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MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

CONAE

Monitoreo de los procesos de desertificación con el uso de imágenes de radar

Héctor F. del Valle

CONICET CENPAT CONICET

delvalle@cenpat.edu.ar
hfdelvalle@gmail.com

Rosario, Argentina, 19 al 23 de Abril de 2010

INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE RESEARCH
IAI

GEO GROUP ON EARTH OBSERVATIONS

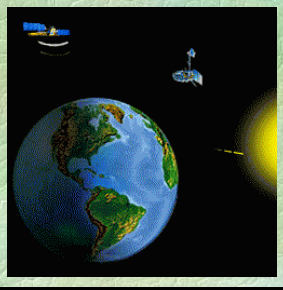
CEOS Working Group on Training and Education (WGEdu)

Geotecnologias em Desastres Naturais e Eventos Extremos
INPE - CRS

UNIVERSIDAD NACIONAL DE ROSARIO

OBJETIVOS

1. Proporcionar conocimientos básicos de los instrumentos de teledetección en radar orientados a los estudios de ecosistemas secos (degradación de la tierra).
2. Aprender las diferencias, ventajas y sinergias que presentan frente a los instrumentos ópticos de teledetección.
3. Conocer los sensores y plataformas espaciales empleados.



RAR (REAL APERTURE RADAR)

Apertura real implica que la resolución en la dirección del alcance se establece como el producto del ancho del haz y el alcance del radar. El ancho del haz es inversamente proporcional al tamaño de la apertura.

OBJETO DE ESTUDIO

SAR (SYNTHETIC APERTURE RADAR)

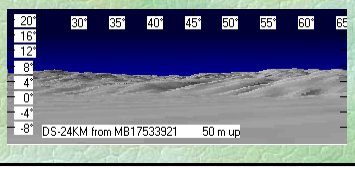
Es llamado así porque la resolución en la dirección del azimut se obtiene por medio de operaciones de un conjunto de señales (coherentemente registradas), de tal manera que el procesador es capaz de funcionar como una gran apertura de la antena en la memoria de la computadora. Por lo tanto, es posible mejorar la resolución hasta obtener una resolución en la dirección del azimut del orden del tamaño de la apertura.

GUÍA DIDÁCTICA

En resumen, ¿de qué se trata?

Se tratará de entender los **principios básicos de los sistemas radar.** Estudiaremos qué **tipos de radares existen**, así como las **características** que deben tener en función de la **aplicación**. Analizaremos las **señales** que se emplean, las técnicas de **captación y detección** de las mismas, así como los métodos de **procesado de señal** más comunes en este tipo de sistemas.

Además se podrá evaluar con más detalle el funcionamiento de algunos **radares de características especiales.**



DOMINIO DE LAFRECUENCIA- frequency domain

Para cada distribución **f** en el tiempo, existe una representación equivalente **F**, cuya variable independiente es la frecuencia.

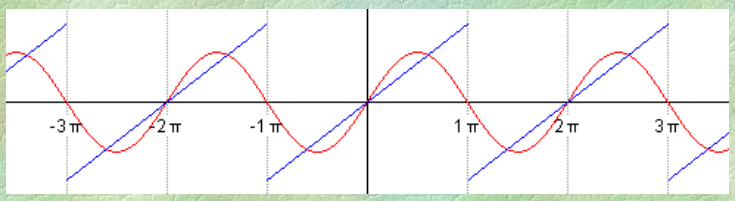
La representación en el dominio de la frecuencia es la transformada de Fourier de la distribución original. **F** y **f** son equivalentes en el sentido de que contienen la misma información, pero expresada de manera alternativa.

Este concepto se generaliza frecuentemente a distribuciones en el dominio del espacio, para las cuales la **transformada de Fourier** representa la información en el dominio de la frecuencia espacial, que tiene unidades de ciclos por unidad de longitud.

El dominio de la frecuencia asociada a la dirección del azimut también es conocido como el dominio Doppler.

TRANSFORMADA DE FOURIER - fourier transform

Operación matemática utilizada para derivar la descripción de una distribución en el dominio de la frecuencia. Una implementación digital eficiente es la "Transformada Rápida de Fourier" o FFT.



Animated plot of the first five successive partial Fourier series

RADARES EN SATELITES DE OBSERVACION DE LA TIERRA: SU RELACION CON PROPIEDADES BIOFISICAS DE LOS ECOSISTEMAS

H. Karszenbaum [1], P. Kandus [2]

1 Instituto de Astronomía y Física del Espacio (IAFE)
2 Dep. de Biología, Facultad de Ciencias Exactas y Naturales, UBA

El desarrollo de la teledetección con datos SAR como lo es la obtención de información de propiedades biofísicas, incluye cuatro actividades interrelacionadas:

1. Desarrollo de software específico para la calibración de las imágenes.
2. Preprocesamiento de las imágenes.
3. Desarrollo de modelos teóricos y empíricos o alguna combinación de ambos que puedan determinar la respuesta del radar después de que la señal ha interactuado con un objeto (problema directo).
4. Solución del problema inverso cuyo objetivo es desarrollar algoritmos y/o procedimientos a fin de obtener propiedades biofísicas de un determinado elemento del terreno a partir de las observaciones del radar.

Objetivos cronológicos a tener en cuenta para el aprendizaje adecuado de la Teledetección con radar

B. Leblon (2008)

1. Identificar los factores que influencian la energía retrodispersada (radar backscatter) en el caso de imágenes de **polarización simple**.
2. Entender los principales conceptos: **onda de polarización** (wave polarization), **polarimetría** (polarimetry), **polarización elíptica y fase** (polarization ellipse and phase), **vector Jones y Stokes** (Jones and Stokes vector), **esfera de Poincaré** (Poincaré sphere), **cociente de polarización** (polarization ratio) y **grado de polarización** (degree of polarization).
3. Identificar los factores que influencian la energía retrodispersada (radar backscatter) en el caso de imágenes de **múltiple polarización**.
4. Interpretar los mecanismos de dispersión para las imágenes polarimétricas usando una representación de la matriz en función de los blancos (targets, objetos) y de los sistemas de coordenadas.

Objetivos cronológicos a tener en cuenta para el aprendizaje adecuado de la Teledetección con radar

B. Leblon (2008)

5. Entender principalmente las variables de la polarización como: la **síntesis** (polarization synthesis), la **firma** (polarization signature) y la **altura en pedestal** (pedestal height).
6. Identificar las variables **dependientes** (polarization-dependent) e **independientes** (polarization-independent) de la polarización.
7. Identificar las distintas técnicas de descomposición de **blancos coherentes** (coherent targets).
8. Identificar las distintas técnicas de descomposición de **blancos incoherentes** (incoherent targets).
9. Clasificar.

Websites de Microwave Remote Sensing

http://sar.ece.ubc.ca/sites/RRSwww.html

Radar Remote Sensing Sites

Canada: (updated April 28, 2004)

- CCRS Glossary
- CCRS Tutorial on Radar Polarimetry
- GlobeSAR Projects
- Canada Centre for Remote Sensing
- CCRS: C & X-Band Airborne SAR
- CCRS: RADARSAT Pages
- CSA: RADARSAT-1 Home Page
- Canadian Ice Service
- MDA's RADARSAT-2 page
- MDA - RADARSAT-2 Photos of satellite
- RADARSAT International
- Intermap Technologies

Europe:

- ENVISAT satellite news
- DLR Space News
- DLR German Remote Sensing Data Center
- DLR Remote Sensing Technology Institute
- DLR Satellite Data Information Service (ISIS)
- DLR Microwaves and Radar Institute
- DLR E-SAR Experimental Airborne Radar System
- ESTEC Data Compression Working Group
- The ESA AO Web Site
- ESA: Earthnet Online
- Astrium Earth Observation Systems
- Danish Center for Remote Sensing
- Chalmers University Radar Remote Sensing Group
- Gamma Remote Sensing

Websites de Microwave Remote Sensing
http://sar.ece.ubc.ca/sites/RRSwww.html

USA Radar Sites:

- JPL Imaging Radar
- JPL AIRSAR
- SIR-C / X-SAR Images
- The Alaska SAR Facility
- Magellan Mission to Venus
- APL Ocean Remote Sensing
- University of Michigan Radiation Lab
- University of Kansas Radar Remote Sensing Lab
- Sandia National Laboratories
- Zebker's web page.
- Uni Texas Remote Sensing

Other locations:

- NASDA National Space Development Agency of Japan
- RRSG of the University of Cape Town

SAR Interferometry Sites:

- JPL's Shuttle Radar Topography Mission
- DLR's SRTM Home Page
- ERS Interferometry
- ERS InSAR Tandem Baseline Listings
- ESRIN's catalogue of Quicklook InSAR Images.
- Dutch Interferometry Group
- Vexcel's InSAR Processor.
- IFSARE Images

Documents and References:

- Science Results from SIR-C/X-SAR
- Differential Interferometry Workshop
- JPL SAR References
- Radar Images of the Moon

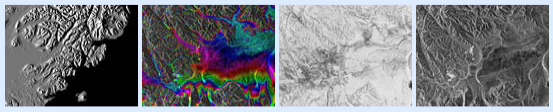
Go to:

- General Remote Sensing Sites
- Sites of General Interest
- RRSG Homepage

isprs
information from imagery

ISPRS Commission VII - Thematic Processing, Modeling and Analysis of Remotely Sensed Data

Working Group VII/2 SAR Interferometry, 2008 - 2012



March 5, 2010

WG VII/1 - FUNDAMENTAL PHYSICS AND MODELLING
WG VII/2 - INFORMATION EXTRACTION FROM SAR DATA ← http://www.commission7.isprs.org/wg2
WG VII/3 - INFORMATION EXTRACTION FROM HYPERSPECTRAL DATA
WG VII/4 - ADVANCED CLASSIFICATION TECHNIQUES
WG VII/5 - PROCESSING OF MULTI TEMPORAL DATA AND CHANGE DETECTION
WG VII/6 - REMOTE SENSING DATA FUSION ←
WG VII/7 - INNOVATIVE PROBLEM SOLVING METHODOLOGIES FOR LESS DEVELOPED COUNTRIES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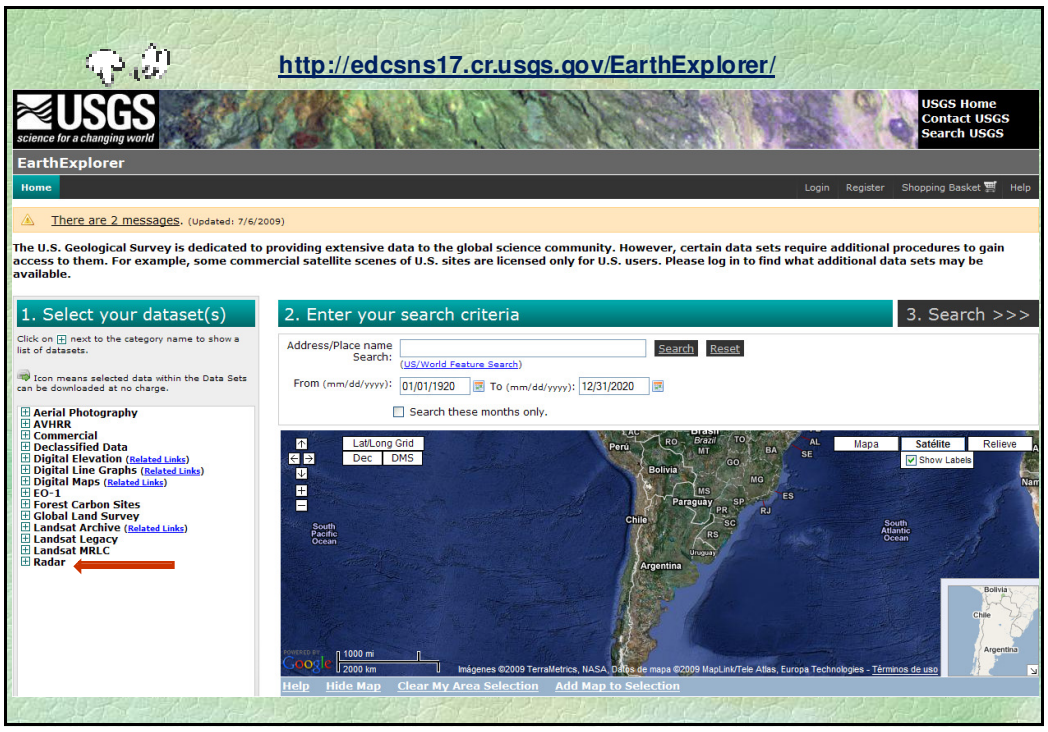
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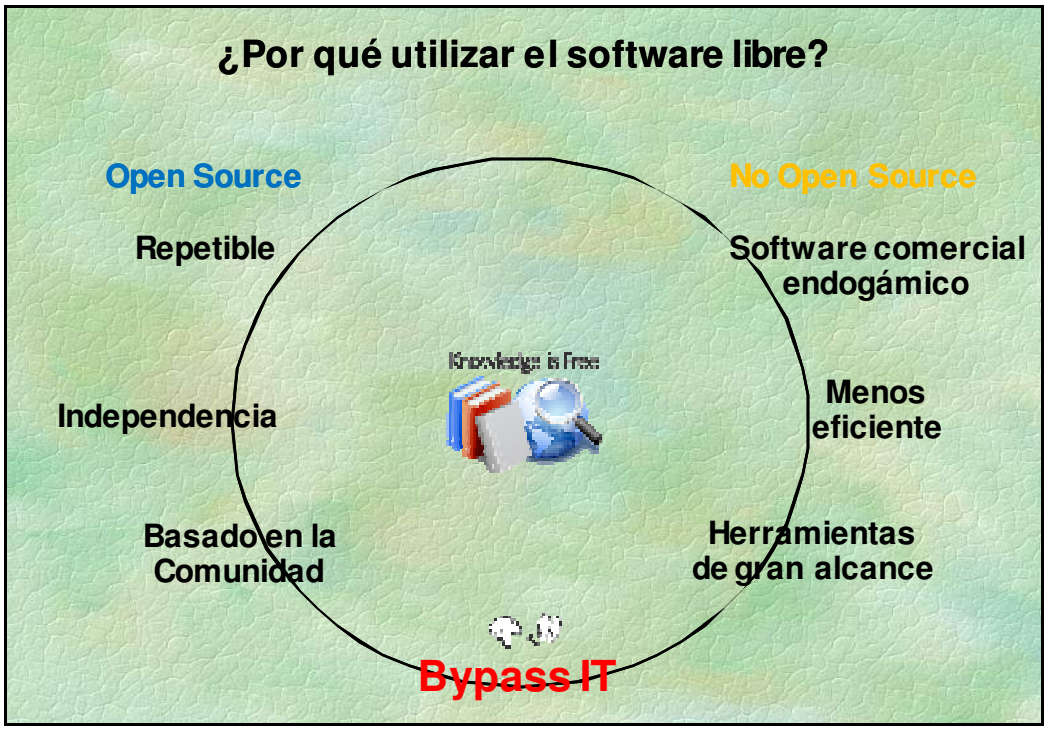
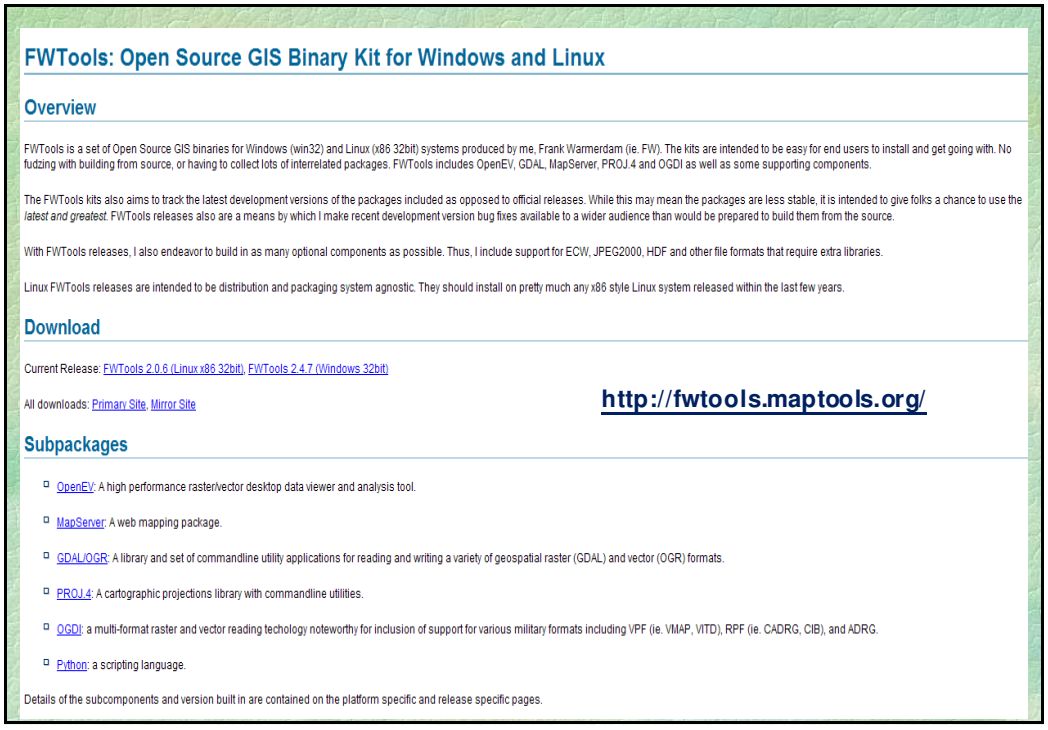
Lat/Long Grid
Dec DMS
Mapa
Satélite
Relieve
Show Labels
Help Hide Map Clear My Area Selection Add Map to Selection





FWTools: Open Source GIS Binary Kit for Windows and Linux

Overview

FWTools is a set of Open Source GIS binaries for Windows (win32) and Linux (x86 32bit) systems produced by me, Frank Warmerdam (ie. FW). The kits are intended to be easy for end users to install and get going with. No fudzing with building from source, or having to collect lots of interrelated packages. FWTools includes OpenEV, GDAL, MapServer, PROJ.4 and OGDI as well as some supporting components.

The FWTools kits also aims to track the latest development versions of the packages included as opposed to official releases. While this may mean the packages are less stable, it is intended to give folks a chance to use the *latest and greatest*. FWTools releases also are a means by which I make recent development version bug fixes available to a wider audience than would be prepared to build them from the source.

With FWTools releases, I also endeavor to build in as many optional components as possible. Thus, I include support for ECW, JPEG2000, HDF and other file formats that require extra libraries.

Linux FWTools releases are intended to be distribution and packaging system agnostic. They should install on pretty much any x86 style Linux system released within the last few years.

Download

Current Release: FWTools 2.0.6 (Linux x86 32bit), FWTools 2.4.7 (Windows 32bit)

All downloads: Primary Site, Mirror Site

http://fwtools.maptools.org/

Subpackages

- OpenEV: A high performance raster/vector desktop data viewer and analysis tool.
- MapServer: A web mapping package.
- GDAL/OGR: A library and set of commandline utility applications for reading and writing a variety of geospatial raster (GDAL) and vector (OGR) formats.
- PROJ.4: A cartographic projections library with commandline utilities.
- OGDI: a multi-format raster and vector reading techology noteworthy for inclusion of support for various military formats including VPF (ie. VMAP, VITD), RPF (ie. CADRG, CIB), and ADRG.
- Python: a scripting language.

Details of the subcomponents and version built in are contained on the platform specific and release specific pages.


http://www.asf.alaska.edu/sardatacenter
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SAR Data Center
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Installer for Windows XP, Vista and 7
Installer for Linux
Installer for Unix (requires a 1.6 JRE)
Installer for Mac OS 10.5+, 64-bit Intel
Installer for Solaris
BEAM API documentation
BEAM source code (for instructions how to build BEAM, click here)
http://www.brockmann-consult.de/cms/web/beam/software
CHRIS-Box 1.5 Add-on for BEAM 4.7 (08.03.2010)
Installer Windows 2000, XP and Vista
Installer for Mac OS 10.5+, 64-bit Intel
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GlobToolbox 1.0 (Reader Pack) Add-on for BEAM 4.7 (03.03.2010)
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http://www.brockmann-consult.de/cms/web/beam/software
GETASSE30 DEM
The GETASSE30 Digital Elevation Model is a composite DEM at 30 arc second resolution (in courtesy of Marc Bouvet of ESA/ESRIN). Download (.zip) 308 MB
Note that the format of this DEM is not compatible with the one required by the AMORGOS tool.
Envisat Reader API for C 2.1 (06.05.2009)
Envisat Reader API for C (epr_api) comprises ANSI-C source code and API documentation. The API can be used to open Envisat MERIS and AATSR N1-files and to use the data in your C-programs. Download (.zip) < 1 MB
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http://www.array.ca/nest/tiki-index.php
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The Next ESA SAR Toolbox (NEST) is a user friendly open source toolbox for reading, post-processing, analysing and visualising the large archive of data (from Level 1) from ESA SAR missions including ERS-1 & 2, ENVISAT and in the future Sentinel-1. In addition, NEST supports handling of products from third party missions including JERS-1, ALOS PALSAR, TerraSAR-X, Radarsat-1 & 2 and Cosmo-Skymed.
NEST helps the remote sensing community by supporting the handling of various SAR products and complimenting existing software packages. NEST has been built using the BEAM Earth Observation Toolbox and Development Platform and it covers the functionality of the older Basic Envisat SAR Toolbox (BEST). NEST is currently undergoing development with periodic new releases. The major new functionality in NEST over BEST is an integrated viewer and orthorectification and mosaicking of SAR images.
NEST is extensible with an API that allows users to easily create their own plugin Readers, Processors and Writers. Developer workshops and tutorials will be planned to actively encourage contributions by the SAR community. NEST is programmed in Java and is open source under the GNU General Public License (GNU GPL). If you are interested in contributing by developing a reader or writer for a product please contact us.
NEST is being developed by Array Systems Computing Inc. of Toronto Canada under ESA Contract number 20698/07/I-LG.
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NEST Software Downloads
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The Polarimetric SAR Data Processing and Educational Tool
European Space Agency
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Airborne Data Sources
Spaceborne Data Sources
Simulated Data Sources
Polarimetry Tutorial
Course Material
Documentation and Training Course
Release notes
Download and Install
Exploitation Results and News
Contacts and Acknowledgements
version 4.0 beta 1.3 (June 2009)
The Polarimetric SAR Data Processing and Educational Tool aims to facilitate the accessibility and exploitation of multi-polarised SAR datasets including those from ESA Third Party Missions (ALOS PALSAR), Envisat ASAR Alternating Polarisation mode products, RADARSAT-2 and TerraSAR-X.
A wide-ranging tutorial and comprehensive documentation provide a grounding in polarimetry and polarimetric interferometry necessary to stimulate research and development of scientific applications that utilise such techniques; the toolbox of processing functions offers users the capability to implement them.
PolSARpro is developed under contract to ESA by a consortium comprising IETR at the University of Rennes 1, The Microwaves and Radar Institute (HR) of DLR and AEL Consultants, together with Dr Mark Williams. The initiative is a direct result of recommendations made at the POLInSAR Workshops held at ESRIN in January 2003, 2005 and 2007.
All elements of the PolSARpro project are distributed by ESA free of charge, including the source code.
This website will provide details of the project, access to the tutorial material and software, information about sources of multi-polarised data and recently obtained results of POLInSAR studies. Navigate between pages using the menu on the left.
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GIMP Setup
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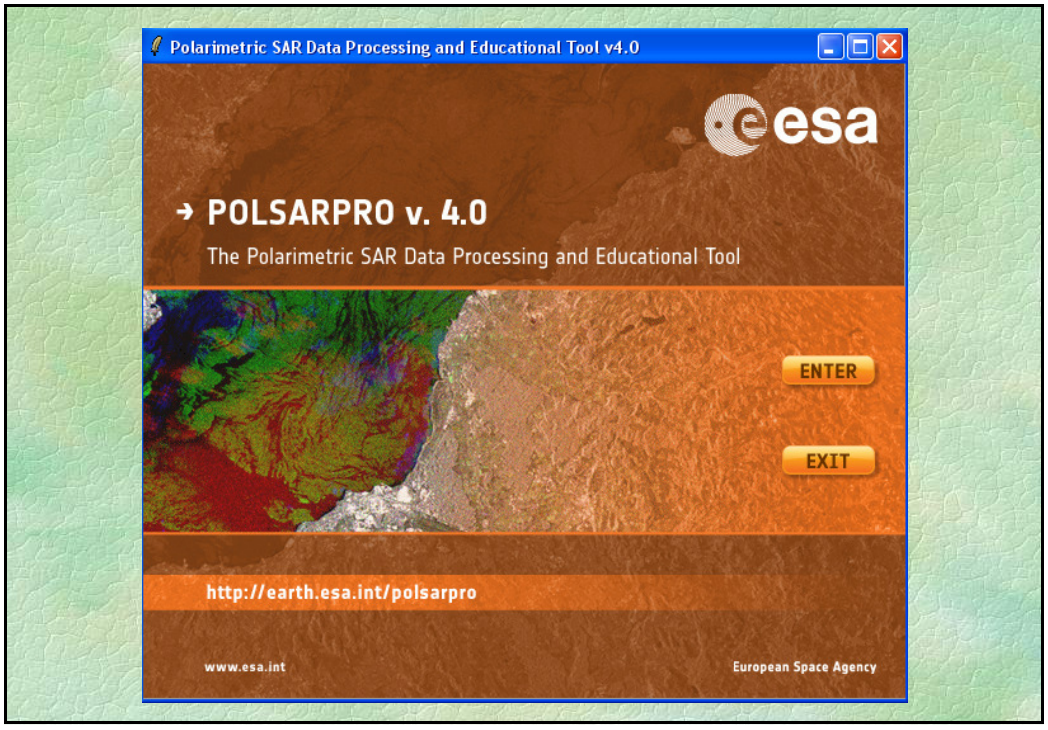
Polarimetric SAR Data Processing and Educational Tool v4.0
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POLSARPRO v. 4.0
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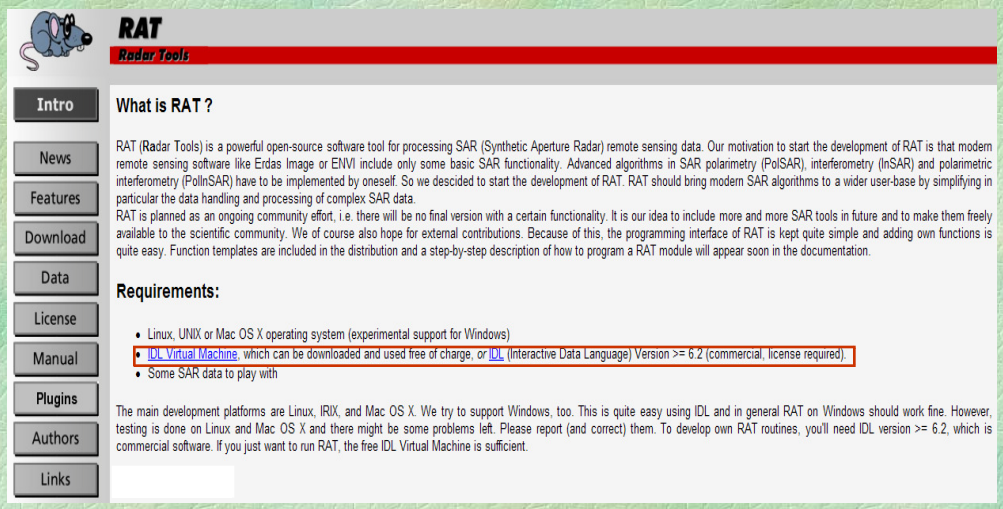
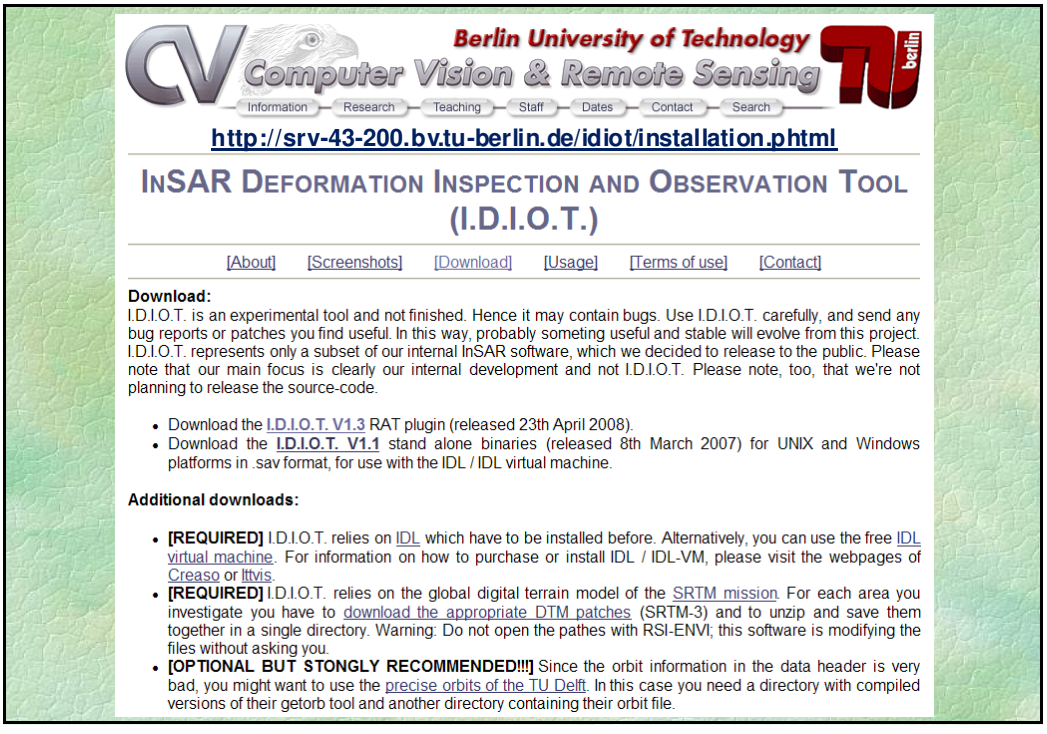
http://radartools.berlios.de/






http://enterprise.lr.tudelft.nl/doris/
Doris
TU Delft
Delft University of Technology
Home
Introduction
Status
Literature
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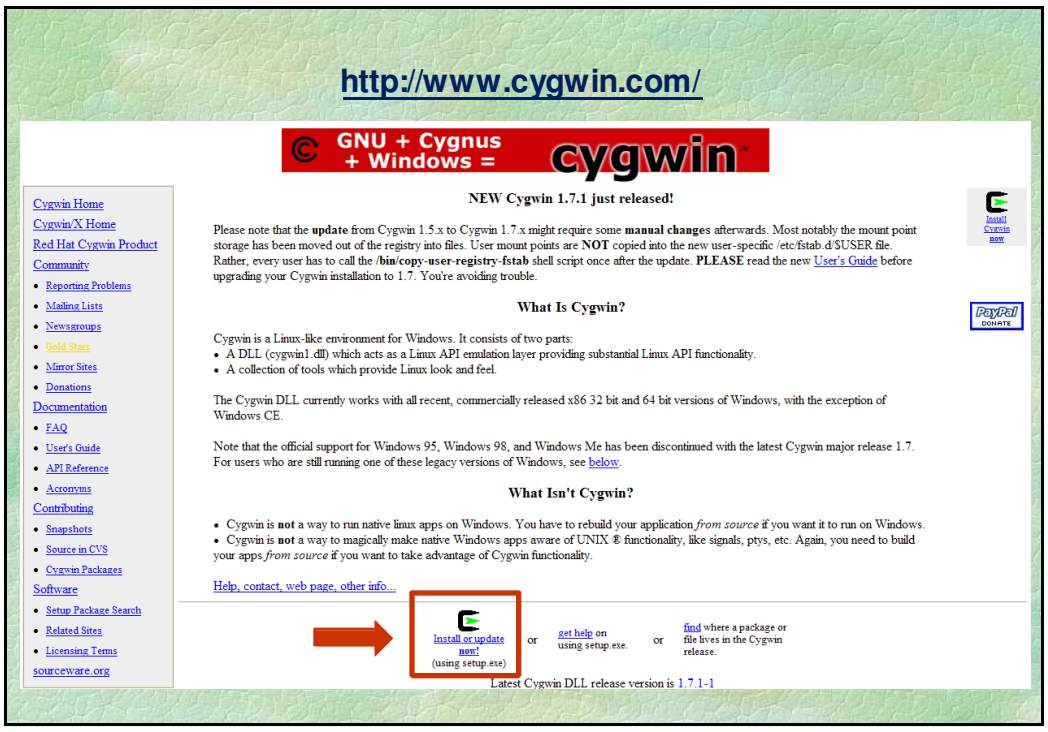
Brain Pool
Links
The Delft Institute of Earth Observation and Space Systems of Delft University of Technology has developed an Interferometric Synthetic Aperture Radar (InSAR) processor named Doris (Delft object-oriented radar interferometric software). The Doris software can be downloaded freely from this site for non-commercial applications (conditions).
Interferometric products and endproducts such as Digital Elevation Models and displacement maps can be generated with this software from Single Look Complex data. Data from the satellites ERS, ENVISAT (first ENVISAT interferogram, 54kB, DEM, 107kB, and perspective view, 177kB), JERS (first JERS interferogram), and RADARSAT (first RADARSAT interferogram) can be processed with the Doris software.
Introduction - 24 December 2008
Introduction to interferometric processing with the Doris software.
Status - 24 December 2008
What's the current status of these pages and the Doris software.
Literature - 24 December 2008
Online publications and InSAR references
FRINGE 2003 presentation,
BAM Earthquake processing overview,
Searchable InSAR literature (bibtex file with ~2100 entries),
Download - 15 June 2009
Access to the Doris software
User manual (pdf - v4.02 changelog)
Online user manual (html - v4.02)
Brain Pool - 17 February 2010
Experienced users help answer questions from new users and processing strategies are discussed. We encourage you to join this list when you are using the Doris software. Users of other software packages are also welcome to join this list, in order to have as broad a platform as possible.
Join the email list
FAQ for Doris (Yahoo! group, member of aforementioned list to automatically collect all emails in a searchable archive).
Links - 24 December 2008
Interesting links.


http://www.cygwin.com/
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Cygwin/X Home
Red Hat Cygwin Product
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NEW Cygwin 1.7.1 just released!
Please note that the update from Cygwin 1.5.x to Cygwin 1.7.x might require some manual changes afterwards. Most notably the mount point storage has been moved out of the registry into files. User mount points are NOT copied into the new user-specific /etc/fstab.d/$USER file. Rather, every user has to call the /bin/copy-user-registry-fstab shell script once after the update. PLEASE read the new User's Guide before upgrading your Cygwin installation to 1.7. You're avoiding trouble.
What Is Cygwin?
Cygwin is a Linux-like environment for Windows. It consists of two parts:
A DLL (cygwin1.dll) which acts as a Linux API emulation layer providing substantial Linux API functionality.
A collection of tools which provide Linux look and feel.
The Cygwin DLL currently works with all recent, commercially released x86 32 bit and 64 bit versions of Windows, with the exception of Windows CE.
Note that the official support for Windows 95, Windows 98, and Windows Me has been discontinued with the latest Cygwin major release 1.7. For users who are still running one of these legacy versions of Windows, see below.
What Isn't Cygwin?
Cygwin is not a way to run native linux apps on Windows. You have to rebuild your application from source if you want it to run on Windows.
Cygwin is not a way to magically make native Windows apps aware of UNIX® functionality, like signals, ptys, etc. Again, you need to build your apps from source if you want to take advantage of Cygwin functionality.
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