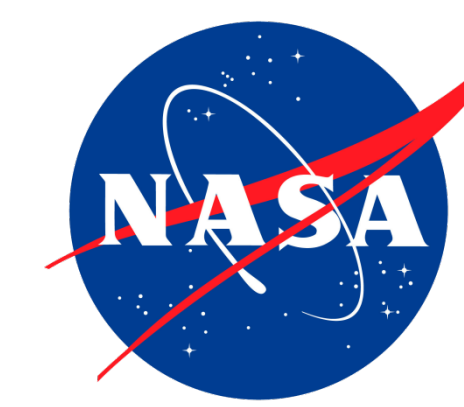# Exporting VIIRS and MODIS Products for Visualization using Polar2Grid
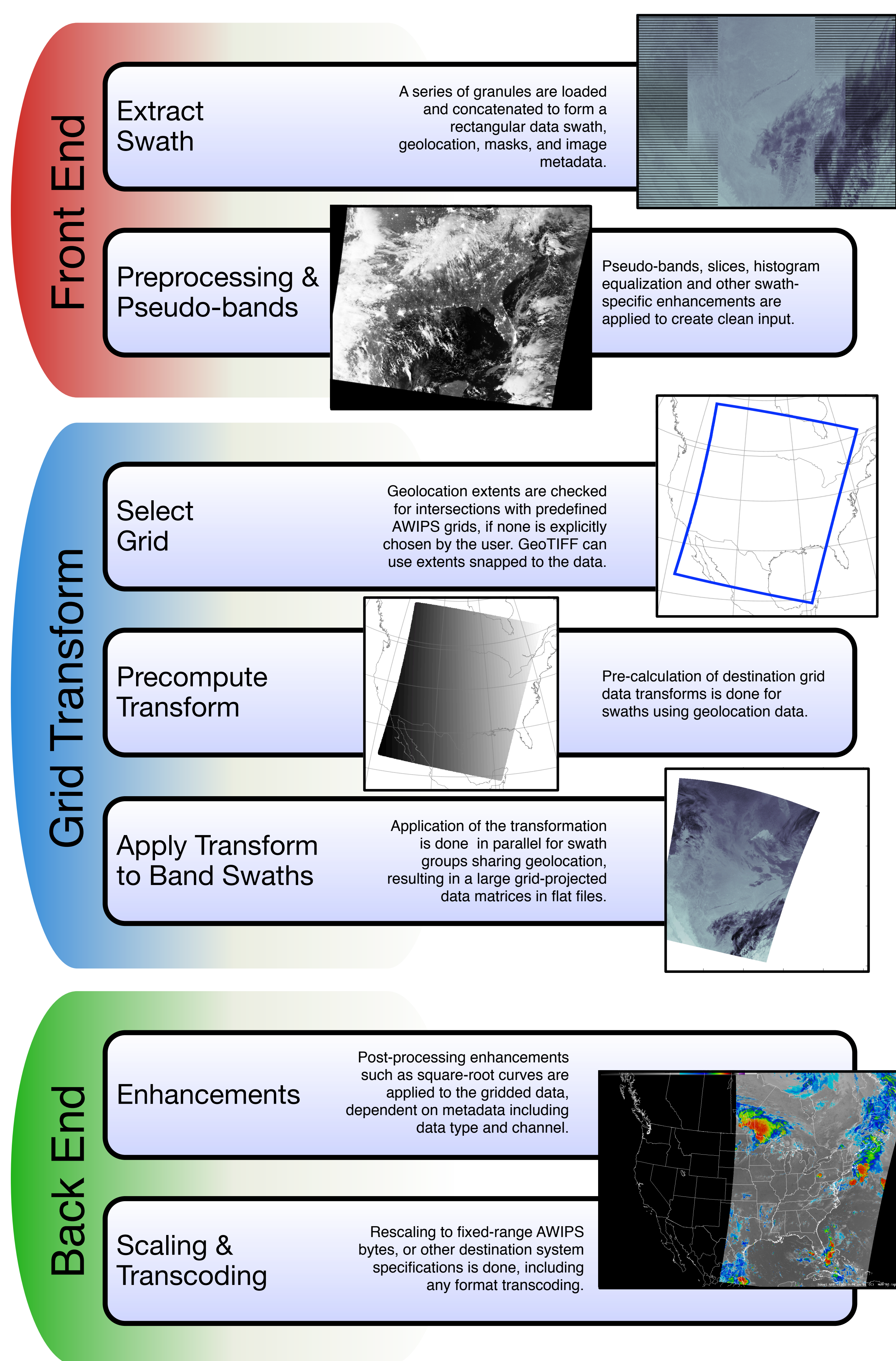
D.J. Hoese, R.K.Garcia, K.I.Strabala, E.N.Schiffer, W.C.Straka III

Abstract

Polar-orbiting multi-band meteorological sensors such as VIIRS and MODIS pose substantial challenges for taking imagery "the last mile" to forecast offices, scientific analysis environments, and the general public. To do this quickly and easily, the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin has created an open-source, modular application system, Polar2Grid. This bundled solution automates tools for converting VIIRS and MODIS products into a variety of output formats, including GeoTIFF and AWIPS, as well as NinJo forecasting workstation formats. Polar2Grid includes perceptual enhancements for products such as the VIIRS Day-Night Band (DNB), and performs conversions and projections in seconds on large swaths of data. Polar2Grid is currently providing VIIRS imagery over the Continental United States, as well as Alaska and Hawaii, from various Direct-Broadcast antennas to forecasters at the NOAA National Weather Service (NWS) offices in their AWIPS terminals, within minutes of an overpass of the Suomi NPP satellite. These images have been used by operation NWS forecasters.
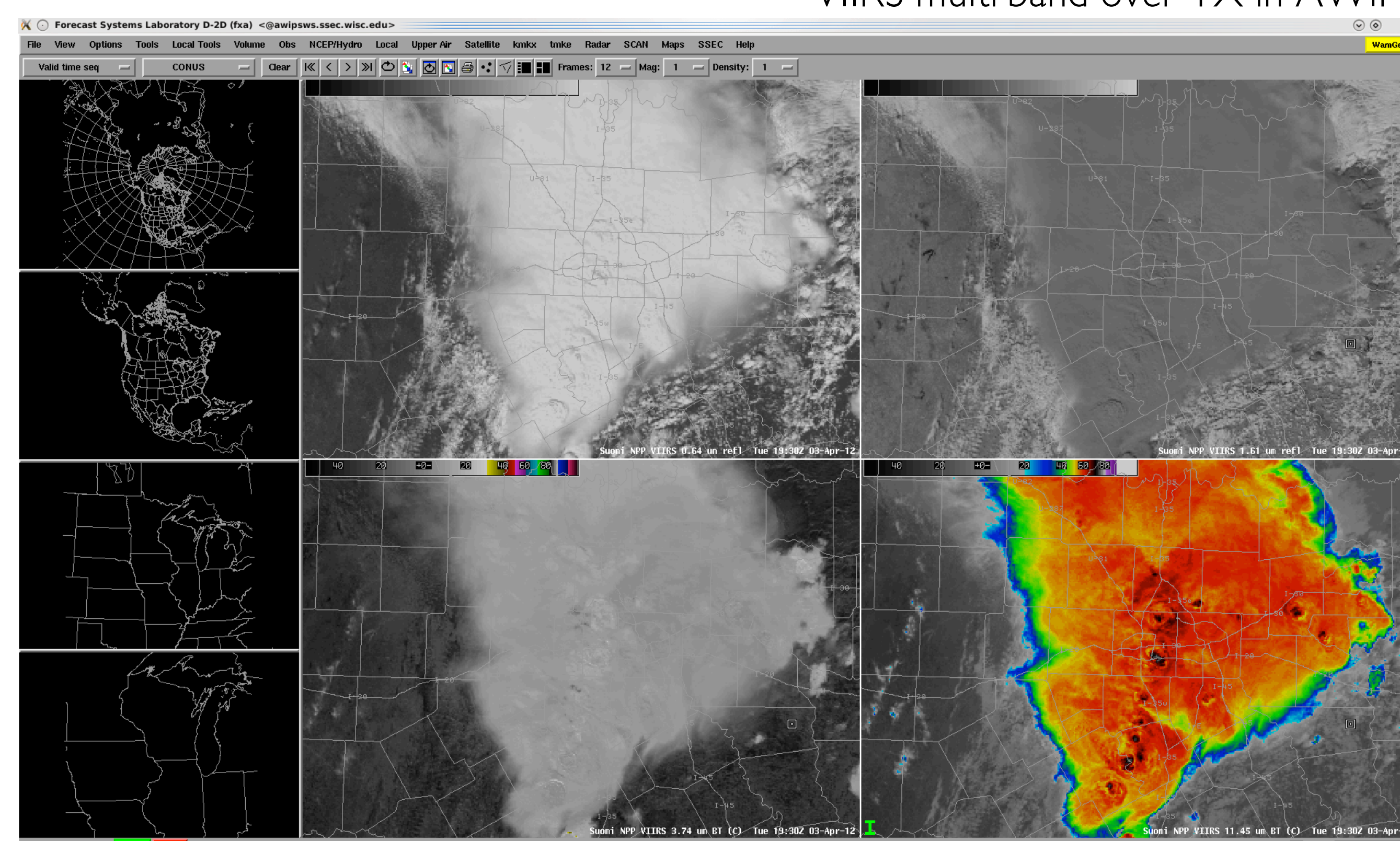
Polar2Grid Software Processing Chain

Polar2Grid is partitioned into three major segments: a FrontEnd which abstracts away the specifics of a given instrument and provides well-conditioned swaths and geolocation; a reusable transformation core using a variety of algorithms and implementations to convert swaths to grids; and a BackEnd which converts the gridded data to display ranges and exports in destination-system file formats.

Front End

Extract Swath — A series of granules are loaded and concatenated to form a rectangular data swath, geolocation, masks, and image metadata.

Preprocessing & Pseudo-bands — Pseudo-bands, slices, histogram equalization and other swath-specific enhancements are applied to create clean input.

Grid Transform

Select Grid — Geolocation extents are checked for intersections with predefined AWIPS grids, if none is explicitly chosen by the user. GeoTIFF can use extents snapped to the data.

Precompute Transform — Pre-calculation of destination grid data transforms is done for swaths using geolocation data.

Apply Transform to Band Swaths — Application of the transformation is done in parallel for swath groups sharing geolocation, resulting in a large grid-projected data matrices in flat files.

Back End

Enhancements — Post-processing enhancements such as square-root curves are applied to the gridded data, dependent on metadata including data type and channel.

Scaling & Transcoding — Rescaling to fixed-range AWIPS bytes, or other destination system specifications is done, including any format transcoding.

Examples

VIIRS multi-band over TX in AWIPS

Histogram Equalized VIIRS DNB in AWIPS
Suomi NPP VIIRS Day Night Band Wed 07:50Z 04-Apr-12
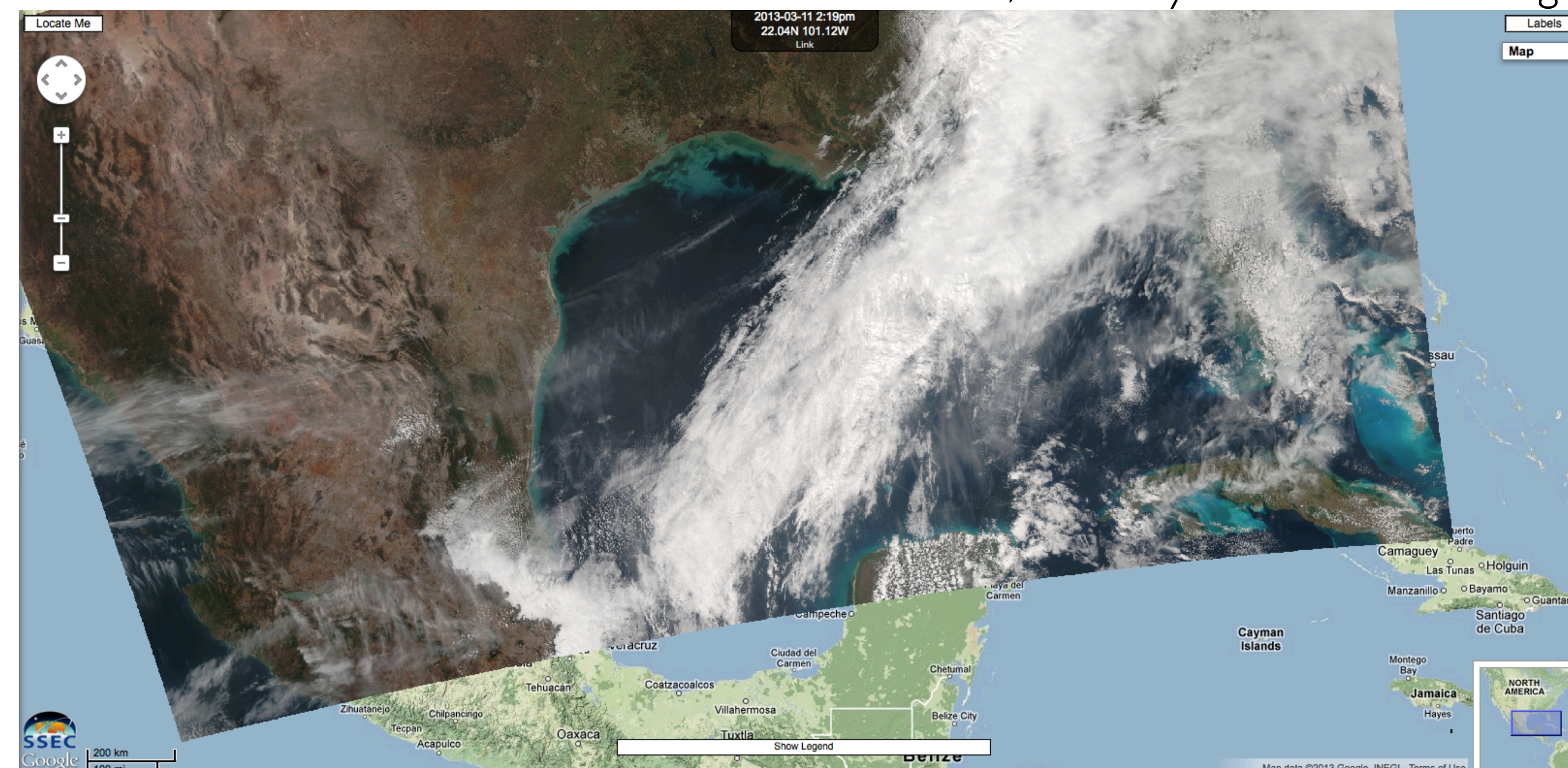

MODIS True Color CREFL in wms.ssec.wisc.edu, courtesy S. Batzli & R. Dengel
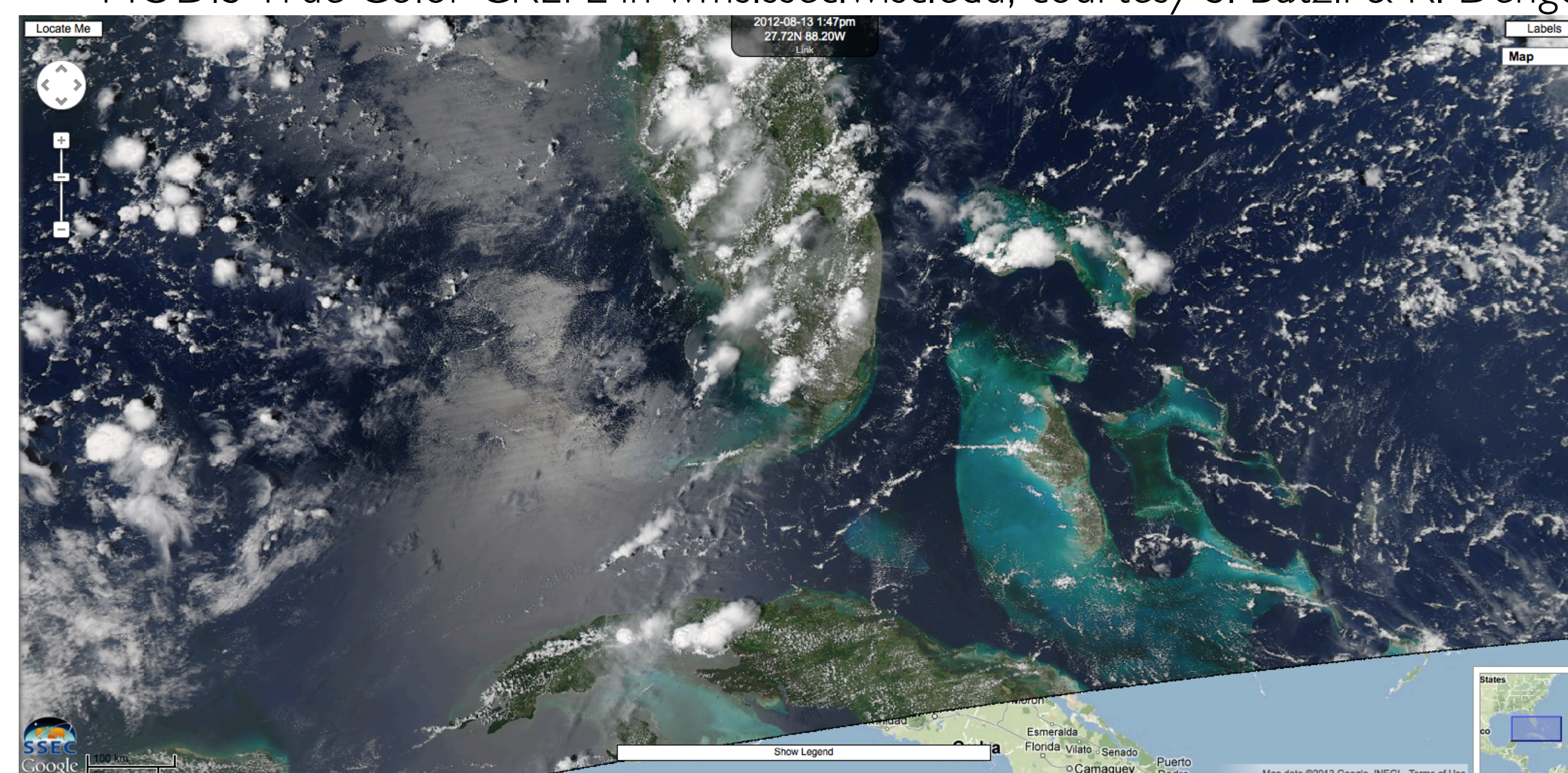
VIIRS True Color CREFL in wms.ssec.wisc.edu, courtesy S. Batzli & R. Dengel

FrontEnd & BackEnd Modules

Module	Capability	Status
VIIRS SDR Front End	VIIRS M, I, DNB with enhancements	stable
MODIS Front End	Funded by NASA, BTemp / Reflectances	stable
VIIRS CREFL Front End	Corrected Reflectance product for true-color	stable
MODIS CREFL Front End	Corrected Reflectance product for true-color	stable
CrIS SDR Front End	Brightness Temperature Slices	in development
CSPP CrIS EDR Front End	Surface parameters, T / WV layers	in development
AWIPS NetCDF Back End	NetCDF files, ready for AWIPS injection	stable
NinJo TIFF Back End	DWD contributed feature for VIIRS in NinJo	stable
GeoTIFF Back End	Export to localized GeoTIFF images	stable

Fork Polar2Grid @ GitHub!

https://github.com/davidh-ssec/polar2grid

Polar2Grid is built in the Python scripting language, using open-source software including MS2GT, GDAL, libtiff, PROJ.4, numpy, and matplotlib. Community users are welcome to download ready-to-run Linux binary bundles, or build it from scratch on their own systems. Contributors can use github to obtain the full source repository, implement and share new capabilities, and request their integration into future releases. Developer documentation is at
http://www.ssec.wisc.edu/software/polar2grid/index.html .
The ready-to-run linux binary bundle can be found at
http://cimss.ssec.wisc.edu/cspp/