GeoIPS FY23 Updates and FY24 Plans

ONR Code 32 Marine Meteorology and Space: Basic and Applied Research Reviews

30 August 2023

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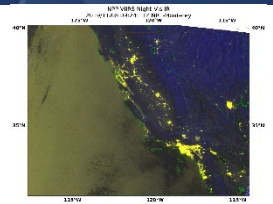
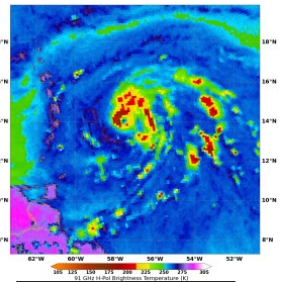
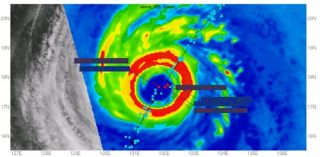
Geolocated Information Processing System



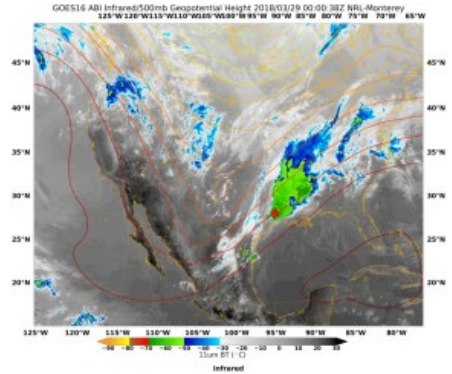
Environmental Characterization Imagery



TC Imagery



Quantitative Imagery



Data Fusion Products

Digital Satellite Products

GeoIPS®

Further Development

Transition and Open Source

Research Partners (e.g. university)

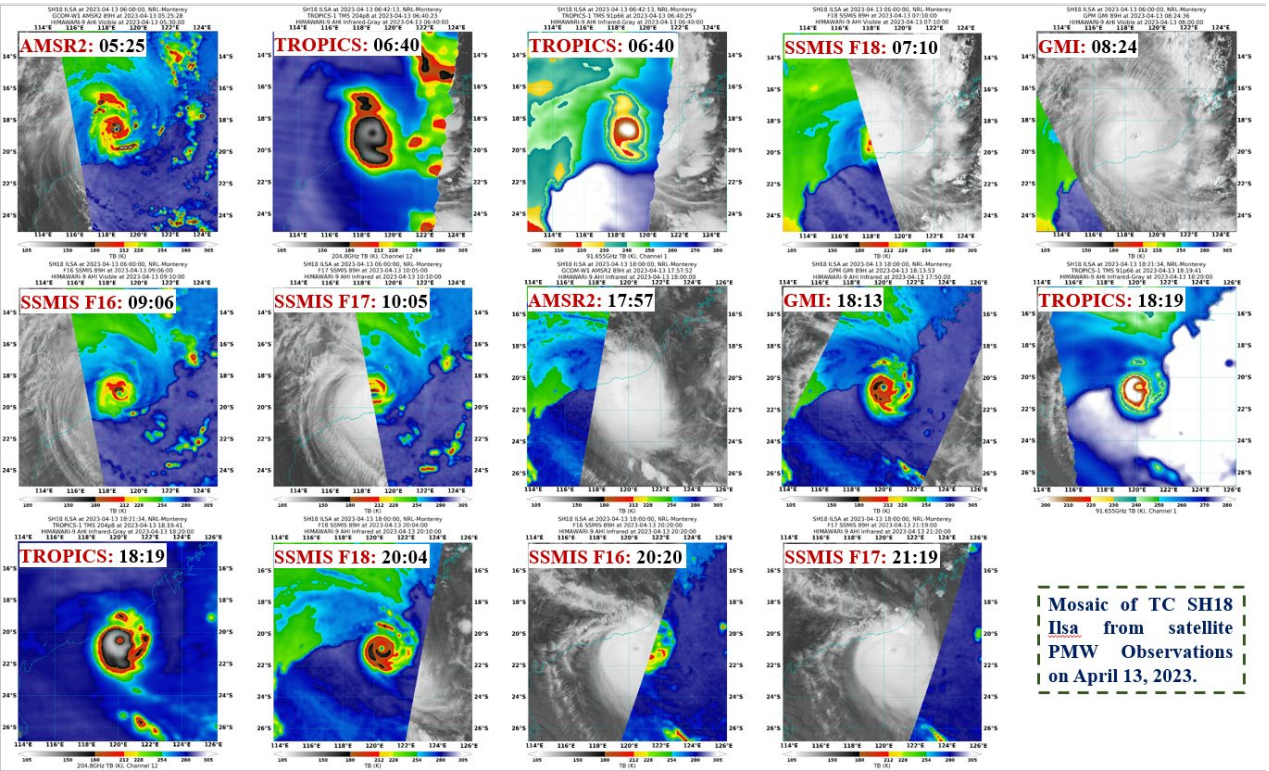
Operational Partners

Feedback

Geospatial Data

Satellite, Numerical Model, etc.

GeoIPS Functionality Updates: TROPICS Processing



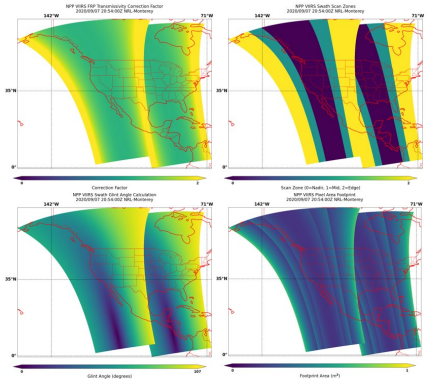
- TROPICS imagery available publicly.
- Tuning efforts ongoing to optimize colorbar and interpolation selection.
- GeoIPS TROPICS repo approved to share with collaborators – discussing implementing MIT-LL developed interpolation routines within GeoIPS TROPICS processing.
- Coordinating with MIT-LL and SSEC for setting up AWIPS2 L1B data stream for JTWC

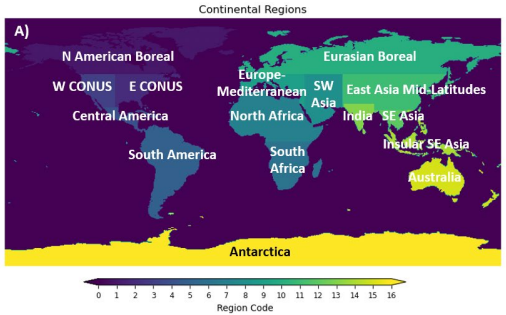
GeoIPS Functionality Updates: Generic QA/QC in GeoIPS

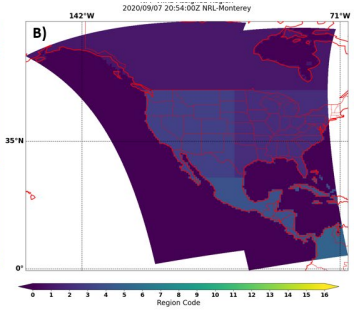
- Navy has operational processing streams that leverage L2 products:
  - FLAMBE and NAAPS-OBSNEW
  - Mainly suited for observations from polar orbiting platforms
    - Dependent on MODIS
  - Geostationary products can help fill spatial and temporal gap
- Develop generalized quality assurance/quality check modules in GeoIPS that can be leveraged by FLAMBE and OBSNEW processing
  - Need to account for varying sensitivity among sensors
  - Consistency between collocated observations in the final product
- Using L2 fire products (fire radiative power – FRP) to drive development

GeoIPS Functionality Updates: QAQC Components

- Implemented algorithm that is capable of running multiple QAQC modules on a dataset before being passed to fire weighting algorithm
  - Observation quality and threshold filtering
  - Transmissivity correction
  - Pixel size sensitivity correction
  - Sensed clear land
  - Glint angle filtering
  - Persistent thermal anomaly filtering
- Additional modules:
  - Scan zone
  - Land regions
    - Provides ability to apply regions specific correction values

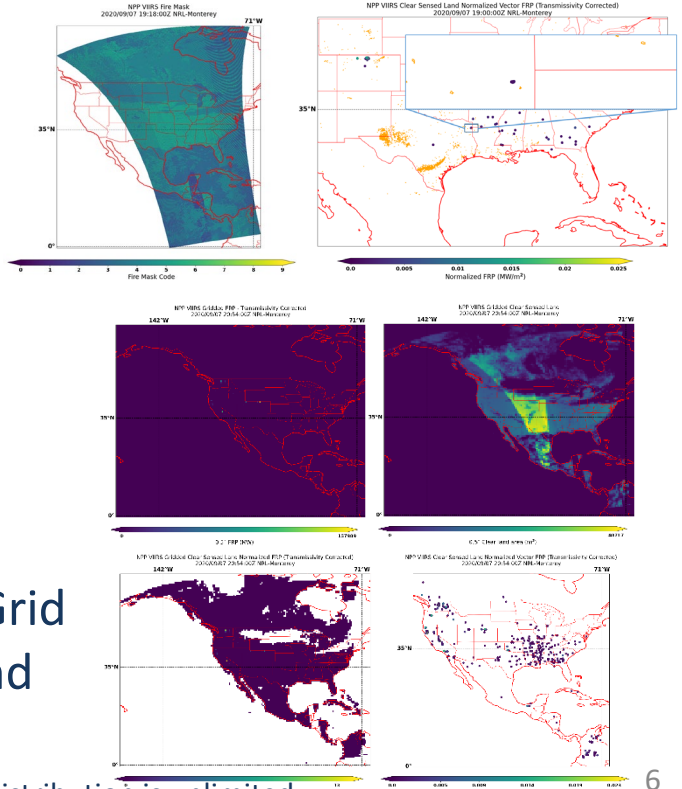






GeoIPS Functionality Updates: QAQC Merging Weights Procedure

- Filter 1D FRP by observation quality and glint angle
  - Observation quality extracted from 2D Fire Mask
- Check FRP retrievals against known persistent thermal anomalies
  - Compare to KMZ database
- Run QAQC modules that calculate:
  - Pixel footprint size, correction multipliers, sensed clear-land
- Calculate merging weights
  - Apply transmissivity corrections
  - Bin corrected FRP and sensed-clear land to 0.5° Grid
  - Normalize binned FRP by binned sensed clear-land
  - Map gridded values back to 1D retrievals



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GeoIPS Functionality Updates: QAQC Remaining Steps

- Finalize procedure for producing merging weights for geostationary FRP retrievals
- Expand temporal aggregation window
  - FLAMBE requires 24hours for VIIRS, 1hour for GOES
- Develop ASCII hourly output formatter
  - Hourly file holding aggregated QAQC'd L2 retrievals
  - Can be leveraged by both FLAMBE and NAAPS-OBSNEW (AOD) processing
- Implement bit-packed QC field unpacking module

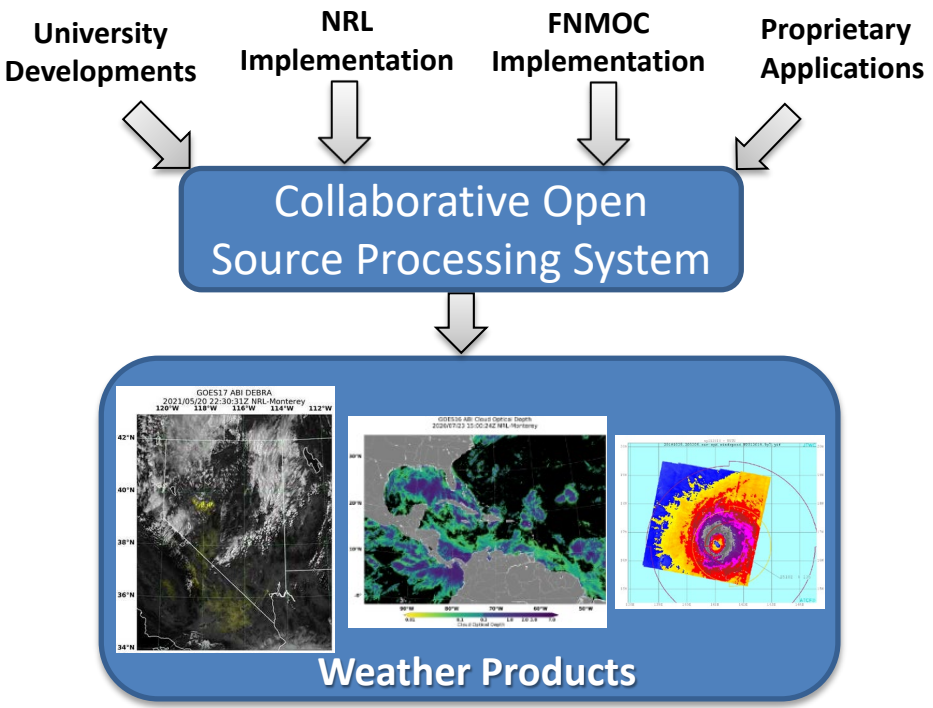
GeoIPS Collaborations High Level Goals

Lowering barriers to entry
- Improved documentation
- Simplified installation
- More plugin and usage examples

Standardized plugin infrastructure
- Common metadata for all plugins
- Common methods of operation
- Plugin Validation

Improved development process
- Integration tests
- Unit tests
- Usable in Continuous Integration
- Enforced code standards
- Updated software release process

Improved CLI



GeoIPS® Open Source Release Cycle

External University Collaborators

Retrieve Latest Updates

↓

Develop Open Source Contributions

2023 GeoIPS® releases include primarily TC-specific capabilities, to fulfill FNMOC transition requirements

GeoIPS® v1.6 Dec 2022, data fusion support

GeoIPS® v1.8 Feb 2023, module-based interfaces

GeoIPS® v1.9 Apr 2023, documentation build

GeoIPS® v1.10 May 2023, YAML-based interfaces

GeoIPS® v1.11 Aug 2023

- In conjunction with GeoIPS workshop – streamlined installation and testing

GeoIPS® v1.12/v1.13 expected Sept 2023 – finalized post-workshop updates

GeoIPS® v2.0/v2.1 expected Oct 2023 – finalized interfaces, backwards compatible going forward. In conjunction with FNMOC transition.

Open Source GeoIPS®

Internal Navy Development

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Quarterly Open Source Releases of New Functionality

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Quarterly integration of community developed functionality

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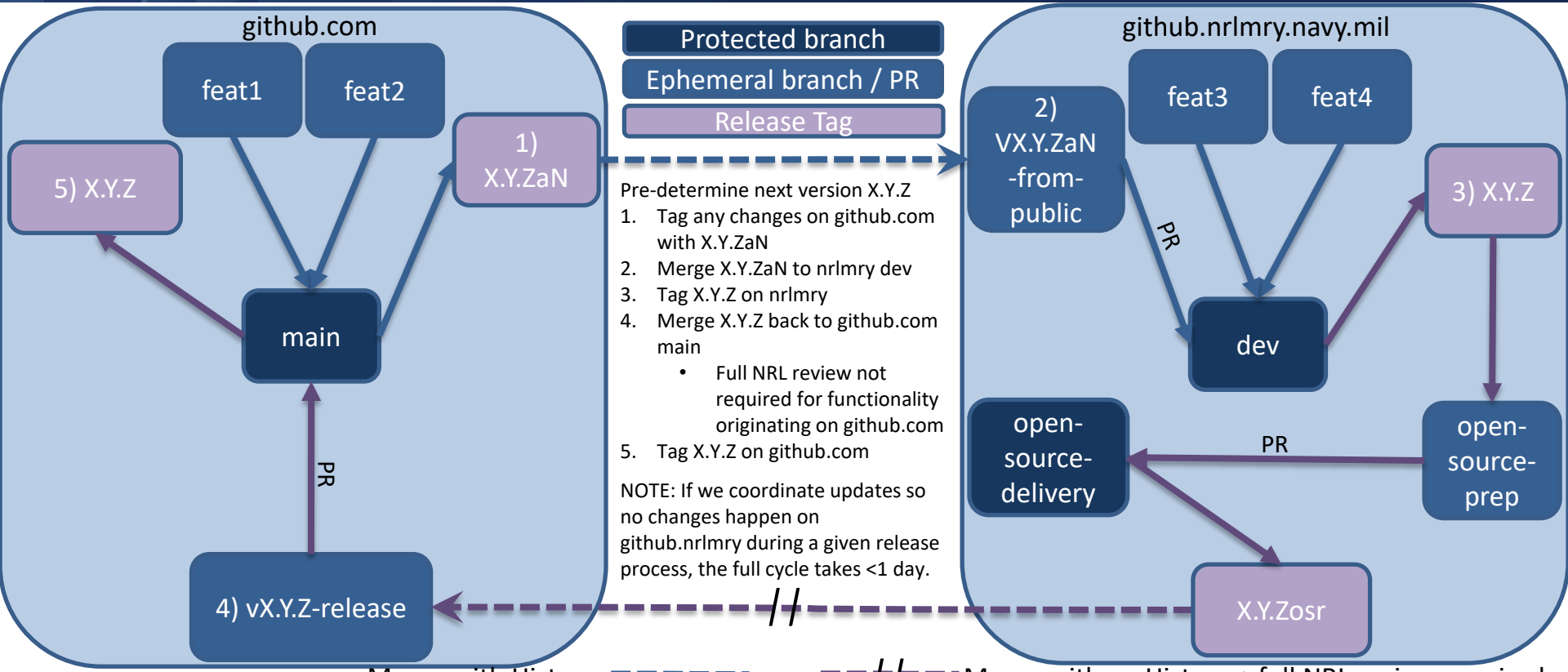
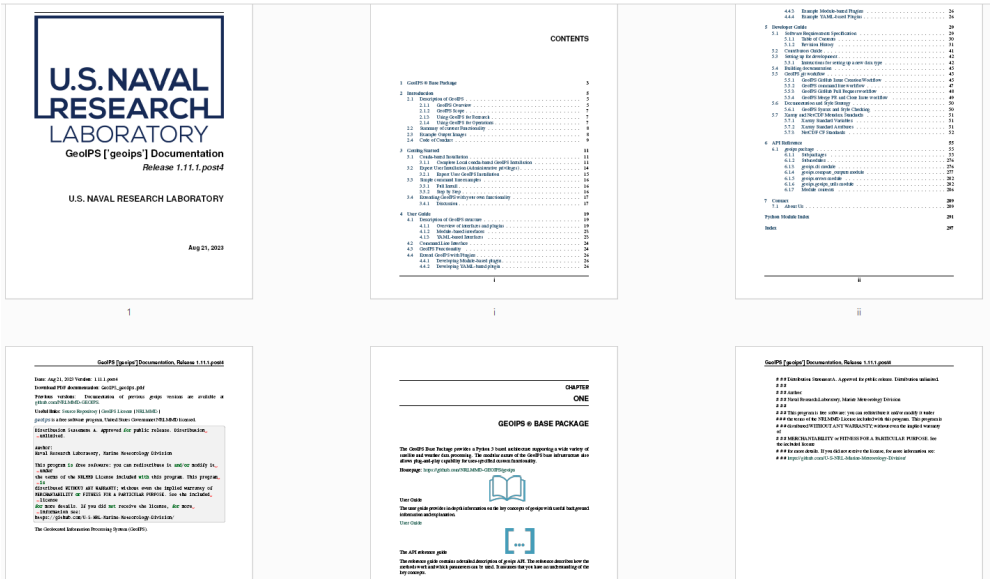
GeoIPS® Release and Update Process



GeoIPS® Documentation Build

- Sphinx based documentation build process
- Can be called on any GeoIPS plugin that contains a properly formatted documentation directory.
- Creates consistent looking documentation across the GeoIPS ecosystem.
- Builds both html and pdf outputs.
- Integrated within the test environment to ensure valid formatting / structure.

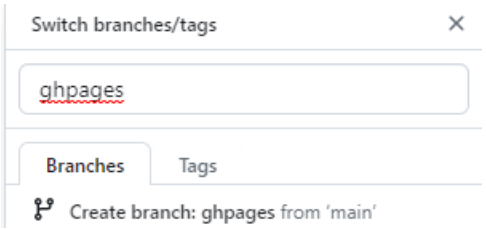


PDF Documentation Output

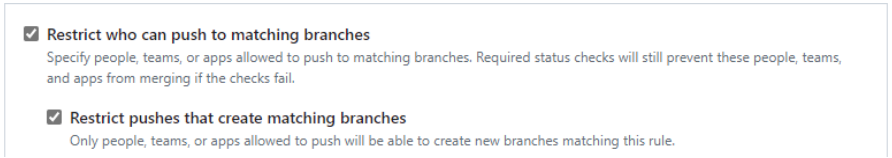
- `$GEOIPS_PATH/docs/build_docs.sh $GEOIPS_PATH geoips`
- `$GEOIPS_PATH/docs/build_docs.sh $DATA_FUSION_PATH data_fusion`

GeoIPS® Documentation Hosting

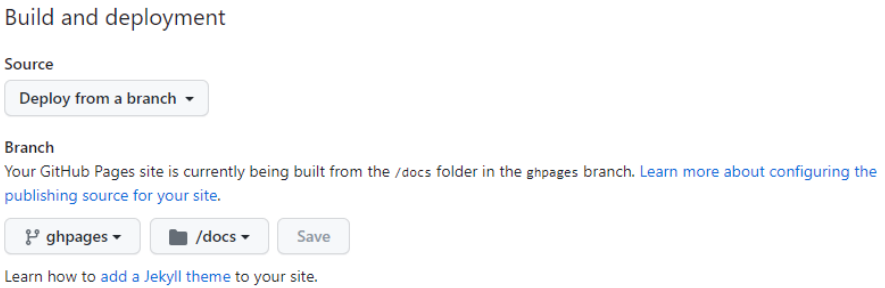
- Documentation hosted on GitHub Pages.
- Script-based deployment
- Currently setting up within GitHub Actions to automate the documentation build and deployment with every version release.



1. Create the ‘ghpages’ branch



2. Protect the ‘ghpages’ branch



3. Select ‘ghpages’ as the deployment branch

- `$GEOIPS_PATH/docs/deploy_pages.sh $GEOIPS_PATH`
- `$GEOIPS_PATH/docs/deploy_pages.sh $DATA_FUSION_PATH`

4. Deploy documentation to GitHub pages

GeoIPS® Documentation Examples

https://nrlmmd-geoips.github.io/geoips/index.html

Introduction Getting Started User Guide Developer Guide API Reference More

GeoIPS ® geoips Documentation

Date: Aug 21, 2023 **Version**: 1.11.1.post4

Download PDF documentation: `GeoIPS_geoips.pdf`

Previous versions: Documentation of previous geoips versions are available at github.com/

Useful links: Source Repository | GeoIPS License | NRLMMD |

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```
Distribution Statement A. Approved for public release. Distribution unlimited.

Author:
Naval Research Laboratory, Marine Meteorology Division

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https://github.com/U-S-NRL-Marine-Meteorology-Division/
```

The Geolocated Information Processing System (GeoIPS).

GeoIPS ® Base Package

The GeoIPS Base Package provides a Python 3 based architecture supporting a wide variety processing. The modular nature of the GeoIPS base infrastructure also allows plug-and-play custom functionality.

Homepage: NRLMMD-GEOIPS/geoips

https://nrlmmd-geoips.github.io/data_fusion/

Introduction User Guide API Reference Release Notes Contact

GeoIPS ® data_fusion Documentation

Date: Aug 21, 2023 **Version**: 1.11.1.post4

Download PDF documentation: `GeoIPS_data_fusion.pdf`

Previous versions: Documentation of previous data_fusion versions are available at github.com/NRLMMD-GEOIPS.

Useful links: Source Repository | GeoIPS License | NRLMMD |

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```
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Author:
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```

The GeoIPS ® data_fusion Package provides a Python 3 plugin to GeoIPS.

The data_fusion plugin provides the capability for including an arbitrary number of data types within a single product or algorithm.

User Guide

The API reference guide

Code Standards

Documentation and Style Strategy

GeoIPS uses Sphinx with the Napoleon extension for automated documentation generation.

https://www.sphinx-doc.org/en/master/usage/extensions/napoleon.html

The **geoips/docs** directory contains high level restructured text (rst) format documentation (including this page), along with a **build_docs.sh** script that will setup sphinx and build complete documentation from the high level rst files as well as docstrings contained within the GeoIPS source code.

GeoIPS Syntax and Style Checking

GeoIPS uses the NumPy docstring format within the code base for simplicity:

https://numpydoc.readthedocs.io/en/latest/format.html

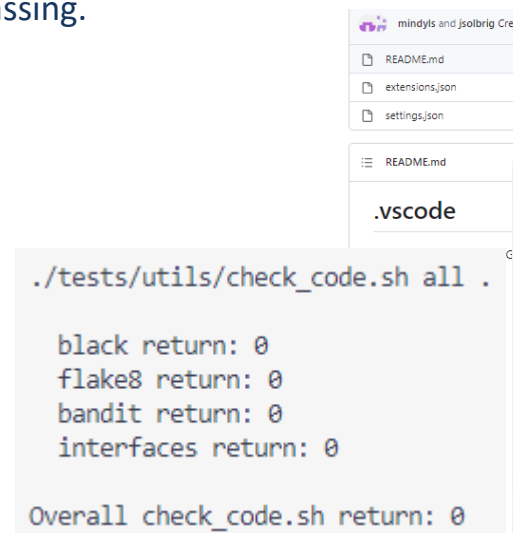
bandit, flake8, and black are used to enforce appropriate style, security, and syntax usage. flake8-rst and flake8-rst-docstring plugins are used to enforce numpy docstring formatting. Sphinx is used to validate the formatting and syntax within RST files themselves.

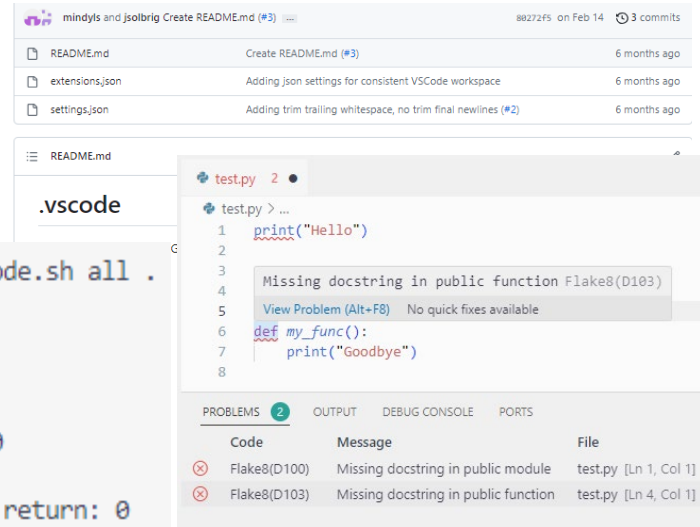
All branches must pass the `geoips/tests/utils/check_code.sh` script prior to any Pull Requests being approved and merged. Please ensure this script has a successful 0 return as you develop code within the GeoIPS Ecosystem to expedite the review and approval process.

VSCode plugins are also available to provide automated syntax checking and highlighting:

NRLMMD-GEOIPS/.vscode

- Provide details of style and documentation requirements in documentation
- Tools within VSCode and command line scripts to ensure compliant development.
- Currently developing GitHub Actions to automate the code evaluation process – no Pull Requests can be merged without code checks passing.





FY24 Plans

REMINDER! If you are attending the workshop this week, please pre-install geoips and geoips_clavrx! Let us know if you have any questions/issues!

Set up real-time processing infrastructure for global multi-sensor processing capability
- Will support real-time testing of OVERCAST products

Make better use of satpy functionality within GeoIPS
- Will support ProxyVis and other satpy-based algorithms

Continue supporting external plugin integrations, as time permits
- OCTANE
- CLAVR-x
- AWIPS outputs
- TC Products
- Machine Learning based plugins

Continue supporting weekly meetings, workshops, tutorials, etc.