# GeoIPS: An Open Source Tool for Geolocated Data Analysis

Gwyn Uttmark, Jeremy Solbrig, Evan Rose, Kumar Gampa, Melinda Surratt, Christopher Camacho, Christopher Selman, Andrew Thorpe, and Lance Wilson
Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University
U.S. Naval Research Laboratory

## Introduction

This poster is about why you – a scientist or operational deployer – might want to use GeoIPS.

**GeoIPS** is 17 years old.It is run operationally by the US Navy and supports NRL's TC Web and NexSat webpages with near real-time data products and imagery.

It is **Python-based** and recently became **open source.** Reusable plugins can contain code inlanguages such as Python, Fortran, Rust, C and C++ as well as frameworks such as PyTorch and TensorFlow.

## A Scientific Toolkit

GeoIPS provides **built-in readers, interpolators** and **other plugins** and supports data from active and passive sensors in both GEO and LEO orbits as well as model data.

Reading GOES, Himawari, VIIRS, or EarthCARE data is as simple as importing the reader and providing a path to your files in a python script.

```python
# Import glob for file handling
import glob

# Import from GeoIPS
from geoips.interfaces import readers, sectors

# Load the ABI Reader
abi_reader = readers.get_plugin("abi_netcdf")

# Load the CONUS Sector
conus = sectors.get_plugin("conus")

# Read ABI Reader
xarray_abi_data = abi_reader(glob("/path/to/files"),
                        area_def=conus.area_definition,
                        chans=["B01Ref", "B02Ref", "B03Ref"]
                       )
```

**GeoIPS** (Geolocated Information Processing System) is a **Python-based**, **open source** framework for geolocated data analysis and exploration.

It is easy to use, provides **built-in readers, interpolators** and more, and helps you **transition algorithms to real-world operations**.

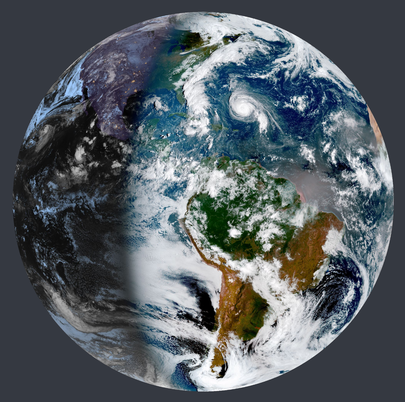


Fig 1. GeoColor as produced by GeoIPS. GOES-18, 2025-07-03

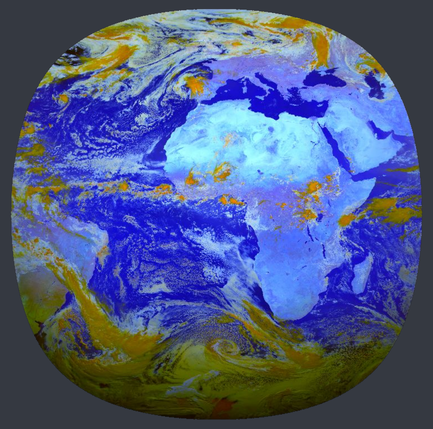


Fig 2. Day Solar as produced by GeoIPS. MSG-3, 2025-06-24

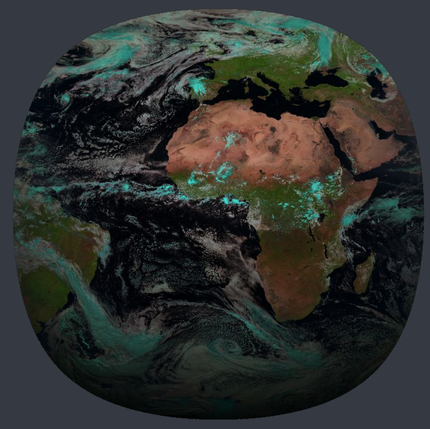


Fig 3. Natural Color as produced by GeoIPS. MSG-3, 2025-06-24

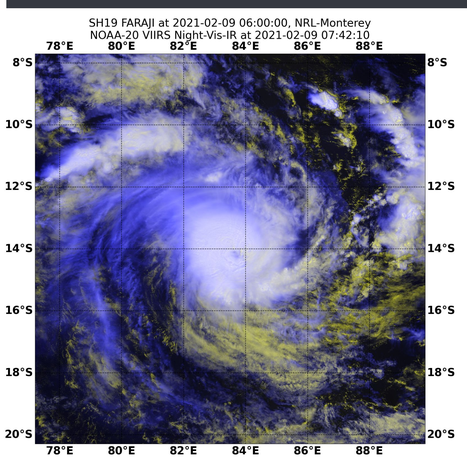



Fig 4. Night-Vis-IR from NOAA-20 VIIRS, 2021-02-09

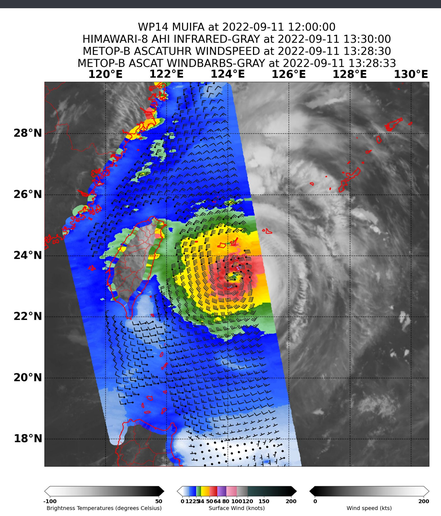



Fig 5. Layered Winds via GeoIPS. TC 2022 WP14 Muifa, 2022-09-11

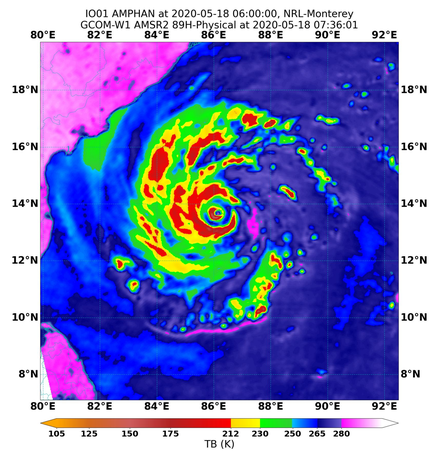



Fig 6. 89H-Physical via GeoIPS, Tropical Cyclone IO01, 05-18-2020

## Traversing the Valley of Death

GeoIPS helps you **transition algorithms to real-world operations.** Since algorithms (and more) are implemented as isolated plugins, operational partners can run your code via GeoIPS. Operational centers can mix-and-match data sources, and can define a YAML pipeline of multiple algorithms without further input from the developer.

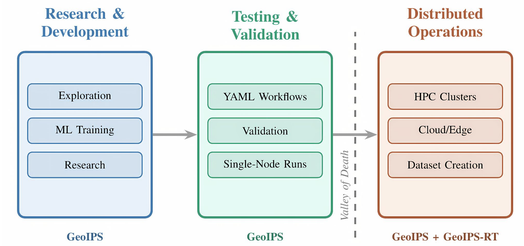



Fig 7. GeoIPS is a tool from research to deployment

## Configuration-based operation

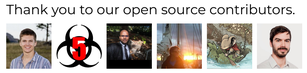
GeoIPS processing workflows are fully configurable through YAML-based processing workflow (procflow) configuration files. These YAML files allow users to specify complete processing chains - readers, algorithms, output formatters and validation - without modifying source code. Operational centers can easily customize workflows by selecting different plugins for each processing step. These procflows are designed to follow common conventions in distributed computing.

## Dynamic Sectoring

GeoIPS supports dynamic sectoring. For example, best track files can automatically center imagery on tropical cyclones or other mobile storm features.

Scan this QR Code to download a copy of this poster and visit the GeoIPS GitHub repository.

Thank you to our open source contributors.



Connecting Models and Observations

This work is sponsored by grant number N000142512067 with the United States Office of Naval Research.