



# HDF Java

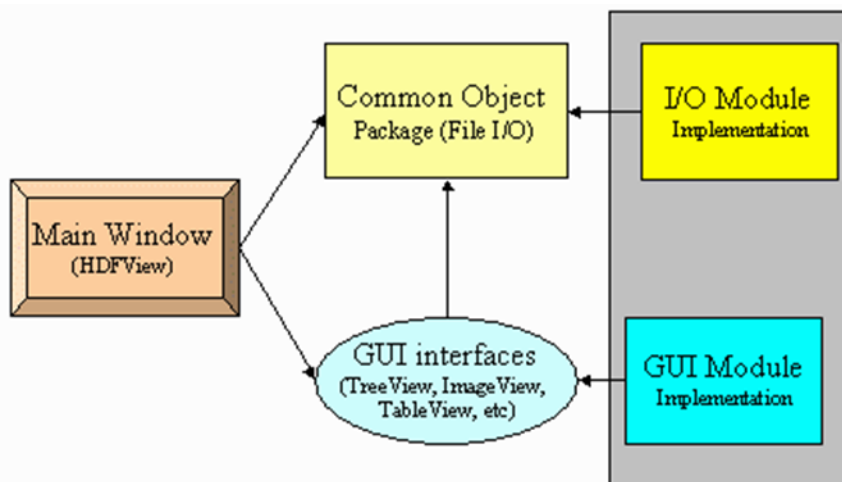
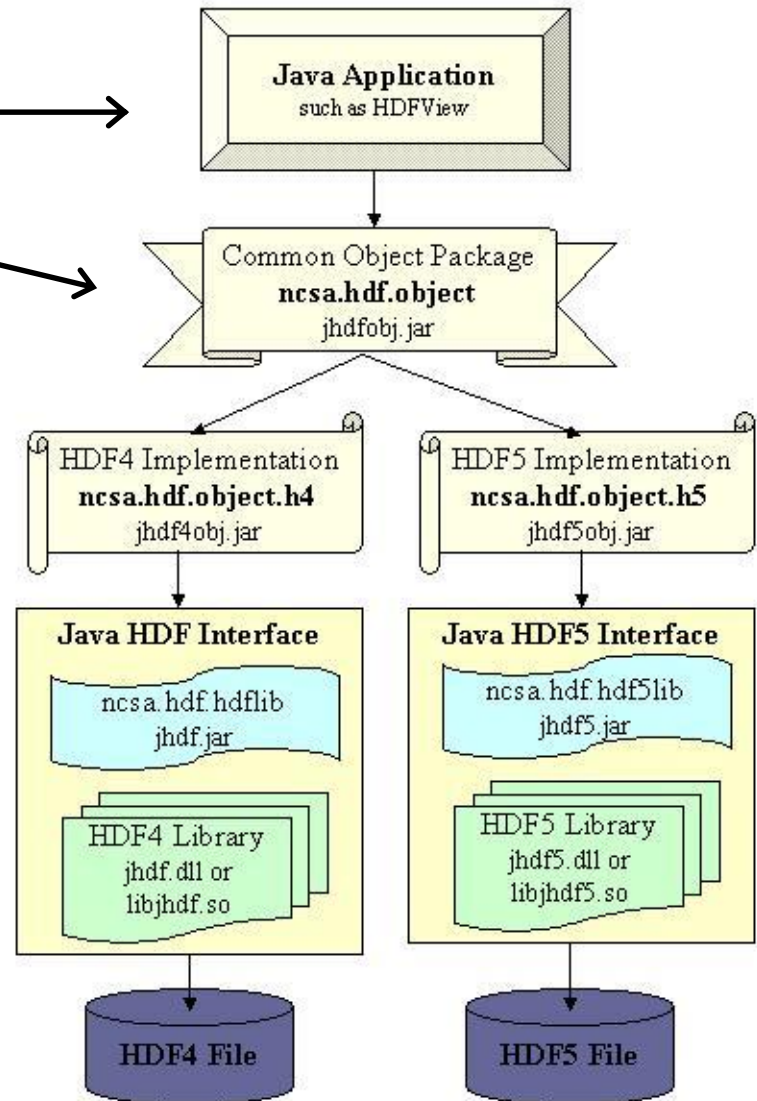
Joel Plutchak

Deputy Director for Earth Science

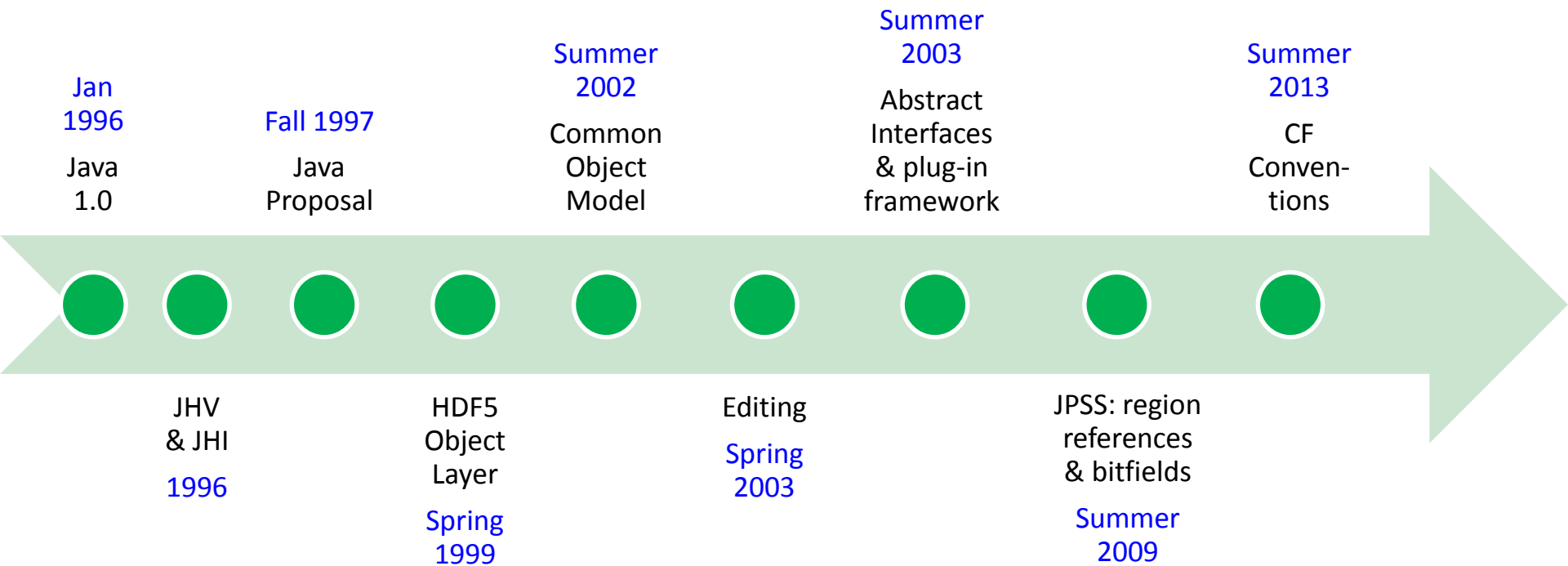
JPSS Project Manager & Java Product Owner

## High-level architecture:

- Java Application
- Java Object Layer API
- Format-specific / Java Native Interface (JNI) implementations
- HDFView



## An HDF-Java Timeline



HDFView 2.9

File Window Tools Help

Recent Files: H:\lrknox\UPSSIS\VDNB\_npp\_d20150825\_t0605500\_e0607142\_b19818\_c20150825124131092529\_noaa\_ops.h5

S\VDNB\_npp\_d20150825\_t0605500\_e0607142

- All\_Data
  - VIIRS-DNB-SDR\_All
    - ModeGran
    - ModeScan
    - NumberOfBadChecksums
    - NumberOfDiscardedPkts
    - NumberOfMissingPkts
    - NumberOfScans
    - PadByte1
    - QF1\_VIIRSDNBSDR
    - QF2\_SCAN\_SDR
    - QF3\_SCAN\_RDR
    - Radiance
  - Data\_Products
    - VIIRS-DNB-SDR
      - VIIRS-DNB-SDR\_Aggr
      - VIIRS-DNB-SDR\_Gran\_0

TableView - Radiance - /All\_Data/VIIRS-DNB-SDR\_All/ - H:\lrknox\UPSSIS\VDNB\_npp\_d20150...

	0	1	2	3
0	-1.5E-9	3.869286E-9	6.0220255...	1.921365E-9
1	-1.5E-9	1.7156684...	3.0318896...	1.7438226...
2	-1.5E-9	1.7546343...	1.1375468...	3.0478338...
3	-1.5E-9	2.134764E-9	4.475134E-9	2.698275E-9
4	-1.5E-9	1.9956563...	8.720994E-9	2.1479039...
5	-1.5E-9	2.1548001...	4.6797735...	3.4693652...
6	-1.5E-9	2.8836753...	8.064373E-9	2.571442E-9
7	-1.5E-9	2.6544895...	2.5648705...	2.4432896...
8	-1.5E-9	2.9214011...	2.4550733...	1.9368804...
9	-1.5E-9	1.9970279...	2.1603108...	2.1019477...
10	-1.5E-9	1.6399881...	1.8238382...	2.4440516...
11	-1.5E-9	1.4805261...	1.7494346...	2.1801165...
12	-1.5E-9	1.423953E-9	1.5985494...	1.4127438...
13	-1.5E-9	9.46234E-10	1.3394745...	1.5129378...
14	-1.5E-9	1.2085941...	1.5681801...	1.0163673...
15	-1.5E-9	1.461659E-9	1.663995E-9	2.2526558...
16	-1.5E-9	1.6132835...	1.5368085...	2.8380969...

ImageView <UpperLeft> - Radiance - /All\_Data/VIIRS-DNB-SDR\_All/ - H:\lrknox\UPSSIS\VDNB\_npp\_d20150825\_t06...

Histogram - /All\_Data/VIIRS-DNB-SDR\_All/Radiance - by pixel index

Group size = 2  
 Number of attributes = 7  
 Distributor = arch  
 Mission\_Name = NPP  
 N\_Dataset\_Source = noaa  
 N\_GEO\_Ref = GDNBO\_npp\_d20150825\_t0605500\_e0607142\_b19818\_c20150825124131092529\_noaa\_ops.h5  
 N\_HDF\_Creation\_Date = 20150825  
 N\_HDF\_Creation\_Time = 124131.092529Z  
 Platform\_Short\_Name = NPP

Log Info Metadata

## Support:

- Prebuilt-binaries:
  - Windows 32- and 64-bit (Visual Basic 2012)
  - Mac OS X Darwin
  - Linux CentOS 5 and CentOS 6
  - Solaris
- Source distribution with CMake builds

## The Good:

- JNI layer is moderately complete (limited callbacks)
- HDFView application most popular HDF download
- HDFView plug-in architecture for customization

## The Bad:

- JNI data type implementation is incomplete and insufficiently documented (compound types)
- HDFView and Object Model memory usage is very inefficient
- Java staffing has dwindled

## The Ugly:

- The HDFView “look and feel” is outdated

- Separate JNI layer from Pure Java code
  - Include HDF4 and HDF5 JNI layers with the appropriate library release (from HDF5 v1.10)
  - Release HDFView separately as complete standalone application (plus source)
  - Use Ant to build native Java components
- Prototyping an SWT GUI implementation
  - More modern and platform-native look and feel
  - Anticipates the deprecation of the Swing GUI
- Prepare for HDF version 1.10
  - API changes and new features
  - All new Java development will target v1.10
- Memory Model
  - Study issue and make plan for remedy



- NetCDF Java (Unidata, UCAR)
  - Implements the Common Data Model (CDM)
  - Supports a wide variety of scientific data formats and products
  - Native Java reading / JNI (netCDF C library) writing
  - <http://www.unidata.ucar.edu/software/thredds/current/netcdf-java/>
- JHDF (Swiss Institute of Bioinformatics)
  - Supports Linux, Windows, Macintosh 10.6 – 10.10
  - High-level API on top of HDF JNI layer
  - <https://wiki-bsse.ethz.ch/pages/viewpage.action?pageId=26609113>



- Do our users need/want....
  - More JPSS-specific tailoring (e.g., plugins)?
  - Additional functionality?
  - Additional platforms or builds?
  - Maintain the status quo?



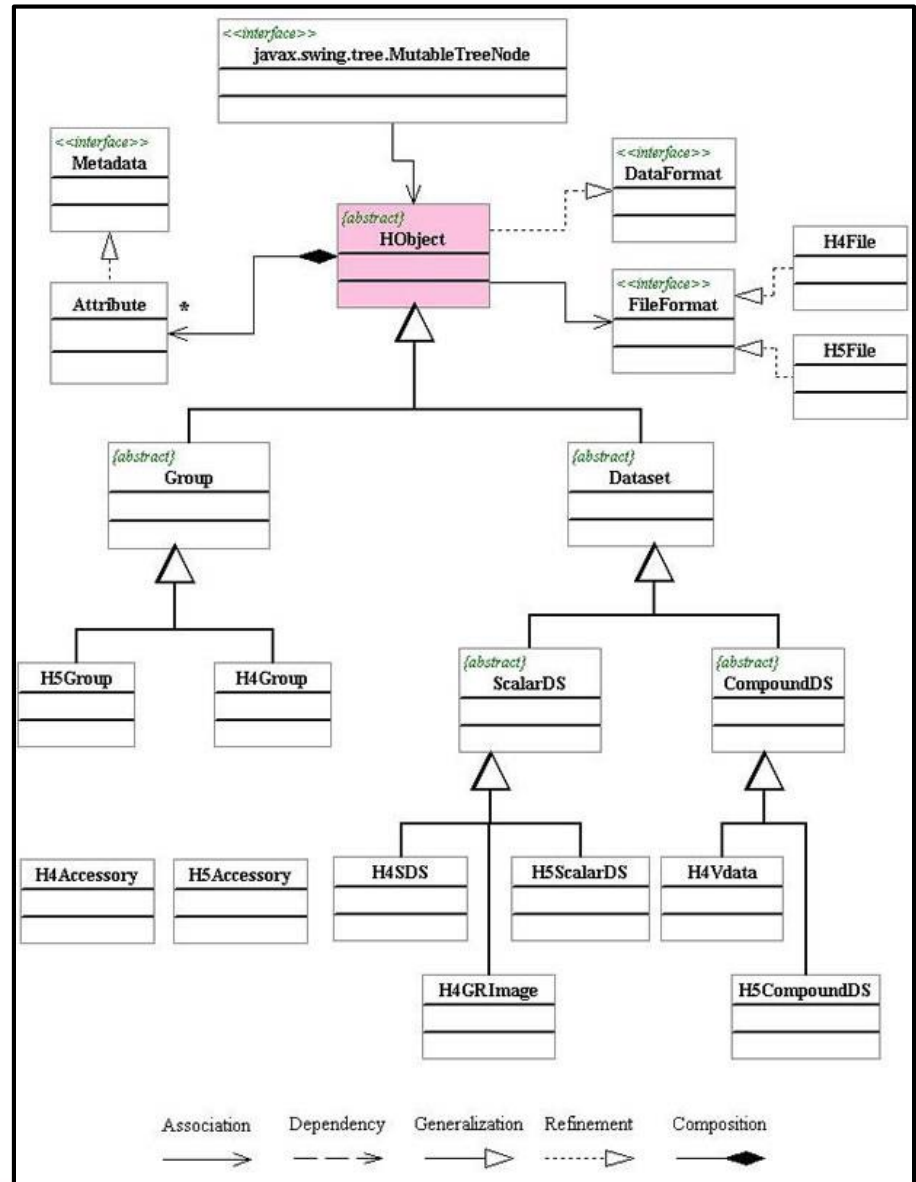
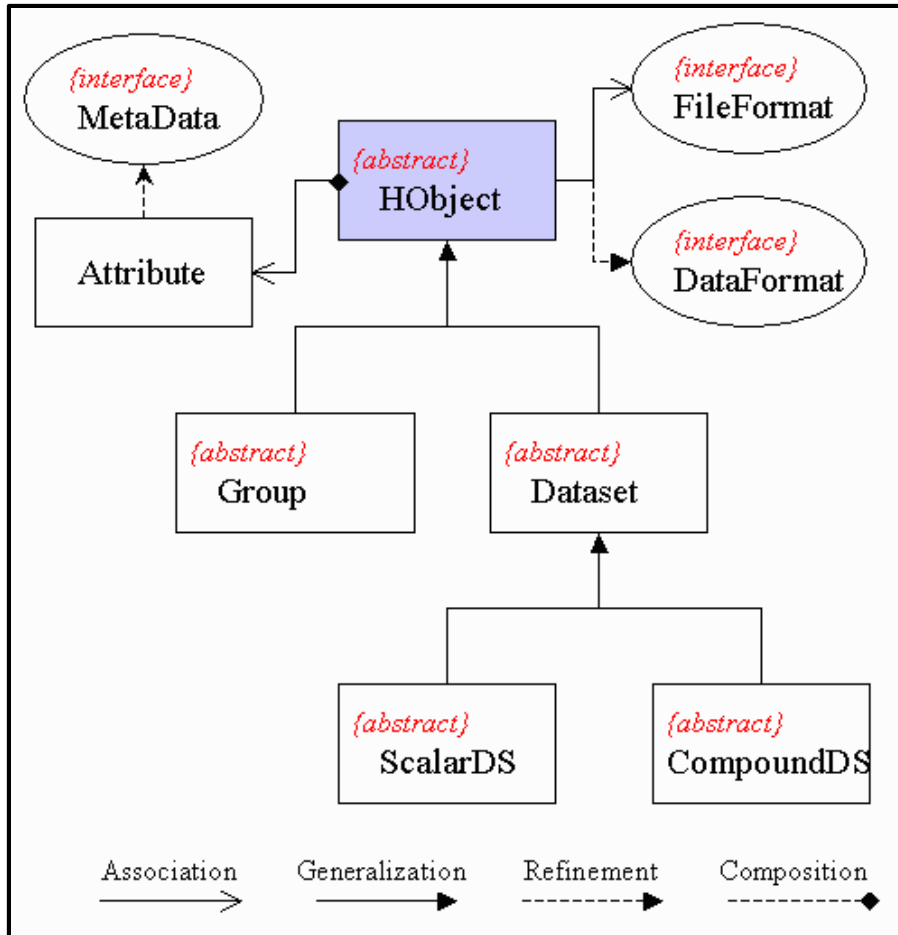
# THANK YOU

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<http://www.hdfgroup.org/products/java/>





## Basic capabilities & limitations

### HDFView:

- Image & table views, editing, animation, some metadata convention support
- Plug-in architecture for I/O and GUI (netCDF, FITS, HDF-EOS2/5)
- Outdated graphical interface; scope creep

### Java Object Layer:

- Abstraction of HDF & generic dataset concepts
- Data type mapping issues from HDF representation to Java
- Memory model: monolithic

### HDF4/HDF5 JNI Layer:

- Most HDF functionality and data types supported
- Some missing: e.g., variable length types, compound compound

<http://www.hdfgroup.org/products/java/>

HDFView 2.10.1

File Window Tools Help

Recent Files C:\Users\plutchak\Documents\ESD\SIESIP2014\DeepBlue-SeaWIFS-1.0\_L3\_20100101\_v002-20110527T191319Z.h5

swp05569slg.fits

- ImageHDU #0
- ImageHDU #1

DeepBlue-SeaWIFS-1.0\_L3\_20100101\_

- aerosol\_optical\_thickness\_550\_cou
- aerosol\_optical\_thickness\_550\_cou
- aerosol\_optical\_thickness\_550\_cou
- aerosol\_optical\_thickness\_550\_lanc
- aerosol\_optical\_thickness\_550\_lanc
- aerosol\_optical\_thickness\_550\_oce
- aerosol\_optical\_thickness\_550\_oce
- aerosol\_optical\_thickness\_550\_std
- aerosol\_optical\_thickness\_550\_std
- aerosol\_optical\_thickness\_550\_std
- aerosol\_optical\_thickness\_550\_std
- aerosol\_optical\_thickness\_count\_la
- aerosol\_optical\_thickness\_count\_la
- aerosol\_optical\_thickness\_count\_oc
- aerosol\_optical\_thickness\_land
- aerosol\_optical\_thickness\_land
- aerosol\_optical\_thickness\_ocean
- aerosol\_optical\_thickness\_stddev\_la
- aerosol\_optical\_thickness\_stddev\_la
- aerosol\_optical\_thickness\_stddev\_o
- aerosol\_optical\_thickness\_stddev\_o
- angstrom\_exponent\_count\_land
- angstrom\_exponent\_count\_land\_oc
- angstrom\_exponent\_count\_ocean
- angstrom\_exponent\_land
- angstrom\_exponent\_land\_ocean
- angstrom\_exponent\_ocean
- angstrom\_exponent\_stddev\_land
- angstrom\_exponent\_stddev\_land\_oc
- angstrom\_exponent\_stddev\_ocean

diagnostics

- land\_bands
- latitude
- longitude
- ocean\_bands
- relative\_azimuth\_angle
- scattering\_angle
- solar\_zenith\_angle

aerosol\_optical\_thickness\_550\_ocean at / DeepBlue-SeaWIFS-1.0\_L3\_20100101\_v002-20110527T191319Z.h5 in C:\Users\plutchak\Documents\ESD\SIESIP2014

Table

28, 8 = 0.098222554

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
21	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
22	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
23	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
24	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
25	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
26	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
27	0.1074	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
28	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
29	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
30	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
31	0.0482	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
32	0.0437	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
33	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
34	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
35	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
36	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0
37	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0	-999.0

Properties - /aerosol\_optical\_thickness\_550\_ocean

General Attributes

Name: aerosol\_optical\_thickness\_550\_ocean  
 Path: /  
 Type: HDF5 Scalar Dataset  
 Object Ref: 1058126, 4

Dataspace and Datatype

No. of Dimension(s): 2  
 Dimension Size(s): 180 x 360  
 Max Dimension Size(s): 180 x 360  
 Data Type: 32-bit floating-point

Chunking: 36 X 36  
 Compression: GZIP: level = 5, Storage allocation time: Incremental  
 Fill value: -999.0

Close

Image

(0,0)

Histogram - /aerosol\_optical\_thickness\_550\_ocean - by pixel index

Close

aerosol\_optical\_thickness\_550\_ocean (1058126, 4)  
 32-bit floating-point, 180 x 360  
 Number of attributes = 4  
 DIMENSION\_LIST = 1-3656,1-6504  
 long\_name = aerosol optical thickness estimated at 550 nm over ocean  
 standard\_name = atmosphere\_optical\_thickness\_due\_to\_ambient\_aerosol  
 units = 1

Log Info Metadata