Polar2Grid 2.0:
Reprojecting Satellite Data Made Easy

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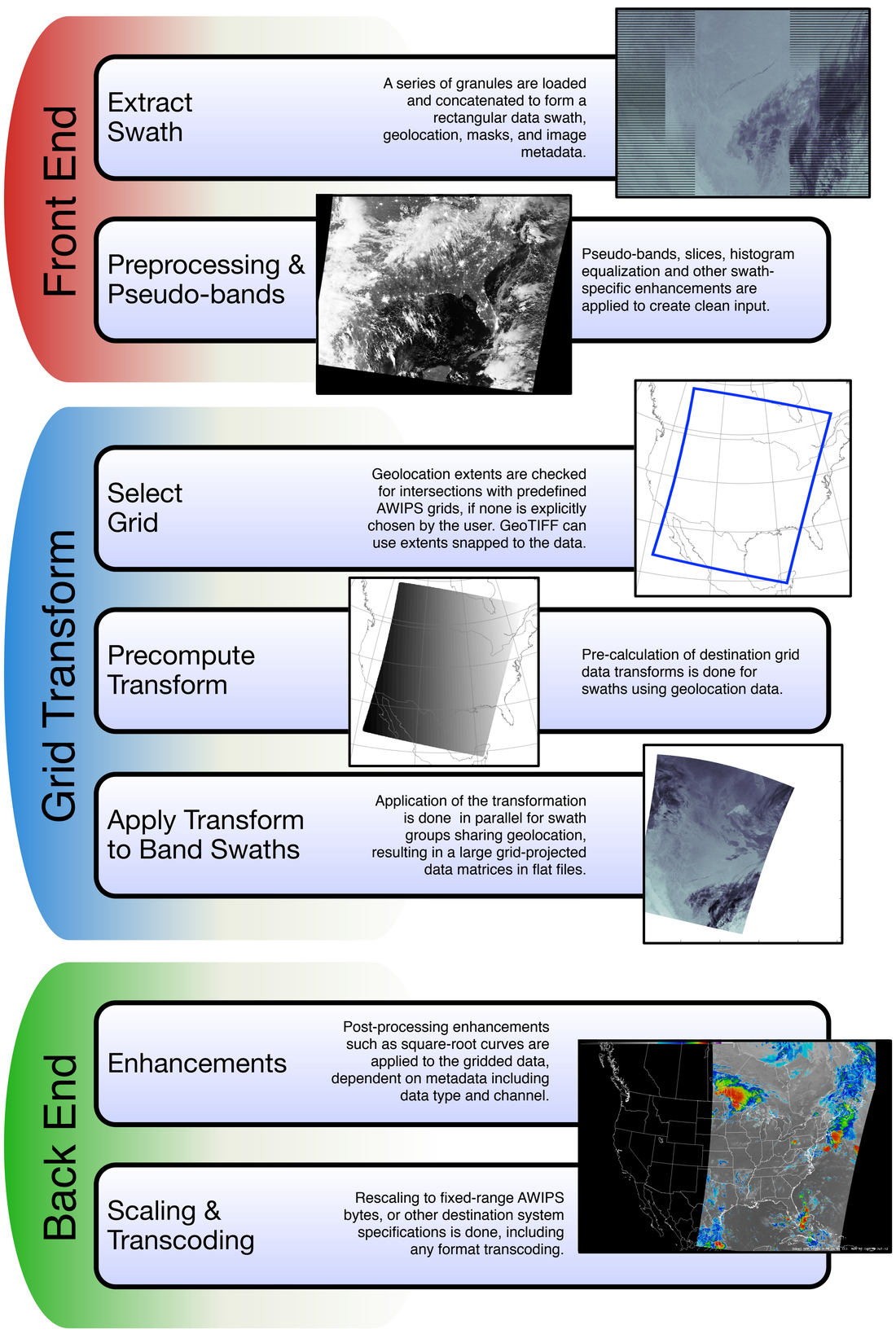
Abstract

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 various satellite products like those from VIIRS and MODIS into a variety of output formats, including GeoTIFFs, AWIPS, and NinJo forecasting workstation compatible TIFF images. In addition to traditional visible and infrared imagery, Polar2Grid includes three perceptual enhancements for products such as the VIIRS Day-Night Band (DNB), and as well as providing the capability to create sharpened true color, sharpened false color, and user-defined RGB images. Polar2Grid 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 operational forecasters at the NOAA National Weather Service (NWS) offices in their AWIPS terminals, within minutes of an overpass of the Suomi NPP satellite. Three years after Polar2Grid development started, the Polar2Grid team is now releasing version 2.0 of the software; supporting more sensors, generating more products, and providing all of its features in an easy to use command line interface.

Polar2Grid Software Processing Chain

Polar2Grid is partitioned into three major segments: a Front End 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 Back End which converts the gridded data to display ranges and exports in destination-system file formats.

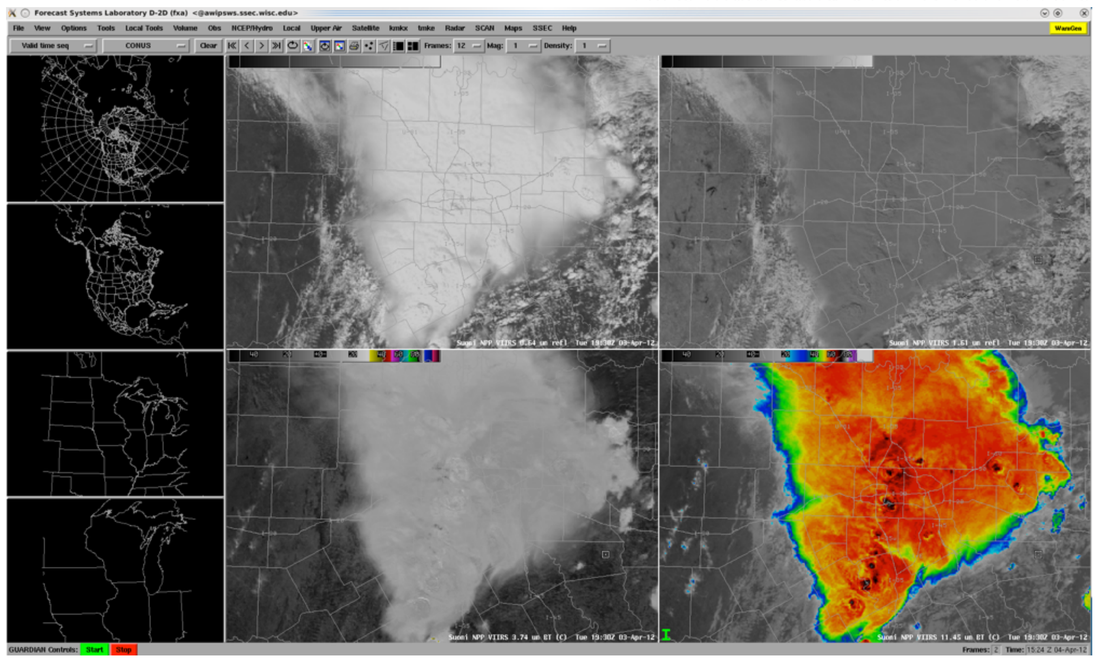


Front End & Back End Modules

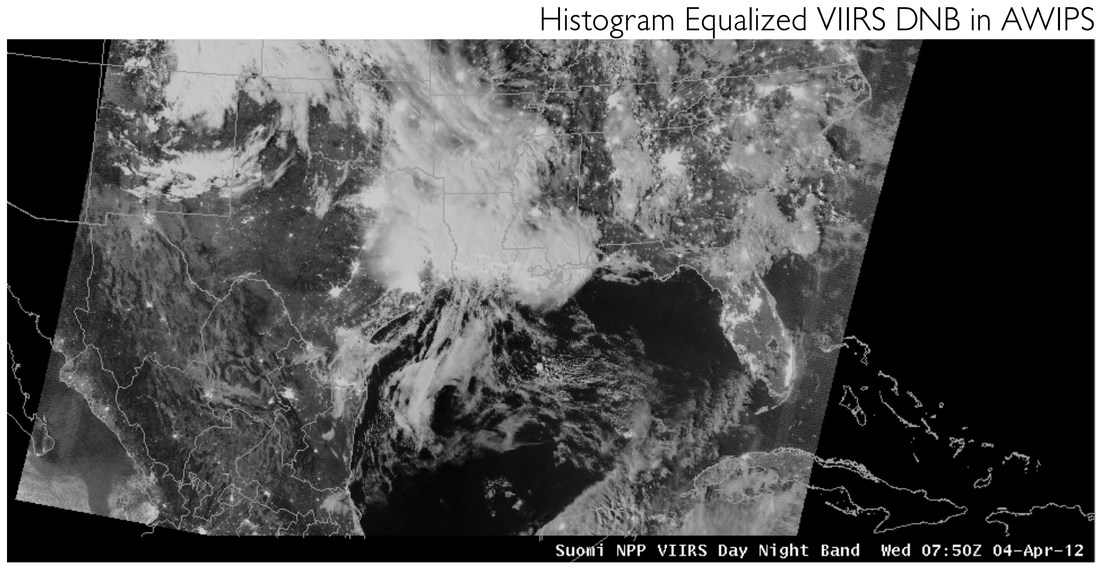
Module	Capability	Status
VIIRS SDR Front End	VIIRS M, I, DNB with enhancements	stable
MODIS Front End	Funded by NASA, BTemp / Reflectances	stable
AVHRR Front End	Band 1, 2, 3a, 3b, 4, and 5	stabe
CREFL Front End	Corrected Reflectance product for true/false color	stable
AWIPS NetCDF Back End	NetCDF files, ready for AWIPS injection	stable
NinJo TIFF Back End	DWD contributed feature for VIIRS in NinJo	stable
GeoTIFF Back End	Export to localized compressed GeoTIFF images	stable
HDF5 Back End	Export multiple datasets to compressed HDF5 file	stable
CSPP MIRS Front End	Rain rate and Brightness Temperatures	beta
CSPP ACSPO Front End	Sea Surface Temperature	beta

Examples

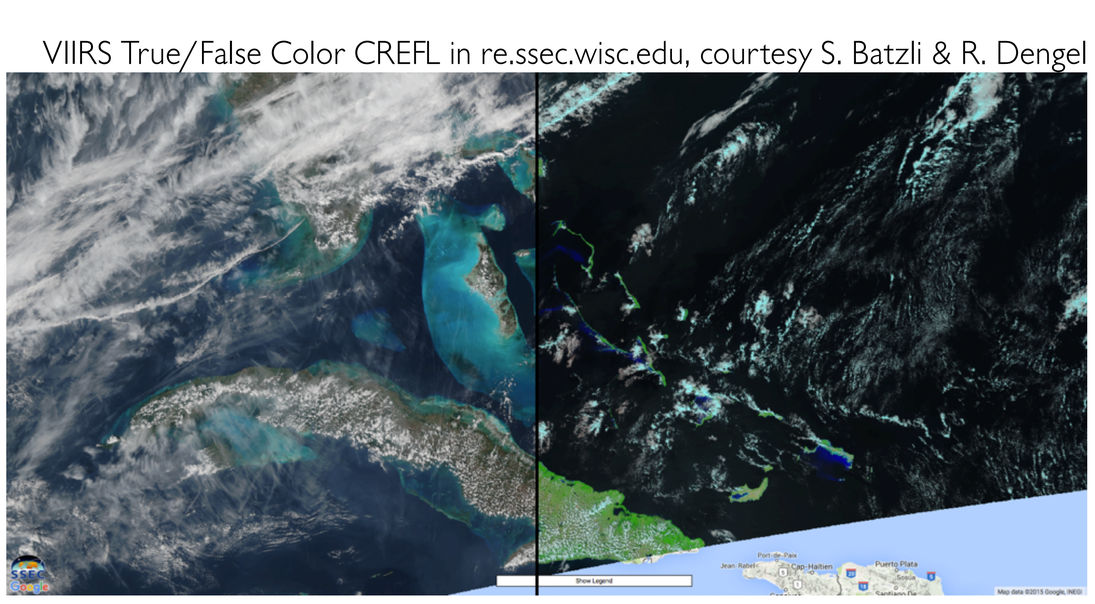
VIIRS multi-band over TX in AWIPS



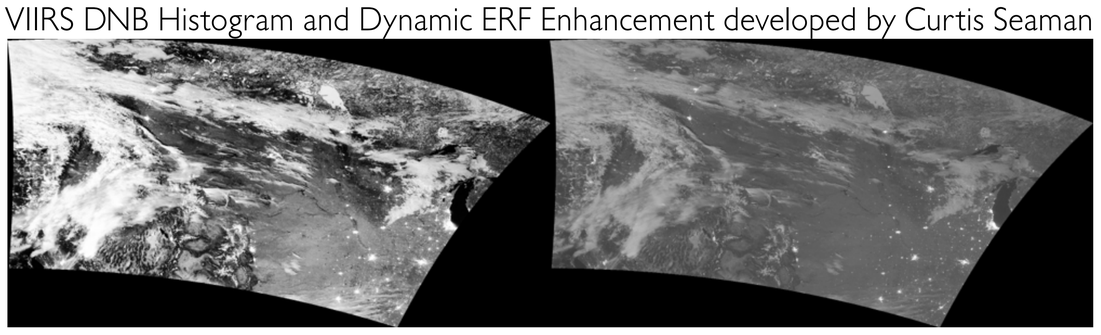
Histogram Equalized VIIRS DNB in AWIPS



VIIRS True/False Color CREFL in re.ssec.wisc.edu, courtesy S. Batzli & R. Dengel



VIIRS DNB Histogram and Dynamic ERF Enhancement developed by Curtis Seaman



Fork Polar2Grid @ GitHub!

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

Polar2Grid is built in the Python scripting language, using open-source software including GDAL, libtiff, PROJ.4, cython, 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/

Collaboration With The PyTroll Team

The Polar2Grid team is now working closely with the PyTroll team. The PyTroll group has succeeded in building a collection of open source python packages for working with satellite imagery and building a community around these tools. Our teams have realized how similar our projects are and will be combining efforts to bring the direct broadcast and satellite imagery community better tools with more features.