Satellite image catalogues and spatial data archives

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Geographic Information Systems and Remote Sensing, Eberswalde University for Sustainable Development, HNEE, GI’em ERASMUS IP Course at NKUAS Joensuu, Finland Sumer Term 2012
Session 2:
Satellite Data query portals and catalogues
Session 1:
Part 1: Basics of RS

- Overview of Satellite Data query portals
- Glovis Examples
Multi-Sensor catalogues and archives

- **LAND PROCESSES DISTRIBUTED ACTIVE ARCHIVE CENTER:** [https://lpdaac.usgs.gov/lpdaac/get_data/glovis](https://lpdaac.usgs.gov/lpdaac/get_data/glovis)
- **SSEC Global Composite Images:** [http://dbaron.org/sat/comp/#global](http://dbaron.org/sat/comp/#global)
- **ESA - archives:** [http://earth.eo.esa.int/satelliteimages/](http://earth.eo.esa.int/satelliteimages/) ; [http://www.esa.int/esaEO/index.html](http://www.esa.int/esaEO/index.html)
- **NOAA – archives:** [http://www.osdpd.noaa.gov/ml/imagery/archive.html](http://www.osdpd.noaa.gov/ml/imagery/archive.html)
Satellite Data query portals, catalogues

- **IKONOS / ORBview**: [http://www.imagesearch.geoeye.com](http://www.imagesearch.geoeye.com)
- **Digitalglobe**: [http://archivetool2.digitalglobe.com/](http://archivetool2.digitalglobe.com/)
- **Spot**: [http://www.sirius.spotimage.fr](http://www.sirius.spotimage.fr)
- **ESA**: [http://earth.esa.int/dataproducts/accessingeodat/howtoaccess.html](http://earth.esa.int/dataproducts/accessingeodat/howtoaccess.html)
- **South Africa**: [http://www.csir.co.za/SAC/catalogue.html](http://www.csir.co.za/SAC/catalogue.html)
MIPAS level 2 NRT processing problems
08 November 2010
Due to processing problems, the MIPAS level 2 Near Real Time (NRT) products were not generated and disseminated at the PDHS-E (ESRIN) and PDHS-K (Kiruna) between 06 and 08 November 2010. The processing problems were solved during 08 November 2010. The re-processing is already on-going and will be completed as soon as possible.

Envisat NRT processing problems
05 November 2010
Due to processing problems, RA-2 and MERIS Full (FR) and Reduced Resolution (RR) level 1 and level 2 Near Real Time (NRT) products are not generated and disseminated at the PDHS-E (ESRIN), PDHS-K (Kiruna) and Matera stations since 04 November 2010.

ENVISAT Extension Phase (Phase 3) - Preliminary status on instrument product quality
02 November 2010
ENVISAT has successfully been lowered into its new altitude. Between 22 October and 02 November ENVISAT was in Yaw Steering Mode (YSM). Since 2 November, 10:25 UTC, ENVISAT is in Stellar Yaw Steering Mode (SYSM), which is the nominal mode of operations.
The atmosphere is changing and the potential consequences for the "System Earth" are manifold. Dynamics, chemistry, and radiation determine its state and because all are coupled with each other via various mechanisms it is often difficult to identify a direct link between causes and consequences. A better understanding of this system requires integral, continuous, precise, long term and global observations. In order to contribute to this effort of improved understanding, the World Data Center for Remote Sensing of the Atmosphere (WDC-RSAT) was established.

**Ozone Hole Size**

Size of the Antarctic ozone hole for 2007, 2008, 2009 and 2010. The ozone hole sizes shown here are derived using the ROSE/SLR Chemistry and Transport Model (CTM) assimilating total ozone columns derived from MetOp/GOME-2 measurements. To allow the comparison of the ozone hole extents comparing the different years, only trace gas information derived from GOME-2 as well as an equivalent model setup was applied.

The size of the ozone hole is defined as the area where the total ozone column amount is below 220 DU.

**Further Links:**
- WMO Antarctic Ozone Bulletin 2009
- Southern Hemisphere Ozone Analysis Page
- Media products (DLR Media)
- Near-real-time GOME-2 observations and model analyses.
Satellite Data query portals - IKONOS / ORBview: http://www.imagesearch.geoeye.com
Satellite Data query portals, Digitalglobe: http://archivetool2.digitalglobe.com/

Please Zoom In on the Map or refine the SEARCH CRITERIA.
There are too many results to display.
RS query portals - ALOS / PALSAR:

>ALOS Data Take Simulation(Sep. 16, 2008)

Observation Area

PRISM
Digital Globe Quick Look Portal
Limited imagery available with Google Earth

Overview of QuickBird imagery of 2008

Archive Data and Quick Looks
Google Earth: Digital Globe Quick Look Portal
Satellite Applications Centre: Online Catalogue

Main Catalogue

*New Catalogue can already be used - click on this link for information*

The main CSIR earth observation data catalogue is for Landsat 4,5 MSS; Landsat 5 TM; Landsat 7 ETM; SPOT 1,2,4; ERS 1,2 and NOAA sensors.

Click on the following items for more information:
- Instructions for Use of the Main CSIR Satellite Applications Centre Catalogue
- Information on data in the Catalogue
- Notes on using the Main CSIR Satellite Applications Centre Catalogue
- Browser requirements for the Main CSIR Satellite Applications Centre Catalogue

Should you have problems in accessing the catalogue, please contact Sales and Customer Services or telephonically at +27 12 334 5000. We will attempt to rectify your problem or, if required, perform a search of the catalogue for you.

Here are brief instructions for first time users of the On-line Catalogue as well as other information on the content and use of the Catalogue.

The initial page has a map showing the coverage area of the CSIR Satellite Applications Centre. To zoom in on the map and perform a catalogue search, just follow these 10 easy steps:

1. Use your mouse cursor to draw a rectangle covering your area of interest on the map.
2. Click on the zoom + button to zoom in to that area. Repeat steps 1 and 2 if required to zoom in further.
3. Use the mouse cursor again to draw a rectangle covering the area over which you wish to search for available images.
4. Alternatively, if you have the geographic coordinates of your area, type in the upper left and lower right corner into the geographical search map fields. If you need to enter a
Session 1:
Part 2:
RS archives

- Glovis Satellite Data
GLOVIS Archive Interface

USGS Global Visualization Viewer

- All data FREE!
- Data format: GeoTIFF, UTM
Combined Ground Station Network

KHC
MLK

KHC

L7 Stations
L5 Stations
L5 and L7 Stations
Campaign Stations
Scene location / organization

- Each scene has a unique Worldwide Reference System (WRS) Path/Row locator

L1-L3 WRS-1, L4-L7 WRS-2
GLS 1975-2005 Status

- Reprocessed GLS 1975, 1990, 2000 available
- GLS 2005 Originally “due” by December 31, 2008
  - ~90% complete by that date
- Data Set “essentially” complete May 2009
  - 140 scenes from Brazil (CUB), Indonesia (BKT) were still missing
  - Notification to LCLUC program, USGS press release
- Final scenes delivered and processed September 2009
- Free, per-scene download from GLOVIS, EE
  - Bulk distribution from UMD GLCF for fee
  - Bulk distribution from USGS if disk provided (?)
GLS2005 stats

- Landsat scenes:
  - 5764 ETM+ path/rows
    - 4,702 gap-filled
    - 1,062 assigned multiple scenes (non gap-filled)
  - 2,425 TM path/rows
    - 67% from IC, Campaign Station acquisitions

- EO-1 scenes: 555 (islands and reefs)
Acquisition Day of Year
GLS2005 Metadata: Sensor Choice

Landsat 5: 2109  
Landsat 7: 4658
NDVI average: 0.914 (normalized)
NDVI average: 0.501 (raw)
GLS 2010 Status

2009-2010 Acquisition Window
- combination of Landsat-5, Landsat-7, ALI
- 8 Campaign Stations + IC Participation

Data Processing: 2010-2011
- scene selection via LASSI
- standard L1T product for L5
- L7 gap-filled (for cloud-cover < 8%) at GSFC

Delivery in late 2011
Note about SLC-off Landsat 7 Data

L7 data collected after 5/30/03 has missing data

Fig. 1
Session 1:
Part 2: RS archives

- Regional data examples
MDGLS – Boreal forest cover and change
Developing land cover data products in monsoon Asia through integration of Landsat (GLS2005), multi-temporal ALOS/PALSAR and MODIS images

PI: Xiangming Xiao, University of Oklahoma, Norman, OK
Co-I: William Salas, Applied Geosolutions Inc. Durham, NH
International collaboration: Thailand, Indonesia, China, and India

✓ Image data acquisition and preprocessing
  Landsat (800+ images), PALSAR ScanSAR, MODIS
✓ Image data co-registration and fusion
✓ Decision tree algorithms for paddy rice, water body, wetland, cropping intensity & irrigation
✓ Field work for ground truth data collection
  Thailand, China, and India (2009)
  Indonesia (3/2010)
  Global Geo-Referenced Field Photo Library

http://www.eomf.ou.edu/photos/
Implementation of decision tree algorithm for paddy rice, water and wetlands

- Algorithm implementation and evaluation at image or watershed scale (China, Indonesia, and Thailand)
- Algorithm implementation and evaluation at country scale (to be done)

Paddy rice, water and wetlands
in Poyang Lake, China

Multi-temporal PALSAR ScanSAR
(RGB: DOY 241,149,103, 100-m)

Land cover map: paddy rice (red), water (black), wetland (blue)
Hansen – Humid tropical forest cover and change

Sumatra
ETM+ forest cover loss, 1999 to 2009
The test site catalog was created to provide a comprehensive list of prime candidate terrestrial targets for consideration as benchmark sites for the post-launch radiometric calibration of space-based optical sensors.

The online test site catalog provides easy public Web site access to this vital information for the global community.
Regional Remote Sensing Centers – Africa Partners

**AGRHYMET Regional Centre**
GeoCover (1970s, 1980s, 2000) + Landsat archive (EROS) + MODIS/ASTER/SRTM data

**SADC Regional RS Unit**
Landsat (1970s/90s, 2000); MODIS NDVI

**EROS Support to Regional Remote Sensing Centers**
- Collection/dissemination of RS data
- Landsat, SRTM, MODIS, ASTER
- Training in applications of RS data
Analysis of suitability of GeoCover images for 1990 for Southern Africa by GLCF

- Total Number: 308
  - Fully acceptable: 180
  - Restricted value due to cloud etc: 89
  - Unacceptable: 39

- Hence historical record is less satisfactory than at first appears
What is the GLCF?

A Non-Governmental Science Information Center
- Making quality Earth science data easily available to researchers

- Developing tools for data access and data sharing
- Innovating visualizations for spatial data
- Land cover research & production

A research facility sponsored by NASA & University of Maryland
- Joint activity between the University of Maryland Institute for Advanced Computer Studies (UMIACS) and Geography Department
- John Townshend = Director
- NASA MEaSUREs, REASoN, ESIP, ACCESS, EOS, ESDS programs
Data Collections Available

Data Collections

• Earth observation imagery and land cover products
• Landsat scenes
• MODIS composites
• ASTER
• IKONOS, QuickBird
• SRTM
• AVHRR – derived land cover products
• MODIS – derived land cover products
• Landsat – derived land cover products
• special collections

Data & Products

Imagery and products can be accessed from this list or using the Earth Science Data Interface. Users are also asked to consider GLCF data policies, especially providing appropriate citations when displaying imagery or products downloaded from this site.

Satellite Imagery

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<th>QuickBird</th>
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<td>Fine Resolution Imagery</td>
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<td>Fine Resolution Imagery</td>
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<td>Landsat ETM+</td>
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<td>Landsat MSS</td>
<td>1km Elevation Imagery</td>
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<td>Landsat TM</td>
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<th>MODIS</th>
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<td>32-day Composites</td>
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<td>16-day Composites</td>
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Products Derived from Satellite Imagery

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<td>Land Cover Classification</td>
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<td>Tree Cover Continuous Fields</td>
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<td>Burned Areas in Russia</td>
<td>Landsat Mosaics</td>
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<td>Landsat Subsets</td>
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<td>Coastal Marsh Health Index</td>
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<td>Radiative Fluxes</td>
<td>Vegetative Cover Conversion (VCC)</td>
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<td>Vegetation Continuous Fields (VCF)</td>
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<td>Vegetation Index (NDVI)</td>
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<td>Pyrogenic Emissions</td>
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<th>TUCN/UNEP Protected Areas Database</th>
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<td>Reference Layers</td>
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Simple, Effective Visualization Application

A primary application was developed at GLCF for accessing spatial data collections visually: the Earth Science Data Interface (ESDI).

Goal to provide easy access:
• registration not required
• minimal clicks to actual data
• improved previews
• reliable
• ESDI can be bypassed to FTP
• no fees = quick access
Global Land Monitoring Service Section

http://www.gmes.info/pages-principales/services/land-monitoring/

Land Monitoring

Benefiting from Earth Observation satellite data, the GMES land monitoring service provides accurate and cross-border harmonised geo-information at global to local scales.

The service provides geographical information on land cover including its seasonal and annual changes and monitors variables such as the vegetation state or the water cycle.

It has a wide range of applications for use in land use / land cover change, soil sealing, water quality and availability, spatial planning, forest monitoring and global food security.
http://gcmd.nasa.gov/

Find Data Sets by Topic:

- **Agriculture**
  forest science, soils ...

- **Atmosphere**
  precipitation, air quality ...

- **Biosphere**
  vegetation, zoology ...

- **Climate Indicators**
  air temperature, drought ...

- **Cryosphere**
  frozen ground, sea ice ...

- **Hydrosphere**
  rivers/streams, water quality ...

- **Land Surface**
  erosion, topography ...

- **Oceans**
  marine biology, salinity ...

- **Paleoclimate**
  ice cores, land records ...

- **Solid Earth**
  geochemistry, seismology ...

- **Spectral / Engineering**
  radar, visible imagery ...

- **Sun-Earth Interactions**
  auroras, solar activity ...

- **Data Centers**
  - **Locations**
    - **Instruments**
      - **Projects**
        - **Platforms/Sources**
Four primary data management roles, supporting:

1. **Field Campaigns**
   - 6-9 year intensive study of a region:
     - Amazon (LBA)
     - Canada (BOREAS)
     - Southern Africa (SAFARI 2000)

2. **Validation of Remote Sensing Products**

3. **Regional and Global Studies**
   - Climate
   - Soils
   - Vegetation
   - Hydroclimatology

4. **Model Code**
   - Benchmark Models
     - IBIS, BIOME-BGC, LSM
   - Manuscript Models
     - PNeT, Century, Biome-BGC

http://webmap.ornl.gov/wcsdown/index.jsp
Mission: Support the needs of NASA’s Earth Science Enterprise (ESE) and Earth Observing System (EOS) Program by assembling, archiving, and distributing terrestrial biogeochemistry and ecosystem dynamics data.

Sponsor: NASA
- Martha Maiden - EOSDIS
- Diane Wickland - Earth System Science – Carbon Cycle and Ecosystems

Is not responsible for satellite downloading. Does get satellite data from other NASA data centers… and then puts it in a format accessible to ecological field researchers.
New Data Sets in the pipeline

SEA-2
Insular South-East Asia
(Kalimantan, Java, Sumatra, Sulawesi)
Mosaicking & SAR processing: JAXA
Target: April 2004

AU-1
Australia
Single season
Mosaicking & SAR processing by JAXA
Target: JFY 2004

SEA-3
Insular South-East Asia
(Philippines, New Guinea)
Single season
Mosaicking & SAR processing by JAXA
Target: June 2004

AFR-2
Southern Africa
Single season
Mosaicking by JPL
SAR processing by JAXA
Target: JFY 2004

India
Single season
Mosaicking & SAR processing by JAXA
Target: JFY 2004

AM-4
Southern South America
Single season
Mosaicking by JPL
SAR processing by JAXA
Target: JFY 2004

China
Single season
Mosaicking & SAR processing by JAXA
Target: JFY 2004
This dataset of Thailand covers 5.4 million square kilometers. Eight scenes of data were unavailable from this system.

The original projection data is UTM with datum WGS84.

The data amount of the mosaic image from 105 Landsat scenes (composed of 4 bands) is around 40 GB.
Landsat image server example
The Landsat Image Mosaic of Antarctica Web Portal

- Joint Effort
- Landsat Mosaic Product Production
  - Scene Selection
  - Data Preparation
  - Mosaicking Process
- Antarctic Web Portal
  - Accessing the Landsat Mosaics
  - Interactive Map Viewer
  - Collaborative Content
  - Data Hosting/Metadata
- USGS EROS Infrastructure and Services
Joint Effort

- U. S. Geological Survey (USGS)
- British Antarctic Survey (BAS)
- National Science Foundation (NSF)
Landsat Mosaic Product: Scene Selection

- 1,028 Landsat-7 Enhanced Thematic Mapper Plus (ETM+) Scenes
- Most Prior to May 31, 2003 before mode was changed to “SLC-off”
Web Portal: Accessing Landsat Mosaics

- Seamless Viewing and access for all three mosaics
- Tiled access for original scenes
- Direct Online access using Open GIS Consortium standards and Environmental Research Systems Institute (ESRI) map services
Web Portal: Interactive Map Viewer

- Same Code base as the Seamless Server (Seamless Data Distribution System)
- WMS-based Map Viewer
- Query and Download functionality
Thank you for your attention!