



Working at NASA A Brief Summary

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Background



- My experience is as an electronics engineer for NASA spaceflight and airborne applications since 2002.
 - Proposals, concepts, development, operations
 - My favorite work is on scientific instruments
- Non-traditional education & career path
 - BSEE 2000 (Virginia Tech)
 - Constant continuing education (graduate courses, certificate, training classes, conferences)
 - Set highest priority on hands-on, high-reliability projects with several groups within NASA



Background

- What does my day look like?
 - I work on a base built in the 1950s
 - “Collegiate” atmosphere
 - Lots of trees
 - Old buildings & facilities
 - I average 40-45 hrs/wk, with peaks to ~55-60 hrs/wk
 - I make as much time for design as possible, but typically get about 40-60%
 - Team work - small & large, which requires emails, phone calls, & meetings to varying degrees
 - Mentoring & consulting for others’ projects
 - Lab & field work is about 10%
 - Project cycle goes in phases which vary considerably (computer vs. lab, clean room, etc.)



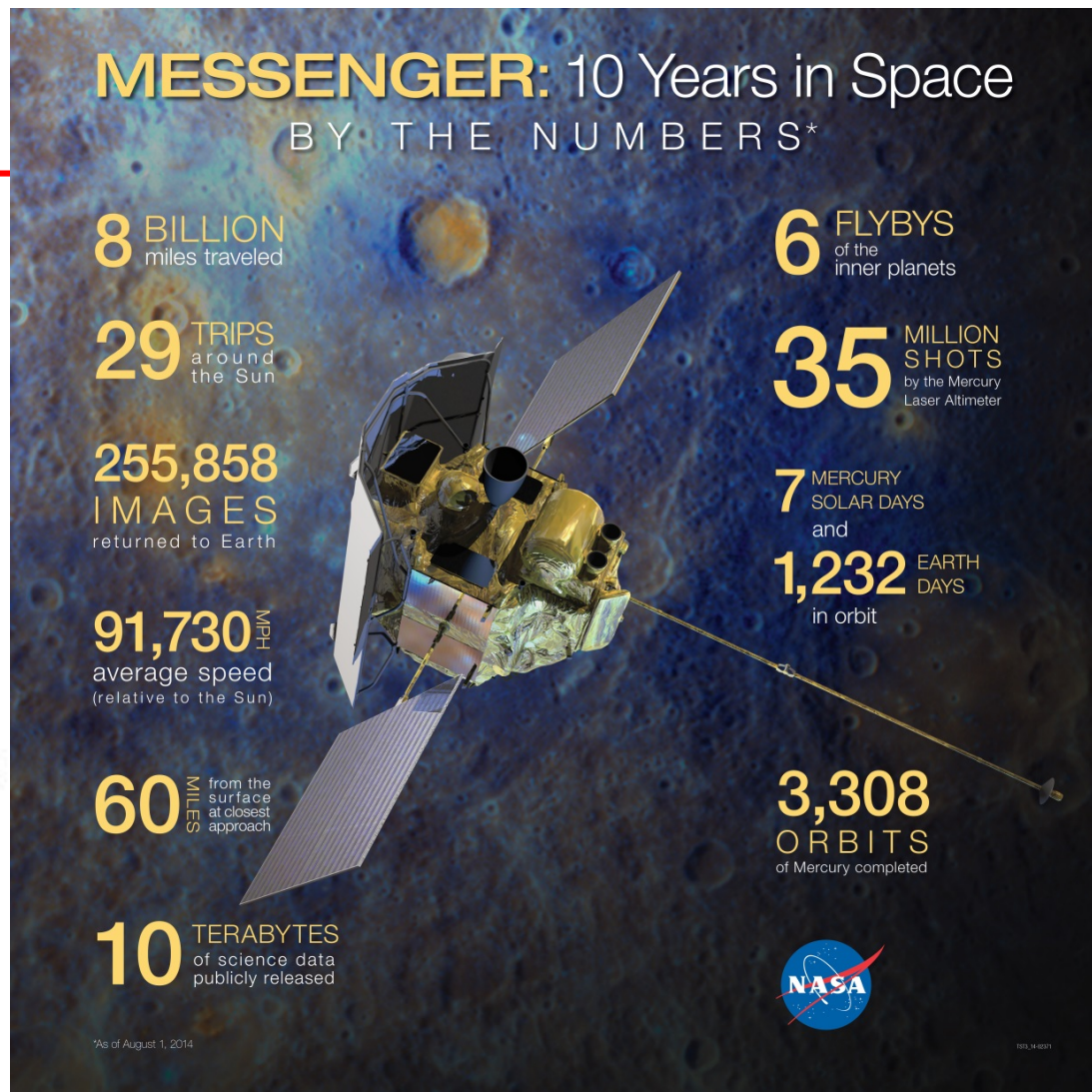
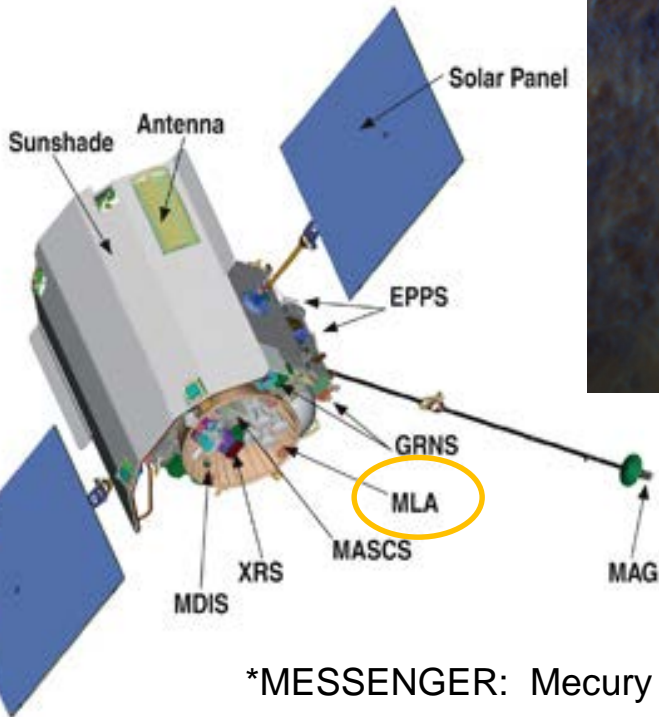
Example Projects



Mercury Laser Altimeter (MLA)

- Instrument onboard the MESSENGER* spacecraft (2004)
- Topographical map of Mercury's surface – fire a laser at the surface, measure the time to reflect back
- Identified water ice in polar regions of Mercury (2012)

MESSENGER Spacecraft

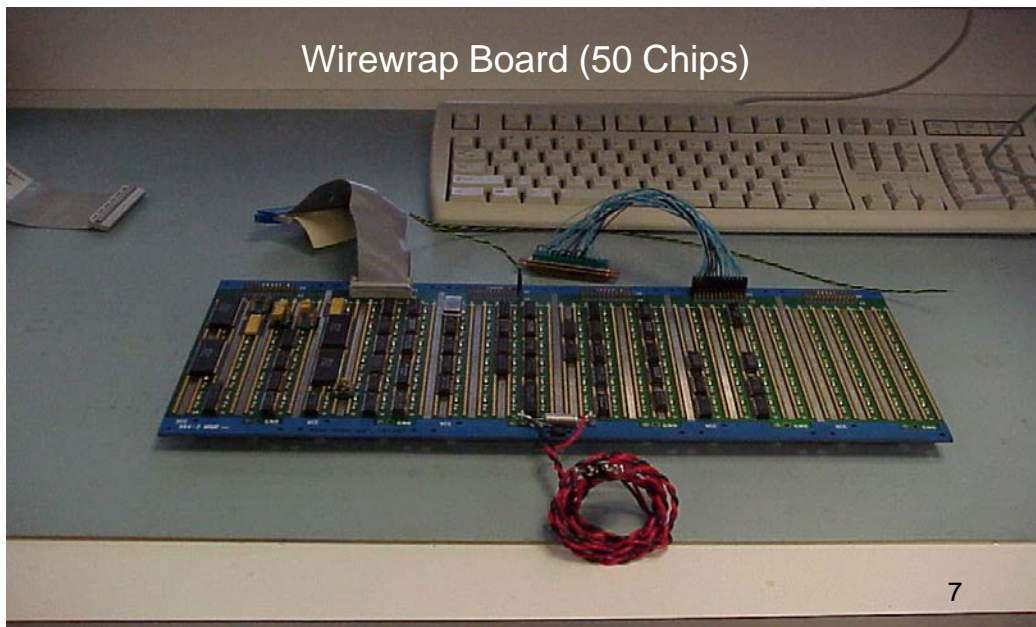
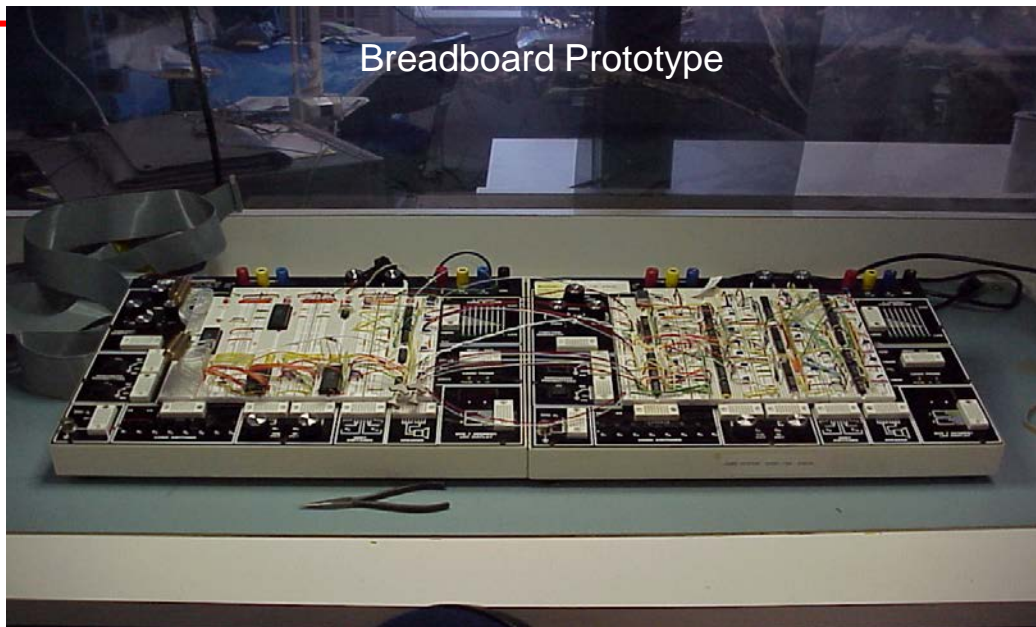


http://www.nasa.gov/mission_pages/messenger/main/index.html
<http://messenger.jhuapl.edu/>



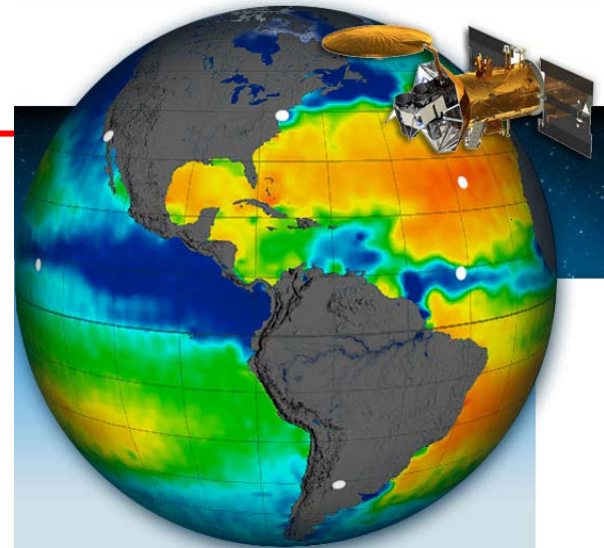
MLA EGSE (2002)

- EGSE = Electrical Ground Support Equipment = custom test gear
- Used to test individual circuit boards on MLA
- My first professional project
 - First exposure to construction methods (breadboard, wirewrap)
 - This is now obsolete – can easily do this w/ one 10mm² chip
- In spaceflight, testing is most successful from the ground up:
 - Build any EGSE & test it
 - Test flight hardware w/ EGSE
 - Integrate flight hardware into an instrument
 - Test the instrument
 - Integrate & Test (I&T) of the instrument with the spacecraft
 - Test the spacecraft



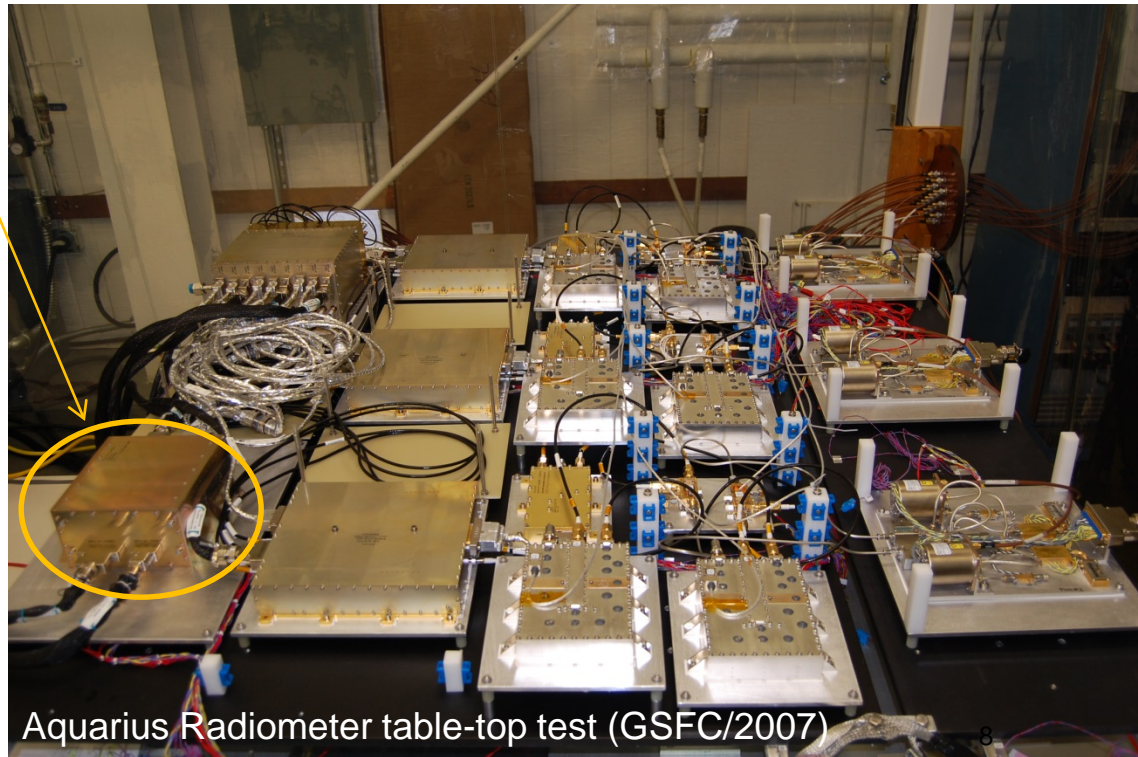


Aquarius/SAC-D Radiometer (2004-2007)



<http://aquarius.nasa.gov/>

- Aquarius made the first global measurements of Sea Surface Salinity (SSS)
 - SSS is critical parameter in the water cycle
 - Prior measurements were discrete (buoys)
 - Produces one map every TBD
- 1.4 GHz (L-Band) Radiometer measures salinity (remote sensing)
- The Digital Processing Unit (DPU) controls & reads all the radiometer data
- I was lead engineer for the DPU, meaning:
 - Overall conceptual design
 - Circuit design of 2 boards
 - Lead a small group of engineers
 - Lots of meetings, emails, phone calls
- Aquarius launched in 2011, still operating



Aquarius Radiometer table-top test (GSFC/2007)



Airborne Science Sensor Web Network (2007-2012)



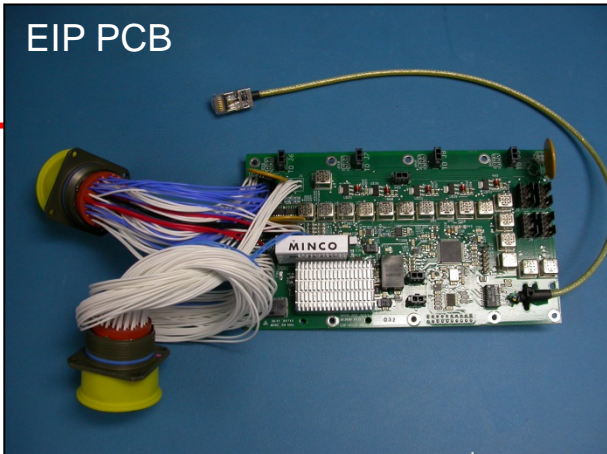
- NASA owns numerous aircraft used to:
 - Calibrate satellite instruments
 - Perform earth science
 - Disaster relief (wildfire monitoring, etc.)
 - Develop new technologies
- Standard interfaces for payloads:
 - Many planes, instruments, combinations
 - Existing standards were old / obsolete
 - Desire for Sensor Webs (discuss)
- My roles:
 - Lead for Experimenter Interface Panel (EIP)
 - Electronics design for other boxes in system (MPCS, NASDAT)

<https://airbornescience.nasa.gov/>

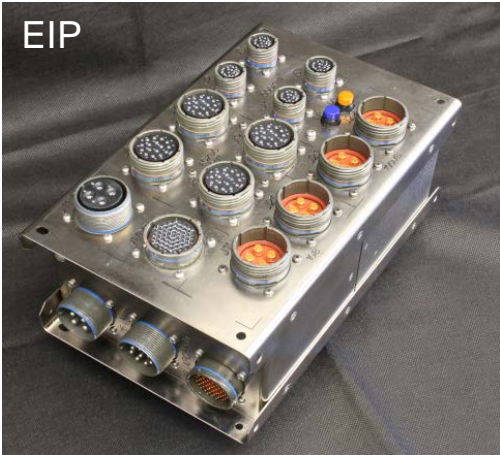
MPCS



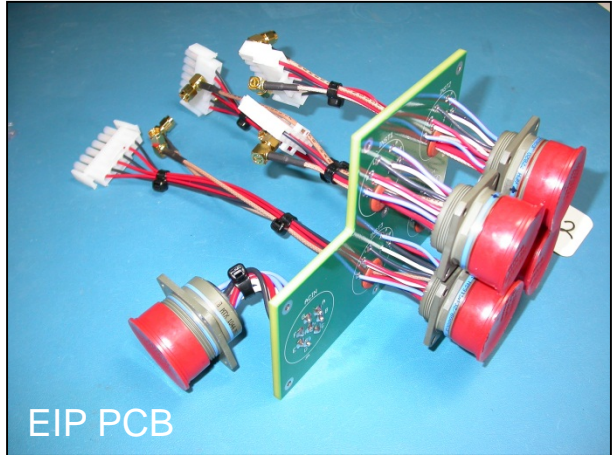
EIP PCB



EIP



EIP PCB



GLOBAL HAWK

WB-57



ER-2

DC-8

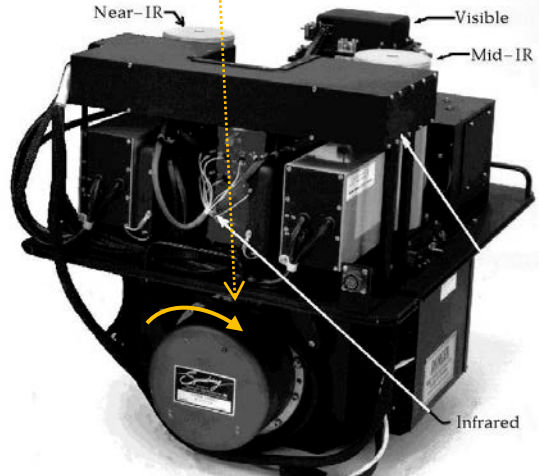
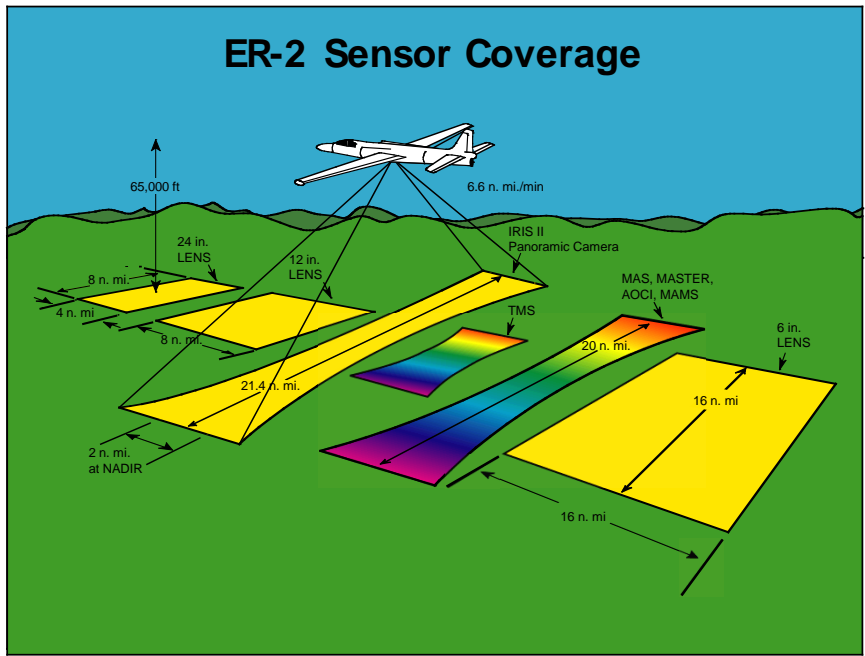
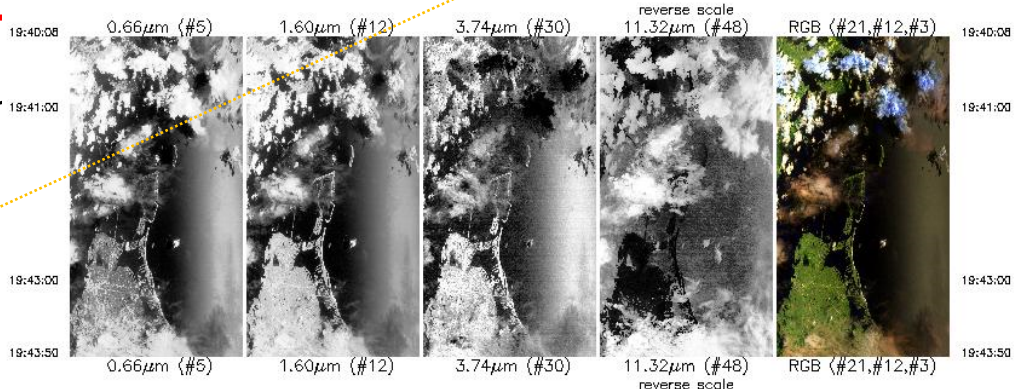


MAS & MASTER (2009-present)

ASTER/MODIS Airborne Simulator Browse Imagery
ER2_Houston2010 Campaign - 28 Aug 2010
Tampa FL
Flight #10-942-00 Track #12



- MODIS and MODIS/ASTER are Airborne Science instruments, used for
 - Calibration of MODIS & ASTER instruments on the Aqua & Terra satellites
 - Ocean color imaging
 - Disaster monitoring
- Whisk-broom spectrometers
 - Airplane flies in a flight track
 - Scan motor 'sweeps' a scan line
 - One flight tracks' worth of scan lines
 - 35-50 spectral bands are simultaneously sampled, allowing overlay of multiple physical phenomena
- My role: analog electronics design

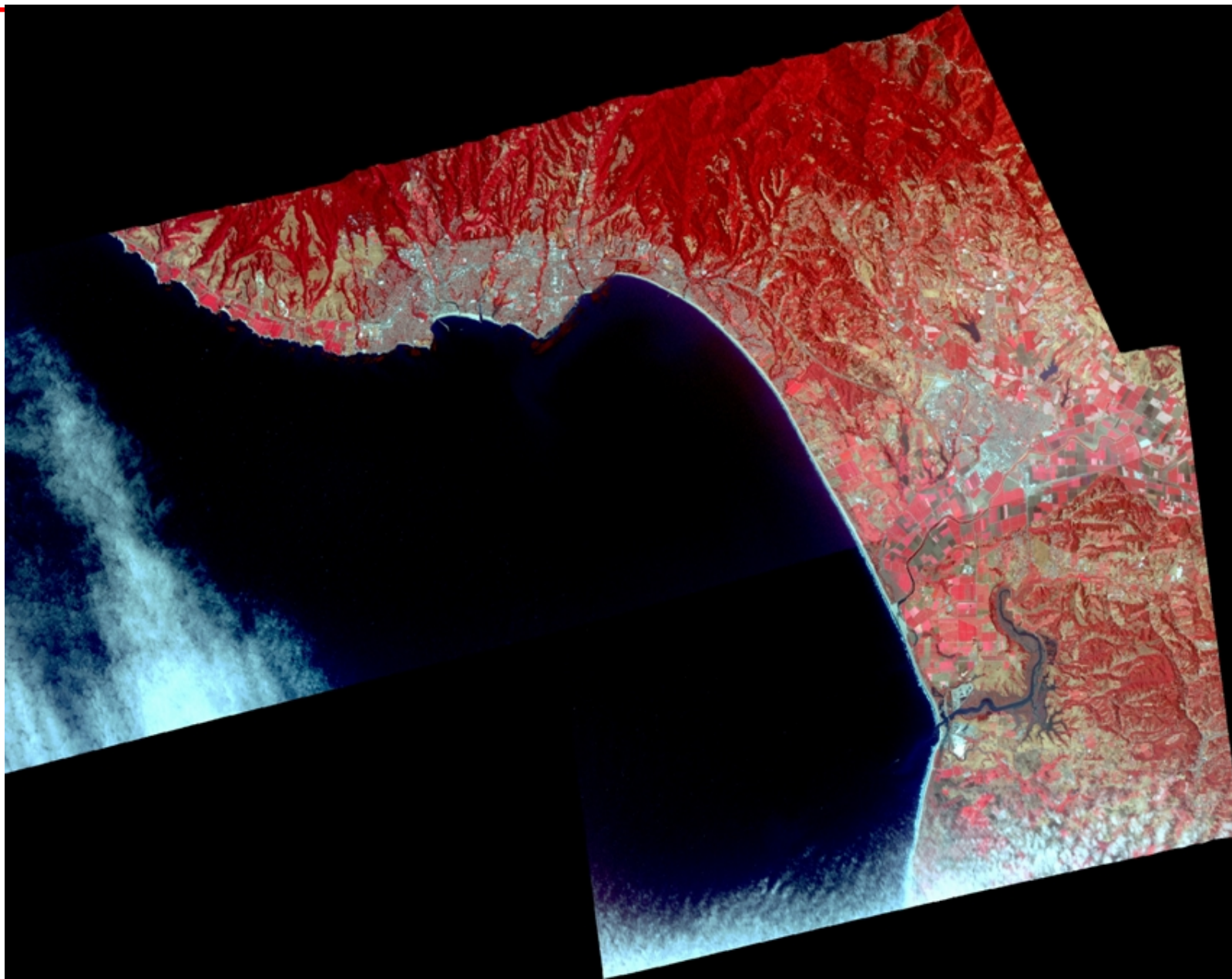


MODIS Airborne Simulator

<http://mas.arc.nasa.gov/>
<http://masterweb.jpl.nasa.gov/>



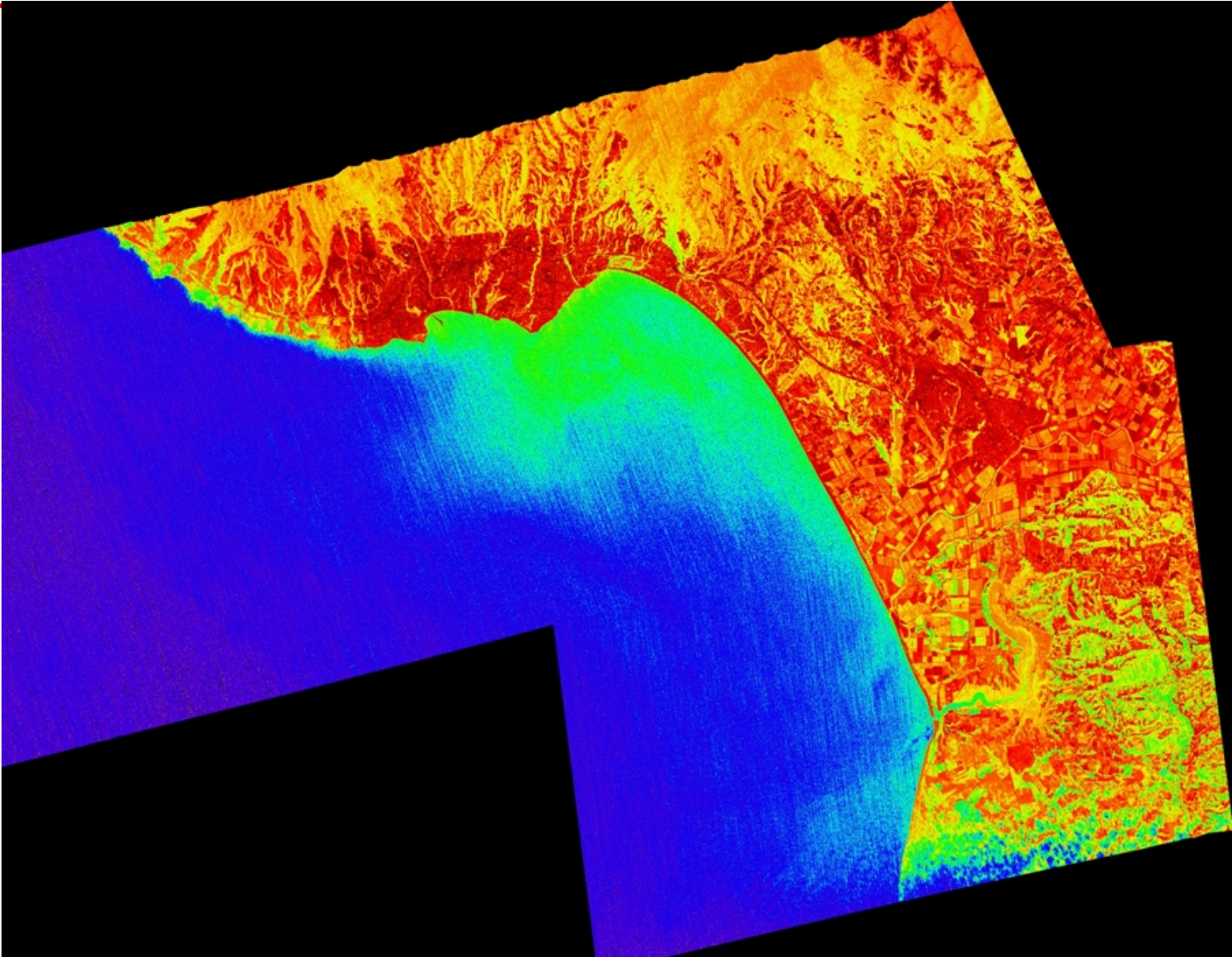
SARP 2010 (Monterey Bay Mosaic) Color Infrared





SARP 2010 (Monterey Bay Mosaic)

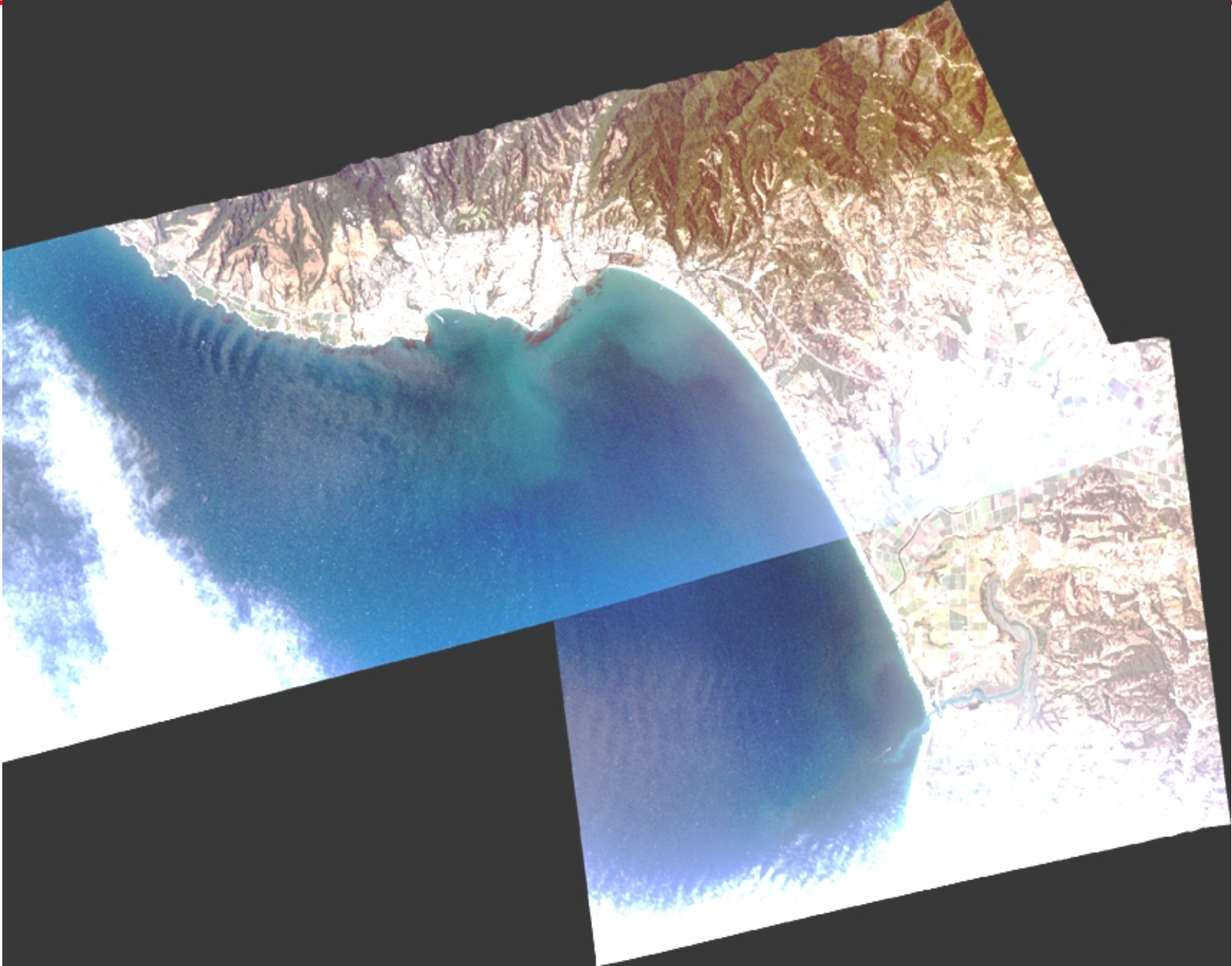
Thermal Infrared SST





SARP 2010 (Monterey Bay Mosaic)

Natural Color

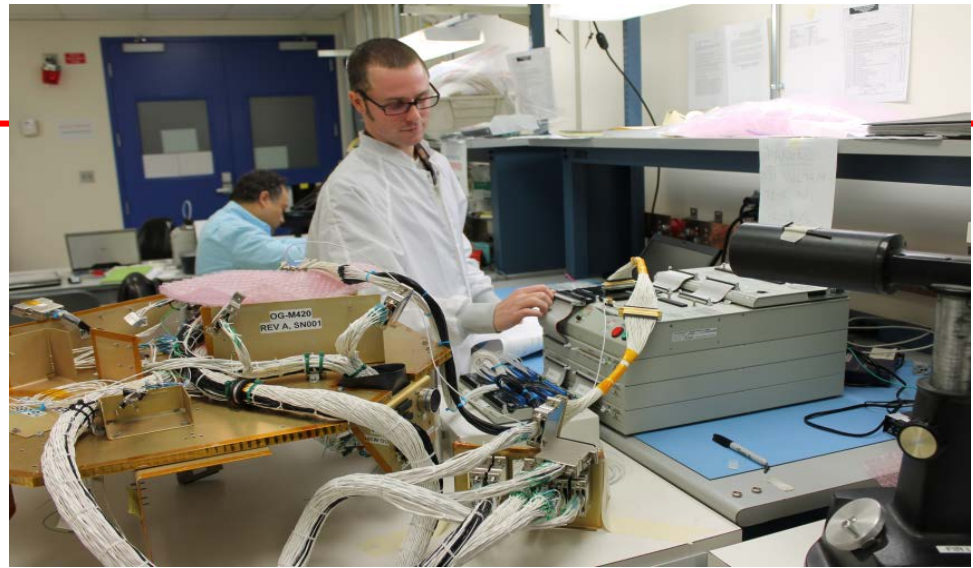




LADEE (2011-2014)



- Lunar Atmospheric and Dust Environment Explorer (LADEE) was:
 - A high-risk (Class D), short-duration mission
 - Launched 9/6/2013
 - Impacted 4/21/2014
- Science:
 - Measure lunar dust environment observed during Apollo era
 - Technology demonstration of laser communications system (MIT)
- My Role: Power System Engineer
 - Testing of the spacecraft wiring harness
 - Led EMI/EMC* Test
 - Developed Photovoltaic Array Test
 - Power System lead for Mission Operations
 - Power systems engineering is very multidisciplinary



http://www.nasa.gov/mission_pages/ladee/main/



LADEE Photovoltaic Testing (IEEE Aerospace Presentation)



Thank you for your time & attention.

I hope you enjoy this LADEE Solar Array Installation Video

Questions?



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