CSPP Geo

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CSPP/IMAPP Users' Group Meeting 2015
Darmstadt, Germany
15 April 2015

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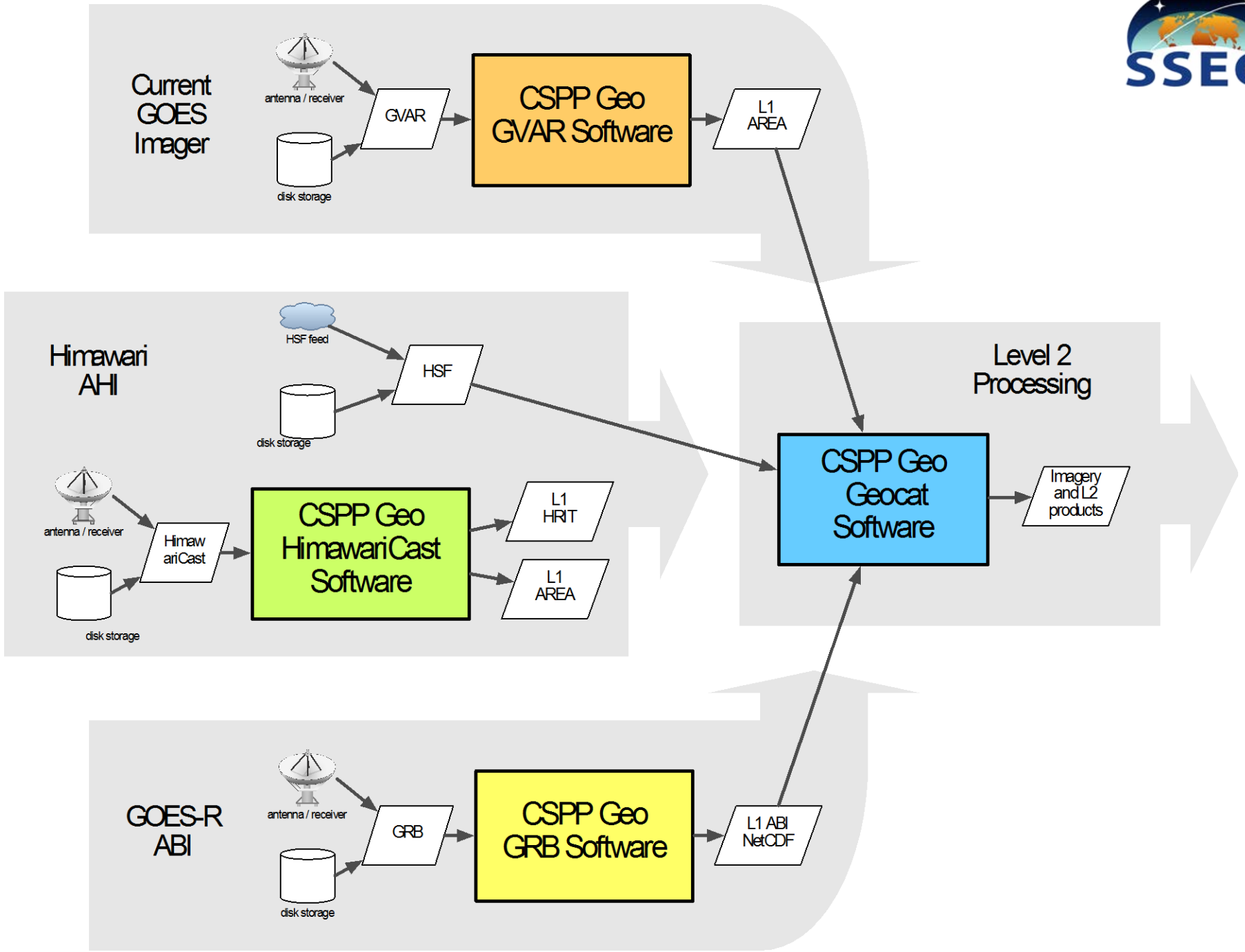
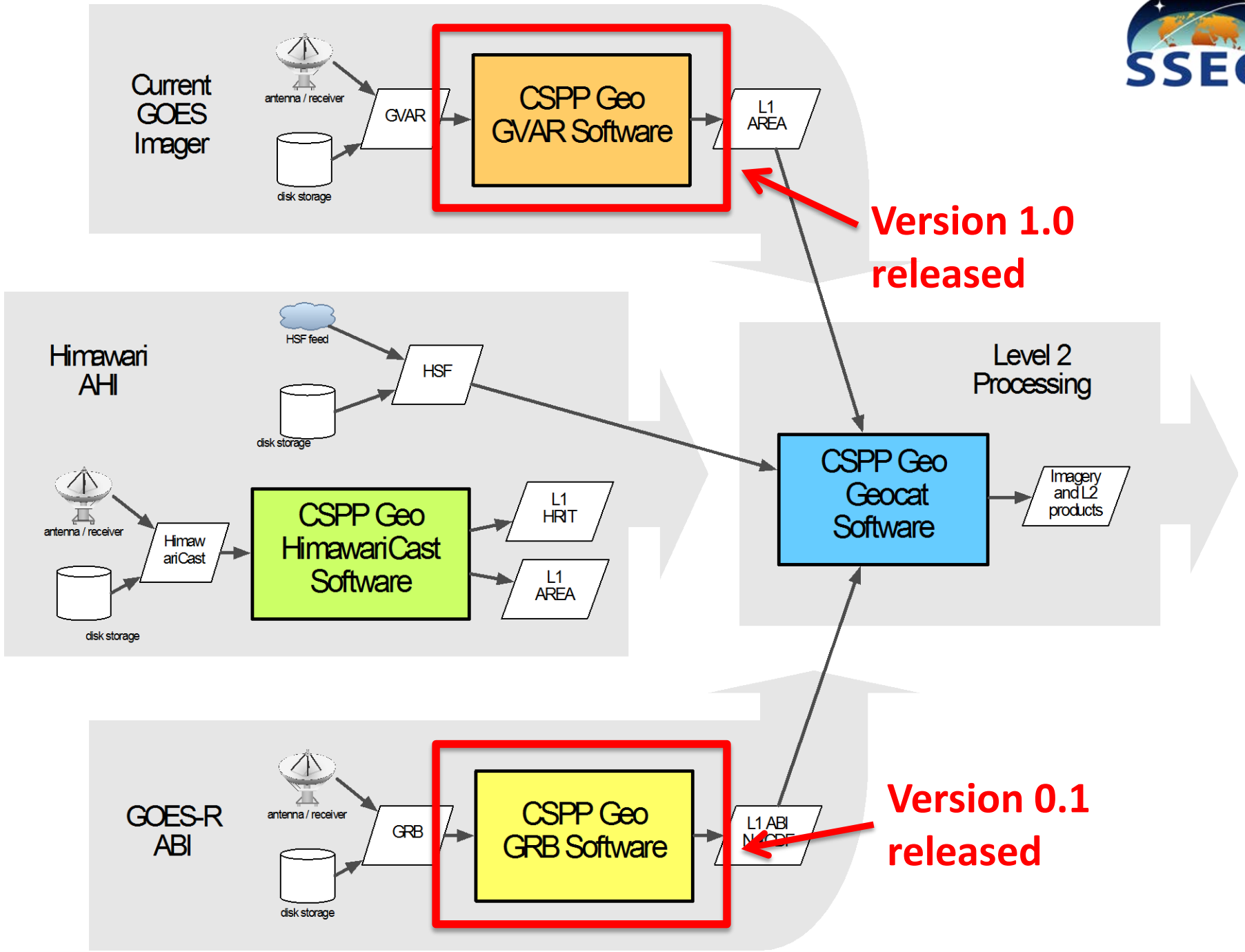
SSEC

CIMSS

Project History

- 2013: started discussing developing a software package for DB users to process GOES-R data
  - Leverage algorithms developed for GOES-R
  - Also wanted to allow users to process data from other satellites (Himawari AHI and current GOES)
  - Same development and distribution model as CSPP
- Late 2013: started pilot project
  - Current GOES imager, raw GVAR to L2 products
  - May 2014: released demo which ran on a canned dataset
- June 2014: funded by GOES-R program office and NOAA STAR.
  - assembled team and started work on software
- March 2015: first public software release
- April 2015: second public software release


Current GOES Imager
antenna / receiver
disk storage
GVAR
CSPP Geo GVAR Software
L1 AREA
Himawari AHI
HSF feed
disk storage
HSF
antenna / receiver
disk storage
Himaw ariCast
CSPP Geo HimawariCast Software
L1 HRIT
L1 AREA
Level 2 Processing
CSPP Geo Geocat Software
Imagery and L2 products
GOES-R ABI
antenna / receiver
disk storage
GRB
CSPP Geo GRB Software
L1 ABI NetCDF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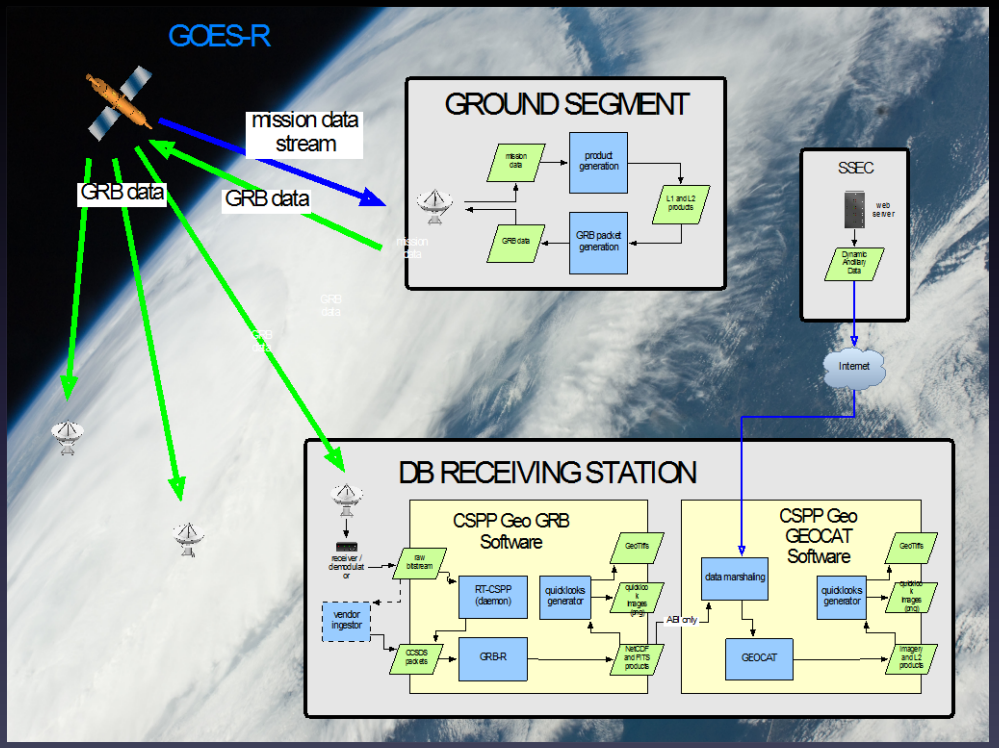
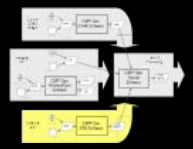
Imagery and L2 products
GOES-R ABI
antenna / receiver
GRB
disk storage
CSPP Geo GRB Software
L1 ABI
Version 0.1 released

GOES Rebroadcast (GRB)

- 6 instruments on GOES-R
- Data processed at ground segment to Level 1 (except Level 2 for GLM)
- GRB stream bounced back off GOES-R
- More information on the NOAA GRB web site: http://www.goes-r.gov/users/grb.html

Graphic courtesy of goes-r.gov



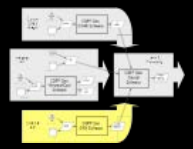


Current GOES vs GOES-R

	GOES Variable (GVAR)	GOES Rebroadcast (GRB)
Full Disk Image	30 Minutes	5 Minutes (Mode 4) 15 min (Mode 3)
Other Modes	Rapid Scan, Super Rapid Scan	3000 km X 5000 km (CONUS: 5 minute) 1000 km X 1000 km (Mesoscale: 30 seconds)
Polarization	Linear	Dual Circular Polarized
Receiver Center Frequency	1685.7 MHz (L-Band)	1686.6 MHz (L-Band)
Data Compression	None	Lossless Compression
Data Rate	2.11 Mbps	31 Mbps
Antenna Coverage	Earth Coverage to 5^0	Earth Coverage to 5^0
Data Sources	Imager (5 bands), Sounder, Magnetometer	ABI (16 bands), GLM, SUVI, MAG
Space Weather	None	~2 Mbps
Lightning Data	None	~0.5 Mbps

	ABI	Current GOES Imager
Spectral Coverage	16 bands	5 bands
Spatial Resolution		
0.64 µm Visible	0.5 km	~ 1 km
Other visible/near-IR	1.0 km	n/a
Bands (>2 µm)	2 km	~ 4 km
Spatial Coverage		
Full Disk	4 per hour	Scheduled (3 hrly)
CONUS	12 per hour	~4 per hour
Mesoscale	Every 30 sec	n/a

Graphics courtesy of goes-r.gov

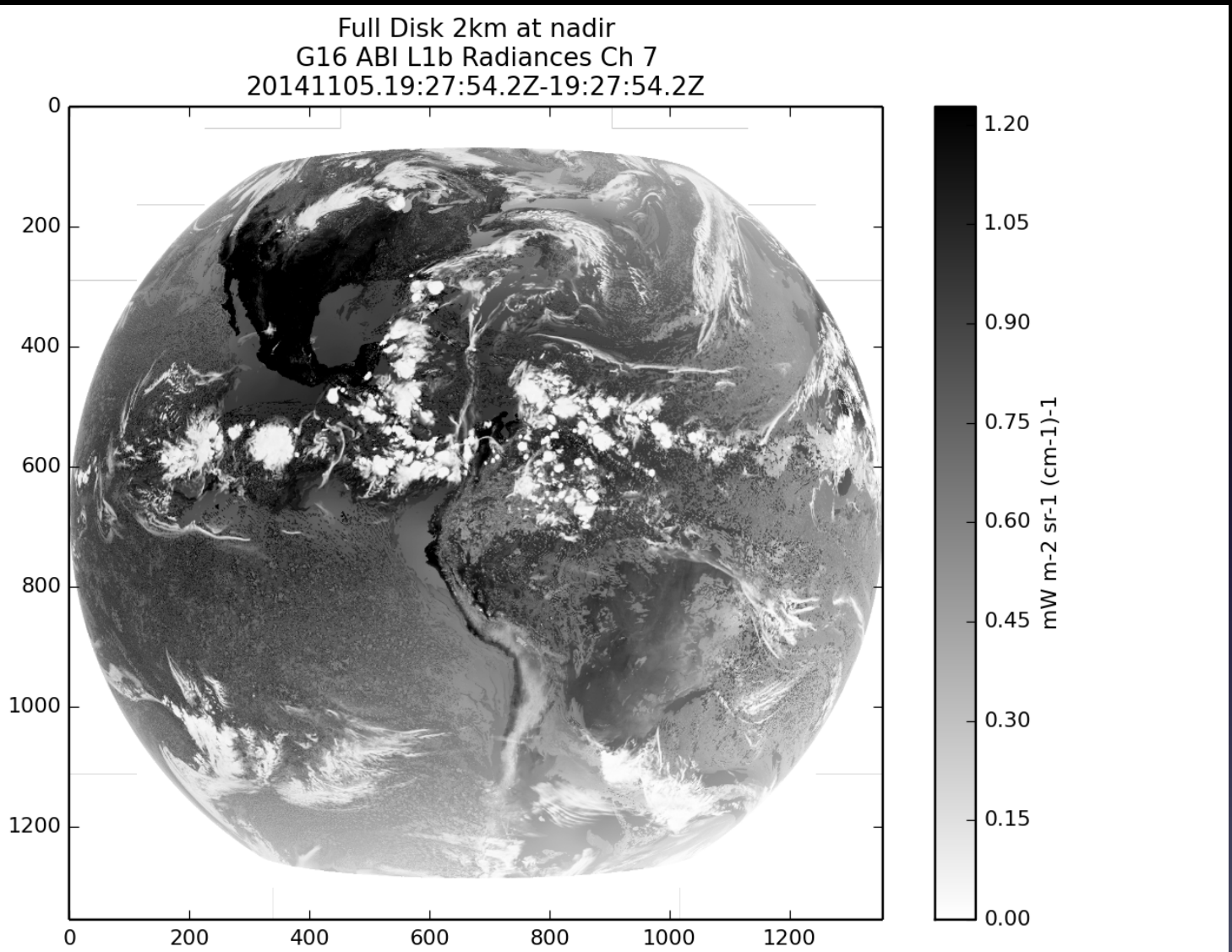


CSPP Geo GRB software

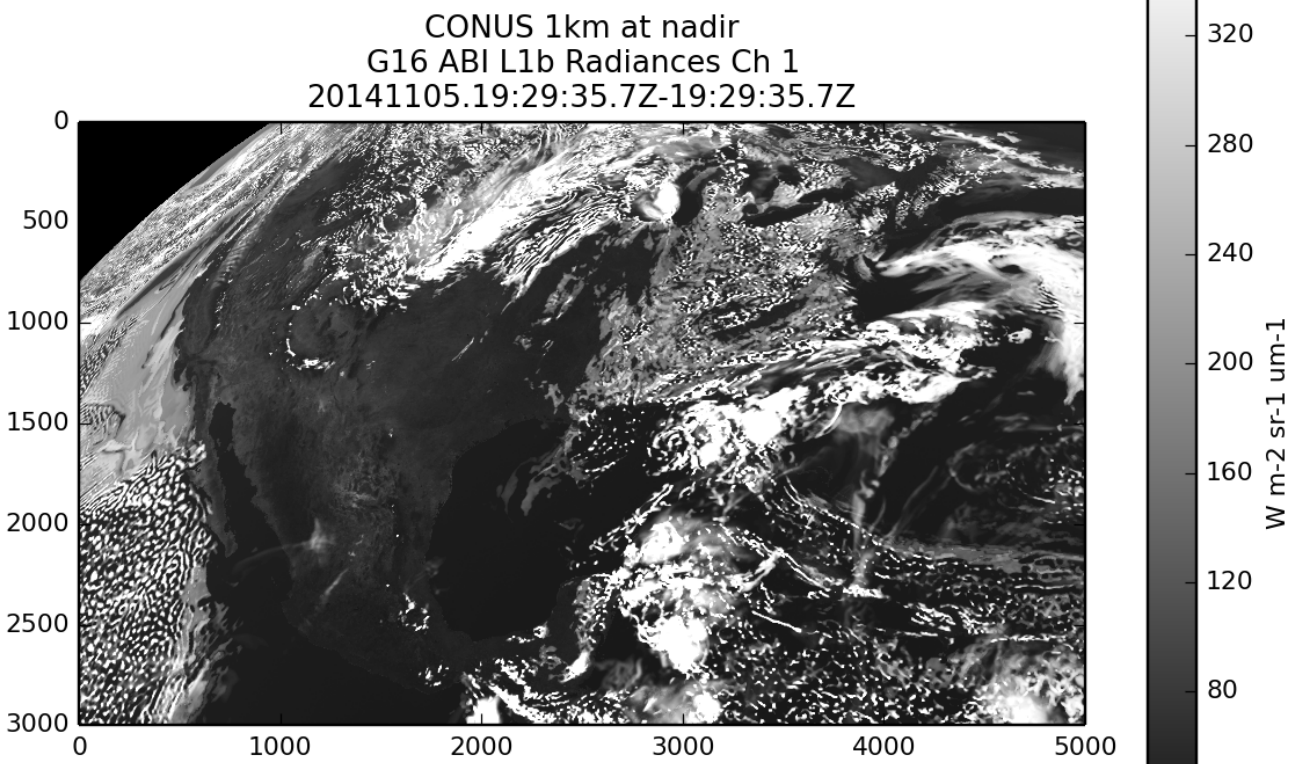
- Ingests raw GRB stream, extracts payloads from packets and constructs datasets
- Primarily new Python code, NASA RT-STPS used for ingest
- Tested with Harris GRB simulator, DOE data
- High data rate drives software design and hardware spec
- GRB V0.1 prototype released March 2015
  - Creates ABI Level 1 and GLM Level 2 datasets
  - Writes output to NetCDF4 files
  - Test dataset provided
- Software and documentation available from website: http://cimss.ssec.wisc.edu/csppgeo/
  - Includes ICD describing planned upstream data interface
- Planning new releases ~every 3 months, eventually support all GOES-R instruments

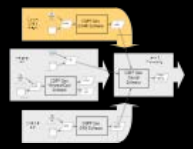
GRB minimum hardware requirements
12 core, 2.4 GHz CPU with 64-bit instruction support
32GB RAM
CentOS 6 64-bit Linux (or other compatible 64-bit Linux distribution
100 GB disk space

GRB package output
Level 1 simulated ABI (DOE-0), 3.9μm



GRB package output
Level 1 simulated ABI (DOE-0)

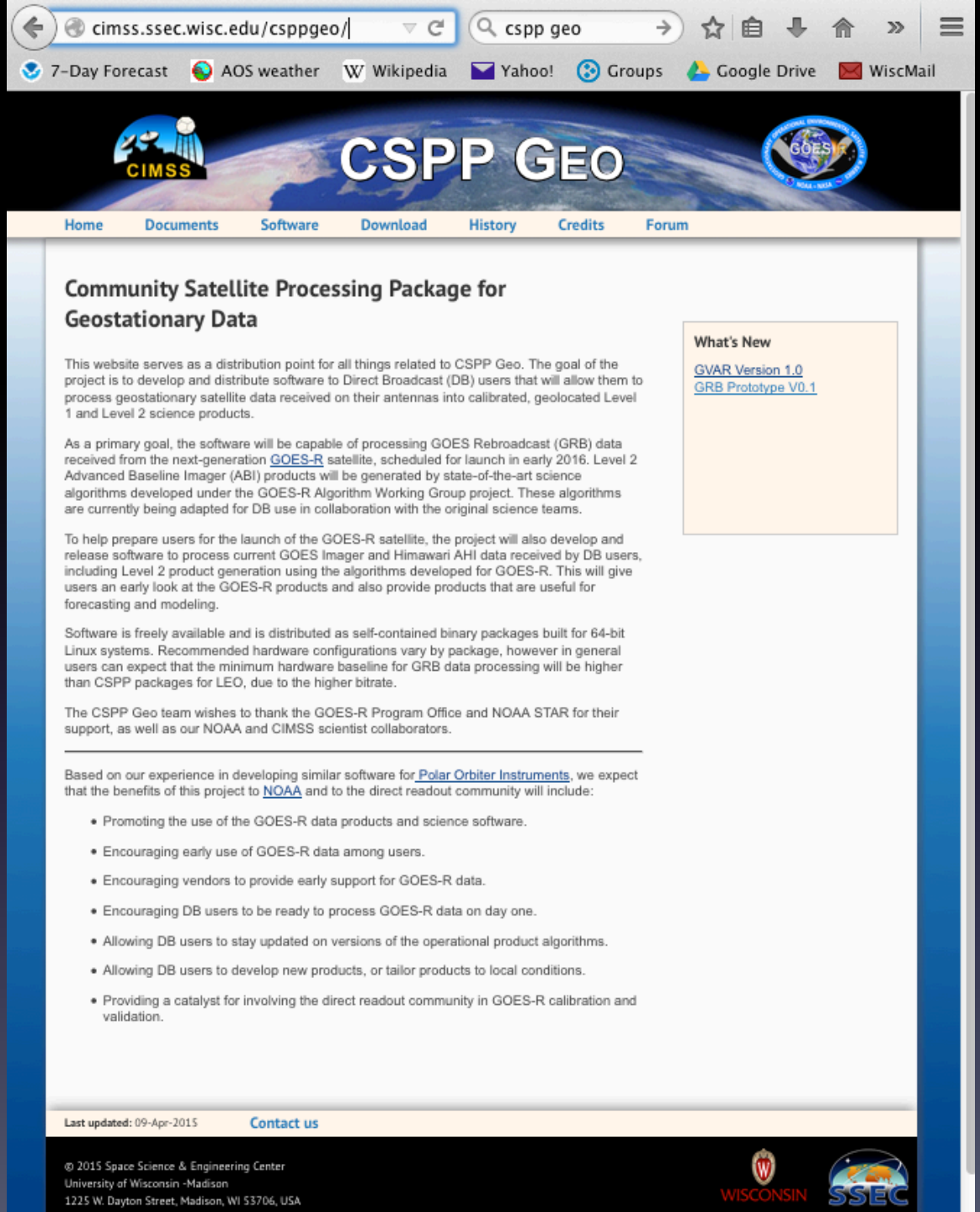




CSPP Geo GVAR software

- Allows users to process GOES-13 and GOES-15 Imager data
- Input is GVAR data files and index files
- Output is AREA files, suitable for input into GEOCAT (not yet released), MCIDAS, or other software
- Initially adapted from MCIDAS code base
- V1.0 released early April 2015
  - Software and documentation available from website: http://cimss.ssec.wisc.edu/csppgeo/

GVAR minimum hardware requirements
Intel or AMD CPU with 64-bit instruction support
4GB RAM (minimum)
CentOS 6 64-bit Linux (or other compatible 64-bit Linux distribution)
100 GB disk space (minimum)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cspp geo
7-Day Forecast
AOS weather
Wikipedia
Yahoo!
Groups
Google Drive
WiscMail
CIMSS
CSPP GEO
GOES-R
Home
Documents
Software
Download
History
Credits
Forum
Community Satellite Processing Package for Geostationary Data
This website serves as a distribution point for all things related to CSPP Geo. The goal of the project is to develop and distribute software to Direct Broadcast (DB) users that will allow them to process geostationary satellite data received on their antennas into calibrated, geolocated Level 1 and Level 2 science products.
As a primary goal, the software will be capable of processing GOES Rebroadcast (GRB) data received from the next-generation GOES-R satellite, scheduled for launch in early 2016. Level 2 Advanced Baseline Imager (ABI) products will be generated by state-of-the-art science algorithms developed under the GOES-R Algorithm Working Group project. These algorithms are currently being adapted for DB use in collaboration with the original science teams.
To help prepare users for the launch of the GOES-R satellite, the project will also develop and release software to process current GOES Imager and Himawari AHI data received by DB users, including Level 2 product generation using the algorithms developed for GOES-R. This will give users an early look at the GOES-R products and also provide products that are useful for forecasting and modeling.
Software is freely available and is distributed as self-contained binary packages built for 64-bit Linux systems. Recommended hardware configurations vary by package, however in general users can expect that the minimum hardware baseline for GRB data processing will be higher than CSPP packages for LEO, due to the higher bitrate.
The CSPP Geo team wishes to thank the GOES-R Program Office and NOAA STAR for their support, as well as our NOAA and CIMSS scientist collaborators.
Based on our experience in developing similar software for Polar Orbiter Instruments, we expect that the benefits of this project to NOAA and to the direct readout community will include:
• Promoting the use of the GOES-R data products and science software.
• Encouraging early use of GOES-R data among users.
• Encouraging vendors to provide early support for GOES-R data.
• Encouraging DB users to be ready to process GOES-R data on day one.
• Allowing DB users to stay updated on versions of the operational product algorithms.
• Allowing DB users to develop new products, or tailor products to local conditions.
• Providing a catalyst for involving the direct readout community in GOES-R calibration and validation.
What's New
GVAR Version 1.0
GRB Prototype V0.1
Last updated: 09-Apr-2015
Contact us
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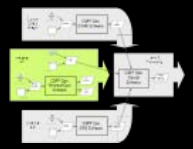
University of Wisconsin -Madison
1225 W. Dayton Street, Madison, WI 53706, USA
WISCONSIN
SSEC



CSPP Geo HimawariCast software

- The JMA plans to distribute Himawari AHI data to DB users via the HimawariCast stream
  - Reduced spatial resolution, contains 14 of 16 channels
- Currently distributing MTSAT-2 data, will switch to H-8 this year
- We are developing software to convert HimawariCast data to AREA files
- Data must be decoded upstream using proprietary third-party software (Refer to JMA website)
- Beta release planned for end of May

HimawariCast coverage

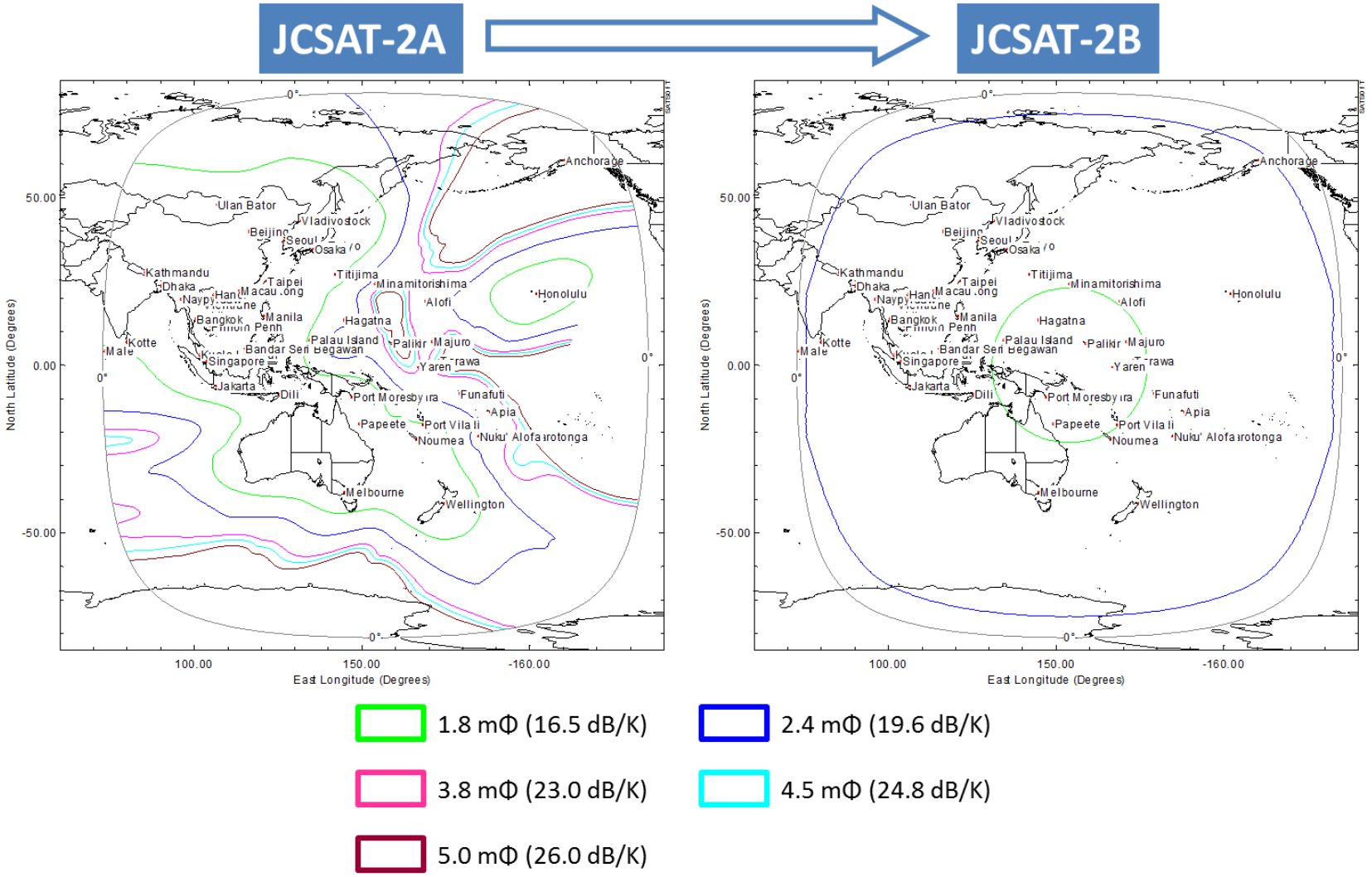
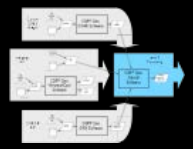
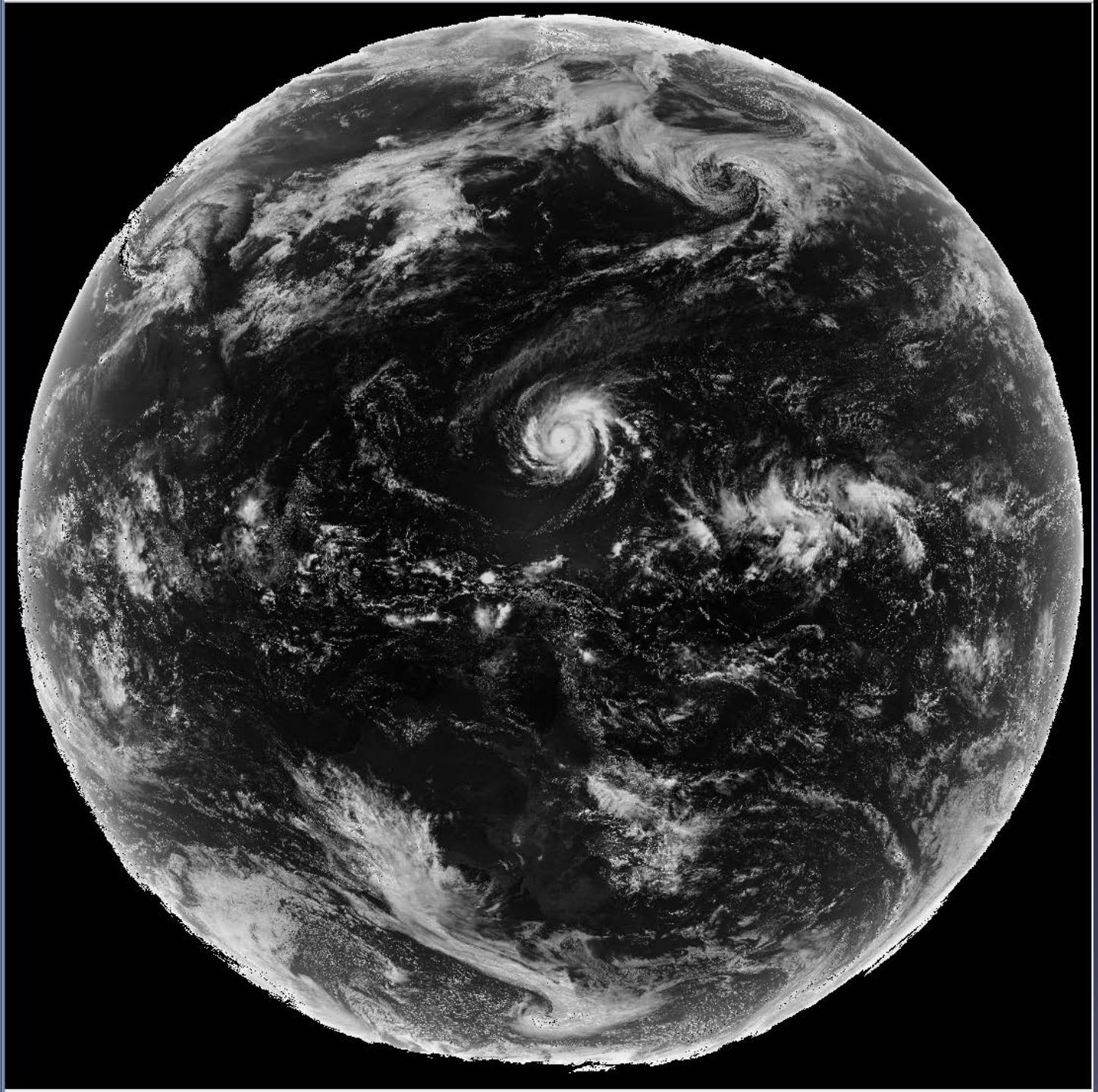


Image courtesy of JMA (www.data.jma.go.jp)



GEOCAT

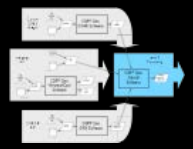
- GEOCAT is an algorithm testbed developed by Mike Pavolonis (NOAA STAR) and CIMSS
- Many of the GOES-R Algorithm Working Group algorithms were developed in Geocat
- Provides an easy way to distribute many product algorithms to DB users, including science updates
- Processes data from multiple instruments
- Recently added support for AHI data, scientists can now adapt algorithms



Geocat L1 AHI output

Ch 1 refl (0.47µm)

31 March 2015

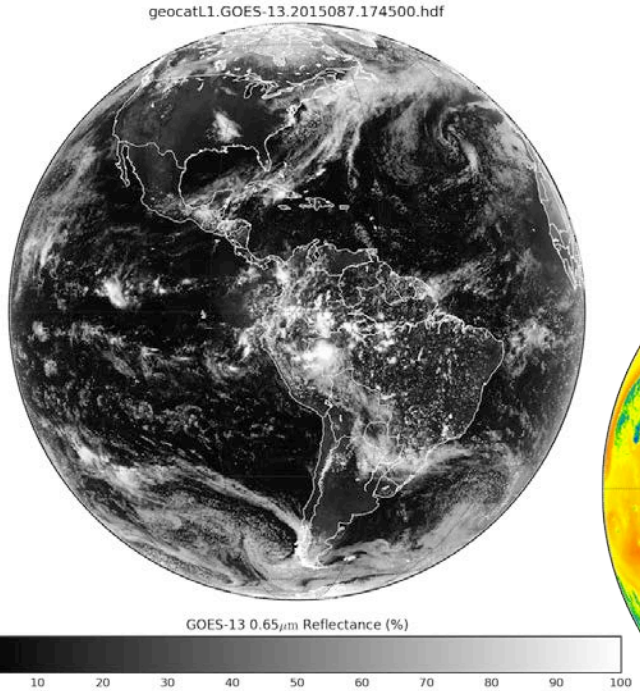


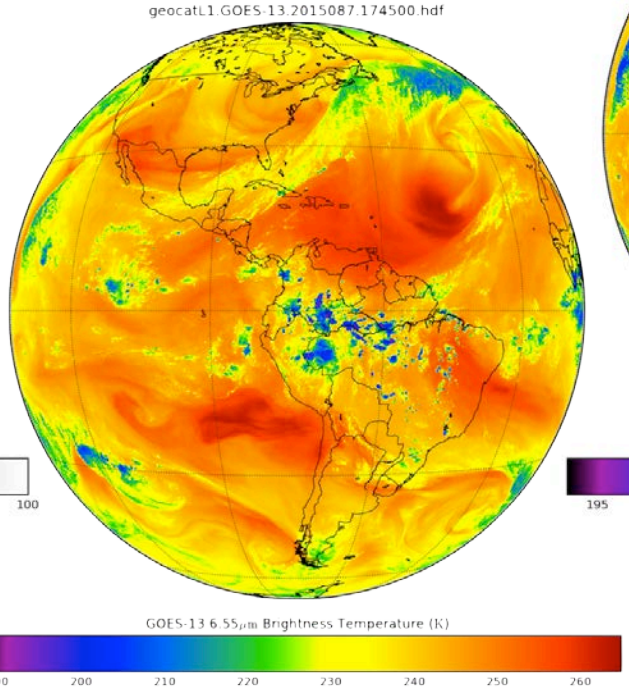
CSPP Geo GEOCAT software

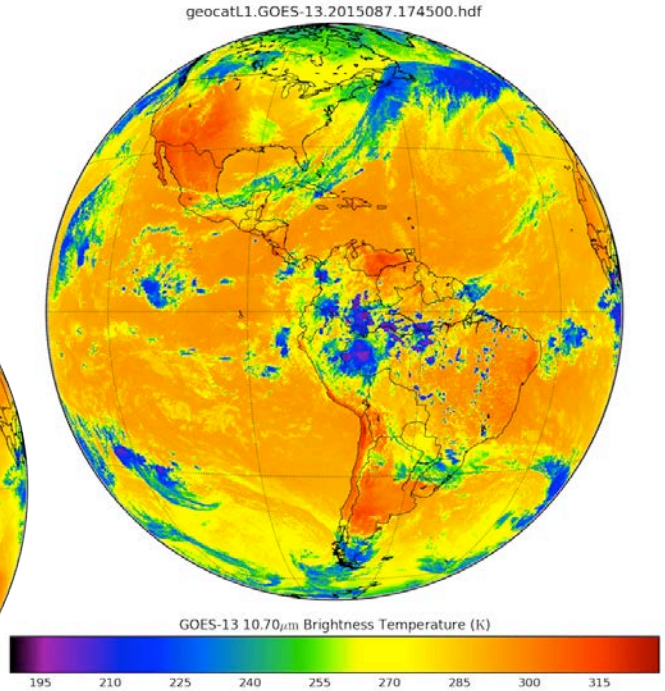
- Initial version will support GOES Imager and produce
  - cloud products (Andrew Heidinger, NOAA/STAR)
  - fog / low stratus (Mike Pavolonis, NOAA/STAR)
- Later versions will add support for AHI and ABI, add other L2 products and algorithm updates
- Ancillary data will be served from SSEC / CIMSS via the internet
- Design challenges:
  - Some L2 algorithms use data from previous timesteps; so all images must mapped to same projection
  - High data rate will require parallelization and substantial hardware
- Initial release summer 2015

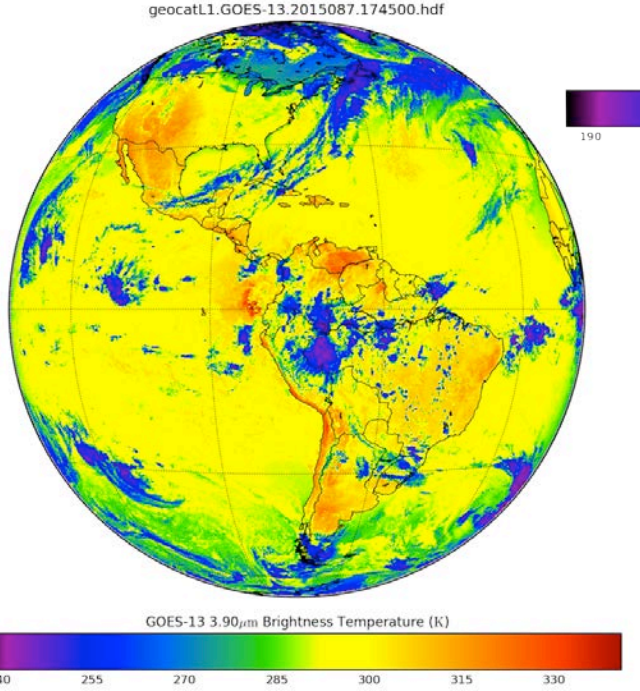
Estimated system requirements*
CPU: Intel Xeon E5 v2 "Ivy Bridge", 20-core (2 x 10-core), 2.8GHz
RAM: 192GB
Disk: 14TB (does not include long-term storage)

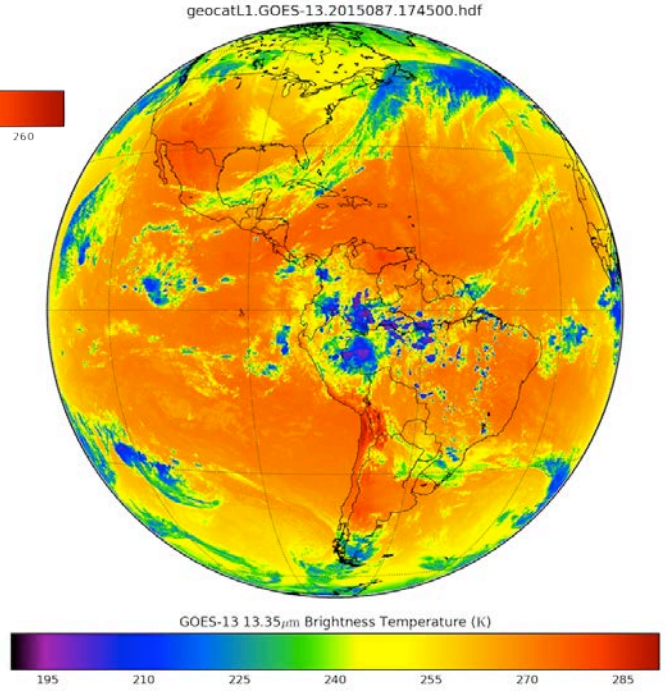
* includes imagery, clouds, fog, winds and hurricane intensity estimation



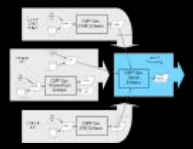








Geocat Imagery
GOES-13 Imager



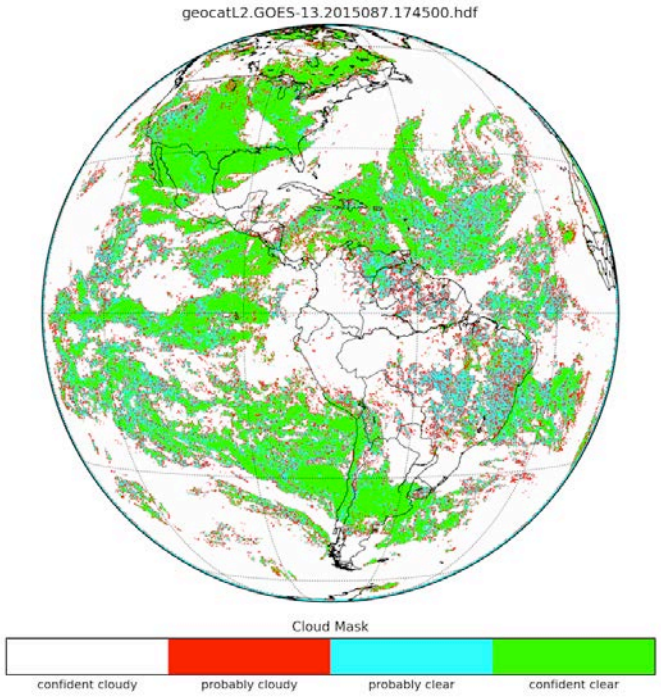
GEOCAT initial products

product	algorithm	maintainer
0.65 um reflectance	GEOCAT L1	GEOCAT team
3.9 um reflectance	GEOCAT L1	GEOCAT team
3.9 um brightness temperature	GEOCAT L1	GEOCAT team
6.7 um brightness temperature	GEOCAT L1	GEOCAT team
11.0 um brightness temperature	GEOCAT L1	GEOCAT team
13.3 um brightness temperature	GEOCAT L1	GEOCAT team
Cloud mask	Cloud mask	A Heidinger
Cloud phase	Cloud type	M Pavolonis
Cloud type	Cloud type	M Pavolonis
Cloud top height	Cloud height	S Wanzong
Cloud top temperature	Cloud height	S Wanzong
Cloud top pressure	Cloud height	S Wanzong
Cloud 11 um emissivity	Cloud height	S Wanzong
Cloud visible optical depth	DCOMP / NCOMP	A Walther / P Heck
Cloud effective radius	DCOMP / NCOMP	A Walther / P Heck
Cloud liquid water path	DCOMP / NCOMP	A Walther / P Heck
Cloud ice water path	DCOMP / NCOMP	A Walther / P Heck
Probability of Marginal Visual Flight Rules (MVFR)	Fog	M Pavolonis
Probability of Instrument Flight Rules (IFR)	Fog	M Pavolonis
Probability of Low Instrument Flight Rules (LIFR)	Fog	M Pavolonis
Low cloud geometric thickness	Fog	M Pavolonis

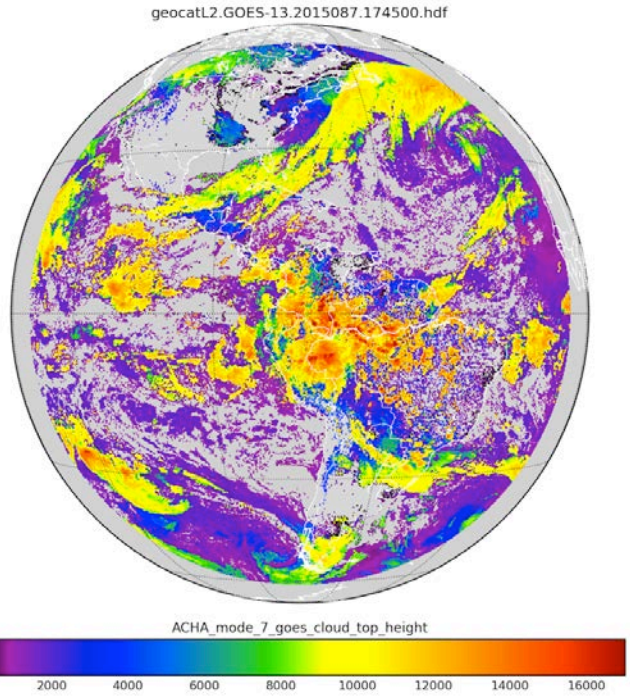
Geocat L2 products

GOES-13 Imager

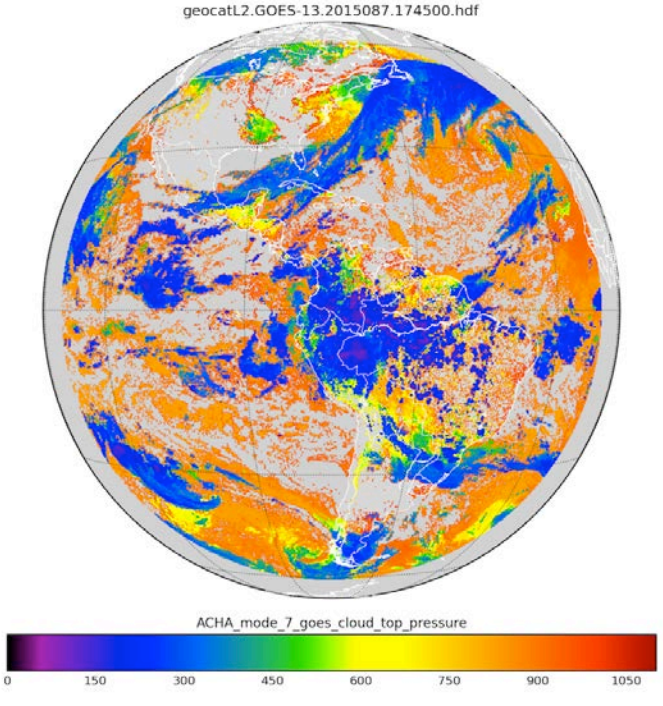
Cloud mask



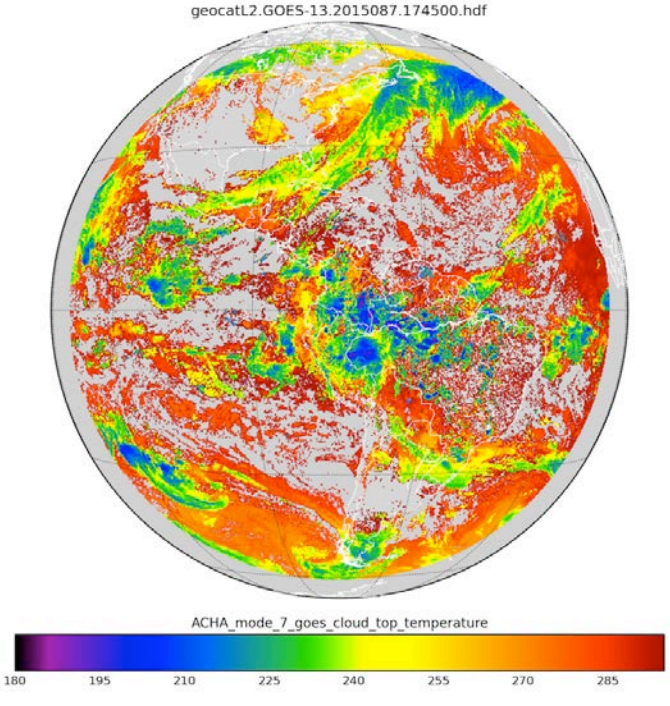
Cloud top height



Cloud top pressure



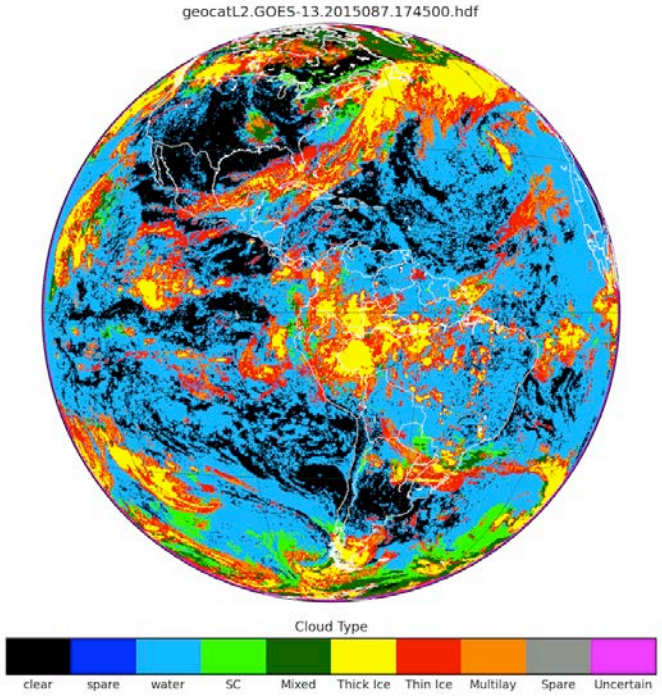
Cloud top temperature



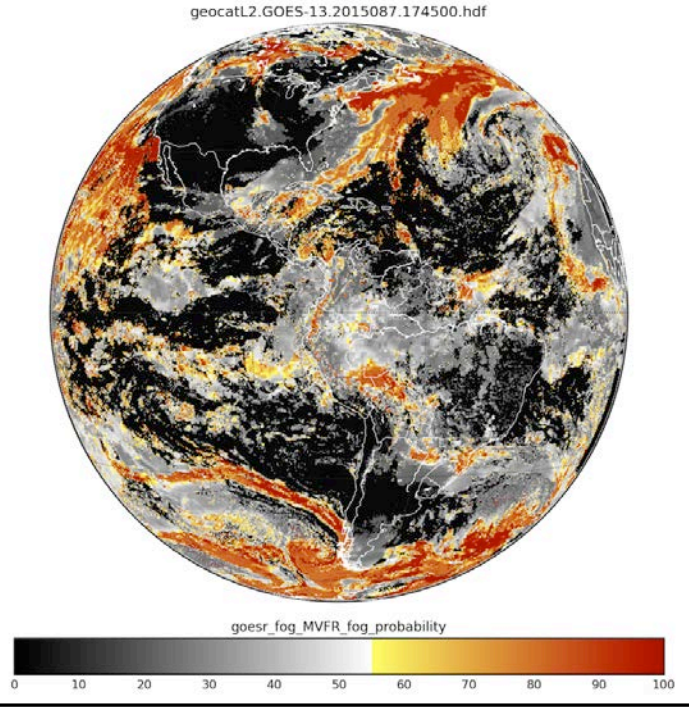
Geocat L2 products

GOES-13 Imager

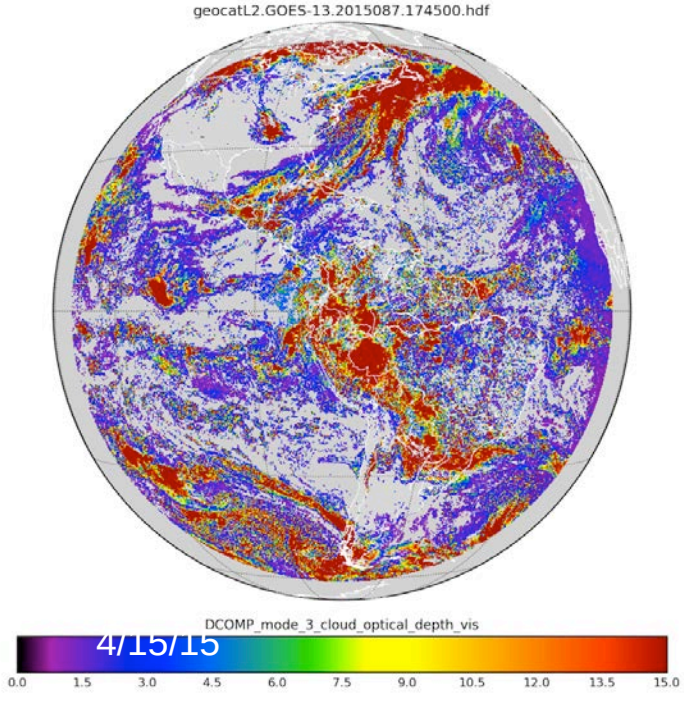
Cloud type



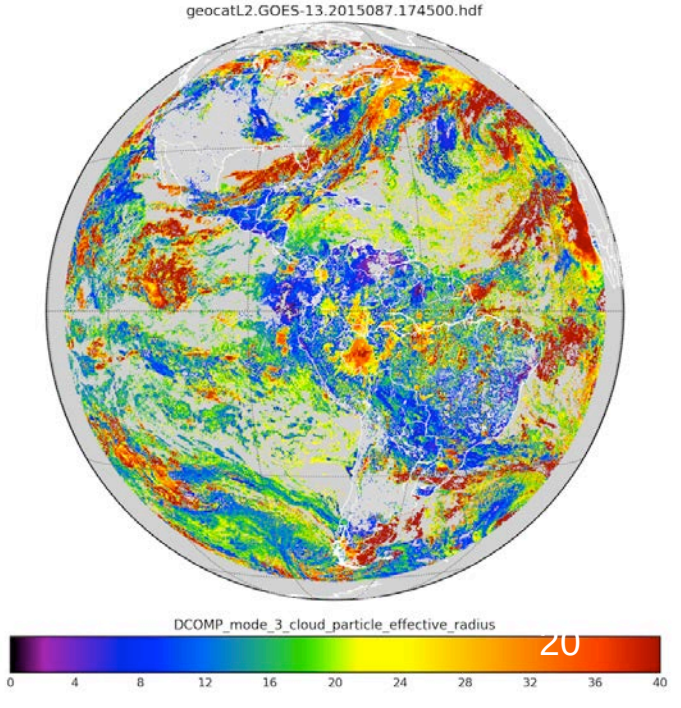
Fog probability (MVFR)



Cloud optical depth



Cloud particle effective radius



Future L2 processing packages

- AIT Framework
  - Developed by GOES-R Algorithm Integration Team
  - Most of the AWG algorithms run in the AIT framework
  - Assessing task of integrating and releasing as part of CSPP Geo
- Standalone algorithms / other processing systems

Personnel

Core CSPP Geo team

name	role
Liam Gumley	Principal Investigator
Graeme Martin	Project Manager
Jessica Braun	User support, documentation and testing
Kathy Strabala	User support, ancillary data
Scott Mindock	GVAR, HimawariCast, infrastructure
Nick Bearson	GRB
Tommy Jasmin	GRB
Geoff Cureton	GEOCAT, L2 products
Ray Garcia	Himawari, infrastructure

GOES-R AWG scientist collaborators

name	role
Andy Heidinger	Cloud team PI
Mike Pavolonis	Fog / low stratus team PI
Steve Wanzong	Cloud height
Andi Walther	Daytime cloud optical properties
Pat Heck	Nighttime cloud optical properties
Corey Calvert	Fog / low stratus

*blue comic sans indicates individuals attending the conference