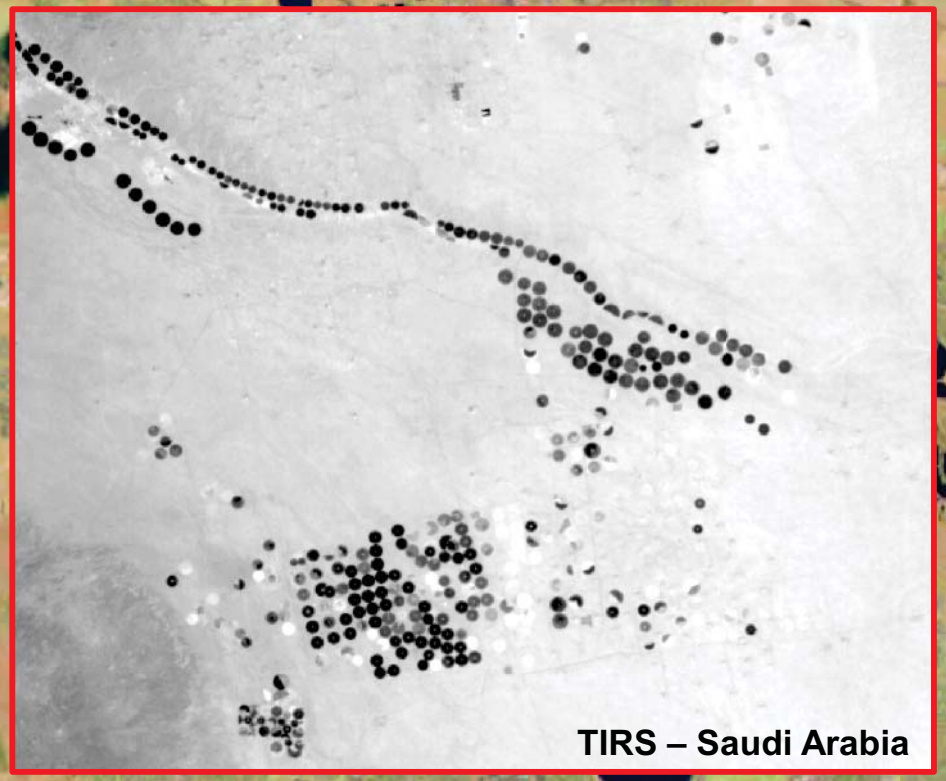
National Aeronautics and Space Administration

Earth Science



TIRS – Saudi Arabia

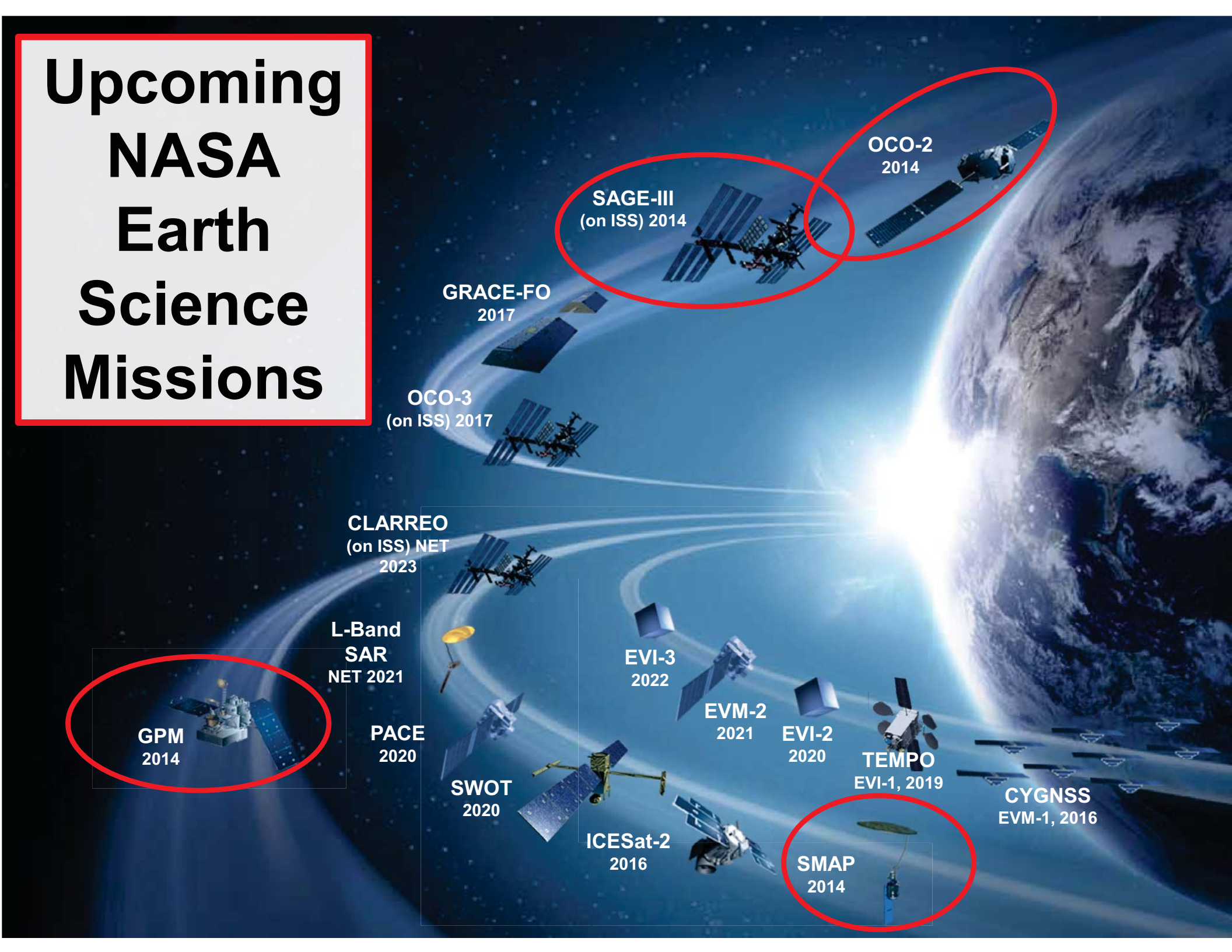
LDCM First-Light
OLI False-Color
Fort Collins, CO area

NASA Earth Science Highlights

- Initiates new Land Imaging project for development of a national sustained Land Imaging Satellite System (with USGS)
- Expands Venture-Class competitive flight program
- Initiates **development of a program** for TSIS, OMPS-Limb, and "CERES" measurements starting in the JPSS-2 time frame – ex-NOAA climate sensors
- Completes integration of DSCOVR Earth observing instruments (EPIC and NISTAR) and initiates ground data system development in preparation for 2014 launch
- Ops funding for QSCAT, Jason-1, CloudSat, GRACE, SORCE in FY14 – ends all by FY18
- Advances development of SMAP, SAGE III/ISS, GRACE-FO, SWOT, CYGNSS, OCO-3, TEMPO, and ICESat-2 for launch before 2021
- Pre-formulation studies will continue for PACE, L-band SAR, and other US NAS Decadal survey-recommended and climate architecture missions

Bi-annual Senior Review Ongoing in 2013

Upcoming NASA Earth Science Missions



VENTURE-CLASS UPDATE/STATUS

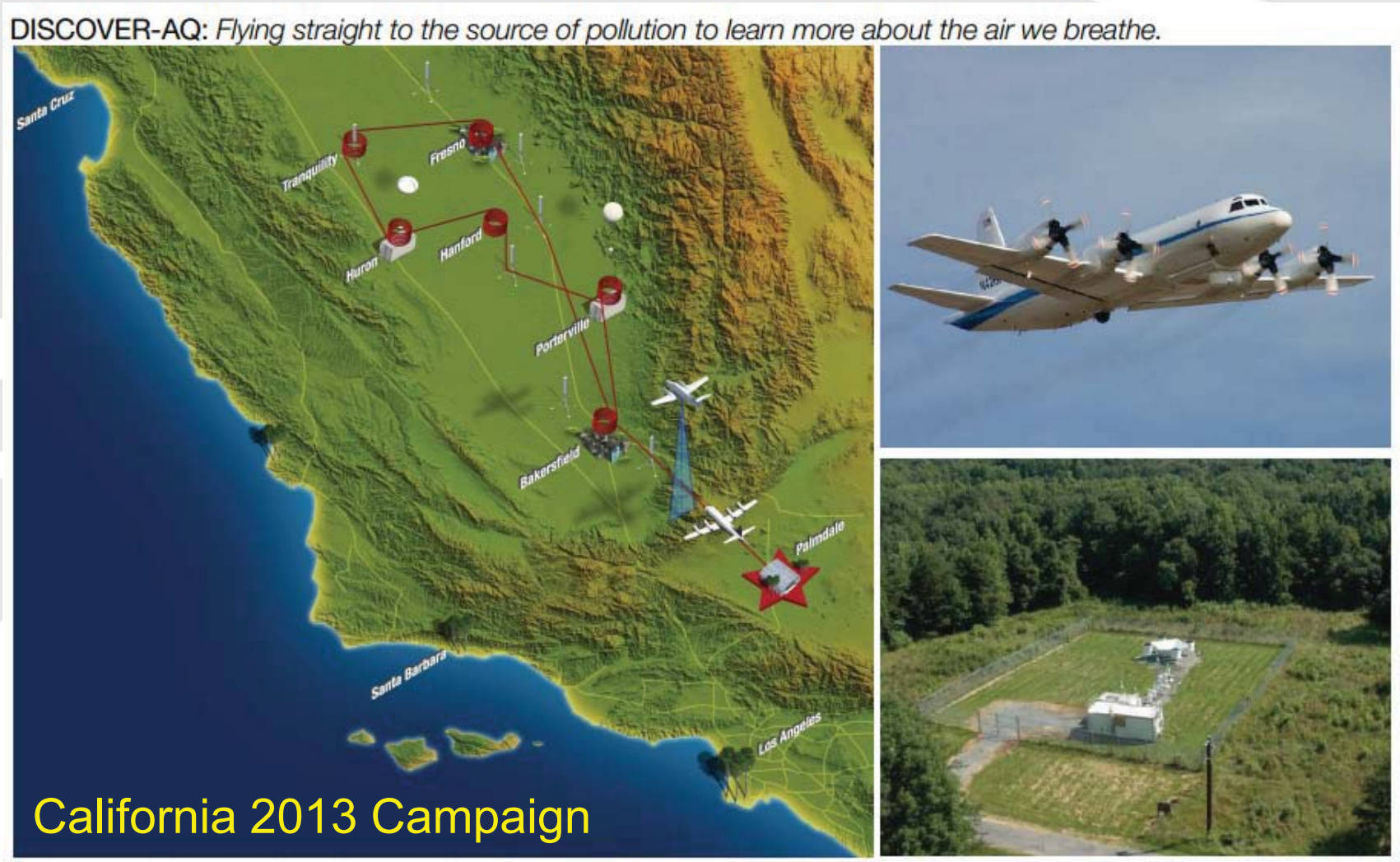
- **EV-1 ("EV-S" - Suborbital, Airborne)**
  - All 5 investigations have completed at least 1 sustained field campaign
  - All EV-1 investigations will fly during 2013
  - **Second EV-S solicitation funded, in preparation for release on schedule in mid-2013**

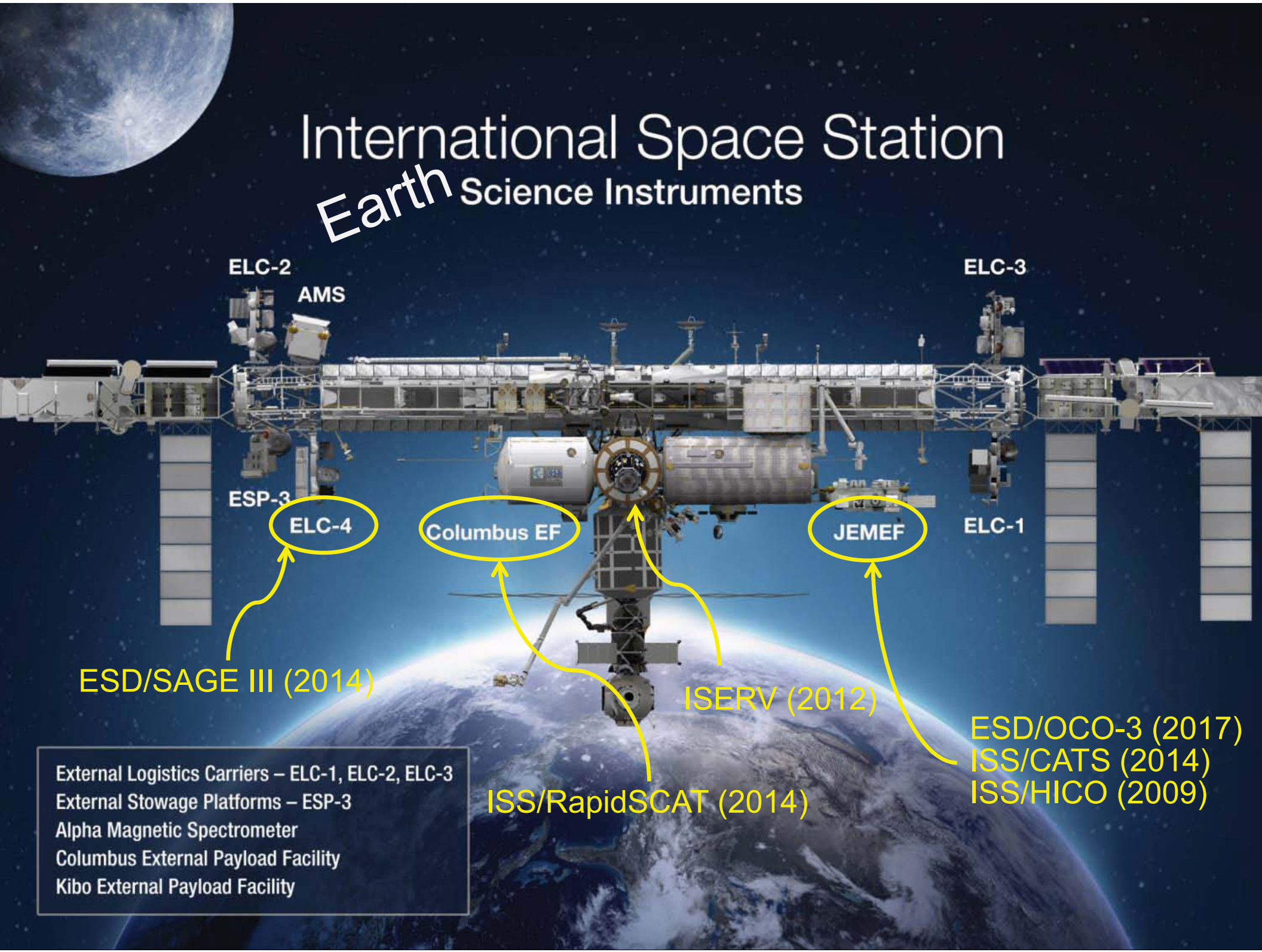
- **EV-2 ("EV-M" - Small-sat)**
  - **CYGNSS PI team and NASA program office making good progress, under contract 7 Dec 2012 (planned 2016-2017 launch)**
  - ESD/SMD developing detailed "Class D" management approaches and processes

- **EV-I (Instrument)**
  - **TEMPO selected for GEO hosted payload opportunity (2017 launch)**
  - ESD initiating formal host selection/negotiation process
  - **Second "EV-I/2" solicitation funded, on schedule for release**

VENTURE-CLASS UPDATE/STATUS

- **EV-1 Highlights: DISCOVER-AQ (**Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality)
  - Focuses on near-surface pollution, improving air quality forecasts, and determining the sources of pollutants in the air and fluctuations in emissions levels.




International Space Station
Earth Science Instruments
ELC-2
AMS
ELC-3
ESP-3
ELC-4
Columbus EF
JEMEF
ELC-1
ESD/SAGE III (2014)
ISERV (2012)
ESD/OCO-3 (2017)
ISS/CATS (2014)
ISS/HICO (2009)
ISS/RapidSCAT (2014)
External Logistics Carriers – ELC-1, ELC-2, ELC-3
External Stowage Platforms – ESP-3
Alpha Magnetic Spectrometer
Columbus External Payload Facility
Kibo External Payload Facility

Earth Observations from the ISS: NASA/ESD Status and Plans

- On-orbit instruments funded by non-ESD sources, ESD funding for analysis
  - HICO (Hyperspectral Imager for the Coastal Ocean)
    - Launched September, 2009 on HTV; mounted on JEM-EF
  - ISERV (Digital Camera and Telescope)
    - Launched July, 2012 on HTV-3; mounted internally on WORF

- Planned instruments funded by NASA/HEOMD, ESD funding for analysis
  - CATS (Cloud-Aerosol Transport System for ISS)
    - LIDAR, summer 2013, HTV, JEM-EF
  - Rapid-Scat (Ku-band scatterometer)
    - Launch early CY2014, Falcon/Dragon
  - *Lightning Imaging Sensor (under consideration)*
  - *Hyperspectral Follow-on to HICO (under consideration)*

- Approved instruments funded by ESD
  - SAGE-III (Stratospheric Aerosol and Gas Expt)
    - In Phase-C; 12/2014 Launch on Falcon/Dragon; ESA provides hexapod pointing p'form
  - *OCO-3 (Orbiting Carbon Observatory-3 instrument only)*
    - *Phase-A November 2012; Launch Fall, 2017*

LDCM Status Update

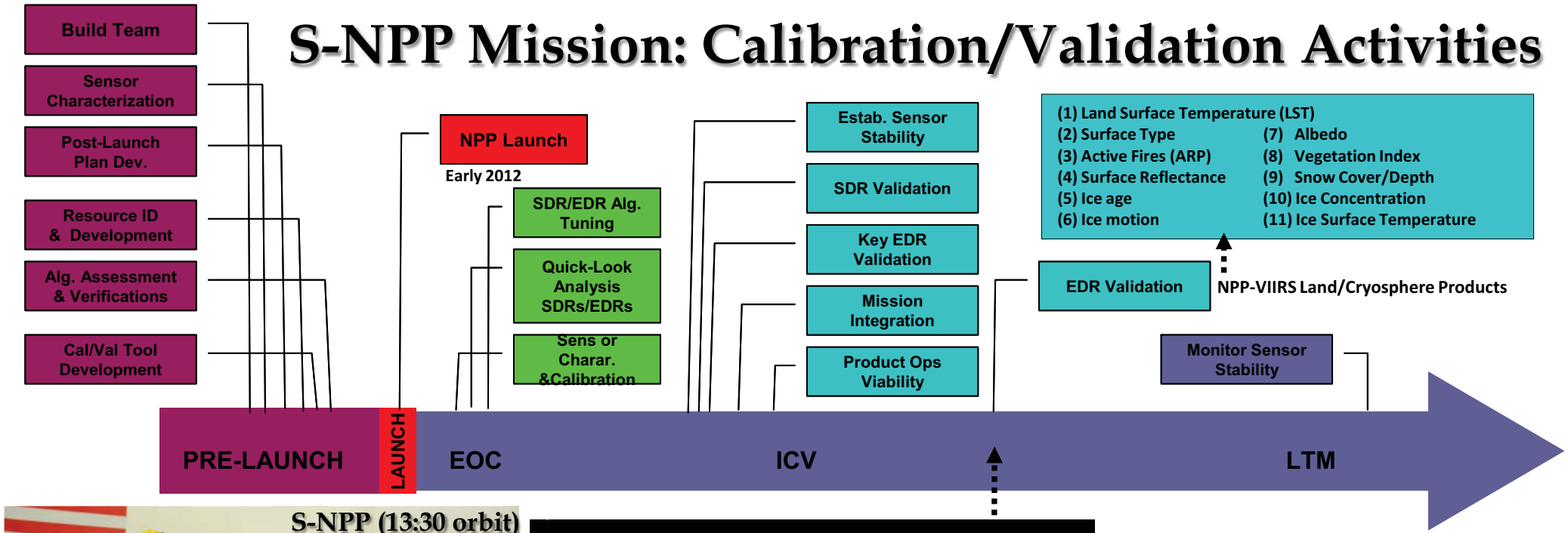
- All spacecraft and instrument systems continue to perform normally.
- Routine calibrations have continued along with OLI and TIRS instrument imaging.
- 16-day operational imaging and calibration test cycle (400 scenes/day) completed.

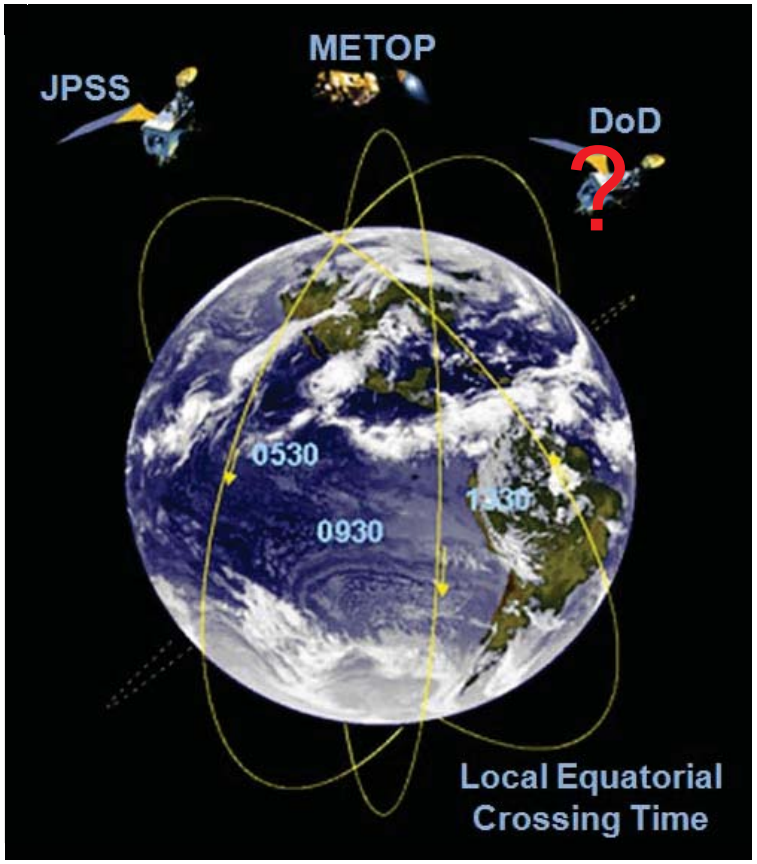
NASA Goddard SPACE FLIGHT CENTER

Suomi NPP – Revisiting the Blue Marble

2012 Blue Marble VIIRS

S-NPP Mission: Calibration/Validation Activities





JPSS Land Cal/Val Team Objectives:

- *To validate the VIIRS Land products to meet operational performance requirements.*
- *Suitable for inclusion in civilian and defense mission support, with robust performance, minimum down time, and low data latency.*

NASA Land Science Team Role:

- *To continue the scientific data record started in the EOS era.*
- *To coordinate science algorithm development, QA (production + science testing), and validation activities for "research-quality" NPP products.*
- *Reprocessing will also be required to produce consistent, integrated, EOS/NPP/JPSS long-term data records.*

A Land Climate Data Record

Eric Vermote, Code 619, NASA GSFC

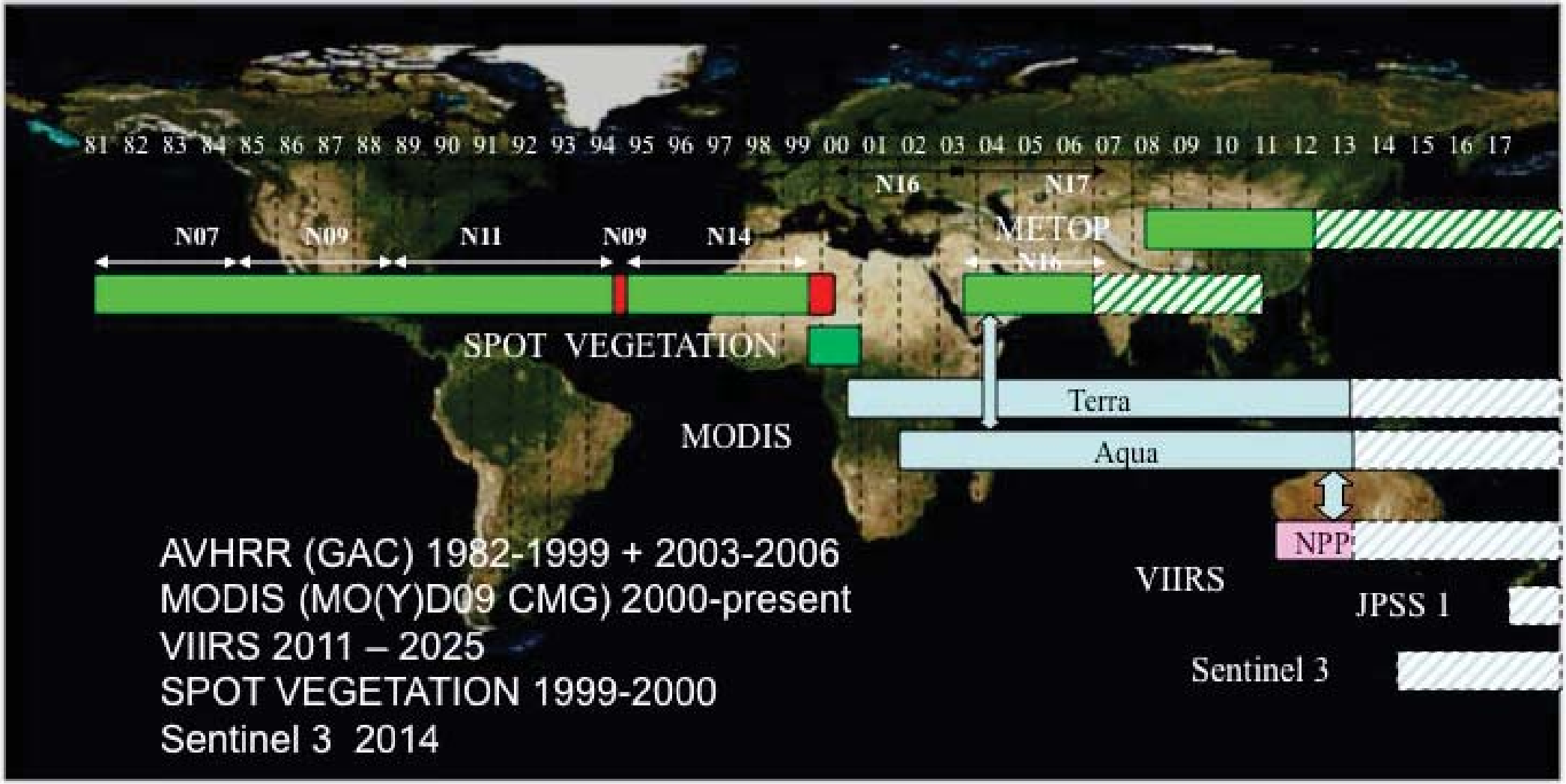
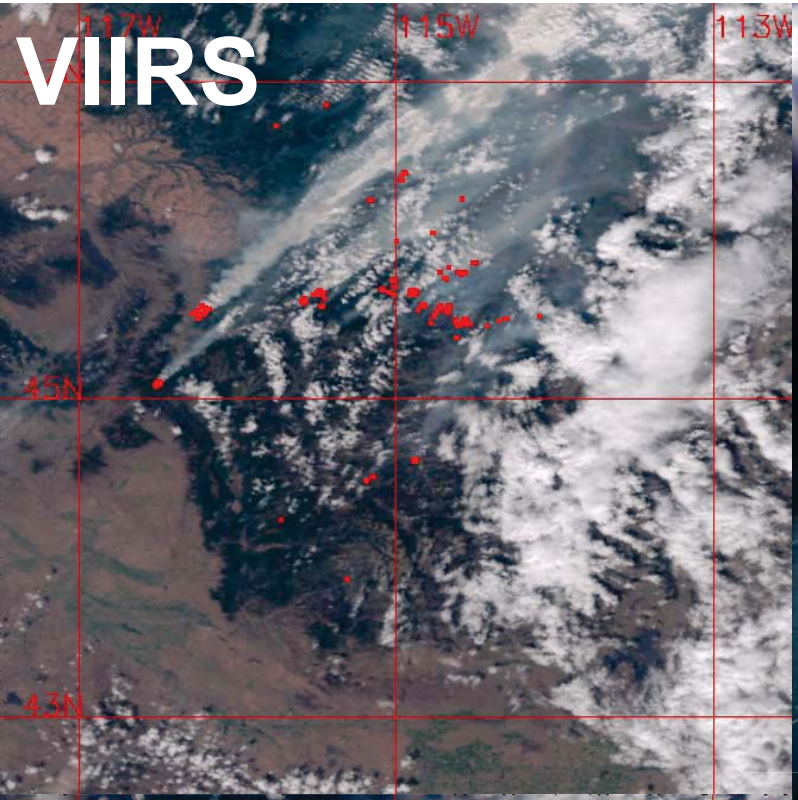
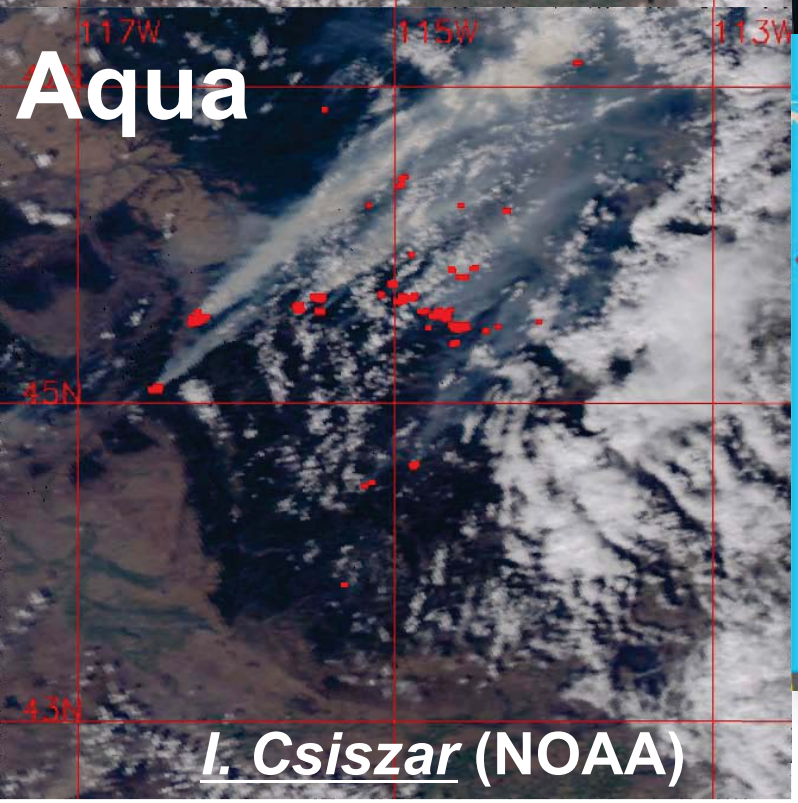
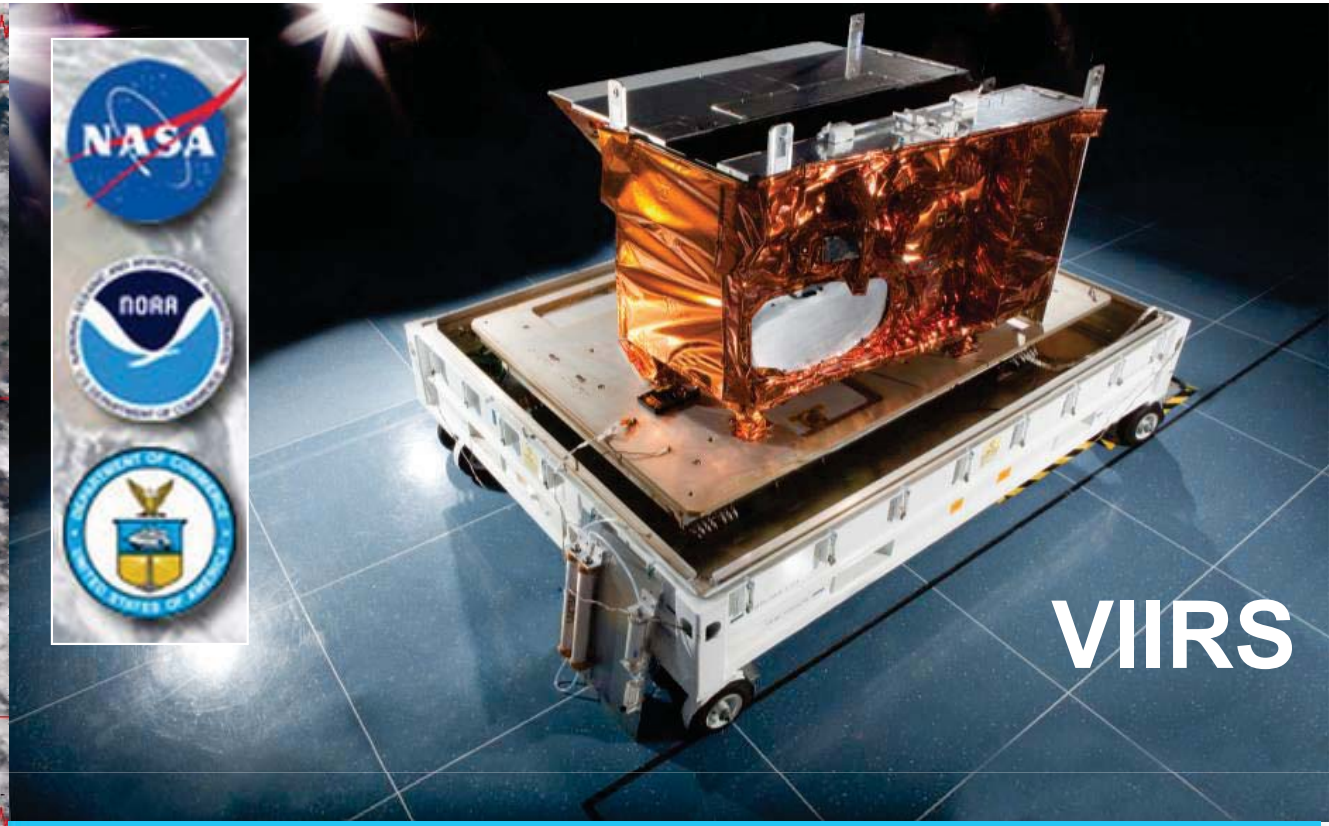


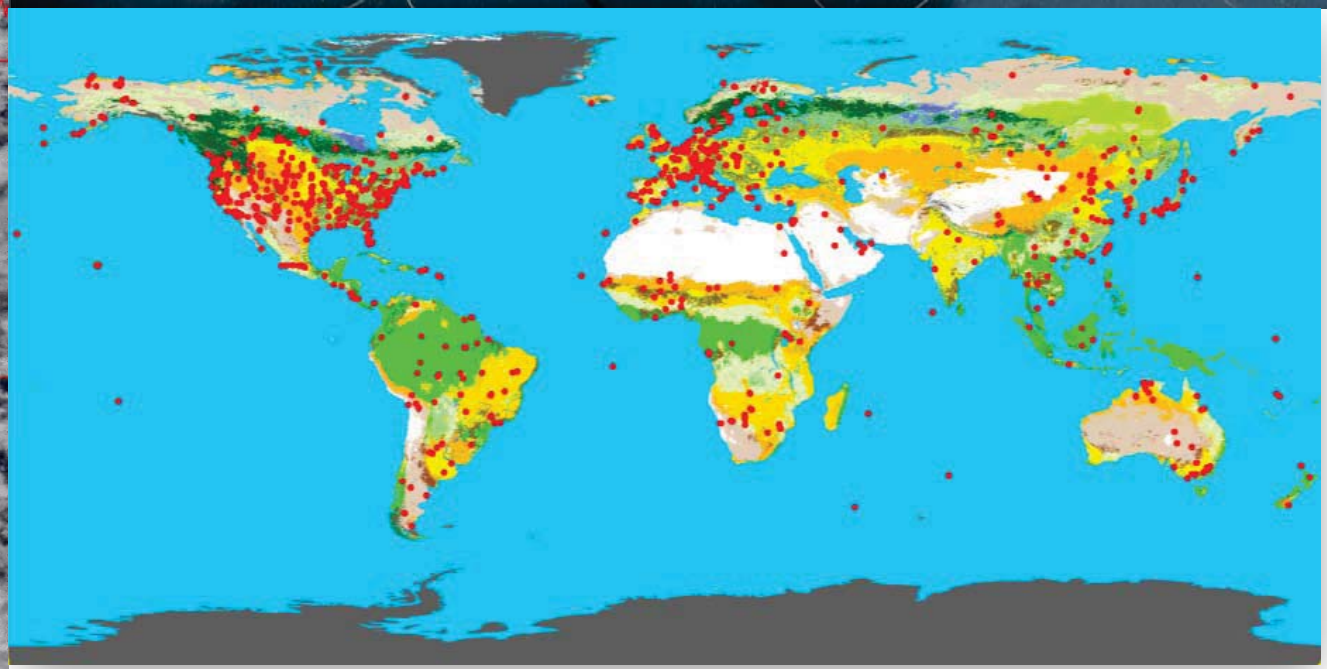
Figure 1: The generation of a Land climate data record (several decade) necessitates the use of multi instrument/multi sensor science quality data record. This record is used to quantify the trend and change in land surface parameter (e.g. Vegetation/Land Cover). A strong emphasis is put on data consistency which is achieved by careful characterization and processing of the original data rather than degrading and smoothing the dataset.





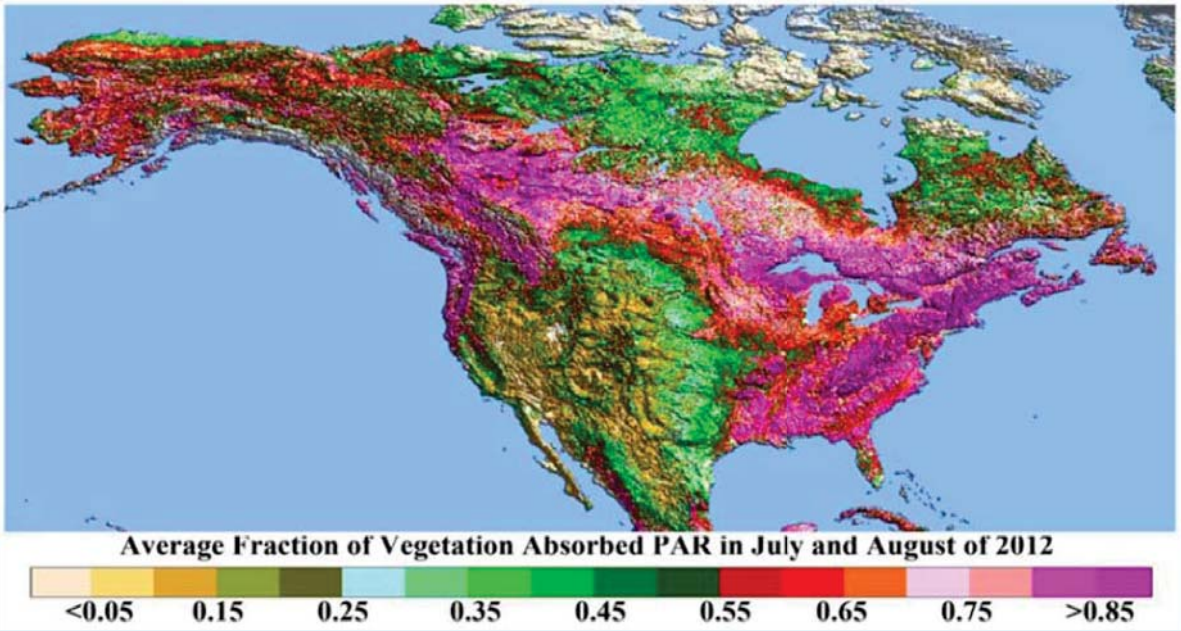
I. Csiszar (NOAA)





Suomi-NPP Land Validation Sites

Continuation of the EOS record of Climate-Quality Observations



Conversion of MODIS code for Daily LAI/FPAR to VIIRS Land Science gridded product.

R. Myneni (BU)

Provision of spatially gridded VIIRS Surface Reflectance at both moderate (0.5 - 1.0 km) and CMG resolutions.

Land PEATE- adjusted version of VIIRS Surface Reflectance IP

E. Vermote (GSFC)

The Suomi National Polar Orbiting Partnership (NPP) Day/Night Visible Sensor: Unleashing A New Era of Nighttime Remote Sensing Applications

Credit: NASA Earth Observatory/NOAA NGDC

Demonstrate the high potential of using VIIRS DNB to estimate surface $PM_{2.5}$ at night.

Jun Wang
Jing Zeng
Zhifeng Yang

Yang Liu

Robert Levy
SSAI & NASA GSFC

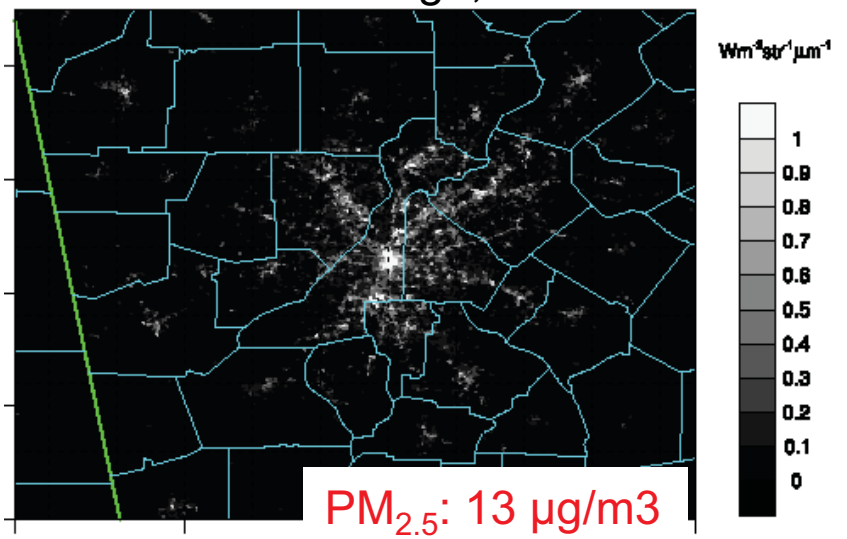
In collaboration with

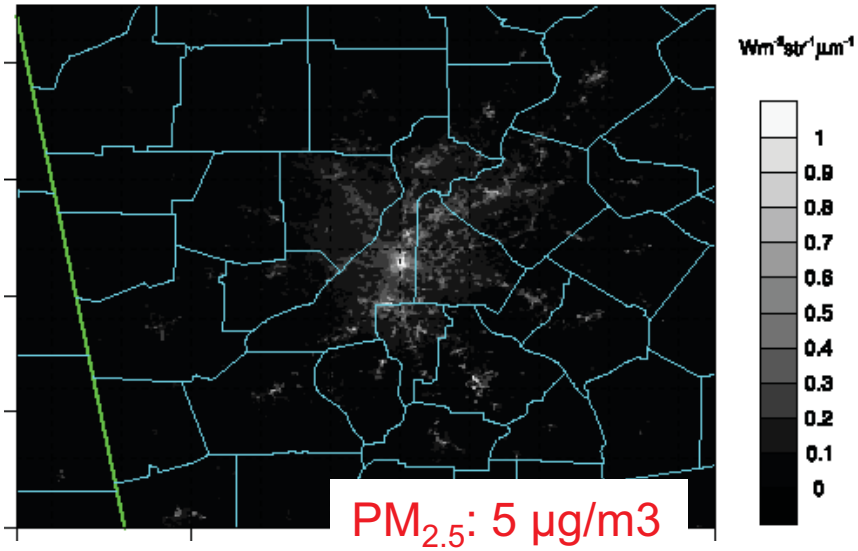
James J. Szykman

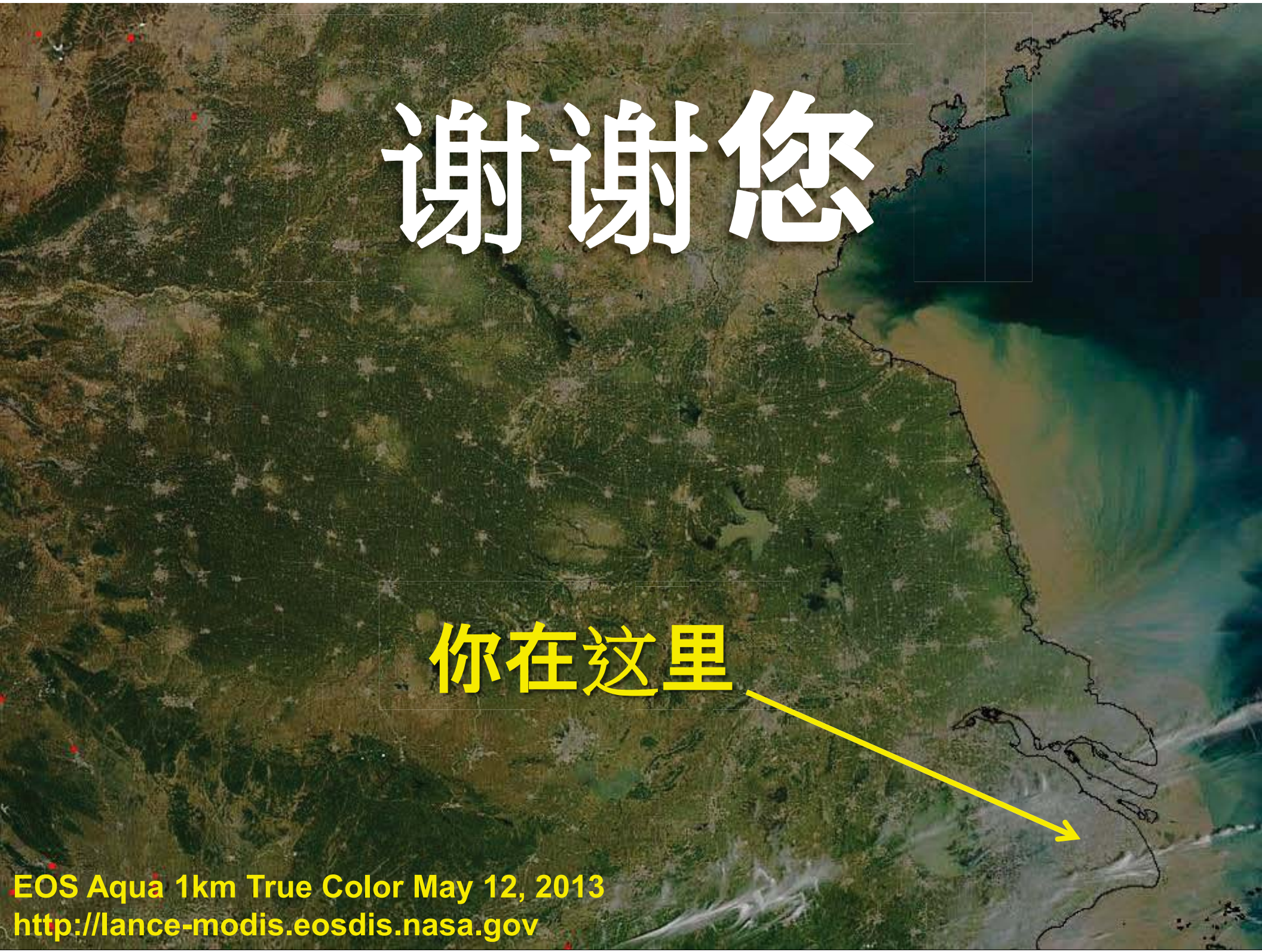
Raymond Hoff
Hai Zhang

Helen Flowers
Judith Qualters

VIIRS DNB image, Atlanta



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