



Data Recipes

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Sept 20-21, 2016



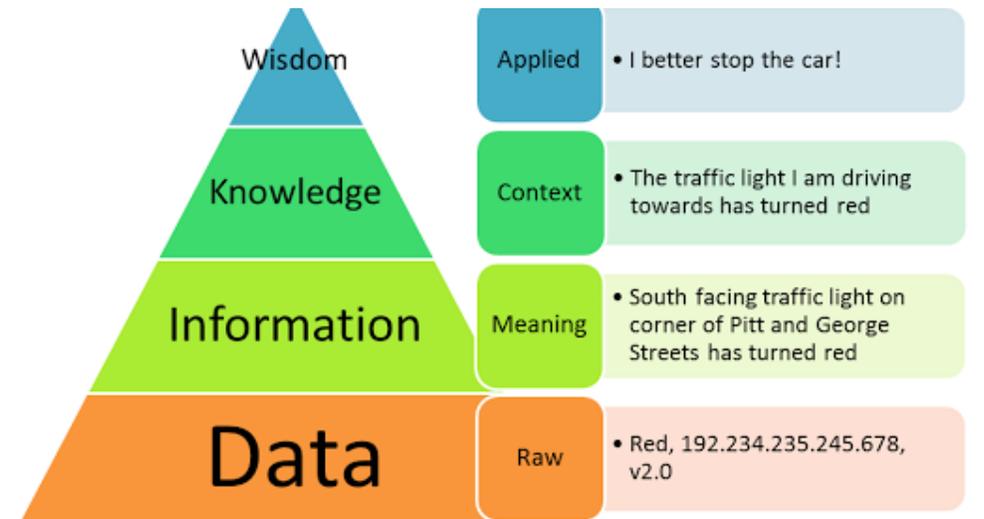
Data Recipes – What are they?

They have nothing to do with food, however like recipes they provide instructions on how to use data

- Easily and interpretable resources that enhance data usability
- Provide How-To instructions for various data.
- These may involve tools, science notebooks, software use instructions, data processing routines, web applications, and educational resources



- Earth and atmospheric science is becoming increasingly interdisciplinary as large quantities of data and information become available
- Data is available to a broad user base, each with their own needs and knowledge bases
 - A barrier exists for unfamiliar users, impeding data applications and scientific discovery
- Traditionally, acquiring the necessary knowledge to use scientific data has been limited to:
 - Coursework, experience, literature review
- Data recipes provide broad users with a linkage between data and wisdom



- GHRC has begun compiling a series of data recipes that make our data and tools more usable to a broader user community
- **What types do we offer?**
 - Using NetCDF data in ArcGIS
 - Python Notebooks and scripts
 - Dataset subsetting and plotting routines
 - Leveraging PyCMR
 - GHRC tool tutorials
- **Language** – Insure wording is not too technical and easily understandable
- **Visuals** – Insure content is visually appealing and communicates information in an easily ingestible manner

Data Recipe Example

- Explore GHRC Data Recipes at: <https://ghrc.nsstc.nasa.gov/home/data-recipes>

The screenshot shows the GHRC website interface. At the top left is the NASA and GHRC logo. A search bar is located at the top right. Below the logo is a navigation menu with the following items: ACCESS DATA, MEASUREMENTS, FIELD CAMPAIGNS, PROJECTS, RESOURCES, MULTIMEDIA, ABOUT, CITE, and CONTACT. The main content area features a large, colorful satellite-style map of the United States. Below the map, there are two columns of icons representing different science focus areas and data items. The 'DATA RECIPES' icon, which depicts a notepad and pencil, is highlighted with a blue rectangular box. A black arrow with the word 'Click' points to this icon. Other icons include a lightning bolt for 'LIGHTNING', a hurricane for 'HURRICANES', a cloud with rain for 'STORM-INDUCED HAZARDS', a water drop for 'FIND DATA', and a list icon for 'MICRO ARTICLES'. A vertical 'feedback' button is visible on the left side of the page.

Data Discovery - DAACs - Community - Science Disciplines -

Search datasets, news, articles, and information

ACCESS DATA MEASUREMENTS FIELD CAMPAIGNS PROJECTS RESOURCES MULTIMEDIA ABOUT CITE US CONTACT US

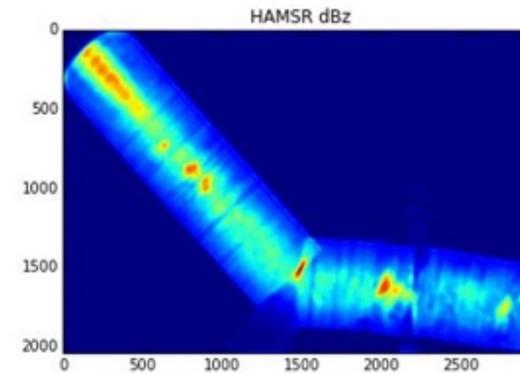
HS3 HAMSRRadar Reflectivity Profile Data Subset Quick View

[Description](#) | [How to Use](#) | [Dataset Information](#) | [Key Parameters](#)

Description

This data recipe enables users to plot temporal subsets of the HS3 HAMSRRadar Reflectivity Profiles through a Python plotting routine. The routine requires users to define a HS3 HAMSRR L2 data file, and time period of interest along a HS3 flight track. The Python script extracts the user defined temporal subset from the specified HAMSRR data file through OPeNDAP, then plots the data to provide a quick visualization of radar reflectivity. Advanced users may alter the code to plot additional variables provided within the HAMSRR data files, or use the iPython Notebook version.

The figure to the right depicts a sample plot generated by the HS3 HAMSRRadar Reflectivity Profile Data Subset Quick View



Feedback

Data Recipe Type



Data
Visualization

Supporting Software Information

TYPE



iPython Notebook



iPython Script

ACCESS



Open Source



Location

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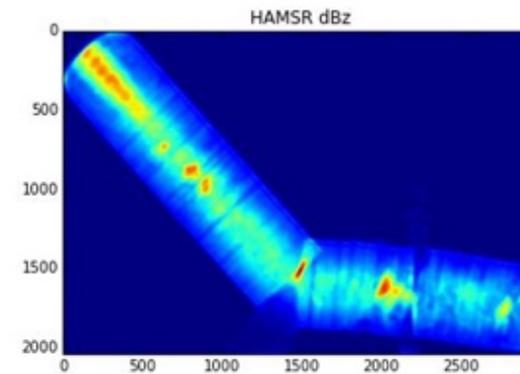
HS3 HAMSAR Radar Reflectivity Profile Data Subset Quick View

[Description](#) | [How to Use](#) | [Dataset Information](#) | [Key Parameters](#)

Description

This data recipe enables users to plot temporal subsets of the HS3 HAMSAR Radar Reflectivity Profiles through a Python plotting routine. The routine requires users to define a HS3 HAMSAR L2 data file, and time period of interest along a HS3 flight track. The Python script extracts the user defined temporal subset from the specified HAMSAR data file through OPeNDAP, then plots the data to provide a quick visualization of radar reflectivity. Advanced users may alter the code to plot additional variables provided within the HAMSAR data files, or use the iPython Notebook version.

The figure to the right depicts a sample plot generated by the HS3 HAMSAR Radar Reflectivity Profile Data Subset Quick View



Feedback

Data Recipe Type



Data Visualization

Supporting Software Information

TYPE



iPython Notebook



iPython Script

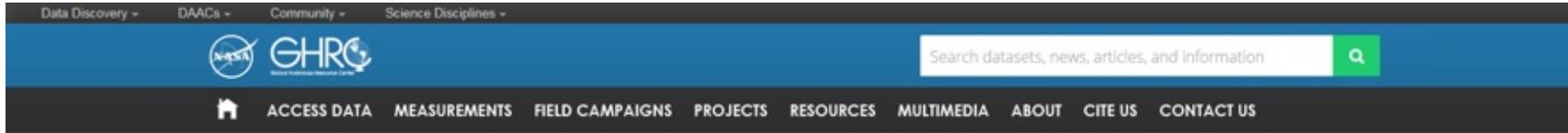
ACCESS



Open Source



Location



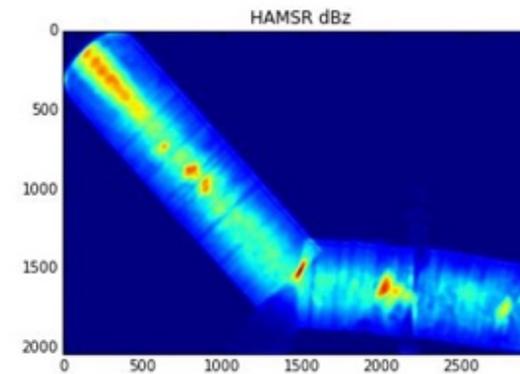
HS3 HAMSRRadar Reflectivity Profile Data Subset Quick View

[Description](#) | [How to Use](#) | [Dataset Information](#) | [Key Parameters](#)

Description

This data recipe enables users to plot temporal subsets of the HS3 HAMSRRadar Reflectivity Profiles through a Python plotting routine. The routine requires users to define a HS3 HAMSRR L2 data file, and time period of interest along a HS3 flight track. The Python script extracts the user defined temporal subset from the specified HAMSRR data file through OPeNDAP, then plots the data to provide a quick visualization of radar reflectivity. Advanced users may alter the code to plot additional variables provided within the HAMSRR data files, or use the iPython Notebook version.

The figure to the right depicts a sample plot generated by the HS3 HAMSRRadar Reflectivity Profile Data Subset Quick View



Feedback

| Data Recipe Type | Supporting Software Information | | | | | | |
|---|--|------|--------|--|---|--|--|
|  Data Visualization | <table border="1"><thead><tr><th>TYPE</th><th>ACCESS</th></tr></thead><tbody><tr><td> iPython Notebook</td><td> Open Source</td></tr><tr><td> iPython Script</td><td> Location</td></tr></tbody></table> | TYPE | ACCESS |  iPython Notebook |  Open Source |  iPython Script |  Location |
| TYPE | ACCESS | | | | | | |
|  iPython Notebook |  Open Source | | | | | | |
|  iPython Script |  Location | | | | | | |

How to Use

This data recipe is available as a Python script and an iPython Notebook, which is an interactive Python environment for the web and shell. Instructions on how to use these recipes are as follows.

Please note that to run the Python script and iPython Notebook, the following Python modules are required:

matplotlib: <http://matplotlib.org/>
NumPy: <http://www.numpy.org/>
Pydap: <http://www.pydap.org/>
SciPy: <https://www.scipy.org/>

STEP 1 Follow the location link on this page to access the GHRC DAAC data-recipe folder on GitHub. The HS3 HAMSRRadar Reflectivity Profile Data Subset Quick View has two separate files available for download:

iPython Notebook: [HS3 HAMSRR Data Recipe.ipynb](#)
Python Script: [HS3 HAMSRR Data Recipe.py](#)

You can preview each by clicking the file name. To download, select the green "Clone or download" button located on the right side of the webpage to download both scripts as a zipped file or open to your desktop.

STEP 2 The Python script provides a series of editable fields that can be used to subset and plot desired parameters and locations recorded within each HS3 HAMSRR data file. This data recipe focuses on the radar reflectivity (ham_dBz) parameter.

The GHRC OPeNDAP link is used to pull in and plot subsets of data files. To change the default data file, simply substitute your desired file name within the datafile variable highlighted in the figure below.

Open data stream using OPeNDAP link to file and look for data fields

```
In [2]: datafile = open_url('https://hs3.nsstc.nasa.gov/opendap/hyrax/hs3/HAMSRR/data/2013/HAMSRR_L2_20130903_r034600_20130904T020933_v01.nc')
print datafile.keys()

['time', 'lat', 'lon', 'altitude', 'TB', 'inc', 'AClat', 'AClon', 'ACroll', 'ACpitch', 'ACheading', 'PWV', 'CLW', 'sea_ice_flag', 'anc_sfc_ht', 'anc_Psfc', 'land_flag', 'anc_ws', 'ham_airT', 'ham_airQ', 'ham_airL', 'ham_airRH', 'ham_airPT', 'ham_airEPT', 'ham_LCL', 'ham_LFC', 'ham_prof_PWV', 'ham_prof_CLW', 'ham_sfc_airT', 'ham_sfc_airQ', 'ham_sfc_airRH', 'ham_FltLvl_airT', 'ham_FltLvl_airQ', 'ham_FltLvl_airRH', 'ham_ret_qual_flag', 'ham_pres_levels', 'ham_airHt', 'ham_dBz', 'ham_dBz_heights']
```



Dataset Information

| | |
|-------------------|--|
| Dataset Name | Hurricane and Severe Storm Sentinel (HS3) Global Hawk High Altitude MIC Sounding Radiometer (HAMSR) L2 |
| Platform | Global Hawk UAV |
| Instrument | High Altitude MMIC Sounding Radiometer (HAMSR) |
| Science Parameter | Radar Reflectivity |
| Format | NetCDF-CF |
| Data Information |  |



Data and Parameters

Key Parameters

| VARIABLE | DESCRIPTION | DIMENSION | UNITS | SCALE FACTOR |
|----------|---|-------------|---------|--------------|
| time | Time | n/a | seconds | 1.0 |
| lat | Latitude | along track | degrees | 0.001 |
| lon | Longitude | along track | degrees | 0.001 |
| ham_dBz | HAMSR X-band reflectivity derived from HAMSR TBs at 33 levels (dBz) | along track | dBz | 0.01 |

- Data recipes provide GHRC data users with resources for learning how to use data
- These resources crafted to be understandable to a wide user base
- Provide information that requires a lot of effort from unfamiliar users to identify
- GHRC data recipes also emphasize the visual presentation of content in order to communicate and educate users on proper data use.



Discussion

1. From a scientific research perspective, are these types of data recipes useful?
2. From an educators perspective, would these data recipes be something you could pass along to students and unfamiliar users to learn how to use the data?
3. Do you feel these data recipes are visually appealing and easy to understand?

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