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HDF-EOS to GeoTIFF Conversion Tool (HEG) User's Guide for Data Pool

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Preface

The EMD program, under the auspices of NASA's Earth Observing System (EOS), provides a tool for the conversion of HDF-EOS formatted granules to Geographical Information System (GIS) compatible formats, such as GeoTIFF. The initial focus of the tool's development is to provide conversion services for standard HDF-EOS science products produced by the MODIS, MISR and ASTER instruments. The tool is available online through the EOS Data Pools, and is also available as a stand-alone product which can be downloaded to a user workstation.

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Abstract

The HDF-EOS to GeoTIFF Conversion Tool (HEG) has been developed to allow users of EOS data to convert that data from HDF-EOS to GeoTIFF format for use in GIS application tools. The HEG also provides users the ability to convert EOS data from its original map projection to a user-specified map projection, and to request subsets of EOS data products by spatial coordinates or band specification. The tool is available online through the EOS Data Pools, and is also available as a stand-alone product which can be downloaded to a user workstation. This document is a user's guide for the Data Pool version of the HEG tool.

***Keywords**:* HDF-EOS, GeoTIFF, GIS, Subsetter

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Appendix A. List of Supported Data Sets

Appendix B. State Plane Zones and Values

Appendix C. Sample Output Metadata

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1. Introduction

1.1 Identification

The HDF-EOS to GeoTIFF Conversion Tool (HEG) Users Guide for Data Pool was prepared under the Earth Observing System Data and Information System (EOSDIS) Maintenance and Development Contract (NAS5-03098).

1.2 Scope

This document is a Users Guide for the Data Pool version of the HDF-EOS to GeoTIFF Conversion Tool (HEG) software.

1.3 Purpose and Objectives

This document provides users of the Data Pool HEG with a description of how to use the Data Pool web interface to place orders for HEG conversion of data in the EOS Data Pools, and how HEG conversion orders are processed and delivered. This document should be used in conjunction with online help text and tutorials available with the Data Pool web interface.

1.4 Document Organization

This document is organized as follows:

Section 1. Introduction

Section 2. Related Documentation

Section 3. Operations Concept

Section 4. Using the HEG through the EOS Data Pools

Appendix A. List of supported data sets

Appendix B. State Plane Zones and Values

Appendix C. Sample Output Metadata

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2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content are derived:

none

2.2 Related Documents

The following documents are referenced within this technical paper, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document.

333-EMD-001, Rev. 2	Release 7 SCF Toolkit Users Guide for the ECS Project
170-EMD-001, Rev. 2	HDF-EOS Library User's Guide Volume 1: Overview and Examples
170-EMD-002, Rev. 2	HDF-EOS Library User's Guide Volume 2: Function Reference Guide
515-EMD-001	HDF-EOS to GeoTiff Conversion Tool (HEG) Standalone User's Guide
	HDF User's Guide, V 4.1r5, NCSA, U of Illinois, Campaign, IL, 2001
	HDF Specification and Developer's Guide, V 4.1r5, NCSA, U of Illinois, Campaign, IL, 2001
	HDF Reference Manual, V 4.1r5, NCSA, U of Illinois, Campaign, IL, 2001
none	An Album of Map Projections, USGS Professional Paper 1453, Snyder and Voxland, 1989
none	Map Projections - A Working Manual, USGS Professional Paper 1395, Snyder, 1987

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3. Operations Concept

EOS Terra and Aqua, launched in December 1999 and May 2002 respectively, carry instruments which provide observations of the earth at many wavelengths and spatial resolutions. The data are used to provide scientists, policy makers and others with a continuous record of parameters used to characterize, for example, land use, pollutant transport and climate change.

The standard format for EOS instrument data is HDF-EOS, which is derived from the National Center for Supercomputers (NCSA) HDF format. HDF is a self-describing, portable format for scientific data. HDF-EOS applies standards for attaching geolocation and temporal information to scientific data. Most EOS data products are stored and distributed in this format. HDF-EOS files also contain core and product-specific metadata. The former metadata are also stored in databases for user search and access.

HDF-EOS is not generally usable in common GIS application tools such as ArcInfo, ENVI and ERDAS. The HDF-EOS to GeoTIFF Conversion Tool (HEG) has been developed to allow users of EOS data to convert that data from HDF-EOS to GeoTIFF format for use in GIS application tools. The HEG also provides users the ability to convert EOS data from its original map projection to a user-specified map projection and to request subsets of EOS data products by spatial coordinates or band specification.

The HEG is available as a standalone tool to be run on an end user's workstation against the user's local directory of EOS data products, and is also available publicly online at the EOS Distributed Active Archive Centers (DAACs), where it can be run against EOS data in the DAAC's Data Pool. The Standalone HEG may be run from the command line or via the Standalone HEG GUI. The Data Pool HEG is available through the Data Pool web search and order interface at each DAAC.

This document describes usage of the Data Pool version of the HEG. Refer to 515-EMD-001, HDF-EOS to GeoTiff Conversion Tool (HEG) Standalone User's Guide, for instructions on usage of the Standalone version of the HEG.

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4. Using the HEG through the EOS Data Pools

4.1 Data Pool Overview

The Data Pool is a large disk cache at each EOS Distributed Active Archive Center (DAAC) that contains frequently used data from the DAAC's EOS archive. The contents of this cache are tuned to the needs of each DAAC's user community. The goal of the Data Pool is to increase the distribution capacity of EOS data by significantly reducing the need to access tape archives. Users may access data in the Data Pool directly via FTP, or using a web interface.

The Data Pool web interface employs a simple 'drill-down' paradigm which allows users to continuously refine search criteria until a desired results set is achieved. All data "granules" in the results set are displayed on a results page. Data granules may be downloaded directly from the results page with or without HEG conversion, or may be grouped with other search results in a shopping cart, where ftp or media distribution are available. HEG conversion is available from the shopping cart for ftp distribution.

This chapter describes how to request HEG conversion for granules in a user's Data Pool web interface results set. It will not, however, describe the basic usage of the drill down interface to produce the results set. If the user is not already familiar with how to use the Data Pool web interface to search for data of interest, help text and tutorial text are available online.

4.2 HEG usage overview

HEG conversion options are available for many, but not all, EOS data types. (See Appendix A for a list of data types currently supported by the HEG). If a data type is eligible for HEG conversion, the HEG Converter Icon will be displayed in the rows for granules of that data type on the search results page.

There are four types of HEG conversion operations which are supported by the Data Pool HEG. These are format conversions, projection conversions, spatial subsetting, and band subsetting. These types of conversions may be selected individually or in combination with each other (e.g., the user may request a format conversion only, or a format conversion combined with a projection conversion, or a format conversion combined with spatial subsetting, etc.) Not all types of conversions and conversion options are available for each data type; only the applicable ones will be presented on the Data Pool web interface.

The Data Pool HEG supports two options for format conversion: HDF-EOS (i.e., the data remains in its original EOS format), and GeoTIFF. GeoTIFF is a TIFF (Tagged Image File Format) based interchange format for georeferenced raster imagery. GeoTIFF formatted data is accepted as input by common GIS applications such as ArcInfo, ENVI and ERDAS.

The Data Pool HEG supports reprojection of input data to the following output projections: Geographic, Sinusoidal, Universal Transverse Mercator (UTM), Transverse Mercator (TM),

Polar Stereographic (PS), Lambert's Equal Area Azimuthal, Lambert's Conformal Conic, and State Plane Coordinate system (See Appendix B for a listing of State Plane Zones and Values). When choosing a reprojection option, users may accept default projection parameter values, or may override the defaults by providing projection parameter information.

Spatial subsetting and/or band subsetting of the input data is also supported by the Data Pool HEG. To perform spatial subsetting, the user must provide bounding box coordinates. To perform band subsetting, the user chooses one or more available bands from a pick list. Note that users are REQUIRED to select spatial and/or band subsetting when performing HEG conversions for granules from certain data types such as MISR data types.

Products of Data Pool HEG conversion requests are stored for a finite time period in an order directory at the host DAAC. The user receives an email indicating that the HEG conversion request is complete. The email provides links to the order directory, from which the user may download the HEG converted products. The email also informs the user of the order expiration date, after which the order directory will no longer be available.

Descriptions of how to submit HEG conversion requests in this chapter assume that the user has already performed a drill down search using the Data Pool web interface. Results of the user's search are displayed on a "Results of Your Search" page (results page). Figure 1 shows an example of this page.

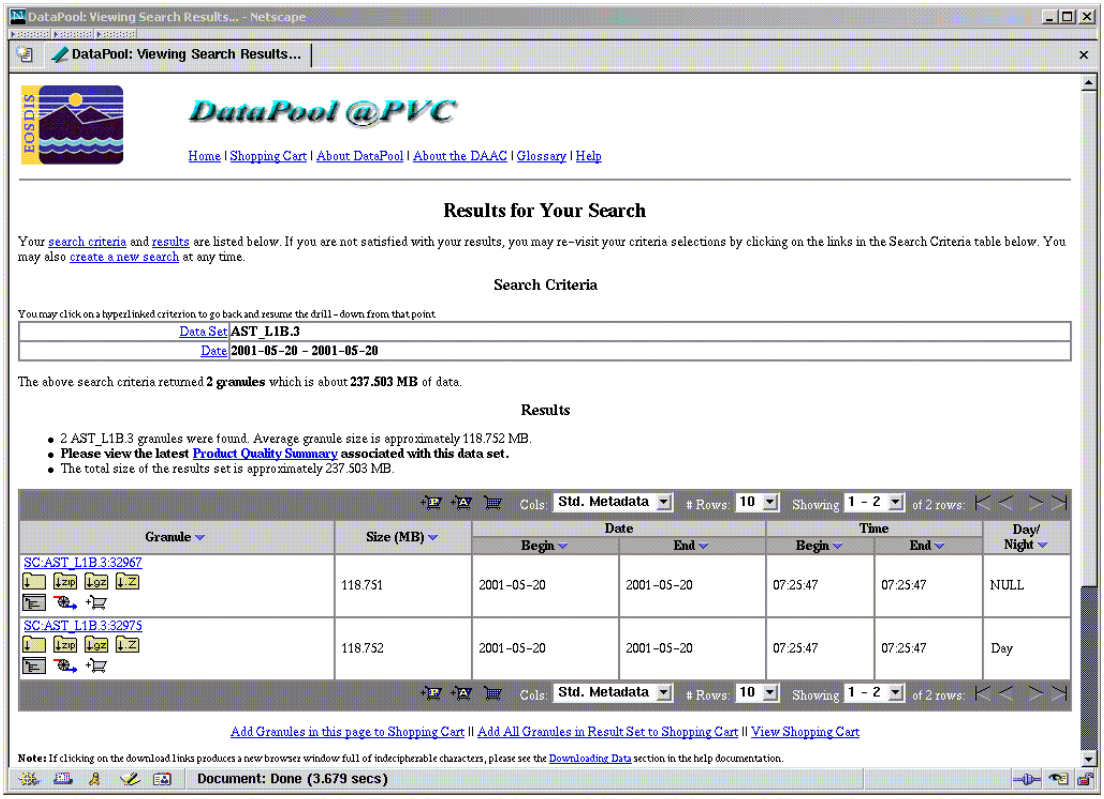


Figure 1. Search results of drill-down

HEG conversions may be requested directly on the search results page for individual granules in the results set (see section 4.3, HEG Conversions via the Results Page), or may be requested for one or more granules after all granules to be ordered have been placed in the shopping cart. (see section 4.4, HEG Conversions via the Shopping Cart).

Note that the XML File icon displayed in each row on the results page allows the user to examine the metadata associated with the granule, in xml format. This metadata includes spatial coordinates of the granule, which may be helpful when requesting spatial subsetting of the granule with the HEG.

4.3 HEG Conversions via the Results Page

The user initiates a HEG conversion of a single granule by selecting the HEG Converter Icon in the result row for that granule. When selected, the Converter Dialog is displayed for that granule. (See Figure 2)

DataPool: Converter Dialog - Netscape

Select Conversion Parameters for this Granule:

SC:AST_L1B.3:32967

Note that requests for formatting, projection changes or subsetting can take some time (some large files can take several hours of processing time). As such, you may want to download files that don't require processing separately from those that do (go back to results to do the separate downloads). For any downloads that do contain formatting, projection changes or spatial subsetting, you will receive two e-mails from this site: the first e-mail is an acknowledgment of your download order and the second contains the results of your order. The acknowledgment e-mail contains information such as your order id. The order e-mail will be sent when your download request has been fulfilled. This e-mail will contain a link(s) to your file(s). You will have a limited period in which to ftp the processed files from the download site. After that, your files will be removed.

Conversion Parameters (Optional)

Format:	HDF-EOS
Projection:	No Change There are no input projection parameters for this projection.
Band Subsetting:	All VNIR_Swath SWIR_Swath

Download Profile

User Name: (Optional)	First: Last:
E-mail:	**Required** if you selected formatting and projection changes or subsetting OR if you always want an acknowledgment.

☐ Send acknowledgment e-mail even if no conversions are requested (i.e. Packaging Only)

Convert this granule | Cancel

Figure 2. Converter Dialog

To convert the granule using the HEG, the user selects the output format and output projection from the pull-down lists on the dialog. For some choices of output projections, the Converter Dialog page will be redisplayed with additional input blocks allowing the user to enter parameter values associated with that projection. (See Figure 3 for an example of a Converter Dialog showing projection parameter input blocks). If the user does not enter projection parameter values, default values will be used. (Reference Chapter 1.6.4 of the HDF-EOS Library User's Guide Volume 2: Function Reference Guide, for a listing and descriptions of the U.S. Geological Survey General Cartographic Transformation Package (GCTP) Projection Parameters for HEG-supported projections. This document may be found on the SDP Toolkit website at http://newsroom.gsfc.nasa.gov/sdptoolkit/userguide.html.)

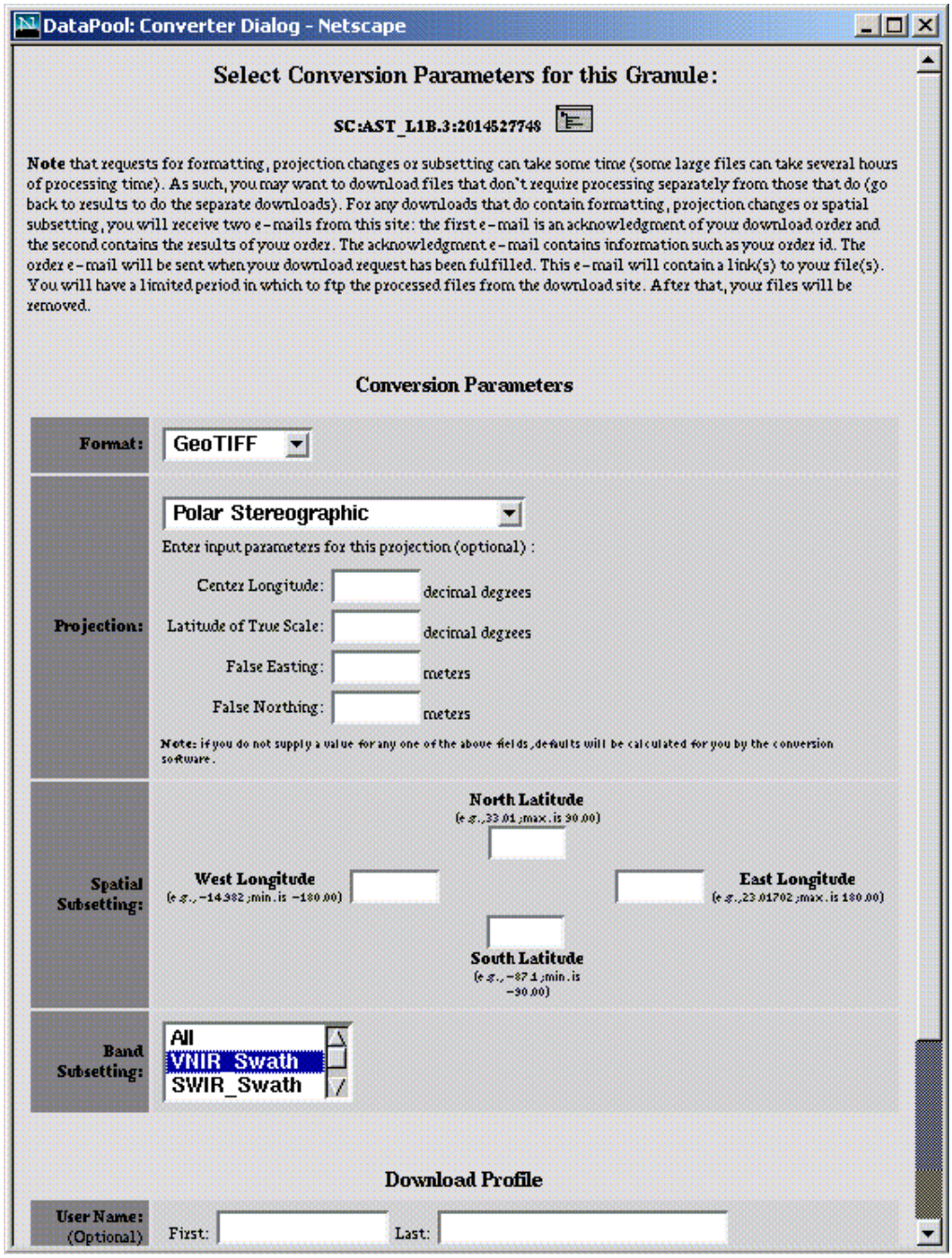


Figure 3. Converter Dialog with Projection Parameters (PS Projection)

Depending on the data type, Band and/or Spatial subsetting may also be presented as options on the Converter Dialog. In Figure 2, band subsetting is offered as an option whereas spatial subsetting is not. To perform band subsetting, the user selects one or more bands from the band pull-down list. (To select a number of consecutively listed bands, the user selects one band and then selects another band while holding down the shift key. All listed bands between and including these bands will be selected from the list. Non-consecutive bands in the list can be

selected by selecting one band at a time while pressing the control key.) The default option of 'All' on the band subsetting pull-down list means that band subsetting will not be performed.

The user then enters download profile information, including a required email address. When all the required information has been entered, the user selects "Convert This Granule". An order acknowledgement is then displayed confirming the acceptance of the HEG conversion request, and showing the details of the user's HEG conversion choices (see Figure 4). In this example, we placed an order for one AST_L1B version 3 science granule with an output format of GeoTIFF, output projection Geographic, no Spatial Subsetting and a Band Subsetting choice of SWIR_Swath only.

Figure 4. Order Acknowledgment Page

The user receives an Order Confirmation email stating that the HEG conversion order was placed. The email text includes the same information that is included in the order acknowledgement page in Figure 4. The order id on the acknowledgment page and in the confirmation email should be referenced in all communications with DAAC User Services about the order.

The user also receives an Order Notification email when the HEG conversion order is completed. (See Figure 5) The email notification contains links to the directory from which the converted products may be downloaded, as well as links for zip or tar files of the packaged order. The email also states when the order directory is scheduled to expire.

```
xterm
  PINE 4.05   MESSAGE TEXT                    Folder: INBOX  Message 1,225 of 1,225 72%

Date: Tue, 7 Dec 2004 10:06:03 -0500 (EST)
From: CMOPS Mike Molinet x0874 <cmops@p2ins02u.ecs.nasa.gov>
To: jcorbett@eos.east.hitc.com
Subject: LP DAAC DataPool Order Notification: 0000000000000770

Thank you for ordering from the LP DAAC DataPool.  This is a system-generated mail.
Please do not reply to it.  If you have any questions, please contact LP DAAC User
Services at edc@eos.nasa.gov

Your DataPool order, 0000000000000770, is ready.  Per your request, your order is being
delivered using a standard web download (FTP).  Your files are stored in a unique
directory residing on the DataPool anonymous FTP site.  To access your files, click on one
of the links below.

NOTE: The data associated with your order will expire in 120 days.  It is your
responsibility to retrieve the data within this timeframe.

++++++++++++++++++++

Order ID: 0000000000000770

Finished: Tue Dec 07 10:06:03 EST 2004

Media Type: Download

Download Links:
    - File Listing: ftp://p2dps01u.ecs.nasa.gov/downloads/0000000000000770/
    - Download ZIP file of packaged order:
      ftp://p2dps01u.ecs.nasa.gov/downloads/0000000000000770.zip
    - Download TAR file of packaged order:
        - Uncompressed:
          ftp://p2dps01u.ecs.nasa.gov/downloads/0000000000000770.tar
        - GZIP Compressed:
          ftp://p2dps01u.ecs.nasa.gov/downloads/0000000000000770.tar.gz
        - UNIX Compressed:
          ftp://p2dps01u.ecs.nasa.gov/downloads/0000000000000770.tar.Z

++++++++++++++++++++

Data Ordered:

Granule: SC:AST_L1B.003:2014527748   ESDT: AST_L1B.003
    Original Source File Info:
        Name:  quatar2.hdf
        Size:  118.743706 MB
        Status:  Successfully packaged
    Generated Output Files:
        Name: quatar2_ImageData7_1006.tif
        Size: 6 MB
        Name: quatar2_ImageData6_1006.tif
        Size: 6 MB
        Name: quatar2_ImageData5_1006.tif
        Size: 6 MB
        Name: quatar2_ImageData4_1006.tif
        Size: 6 MB
        Name: quatar2_ImageData9_1006.tif
        Size: 6 MB
        Name: quatar2_ImageData8_1006.tif
        Size: 6 MB

++++++++++++++++++++

? Help        < MsgIndex    - PrevMsg     - PrevPage   D Delete    R Reply
O OTHER CMDS  > ViewAttch   N NextMsg     Spc NextPage  U Undelete  F Forward
```

Figure 5. HEG Conversion Order Completion Notification Email

4.4 HEG Conversions via the Shopping Cart

The second method for submitting an order for HEG conversion allows the user to perform HEG conversion for one or more granules at the same time. To do this, the user must use the shopping cart feature of the Data Pool web interface. A single granule can be added to the shopping cart by selecting the "Add to Cart" icon ( ) next to the granule of interest on the "Results of Your Search" page (see Figure 1). The user may also add more than one granule at a time to the shopping cart using either the "Add Granules in this page to Shopping Cart" or "Add All Granules in Result Set to Shopping Cart" links. The user may continue to add granules to the shopping cart from subsequent drill down searches. When a granule is added to the shopping cart, the "Granule in Shopping Cart" icon ( ) is displayed for the granule.

Once all desired granules are placed in the shopping cart, the user may view the shopping cart by clicking on "View Shopping Cart" at the bottom of the results page, or by clicking on "Shopping Cart" in the page header.

To illustrate the conversion of granules in the shopping cart, we add the granules returned in the drill down of the two AST_L1B.3 granules found earlier (See Figure 1) to the shopping cart. Upon entering the shopping cart, the "Your Shopping Cart" screen is displayed (see Figure 6). The XML File icon allows the user to examine the metadata associated with the science granule in xml format. The user is also presented with two pull down dialog boxes, one for choosing the output format and the other for choosing the output projection. If applicable for this data granule, the Spatial Subsetting and Band Subsetting icons are also presented, and may be used to invoke the corresponding subsetting dialogs. For the AST_L1B.3 granules displayed in Figure 6, only the Band Subsetting icon is available. An example illustrating the use of the Spatial Subsetting icon will be presented in section 4.4.4.

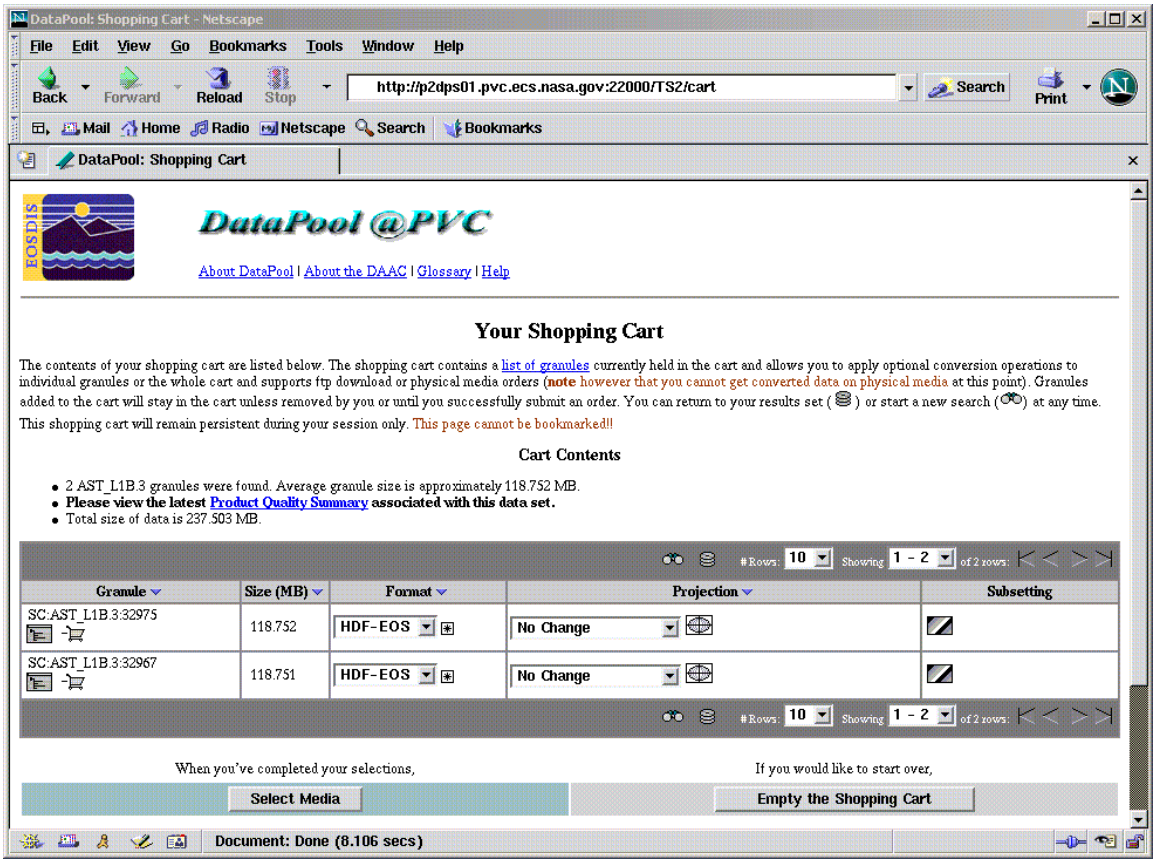


Figure 6. Shopping cart containing two AST_L1B.3 granules

In this example, we will convert both AST_L1B.3 granules to GeoTIFF output format, Geographic output projection and band subset only the VNIR_Swath band. This example will be used to illustrate the "apply to all in shopping cart" feature which allows the user to quickly set output formats, projections, projection parameters and band subsetting parameters for like granules. An example of the "apply to all in shopping cart" for spatial subsetting will be illustrated in a later example.

4.4.1 Choosing an output format

To select the output format for a given granule, the user selects one of the available formats (HDF-EOS, GeoTIFF) on the Format pull-down list for the granule. To make the selected output format apply to all granules in the shopping cart, the user clicks on the "Apply this selection to all granules in the shopping cart" ⊠ icon.

4.4.2 Choosing an output projection

To select the output projection for a given granule, the user selects one of the available projections on the Projection pull-down list for the granule. Output projections supported by the

Data Pool HEG are: Geographic, Sinusoidal, Universal Transverse Mercator (UTM), Transverse Mercator (TM), Polar Stereographic (PS), Lambert's Equal Area Azimuthal, Lambert's Conformal Conic, and State Plane Coordinate system. However, not all projection options are available for all data types. Only projections supported for the relevant data type will be shown on the pull-down list for a particular granule. (See Figure 7 for an example). "No Change" is the default output projection (i.e., the output product will be in the same projection as the input product).

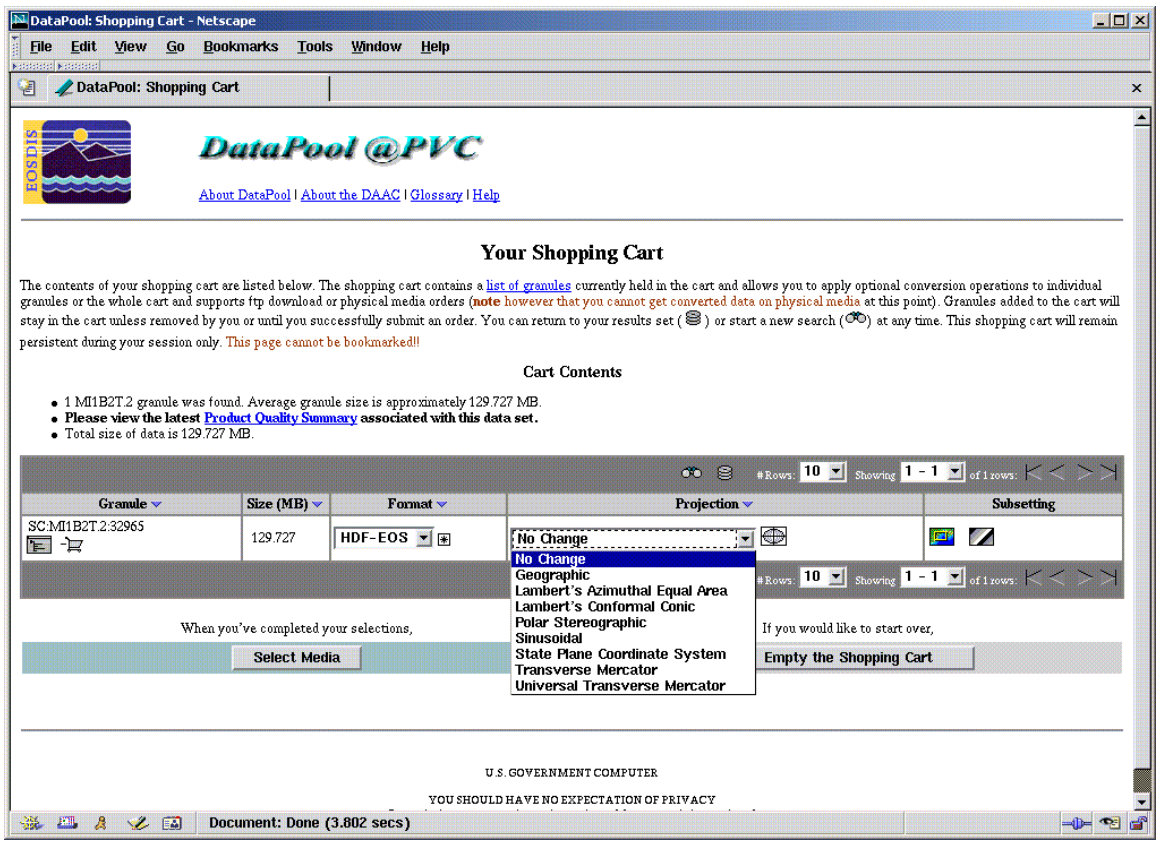


Figure 7. Choosing an output projection

Output projections may be selected one at a time for each granule in the shopping cart. Default projection parameters for the selected projection will be supplied automatically, but the user may override the default projection parameters by clicking on the Projection Input Parameters icon. This will bring up the Projection Input Parameters page. (See Figures 8 and 9 for examples.) (Reference Chapter 1.6.4 of the HDF-EOS Library User's Guide Volume 2: Function Reference Guide, for a listing and descriptions of the U.S. Geological Survey General Cartographic Transformation Package (GCTP) Projection Parameters for HEG-supported projections. This document may be found on the SDP Toolkit website at http://newsroom.gsfc.nasa.gov/sdptoolkit/userguide.html.)

By selecting "Apply these settings to all granules" on the Projection Input Parameters page, and selecting OK, the projection parameters entered by the user will be applied to all granules in the cart for which the same projection is selected. (Note that if the granules populating the shopping cart belong to more than one data type, some of the projections available to one data type may not be available to granules from another data type. The Projection Input Parameters page will recognize this and not present the user with the option to apply the projection universally to the granules in the shopping cart.)

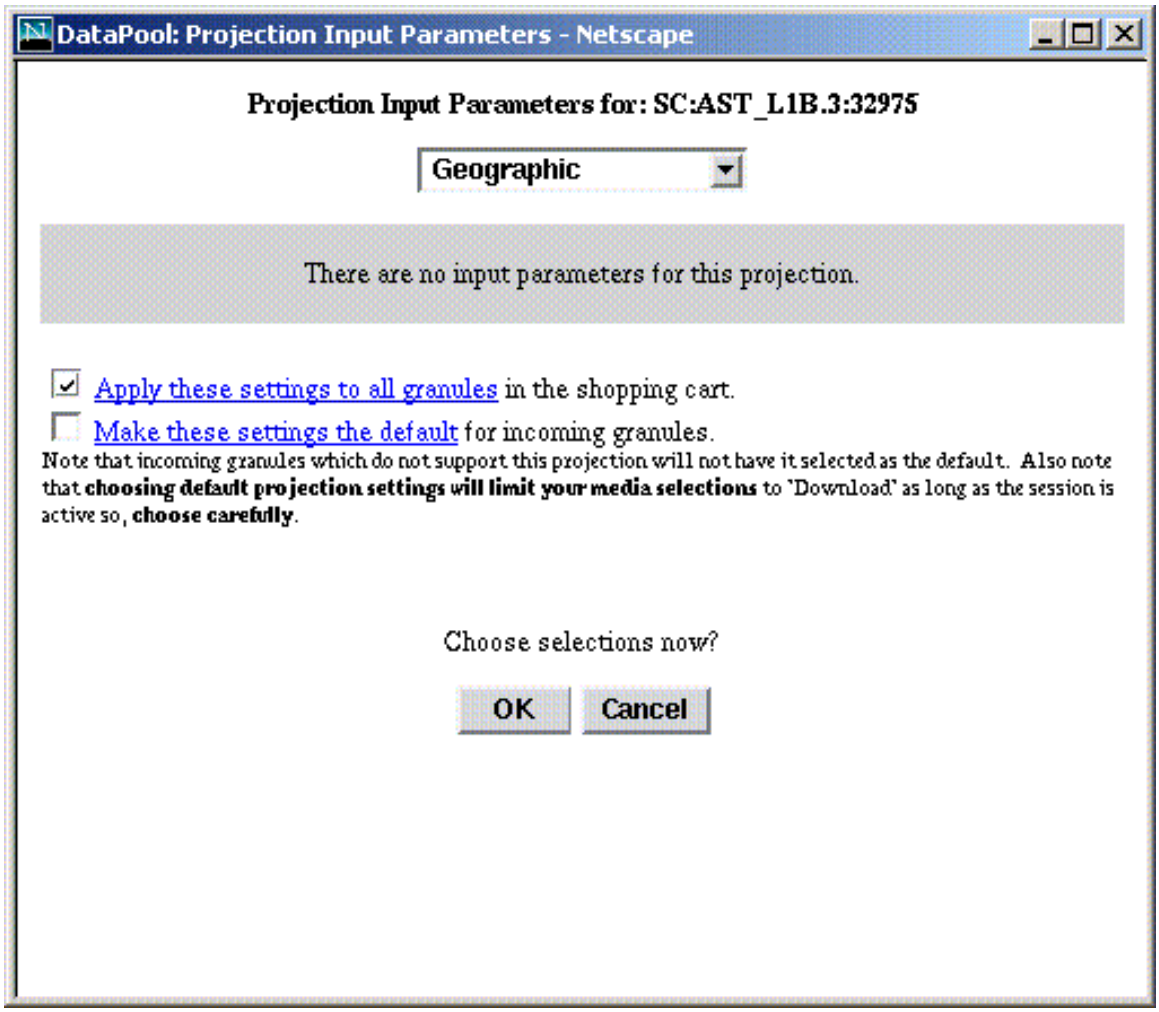


Figure 8. Projection Input Parameter Dialog (Geographic)

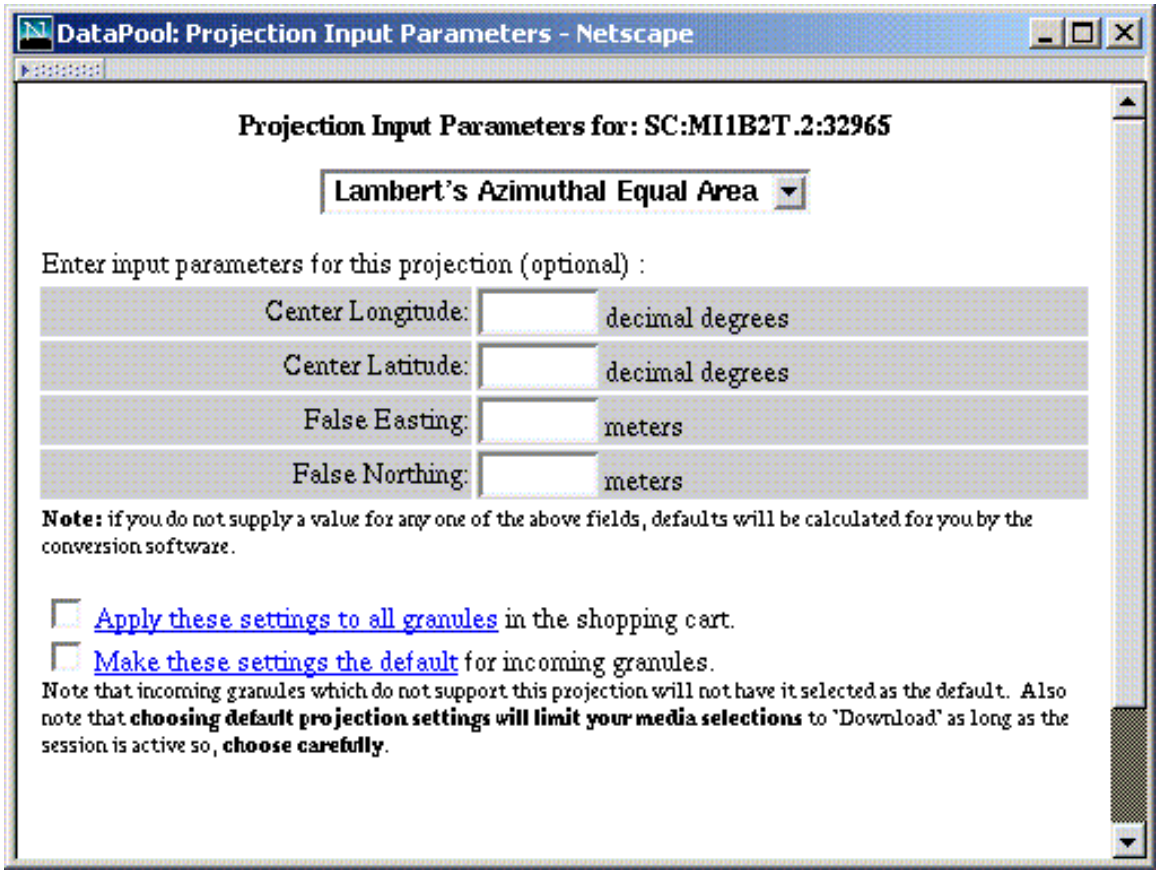


Figure 9. Projection Input Parameter Dialog (Lambert's Equal Area Azimuthal)

4.4.3 Band Subsetting

To perform band subsetting, the user clicks on the Band Subsetting icon for the relevant granule. The Band Subsetting page will be displayed for the granule. (See Figure 10). The user chooses one or more bands from the band pull-down list for this granule. In this example, one band was selected (VNIR_Swath). We have also selected the "Apply common band selections" box. This will apply the same band subsetting selection to all granules in the shopping cart of the same data type.

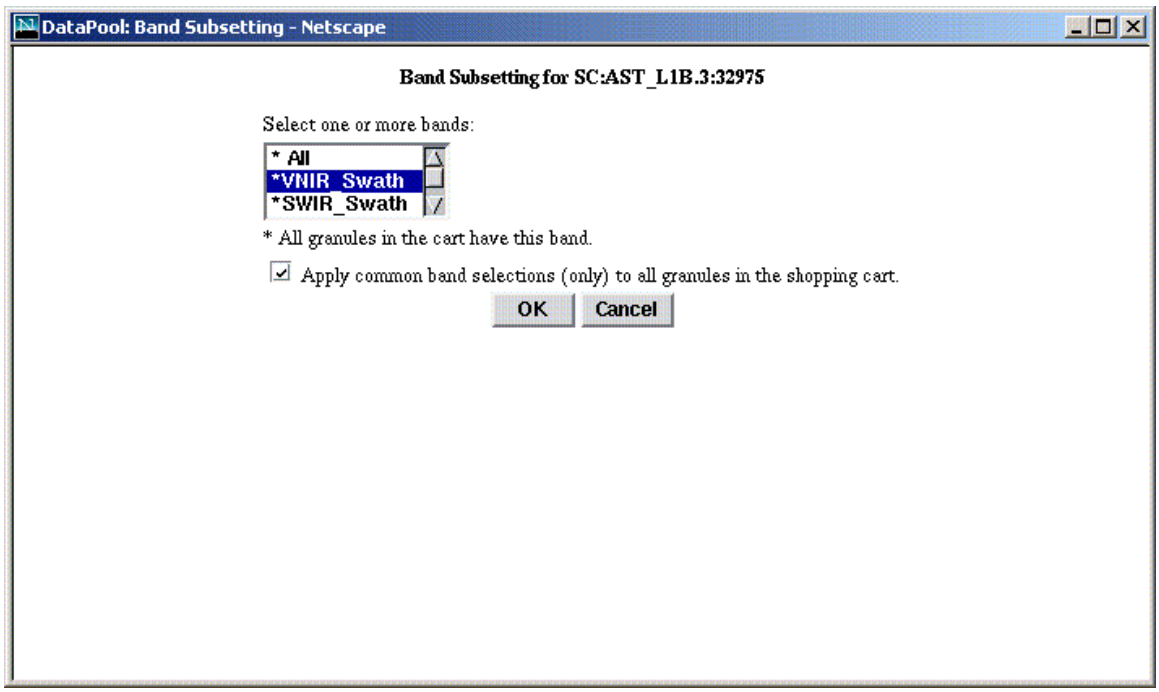


Figure 10. Band Subsetting Dialog (AST_L1B granule)

The user now clicks OK to accept the band selections. This returns the user to the modified shopping cart page shown in Figure 11. Notice the red check mark next to the Band Subsetting icon. This indicates that a selection has been made to perform band subsetting for the granule. (A similar red check mark will appear next to the Spatial Subsetting icon when spatial subsetting values have been selected for granules offering this option.)

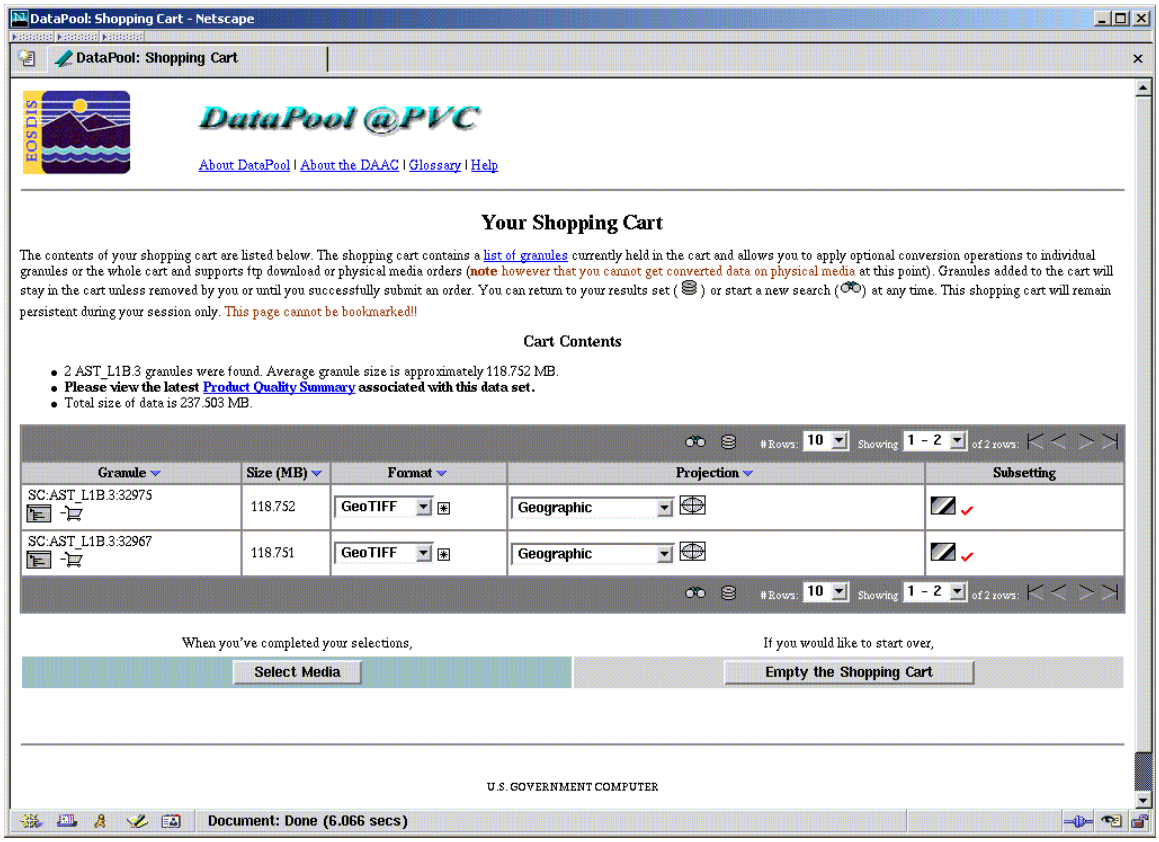


Figure 11. Shopping cart with HEG conversion selections

4.4.4 Spatial Subsetting

Next we will examine the case where several bands are selected and where spatial subsetting is an option. Figure 12 shows a results set containing a single MISR granule from the MI1B2T version 2 data set.

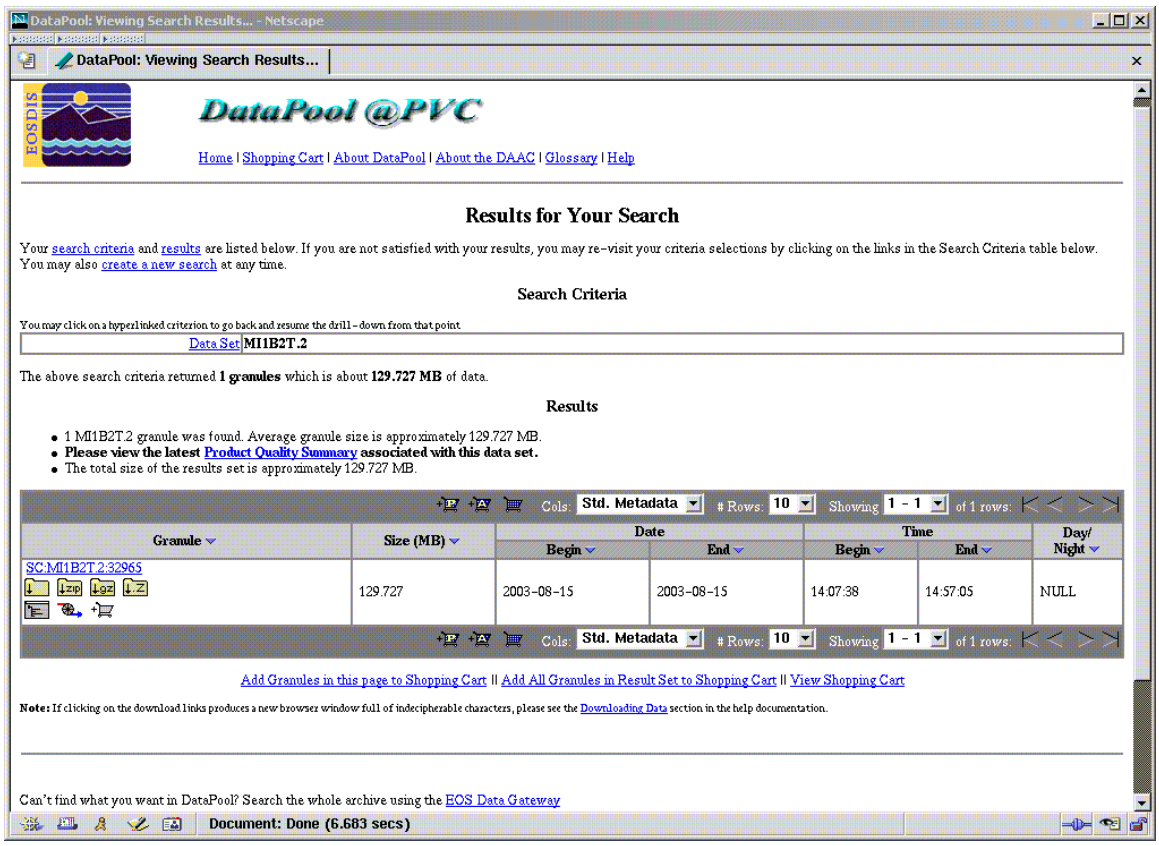


Figure 12. Results page containing a single MI1B2T version 2 granule

Spatial subsetting must be performed with care. Spatial coverage information is contained in the metadata of each granule in the search results set, and may be viewed by clicking on the XML File icon associated with the granule. Reviewing the spatial coverage metadata of the input granules will assist the user in choosing appropriate values for performing HEG spatial subsetting. Note that the Data Pool implementation of HEG does not verify that the spatial subsetting coordinates entered by the user actually intersect the spatial coverage of the granule when placing the order. If a spatial subsetting order is placed for a granule which lies outside of the spatial subsetting area, processing of the granule will fail.

(Note: For MODIS and ASTER granules, the xml metadata file for the input granule contains a HorizontalSpatialDomainContainer. This container includes either GPolygon point values or BoundingRectangle coordinates, depending on the data type. For MISR granules, spatial metadata is represented in a different way. Due to the irregular shape and large extent of spatial regions contained in the MISR products, a system referred to as NOSE (nominal orbit spatial extent) is used to accommodate finer spatial extent of data products associated with fixed, nominal sets of orbits. MISR data is referenced to 233 fixed orbits; each orbit consists of 180 blocks. The resulting 233 x 180 blocks overlay the entire area on the earth that can be observed by the instrument. MISR data is only collected on the sunlit side of the orbit so there the will be a

start and end block for each granule. The MISR xml metadata file will refer to an orbit number and equator crossing longitude in its OrbitCalculatedSpatialDomainContainer, and will also include three additional spatial attributes in its PSA information: SP_AM_PATH_NO, SP_AM_MISR_StartBlock, and SP_AM_MISR_StopBlock. See Figure 13 for a sample portion of an xml metadata file for a MISR granule.)

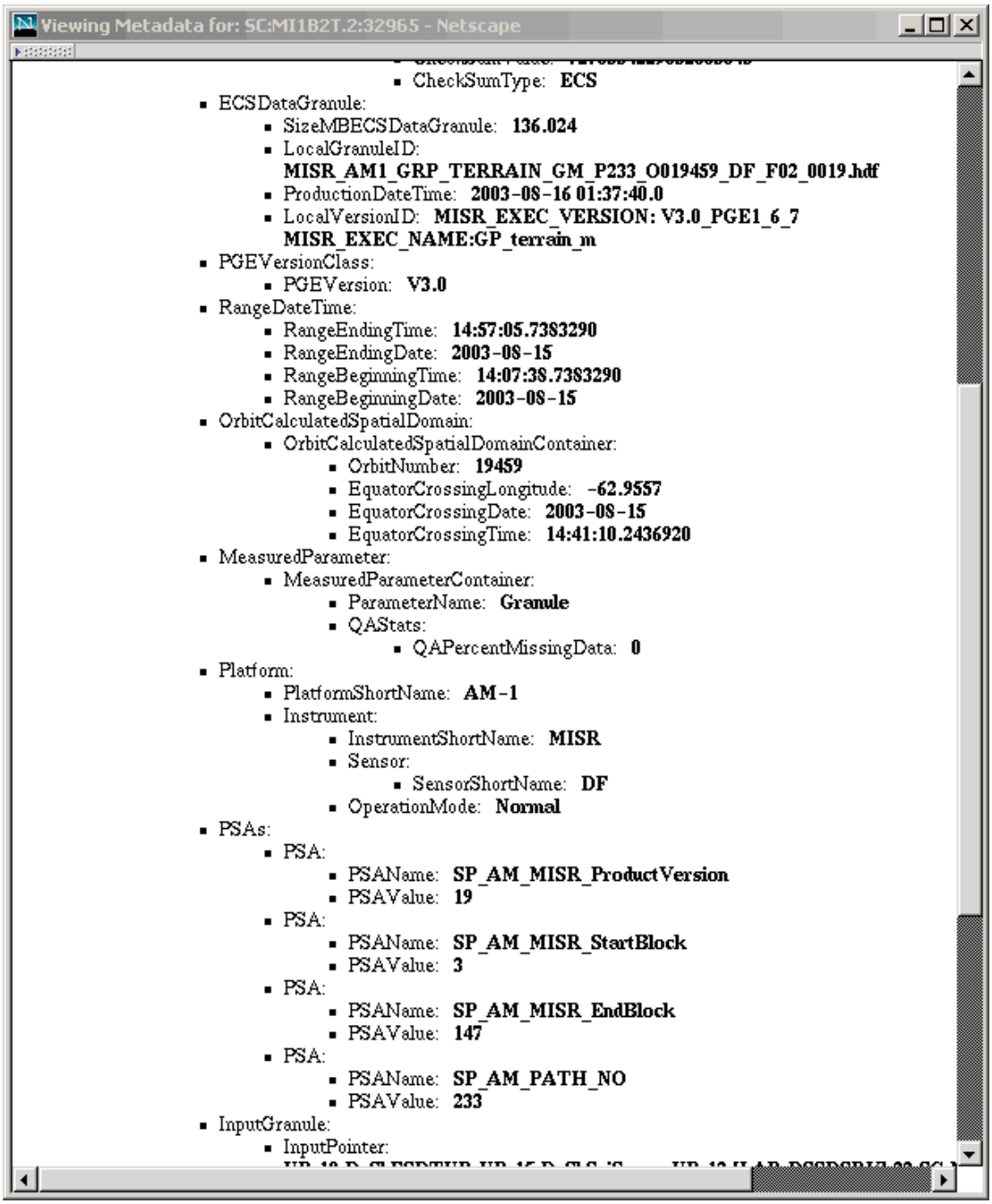


Figure 13. Metadata XML file for MI1B2T.2 granule

Selecting the Spatial Subsetting icon will start the Spatial Subsetting dialog (see Figure 14). The user enters latitude and longitude values defining a bounding rectangle for the spatial subset area. Selecting the option "Apply these settings to all applicable granules" will apply the user's spatial subsetting selections to all granules in the shopping cart that display the Spatial Subsetting icon. Selecting the "Make these settings the default" option will apply these values to any new granules added to the shopping cart that are configured for the spatial subsetting option.

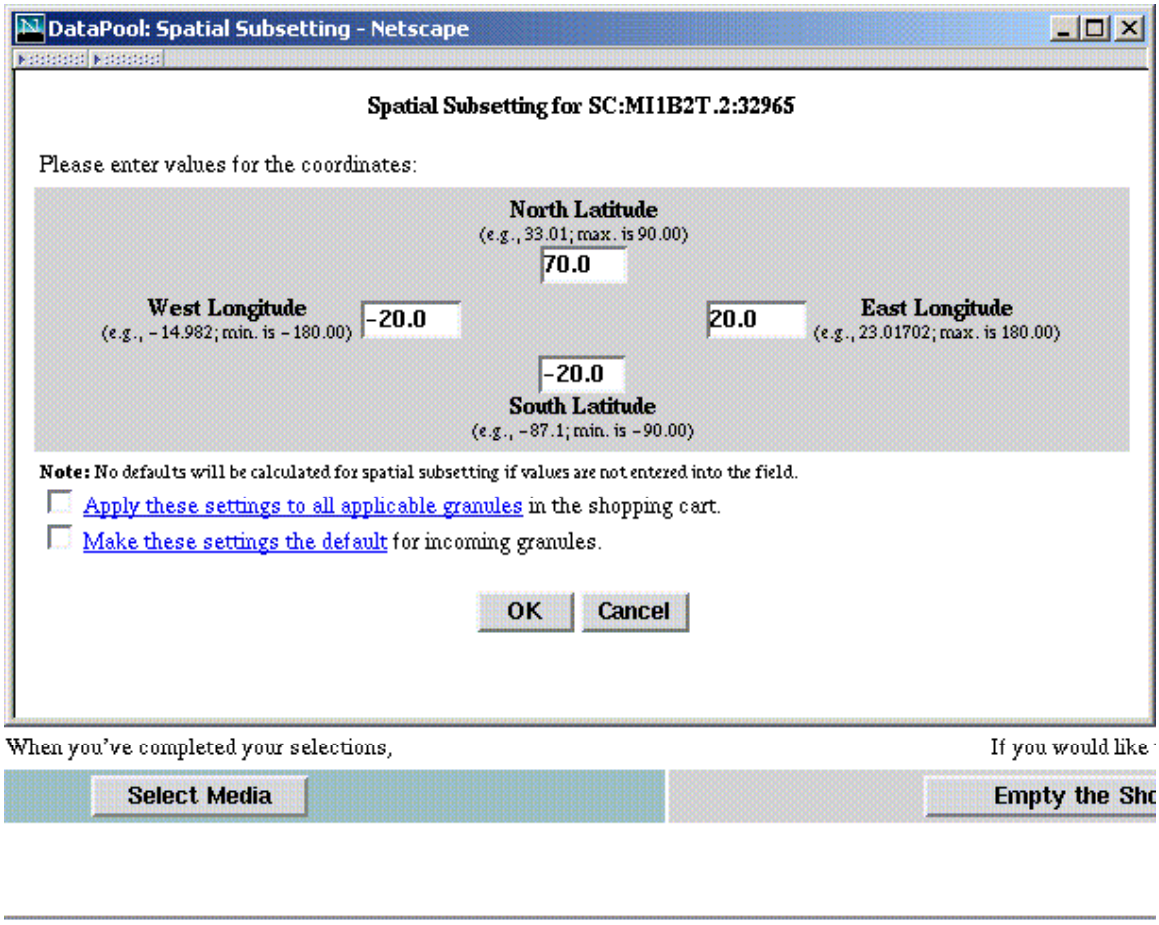


Figure 14. Spatial Subsetting Dialog

Upon returning to the shopping cart, we see check marks next to both the band and spatial subsetting icons, indicating that both band and spatial subsetting have been requested for this granule (See Figure 15).

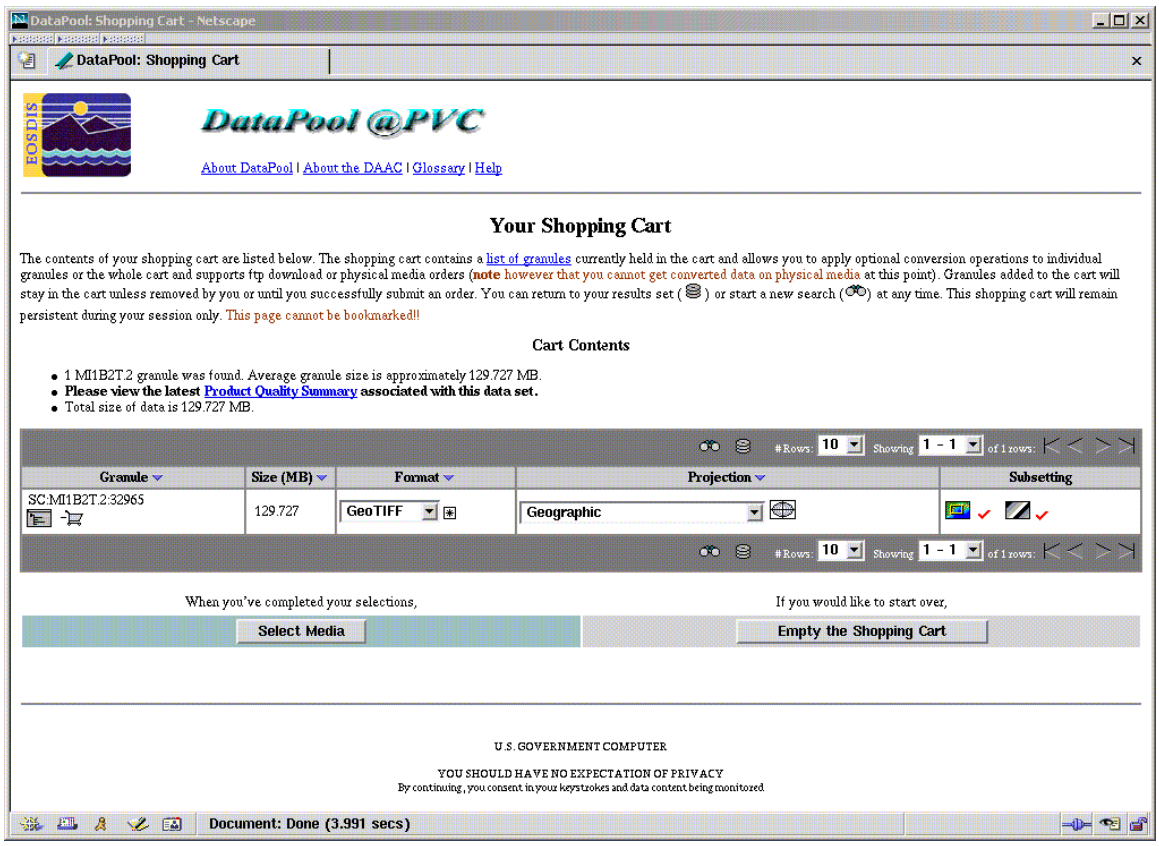


Figure 15. Shopping cart with HEG options selected for MI1B2T.2 granule

4.4.5 Completing the Order

From the Shopping Cart page (see Figure 15), the user clicks on "Select Media" as the next step in submitting the HEG conversion order. The Media Options page is then presented. (See Figure 16).

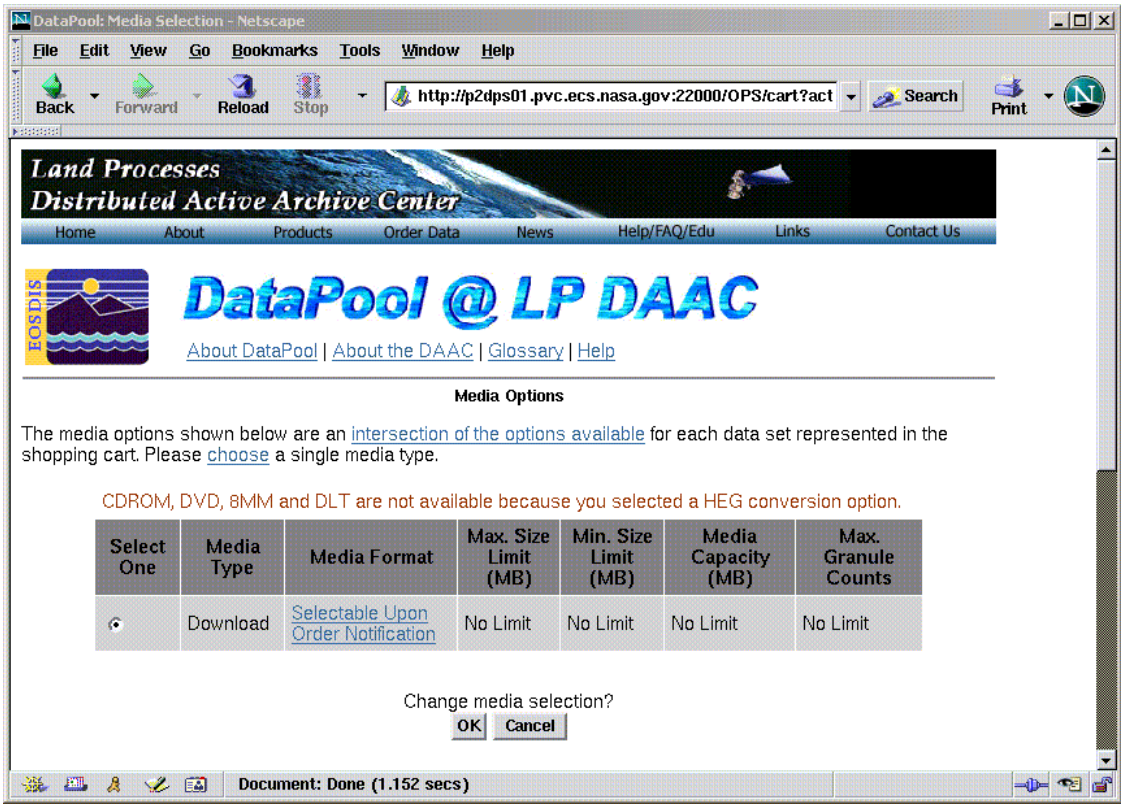


Figure 16. Media Options

On the Media Options page, only the download option is available for HEG conversion orders. The user selects the download option, and then clicks “OK”.

The user must now supply download profile information (see Figure 17), including a valid email address for the order confirmation and completion email messages, and then select “Order the Data”. An Order Acknowledgment page is then displayed (see Figure 18). As discussed in Section 4.3, the user will receive two emails, one acknowledging that the order was placed (Order Confirmation) and the other notifying the success or failure in processing the order (Order Notification).

DataPool: Checkout - Netscape

DataPool: Checkout

DataPool @PVC

About DataPool | About the DAAC | Glossary | Help

Please enter your download profile. Granules will be removed from the shopping cart upon the successful submission of an order. Your download profile will remain persistent during your session only. This page cannot be bookmarked!!

Download Profile

User Name: (Optional)	First: john Last: corbett
E-mail:	jcorbett@eos.hitc.com **Required** if you selected formatting and projection changes or subsetting OR if you always want an acknowledgment.

☐ Send acknowledgment e-mail even if no conversions are requested (i.e. Packaging Only)

When you've completed your selections,	To change data content,	To change media selection,
Order the Data	Back To Cart	Back To Media

Can't find what you want in DataPool? Search the whole archive using the EOS Data Gateway

U.S. GOVERNMENT COMPUTER

YOU SHOULD HAVE NO EXPECTATION OF PRIVACY
By continuing, you consent in your keystrokes and data content being monitored

Document: Done (2.165 secs)

Figure 17. Download Profile

Figure 18. Order Acknowledgment

4.5 Order Output

The Order Notification email text includes links to the output directory where the user's HEG-converted files are placed. (See Figure 19 for a sample output directory listing) This directory contains resulting .hdf files (where the user selected an output format of HDF-EOS) or .tif files (where the user selected an output format of GeoTIFF), and the corresponding ASCII metadata files (.hdf.met or .tif.met). (See Appendix C for an example of an ASCII metadata file produced by the HEG). The naming convention for the science and metadata files in the output directory is:

<inputfilename>_<band/field name>_<internal sequence number>.<hdf|tif>[.met]

The directory also includes an xml metadata file for each input granule (.input.xml), and a single text file containing a summary of the order specifications (ConverterSynopsis.txt). See Figure 20 for an example of a ConverterSynopsis.txt file.

```
xterm
p2dps01{cmshared}[13]-> !!
ls -l
total 83168
-rw-rw-r--   1 tomcat   cmshared    2070 Dec  7 10:06 ConverterSynopsis.txt
lrwxrwxrwx   1 tomcat   cmshared      58 Dec  7 10:06 quatar2.hdf.input.xml -> ../../..//SAN/ASTT/AST_L1B.003/2001.05.20//quatar2.hdf.xml
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:04 quatar2_ImageData4_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:04 quatar2_ImageData4_1006.tif.met
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:04 quatar2_ImageData5_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:04 quatar2_ImageData5_1006.tif.met
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:05 quatar2_ImageData6_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:05 quatar2_ImageData6_1006.tif.met
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:05 quatar2_ImageData7_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:05 quatar2_ImageData7_1006.tif.met
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:05 quatar2_ImageData8_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:05 quatar2_ImageData8_1006.tif.met
-rw-rw-r--   1 cmshared cmshared 6790804 Dec  7 10:06 quatar2_ImageData9_1006.tif
-rw-rw-r--   1 cmshared cmshared   10715 Dec  7 10:06 quatar2_ImageData9_1006.tif.met
p2dps01{cmshared}[14]->
```

Figure 19. Directory listing for sample HEG order

```
xterm
p2dps01{cmshared}[14]-> cat  ConverterSynopsis.txt

*****************************************************
OUTPUT FILE:  quatar2_ImageData4_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData4
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************


*****************************************************
OUTPUT FILE:  quatar2_ImageData5_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData5
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************


*****************************************************
OUTPUT FILE:  quatar2_ImageData6_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData6
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************


*****************************************************
OUTPUT FILE:  quatar2_ImageData7_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData7
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************


*****************************************************
OUTPUT FILE:  quatar2_ImageData8_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData8
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************


*****************************************************
OUTPUT FILE:  quatar2_ImageData9_1006.tif
     INPUT FILE:  quatar2.hdf
     SWATH NAME:  SWIR_Swath
     FIELD NAME:  ImageData9
     3rd DIM NUM:  1
     UL CORNER LAT/LON:  25.611848 / 50.714243
     LR CORNER LAT/LON:  24.948589 / 51.541304
*****************************************************

p2dps01{cmshared}[15]->
```

Figure 20. Sample ConverterSynopsis.txt file

4.6 Special Cases

4.6.1 HDF-EOS format, No Change projection

If the user selects HDF-EOS as the output format, "No Change" (or "No Change (HDF-EOS Only)") as the output projection, and does not select subsetting options, the user is simply ordering the original unconverted granule from the Data Pool. The same result would be accomplished in a simpler way by downloading the granule directly from the results page by clicking on the download icon in the row for that granule.

4.6.2 Automatic Reprojection

In some cases, if the user chooses "No Change" or "No Change (HDF-EOS Only)" as the output projection, the output product will none-the-less be reprojected to the Geographic projection so that the HEG may correctly perform the user-requested reformatting or subsetting operations on the input product. This occurs for GeoTiff format for MODIS swath data, and for HDF-EOS format with Band or Spatial Subsetting. A warning message will be displayed to the user in these cases indicating that the Geographic projection will be automatically applied to the output products.

4.6.3 Conversion of MISR data sets

Because MISR data products are very large, the Data Pool web interface requires that the user select both spatial and band subsetting options for HEG conversion of MISR products.

4.7 HEG Order Submission Errors

4.7.1 Invalid combinations of conversion options

When placing HEG orders, users are presented with a wide range of HEG conversion options. While invalid individual options are not presented to the user (e.g., an invalid projection for a particular data type) and hence cannot be selected, it is possible for the user to select invalid combinations of these conversion options (see section 4.6 above).

To illustrate how invalid combinations are handled by the web interface, we will use the granules listed the shopping cart in Figure 21. This shopping cart contains granules from several data sets. Various options have been selected to illustrate various types of warnings and errors which could be presented to the user.

DataPool: Shopping Cart - Netscape

DataPool: Shopping Cart

About DataPool | About the DAAC | Glossary | Help

Your Shopping Cart

The contents of your shopping cart are listed below. The shopping cart contains a list of granules currently held in the cart and allows you to apply optional conversion operations to individual granules or the whole cart and supports ftp download or physical media orders (**note** however that you cannot get converted data on physical media at this point). Granules added to the cart will stay in the cart unless removed by you or until you successfully submit an order. You can return to your results set ( ) or start a new search ( ) at any time. This shopping cart will remain persistent during your session only. This page cannot be bookmarked!!

Cart Contents

- 1 MI1B2T.2 , 1 MOD021KM.4 , 2 MOD29.4 and 1 AST_L1B.3 granules were found.
- Average MI1B2T.2 granule size is approximately 129.727 MB; average MOD021KM.4 granule size is approximately 136.109 MB; average MOD29.4 granule size is approximately 15.338 MB; average AST_L1B.3 granule size is approximately 118.752 MB.
- **Please view the latest Product Quality Summary information associated with the MI1B2T.2 , MOD021KM.4 , MOD29.4 and AST_L1B.3 data sets.**
- Total size of data is 415.264 MB.

#Rows: 10 Showing 1 - 5 of 5 rows:

Granule	Size (MB)	Format	Projection	Subsetting
SC:MI1B2T.2:32965	129.727	HDF-EOS	Sinusoidal	
SC:MOD021KM.4:32968	136.109	HDF-EOS	No Change (HDF-EOS Only)	
SC:MOD29.4:33033	11.404	HDF-EOS	No Change (HDF-EOS Only)	
SC:MOD29.4:33032	19.272	GeoTIFF	No Change (HDF-EOS Only)	
SC:AST_L1B.3:32980	118.752	HDF-EOS	No Change	

#Rows: 10 Showing 1 - 5 of 5 rows:

When you've completed your selections, Select Media

If you would like to start over, Empty the Shopping Cart

Document: Done (3.761 secs)

Figure 21. Mixed Shopping with HEG Options Selected

If the user attempts to place the order for the granules and HEG options chosen in Figure 21, the Conversion Selection Alert page in Figure 22 will be displayed. This page indicates that there are two error conditions for the MI1B2T.2 granule and a warning message for each of the four other granules in the order. We will examine the exceptions for each granule in turn. Note that the user is required to return to the shopping cart to correct error conditions. This is done by selecting the "**returning to the shopping cart**" link.

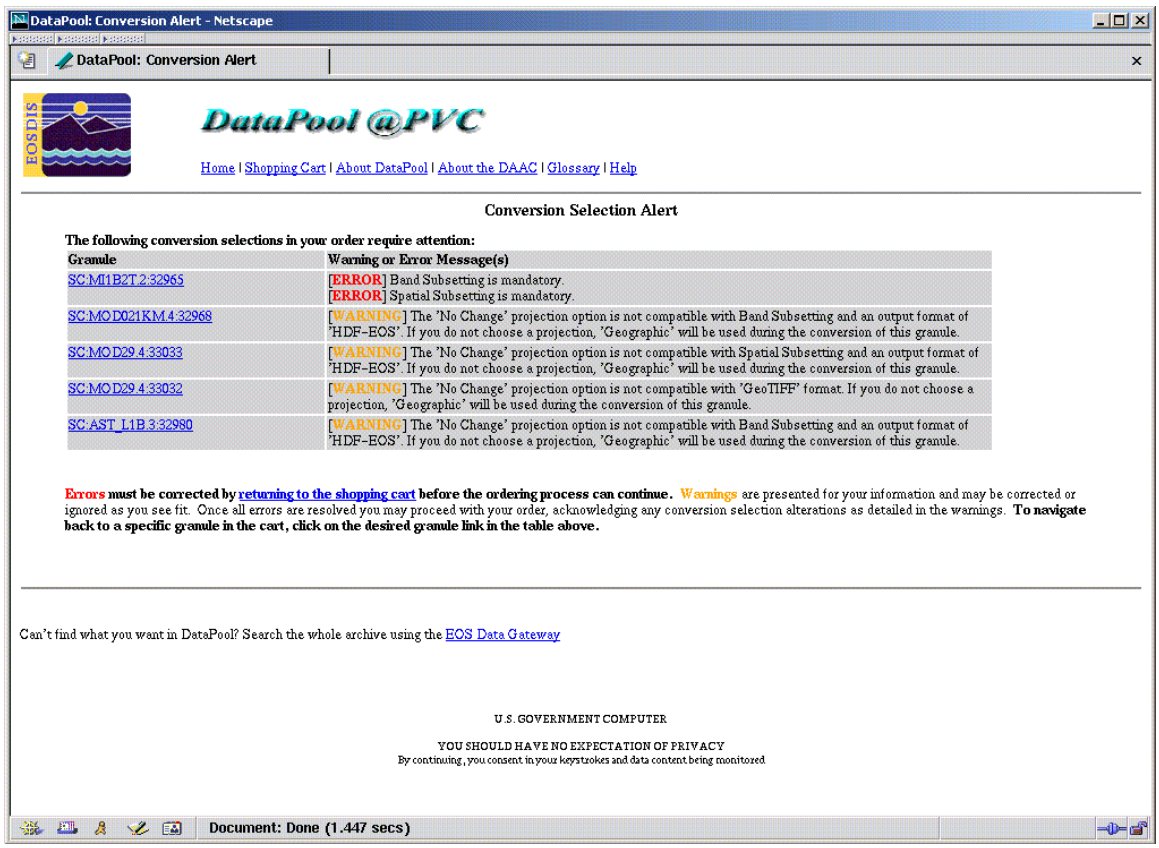


Figure 22. Conversion Selection Alert

Upon returning to the shopping cart, the user will be presented with a modified shopping cart as shown in Figure 23. For each warning and error message on the Conversion Selection Alert page there is a corresponding Flagged Exception icon ! in Figure 23.

The two error conditions triggered for the MI1B2T.2 granule are the result of not meeting the configured requirement that the user must perform band and spatial subsetting for all granules from MISR data sets (see section 4.6.3). The warning for the MOD021KM.4 warns that the user is attempting to initiate a HEG conversion of a MODIS swath granule by band subsetting the granule without selecting an output projection. The warning for the first MOD29.4 granule, warns that the user is attempting to initiate a HEG conversion of a MODIS swath by spatially subsetting the granule without selecting an output projection. The warning for the second MOD29.4, results from the user attempting to initiate a HEG conversion of a MODIS swath granule by changing output format to GeoTIFF without selecting an output projection. Finally, the warning for the AST_L1B.3 granule results from the user attempting to initiate a HEG conversion of an ASTER swath granule by band subsetting the granule while electing to leave the output format as HDF-EOS and No Change for the output projection. All these warnings will result in a default selection of Geographic for the output projection if the order is placed. The

user does not need to make changes to the HEG selections made for the granules with warning if they are satisfied with the default Geographic output projection.

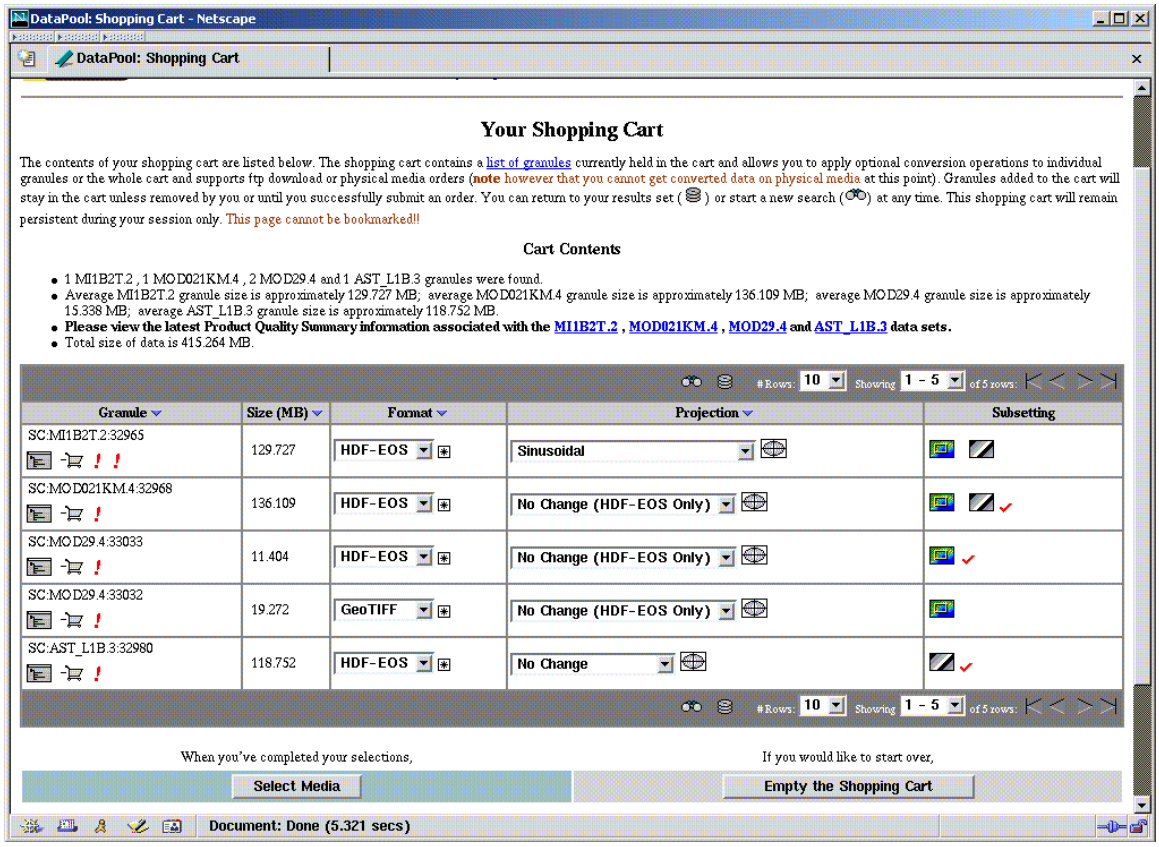


Figure 23. Modified Shopping Cart

If the user selects band and spatial subsetting options for the MI1B2T.2 granules without making changes to the other four granule selections and then resubmits the order (see shopping cart in Figure 24), the Conversion Selection Alert page will now only list the warnings and will allow the user to continue the order. Figure 25 shows the Order Acknowledgement. Note that the output projection listed for the granules with warnings are reported as No Change. They are, in-fact, projected to Geographic, as described in the warning message.

DataPool: Shopping Cart - Netscape

DataPool: Shopping Cart

Your Shopping Cart

The contents of your shopping cart are listed below. The shopping cart contains a list of granules currently held in the cart and allows you to apply optional conversion operations to individual granules or the whole cart and supports ftp download or physical media orders (**note** however that you cannot get converted data on physical media at this point). Granules added to the cart will stay in the cart unless removed by you or until you successfully submit an order. You can return to your results set ( ) or start a new search ( ) at any time. This shopping cart will remain persistent during your session only. This page cannot be bookmarked!!

Cart Contents

- 1 MI1B2T.2 , 1 MOD021KM.4 , 2 MOD29.4 and 1 AST_L1B.3 granules were found.
- Average MI1B2T.2 granule size is approximately 129.727 MB; average MOD021KM.4 granule size is approximately 136.109 MB; average MOD29.4 granule size is approximately 15.338 MB; average AST_L1B.3 granule size is approximately 118.752 MB.
- **Please view the latest Product Quality Summary information associated with the MI1B2T.2 , MOD021KM.4 , MOD29.4 and AST_L1B.3 data sets.**
- Total size of data is 415.264 MB.

#Rows: 10 Showing 1 - 5 of 5 rows:

Granule	Size (MB)	Format	Projection	Subsetting
SC:MI1B2T.2:32965	129.727	HDF-EOS	Sinusoidal	
SC:MOD021KM.4:32968	136.109	HDF-EOS	No Change (HDF-EOS Only)	
SC:MOD29.4:33033	11.404	HDF-EOS	No Change (HDF-EOS Only)	
SC:MOD29.4:33032	19.272	GeoTIFF	No Change (HDF-EOS Only)	
SC:AST_L1B.3:32980	118.752	HDF-EOS	No Change	

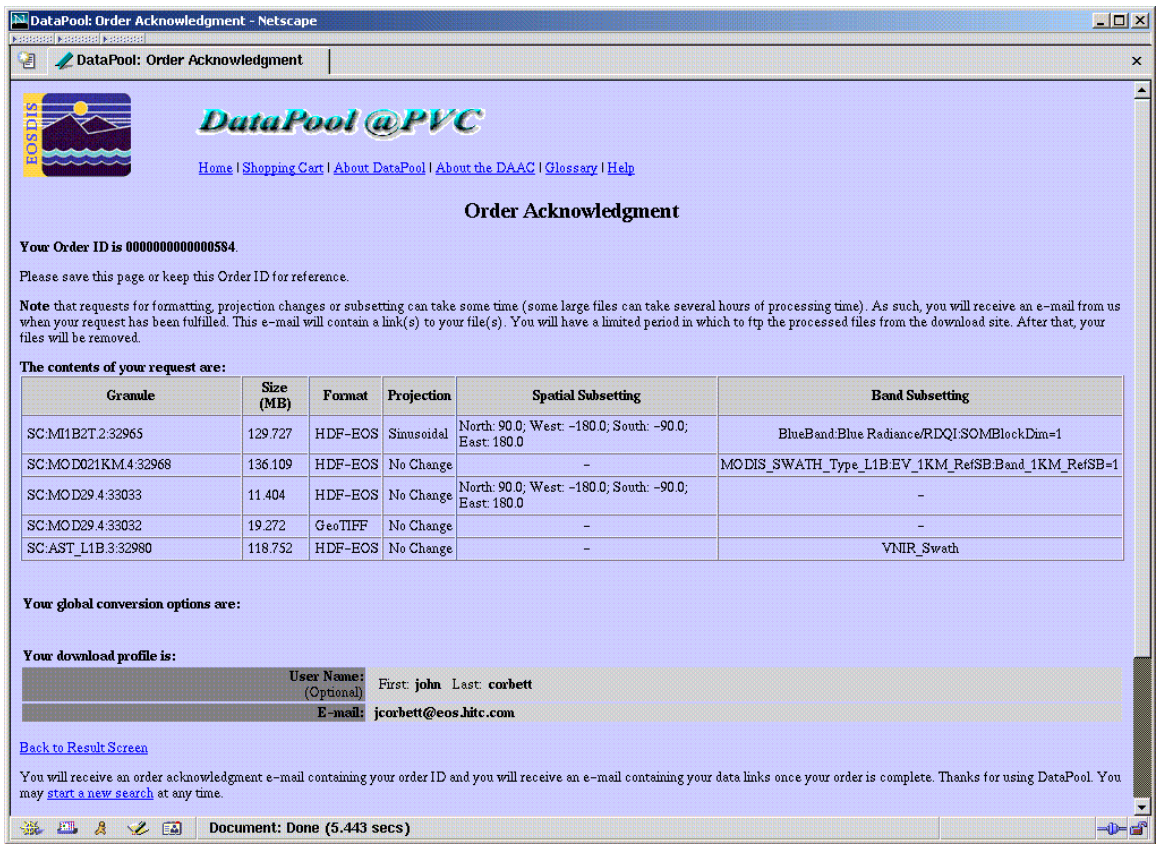
#Rows: 10 Showing 1 - 5 of 5 rows:

When you've completed your selections, Select Media

If you would like to start over, Empty the Shopping Cart

Document: Done (9.545 secs)

Figure 24. Modified Shopping Cart with Band and Spatial Subsetting Selected for MI1B2T.2 Granule



DataPool: Order Acknowledgment - Netscape

DataPool: Order Acknowledgment

DataPool @PVC

Home | Shopping Cart | About DataPool | About the DAAC | Glossary | Help

Order Acknowledgment

Your Order ID is 0000000000000584.

Please save this page or keep this Order ID for reference.

Note that requests for formatting, projection changes or subsetting can take some time (some large files can take several hours of processing time). As such, you will receive an e-mail from us when your request has been fulfilled. This e-mail will contain a link(s) to your file(s). You will have a limited period in which to ftp the processed files from the download site. After that, your files will be removed.

The contents of your request are:

Granule	Size (MB)	Format	Projection	Spatial Subsetting	Band Subsetting
SC:MI1B2T.2:32965	129.727	HDF-EOS	Sinusoidal	North: 90.0; West: -180.0; South: -90.0; East: 180.0	BlueBand:Blue Radiance/RDQI:SOMBlockDim=1
SC:MOD021KM.4:32968	136.109	HDF-EOS	No Change	-	MODIS_SWATH_Type_L1B:EV_1KM_RefSB:Band_1KM_RefSB=1
SC:MOD29.4:33033	11.404	HDF-EOS	No Change	North: 90.0; West: -180.0; South: -90.0; East: 180.0	-
SC:MOD29.4:33032	19.272	GeoTIFF	No Change	-	-
SC:AST_L1B.3:32980	118.752	HDF-EOS	No Change	-	VNIR_Swath

Your global conversion options are:

Your download profile is:

User Name: (Optional)	First: **john** Last: **corbett**
E-mail:	**jcorbett@eos.hitc.com**

Back to Result Screen

You will receive an order acknowledgment e-mail containing your order ID and you will receive an e-mail containing your data links once your order is complete. Thanks for using DataPool. You may start a new search at any time.

Document: Done (5.443 secs)

Figure 25. Order Acknowledgment for Mixed Order

4.7.2 Large Orders

Because HEG conversion orders may consume significant system resources while processing, and because it is possible for many users to submit HEG orders simultaneously at a given DAAC, DAACs have the option of limiting the number of granules in a single Data Pool order for which HEG processing is requested, in order to allocate HEG processing resources more fairly among users. This limit on the number of granules per order (shopping cart) for which HEG conversion may be selected is configured independently by each DAAC. If a user attempts to submit an order where more than the configured limit of granules in the order have associated HEG conversion requests, an Order Submission Warning dialog will be presented to the user (See Figure 26).

In the example in Figure 26, the DAAC has set a limit of 10 granules per HEG order (i.e., 10 granules in the shopping cart) for which HEG conversions may be requested. In this example, the user has selected 12 granules for HEG conversion. The Order Submission Warning dialog allows the user to modify the order so that it complies with the DAAC limitation and then resubmit. Each granule for which the user has requested HEG conversion will appear on the Order Submission Warning dialog. The user may view the HEG format, conversion, and

subsetting selections for each granule by clicking on the link for that granule in the granule column. The user must then modify the order by either removing granules entirely from the order (by clicking on the Remove Granule selection in the granule row) or by choosing to order the granule as-is with no HEG conversion (by clicking on the Remove Conversions selection in the granule row), until the number of granules for which HEG conversions are requested is at or below the DAAC limit. The user may then resubmit the order by clicking on the Submit Order button.

Figure 26. Order Submission Warning Dialog

This page intentionally left blank.

Appendix A. List of Supported Data Sets

MISR Products: (versions 1 and 2)
MI1B2E = L1B2 Ellipsoid Data
MI1B2T = L1B2 Terrain Data
MIL2ASLS = L2 Land Products
MIL2ASAE = L2 Aerosol Products
MIL2TCAL = L2 Cloud Products

ASTER Products: (versions 3 and 4)

AST_L1B = ASTER Level 1B Registered Radiance at Sensor
AST_04 = ASTER Level 2 Brightness Temperature at the Sensor
AST_05 = ASTER Level 2 Emissivity Product
AST_06V = ASTER Level 2 Decorrelation Stretch Product (VNIR)
AST_06S = ASTER Level 2 Decorrelation Stretch Product (SWIR)
AST_06T = ASTER Level 2 Decorrelation Stretch Product (TIR)
AST_07 = ASTER Level 2 Surface Reflectance Product (VNIR)
AST_07 = ASTER Level 2 Surface Reflectance Product (SWIR)
AST_07 = ASTER Level 2 Surface Reflectance Product (TIR)
AST_08 = ASTER Level 2 Surface Kinetic Temperature Product
AST_09 = ASTER Level 2 Surface Radiance Product (VNIR)
AST_09 = ASTER Level 2 Surface Radiance Product (SWIR)
AST_09T = ASTER Level 2 Surface Radiance Product (TIR)

ASTER Level 3 DEM Product

AST14DEM = (Absolute) Digital Elevation Model (DEM)
AST14DEM = (Relative) Digital Elevation Model (DEM)

MODIS Products: (versions 3 and 4)

Level 1
MOD021KM = Level 1B Calibrated Radiances (1000 m)
MOD02HKM = Level 1B Calibrated Radiances (500 m)
MOD02QKM = Level 1B Calibrated Radiances (250 m)
MOD03 =Level 1A Geolocation Fields – 5-Min Swath (1km)

Level 2 Modis Oceans
MODOCL2 = MODIS/Terra Ocean Color Radiance Products 5-Min L2 Swath 1km Day
MODOCL2A = MODIS/Terra Ocean Color Derived Products Group 1 5-Min L2 Swath 1km Day
MODOCL2B = MODIS/Terra Ocean Color Derived Products Group 2 5-Min L2 Swath 1km Day
MODOCQC = MODIS/Terra Ocean Color QC Products 5-Min L2 Swath 1km Day
MOD28L2 = MODIS/Terra Sea Surface Temperature Products 5-Min L2 Swath 1km

MOD28QC = MODIS/Terra Sea Surface Temperature QC Products 5-Min L2 Swath 1km

Level 2 MODIS Atmosphere and Land
MOD04 = MODIS Level 2 Aerosol
MOD05 = MODIS Total Precipitable Water Vapor Test Results
MOD06 = MODIS Cloud Product
MOD07_L2 = MODIS Temperature and Water Vapor Profile Product
MOD09GQK = Level 2 Land Surface Reflectance - 250 m,
MOD09GHK = Level 2 Land Surface Reflectance - 500 m
MOD09GST = Level 2 Land Surface Reflectance - 1 km
MOD10_L2 = Level 2 Snow Cover- 500 m
MOD11_L2 = Level 2 Land Surface Temperature and Emissivity - 1 km
MOD29 = Sea Ice Extent L2 Swath 1km
MOD35 = MODIS/Terra Cloud Mask and Spectral Test Results Daily L2 Swath 250m and 1km

Level 3
MOD08_D3 = MODIS L3 Daily Joint Aerosol/Water Vapor/Cloud Product
MOD08_E3 = MODIS L3 8-Day Joint Aerosol/Water Vapor/Cloud Product
MOD08_M3 = MODIS/Terra Aerosol Cloud Water Vapor Ozone Monthly L3 global 1 Deg CMG Product
MOD09A1 = Level 3 8-Day Gridded Surface Reflectances - 500 m
MOD09Q1 = Level 3 8-Day Gridded Surface Reflectances - 250 m
MOD10A1 = Level 3 Daily Gridded Snow Cover Product - 500 m
MOD10A2 = Level 3 8-Day Gridded Snow Cover Product – 500m
MOD11A1 = Level 3 Gridded Daily Land Surface Temperature/Emissivity - 1 km
MOD11A2 = Level 3 Gridded 8-Day Land Surface Temperature/Emissivity – 1km
MOD12Q1 = Level 3 Gridded 96-Day Land Cover – 1km
MOD13A1 = Level 3 Gridded 16-Day Vegetation Indices - 500m
MOD13A2 = Level 3 Gridded 16-Day Vegetation Indices - 1km
MOD13Q1 = Level 3 Gridded 16-Day Vegetation Indices – 250m
MOD14A1 = Level 3 Daily Gridded Thermal Anomalies - 1 km
MOD14A2 = Level 3 8-day Gridded Thermal Anomalies - 1 km
MOD15A2 - Leaf Area Index/FPAR 8-Day L4 Global 1km ISIN Grid
MOD17A2 - Net Photosynthesis 8-Day L4 Global 1km ISIN Grid
MOD29P1D = L3 Daily Gridded Sea Ice Extent - 1 km for Day Mode
MOD29P1N = L3 Daily Gridded Sea Ice Extent - 1 km for Night Mode
MOD43B1 = Level 3 16-day SemiEmpirical BRDF and Albedo Product - 1 km (3-D only)
MOD43B3 = Level 3 16-day Minimal BRDF and Albedo Product - 1 km (3-D only)
MOD43B4 = Level 3 16-day BRDF Adjusted Nadir Surface Reflectance - 1 km (3-D only)

Level 3 (maps) OCEAN products
MO04MD = MODIS/Terra Ocean Color and SST Mean Maps Daily L3 Global 4km CylEqDis
MO04QD = MODIS/Terra Ocean Color and SST Common Flags Maps Daily L3 Global 4km CylEqDis
MO04MW = MODIS/Terra Ocean Color and SST Mean Maps 8-Day L3 Global 4km CylEqDis
MO04QW = MODIS/Terra Ocean Color and SST Quality Maps 8-Day L3 Global 4km CylEqDis
MO1DMW = MODIS/Terra Ocean Color and SST Mean Maps 8-Day L3 Global 1 Deg CyEqDis

MO1DQW = MODIS/Terra Ocean Color and SST Quality Maps 8-Day L3 Global 1Deg CylEqDis
MO36MD = MODIS/Terra Ocean Color and SST Mean Maps Daily L3 Global 36km CylEqDis
MO36QD = MODIS/Terra Ocean Color and SST Quality Maps Daily L3 Global 36km CylEqDis

Digital Elevation Model:

1 Km Global DTED

Appendix B. State Plane Zones and Values

NAD83 = North American Datum 1983
NAD27 = North American Datum 1927

NAD83 Alaska Zone 1 = 5001
NAD83 Alaska Zone 2 = 5002
NAD83 Alaska Zone 3 = 5003
NAD83 Alaska Zone 4 = 5004
NAD83 Alaska Zone 5 = 5005
NAD83 Alaska Zone 6 = 5006
NAD83 Alaska Zone 7 = 5007
NAD83 Alaska Zone 8 = 5008
NAD83 Alaska Zone 9 = 5009
NAD83 Alaska Zone 10 = 5010
NAD83 Alabama East = 0101
NAD83 Alabama West = 0102
NAD83 Arizona East = 0201
NAD83 Arizona Central = 0202
NAD83 Arizona West = 0203
NAD83 Arkansas North = 0301
NAD83 Arkansas South = 0302
NAD83 California Zone 1 = 0401
NAD83 California Zone 2 = 0402
NAD83 California Zone 3 = 0403
NAD83 California Zone 4 = 0404
NAD83 California Zone 5 = 0405
NAD83 California Zone 6 = 0406
NAD83 Colorado North = 0501
NAD83 Colorado Central = 0502
NAD83 Colorado South = 0503
NAD83 Connecticut = 0600
NAD83 Delaware = 0700
NAD83 Florida East = 901
NAD83 Florida West = 902
NAD83 Florida North = 903
NAD83 Georgia East = 1001
NAD83 Georgia West = 1002
NAD83 Hawaii Zone 1 = 5101
NAD83 Hawaii Zone 2 = 5102
NAD83 Hawaii Zone 3 = 5103
NAD83 Hawaii Zone 4 = 5104
NAD83 Hawaii Zone 5 = 5105

NAD83 Idaho East = 1101
NAD83 Idaho Central = 1102
NAD83 Idaho West = 1103
NAD83 Illinois East = 1201
NAD83 Illinois West = 1202
NAD83 Indiana East = 1301
NAD83 Indiana West = 1302
NAD83 Iowa North = 1401
NAD83 Iowa South = 1402
NAD83 Kansas North = 1501
NAD83 Kansas South = 1502
NAD83 Kentucky North = 1601
NAD83 Kentucky South = 1602
NAD83 Louisiana North = 1701
NAD83 Louisiana South = 1702
NAD83 Maine East = 1801
NAD83 Maine West = 1802
NAD83 Maryland = 1900
NAD83 Massachusetts = 2001
NAD83 Massachusetts Island = 2002
NAD83 Michigan North = 2111
NAD83 Michigan Central = 2112
NAD83 Michigan South = 2113
NAD83 Minnesota North = 2201
NAD83 Minnesota Central = 2202
NAD83 Minnesota South = 2203
NAD83 Mississippi East = 2301
NAD83 Mississippi West = 2302
NAD83 Missouri East = 2401
NAD83 Missouri Central = 2402
NAD83 Missouri West = 2403
NAD83 Montana = 2500
NAD27 Montana North = 2501
NAD27 Montana Central = 2502
NAD27 Montana South = 2503
NAD83 Nebraska = 2600
NAD27 Nebraska North = 2601
NAD27 Nebraska South = 2602
NAD83 Nevada East = 2701
NAD83 Nevada Central = 2702
NAD83 Nevada West = 2703
NAD83 New Hampshire = 2800
NAD83 New Jersey = 2900
NAD83 New Mexico East = 3001
NAD83 New Mexico Central = 3002

NAD83 New Mexico West = 3003
NAD83 New York East = 3101
NAD83 New York Central = 3102
NAD83 New York West = 3103
NAD83 New York Long Island = 3104
NAD83 North Carolina = 3200
NAD83 North Dakota North = 3301
NAD83 North Dakota South = 3302
NAD83 Ohio North = 3401
NAD83 Ohio South = 3402
NAD83 Oklahoma North = 3501
NAD83 Oklahoma South = 3502
NAD83 Oregon North = 3601
NAD83 Oregon South = 3602
NAD83 Pennsylvania North = 3701
NAD83 Pennsylvania South = 3702
NAD83 Rhode Island = 3800
NAD83 South Carolina = 3900
NAD27 South Carolina North = 3901
NAD27 South Carolina South = 3902
NAD83 South Dakota North = 4001
NAD83 South Dakota South = 4002
NAD83 Tennessee = 4100
NAD83 Texas North = 4201
NAD83 Texas North Central = 4202
NAD83 Texas Central = 4203
NAD83 Texas South Central = 4204
NAD83 Texas South = 4205
NAD83 Utah North = 4301
NAD83 Utah Central = 4302
NAD83 Utah South = 4303
NAD83 Vermont = 4400
NAD83 Virginia North = 4501
NAD83 Virginia South = 4502
NAD83 Washington North = 4601
NAD83 Washington South = 4602
NAD83 West Virginia North = 4701
NAD83 West Virginia South = 4702
NAD83 Wisconsin North = 4801
NAD83 Wisconsin Central = 4802
NAD83 Wisconsin South = 4803
NAD83 Wyoming East = 4901
NAD83 Wyoming East Central = 4902
NAD83 Wyoming West Central = 4903
NAD83 Wyoming West = 4904

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Appendix C. Sample Output Metadata

The following is an example of an ASCII metadata file produced by the HEG for HDF-EOS and GeoTIFF output. One metadata file of this type is placed in the user's order directory for each .hdf or .tif file produced by the HEG conversion order. Metadata files have either a .hdf.met extension (for HDF-EOS output) or a .tif.met extension (for GeoTIFF output).

```
  GROUP                = INVENTORYMETADATA
  GROUPTYPE            = MASTERGROUP

  GROUP                = COLLECTIONDESCRIPTIONCLASS

    OBJECT               = SHORTNAME
      NUM_VAL            = 1
      VALUE              = "ASTL1B"
    END_OBJECT           = SHORTNAME

    OBJECT               = VERSIONID
      NUM_VAL            = 1
      VALUE              = "NOT SET"
    END_OBJECT           = VERSIONID

  END_GROUP            = COLLECTIONDESCRIPTIONCLASS

  GROUP                = ECSDATAGRANULE

    OBJECT               = LOCALGRANULEID
      NUM_VAL            = 1
      VALUE              =
"AST_L1BE_multiband_npr_VNIR_Swath_UTM.tif"
    END_OBJECT           = LOCALGRANULEID

    OBJECT               = PRODUCTIONDATETIME
      NUM_VAL            = 1
      VALUE              = "2004-09-17T19:08:16.000Z"
    END_OBJECT           = PRODUCTIONDATETIME

  END_GROUP            = ECSDATAGRANULE

  GROUP                = PGEVERSIONCLASS

    OBJECT               = PGEVERSION
      NUM_VAL            = 1
```

```
    VALUE                = "03.00R02"
  END_OBJECT             = PGEVERSION

END_GROUP              = PGEVERSIONCLASS

GROUP                  = SINGLEDATETIME

  OBJECT                 = TIMEOFDAY
    NUM_VAL              = 1
    VALUE                = "155308030000Z"
  END_OBJECT             = TIMEOFDAY

  OBJECT                 = CALENDARDATE
    NUM_VAL              = 1
    VALUE                = "20020503"
  END_OBJECT             = CALENDARDATE

END_GROUP              = SINGLEDATETIME

GROUP                  = RANGEDATETIME

  OBJECT                 = RANGEBEGINNINGTIME
    NUM_VAL              = 1
    VALUE                = "NOT SET"
  END_OBJECT             = RANGEBEGINNINGTIME

  OBJECT                 = RANGEBEGINNINGDATE
    NUM_VAL              = 1
    VALUE                = "NOT SET"
  END_OBJECT             = RANGEBEGINNINGDATE

  OBJECT                 = RANGEENDINGTIME
    NUM_VAL              = 1
    VALUE                = "NOT SET"
  END_OBJECT             = RANGEENDINGTIME

  OBJECT                 = RANGEENDINGDATE
    NUM_VAL              = 1
    VALUE                = "NOT SET"
  END_OBJECT             = RANGEENDINGDATE

END_GROUP              = RANGEDATETIME

GROUP                  = SPATIALDOMAINCONTAINER

  GROUP                  = HORIZONTALSPATIALDOMAINCONTAINER
```

```
    GROUP                = BOUNDINGRECTANGLE

      OBJECT               = WESTBOUNDINGCOORDINATE
        NUM_VAL            = 1
        VALIDRULE          = "Range(-180.0,+180.0)"
        VALUE              = -77.488089
      END_OBJECT           = WESTBOUNDINGCOORDINATE

      OBJECT               = NORTHBOUNDINGCOORDINATE
        NUM_VAL            = 1
        VALIDRULE          = "Range(-90.0,+90.0)"
        VALUE              = 39.131487
      END_OBJECT           = NORTHBOUNDINGCOORDINATE

      OBJECT               = EASTBOUNDINGCOORDINATE
        NUM_VAL            = 1
        VALIDRULE          = "Range(-180.0,+180.0)"
        VALUE              = -76.498469
      END_OBJECT           = EASTBOUNDINGCOORDINATE

      OBJECT               = SOUTHBOUNDINGCOORDINATE
        NUM_VAL            = 1
        VALIDRULE          = "Range(-90.0,+90.0)"
        VALUE              = 38.474253
      END_OBJECT           = SOUTHBOUNDINGCOORDINATE

    END_GROUP            = BOUNDINGRECTANGLE

  END_GROUP            = HORIZONTALSPATIALDOMAINCONTAINER

END_GROUP            = SPATIALDOMAINCONTAINER

GROUP                = INPUTGRANULE

  OBJECT               = INPUTPOINTER
    NUM_VAL            = 1
    VALUE              = "AST_L1BE_0030503200215530800000000"
  END_OBJECT           = INPUTPOINTER

END_GROUP            = INPUTGRANULE

GROUP                = ADDITIONALATTRIBUTES

  OBJECT               = ADDITIONALATTRIBUTESCONTAINER
    CLASS              = "1"
```

```
  OBJECT                = ADDITIONALATTRIBUTENAME
    CLASS               = "1"
    NUM_VAL             = 1
    VALUE               = "BANDNUMBER"
  END_OBJECT            = ADDITIONALATTRIBUTENAME

  GROUP                 = INFORMATIONCONTENT
    CLASS               = "1"

    OBJECT                = PARAMETERVALUE
      CLASS               = "1"
      NUM_VAL             = 1
      VALUE               = "1"
    END_OBJECT            = PARAMETERVALUE

  END_GROUP             = INFORMATIONCONTENT

END_OBJECT            = ADDITIONALATTRIBUTESCONTAINER

OBJECT                = ADDITIONALATTRIBUTESCONTAINER
  CLASS               = "2"

  OBJECT                = ADDITIONALATTRIBUTENAME
    CLASS               = "2"
    NUM_VAL             = 1
    VALUE               = "BANDNUMBER"
  END_OBJECT            = ADDITIONALATTRIBUTENAME

  GROUP                 = INFORMATIONCONTENT
    CLASS               = "2"

    OBJECT                = PARAMETERVALUE
      CLASS               = "2"
      NUM_VAL             = 1
      VALUE               = "1"
    END_OBJECT            = PARAMETERVALUE

  END_GROUP             = INFORMATIONCONTENT

END_OBJECT            = ADDITIONALATTRIBUTESCONTAINER

OBJECT                = ADDITIONALATTRIBUTESCONTAINER
  CLASS               = "3"

  OBJECT                = ADDITIONALATTRIBUTENAME
```

```
      CLASS              = "3"
      NUM_VAL            = 1
      VALUE              = "BANDNUMBER"
    END_OBJECT           = ADDITIONALATTRIBUTENAME

    GROUP                = INFORMATIONCONTENT
      CLASS              = "3"

      OBJECT               = PARAMETERVALUE
        CLASS              = "3"
        NUM_VAL            = 1
        VALUE              = "1"
      END_OBJECT           = PARAMETERVALUE

    END_GROUP            = INFORMATIONCONTENT

  END_OBJECT           = ADDITIONALATTRIBUTESCONTAINER

END_GROUP            = ADDITIONALATTRIBUTES

GROUP                = PLATFORMINSTRUMENTSENSOR

  OBJECT               = PLATFORMSHORTNAME
    NUM_VAL            = 1
    VALUE              = "AM-1"
  END_OBJECT           = PLATFORMSHORTNAME

  OBJECT               = INSTRUMENTSHORTNAME
    NUM_VAL            = 1
    VALUE              = "ASTER"
  END_OBJECT           = INSTRUMENTSHORTNAME

END_GROUP            = PLATFORMINSTRUMENTSENSOR

GROUP                = POINTINGANGLES

  OBJECT               = POINTINGANGLESCONTAINER
    CLASS              = "1"

    OBJECT               = SENSORNAME
      CLASS              = "1"
      NUM_VAL            = 1
      VALUE              = "VNIR"
    END_OBJECT           = SENSORNAME

    OBJECT               = POINTINGANGLE
```

```
      CLASS              = "1"
      NUM_VAL            = 1
      VALUE              = -20.654000
    END_OBJECT           = POINTINGANGLE

    OBJECT               = SETTINGTIMEOFPOINTING
      CLASS              = "1"
      NUM_VAL            = 1
      VALUE              = "2002-05-03T15:52:57Z"
    END_OBJECT           = SETTINGTIMEOFPOINTING

  END_OBJECT           = POINTINGANGLESCONTAINER

END_GROUP            = POINTINGANGLES

GROUP                = PRODUCTSPECIFICMETADATA

  OBJECT               = MAPORIENTATIONANGLE
    NUM_VAL            = 1
    VALUE              = 9.818777
  END_OBJECT           = MAPORIENTATIONANGLE

  OBJECT               = SOLAR_AZIMUTH_ANGLE
    NUM_VAL            = 1
    VALUE              = 140.556708
  END_OBJECT           = SOLAR_AZIMUTH_ANGLE

  OBJECT               = SOLAR_ELEVATION_ANGLE
    NUM_VAL            = 1
    VALUE              = 61.909232
  END_OBJECT           = SOLAR_ELEVATION_ANGLE

END_GROUP            = PRODUCTSPECIFICMETADATA

GROUP                = GRID_INFO

  GROUP                = PROJECTION_INFO

    OBJECT               = PROJECTION
      NUM_VAL            = 1
      VALUE              = "UNIVERSAL TRANSVERSE MERCATOR"
    END_OBJECT           = PROJECTION

    OBJECT               = PROJECTIONPARAMETERS
      NUM_VAL            = 13
```

```
        VALUE              = (0.000000, 0.000000, 0.000000,
0.000000, 0.000000, 0.000000, 0.000000, 0.000000, 0.000000,
0.000000, 0.000000, 0.000000, 0.000000)
      END_OBJECT           = PROJECTIONPARAMETERS

      OBJECT               = DATUM
        NUM_VAL            = 1
        VALUE              = "WGS 1984"
      END_OBJECT           = DATUM

      OBJECT               = UTMZONE
        NUM_VAL            = 1
        VALUE              = 18
      END_OBJECT           = UTMZONE

    END_GROUP            = PROJECTION_INFO

    GROUP                = GRIDSTRUCTUREINFO

      OBJECT               = GRIDRESAMPLINGMETHOD
        NUM_VAL            = 1
        VALUE              = "Nearest neighbor resampling"
      END_OBJECT           = GRIDRESAMPLINGMETHOD

      OBJECT               = DATACOLUMNS
        NUM_VAL            = 1
        VALUE              = 5622
      END_OBJECT           = DATACOLUMNS

      OBJECT               = DATAROWS
        NUM_VAL            = 1
        VALUE              = 4987
      END_OBJECT           = DATAROWS

      OBJECT               = UPPERLEFTCORNER
        NUM_VAL            = 2
        VALUE              = (284937.415469, 4334316.023925)
      END_OBJECT           = UPPERLEFTCORNER

      OBJECT               = LOWERRIGHTCORNER
        NUM_VAL            = 2
        VALUE              = (369286.756930, 4259500.068986)
      END_OBJECT           = LOWERRIGHTCORNER

      OBJECT               = CORNERCOORDINATEUNITS
        NUM_VAL            = 1
```

```
        VALUE                = "Meters"
      END_OBJECT             = CORNERCOORDINATEUNITS

      GROUP                  = RESOLUTION

        OBJECT                 = XPIXELSIZE
          NUM_VAL              = 1
          VALUE                = 15.003440
        END_OBJECT             = XPIXELSIZE

        OBJECT                 = YPIXELSIZE
          NUM_VAL              = 1
          VALUE                = 15.002197
        END_OBJECT             = YPIXELSIZE

        OBJECT                 = XYPIXELSIZEUNIT
          NUM_VAL              = 1
          VALUE                = "Meters"
        END_OBJECT             = XYPIXELSIZEUNIT

      END_GROUP              = RESOLUTION

    END_GROUP              = GRIDSTRUCTUREINFO

  END_GROUP              = GRID_INFO

END_GROUP              = INVENTORYMETADATA

END
```