



University of Wisconsin SSEC Satellite Data Center Services

2016 McIDAS Users Meeting

November 16, 2016



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

2016 MUG Meeting



- Satellite Data Services Overview
- GOES-R at SSEC
- Other Satellite Data Services Projects



Satellite Data Services Team

- Dan Forrest
- Rosie Spangler
- Nancy Troxel-Hoehn
- Douglas Ratcliff
- Rick Kohrs
- Clayton Suplinski
- Istvan Bocsi



SSEC Satellite Data Services Mission Statement



- The SSEC Data Center mission is to create and maintain the facilities, human expertise and technology necessary to provide SSEC scientists and collaborators with the highest quality geophysical data in a timely fashion and to provide real-time data access, archive and retrieval services as necessary to support SSEC's scientific programs.



SSEC Satellite Data Services Mission Statement



- Provide timely, high quality real-time and archive data, reliably to SSEC scientists and collaborators.



SSEC SDS



Staffed M-F , 7:30 AM - 11:00 pm Central time.

- 2 FTE ~100% time
 - Computer Operator (1st shift)
 - Computer Operator (1st shift)
- 5 FTE ~portions of their time
 - Program Manager
 - System Programmer
 - DataBase/Web Programmer
 - Research Specialist (PM assistant)
 - Antenna/Communication technician
- 2 Student programmers
- 2 student QC assistants (2nd shift)



Data Center Facilities

- Over 2100 ft.
- Currently the Data Center has 44 racks representing over 1,840 rack units of space.
- The Data Center's disk storage exceed 12 PBs.
- The entire room is on three 72 KW UPSs, of which, about 155 KW are in use. Non UPS power usage is ~17 KW. An additional 72 KW UPS for a smaller 5th floor computer room
- Cooling provided by campus chilled water and outside air in the winter. Racks are cooled by 16 in row APC coolers.
- Gigabit and 10 Gigabit network (also 100 MB admin network, 40 Gigabit InfiniBand).



Antennas @ SSEC

- C-Band

- 11 meter heated (87° West - SES-2, POES Wallops Relay, MSG)
- 6.3 meter heated (101° West - SES-1, POES Fairbanks Relay, MTSAT, Noaaport)
- 4.5 meter (101° West - SES-1, POES Fairbanks Relay, MTSAT, Noaaport)

- L-Band

- 7.3 meter (75° West -GOES-East Primary/GOES-R/S ready)
- 7.3 meter (135° West -GOES-West Primary/GOES-R testing)
- 4.6 meter (135° West -GOES-West Primary)
- 4.5 meter (60° West -GOES-East auto tracking)
- 3.7 meter (offline spare)

- X-Band

- 4.4 meter (Tracking - EOS)

- X/L Band

- 2.4 meter (Tracking - Suomi NPP, EOS, Metop A&B, NOAA-18, 19 and FY3)



UW SSEC SDS

Antennas Remotely Managed

- X/L Band

- Honolulu Community College



- Atlantic Oceanographic & Met Lab , Miami, FL

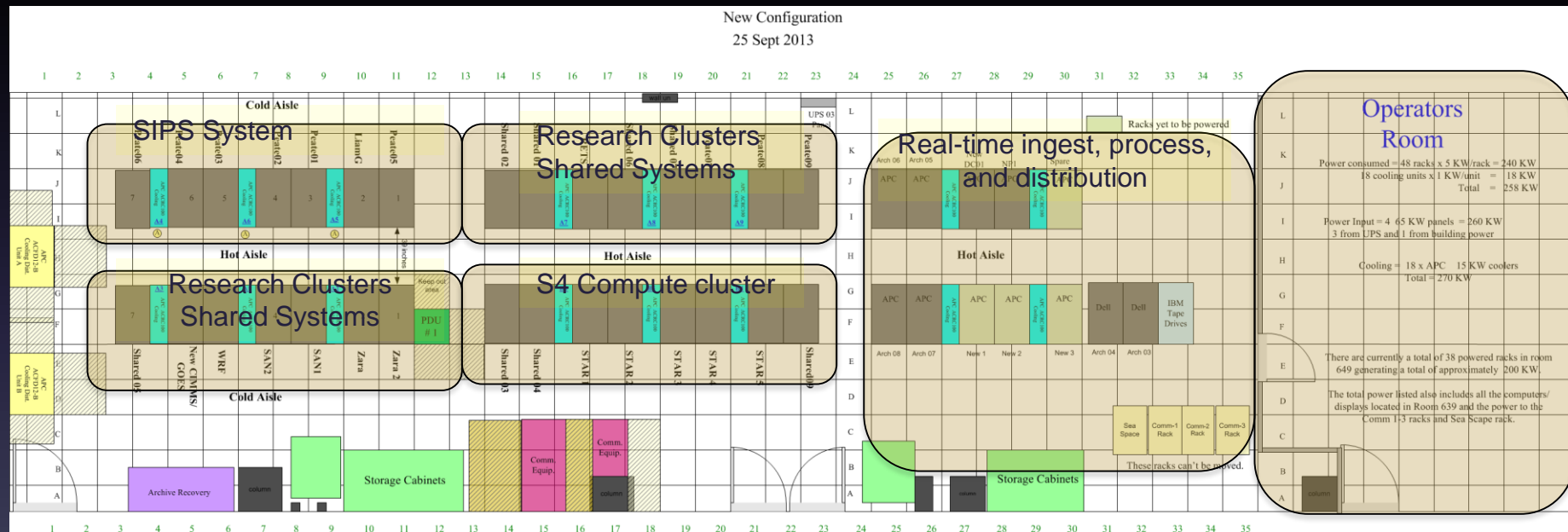


- University of Puerto Rico

- All are 2.4 m used for Tracking - Suomi NPP, EOS, Metop A&B, NOAA-18, 19 and FY3



Server room layout



SSEC SDS Incoming Data

January, 2016

420+ GB/day
via Satellite
(C-band, L-band, X-band)



2,600+ GB/day
via Internet
(ftp, LDM, ADDE, http)

GOES satellites
International Geo Satellites
NOAA Polar
Landsat-8
Miscellaneous Polar
MODIS polar from NASA archive
NPP (VIIRS CrIS ATMS)
Noaaort

~72 GB/day
~360 GB/day
~27 GB/day
~50 GB/day
~35 GB/day
~150 GB/day
~1,800 GB/day
~300+ GB/day



SSEC SDS Incoming Data

May, 2015

170+ GB/day
via Satellite
(C-band, L-band, X-band)



GOES satellites	~96 GB/day
International Geo Satellites	~360 GB/day
NOAA Polar	~27 GB/day
Landsat-8	~50 GB/day
Miscellaneous Polar and Non satellite	~85 GB/day
MODIS polar from NASA archive	~150 GB/day
NPP (VIIRS CrIS ATMS)	~1,800
GB/day	

2,300+ GB/day
via Internet
(ftp, LDM, ADDE, http)



SSEC SDS Outgoing Data

Four primary methods of Data delivery

1.ADDE

2.HTTP

3.FTP

4.LDM (Unidata local data manager)



Outgoing Data

As of November 1, 2016

- On average over 875,000 ADDE transactions per day
- Over 4.1 TB data distributed per day via ADDE
- In addition over 1 TB data distributed via ftp, http, and Idm



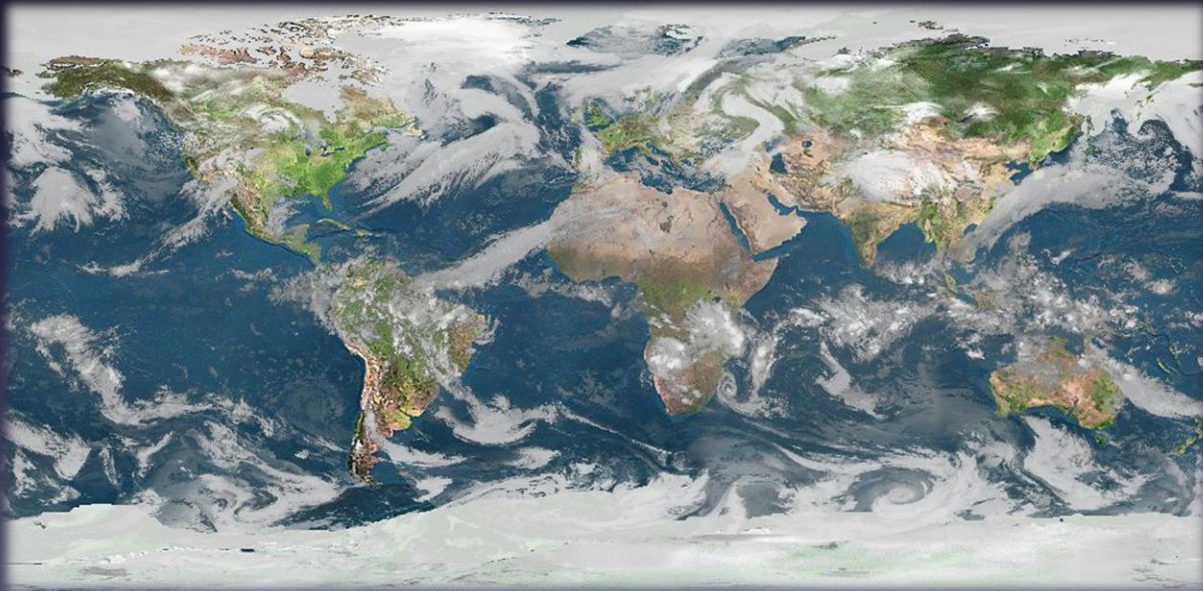
Data Distribution

- Realtime
 - McIDAS ADDE (Abstract Data Distribution Environment)
 - ftp
 - http
 - Ldm
 - Direct access via mount
 - WMS (Web map service)
- Archive
 - ADDE
 - Direct Access
 - WMS
 - McFETCH



Real-time Data

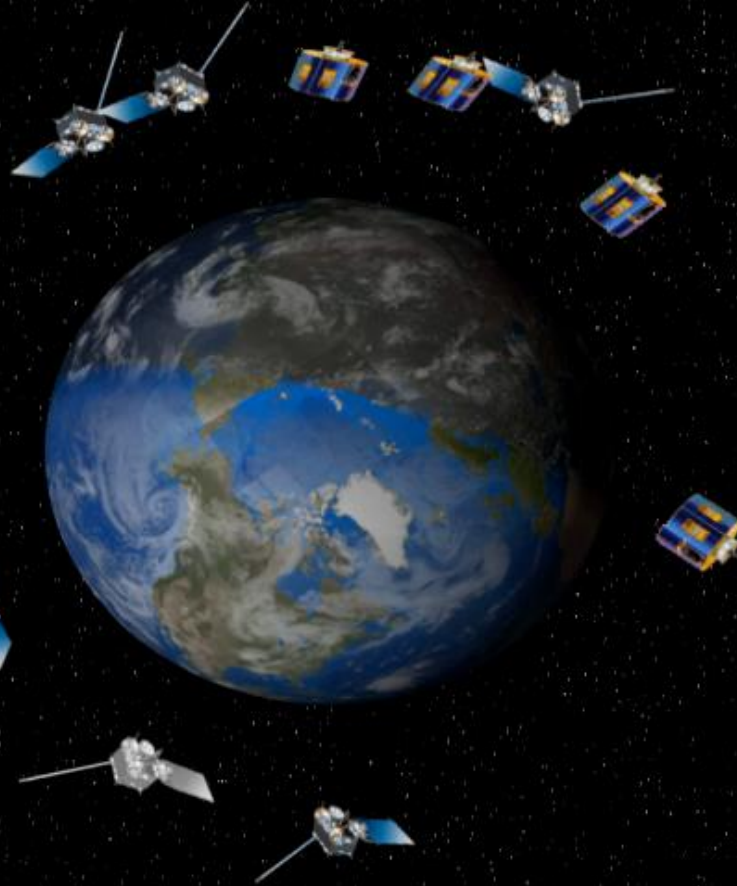
The SSEC Data Center receives data from 11 different geostationary satellites and 11 different polar orbiting satellites. Most data are available in near real-time via ADDE. Other methods of data access are available upon request.



Geostationary Satellites received

- GOES-13 -East (75° W)
- GOES-15 -West(135° W)
- GOES-14 -Test (105° W)
- Meteosat-10 (0° E)
- Meteosat-7 (57° E)
- Meteosat-8(near 57° E)
- COMS (128° E)

- FY-2E (86° E)
- FY-2G (105° E)
- Himawari-8 (140° E)
- Kalpana(74° E)
- INSAT-3D(83° E)



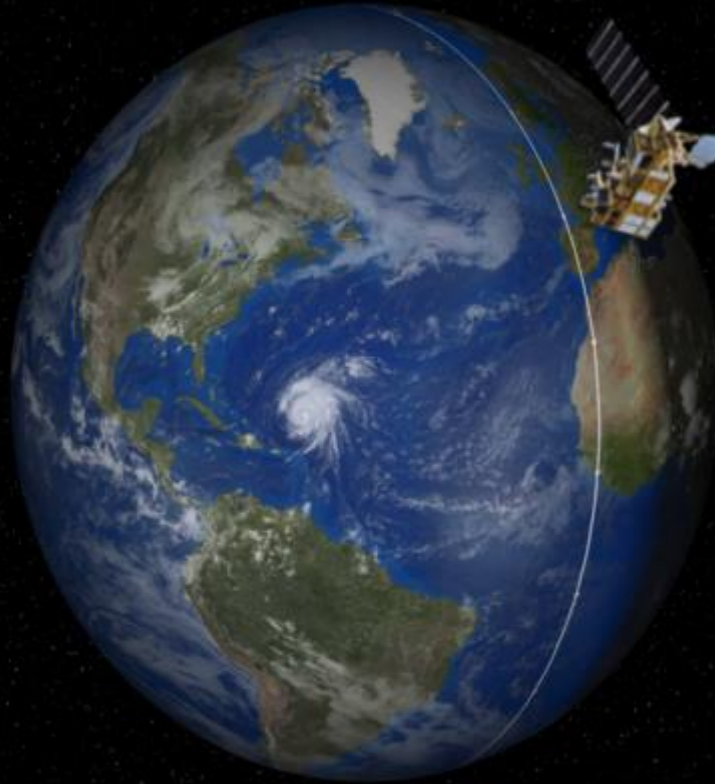
Geostationary Satellites Received at UW SSEC in 2016



	Sub-Point	Reception Method	Source	Latency	Daily Volume
GOES-13	75° West	L-Band	DB	<2 minutes	23 GB
GOES-14	105° West	L-Band	DB	<2 minutes	23 GB
GOES-15	135° West	L-Band	DB	<2 minutes	23 GB
Meteosat-10	0° East	C-Band Relay	DB Relay	<15 minutes	24 GB
Meteosat-7	59° East	Network Relay	NESDIS	~30 minutes	2 GB
Meteosat-8	59° East	Network Relay	NOAA STAR	~30 minutes	24 GB
Himawari-8	140° East	Network Relay	NOAA STAR	~ 10 minutes	300 GB
Himawari-8	140° East	Himawari Cast Network Relay	Hawaii NWS	~ 10 minutes	62 GB
Kalpana	74° East	Network Relay	ISRO	45-120 minutes	1.4 GB
Insat-3D	83° East	Network Relay	ISRO	45-180 min	19 GB
FY2E	86° East	Network Relay	ABOM	15-30 minutes	4.7 GB
FY2G	105° East	Network Relay	ABOM	15-30 minutes	4.7 GB
COMS	128° East	Network Relay	KMA	9-24 minutes	11 GB

Polar Satellites received

- NOAA-15
- NOAA-18
- NOAA-19
- METOP-A
- METOP-B



- Aqua
- Terra
- Suomi-NPP
- Landsat-8
- FY-3B
- GCOM-W1



Polar Satellites Received at UW SSEC in 2016

	Reception Method	Domain	ADDE Latency	Instruments	External Access
NOAA-15	C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR, AMSU, DCS->level-1	ADDE
				All other instruments Level-0	NA
NOAA-18	DB L-Band, C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR->level-1	ADDE
				All other instruments Level-0	NA
NOAA-19	DB L-Band, C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR->level-1	ADDE
				All other instruments Level-0	NA
Metop-A	DB L-Band, NOAA DDS	DB CONUS Global	CONUS <15 minutes after pass	AVHRR ->level-1	ADDE
				AVHRR, IASI	DB ftp (sips)
Metop-B	DB L-Band, NOAA DDS	DB CONUS Global	CONUS <15 minutes after pass	AVHRR ->level-1	ADDE
				AVHRR,IASI	DB ftp (sips)
Suomi-NPP	DB X/L Band, NASA Relay	DB CONUS Global	CONUS <15 minutes after pass	VIIRS	ADDE
				VIIRS,ATMS, CrIS	DB ftp (sips)
Aqua	DB X-Band, NASA Relay	DB CONUS Global	DB <15 minutes after pass	AIRS, MODIS -> Level-1	ADDE
				AIRS, MODIS	DB ftp (sips)
Terra	DB X-Band, NASA Relay	DB CONUS Global	DB <15 minutes after pass	MODIS -> Level-1	ADDE
				MODIS	DB ftp (sips)
Landsat-8	Network Relay (USGS)	CONUS	22-24 hours	Level-1	ADDE, WMS
Shizuku GCOM-W1	DB X-Band	CONUS	DB <1 min after pass	Level-0	SSEC ftp
FY-3B/C	DB X/L Band	CONUS	DB <1 min after pass	Level-0	SSEC ftp

Non-Satellite data

- NOAAport
 - Text/Point
 - Model Grids
 - Radar



Archive Data

As of Dec 2015, over 975 TBs online.
(closer to 1.5 PB when redundant data are included)



Grows approximately about ~150 TB/year

US Geostationary Satellites

- GOES-8 through GOES-15 (**1994-Present**) (East, West , South America and test)
- GOES-1 through GOES-7 (**1978-1996**)
- SMS-1&2 (**1978-1981**)



Archive Data

International Geostationary Satellites

- GMS/MTSAT (1998-2015)
- Meteosat/Meteosat IODC (1998-Present)
- Meteosat-1 FGGE (1978-1979)
- FY2 (2004-Present)
- Kalpana (2005-Present)
- Insat-3D (June 2014-Present)
- COMS (June 2012 – Present)



Himawari-8 (March 2015 – Present)



Archive Data



NOAAPORT/Conventional Data

- Model Output *(1996-Present)**
- In situ Point Observations *(1976-Present)*



Plans for GOES-R

- Ingest
- Distribution
- Archive



GOES-R Antenna Upgrade



GOES-R Antenna Upgrade



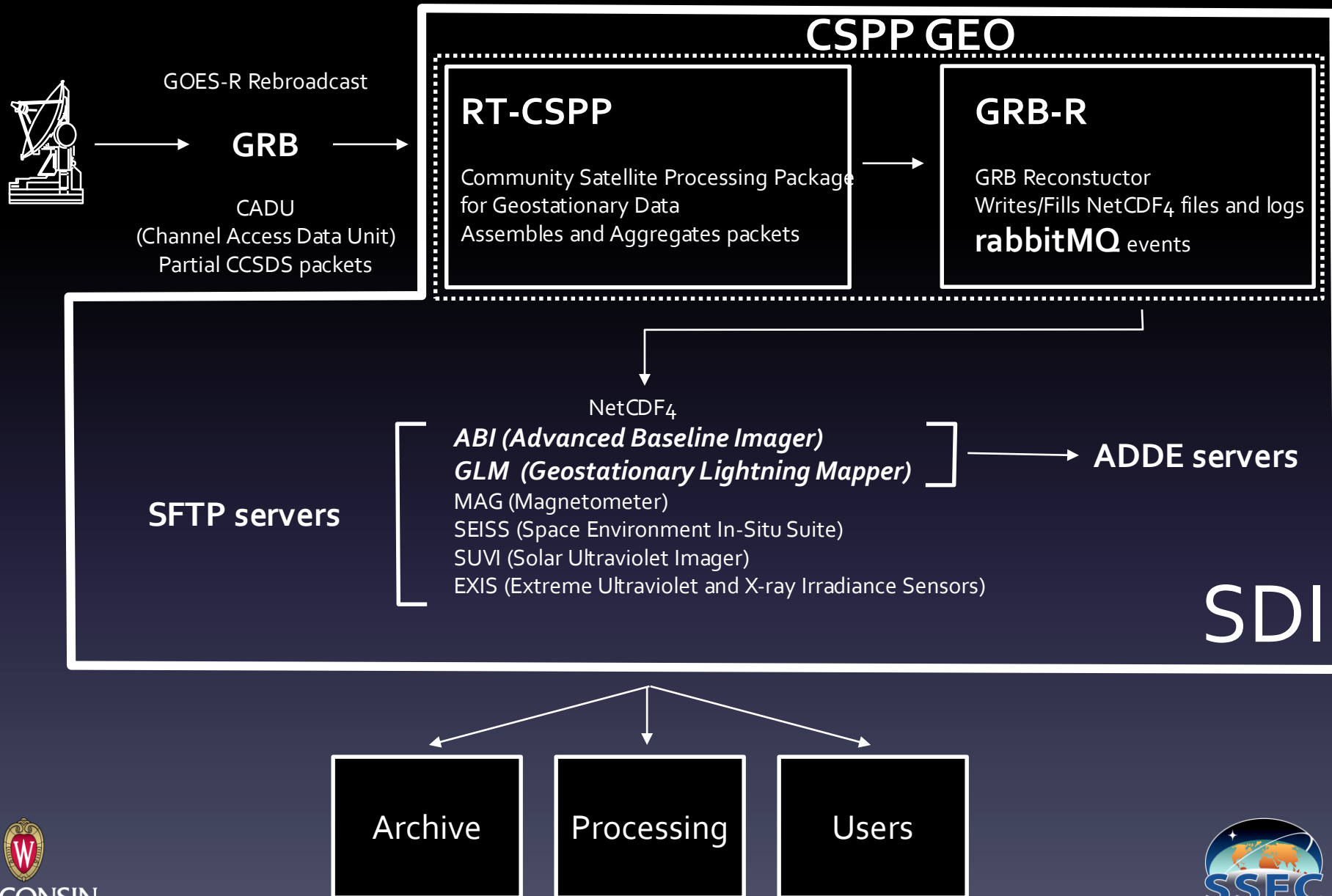
GOES-R Antenna Upgrade



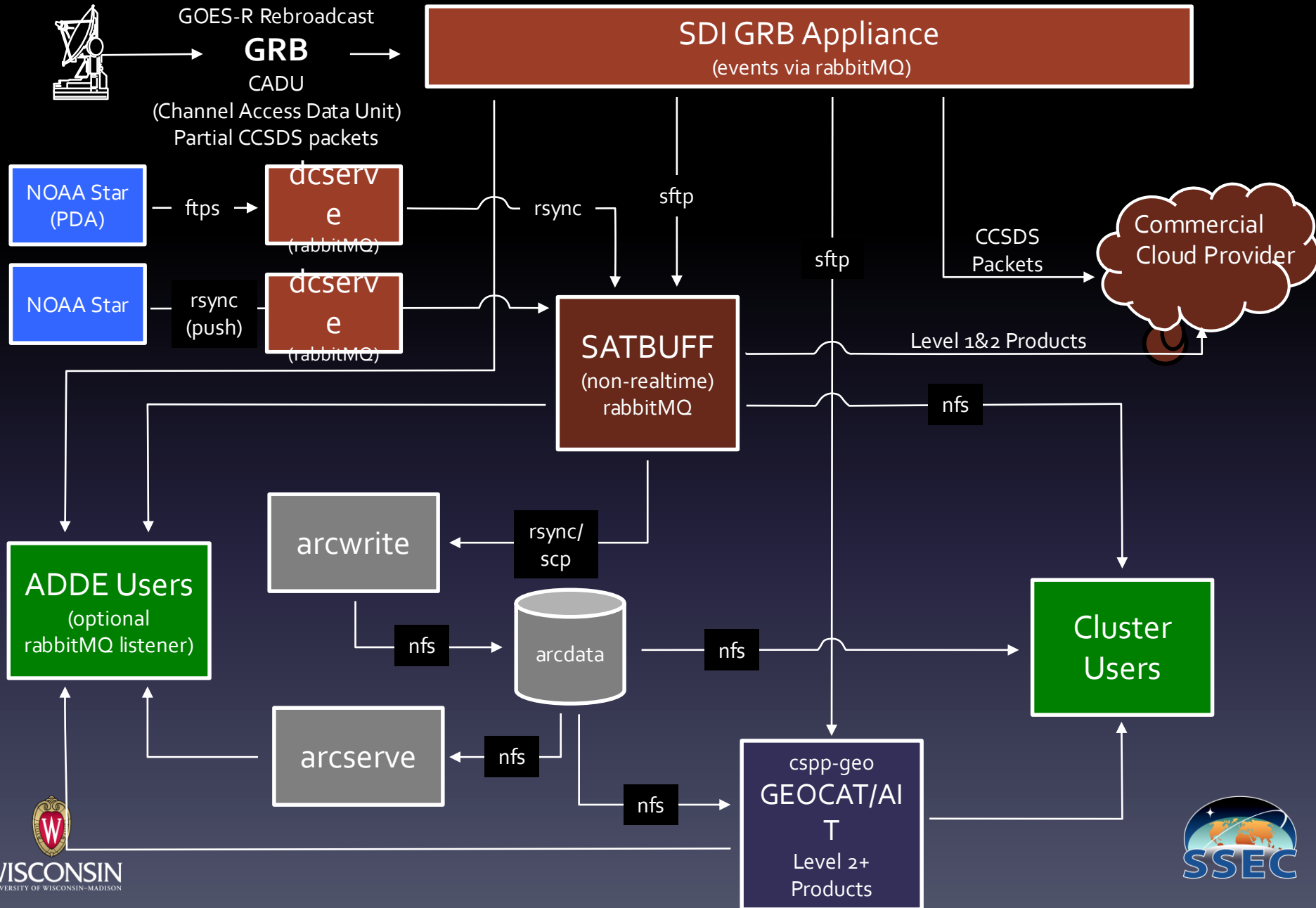
SDI-GRB Appliance



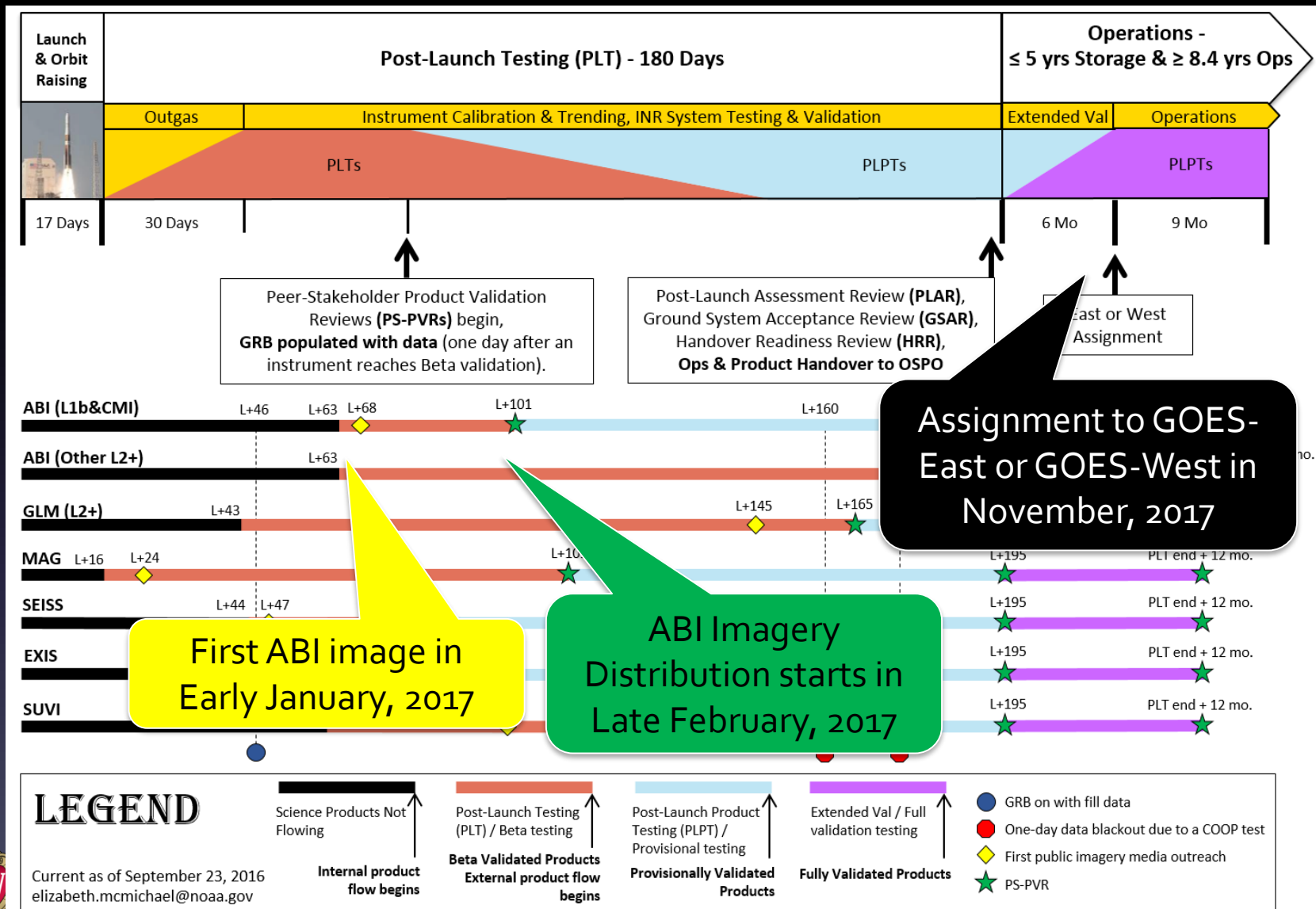
SDI- GRB Appliance



SSEC Datacenter Distribution



Science Product Validation Schedule



GOES-R Archive

- ~500 GB/day netCDF
- Archive ABI, GLM netCDF (no level-2 products)
- Parallel “archive” of GRB packets (first 6 months/TBD)
- Level-0 archive

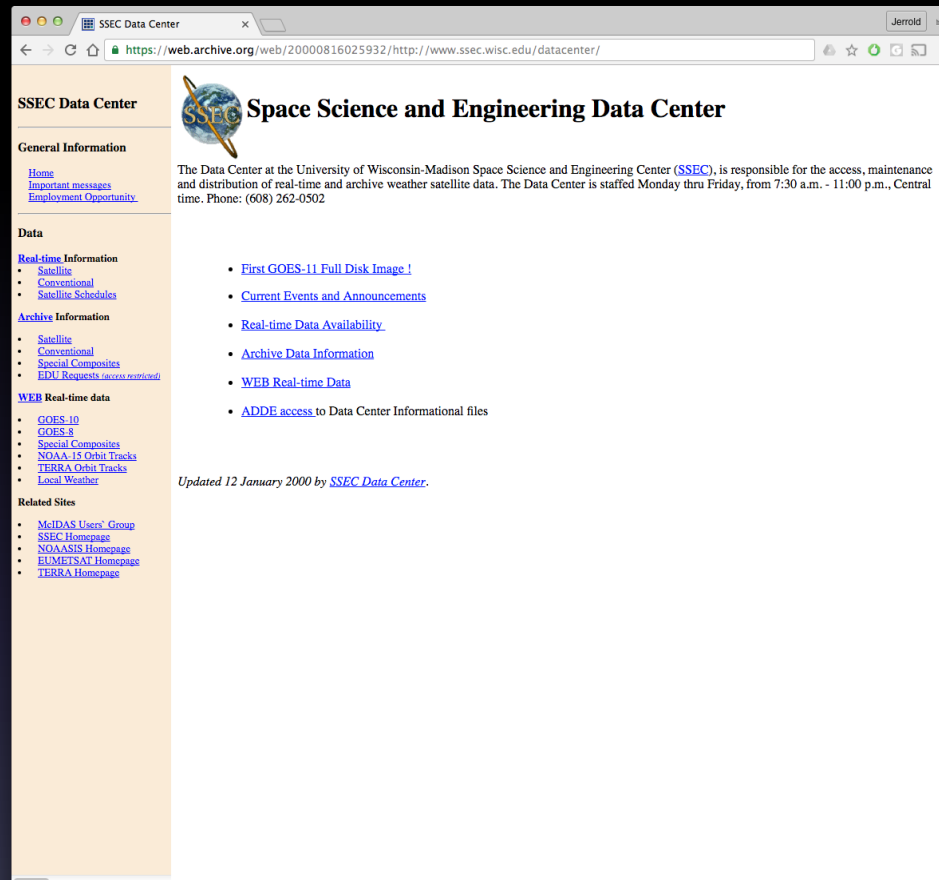


Plans for GOES-R

- External and Internal Data users will have ADDE access to:
 - ABI
 - GLM
 - L2 products from PDA
- Special subscriptions to cloud based data feeds will be provided on request.
- Archiving ABI, GLM, netCDF indefinitely



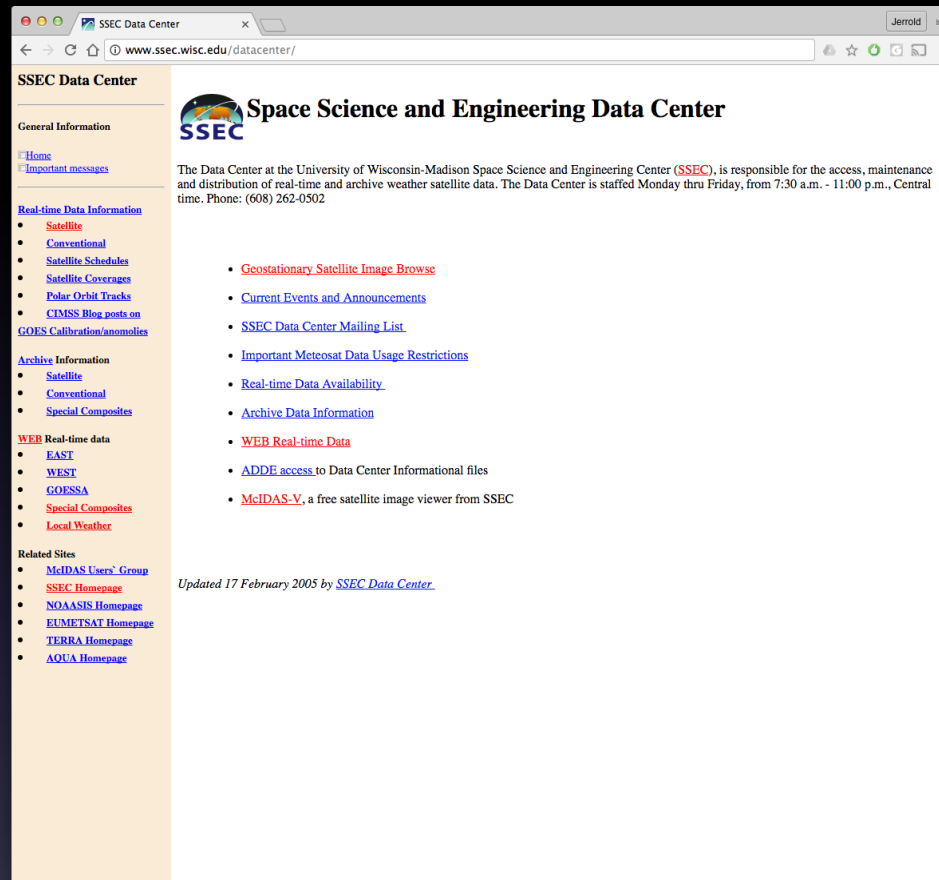
Satellite Data Services Web Site



January 2000



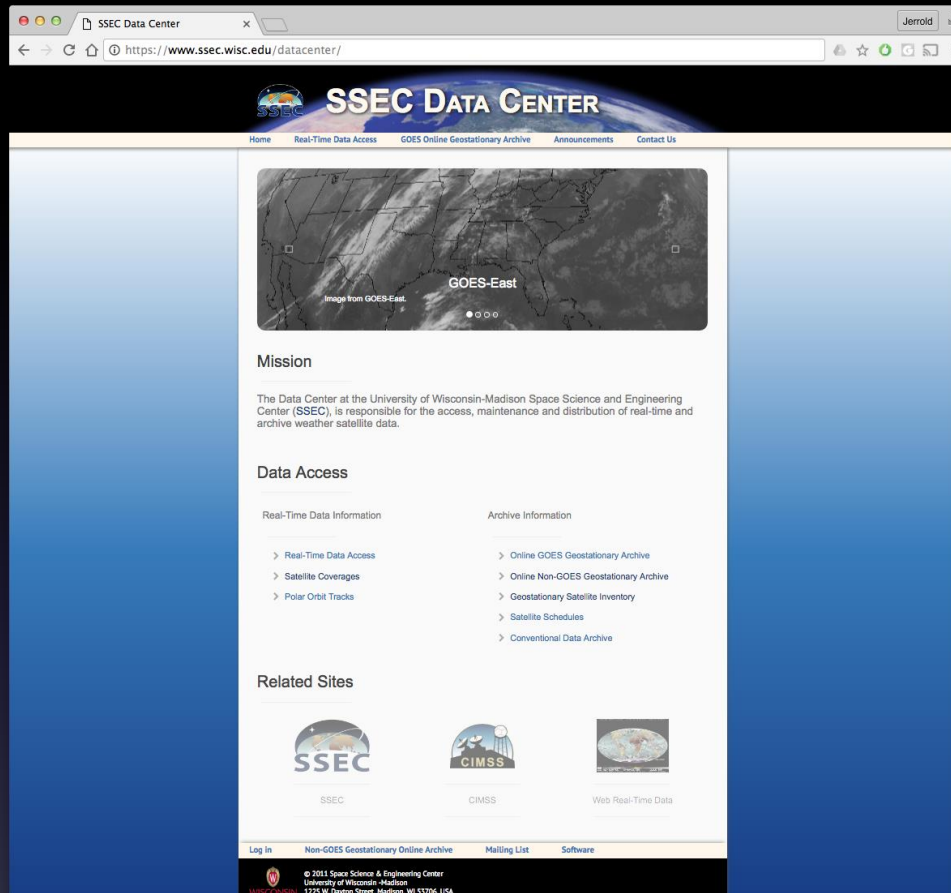
Satellite Data Services Web Site



October 2016



Satellite Data Services Web Site



November 2016



Other SDS Projects



McFETCH Satellite Data Server

Dave Parker, Dave Santek, Bill Bellon, Clayton
Suplinski, Rick Kohrs, Jerry Robaidek



McFETCH Satellite Data Server

This is not new!

McWEB Ken Bywaters in 1995.



McFETCH Satellite Data Server

Multi-format client-agnostic File Extraction
Through Contextual HTTP

- Allows access to ADDE archive servers
- Heavily dependent on McIDAS-X
- Outputs all formats McIDAS-X can plus others



McFETCH Satellite Data Server

- Access via HTTPS
- Any client that can request a URL, can access, subset, and remap satellite data from an ADDE server
- Will eventually be integrated with inventory and RealEarth
- Rolling out now



McFETCH Satellite Data Server

- Output formats:

AREA	Flat Binary
NetCDF	Gif
Geotiff	JPEG
Flat text	PNG

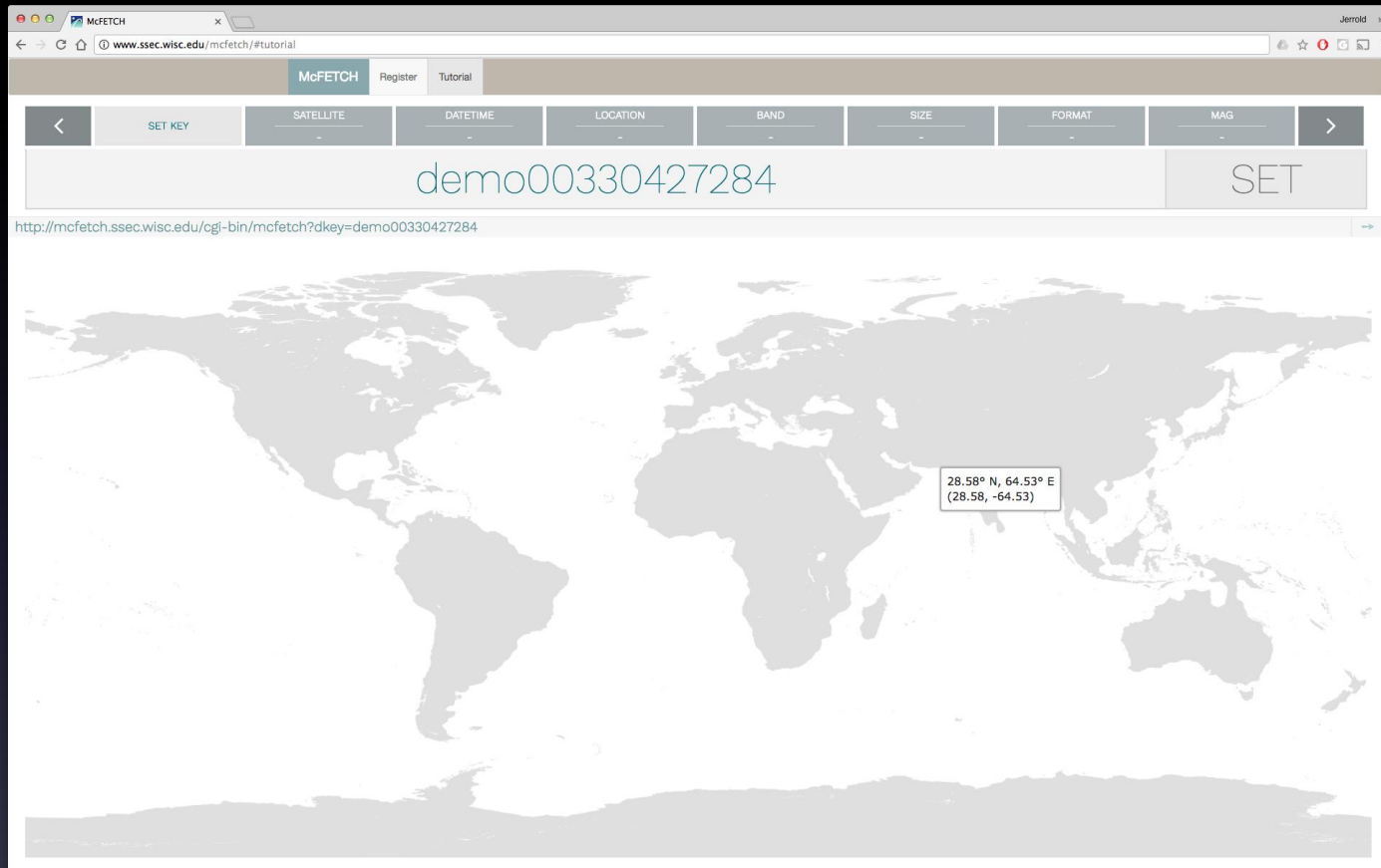


McFETCH Satellite Data Server

- Must register for a unique data key
- 1 GB daily limit
- 1000 transaction per day daily limit
- Data must be 180 days or older



McFETCH Satellite Data Server



McFETCH Satellite Data Server

To get a data access key:

Go to <http://www.ssec.wisc.edu/mcfetch>



WxSatS

- Clayton Suplinski, Rick Kohrs, Jerry Robaidek



WxSatS

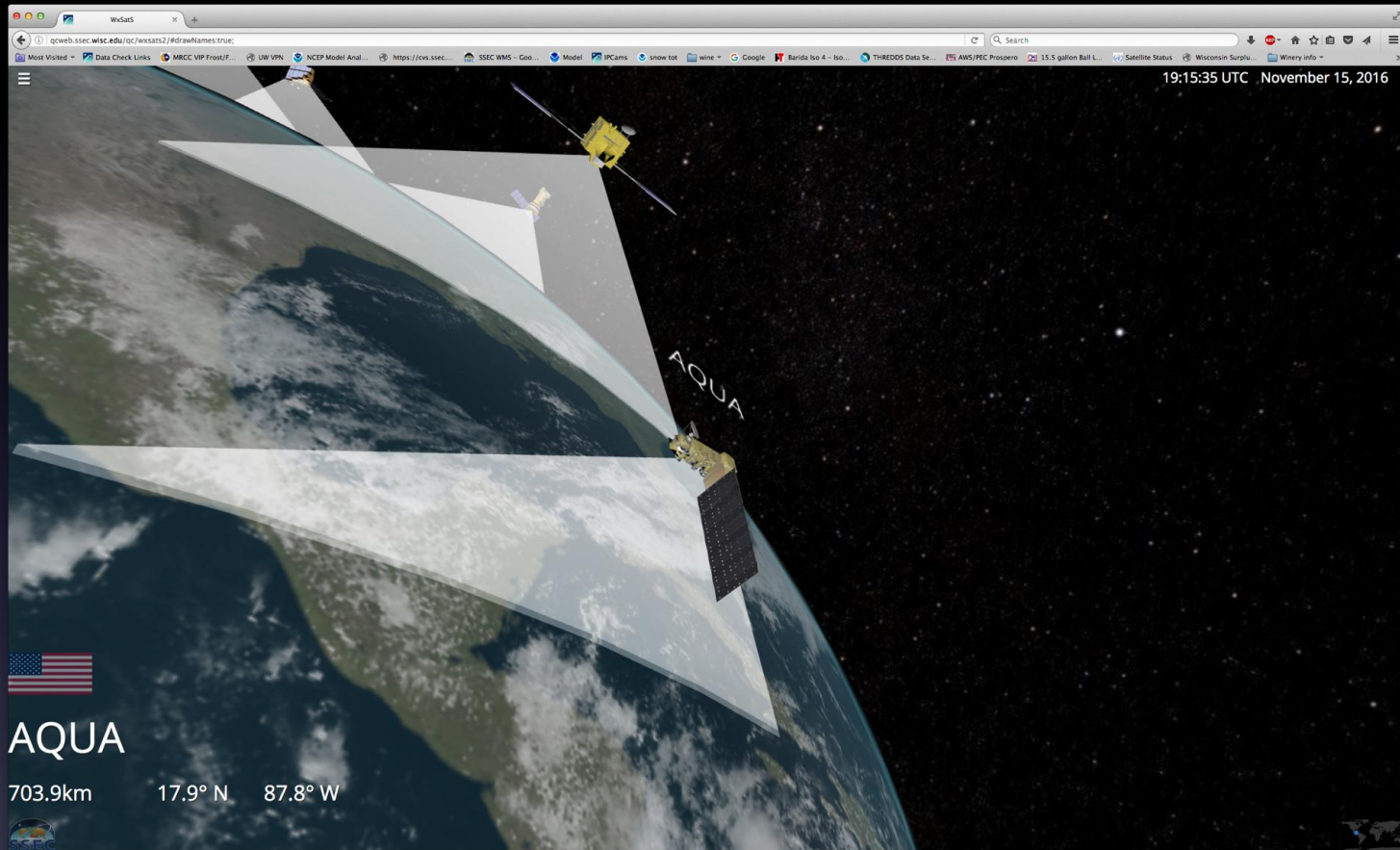
- Interactive educational tool for visualizing SDS satellite data resources
- Uses WebGL, and can be viewed in a browser.
- Mobile and VR options are possible in the future



WxSatS



WxSatS



WxSatS

Go to:

<http://www.ssec.wisc.edu/datacenter/wxsats/>

To try it out.



End