

# How to use HDF-EOS5 augmentation tool for NASA HDF-EOS5 files

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The default option of the HDF-EOS5 augmentation tool is simple to use. So if that option is sufficient for your usage, you can ignore this document.

The file option of the HDF-EOS5 augmentation tool is the most useful one since it provides a way for users to specify the dimension scale information in a dimension to dimension scale mapping file. For general information on how to use the file option, check section 3.2.2, 3.3, 3.4 and 3.5 in the the HDF-EOS5 augmentation tool User's guide<sup>[1]</sup>.

This note provides hints on how to use the file option of the HDF-EOS5 augmentation tool to augment typical NASA HDF-EOS5 files. Sample mapping files are provided for each example to help users.

The HDF-EOS5 files we use here are MLS swath files, HIRDLS zonal average files, OMI swath and grid files, TES swath and grid files and MOPITT swath and grid files.

## I. Retrieve information

### 1) Find the dimension information

One can check dimension information from StructMetadata.0 under the group "HDFEOS INFORMATION". The easiest way is to use HDFView and click StructMetadata.0. You should see another window is opened. Find GROUP=Dimension, under that row, you will find the corresponding dimension information such as DimensionName="nTimes", Size=3494.

### 2) Find the appropriate mapping from dimension to dimension scale

This is necessary except for "XDim" and "YDim" in an HDF-EOS5 grid. For the current HDF-EOS5 products, the tool can obtain the dimension scales of "XDim" and "YDim" by using HDF-EOS5 APIs.

## II. Generate a dimension to dimension scale mapping file

The following table shows examples on how to generate mapping files for typical NASA HDF-EOS5 files.

## 1. MLS/HIRDLS

Type		
MLS/HIRDLS single swath	EOS file	<a href="#">MLS-Aura L2GP-BrO v02-23-c01_2010d255.he5</a>
	Build up the dimension to dimension scale relations	1. Dimension scale of <i>nTimes</i> is the field <i>Time</i> . 2. Dimension scale of <i>nLevels</i> is the field <i>Pressure</i> . 3. Dimension <i>nTimeTotal</i> is not used and should be treated as a pure dimension. No dimension information needs to be specified in the mapping file.
	Mapping file	<a href="#">MLS-Aura L2GP-BrO v02-23-c01_2010d255.txt</a>
MLS/HIRDLS multi-swath	EOS file	<a href="#">MLS-Aura L2GP-Temperature v02-23-c01_2010d058.he5</a>
	Build up the dimension to dimension scale relations	1. Dimension information should be provided for each swath. 2. Dimension scale of <i>nTimes</i> is the field <i>Time</i> . 3. For Swath <i>Temperature</i> , Dimension scale of <i>nLevels</i> is the field <i>Pressure</i> . 4. Dimension <i>nTimeTotal</i> is not used and should be treated as a pure dimension. No dimension information needs to be specified in the mapping file.
	Mapping file	<a href="#">MLS-Aura L2GP-Temperature v02-23-c01_2010d058.txt</a>
HIRDLS zonal average	EOS file	<a href="#">HIR3ZA-test2.he5</a>
	Build up the dimension to dimension scale relations	1. Dimension scale of <i>nTimes</i> is the field <i>Time</i> . 2. Dimension scale of <i>nLevels</i> is the field <i>Pressure</i> . 3. Dimension scale of <i>nLats</i> is the field <i>Latitude</i> .
	Mapping file	<a href="#">HIRza.txt</a>

## 2. OMI

Type		
OMI grid	EOS file	<a href="#">OMI-Aura_L3-OMAEROe_2010m0830_v003-2010m0902t032205.he5</a>
	Build up the dimension to dimension scale relations	<p>1. Dimension scales of <i>XDim</i> and <i>YDim</i> are longitude and latitude. The tool will retrieve them directly. No dimension information needs to be specified in the mapping file.</p> <p>2. Dimension scale of <i>nWaveDiagnositc</i> is stored at an attribute <i>nWaveDiagnostic</i> in a grid <i>ColumnAmountAerosol</i>. To make the augmentation tool access the values in this attribute. Do the following:</p> <p>1) Use HDF tools such as HDFView or h5dump to open the attribute <i>nWaveDiagnostic</i> in a grid <i>ColumnAmountAerosol</i>.</p> <p>2) Create an empty ASCII text file with the name <i>WaveDiagnostic.data</i>.</p> <p>3) Copy the values to file <i>WaveDiagnostic.data</i>. You can copy the values with the comma separator.</p> <p>4) Save the ASCII file.</p> <p>5) The dimension scale of <i>nWaveDiagnositc</i> can be retrieved from the ASCII file <i>WaveDiagnostic.data</i>.</p>
	Mapping file	<a href="#">OMI-Aura_L3-OMAEROe_2010m0830_v003-2010m0902t032205.txt</a>
OMI swath	EOS file	<a href="#">OMI-Aura_L2-OMBRO_2010m1005t1835-o33108_v003-2010m1006t023445.he5</a>
	Build up the dimension to dimension scale relations	<p>1. Dimension scale of <i>nTimes</i> is the field <i>Time</i></p> <p>2. Other dimensions (<i>nXtrack</i> etc.) are just left as pure dimensions. No dimension information needs to be specified in the mapping file. The default option is applied. The users can specify the dimension scale data using an ASCII file or index number if a dimension scale is supposed to be provided.</p>
	Mapping file	<a href="#">OMI-Aura_L2-OMBRO_2010m1005t1835-o33108_v003-2010m1006t023445.txt</a>

### 3. TES

Type		
TES grid	EOS file	<a href="#">TES-Aura L3-O3_r0000011812_C01_F01_07.he5</a>
	Build up the dimension to dimension scale relations	<ol style="list-style-type: none"> <li>1. Use the <i>Latitude</i> and <i>Longitude</i> fields in the EOS file for the scales of YDim and XDim.</li> <li>2. Dimension scale of <i>nLevels</i> is the field <i>Pressure</i>.</li> </ol>
	Mapping file	<a href="#">TES-Aura L3-O3_r0000011812_C01_F01_07.txt</a>
TES swath	EOS file	<a href="#">TES-Aura L2-SUPPLEMENTAL-SO_r0000011860_C01_F01_07.he5</a>
	Build up the dimension to dimension scale relations	<ol style="list-style-type: none"> <li>1. Dimension information should be provided for each swath.</li> <li>2. Based on our best knowledge, dimension scale of <i>nTimes</i> is mapped to field <i>Latitude</i> since no <i>Time</i> field can be found in the file. Users should carefully check the product document about the dimension scale of <i>nTimes</i> and if necessary, use an ASCII file to provide the dimension scale of this dimension.</li> <li>3. Dimension scale of <i>nLevels</i> is stored at an attribute <i>Pressure</i> in the swath <i>CO2NadirSwath</i> or <i>N2ONadirSwath</i>. To make the augmentation tool access the values in this attribute. Do the following: <ol style="list-style-type: none"> <li>1) Use HDF tools such as HDFView or h5dump to open the attribute <i>Pressure</i> in a swath <i>CO2NadirSwath</i>.</li> <li>2) Create an empty ASCII text file with the name TES-l2-pressure.</li> <li>3) Copy the values to file TES-l2-pressure. You can copy the values with the comma separator. You also need to add add a value, probably by interpolation, as the first value to make the dimension size and the number of values in the ASCII file consistent.</li> <li>4) Save the ASCII file.</li> <li>5) The dimension scale of <i>nLevels</i> can be retrieved from the ASCII file TES-l2-pressure.</li> <li>6) In this case, since the attribute value of <i>Pressure</i> is the same for both swathes, you can simply use TES-l2-pressure for both swathes.</li> </ol> </li> </ol>
	Mapping file	<a href="#">TES-Aura L2-SUPPLEMENTAL-SO_r0000011860_C01_F01_07.txt</a>

#### 4. MOPITT

Type		
MOPITT grid	EOS file	<a href="#">MOP03N-20000303-L3V4.2.2.he5</a>
	Build up the dimension to dimension scale relations	<ol style="list-style-type: none"> <li>1. Use the <i>Latitude</i> and <i>Longitude</i> fields in the EOS file for the scales of YDim and XDim.</li> <li>2. Dimension scale of <i>Prs</i> is the field <i>Pressure</i></li> <li>3. Dimension scale of <i>Prs2</i> is the field <i>Pressure2</i></li> <li>4. For the dimension scale values of dimension <i>NTWO</i>, it seems appropriate to just assign them as nature numbers</li> </ol>
	Mapping file	<a href="#">MOP03N-20000303-L3V4.2.2.txt</a>
MOPITT swath	EOS file	<a href="#">MOP02J-20130830-L2V16.2.3.he5</a>
	Build up the dimension to dimension scale relations	<ol style="list-style-type: none"> <li>1. Use the <i>Latitude</i> and <i>Longitude</i> fields in the EOS file for the scales of YDim and XDim.</li> <li>2. Dimension scale of <i>Prs</i> is the field <i>Pressure</i></li> <li>3. Dimension scale of <i>Prs2</i> is the field <i>Pressure2</i></li> <li>4. For the dimension scale values of dimension <i>nTwo</i>, <i>nThree</i>, <i>nRad</i>, <i>nCldd</i> it seems appropriate to just assign them as nature numbers</li> </ol>
	Mapping file	<a href="#">MOP02J-20130830-L2V16.2.3.txt</a>

### III. Generating augmentation files

Assume the original file name is eos-example.he5 and the mapping file name is eos-example.txt. Do the following:

- 1) Make a copy for the original file
- 2) `aug_eos5 -f eos-example.txt eos-example.he5`

For all the sample HDF-EOS5 files and the corresponding mapping file used in this document, check [ftp://ftp.hdfgroup.uiuc.edu/pub/outgoing/NASAHDFTOOLfiles/aug\\_eos5/sample\\_files\\_for\\_batch\\_test/augmented\\_files/file-index/](ftp://ftp.hdfgroup.uiuc.edu/pub/outgoing/NASAHDFTOOLfiles/aug_eos5/sample_files_for_batch_test/augmented_files/file-index/)

### IV. How to modify the HDF5 attributes for the augmented HDF-EOS5 file

Some users prefer to edit the variable attributes. Unfortunately the scope of the augmentation tool is to make the HDF-EOS5 file accessible by netCDF-4. So to add the editing capability is out of the scope of the tool. However, for users who want to edit HDF5 attributes, please check the simple note <sup>[2]</sup>.

### V. Relevant Documents

[1] The HDF-EOS5 augmentation tool User's guide:

[http://hdfeos.org/software/aug\\_eos5/HDFEOS5AugToolUsersGuide.pdf](http://hdfeos.org/software/aug_eos5/HDFEOS5AugToolUsersGuide.pdf)

[2] Edit HDF5 attributes: demonstration with h5py and h5edit

[http://hdfeos.org/software/aug\\_eos5/Edit-HDF5-attr.pdf](http://hdfeos.org/software/aug_eos5/Edit-HDF5-attr.pdf)