

Plugin for Opening and Georeferencing NEON Hyperspectral Data in QGIS

Introduction

NEON Hyperspectral Data

The remote sensing data collected by NEON will provide valuable insight about changes in our world's ecosystems. One sensor integral to the airborne payload, the NEON Imaging Spectrometer (NIS), collects hyperspectral data distributed along 426 spectral bands, each with a 5 nm spectral resolution. (Figure 1)

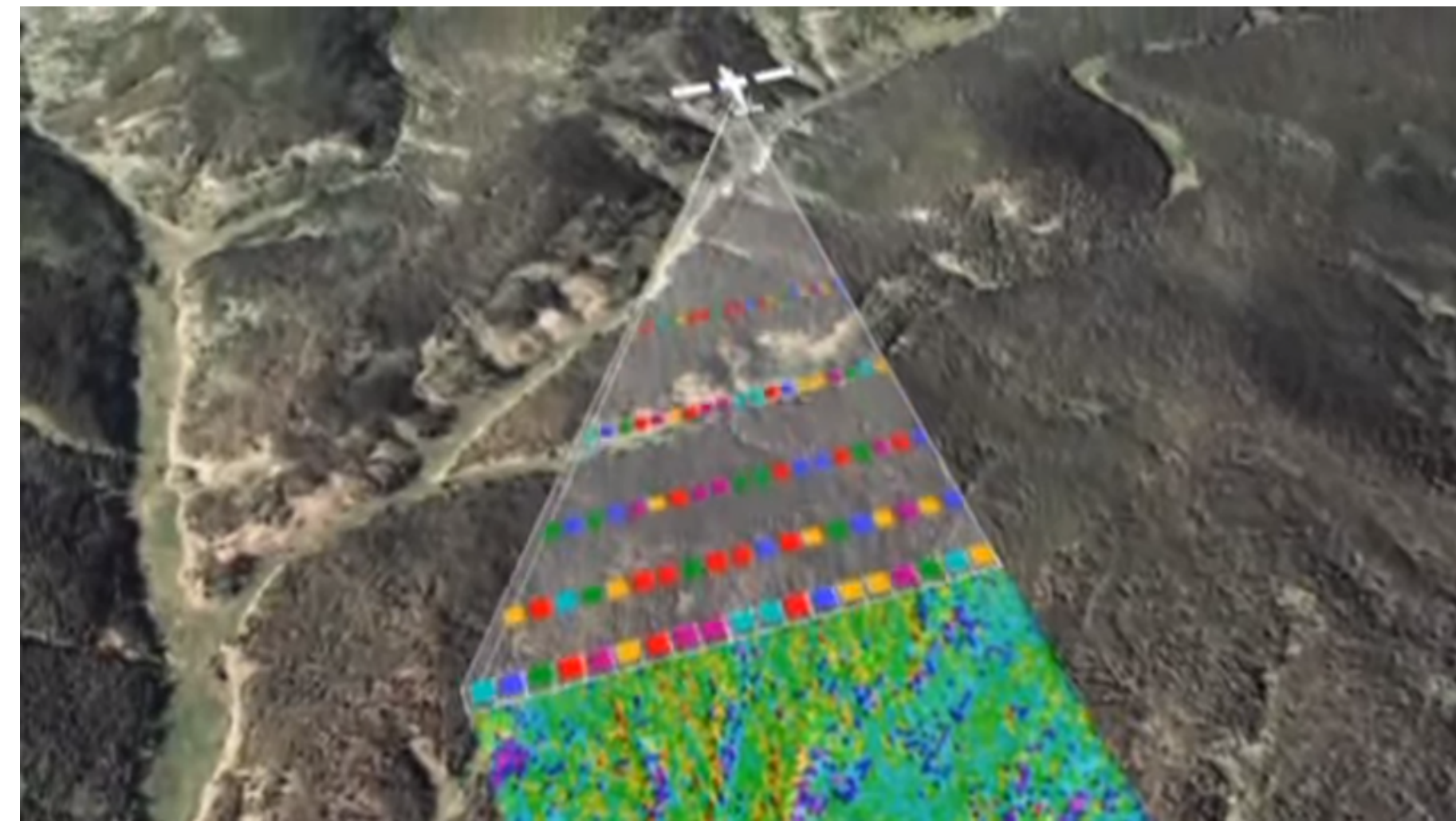


Figure 1. Hyperspectral Data Collection

Data Distribution

The distribution of NEON hyperspectral data is challenging because of its large size and logistics of including metadata in a user-friendly and understandable file format. To ease the process, data is stored in HDF5 files. (Figure 2)

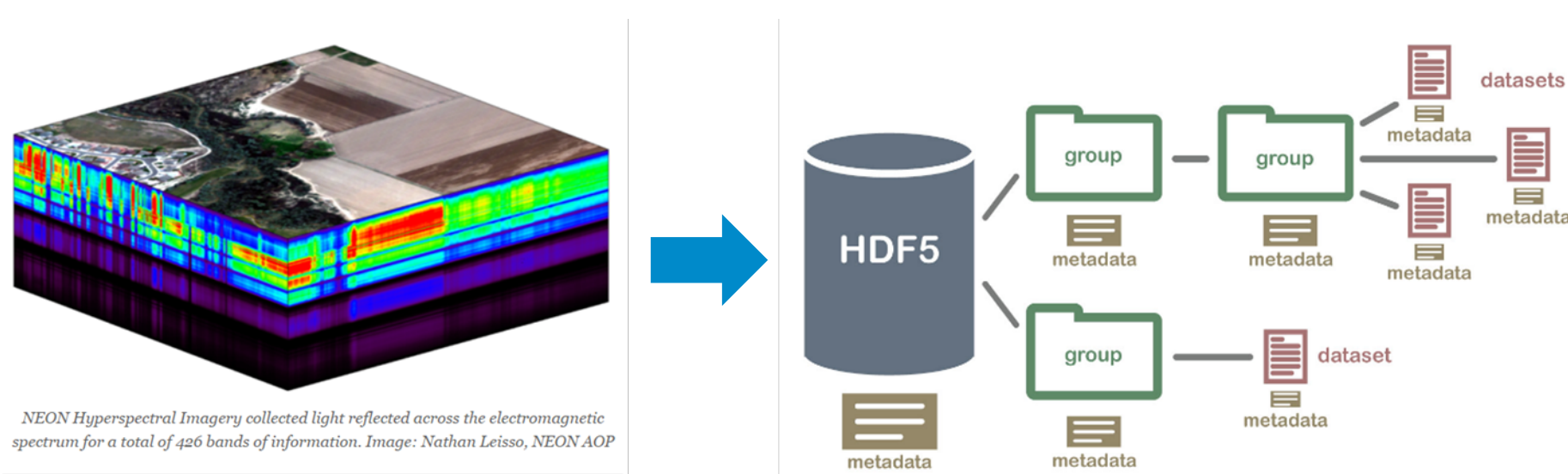
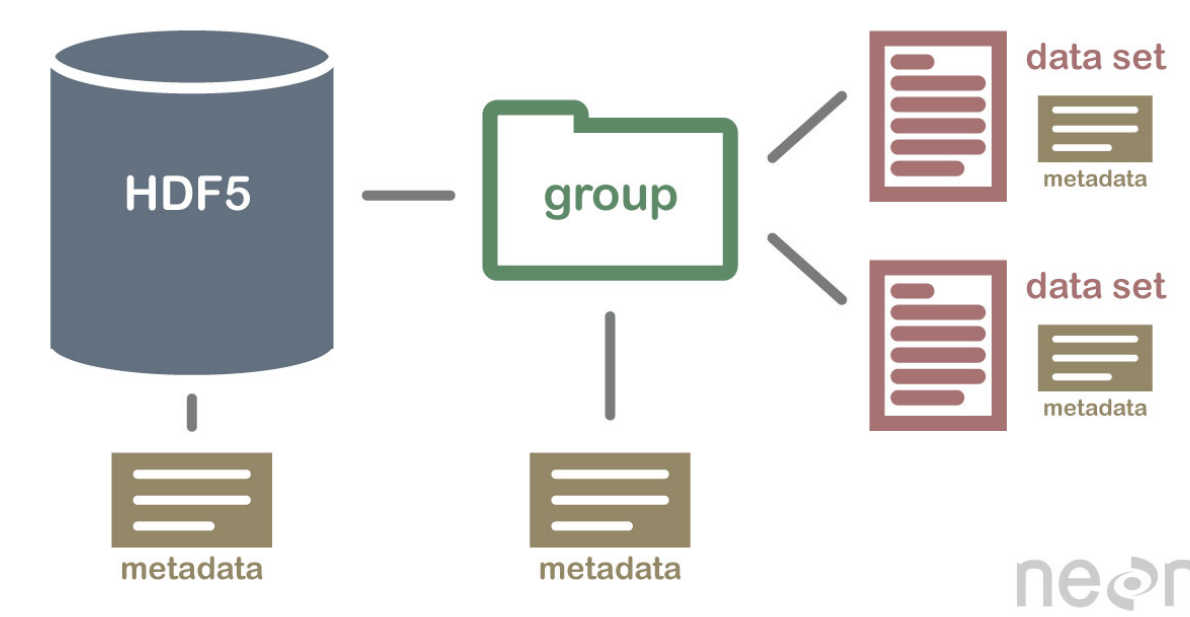


Figure 2. NEON Hyperspectral Data is Stored in HDF5 Files

Need for a Software Tool to Read Data

Since there has been no standardization for writing the internal structure of HDF5 files, available software tools do not have the built-in functionality to properly read data stored inside them. Researchers need a freely available, ready-to-use, and accessible software tool capable of managing NEON Hyperspectral Data. A plugin for the open-source GIS software package called QGIS constitutes such a needed tool.

HDF5 File Format



HDF5 files are useful for storing and organizing big data sets hierarchically. Additionally, metadata files can be embedded directly into the file structure.

One notable trade-off to storing data in HDF5 files is the lack of agreement between both research and commercial groups to set a standardized internal file structure. Any attempt to store data in custom HDF5 files must necessarily entail building an accompanying reader to access the data because available software tools, such as QGIS, are unprepared to manage the files.

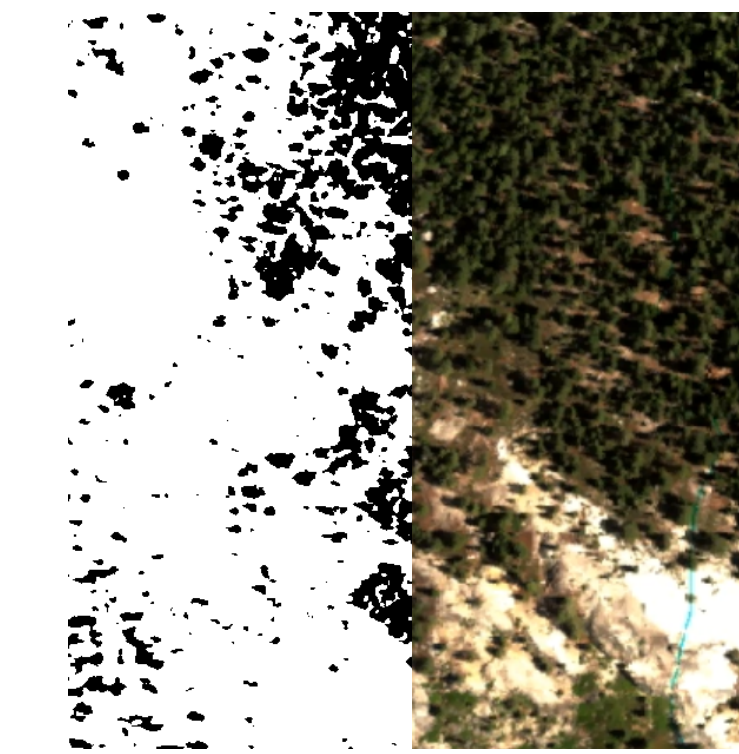
Quantum GIS



Quantum Geographic Information System (QGIS) is a free and open source software package for analyzing geographically explicit data.

QGIS supports the addition of new functionality through plugin development. Both C++ and Python can be used to create a new plugin. We worked on writing a Python plugin that would open NEON Hyperspectral Data with proper georeferencing information, a key feature absent in the program's default capacity.

Georeferencing



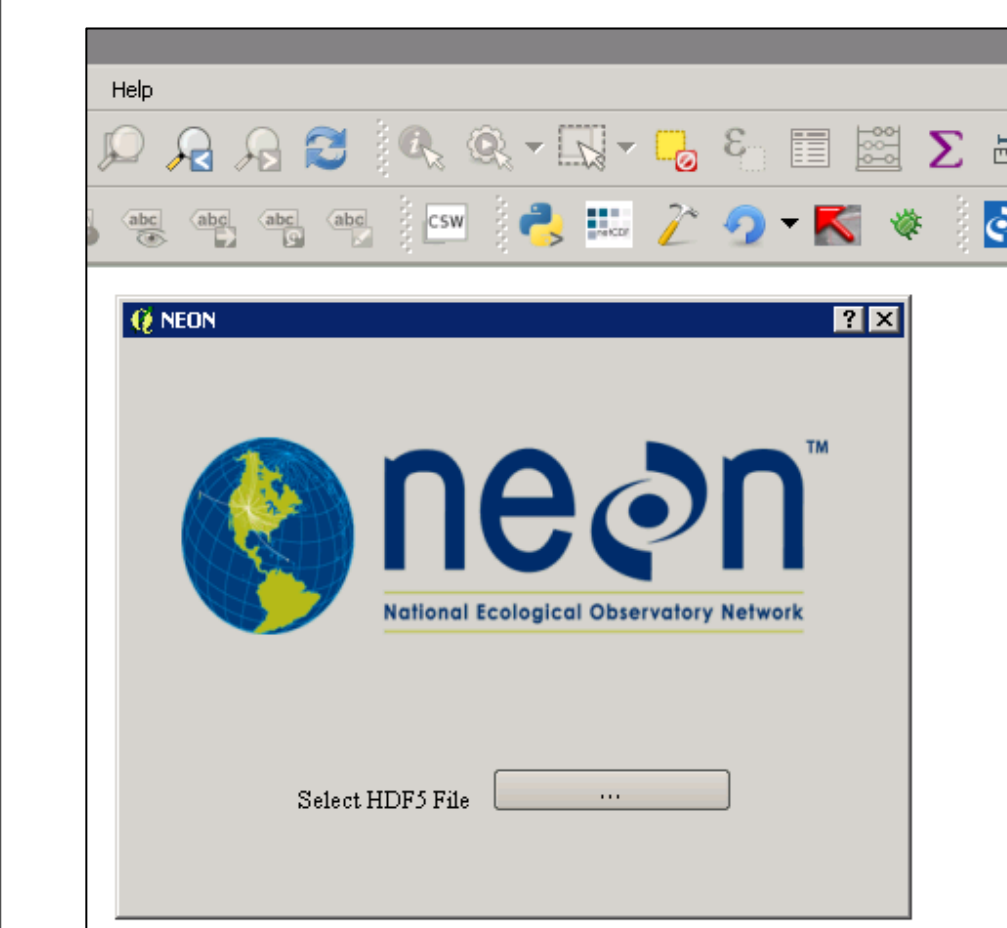
Georeferencing refers to the act of aligning geographic data to a defined coordinate reference system (CRS) so it can be viewed, queried, and analyzed with other geographic data. This action may involve shifting, rotating, scaling, skewing, and in some cases warping, rubber sheeting, or orthorectifying the data.

For this project we focused on loading data in the proper CRS and displaying it in the proper coordinates corresponding with the collection site.

Current QGIS Functionality

Data from San Joaquin Experimental Range should load inside California. This is a consequence of improper georeferencing which hinders analyses with other data sets.

Preliminary Plugin Capability



Plugin Graphic User Interface (GUI)

Currently, the plugin opens, sets proper CRS of NEON Hyperspectral Data, and displays it in the QGIS Map Canvas.

Accomplishments:

- Prompt user to select HDF5 file in directory
- Open any data set in HDF5 file
- Set proper RGB (red, green, and blue) bands
- Set proper CRS

Future Work:

Two important requirements remain unresolved for publishing the plugin through the Official QGIS Plugin Repository. The first is shutting off a misleading error message that appears when loading data through the plugin. The second, and most important, is translating the data to the proper location within the desired map projection.

Later revised versions could expand the basic capability of the plugin by incorporating NEON LiDAR data, providing support for multiple and simultaneous loading, and many more.

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