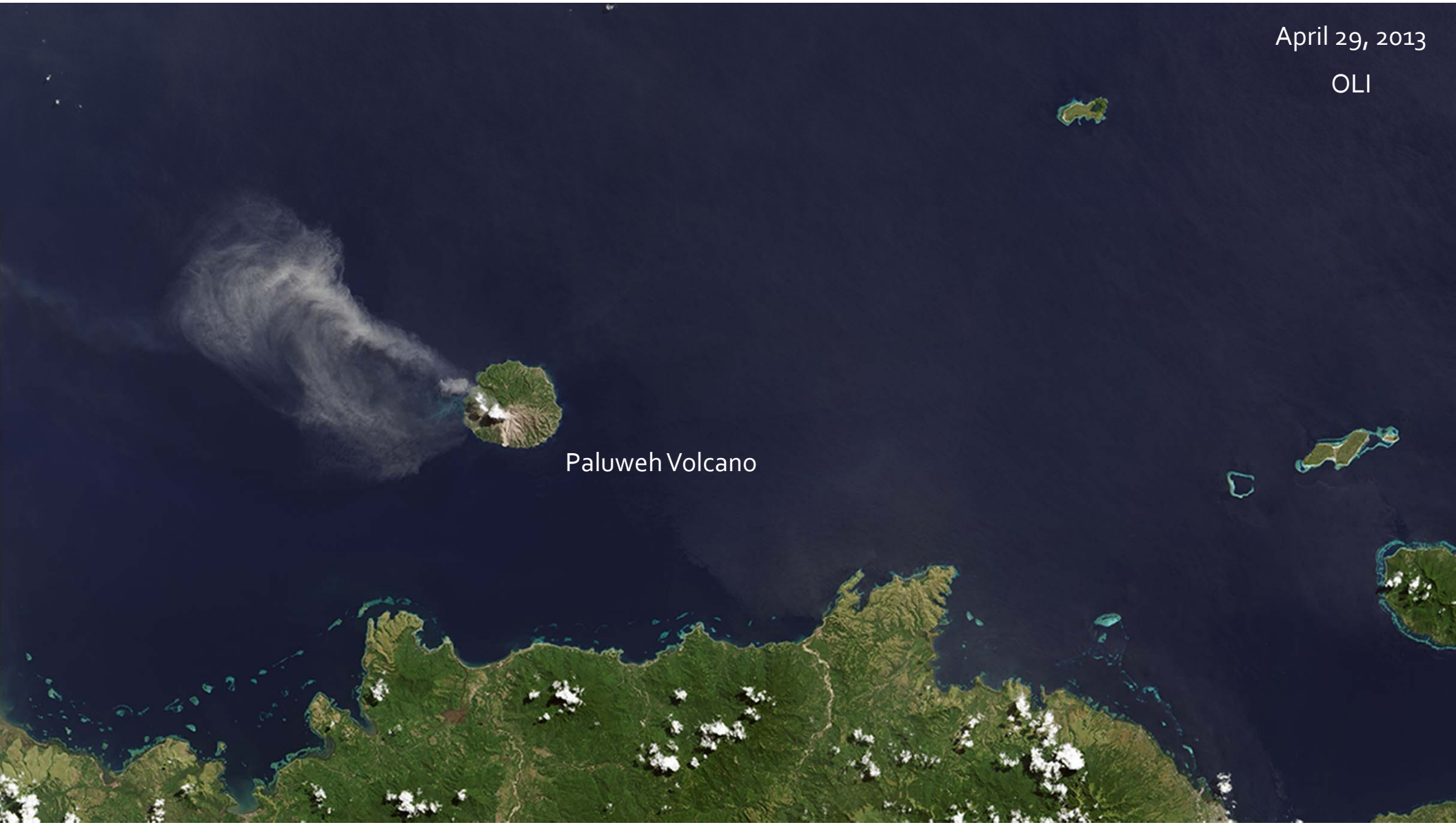


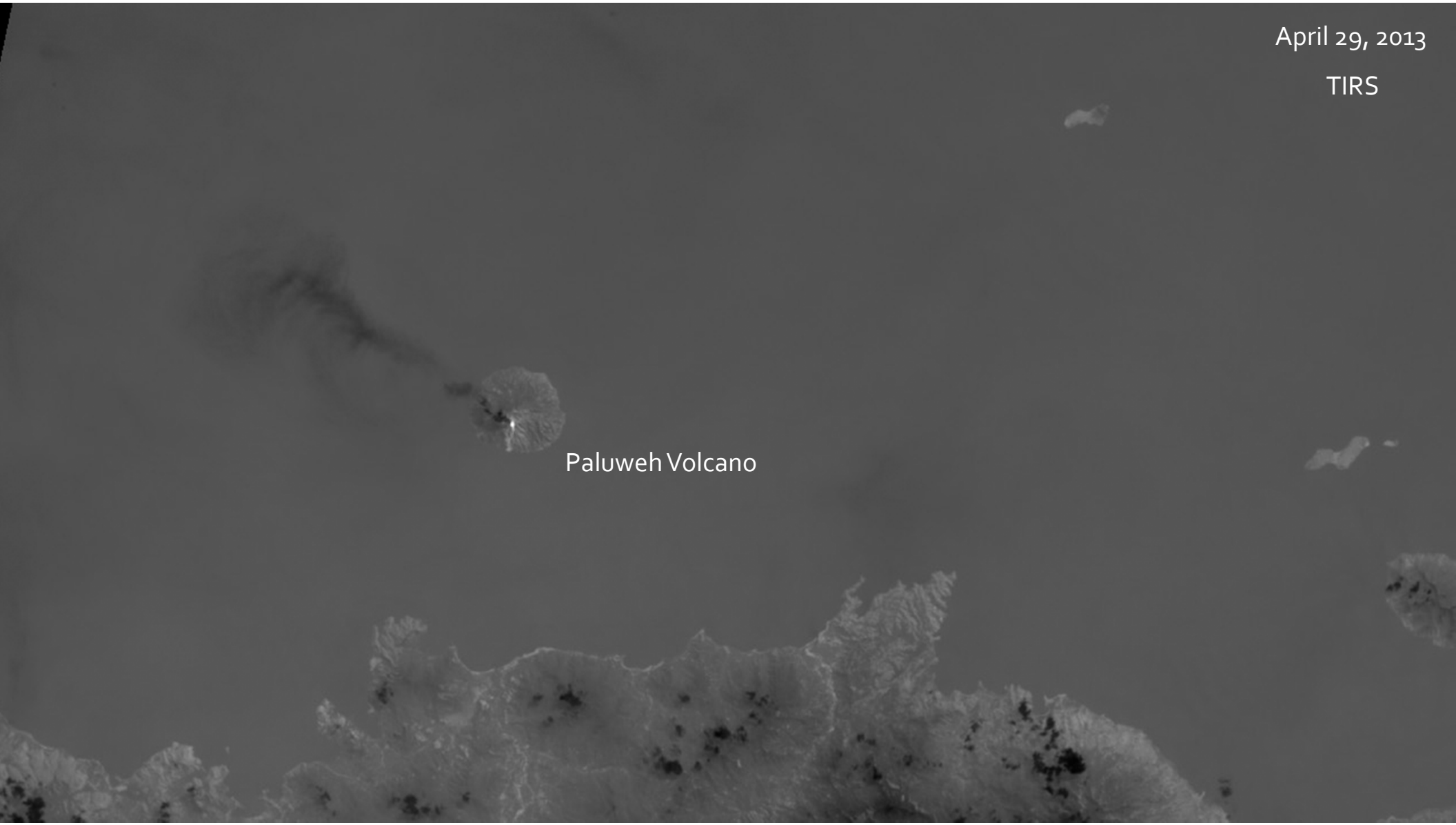
Earth Science Mission Operations

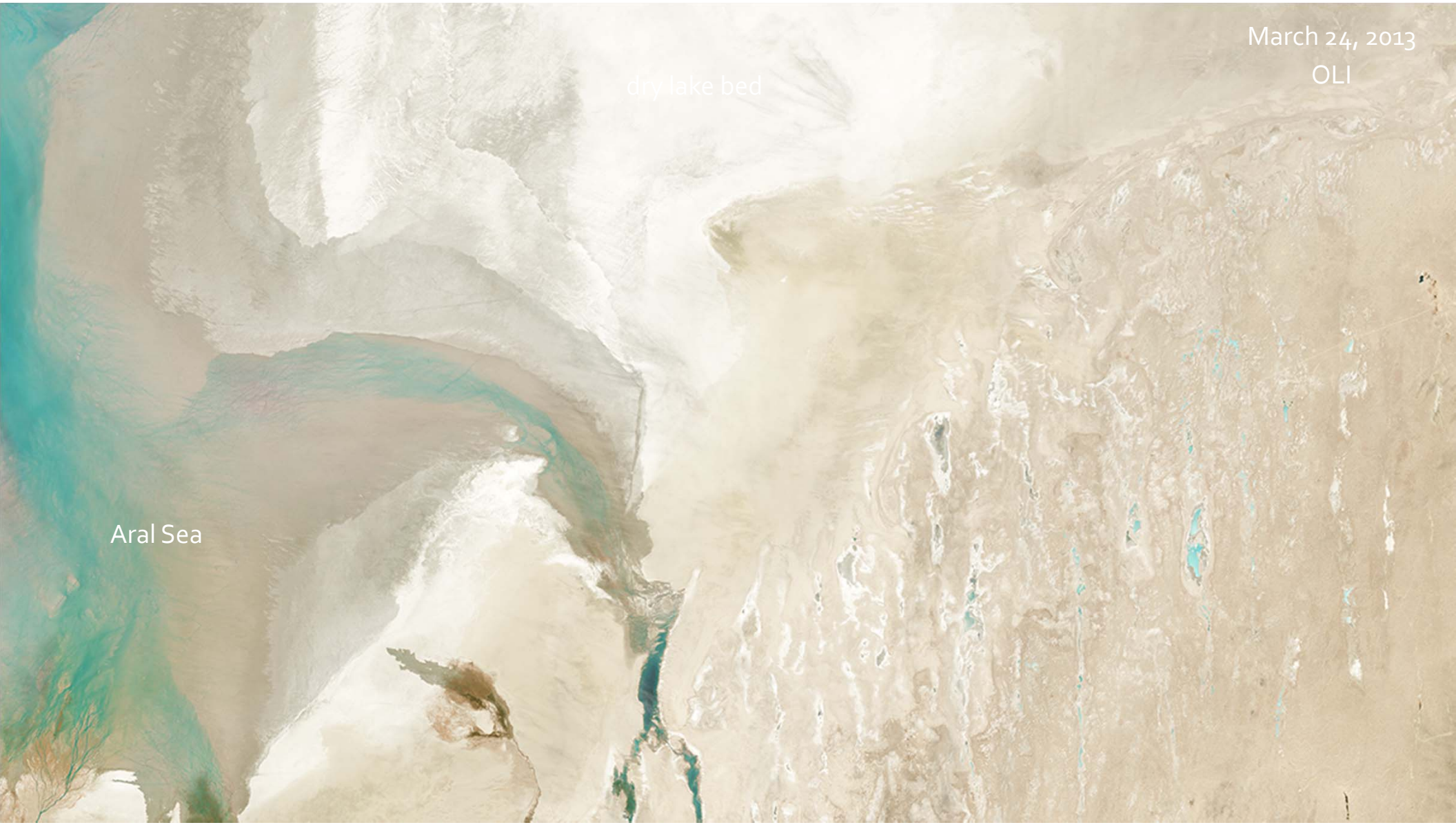
NASA Goddard Space Flight Center


USGS
Landsat Operations
NASA

EOS
TERRA
ASTER
CERES
MISR
MODIS
MOPITT
NASA-GSFC
Earth
Observing System
Operations Center


April 29, 2013
OLI
Paluweh Volcano

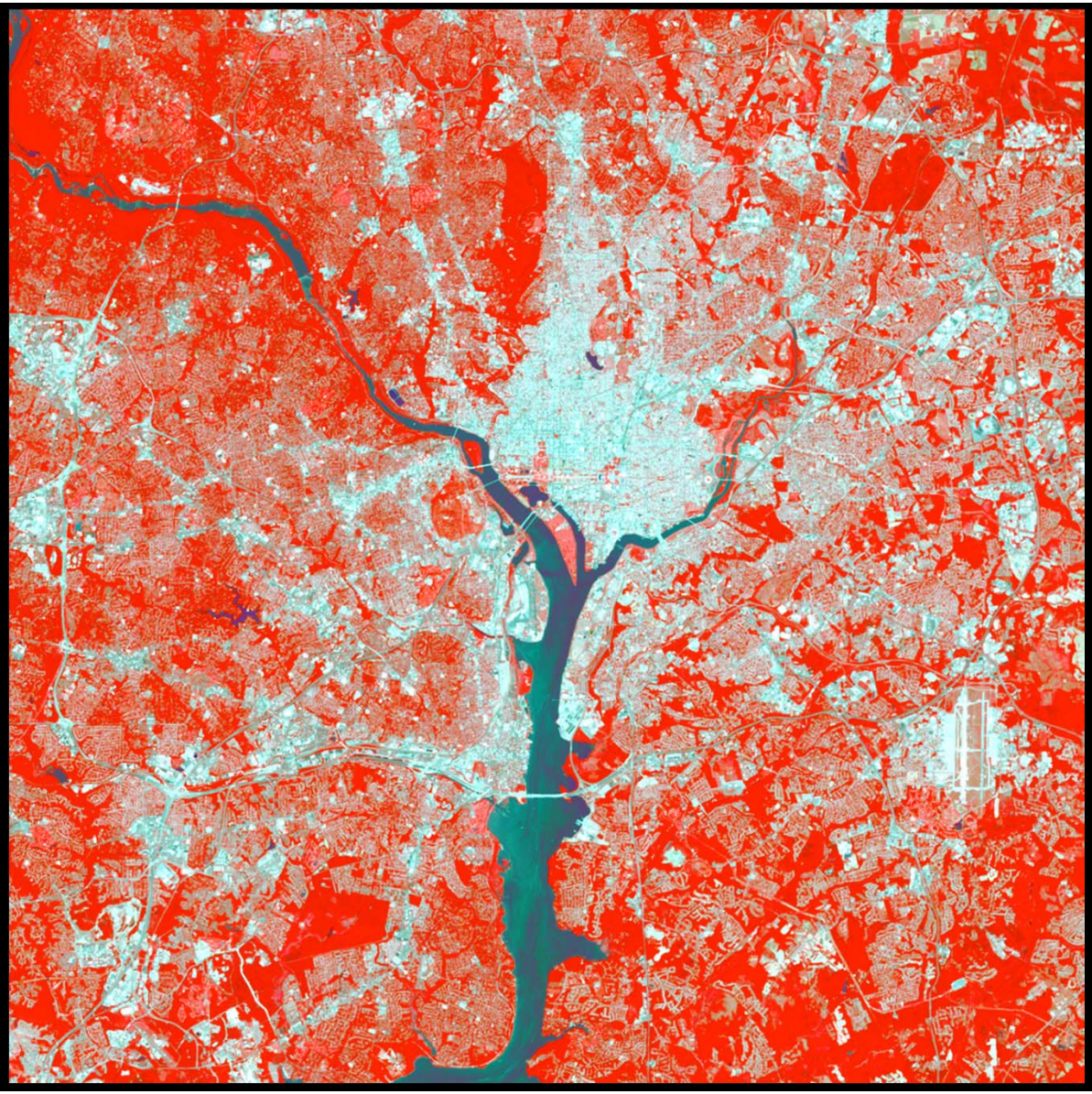

April 29, 2013
TIRS
Paluweh Volcano


March 24, 2013
OLI
dry lake bed
Aral Sea

March 24, 2013
TIRS
dry lake bed
Aral Sea

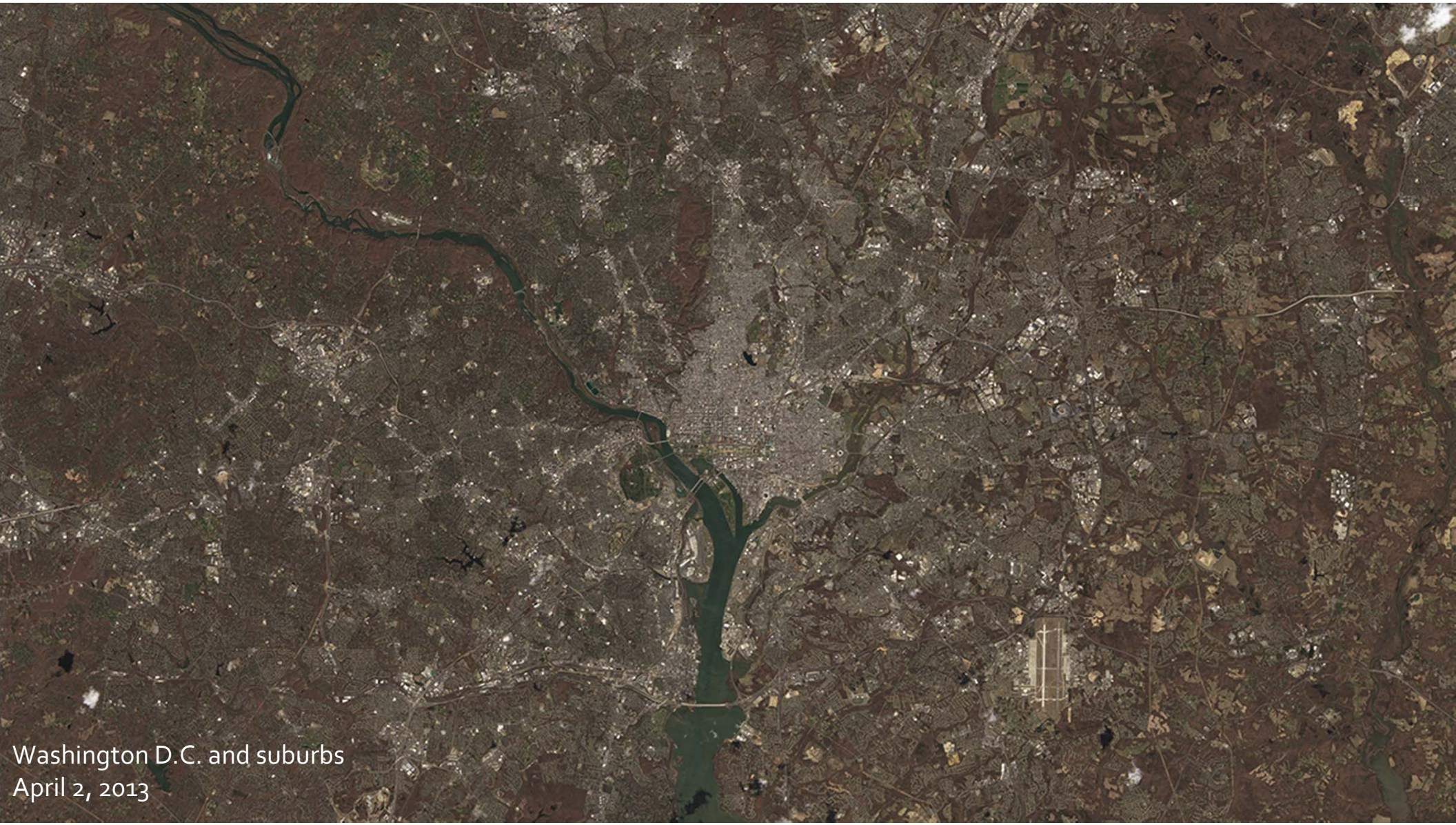
Landsat 1
September 23, 1972

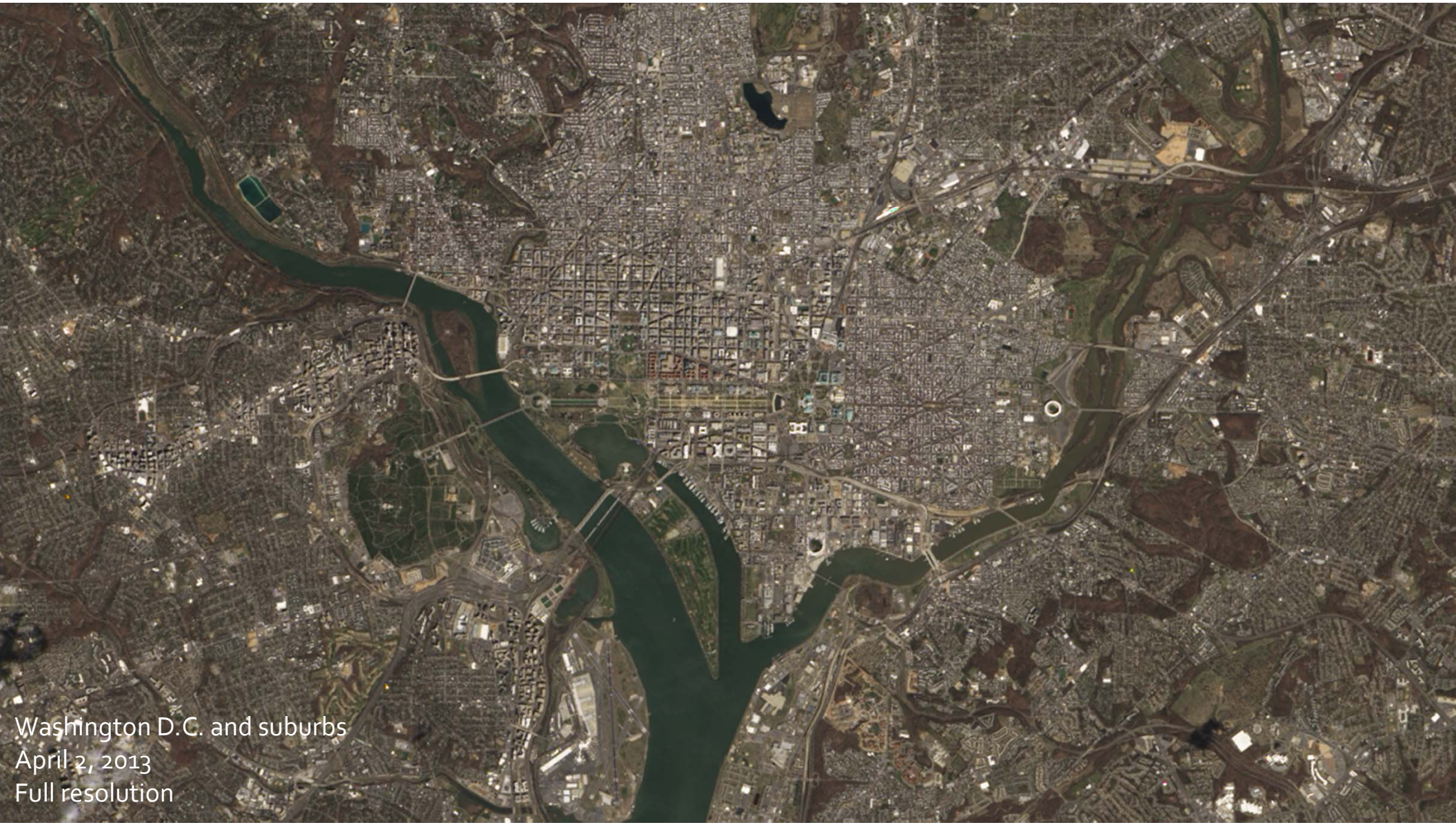
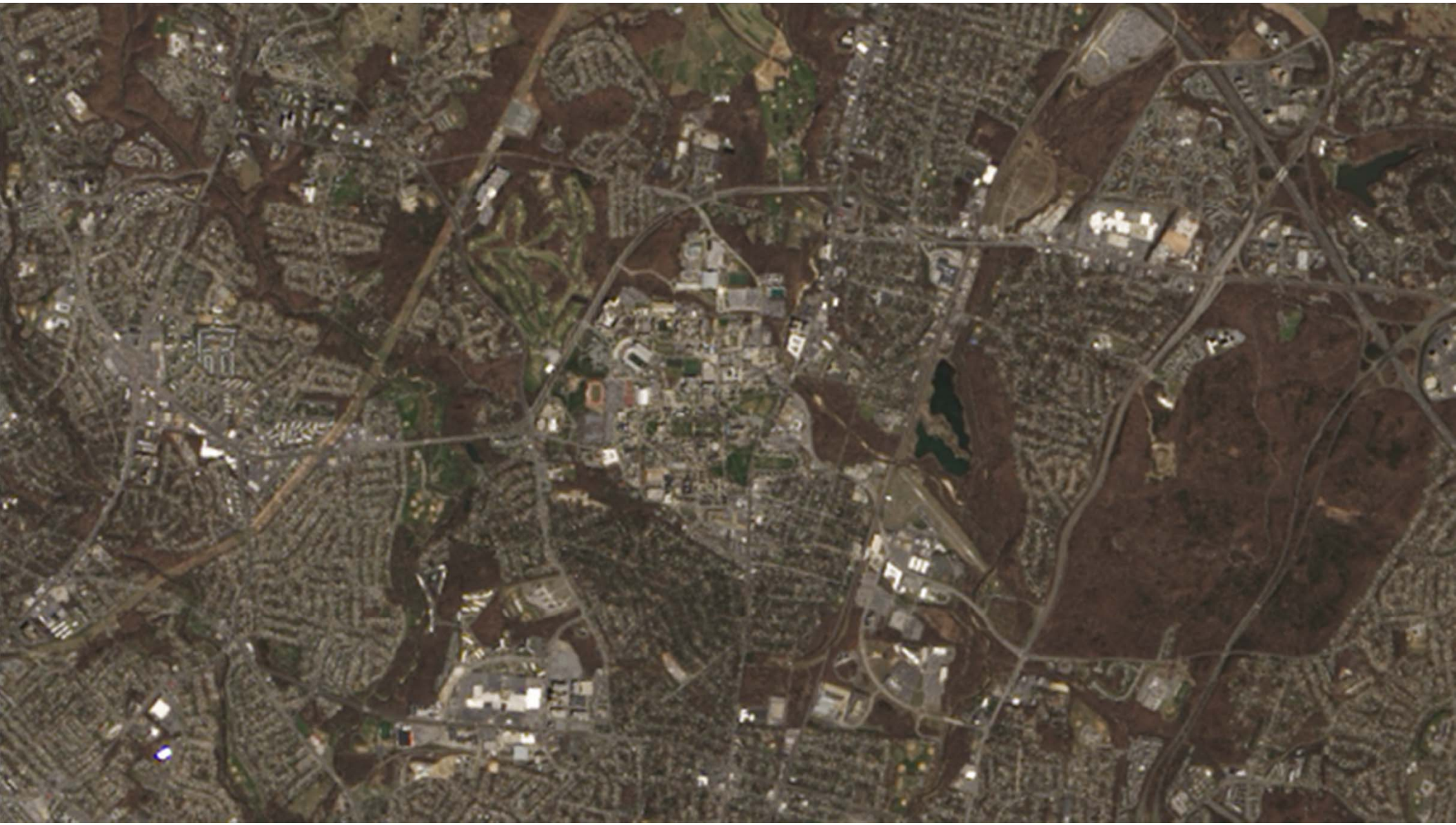
Washington D.C.



Landsat 7
May 28, 2012

Washington D.C.


Washington D.C. and suburbs
April 2, 2013


Washington D.C. and suburbs
April 2, 2013
Full resolution

NASA Goddard Space Flight Center
University of Maryland
April 2, 2013