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AFIDS Server RackStation User Guide

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1. SCOPE

1.1 Identification

This AFIDS Server RackStation User Guide was prepared under the task identified as the Jet Propulsion Laboratory (JPL) "Advanced Image Processing Server Technology," Project Number 103997, Task 1.1, NMO# 716028, performed under management of the California Institute of Technology (CALTECH) via contract with the National Aeronautics and Space Administration (NASA-CALTECH contract NAS7-03001). Historic funding for AFIDS software development has come from NASA and DOD sources.

1.2 Overview

This document describes the AFIDS Server RackStation, including the components, how to assemble it, how to operate it, included software and data, and associated issues. The system is designed to run the AFIDS (Automated Fusion of Image Data System) software, which is currently installed under 64-bit Red Hat Linux Enterprise 5. The "server" application software is described within this document. The AFIDS "workstation" software is also installed, but is described in a separate AFIDS Users Guide document. Several supporting databases are also provided on an included 15TB Raid unit. In brief, the AFIDS software package provides a semi-automated approach for co-registering selected satellite imagery (without human selection of tiepoints [with good ephemeris], and with only one image resampling) for a given multidate satellite dataset covering the same area, assuming the matching images do not contain significant disparaging differences such as cloud, seasonal, viewing angle, or time-displacement variations. Once registered, a connected component change detection capability is available to assist in automated target recognition. The first AFIDS Servers support Landsat, Quickbird, NTM, and Aster image registration. Additional image types and applications will be added as time progresses.

The AFIDS Server supports the Open Geospatial Consortium (OGC) OpenGIS Web Processing Service (WPS), which provides standards that allow a browser client (e.g., Firefox, Internet Explorer, Safari, etc.) to access the AFIDS Server remotely and perform image registration. Both human and computer WPS interfaces are supported. This document will describe the human interface in the process of explaining the operations of AFIDS. The computer WPS interface is described on-line at the OGC website:
http://www.opengeospatial.org/standards/wps

1.3 VICAR License Agreement

AFIDS is built upon the VICAR/IBIS software. The United States Government has a non-exclusive, non-transferable, royalty-free worldwide license to VICAR. Third party use of VICAR is limited to uses for, or on behalf of the US Government, including DOD organizations, but any further use must be negotiated with the NASA Patent Office. Other organiziations wishing to use AFIDS should obtain a license from Caltech/JPL. For licensing information, contact the Caltech/JPL Administrator for Software Licensing, 4800 Oak Grove Drive, Mail Code 202-233, Pasadena, CA 91109-8099, Phone 818-393-3424.

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2. APPLICABLE DOCUMENTS and DATABASES

2.1 Applicable Documents

(1) JPL, "AFIDS Automated Fusion Image Data System User Guide," Version 3.0b, 9AUG05.
(2) Dell, "Systems Management Tools and Documentation," Version 5.4, P/N W473G, Rev. A00, May 2008. www.dell.com
(3) Red Hat, "Red Hat® Enterprise Linux® 5 Installation Disc," For 64-bit AMD64 and INTEL64. DVD0049US, 2007.
(4) Open Geospatial Consortium (OGC) Web Processing Service (WPS) Standards. Website: http://www.opengeospatial.org/standards/wps

2.2 Supporting Databases

Five JPL-prepared databases are installed on the Raid drive to support the AFIDS coregistration of satellite imagery on a global basis. These databases include: 1) A global 1 arc-second (30m) DEM (Digital Elevation Model) database; 2) A global 1 arc-second (30m) Landsat Band 3 (Red wavelength) database; 3) cib01 (Compressed Image Base 1-meter); 4) cib05 (Compressed Image Base 5-meter); and 6) A global set of ADRG (Arc Digitized Raster Graphic) maps of mixed resolution. The combined databases occupy about 7.4TBs of disk space.

2.2.1 Digital Elevation Database

The DEM database (/export/data2/srtmL2_filled) is a one arc-second (~30m) SRTM (Shuttle Radar Topography Mission) digital elevation model (DEM) global dataset, that has had its "voids" (radar shadow areas) filled with NGA's "DTED-1" data, oceans flattened, and coastlines cut to DTED-1 boundaries. This global database uses DTED-1 data above 60 degrees Latitude, and uses "GLOBE" 1KM to fill in any remaining elevation holes (See Figure 2-1). The resulting "srtm_filled" database comprises 19,240 1x1 degree files that are mosaicked together by AFIDS (as needed) to provide the topographic relief offsets that are essential to any image coregistration process. The data are provided in Geographic (Platte Carree) projection and stored in VICAR format. The data should be considered an "interim" database until the NGA provides it's official void-filled SRTM DEM database. This dataset is currently restricted to qualifying U.S. Government Agencies and contractors. As it contains DTED data, the entire database carries the same security handling, storage, distribution, and other limitations as per DTED data (Unclassified; For Official Use Only; No Foreign).

2.2.2 Landsat Database

The Landsat database (/export/data2/landsat) is a one arc-second (~30m) global orthographic mosaic (excluding the Poles and some Islands) preparded using advanced JPL-developed mosaicking and brightness optimization techniques to ensure adjacent scene matching, and

topographically corrected to ensure a correct Geographic (Platte Carree) projection. The Landsat data are primarily derived from early-mid 1990s imagery with some 2000 updates (from the Stennis Science Data Purchase). The utilized Landsat is the best cloud-free data available, although cloud-obscuration is a fact in many cloud-prone geographic areas. The global database is provided in 958 5x5 degree files that are mosaicked together by AFIDS (as needed) to provide orthographic map projection characteristics. This data is provided in VICAR format, and is unclassified and *not* restricted to U.S. Government Agencies, although protected from commercial use by a Caltech license.

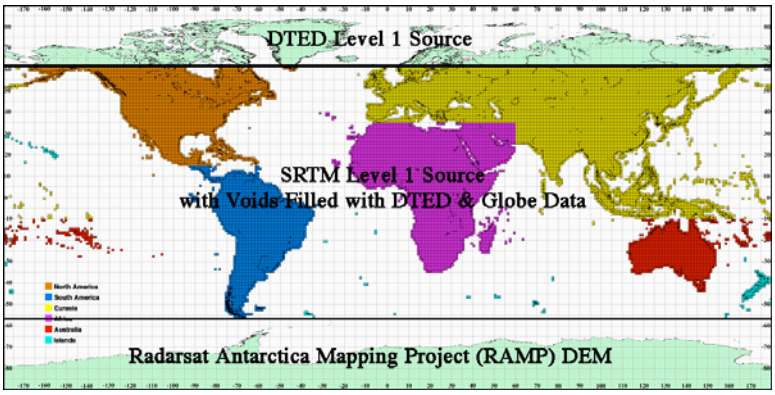

Figure 2-1: AFIDS SRTM/DTED DEM Global Coverage.

2.2.3 CIB01

The one-meter Compressed Image Base directory contains 1123 files, comprising the contents of standard CIB01 CD-ROMs that have been logged into a georeferenced image format. Additional data sets will be added as they become available. A VICAR/IBIS Interface File (.int) is used by the AFIDS software as an index to locate and extract geographic subareas. CIB01 global geographic coverage is very limited.

2.2.4 CIB05

The five-meter Compressed Image Base directory contains 1472 files, comprising the contents of standard CIB01 CD-ROMs that have been logged into a georeferenced image format. Additional data sets will be added as they become available. A VICAR/IBIS Interface File (.int) is used by the AFIDS software as an index to locate and extract geographic subareas. CIB05 global geographic coverage is fairly robust.

2.2.5 ADRG Database

The ADRG (Arc Digitized Raster Graphics) and its compressed version (CADRG) are scan-digitized paper maps. They are useful as map backgrounds and site verification images, but are not currently being used by AFIDS. There are 648 10x10 files in compressed VICAR format. The product is a composite of up to five map scales. At the top level, the JOG (Joint Operational Graphics) at 1:250,000 scale is provided. Where a JOG file was not available, the TPC (Tactical Pilot Chart) at 1:500,000 scale is provided. Where neither a JOG or TPC were available, the next coarser level map sale is provided in the following order: ONC (Operational Navigation Chart) at 1:1,000,000 scale, JNC (Jet Navigation Chart) at 1:2,000,000 scale, and finally, the GNC (Global Navigation Chart) at 1:5,000,000 scale. The result is complete global map coverage with the best available map resolution on top.

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3. RACKSTATION ASSEMBLY AND INSTALLATION

The AFIDS Server Rackstation is delivered mostly configured and ready to run. To begin, connect all the peripherals and power-on the computer as described below.

3.1 AFIDS Rackstation Parts List

- 8u Rack with Dell CPU and Raid installed.
- Dell 17" LCD Monitor.
- Dell Keyboard and Mouse.
- Seagate 1TB spare drive for Raid Unit.
- Dell Documentation and CD-ROMS (Provided upon request)
- Red Hat Enterprise Linux 5 CD-ROMs (Provided upon request)

3.2 Rackstation Hardware

The AFIDS Server Rackstation includes the following hardware:

- Dell PowerEdge 2950 III computer (64-bits).
- Intel Quad Core Xeon X5450 cpu @ 3.0Ghz., or X5460 cpu @ 3.16Ghz.
- 32GB DIMM memory.
- Four 750GB or 1TB internal drives; Raid 1 (Mirror) 1.4TB – 1.7TB
- Internal CD-RW with DVD reader.
- Keyboard and 2-button mouse with scroll.
- DELL 17-inch color LCD monitor.
- Dell PowerVault MD 1000 Raid Storage; 15 slots; 1TB (~12GB available).
- Four USB ports.

3.3 Rackstation Assembly Setup and Power-On

Unpack all the equipment, and place the Rackstation in your location of choice. A regular computer room is preferred, with space in front and behind the Rack, and a network connection. The Rackstation can be noisy.

- Plug-in the three or four cpu and raid power cords from the rear of the rack.
- Plug the dark-blue monitor cable into the dark-blue connector on the back of the CPU.
- Plug the keyboard and mouse USB cables into the back of the CPU.
- Plug-in the power cord from the monitor.
- Plug your network connector into the Gb1 slot on the back side of the CPU.
- **Power-on the Raid first, and let it stabilize before turning on the CPU.** The two power rocker switches are on the back of the Raid unit.
- In front, remove the PowerEdge cover (press in the middle of the cover's left side) and power-on the CPU by pressing the button located in the upper left corner.

- If the system boots, but complains of a missing configuration file (fstab), select the F-button (when offered by the system) to import the foreign configuration file.
- After booting, login and check the filesystem (type: df –h) for the Raid disks "/export/data1" and "/export/data2".

```
$ df -h
Filesystem            Size  Used Avail Use% Mounted on
/dev/sda1             124G  7.1G  111G   6% /
tmpfs                  16G     0   16G   0% /dev/shm
/dev/sda3             1.7T  1.2G  1.6T   1% /home
/dev/sdb1             7.2T  3.2T  4.0T  45% /export/data1
/dev/sdb2             4.5T  4.2T  331G  93% /export/data2
```

- If the "export" disks are NOT there, the System Administrator will need to re-install the fstab file:

```
$ cat /etc/fstab
LABEL=/                 /                       ext3    defaults        1 1
devpts                  /dev/pts                devpts  gid=5,mode=620  0 0
tmpfs                   /dev/shm                tmpfs   defaults        0 0
LABEL=/home             /home                   ext3    defaults        1 2
proc                    /proc                   proc    defaults        0 0
sysfs                   /sys                    sysfs   defaults        0 0
LABEL=SWAP-sda2         swap                    swap    defaults        0 0
/dev/sdb1               /export/data1           ext3    defaults        1 1
/dev/sdb2               /export/data2           ext3    defaults        1 1
```

3.4 Logins and System Names

Logging In:

- The root password is: change$me
- Change the Root password using the "passwd" utility.

System Name and IP Address:

- By default, the AFIDS Rackstation was named either "bushrat" or "devilrat" with an IP address of 137.78.33.98 or 137.78.33.52. The first rackstation was reconfigured as localhost. The host name can be left as-is or changed, but the IP address must be changed. The computer name and IP address can be modified via the Linux gui: `Select System/Aministration/Network`, then click on `DNS`. Update the hostname and IP. Then back track, click on Devices, and update the hostname and IP there. Be sure to "Save" your changes. Alternatively, the following three files can be modified (as root):
  - `/etc/sysconfig/network`
  - `/etc/sysconfig/network-scripts/ifcfg-eth0`
  - `/etc/host`

- Reboot the computer for the new hostname to become effective.

- Five other locations must be updated with the new hostname, but they can be changed by running the following script:

```
cd /usr/local/afids
./install -bovwq
```

3.5 User Accounts

User Directories:

- Ten ‘user’ server accounts (user0 – user9) have been created for convenience. To login as user0 for example, enter the username as “user0” with the password “user0”.
- Server Accounts are different from general User Accounts. A Server Account does NOT require a /home user directory. You can login with your personal account then use one of the ‘user’ server accounts to work with AFIDS. However in the afids baseline, /home directories have been created for the ‘user’ server accounts.

Creating Server Accounts:

- The initial ‘user’ server accounts can be deleted and new server accounts created. The process involves creating several tomcat5 directories and modifying the SQL database. Special shell scripts have been created to simplify this process.

  Create Server Account:
  `./afidsuseradmin.sh -c –u` *`username`* `–p` *`password`*
  Reset Server User Password:
  `./afidsuseradmin.sh -r –u` *`username`* `–p` *`password`*
  Delete Server Account:
  `./afidsuseradmin.sh -d -u` *`username`*

- Server files are placed in special tomcat5 "upload" and "wpsoutput" directories. These directories are located:
  `/var/lib/tomcat5/webapps/ROOT/users`
  Example for ‘user4’:
  `/var/lib/tomcat5/webapps/ROOT/users/user4/upload`
  `/var/lib/tomcat5/webapps/ROOT/users/user4/wpsoutput`
  (NOTE: tomcat5 may replace “user4” with a randomized alpha string)

Creating User Accounts:

- To create User Accounts, select the “Users and Groups” option from the main Linux menu “System Settings”, and create the new user. Select the TCSH shell.
- Add the following to your tcsh .cshrc file (or type in a ‘tcsh’ shell):
  `source /usr/local/afids/setup_afids_env.csh`

  For bash users, specify the following in your bash_profile:
  `. /usr/local/afids/setup_afids_env.sh` (Note the preceding dot)

  The changes to your .cshrc fill will not take effect until a new shell is started. To make a change active immediately, type: `source .cshrc` (in the tcsh shell)

3.6 Setting Up the Browser with a Security Certificate

Launch your browser from the workstation that has access to your data. This is probably your local client workstation, but once your data becomes local to the Server, you can logon directly.

- Launch firefox, IE, or safari from your local client workstation, or login to the AFIDS Server using firefox.
- Enter: `http://yourhostname/` if unsuccessful, try:
  `http://yourhostname.xxx.xxx.gov:80`
- You will need to accept the "`localhost.localdomain`" security certificates. The sequence of certificates varies with the browser and OS. The Firefox sequence is shown below:
  - Secure Connection Failed / "Alert" - Click OK.
  - Secure Connection Failed - Click "Or you can add an exception".
  - "Add Exception" - Click it.
  - Add Security Exception - Click "Get Certificate".
  - "Confirm Security Exception" - Click it.
  - The "AFIDS Image Coregistration Service" should appear.
- Bookmark this page.

3.7 Test Data

An AFIDS Server "test" directory has been created in /home/user1/. The test directory contains sample landsat, quickbird, aster, and other data for testing the master, secondary, and add-band scripts. The data in this directory can also be accessed by the browser, but you will probably need to be logged-in as user1.

- `run_tests.pdf`: This script runs all the scripts and processes all the data. A log file (run_tests.log) is created for locating problems. To run, type:

```
vicarb run_tests > run_tests.log
```

- `clear_old.txt`: This script deletes everything made by the “run_tests” script. It is useful for clearing out all the old files so a new, clean test can be performed. To run, type:

```
source clear_old.txt
```

3.8 Useful Auxillary Software Tools

The following software is available to the user:

- ctv2: An independent AFIDS tool for displaying NITF, TIFF, native VICAR, and FITS formatted files. Navigate to the directory where your data of interest are located, and at the linux prompt, type:

```
ctv2
```

A graphics box will appear for you to select an image to display. Be sure the directory path and filename combined are less than 99 characters.

- gimp: The GNU Image Manipulation Program for displaying and editing raster images. To launch gimp at the linux prompt, type:

```
gimp
```

- Open Office: A suite of word processing, spreadsheet, presentation, and other office tools. To launch the open office suite at the linux prompt, type:

```
oowriter  or
ooffice  or
openoffice.org
```

- text editors: The following text editors are available at the linux prompt. Just type their names:

```
emacs
gedit
joe
nano
```

- Imagemagick: The Image Magick suite is available at the linux prompt. For example, type "`display`" or "`animate`" to activate the software.

- k3b: A CD-ROM burning program from the KDE desktop environment. At the linux prompt, type:

```
k3b
```

3.9 Installation Updates

Occasional AFIDS updates will be necessary to repair bugs and add or modify functionality. When this situation occurs, a new AFIDS will be provided on DVD and must be installed on the Rack Server. The procedure requires the System Manager with Root priviledges:

- The AFIDS tar file has a name similar to: `afids5_20090129_lin64_ctv_oc.tar`

`cd /user/local` (Change your working directory to "/usr/local")

`cp /media/afids/afids5_20090129_lin64_ctv_oc.tar .` (Copy the afids5 file from DVD to /usr/local. Don't forget the "dot" after the tar.)

`tar –xf afids5_20091029_lin64_ctv_oc.tar` (Untar the afids5 update file over the previous installation)

`cd /usr/local/afids` (Change directory to "/usr/local/afids")

`./install –q` (Install the update. Be sure to include the front dot)

4. SERVER DESCRIPTION

4.1 AFIDS Server Design

The AFIDS Server provides a variety of image coregistration, orthorectification, and georeference enhancement services, in support of time-series, change detection, and data fusion activities. A variety of image sensors including Landsat, Aster, Quickbird, Ikonos, ALI, NTM, and Hyperion are currently available or will be added in the future. The AFIDS Server registers your satellite image (red band) to an orthorectified base image, and returns to you the registered image in GeoTIFF or NITF format (plus some accuracy and log files). The remaining bands can also be quickly registered using a correction grid (created with the red-band registration) so everything matches exactly. After the first registration, a second date satellite image can be sent to the AFIDS Server for coregistration with the first image. These "first" and "second" images are referred to as "master" and "secondary." If desired, multiple "secondary" images can be registered to the "master" to develop a time-series of registered satellite imagery.

4.2 AFIDS Software

The AFIDS (Automated Fusion of Image Data System) software currently supports the co-registration of multidate Landsat imagery. When multidate imagery is obtained, one of the dates is identified as the "master," to which all "secondary" dates are registered. The master scene should be as clear and cloud-free as possible, be a near-nadir view, and have the best overlapping 'position' with respect to the secondary scenes, which may be offset due to variations in flight paths.

The basic co-registration concept begins with an orthorectified 'image base' (in Platte Caree projection) to provide an approximate cartographic mapping and projection. The satellite datasets are initially registered to the 'image base' to obtain its projection characteristics. The medium resolution Landsat satellites use a Landsat-based orthorectified image base. Digital elevation models are used to correct perspective shifts due to spacecraft height and view-angle. Satellite images are co-registered to the Landsat database using an automated and recursive series of FFTs (Fast Fourier Transforms) to create a large set of very accurate tiepoints, which are used to warp the images. NO MANUAL tiepoints are used. This approach requires multiple sequential processing steps to warp the dataset by resampling pixel values. To avoid degradation of the data by multiple resamplings, each warp is represented by an "Ultra-Fine" grid of tiepoints. For successive warps, the grids are composed mathematically into a single grid such that ONLY ONE RESAMPLING occurs. The "Ultra-Fine" grid can currently contain over four million points (1000x1000 grid recommended), facilitating very high precision pixel adjustments. A publication describing the process is available.

AFIDS is built upon the VICAR/IBIS software. VICAR (Video Image Communication And Retrieval) is a comprehensive command-line image processing system originally developed in the mid-1960s to support the Nation's unmanned space exploration program. IBIS (Image-Based Information System) is a raster-based Geographic Information System (GIS)

developed in the 1970s as a fully integrated subsystem of VICAR. While both systems have continued to evolve through the years, it is the IBIS portion that has focused on developing an integrated and comprehensive set of semi-automated image co-registration software capabilities. This software set is generally referred to as the "GT" routines for their integrated use and compatibility with GeoTIFF georeferencing algorithms.

4.3 Web Processing Service (WPS)

The goal of a Web Processing Service is to automate the input and output handling of a process activity without human intervention. The AFIDS WPS conforms to the standards of the Open Geospatial Consortium (OGC) Web Processing Service (WPS). The OGC WPS specifies three required operations: Get Capabilities, Describe Process, and Execute. The output from each of these operations is an XML document. Embedded in the XML output are URLs to the actual output product(s).

1. GetCapabilities
   This operation describes the processes offered by the server.
2. DescribeProcess
   This operation provides a detailed description of a particular process to the client:
   - Landsat
     - Describe Master coregistration
     - Describe Secondary coregistration
     - Describe Additional Band coregistration
3. Execute
   This operation allows a client to run a specified process:
   - Landsat
     - Coregister a Master image
     - Coregister a Secondary image
     - Coregister an Additional Band image

Additional description and information can be obtained from the WPS website:
http://www.opengeospatial.org/standards/wps

However, to develop and test a WPS, it is necessary to have a minimum gui interface to the AFIDS WPS so human users can beta test the registration software and automated network interfaces. The combined AFIDS Web Process Server therefore has the conceptual configuration shown in Figure 4-1.

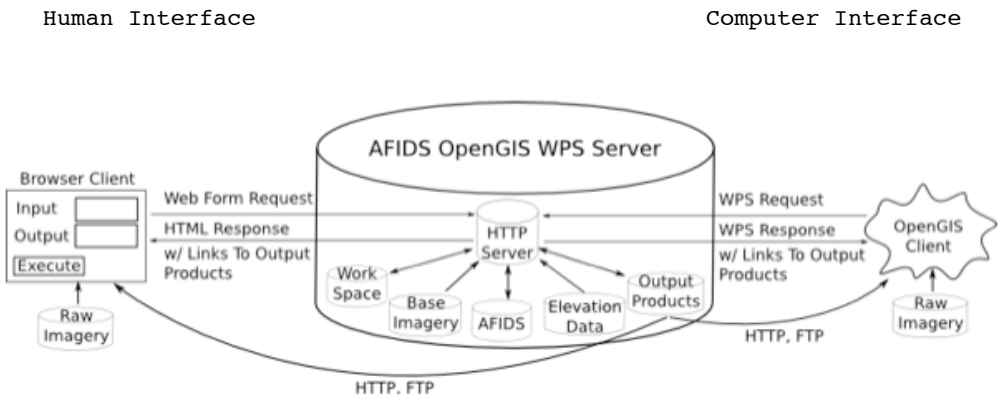

Figure 4-1: Interactions of the AFIDS Web Process Server.

4.4 Landsat Coregistration Concept of Operation

The AFIDS WPS registers your Landsat image (band3) to an orthorectified base image, and returns to you the registered image in GeoTIFF format, plus registration accuracy information and a log file. You may then optionally upload the remaining Landsat bands to have them registered as well (using the same grid so everything matches exactly). After the first registration, a second date Landsat image can be optionally sent to the AFIDS WPS for coregistration with your first image. These First and Second Landsat images are referred to as Master and Secondary. If desired, multiple Secondary images can be registered to the Master to develop a time-series of registered Landsat imagery.

Master - Register your band3 Landsat to an orthorectified base image.

Secondary - Register a second date band3 Landsat to the master band3 Landsat.

Additional Band - Apply the registration (grid) from the master or secondary Landsat to its other bands.

Supported Landsat format types include:
Landsat uncorrected (L0R "raw" or Level 1G) Landsat MSS, TM, ETM, or ETM+ Imagery in TIFF, HDF, or USGS "NLAPS" format (.b3, .b30, *nn3.tif, .I3 or .FST) format with their metadata (.met, .ip3, .H1, WO.tif, or .MTL) file. Other formats and metadata may be acceptable. The 80m Landsat MSS contains 4 files. The 30m TM and ETM Landsats contain 7 or 8 spectral channels (blu, grn, red, nir, fir, tir, Geology Shortwave, and 15m Panchromatic).

4.5 Aster Coregistration Concept of Operation

The AFIDS WPS registers your ASTER VNIR (15-meter) band 2 image to an orthorectified base image, and returns to you the registered image in GeoTIFF format, plus registration accuracy information and a log file. You may then optionally upload the remaining ASTER bands to have them registered as well (using the same grid so everything matches exactly). After the first registration, a second date ASTER image can be optionally sent to the AFIDS WPS for coregistration with your first image. These First and Second ASTER images are referred to as Master and Secondary. If desired, multiple Secondary images can be registered to the Master to develop a time-series of registered ASTER imagery.

Master - Register your band2 ASTER to an orthorectified base image.

Secondary - Register a second date band2 ASTER to the master band2 ASTER.

Additional Band - Apply the registration (grid) from the master or secondary ASTER to its' other bands. ASTER SWIR and TIR images are rescaled to match the VNIR 15-meter pixel size.

4.6 Quickbird Coregistration Concept of Operation

The AFIDS WPS registers your DigitalGlobe(c) Quickbird panchromatic image to an orthorectified base image, and returns to you the registered image in GeoTIFF or NITF format plus a log file. You may then optionally upload the Quickbird multispectral image file to have them registered (using the same grid plus a rescaling, so everything matches exactly). After the first registration, a second date Quickbird panchromatic image can be sent to the AFIDS WPS for coregistration with your first image. These First and Second Quickbird images are referred to as Master and Secondary. If desired, multiple Secondary images can be registered to the Master to develop a time-series of registered Quickbird imagery.

Master - Register your Quickbird Panchromatic image to an orthorectified base image.

Secondary - Register a second date Quickbird Panchromatic image to the Master Quickbird.

Additional Band - Apply the registration (grid) from the Master or Secondary Quickbird to its' Multispectral images, and resize the Multispectral bands to match the Panchromatic pixel scale.

Supported Quickbird format types include:
Quickbird "Basic" Panchromatic and Multispectral Imagery in TIFF or NITF (.TIF or .NTF) formats with the TIFF metadata (.IMD) file. The NITF version uses metadata and rpc parameters that are stored in the NITF file. The Quickbird Pan channel is 0.61m resolution, and the Multispectral bands (blu, grn, red, nir) are 2.44m resolution. The Pan channel is used as the "Master" for both Panchromatic AND Multispectral data that are being registered.

4.7 NTM Coregistration Concept of Operation

The AFIDS WPS registers your NTM/NITF image to an orthorectified base image with elevation corrections, and returns to you: 1) Your original full-scene input NITF image with improved RPC georeference values; and 2) An orthorectified full-scene image in Platte Caree projection with new RPC georeference parameters, plus a log file. Your original/raw image with the updated RPCs will have the suffix "_updatedRPC." Your new orthorectified image will have the suffix "_master," which continues the AFIDS concept that the first orthorectified image bears the reference name "master."

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5. LANDSAT DEMONSTRATION CASE

To demonstrate the basic operation of the AFIDS Server interface, a Landsat example is provided. The Aster, Quickbird, and NTM cases are similar.

From your local workstation, launch your browser (e.g., IE, firefox) then login to the afids rackserver. Refer to Section 3.6 for the web address and security certificate issues. When the "AFIDS Image Coregistration Service" page appears, enter your username and password. You should login as one of the ten predefined users (user0 – user9), not your personal login, unless the rackstation has been reconfigured. Refer to Section 3.5 for the details.

Once logged in, the ASTER Concept of Operation window will appear. Use the two scroll dialog boxes at the top-left of the page to first select "Landsat," then to select "Concept of Operation" as shown in Figure 5-1. This page provides information as to how the coregistration is performed.

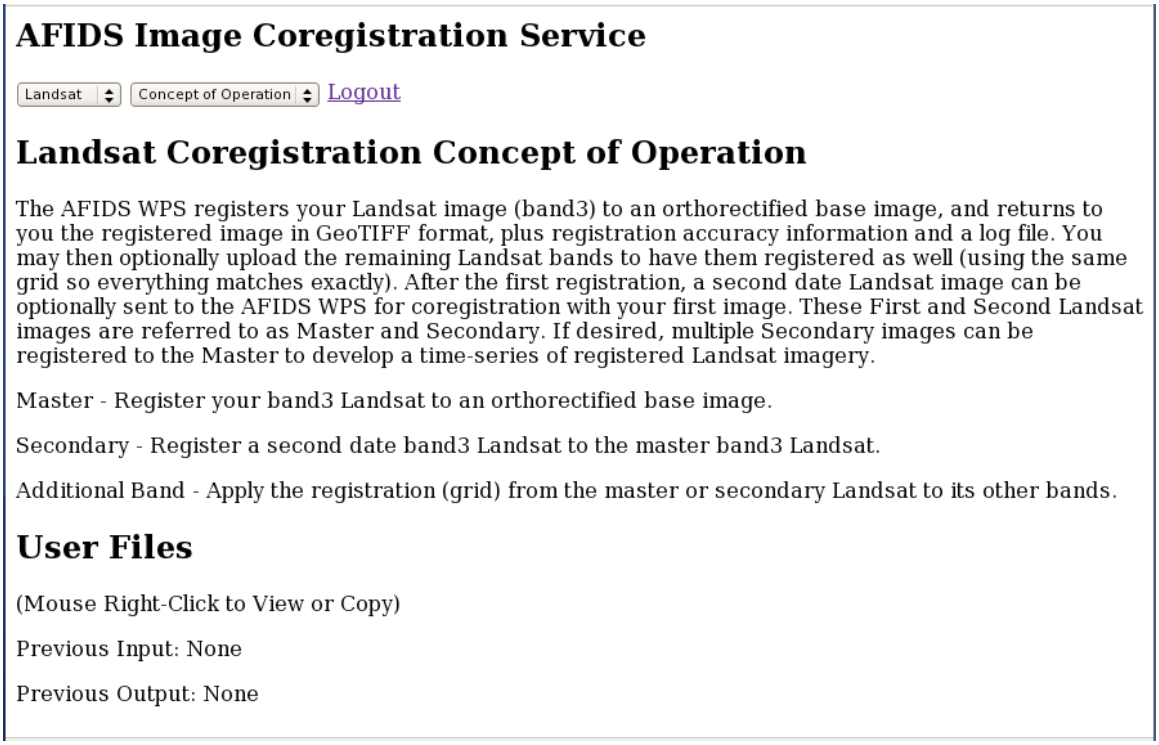


Figure 5-1: Landsat Concept of Operation Web Page.

To begin the Landsat coregistration process (Figure 5-2), select “Landsat” and “Master” using the scroll boxes. Verify that the Master image data is available on your local workstation for upload, and it is in one of the specified formats. Click the first Browser button, and when the “File Upload” dialog box appears, search your local workstation (or network) to find the Master scene’s “band 3” (red wavelength band) and select (Open) it. Then do the same for the Master scene’s metadata text file. Allow some time for the selected files to be uploaded from your workstation to the Afids Server.

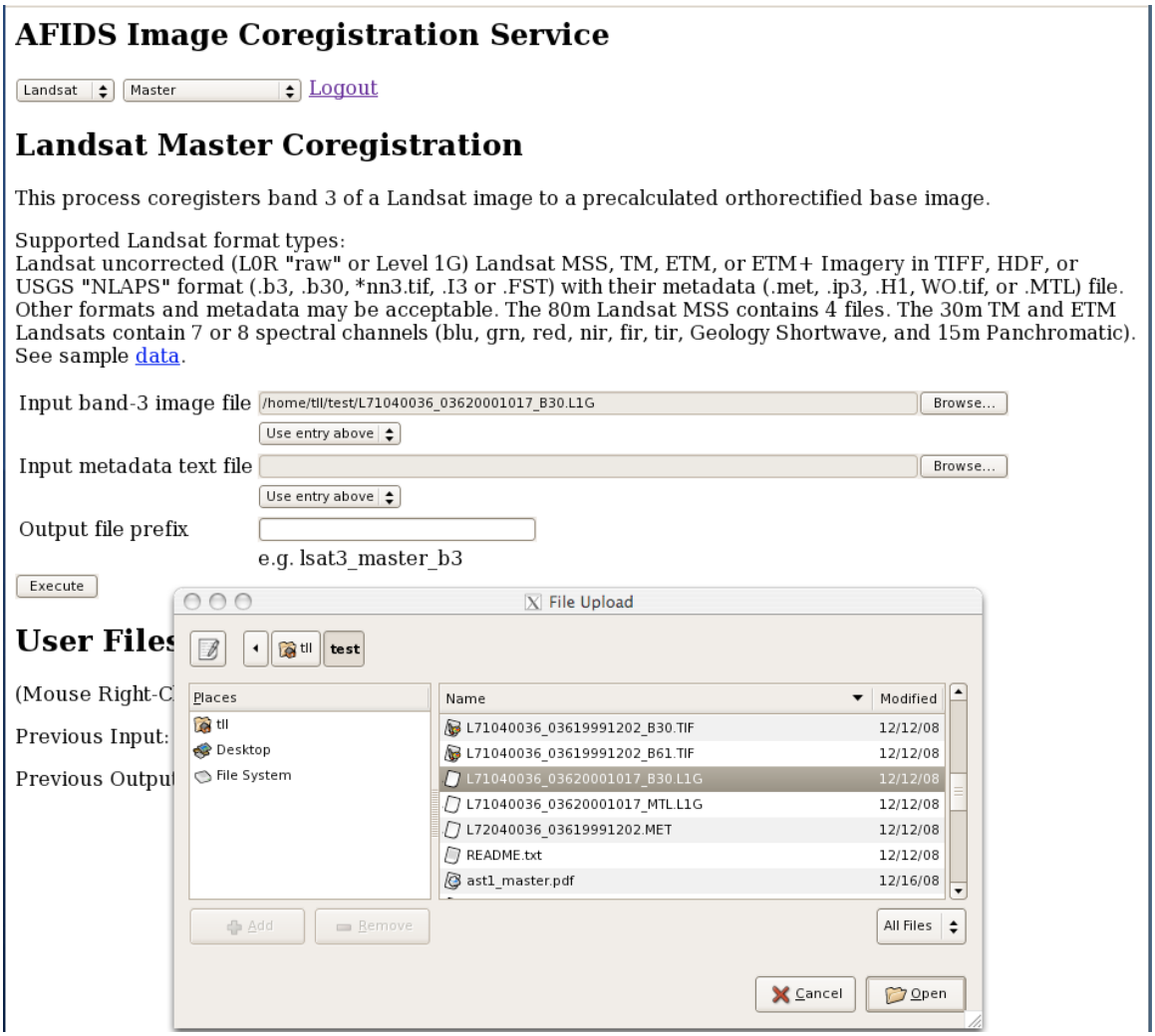


Figure 5-2: Landsat Master Registration Page.

The “Output file prefix” box is a place to put some descriptive text in front of each output filename. Examples include: “lsat3_master_b3” and “master_1017_b3,” etc. Try to limit the number of prefix characters to 20 or less.

Click the “Execute” box to begin the Afids coregistration process.

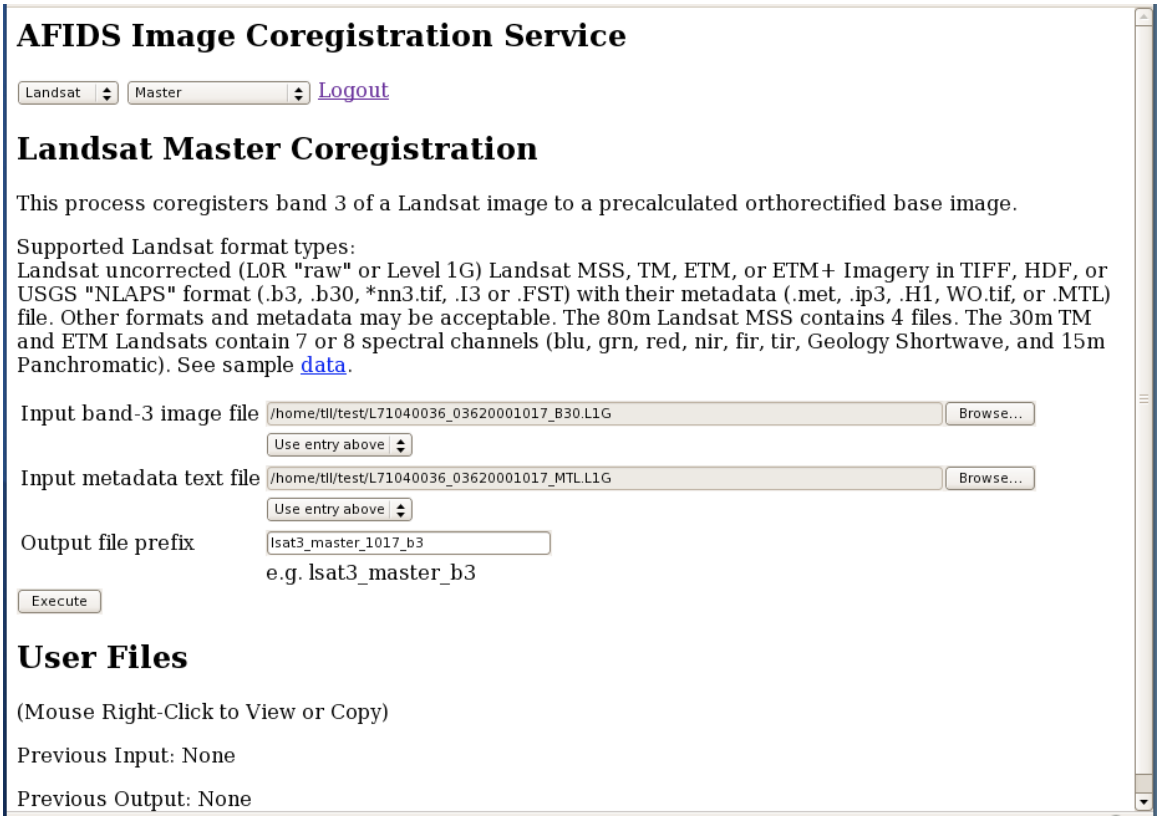


Figure 5-3: Completed Landsat Master Coregistration Page.

While the Landsat Master coregistration process is running, a “progress“ display (Figure 5-4) will appear. Despite the apparent “precision” of the display, the measurements are only approximate.

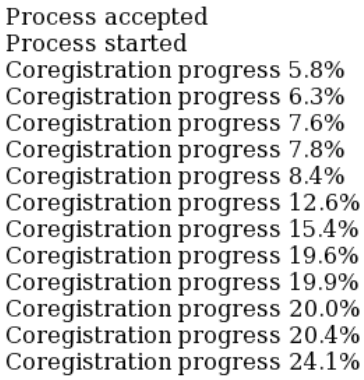


Figure 5-4: Progress Display.

When processing has completed, the Output Products table (Figure 5-5) will appear with a description. Click on a product to display and/or download it to your Desktop. Some products may require a Right-Click “Save link As” selection.

The “Orthorectified output image” is the primary product (Figure 5-6) and is output in GeoTiff format. It should be downloaded to your workstation.

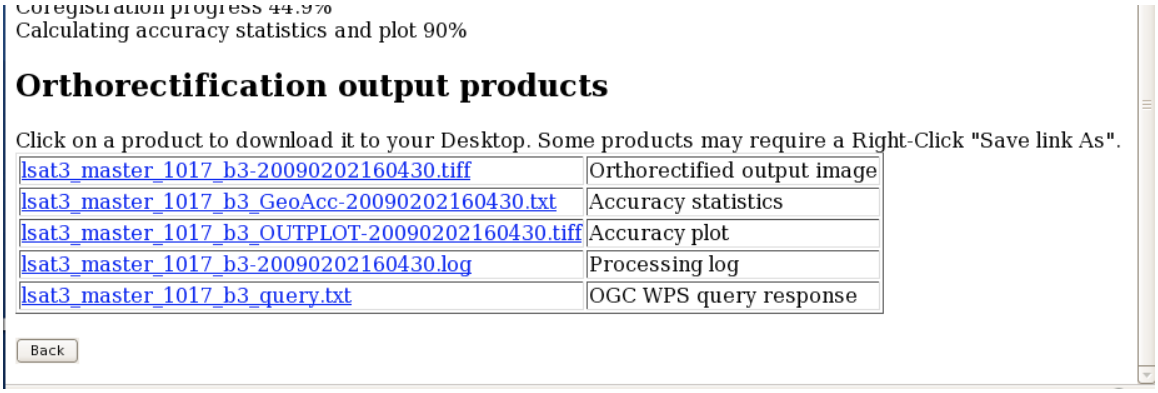


Figure 5-5: Landsat Orthorectification Output Products Table.

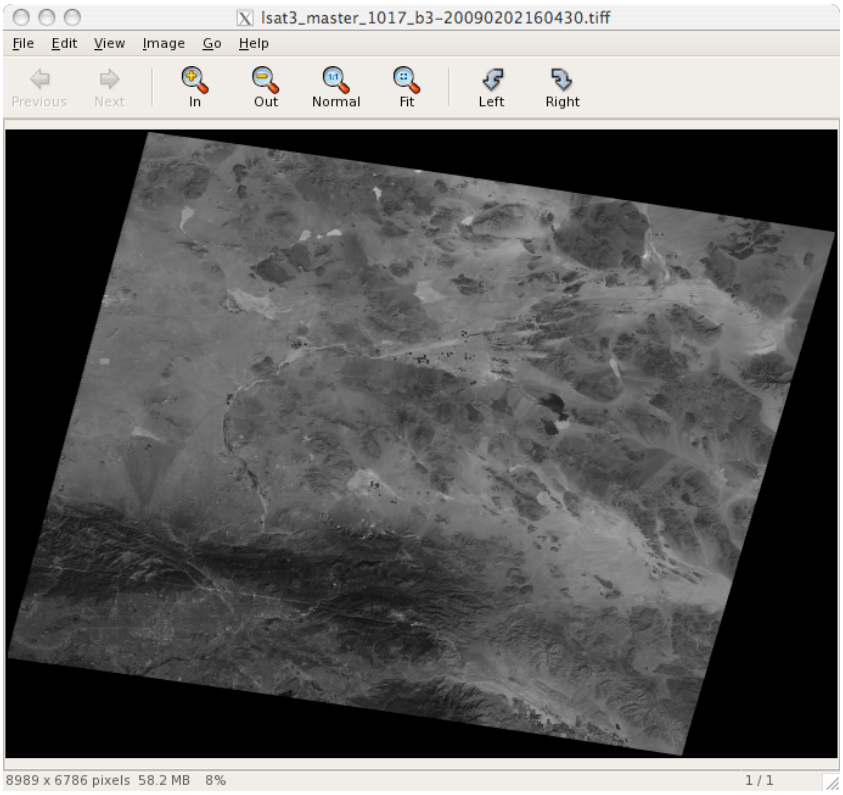
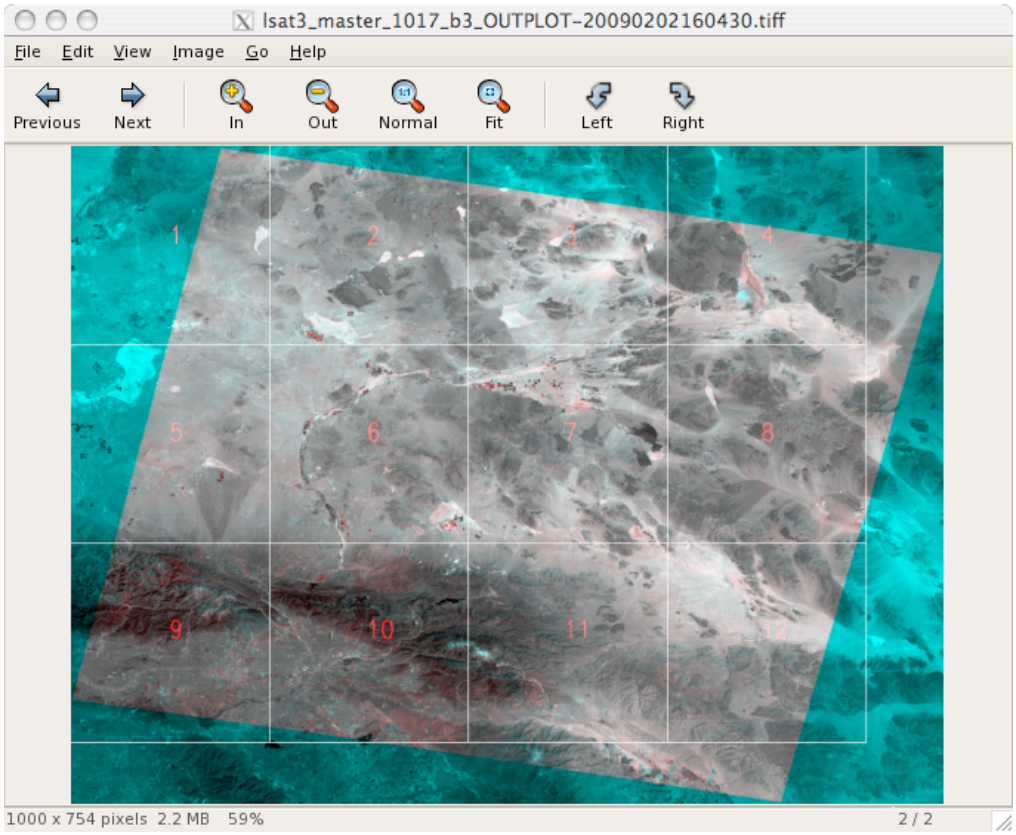


Figure 5-6: Orthorectified Landsat Master Band 3.

Another product is the “Outplot” Accuracy Plot (Figure 5-7). It shows the orthorectifed band 3 with a grid overlay and numbers identifying each grid cell. The Grid Cell numbers match the “window” numbers in the Accuracy Statistics file (Figure 5-8).



Figue 5-7: Landsat Master “Outplot” Reference Map.

GEOLOCATION WINDOW ACCURACIES FOR L7_1017_master_b3
Pixel=3.092250000247e+01 meters; WindowSize=2048 pixels
ORTHO-IMAGE VS. LANDSAT-BASE

WINDOW	RMSm	CEPm	LOFFpxl	SOFFpxl
1	3.57	4.21	0.02	0.01
2	5.04	5.93	0.02	-0.09
3	5.20	6.13	-0.02	-0.14
4	5.92	6.97	-0.03	-0.16
5	2.68	3.15	0.01	0.03
6	2.74	3.23	0.01	0.06
7	2.41	2.84	-0.01	0.01
8	3.80	4.48	-0.02	-0.06
9	8.49	10.00	-0.11	0.01
10	3.17	3.73	0.01	-0.02
11	4.88	5.74	0.02	0.05
12	2.53	2.98	-0.02	0.01

SUMMARY: RMS COLUMN AVERAGES FOR L7_1017_master_b3
4.54 5.35 0.04 0.07

SUMMARY: COLUMN SIGMAS FOR L7_1017_master_b3
1.80 2.12 0.04 0.07

Figure 5-8: Registration Accuracies for Each Outplot Grid Cell.

After copying the Landsat Master products to your local workstation or network, select the "Back" button (lower left corner) to begin the Landsat Secondary registration.

Select "Landsat" then "Secondary" from the upper-left corner scroll boxes to display the Landsat Secondary Coregistration page.

Click the Browse buttons to locate the "Secondary Landsat band 3" file (that you want to match with the Master image), it's metadata file from your local workstation or network, and enter an output file prefix. Note that the "Input secondary image (.img) file" box is pre-filled. This is a special file created in the Master step that contains all the information necessary for the Secondary image to match with the Master. If you should have other previous Master images, you could use the scroll bar to locate and select them instead. By default, the last Master (.img) file is automatically displayed.

Figure 5-9 displays the Landsat Secondary Coregistration web page with all the inputs selected. Also note that previous uploaded Input files and Output products are now listed at the bottom of the web page. They can be selected and or deleted as desired.

Click the "Execute" button to begin the Landsat Secondary Coregistration.

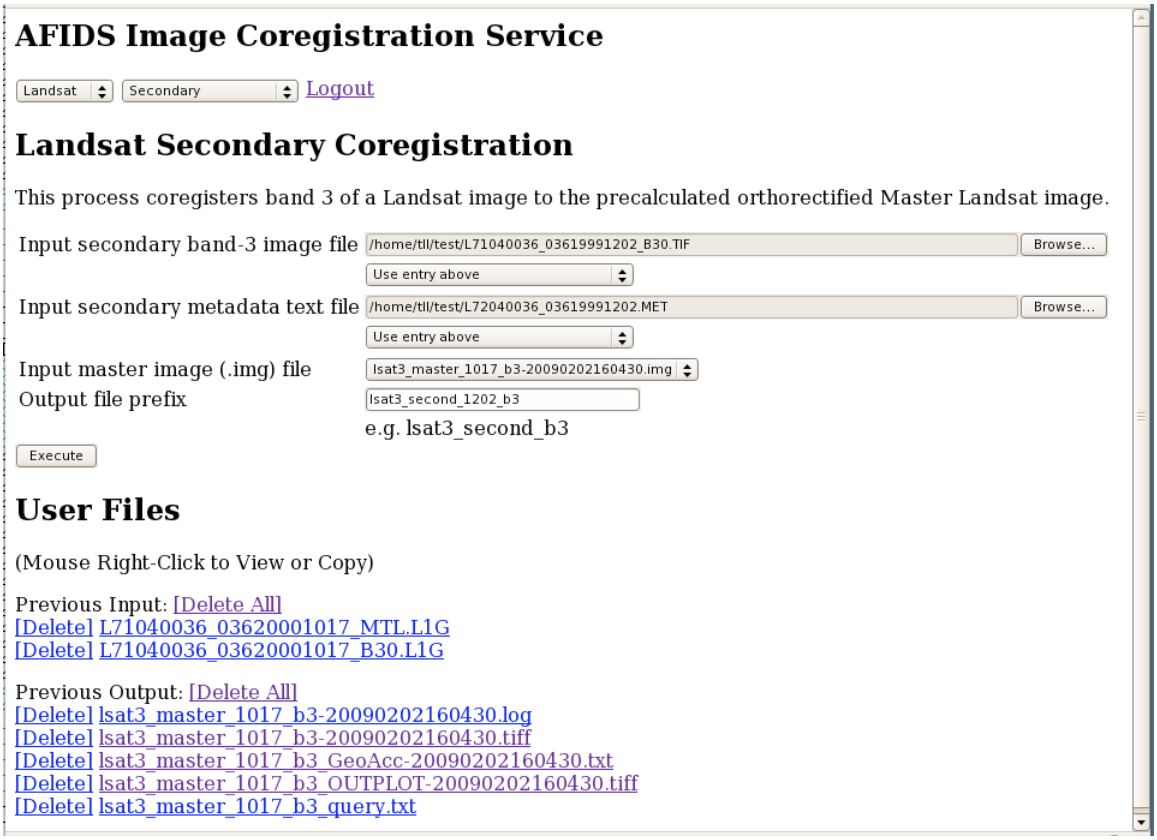


Figure 5-9: Landsat Secondary Coregistration Web Page.

The progress and output products (Figure 5-10) are similar to the Master products except there are no registration accuracies. The GeoTiff file should be downloaded to your workstation.

Figure 5-10: Landsat Secondary Output Products Table.

After copying the Secondary products to your local workstation or network, select the "Back" button (lower left corner) to begin the Landsat Addband process.

Select "Landsat" then "Additional Band" from the upper-left corner scroll boxes to display the Landsat Additional Band Coregistration page (Figure 5-11).

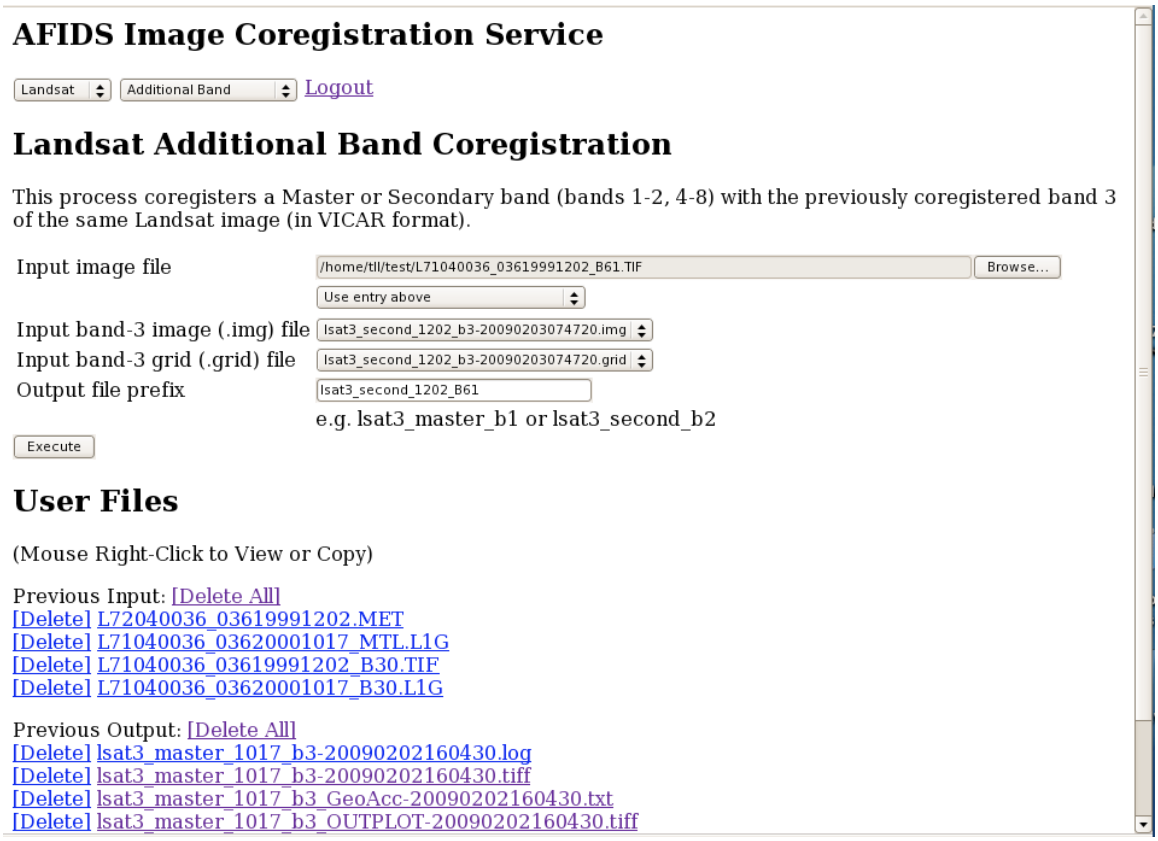


Figure 5-11: Landsat Additional Band Coregistration Web Page.

Click the Browse button to locate one of the remaining Master or Secondary Landsat bands (Bands 1, 2, 4, 5, 61, 62, 7, 8) that you want to have registered. Note that the input band-3 image (.img) and (.grid) boxes are pre-filled with files from the last coregistration. These files may not be what you want. They should be from your Master coregistration if your additional band is from the Master image set, or from your Secondary coregistration if the additional band is from the Second image set.

Select a prefix (that contains the band number) then click the "Execute" button (Figure 5-11).

Figure 5-12: Additional Band Output Products Table.

The Addition Band progress and output products (Figure 5-12) are similar to the Secondary products. The GeoTiff file should be downloaded to your workstation.

Repeat the Additional Band process for each desired band. When done, click the "Back" button, then the "Logout" button at the top of the web page. Select "Quit" from under the "File" menu to exit your browser.

NOTES:

1) Uploaded files are listed on each web page where they can be viewed, copied, or deleted. They are actually located in "/var/lib/tomcat5/webapps/ROOT/users/<you>/upload".

2) Output files are listed on each web page where they can be viewed, copied, or deleted. They are actually located in "/var/lib/tomcat5/webapps/ROOT/users/<you>/wpsoutput".

3) The scroll box labeled "Use Entry Above" is used when you want to repeat a registration process and the input file was previously uploaded. Select the "Use Entry Above" option when you use the "Browse" button to locate a file, otherwise, select a previously uploaded input file (Figure 5-13).

Figure 5-13: The "Use Entry Above" Scroll Box For Previous Uploaded Input Files.