

# H4CF Conversion Toolkit

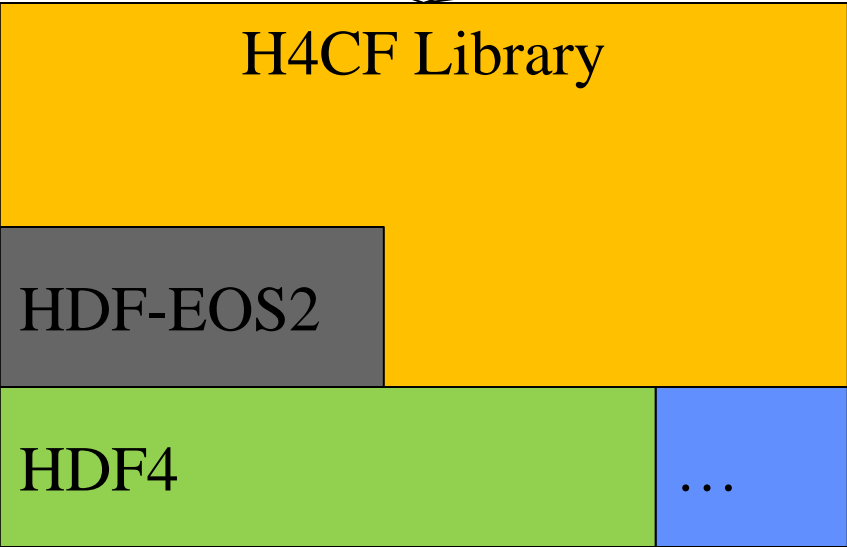
<http://hdfeos.org/software/h4cflib.php>

**MuQun Yang**  
**The HDF Group**

*The HDF Group provides the following toolkit for the NASA HDF-EOS2/HDF4 data.*

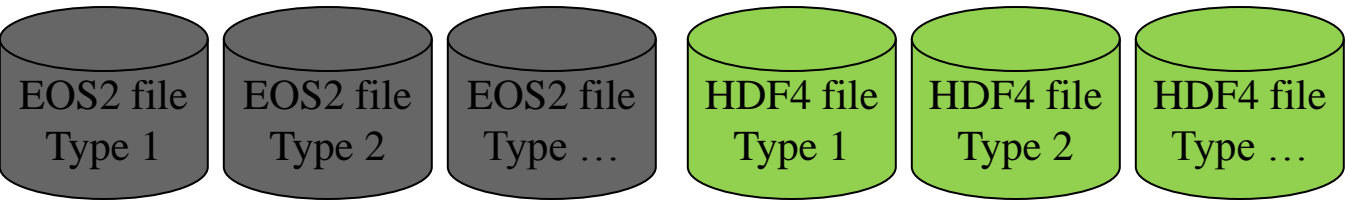
Use the HDF4 CF (H4CF) Conversion Toolkit to access HDF4/HDF-EOS2 following CF conventions.

Tools that use H4CF Library

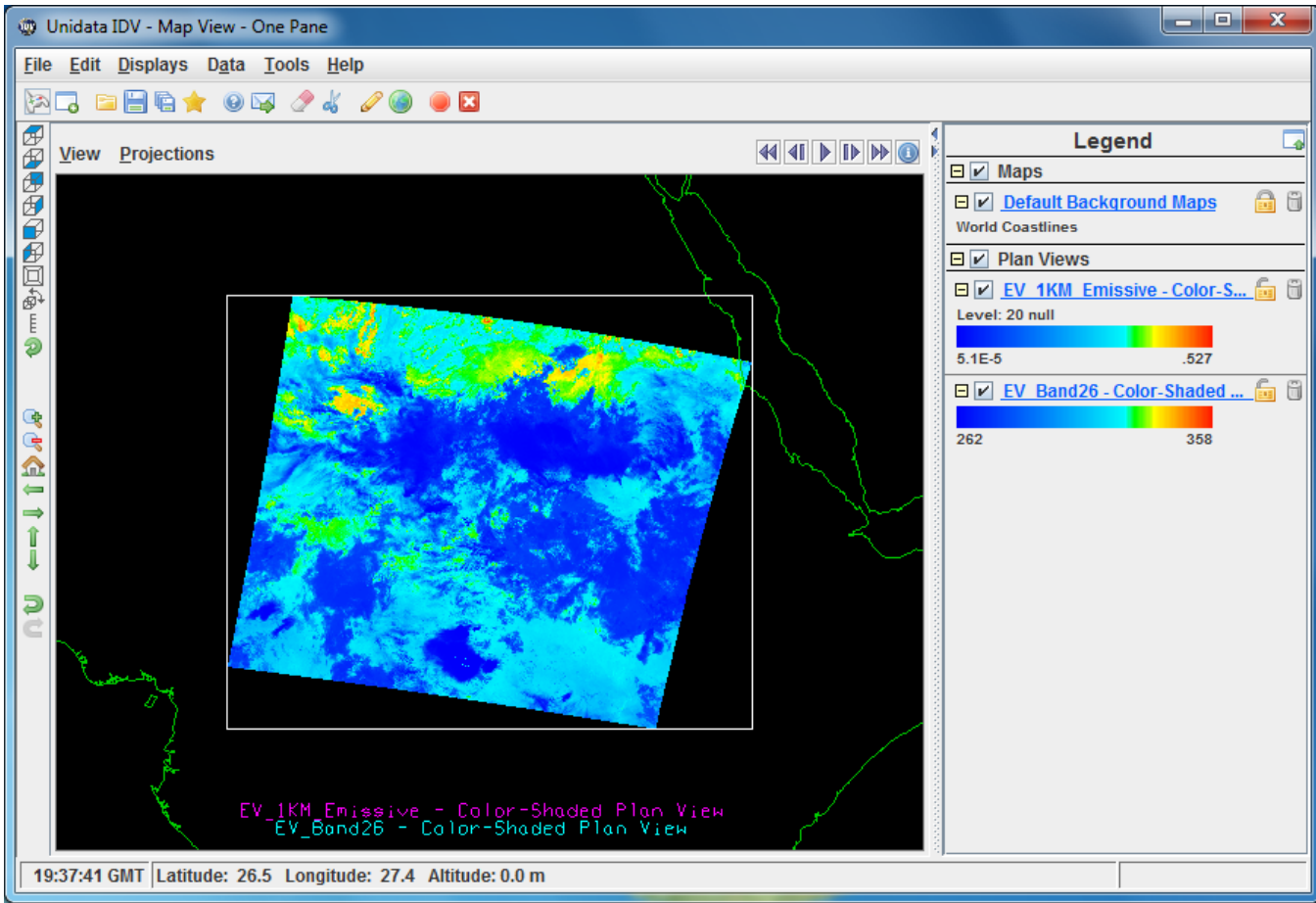


The H4CF Library provides a unified way of accessing different types of HDF4 and HDF-EOS2 files.

- Provides all coordinate and data variables and attributes.
- Adds CF-metadata to data variables for meaningful access.



**h4tonccf** Tool Example



IDV displays the NetCDF-3 file that is converted from NASA MODIS HDF-EOS2 file.

Use the **H4CF Library** API to build your HDF4/HDF-EOS2 application following CF conventions.

```
// open the example HDF file
h4cf_open("geo.hdf");

// HDF file attributes are obtained in a C++ STL map object
const map<string, string> file_attrs =
h4cf_get_file_attrs();

// HDF file variables are obtained in a C++ STL list object
const list<var*> pvars = h4cf_get_vars();

// close the HDF file
h4cf_close();
```

The H4CF Library is available in C++ and the simple, unified API works for both HDF4 and HDF-EOS2 files.

```
netCDF_AMSR_E_L3_5DaySnow_V09_20050126.hdf {
dimensions:
  XDim_Northern_Hemisphere = 721, XDim_Southern_Hemisphere = 721

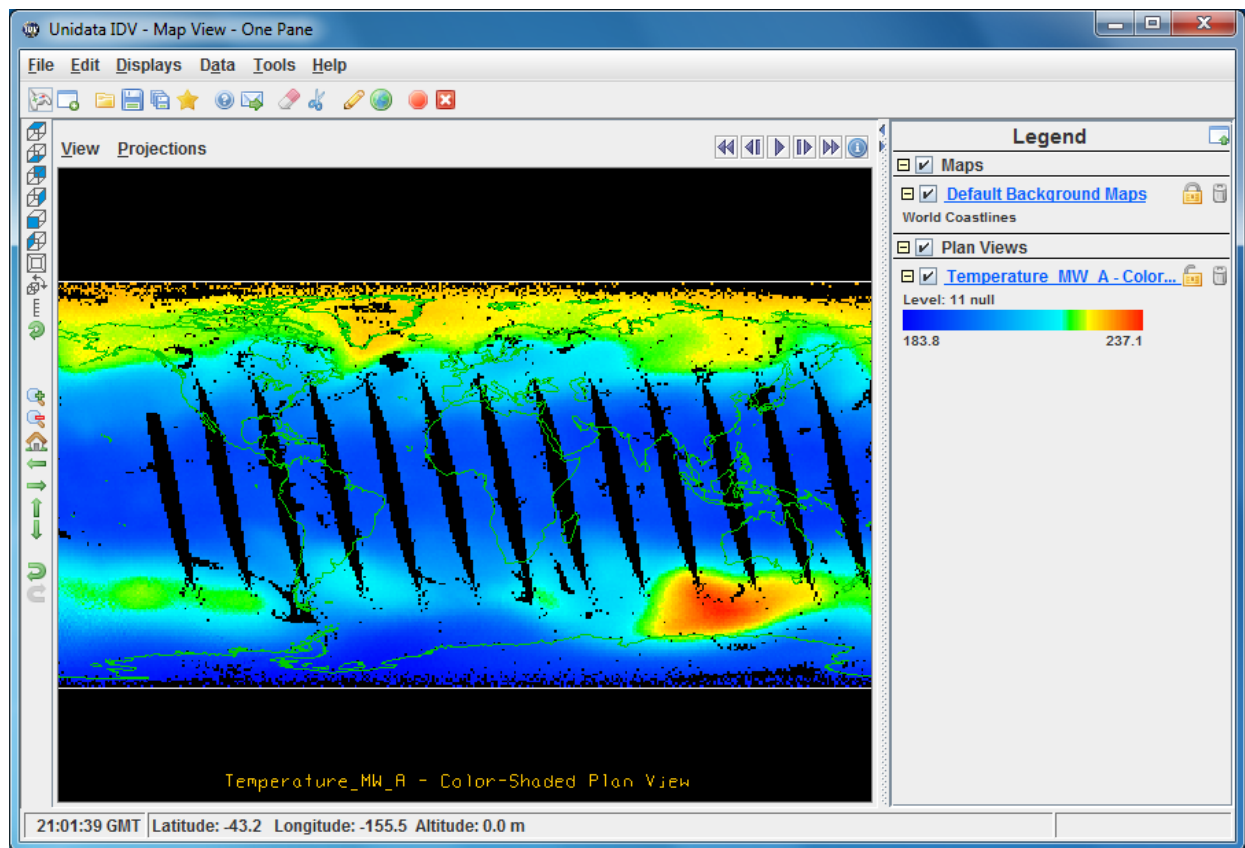
variables:
  ubyte   Flags_NorthernPentad(YDim_Northern_Hemisphere, XDim_Northern_Hemisphere):FillValue = 255;
  Flags_NorthernPentad:origname = "/Northern Hemisphere/Flag
  Flags_NorthernPentad:coordinates = "latitude_Northern_Hemi
  ubyte   Flags_SouthernPentad(YDim_Southern_Hemisphere, XDim_Southern_Hemisphere):FillValue = 255;
  Flags_SouthernPentad:origname = "/Southern Hemisphere/Flag
  Flags_SouthernPentad:coordinates = "latitude_Southern_Hemi
  ubyte   SWE_NorthernPentad(YDim_Northern_Hemisphere, XDim_Northern_Hemisphere):FillValue = 255;
  SWE_NorthernPentad:origname = "/Northern Hemisphere/SWE_Nc
  SWE_NorthernPentad:coordinates = "latitude_Northern_Hemispr
  SWE_SouthernPentad(YDim_Southern_Hemisphere, XDim_Southern_Hemisphere):FillValue = 255;
  SWE_SouthernPentad:origname = "/Southern Hemisphere/SWE_Sc
  SWE_SouthernPentad:coordinates = "latitude_Southern_Hemispr
  double  latitude_Northern_Hemisphere(YDim_Northern_Hemisphere, XDim_Northern_Hemisphere):eoslib = "Calculated latitude
  latitude_Northern_Hemisphere:origname = "/Northern Hemispr
  latitude_Northern_Hemisphere:coordinates = "latitude_North
  latitude_Northern_Hemisphere:unit = "level";
  double  latitude_Southern_Hemisphere(YDim_Southern_Hemisphere, XDim_Southern_Hemisphere):eoslib = "Calculated latitude
  latitude_Southern_Hemisphere:origname = "/Southern Hemispr
  latitude_Southern_Hemisphere:coordinates = "latitude_South
  latitude_Southern_Hemisphere:unit = "level";
  double  longitude_Northern_Hemisphere(YDim_Northern_Hemisphere, XDim_Northern_Hemisphere):eoslib = "Calculated lonituc
  longitude_Northern_Hemisphere:origname = "/Northern Hemisp
  longitude_Northern_Hemisphere:coordinates = "latitude_Nort
  longitude_Northern_Hemisphere:unit = "level";
}
```

CDL dumper

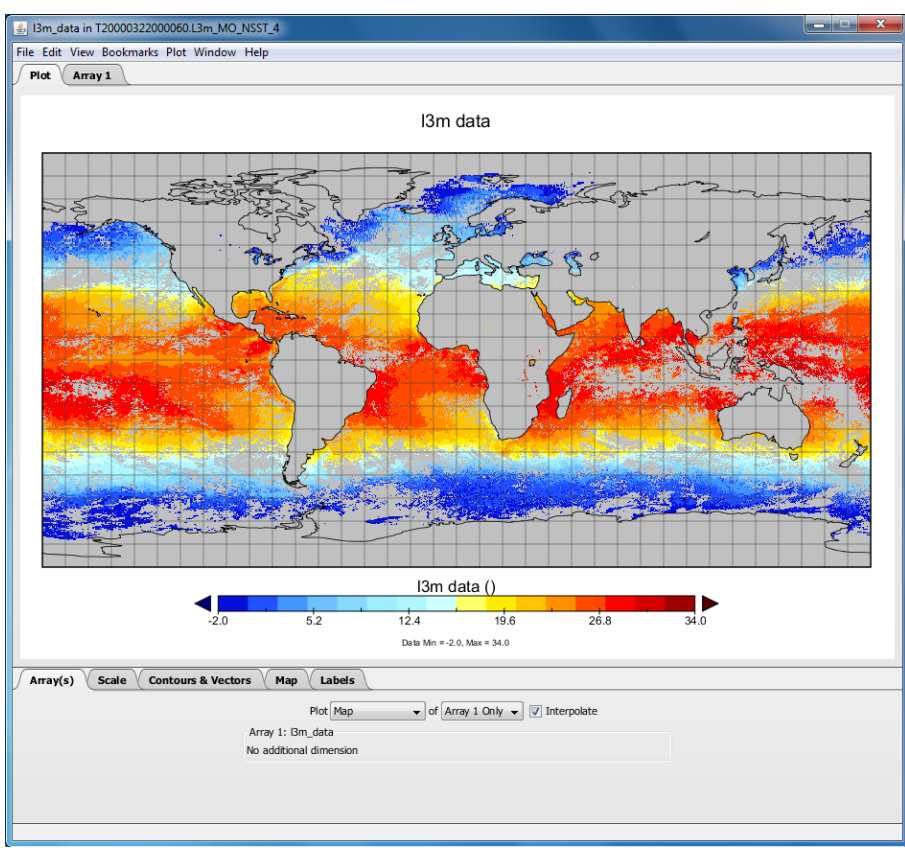
HDFView

The library provides CF data variables and attributes so developers don't have to write codes to meet CF conventions.

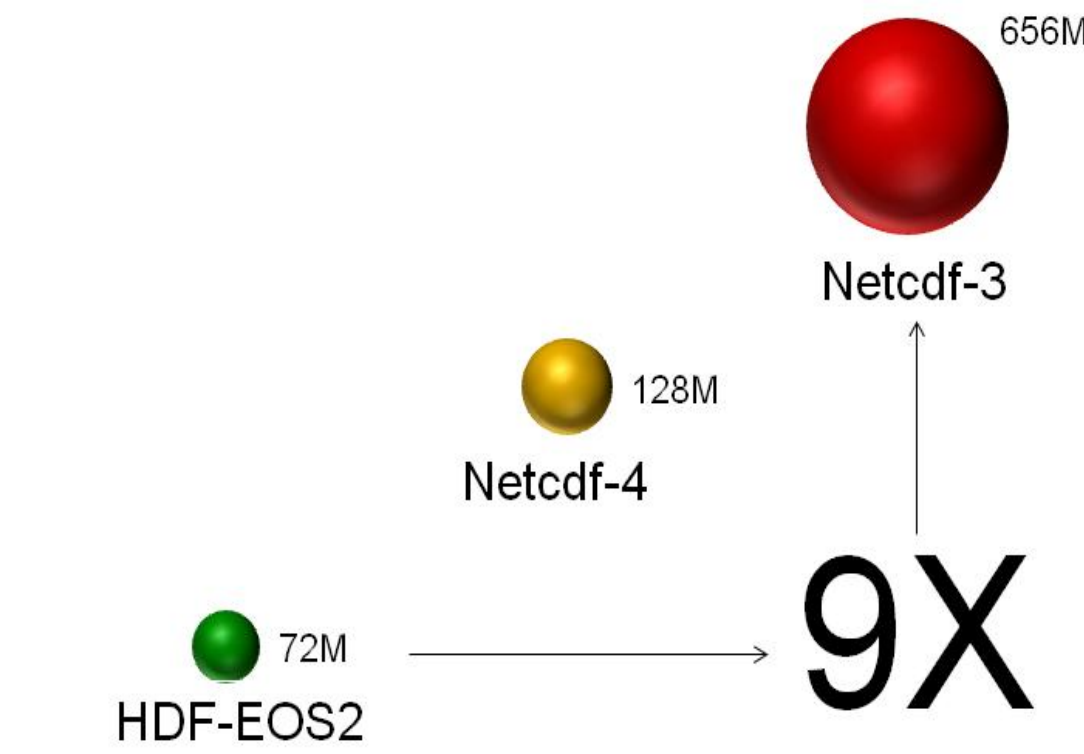
Use **h4tonccf** tool to convert HDF4/HDF-EOS2 to NetCDF-3 or NetCDF-4



IDV displaying the GES DISC AIRS file converted using the `%h4tonccf AIRS.2002.08.01.L3.RetStd_H031.v4.0.21.0.G06104133732.hdf` command. The output file is **AIRS.2002.08.01.L3.RetStd\_H031.v4.0.21.0.G06104133732.nc** and IDV can visualize it.



Panoply displaying the OBPB MOIDS-T file converted using the `%h4tonccf T20000322000060.L3m_MO_NSST_4.hdf` command. The output file is **T20000322000060.L3m\_MO\_NSST\_4.nc** and Panoply can visualize it.



A file size comparison for an MYD21KM file converted using **h4tonccf** from HDF-EOS2 to Netcdf-4 and Netcdf-3.



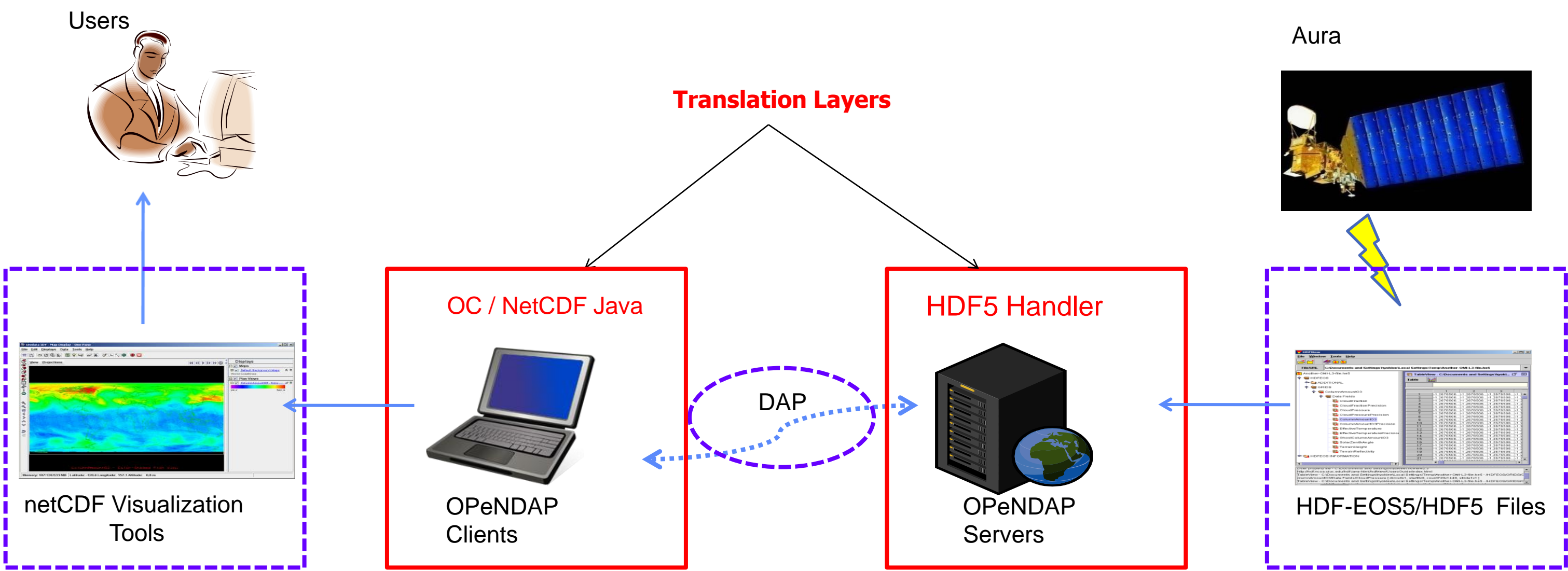
# Reengineered OPeNDAP HDF5 Handler

[http://hdfeos.org/software/hdf5\\_handler](http://hdfeos.org/software/hdf5_handler)

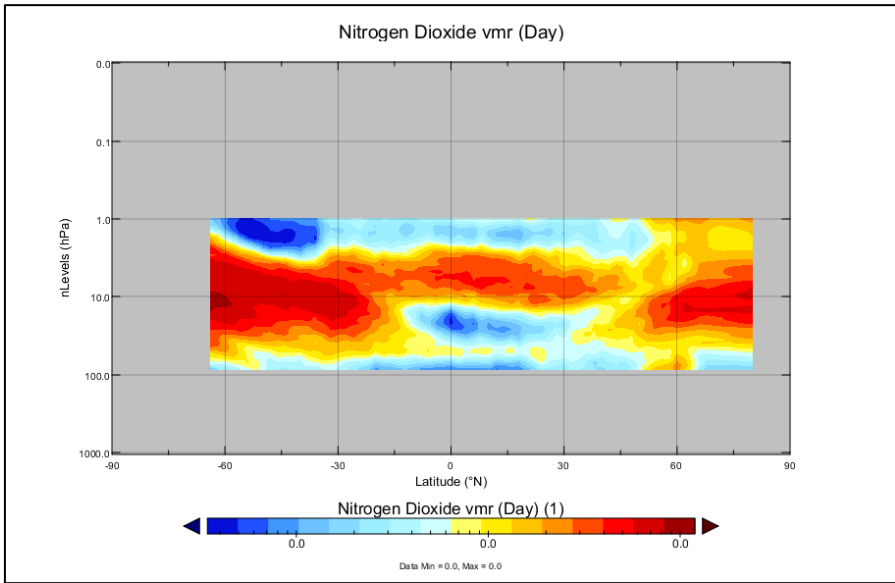
**MuQun Yang and Hyo-Kyung Lee**  
**The HDF Group**

*It can better support NASA HDF-EOS5 and HDF5 products such as Aura HDF-EOS5 products, MEaSUREs SeaWiFS and GSSTF products, and Aquarius product than the previous handler.*

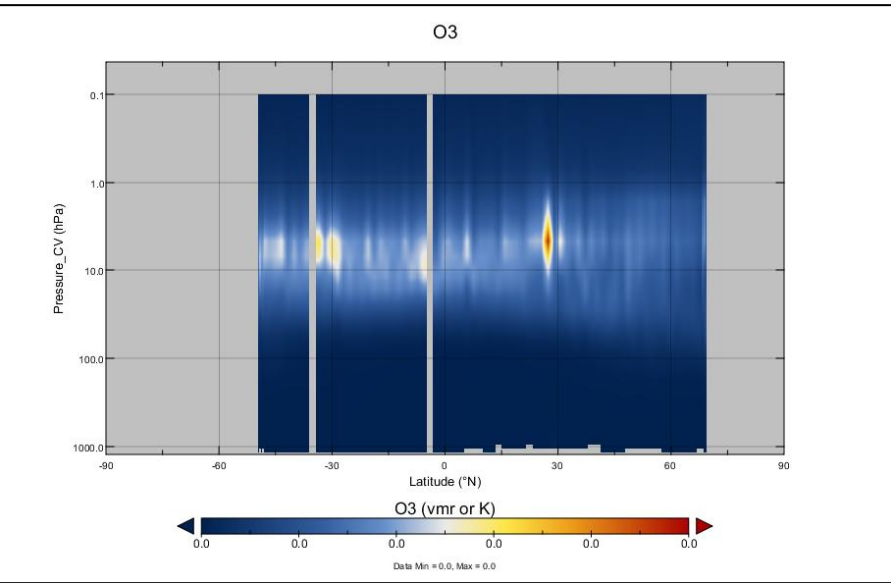
Use netCDF tools to access remote HDF5/HDF-EOS5 via OPeNDAP



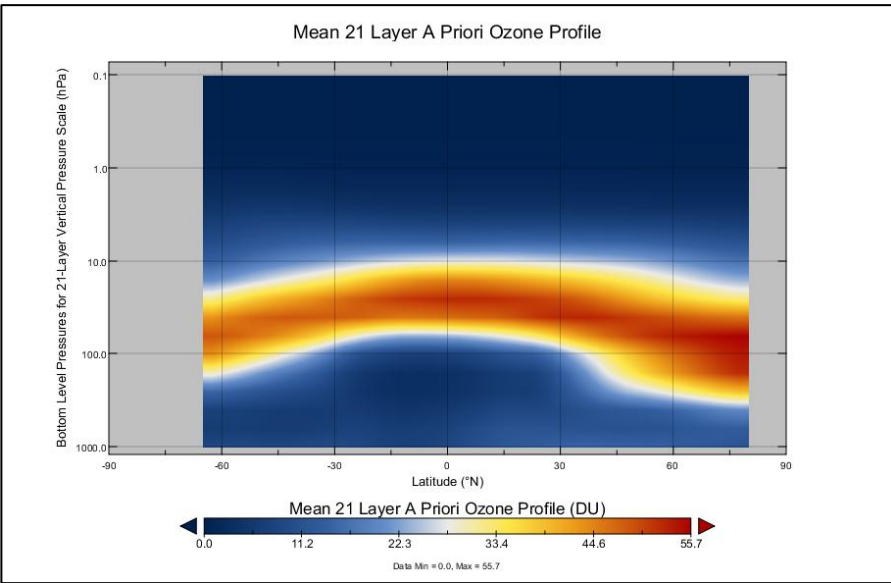
## Examples of Accessing NASA HDF5/HDF-EOS5 via reengineered OPeNDAP HDF5 Handler



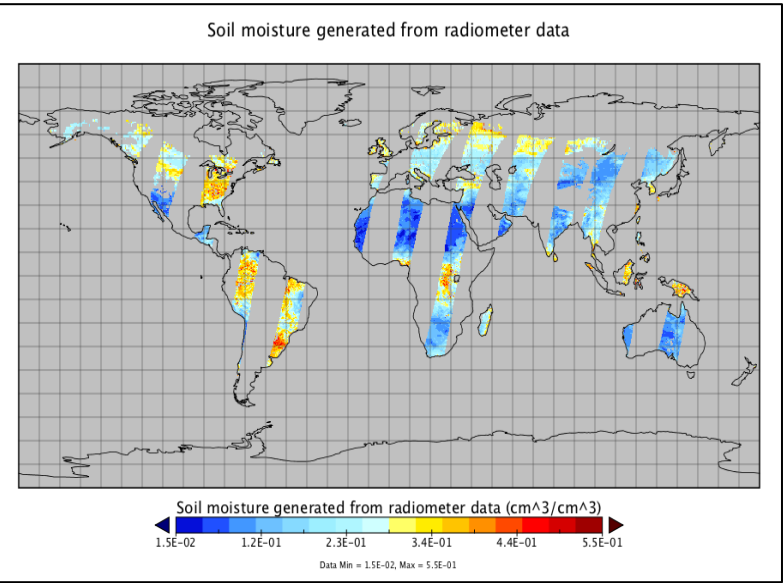
GES DISC HIRDLS ZA Panoply  
HDF-EOS5



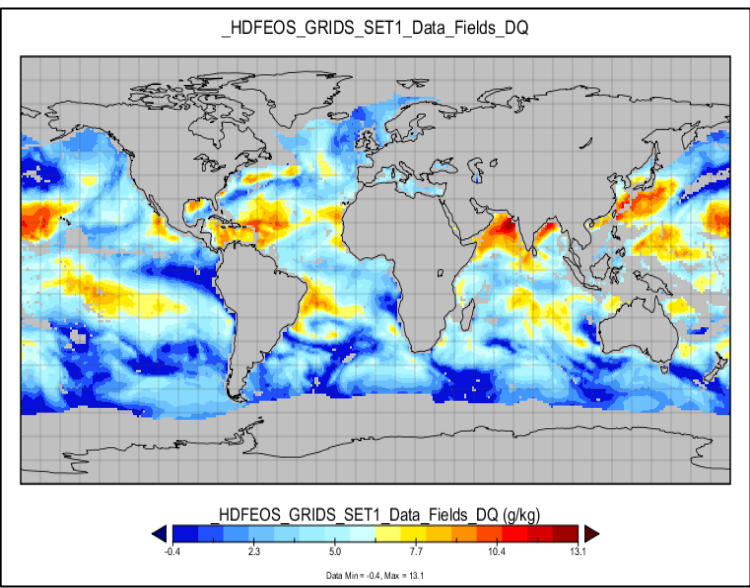
LaRC TES Panoply  
HDF-EOS5



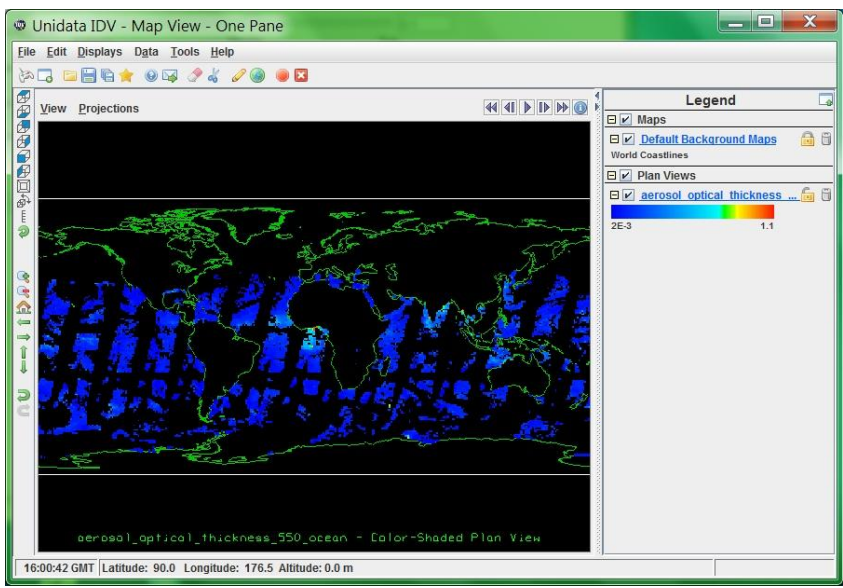
GES DISC BUV O3 Panoply  
HDF5



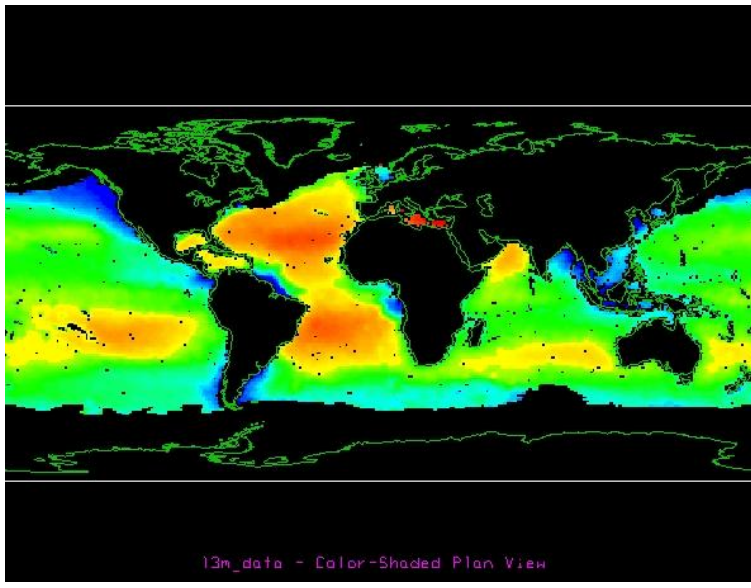
SMAP Panoply  
HDF5 (Simulation)



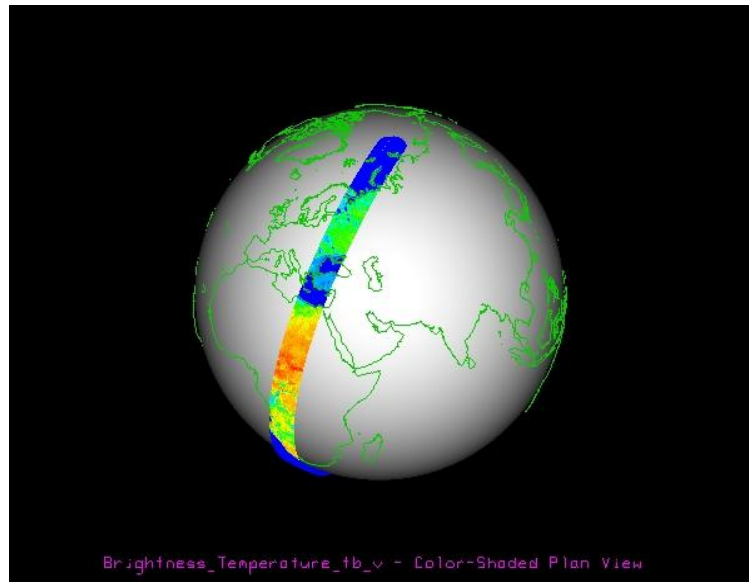
GES DISC GSSTF Panoply  
HDF5



GES DISC MEaSUREs SeaWiFS IDV  
HDF5



PO.DAAC Aquarius IDV  
HDF5 (Simulation)



SMAP IDV  
HDF5 (Simulation)

The HDF5 OPeNDAP handler software can be used to access HDF5 data via OPeNDAP's Data Access Protocol. The HDF Group reengineered the HDF5 OPeNDAP handler to improve the access of NASA HDF-EOS5 (OMI, HIRDLS, MLS, and TES) and to support new HDF5 products via OPeNDAP's visualization client tools. OPeNDAP released the reengineered HDF5 handler on June 14, 2012.

Acknowledgements: We thank Dan Marinelli, Carol Boquist and Rama Ramapriyan of the NASA ESDIS project; Christopher Lynnes, James Johnson and Fan Fang from NASA GES DISC; Ruth Duerr from NSIDC; James Gallagher from OPeNDAP, Inc.; UCAR's NCL User Group and John Evans from MathWorks for their valuable suggestions and help.

This work was supported by Subcontract number 114820 under Raytheon Contract number NNG10HP02C, funded by the National Aeronautics and Space Administration (NASA) and by cooperative agreement number NNX08AO77A from the NASA. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of Raytheon or the National Aeronautics and Space Administration.



# Improved Comprehensive Examples

<http://hdfeos.org/zoo>

Mike Folk, MuQun Yang, and Hyo-Kyung Lee  
The HDF Group

The HDF Group improved the Comprehensive Examples so that users can access NASA HDF data easily with MATLAB, IDL, and NCL.

Overview

New Examples: ICESat-2, Aquarius

Updated Examples: MODIS, MISR

COMPREHENSIVE EXAMPLES

This page provides comprehensive examples on how to access and visualize various NASA HDF/HDF-EOS files using IDL®, MATLAB® and NCL. Other tools and programming languages examples can be found [here](#). Please read this [special note](#) first before you proceed further.

For a list of examples for the different data centers, click on the examples in the table below:

NASA Data Centers	Product Examples using different tools
GESDISC	<a href="#">[Examples]</a>
LAADS	<a href="#">[Examples]</a>
LP DAAC	<a href="#">[Examples]</a>
LaRC	<a href="#">[Examples]</a>
NSIDC	<a href="#">[Examples]</a>
PO.DAAC	<a href="#">[Examples]</a>
Ocean Biology Processing Group	<a href="#">[Examples]</a>
GHRC	<a href="#">[Examples]</a>
ICESat-2	<a href="#">[Examples]</a>

Table 1: Sample Data Files and Code Examples

We also provide examples for other data centers that produce HDF4 files.

Other Data Centers	Product Examples using different tools
CloudSAT Data Processing Center	<a href="#">[Examples]</a>
Ocean Productivity	<a href="#">[Examples]</a>

Table 2: Sample Data Files and Code Examples from Other Data Centers

NASA Data Centers	Product Examples using different tools					
GESDISC	<a href="#">[Examples]</a>					
LAADS	<a href="#">[Examples]</a>					
LP DAAC	<a href="#">[Examples]</a>					
LaRC	<a href="#">[Examples]</a>					
NSIDC	<a href="#">[Examples]</a>					
PO.DAAC	PO.DAAC Product	Type	File	Codes	Plots	Note
	AVHRR	Grid	2005001-2005005_00454pft-bast.hdf	NCL MATLAB IDL	NCL MATLAB IDL	
	SeaWinds	Grid	SW_S3E_2003100_20053531923.hdf	NCL MATLAB IDL	NCL MATLAB IDL	
	QuikSCAT	Grid	QS_YVGRD3_2008001-20080021608.hdf	NCL MATLAB IDL	NCL MATLAB IDL	
	Swath	Grid	Q201128003000_L2_EVSCL_V1.2.h5	NCL IDL	NCL IDL	
Aquarius	Grid	Q2012034_L3m_DAY_EVSCL_V1.2DR_SSS_1deg.h5	NCL MATLAB IDL	NCL MATLAB IDL		
Ocean Biology Processing Group	<a href="#">[Examples]</a>					
	<a href="#">[Examples]</a>					
	<a href="#">[Examples]</a>					
	<a href="#">[Examples]</a>					
ICESat-2	<a href="#">[Examples]</a>					

Table 1: Sample Data Files and Code Examples

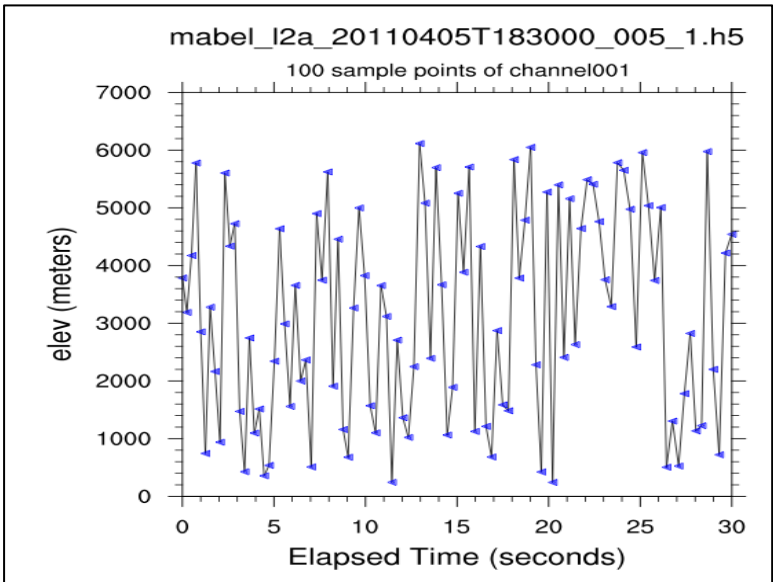
LaRC		CER_SYN_Aqua-FM3-MODIS_Edition2B_007005_20051001.hdf	NCL	MATLAB	IDL	NCL	MATLAB	IDL
		CER_ZAVG_Aqua-FM4-MODIS_Edition2B_007005_200503.hdf	NCL	MATLAB	IDL	NCL	MATLAB	IDL
MISR	Grid	MISR_AM1_CGAL_2005_F06_0012.hdf	NCL	MATLAB	IDL	NCL	MATLAB	IDL
		MISR_AM1_TC_ALBEDO_P223_0056884_F05_0011.hdf lat_MISR_TC_ALBEDO_P223_F05_M50_output lon_MISR_TC_ALBEDO_P223_F05_M50_output	NCL	MATLAB	IDL	NCL	MATLAB	IDL
		MISR_AM1_GRP_ELLIPSOID_GM_P117_0058421_BA_F03_0024.hdf lat_MISR_AM1_GRP_P117_F01_24.hdf lon_MISR_AM1_GRP_P117_F01_24.hdf lat_MISR_AM1_GRP_P117_F03_output_for_all_blocks* lon_MISR_AM1_GRP_P117_F03_output_for_all_blocks* lat_MISR_AM1_GRP_P117_F03_M50_output_for_1_block lon_MISR_AM1_GRP_P117_F03_M50_output_for_1_block	NCL NCL	MATLAB MATLAB	IDL IDL	NCL NCL	MATLAB MATLAB	IDL IDL

The improved website has new product examples. Old examples are also updated.

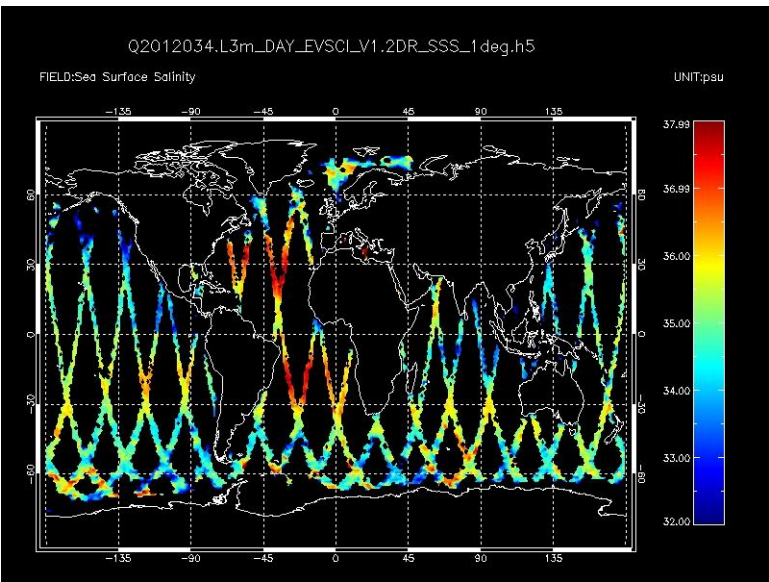
We’ve added recent NASA HDF5 data products.

We’ve corrected errors in handling scale/offset and different projections.

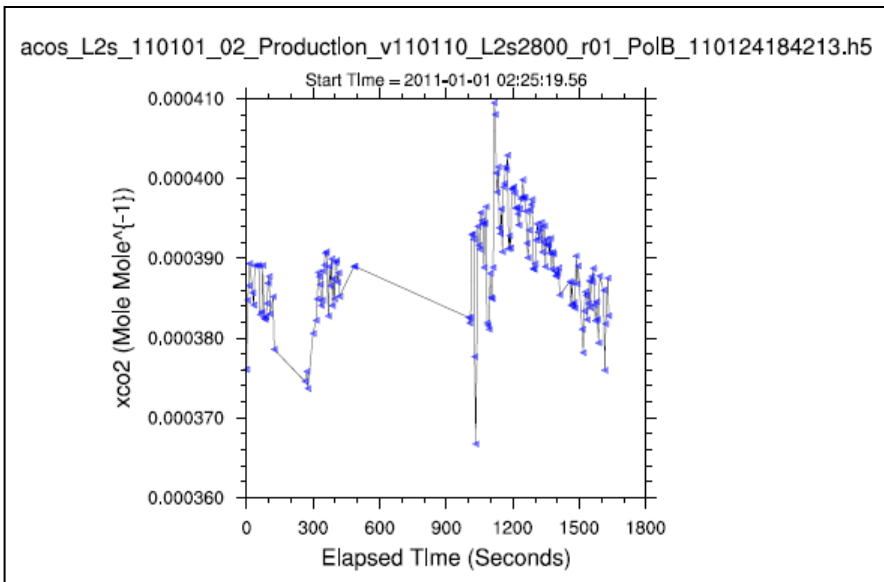
## New Comprehensive Examples of Accessing ICESat-2, Aquarius, GOSAT/acos



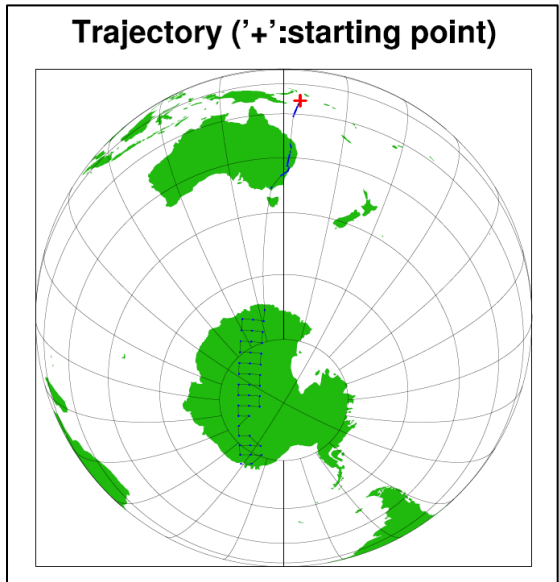
ICESat-2 mabel MATLAB



PO.DAAC Aquarius IDL



GESDISC GOSAT/acos NCL



## Updated Comprehensive Examples of Accessing NASA HDF with MATLAB, IDL, and NCL

Full HDF file name ←

Data set name form *long\_name* attribute if available ←

MOD29E1D.A2000055.005.2006268025009.hdf

Sea\_Ice\_by\_Reflectance\_NP

Discrete color bar

Key Improvements:

- Corrected the title with HDF file name.
- Added descriptive data set name using attributes.
- Corrected color bar with right unit and scale formula.
- Added more projections.
- Added more data products.

More Projection Support

NSIDC MODIS MATLAB

The HDF Group maintains a webpage that includes comprehensive NCL/MATLAB/IDL example codes, and plots of NASA HDF-EOS2, HDF-EOS5, and HDF4 files collected from NASA data centers: GES DISC, MODAPS(LAADS), NSIDC,LP-DAAC, GHRC, OBPG(Ocean Color) and LaRC. More than 80 files and 600 plots and codes of NCL/IDL/MATLAB can be found from this page. More examples will be added soon. We hope this can significantly reduce the time for end users to visualize the NASA HDF and HDF-EOS data. The URL is <http://hdfeos.org/zoo>.

This work was supported by Subcontract number 114820 under Raytheon Contract number NNG10HP02C, funded by the National Aeronautics and Space Administration (NASA). Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of Raytheon or the National Aeronautics and Space Administration.



**What's New at the HDFEOS.org**

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***What's New at***  
**the HDFEOS.org**

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