CSPP Geo support for processing GOES-R, Himawari-8 and current GOES data

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International TOVS Study Conference 2015
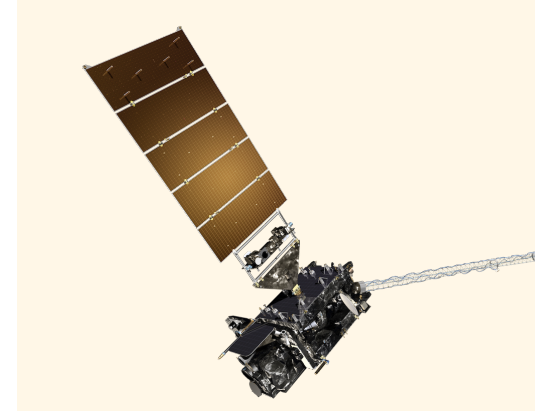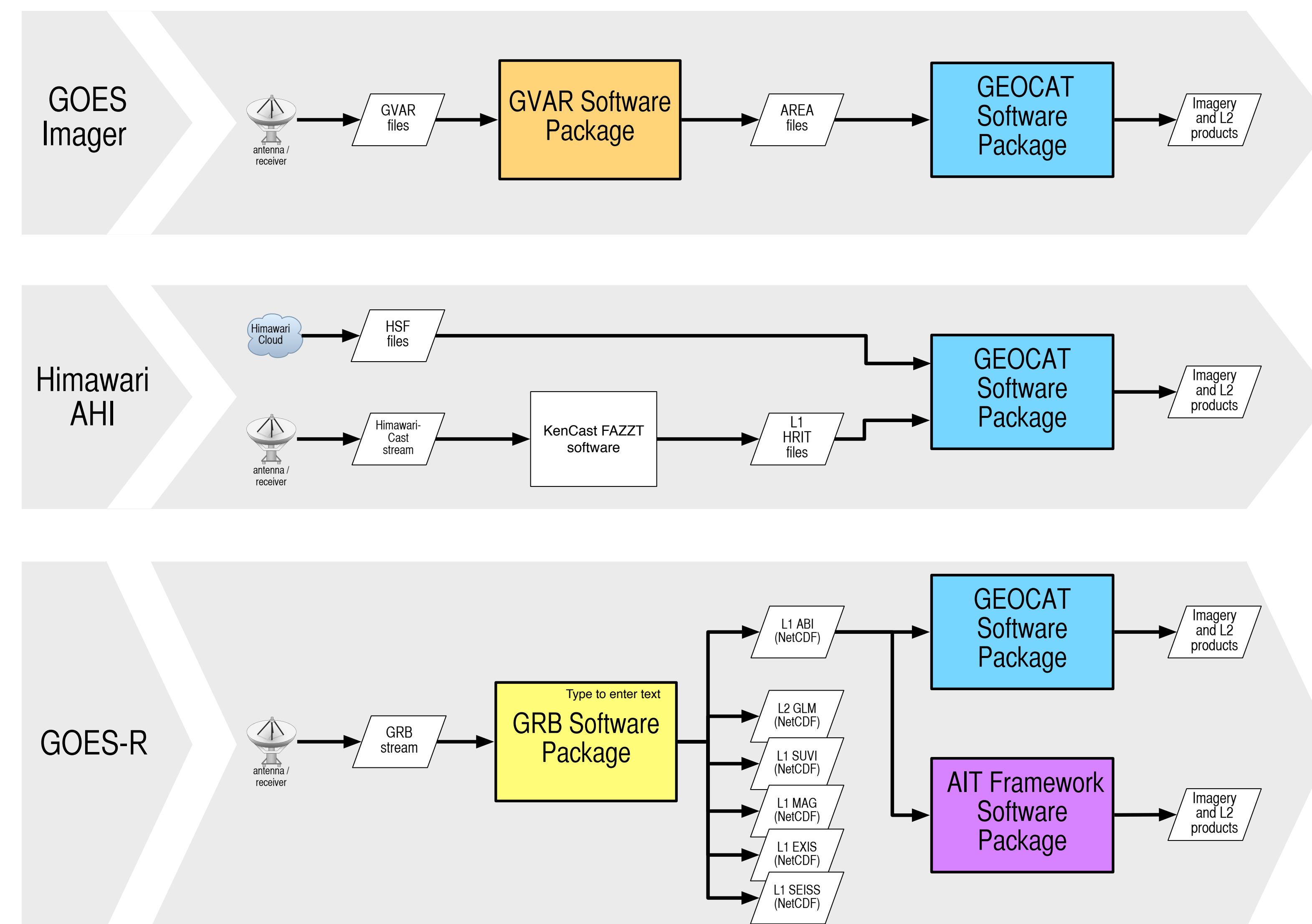
Introduction

While direct broadcast is commonly associated with polar orbiting satellites, a number of geostationary satellites currently offer direct broadcast streams as well. That number will grow as more geostationary satellites offering direct broadcast streams are launched in the coming years.

For users of geostationary satellite data, direct broadcast offers a highly reliable, low-latency source of data that does not require access to a high-throughput terrestrial network.

The CSPP Geo project provides free software that allows users to process direct broadcast data received from geostationary satellites. Software packages are currently available to process current GOES Imager data and simulated GOES Rebroadcast (GRB) data as it will be received from the GOES-R satellite after it is launched in 2016. Packages currently in development will offer Level 2 product generation capabilities for current GOES, the Japanese Advanced Himawari Imager (AHI) instrument, and GOES-R.

The significantly higher data rate from the new generation of imagers including AHI and the Advanced Baseline Imager (ABI) poses challenges from a data processing perspective, affecting both software design and hardware requirements.

Support for processing GOES Imager data

The GVAR Software Package allows users to process data from current GOES imagers received via the GVAR direct broadcast stream. The output is AREA files that are suitable for ingest into the future GEOCAT Level 2 software package, and well as other applications that can read AREA files.

Version 1.0 of the GVAR package is currently available for download, offering support for GOES-13 and GOES-15 Imager. A future release will add support for GOES-14 Imager.

—> For more information on the GVAR package, refer to poster 3p.05 "CSPP GEO Level 1 Packages".

Users will be able to generate Level 2 geophysical products using the GEOCAT Software Package. The science algorithms running in GEOCAT are research software developed under the GOES-R Algorithm Working Group, maintained and updated by the original algorithm developers. This is possible because many of the algorithms developed for GOES-R run on current GOES Imager data as a proxy.

The initial version of the GEOCAT package (Fall 2015) will support generation of imagery, cloud and fog products from current GOES Imager data. Later versions will add support for the AHI and ABI instruments, as well as additional products.

—> For more information on the GEOCAT package, refer to poster 3p.04 "Level-2 Products in the CSPP-GEO Direct Broadcast Package"

A GVAR package quicklook image, generated from direct broadcast data received at UW-Madison

GEOCAT Package quicklooks showing Imagery and Level 2 products

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Current and future CSPP Geo software packages will support product generation from GOES Imager, Himawari AHI and GOES-R instrument data.

Support for processing Himawari data

The Japanese Himawari-8 mission was launched in 2014, and includes an ABI-like instrument called the Advanced Himawari Imager (AHI).

The JMA distributes AHI data to direct broadcast users at reduced spatial and spectral resolution via the HimawariCast stream. Note that the raw HimawariCast data must be decoded using proprietary software from a private vendor before further processing is possible.

Himawari data processing in CSPP Geo
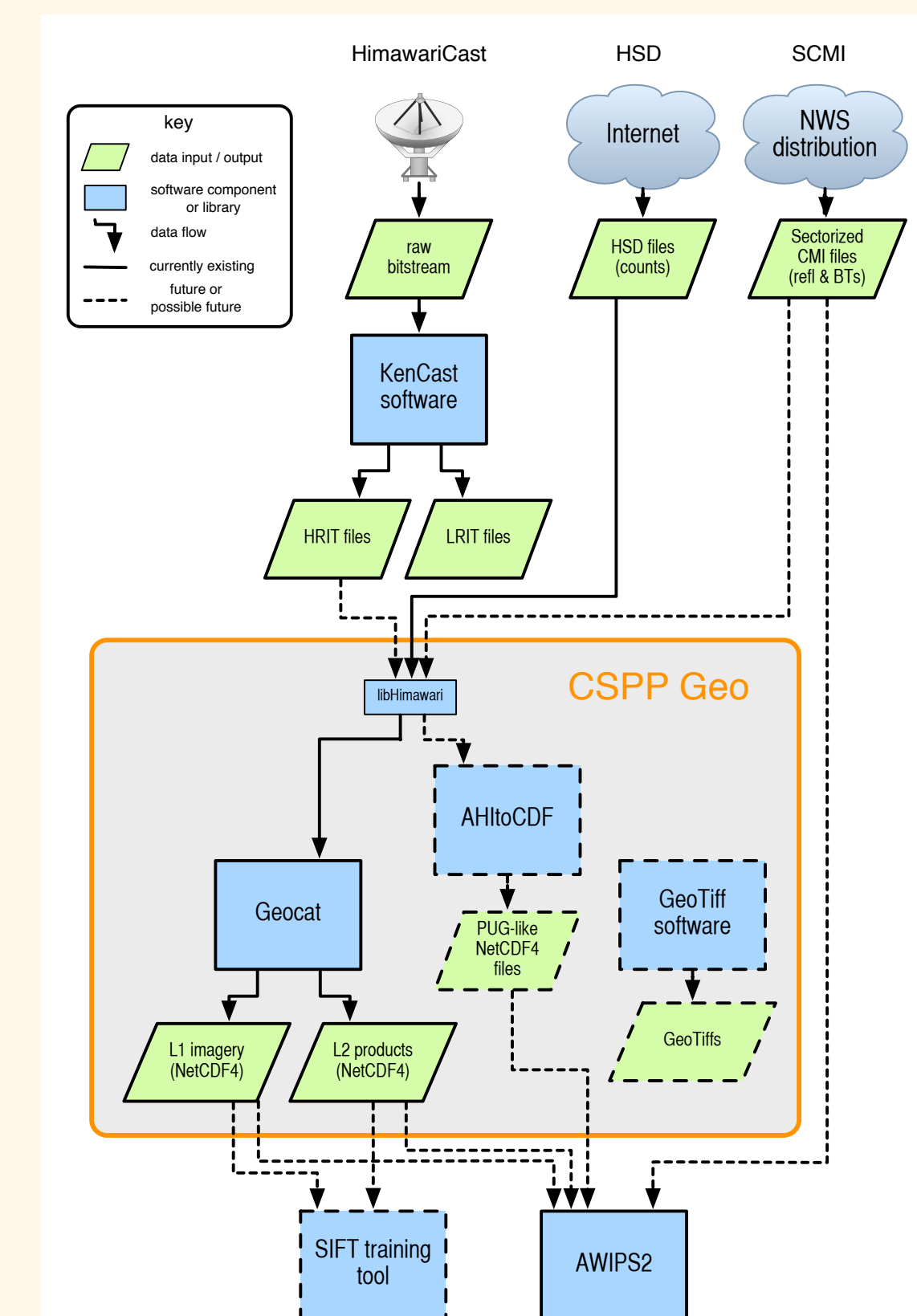
The future GEOCAT Software Package will support generation of Level 2 products from HimawariCast data. Level 2 science algorithms are currently being adapted for Himawari by the original algorithm developers.

In addition, a utility will be offered to convert HimawariCast data to NetCDF-4 files, which will be suitable for ingest into AWIPS and other visualization and processing tools.

The JMA is also distributing AHI data at full spatial and spectral resolution to National Meteorological and Hydrological Services via the HimawariCloud service, in a format called Himawari Standard Data (HSD). CSPP Geo software will also support processing data in HSD format, but note that this is not a direct broadcast stream, and many users will not have access to data in this format.

The initial CSPP Geo software releases to support Himawari processing are planned for late 2015 and early 2016.

Support for processing GOES-R data

The GOES-R satellite is scheduled to be launched into geostationary orbit in late 2016. The instruments on-board will include the Advanced Baseline Imager (ABI), the Geostationary Lightning Mapper (GLM), and several space weather instrument suites. Direct broadcast users will have access to data from all of the instruments via the GRB stream.

The CSPP Geo project has developed the GRB Software Package to allow direct broadcast users to process the raw GRB data stream as it will be received from a demodulator, generating products for all instruments. The software runs as a server, reading CADU frames from two sockets, or optionally at the command line. Output is written to mission standard NetCDF-4 files.
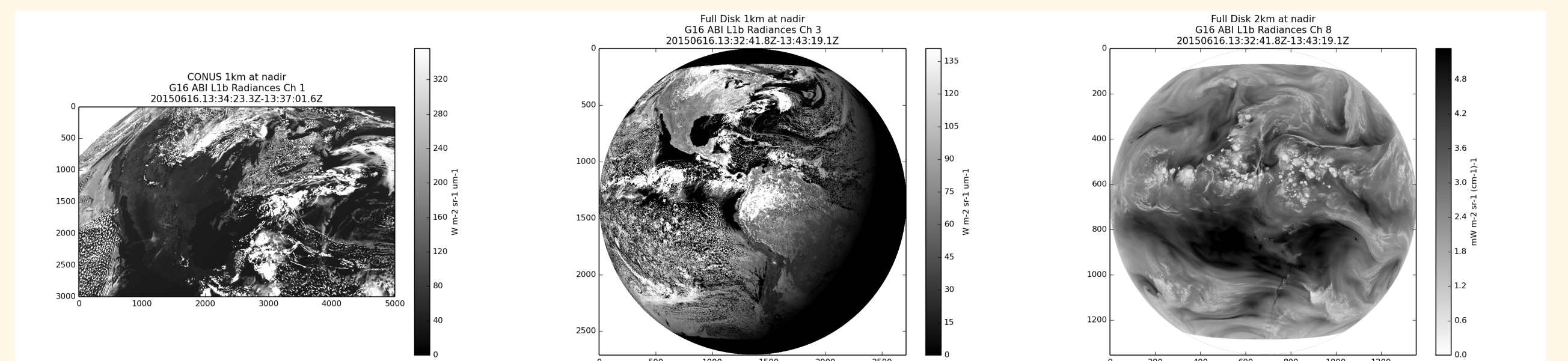
Prototype Version 0.3 of the GRB Software Package is currently available for download from the CSPP Geo website. Development work between now and the GOES-R launch will focus on optimization and configurability enhancements.

—> For more information on the GRB package, refer to poster 3p.07 "Reconstructing GOES Rebroadcast with CSPP Geo GRB"

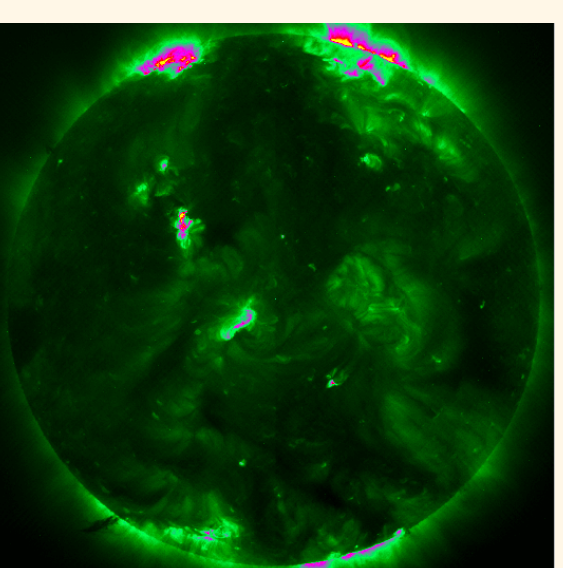*Solar Ultraviolet Imager (SUVI) image from simulated GRB*

Users will be able to further process ABI data to Level 2 products with research versions of science algorithms that were developed for GOES-R, running in the GEOCAT software package.

Additional ABI Level 2 product generation software is planned for release in the late 2016 and 2017 time-frame. This includes the AIT Framework, which runs research versions of many of the GOES-R product algorithms, and also may include standalone single-algorithm packages.
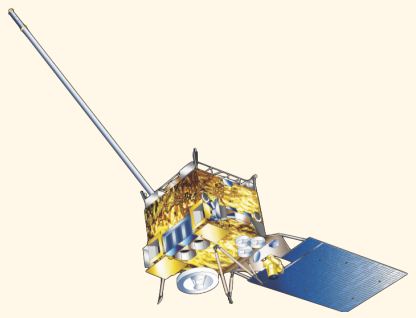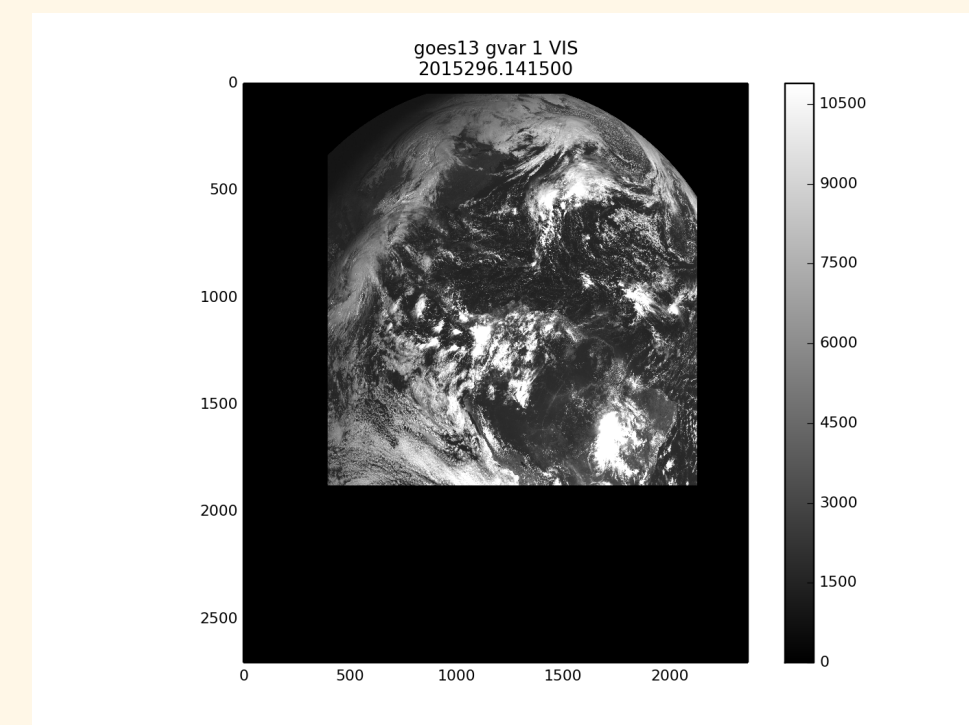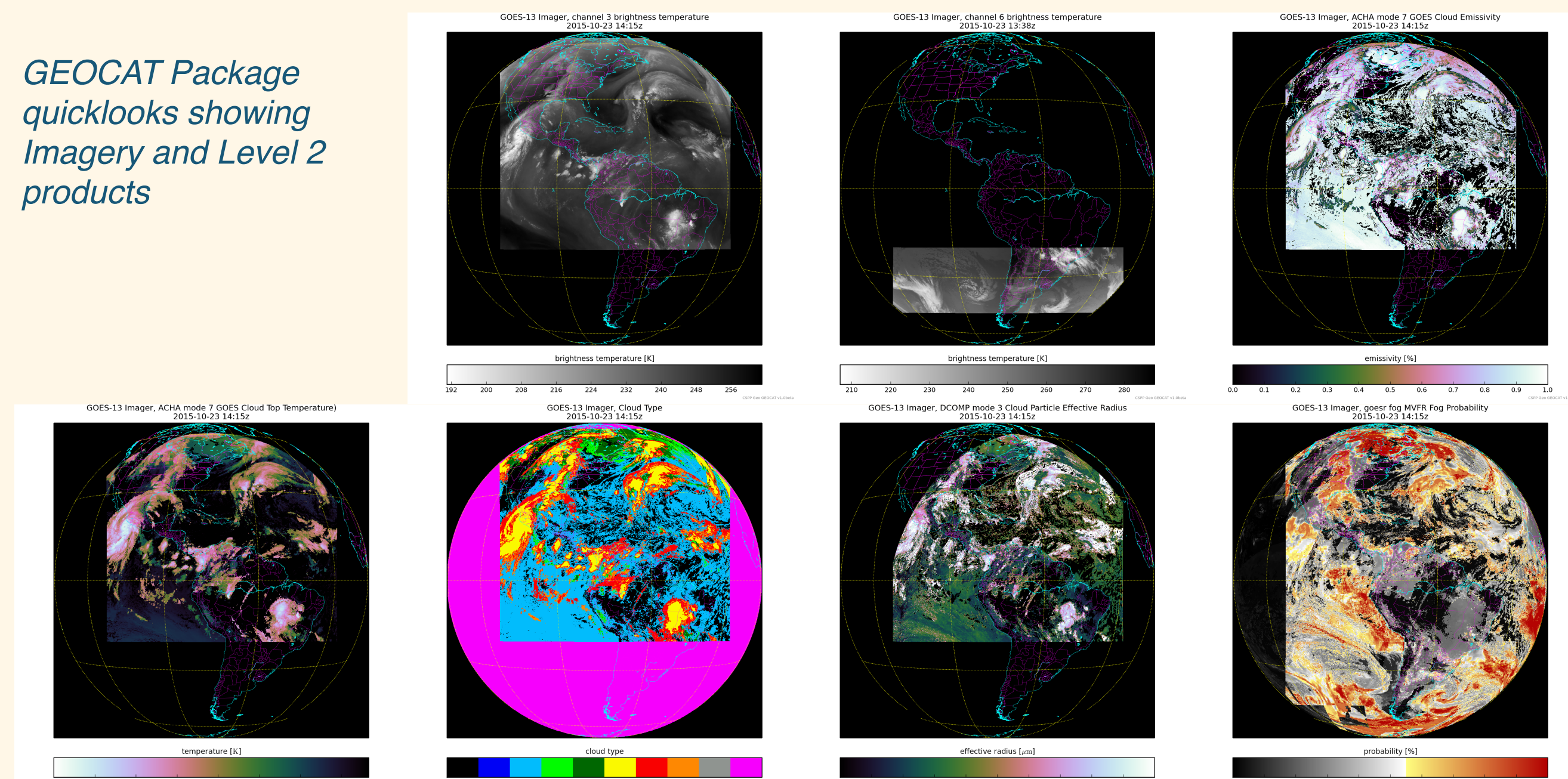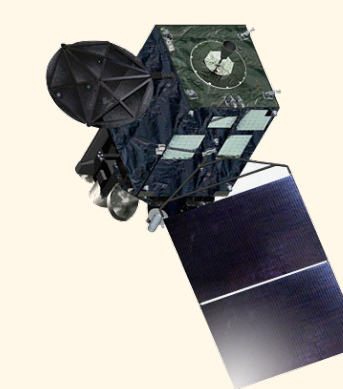
Quicklooks generated by the GRB package from simulated ABI data (DOE 1/2 test of the ground system)

CSPP Geo software

All CSPP Geo software is:

- ☑ free to download and use
- ☑ compatible with 64-bit CentOS6 Linux platforms
- ☑ distributed as binary tarballs that are easy to install and run
- ☑ packaged with all required third-party software included
- ☑ released with an optional test data package and self-test script
- ☑ capable of generating "quicklook" images from products

The estimated minimum hardware requirements for each package are described on the CSPP Geo website.

Acknowledgements and further information