Hierarchical Data Format 4 (HDF4 Hyperion) Reader

Format Notes: This format is not supported by FME Base Edition.

The HDF4 Hyperion Reader module provides FME with access to continuous numeric or classified color data in multiple bands.

Overview

HDF stands for Hierarchical Data Format, and is a container for several different data-sets, including one or more raster images. It is used most often for storing Scientific Datasets (SDS), which are multidimensional arrays filled with data. One HDF file may contain several different SDS arrays. They may differ in size, number of dimensions and may represent data for different regions.

The Hyperion (HDF4) reader can read both HDF4 and HDF4-EOS files. The latter is a modification of HDF maintained by NASA's EOS (Earth Observing System). HDF4-EOS is used for storing telemetry from NASA's 'Terra' and 'Aqua' satellites. HDF5-EOS is used for storing telemetry from 'Aura' satellites.

Note: HDF5 is a newer version of the HDF format, and is completely different from HDF4. The Hyperion (HDF4) reader cannot be used for HDF5 datasets, since HDF4 and HDF5 are not compatible with one another.

Since HDF is a container for datasets rather than a dataset itself, it can contain various subdatasets, which are in most cases associated with a particular imaging sensor. Hyperion data is produced either as level 0, which is raw data with no corrections applied, or level 1R, which is radiometrically controlled data with no geometric corrections applied.

This reader supports Hyperion level 1R data products, which consist of a metadata file, a dataset file (whose subdatasets include image data, spectral center wavelengths, spectral bandwidths, gain coefficients and a flag mask), and an ENVI formatted header file. The image data itself is stored in band interleaved by line, 16-bit signed integer radiance values. There are always 242 bands in a Hyperion L1R raster.

GCPs (ground control points) present along with a projection in a Hyperion file being read can either be applied to the data as an affine transformation, or stored as properties on the raster geometry.

HDF4 Hyperion Quick Facts

About Quick Facts Tables

Format Type Identifier	HDF4_HYPERION
Reader/Writer	Reader
Licensing Level	Professional

Dependencies	None
Dataset Type	Reader: File
Feature Type	HDF4_HYPERION, <source_data-set_filename>, <subdataset_ name>, or <source_dataset_ filename_subdataset_name>
Typical File Extensions	.L1R
Automated Translation Support	No
User-Defined Attributes	Through TAB files
Coordinate System Support	Yes
Generic Color Support	No
Spatial Index	Never
Schema Required	No
Transaction Support	No
Encoding Support	No
Geometry Type	hdf4_hyperion_type

Geometry Support				
Geometry	**Supported?**		**Geometry**	**Supported?**
aggregate	no		point	no
circles	no		polygon	no
circular arc	no		raster	yes
donut polygon	no		solid	no
elliptical arc	no		surface	no
ellipses	no		text	no
line	no		z values	no
none	no			

Band Interpretations	UInt8, Int16, Real32
Palette Key Interpretations	UInt8
Palette Value Interpretations	RGB24, RGBA32
Nodata Value	none
Cell Origin (x, y)	0.5, 0.5
Rotation Support	Yes
GCP Support	Yes
World File Support	No
TAB File Support	Yes

Reader Overview

The FME considers a top-level Hyperion container file to be a dataset.

Reader Directives

The following table lists the keywords processed by the Hyperion (HDF4) reader. The suffixes shown are prefixed by the current <ReaderKeyword> in a mapping file. By default, the <ReaderKeyword> for the Hyperion (HDF4) reader is HDF4_HYPERION.

DATASET

Required/Optional: *Required*

The value for this keyword is the name of the top-level file in the Hyperion hierarchy. The typical extension for Hyperion is .L1R.

Example:

```
HDF4_HYPERION_DATASET "C:\hdf\dat-
a\HYPERION\EO1H0360372003184110KW\EO1H0360372003184110KW.L1R."
```

Workbench Parameter: *Source Hierarchical Data Format 4 (HDF4) Hyperion File(s)*

GROUP_BY_DATASET

GROUP_BY_SUBDATASET

Required/Optional: *Required*

The value for these directives is either Yes or No. The default value for this directive is No. The two values of the two directives together provides four different options for the feature type names:

GROUP_BY_ DATASET	GROUP_BY_ SUBDATASET	Feature Type Name	Example
No	No	<reader_type_name>	HDF4_HYPERION
No	Yes	<subdataset_name>	HDF4_SDS_HYPERION_L1_1
Yes	No	<filename>	EO1H0150332002121112PF
Yes	Yes	<filename_subdataset_ name>	EO1H0150332002121112PF _HDF4_SDS_HYPERION_L1_ 1

An example of the GROUP_BY_DATASET and the GROUP_BY_SUBDATASET keywords in use is:

```
GROUP_BY_DATASET "Yes"
GROUP_BY_SUBDATASET "Yes"
```

APPLY_GCPS

Required/Optional: *Required*

The value for this keyword is either Yes or No. If set to Yes, then GCP information, including a GCP projection, will be read from the file and applied to the raster data as

an affine transformation. If set to No, the GCP information is preserved as properties on the raster geometry. The default value for this directive is No.

Example:

```
APPLY_GCPS "YES"
```

Workbench Parameter: *Apply GCPs*

GCP_INTERPOLATION_METHOD

Required/Optional: *Required*

The value for this keyword is one of NearestNeighbor, Bilinear or Bicubic. If APPLY_GCPS is set to Yes, this directive must be specified. The default value for this directive is NearestNeighbor.

Example:

```
GCP_INTERPOLATION_METHOD "Bilinear"
```

Workbench Parameter: *GCP Interpolation Method*

SEARCH_ENVELOPE

This directive specifies a bounding box used to filter the input features. Only features that interact with the bounding box are returned. If this directive is not specified, then all features are returned.

Mapping File Syntax

```
<ReaderKeyword>_SEARCH_ENVELOPE <minX> <minY> <maxX> <maxY>
```

If all four coordinates of the search envelope are specified as zero, the search envelope will be disabled.

Required/Optional

Optional

Workbench Parameter

Minimum X, Minimum Y, Maximum X, Maximum Y

SEARCH_ENVELOPE_COORDINATE_SYSTEM

This directive specifies the coordinate system of the search envelope if it is different than the coordinate system of the data.

The COORDINATE_SYSTEM directive, which specifies the coordinate system associated with the data to be read, must always be set if the SEARCH_ENVELOPE_COORDINATE_SYSTEM directive is set.

If this directive is set, the minimum and maximum points of the search envelope are reprojected from the SEARCH_ENVELOPE_COORDINATE_SYSTEM to the reader COORDINATE_SYSTEM prior to applying the envelope.

Required/Optional

Optional

Mapping File Syntax

```
<ReaderKeyword>_SEARCH_ENVELOPE_COORDINATE_SYSTEM <coordinate system>
```

Workbench Parameter

Search Envelope Coordinate System

CLIP_TO_ENVELOPE

This directive specifies whether or not FME should clip features to the envelope specified in the SEARCH_ENVELOPE directive.

Values

YES | NO (default)

Mapping File Syntax

```
<ReaderKeyword>_CLIP_TO_ENVELOPE [yes | no]
```

Workbench Parameter

Clip To Envelope

EXPOSED_ATTRS

This directive allows the selection of format attributes to be explicitly added to the reader feature type.

This is similar to exposing format attributes on a reader feature type once it has been generated; however, it is even more powerful because it enables schema-driven applications other than Workbench to access and leverage these attributes as if they were explicitly on the schema as user attributes.

The result of picking a list of attributes is a comma-separated list of attribute names and types that will be added to the schema features. Currently all reader feature types will receive the same set of additional schema attributes for a given instance of the reader.

Required/Optional

Optional

Mapping File Syntax

Not applicable. While it is possible for FME Objects applications to invoke this directive, the required format is not documented. This directive is intended for use in our GUI applications (for example, Workbench) only.

Workbench Parameter

Additional Attributes to Expose

FME Raster Features

FME raster features represent raster data and use several concepts that are unlike those used in the handling of vector data. See *About FME Rasters*.

Feature Representation

In addition to the generic FME feature attributes that FME Workbench adds to all features (see *About Feature Attributes*), this format adds the format-specific attributes described in this section.

Each Hyperion (HDF4) image data subdataset corresponds to a single feature in FME..

Attribute Name	Contents
hdf4_hyperion_type	This will always be hdf4_raster.
hdf4_hyperion_imagestarttime	The starting date and time of image collection.
hdf4_hyperion_dark_offset_method_ [trended_|_predark_|_postdark]	The dark offset method.
hdf4_hyperion_swir_scaling_factor	The SWIR scaling factor used.
hdf4_hyperion_number_of_cross_track_ pixels	The number of columns in the raster image. Fixed at 256.
hdf4_hyperion_file_type	The type of file generated (ie pre-image dark calibration, image, post-image dark calibration, lamp calibration, post-lamp dark calibration).
hdf4_hyperion_level0_pre-dark_file-name	The filename for the level 0 pre-dark calibration.
hdf4_hyperion_frame_number_range	The data file frame number range.
hdf4_hyperion_number_of_along_ track_ pixels	The number of rows in the raster image.
hdf4_hyperion_vnir_scaling_factor	The VNIR scaling factor used.
hdf4_hyperion_file_byte_order	The endianness in which the data is stored.

Attribute Name	Contents
hdf4_hyperion_calibration_parameter_file	The name of the calibration parameter file used to generate the L1R data.
hdf4_hyperion_echoratiofile	The name of the echoratio file used to generate the L1R data.
hdf4_hyperion_time_of_l1_file_generation	The time and date of L1 file generation.
hdf4_hyperion_scene_id	The scene id.
hdf4_hyperion_number_of_bands	The number of bands in the raster image. Fixed at 242.
hdf4_hyperion_level0_image_filename	The name of the level 0 image filename.
hdf4_hyperion_level0_post-dark_filename	The name of the level 0 post-dark filename.
hdf4_hyperion_data_units	The data units.
hdf4_hyperion_l1_file_generated_by	The version of the level 1 processing code used to process the data file.
hdf4_hyperion_subdataset_name	When this is present on a feature, the feature is a subdataset. This attribute shows the name of the subdataset.
hdf4_hyperion_subdataset_description	When this is present on a feature, the feature is a subdataset. This attribute gives a description of the subdataset.