



Introduction to PolSARpro v6.0 Biomass Edition



Eric POTTIER – Wen HONG – Qiang YIN
19 / 11 / 2019

ESA–MOST China Dragon 4 Cooperation

2019 ADVANCED INTERNATIONAL TRAINING COURSE IN LAND REMOTE SENSING

中欧科技合作“龙计划”第四期 2019年陆地遥感高级培训班

18 to 23 November 2019 | Chongqing University, P.R. China



培训时间: 2019年11月18日-23日 主办方: 重庆大学



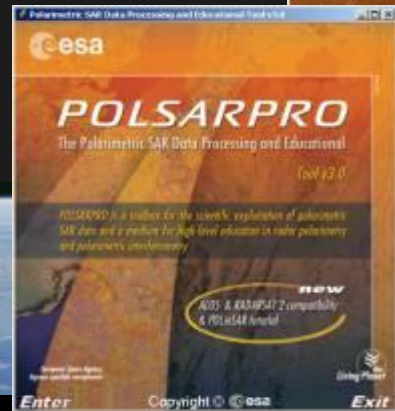
2003



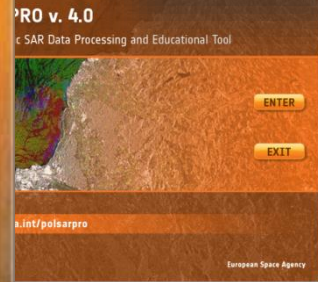
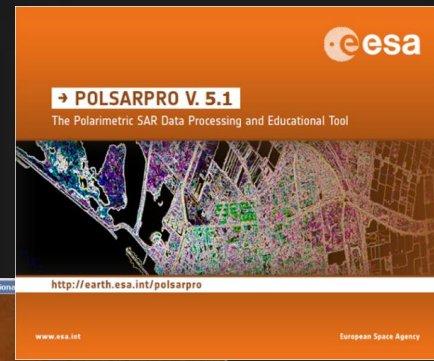
2004



2005



2009



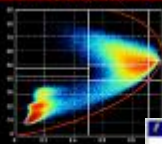
2009

2013 (5.0) to 2018 (5.2)



The initiative development of **PolSARpro Software** is a direct result of recommendations made during the **POLinSAR 2003 Workshop** held at ESA-ESRIN in January 2003.

DATA PROCESSOR



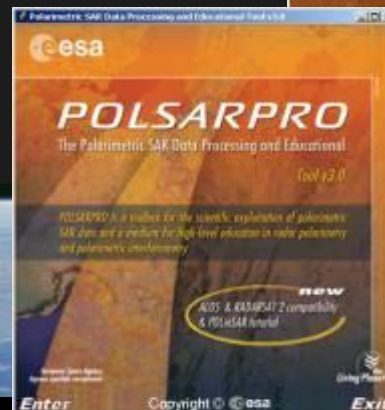
2003



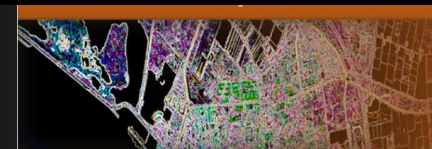
2004



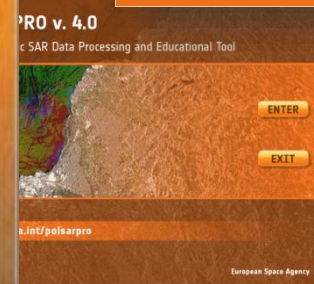
2005



2007



<http://earth.esa.int/polsarpro>



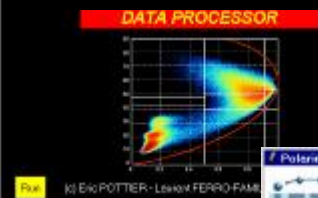
2009

2013 (5.0) to 2018 (5.2)



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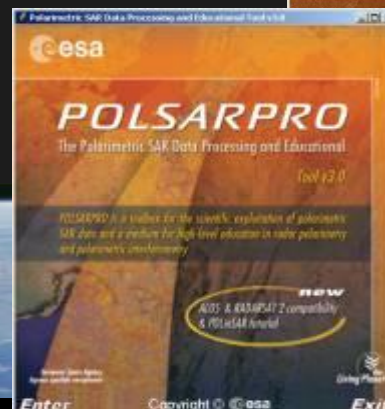
16 YEARS OF DEVELOPMENT



2003



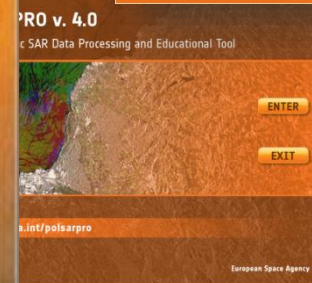
2004



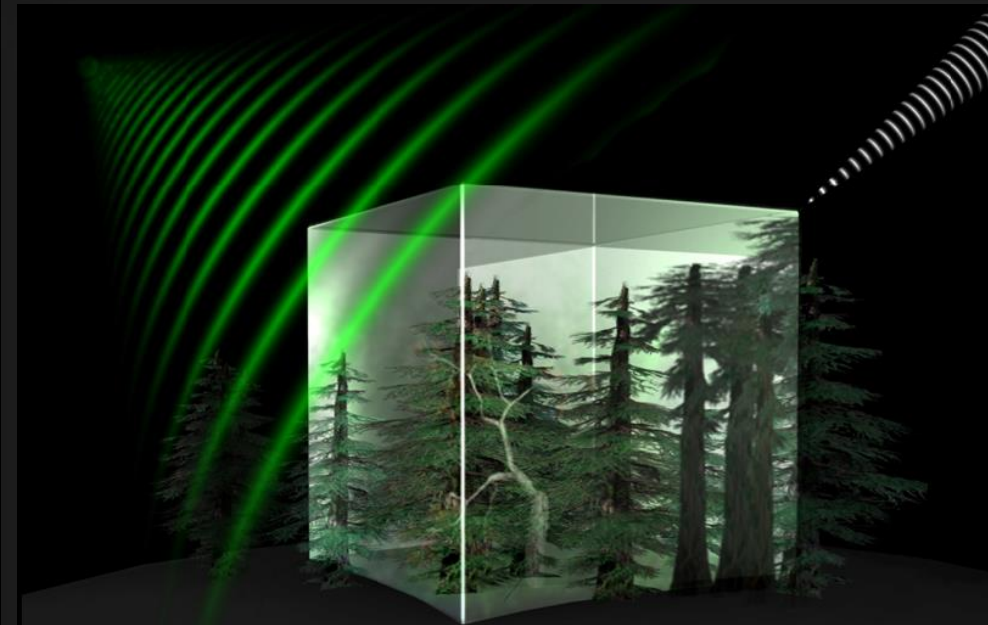
2009



2013 (5.0) to 2018 (5.2)



BIOMASS mission : 7th ESA Earth Explorer (2022)



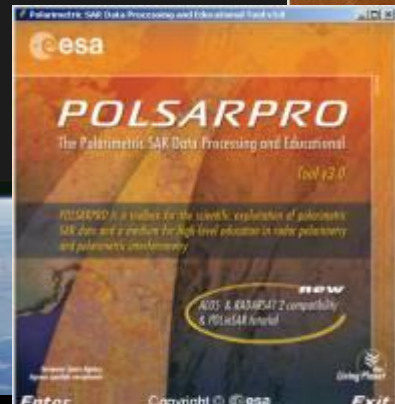
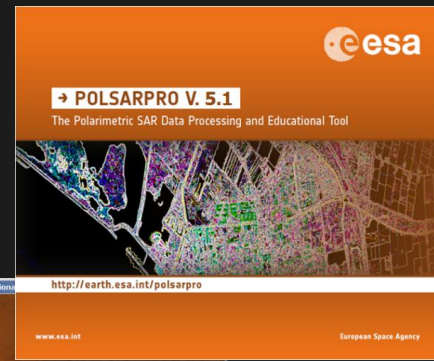
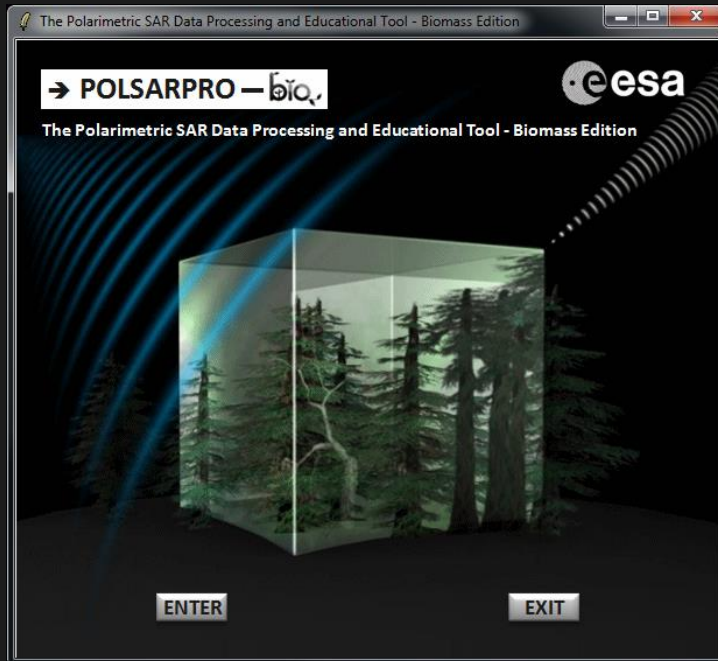
Biomass will provide **global maps** of the amount of **carbon stored** in the world's forests and how this **changes** over time.

Further our **knowledge** of the role **forests** play in the **carbon cycle**.

P-Band Pol-TomoSAR spaceborne mission

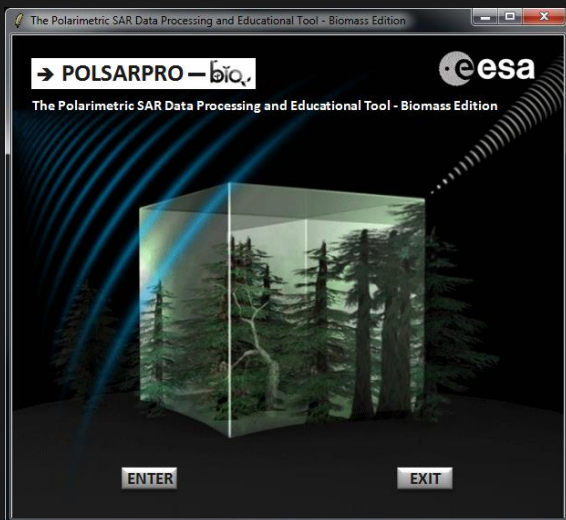
PolSARpro : A General Introduction

© E. Pottier – PolSARpro v6 (Biomass Edition)



2013 (5.0) to 2018 (5.2)

2009




Toolbox specifically designed to handle : **Pol-SAR, Pol-InSAR, Pol-TimeSAR** and now **Pol-TomoSAR** data.

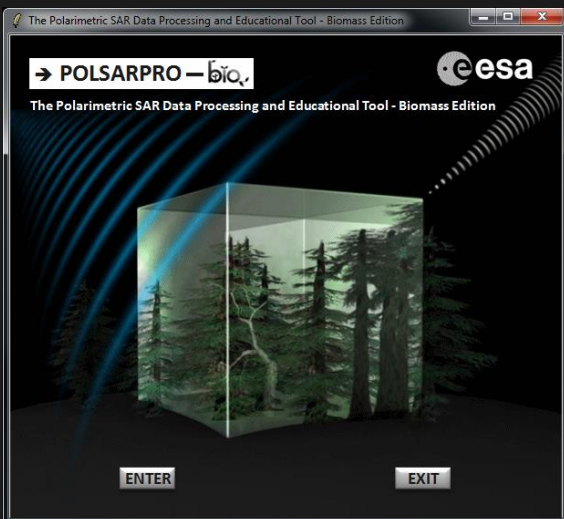
Educational Software offering a tool for **self-education** in the field of **Polarimetric SAR** data processing and analysis.

Developed to be **accessible** to : a wide range of users from **novices** to **experts** in the field of **Pol-SAR, Pol-InSAR, Pol-TomoSAR, Pol-TimeSAR**....

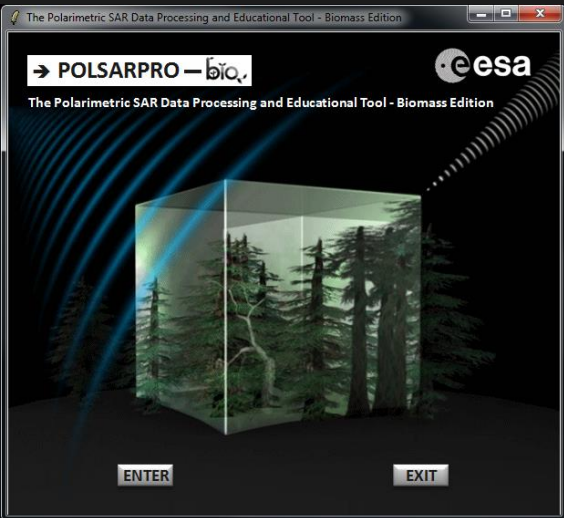
Around **1800** different Pol-SAR, Pol-InSAR, Pol-TimeSAR and now Pol-TomoSAR **functionalities**.



Each element of the Software (*a function*) can be **extracted** and **incorporated** individually into **users'** own processing software.



PolSARpro v6.0 (Biomass Edition) Software is made available following the: **Open Source Software Development (OSSD)** approach, and follows the: **GNU General Public License v2 – June 1991**.



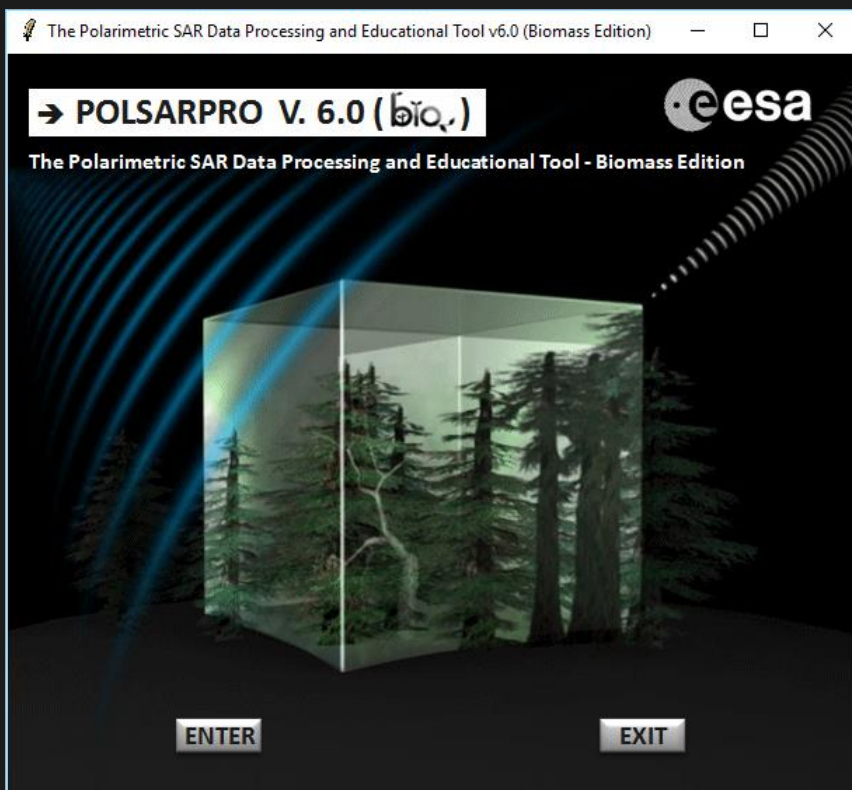
since **2003**

- **+3000** registered users
- **+70** foreign countries

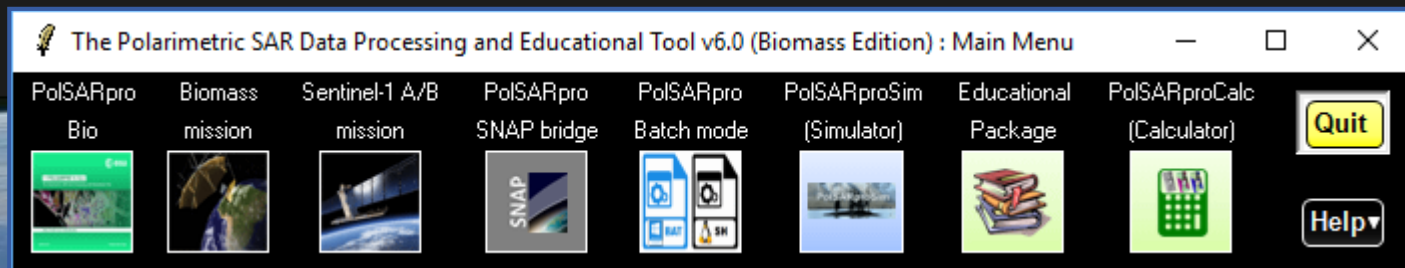
International Collaborative Project

(4 Agencies, 19 Research Centres, 21 Universities)

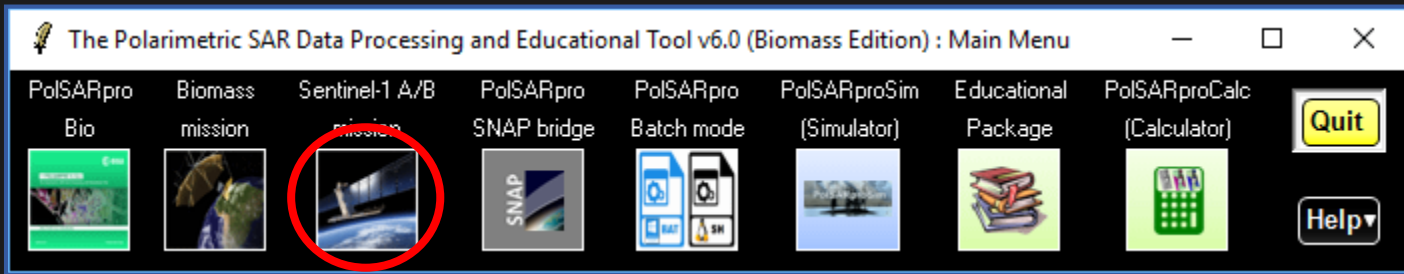




ENTRY SCREEN

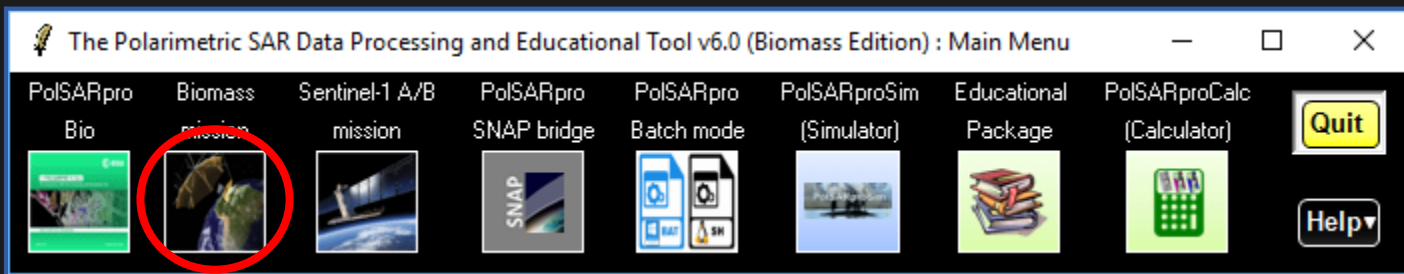


MAIN WINDOW

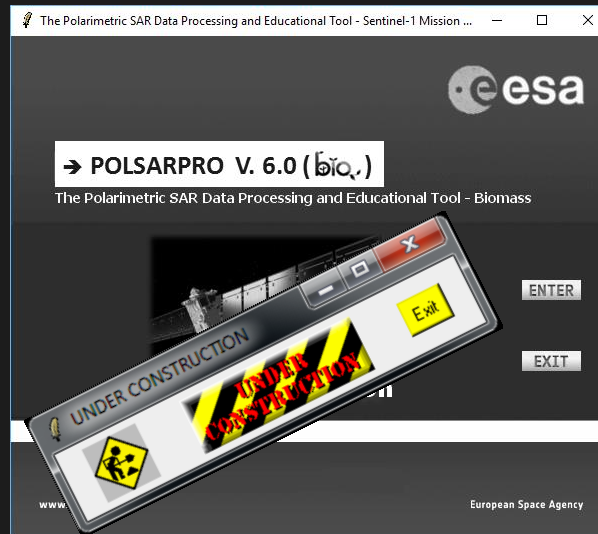
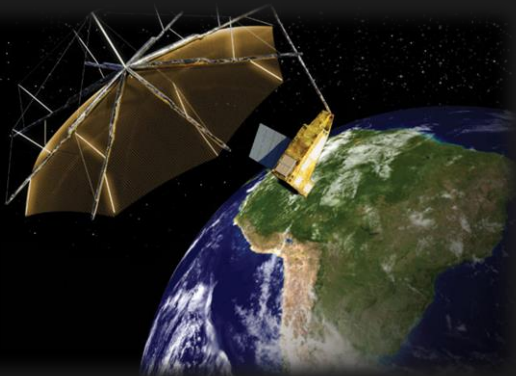


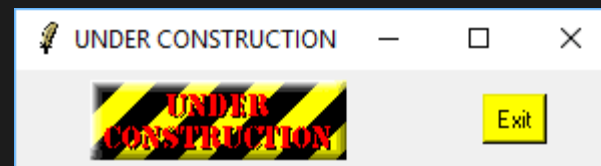
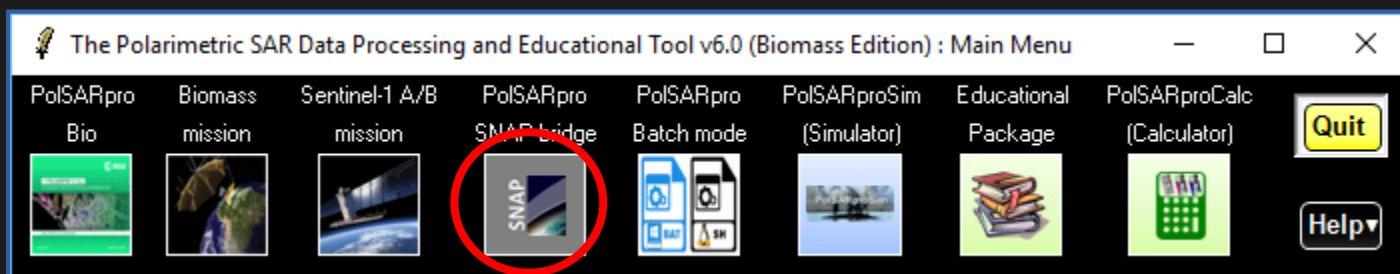
SENTINEL 1A / 1B



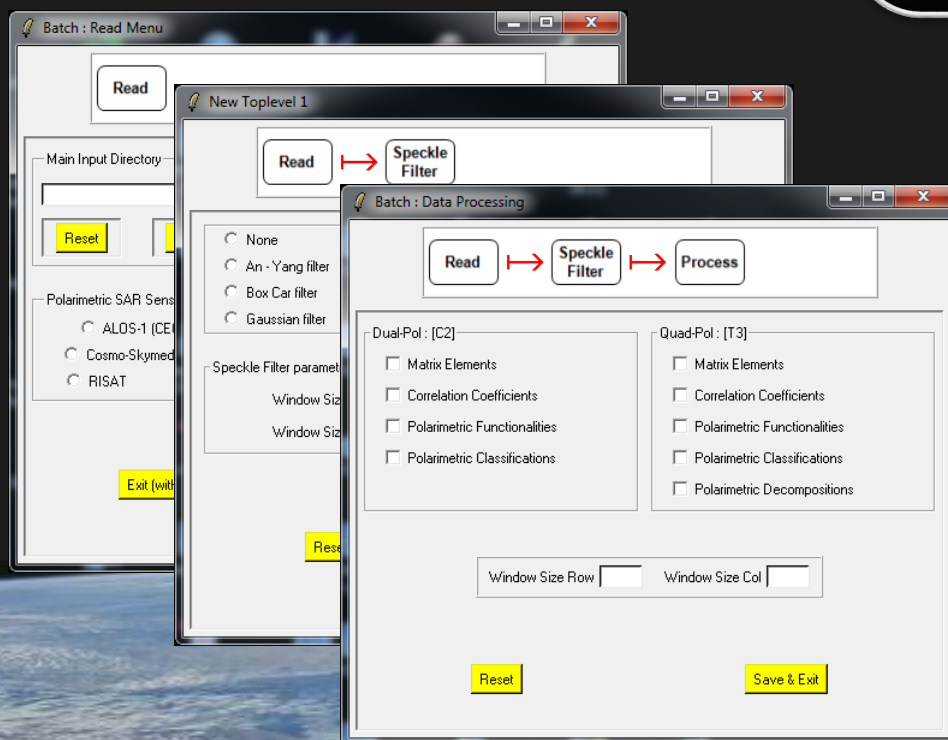
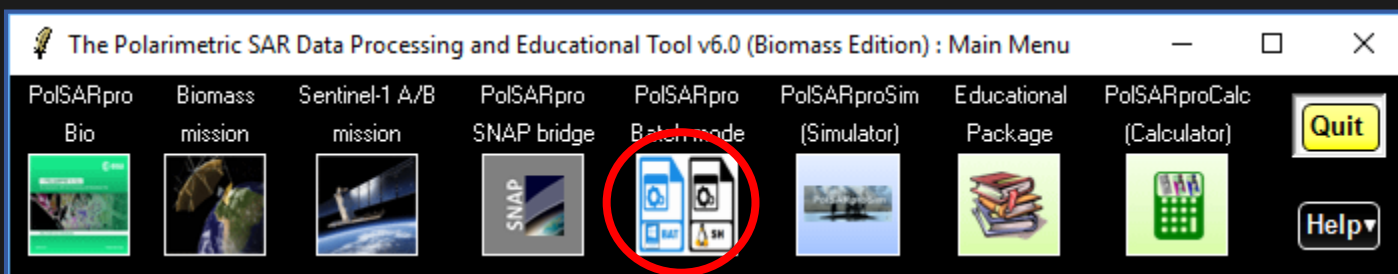


BIOMASS



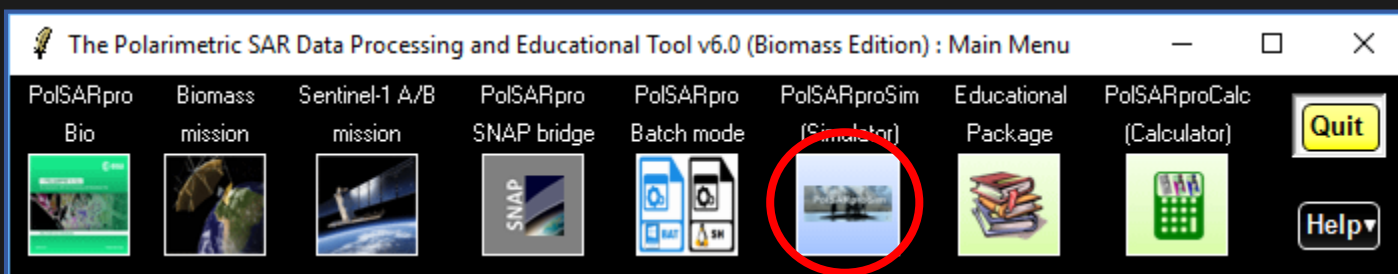


- **S1 toolbox**
(split, deburst, merge ...)
- **Geocoding toolbox**
- **Terrain correction**
- **Interferometric toolbox**
(co-registration, flat Earth estimation ...)



PosARpro Batch Mode

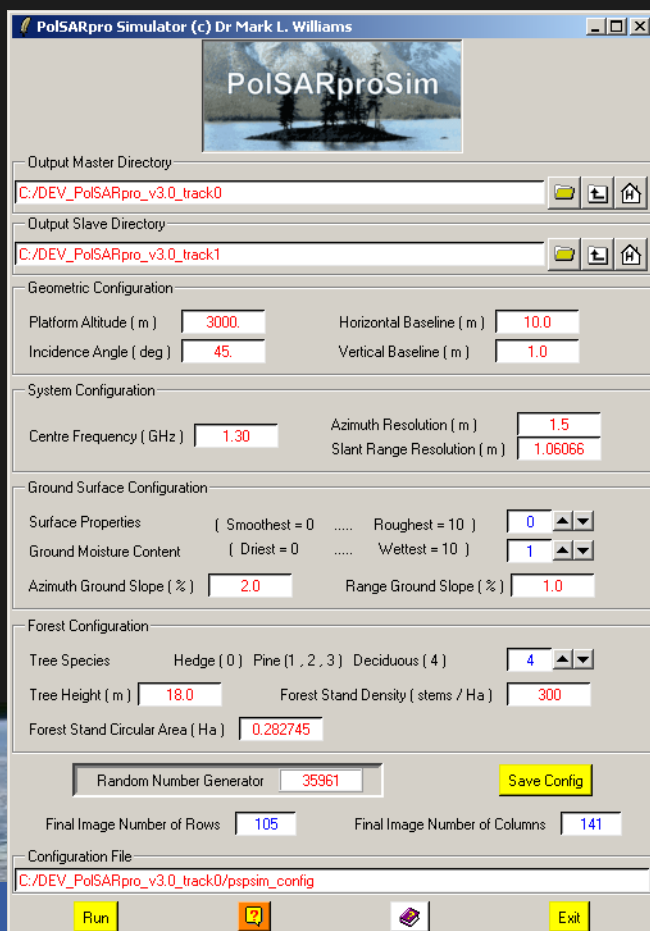
Create a bat (windows) or a sh (linux) file to run different polarimetric data processes in a batch processing mode.

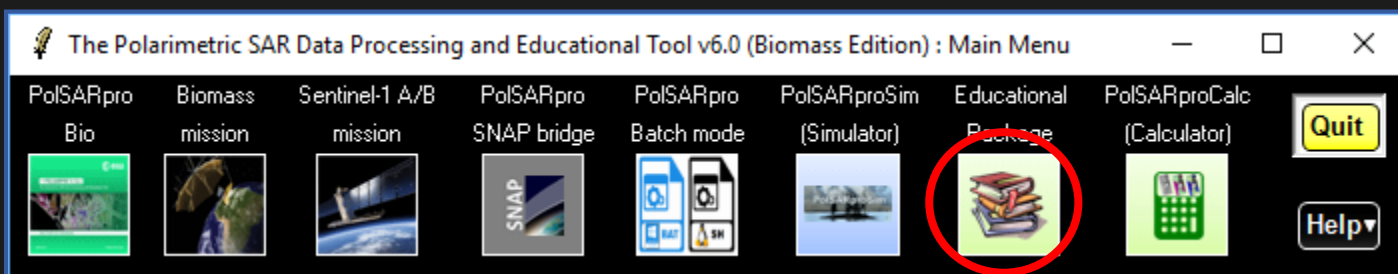


PoSARpro - Sim

This educational tool creates and provides simulated test data of sufficient fidelity to be used to illustrate the concepts of Pol-InSAR when applied on ground surface, ground surface covered with low vegetation or forest stands.

This simulator is developed by Mark Williams ©



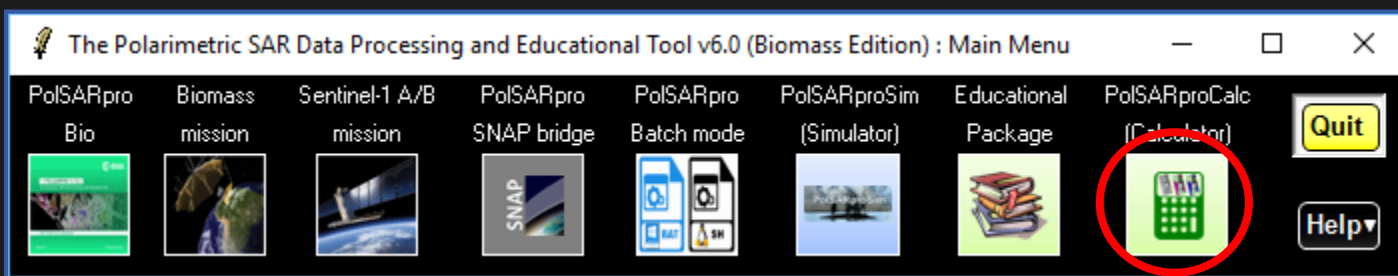


PoSARpro – Biomass Edition web site

- *On-line tutorials*
- *On-line self training packages*
- *Video / Quizz*
- *Blog / Forum*

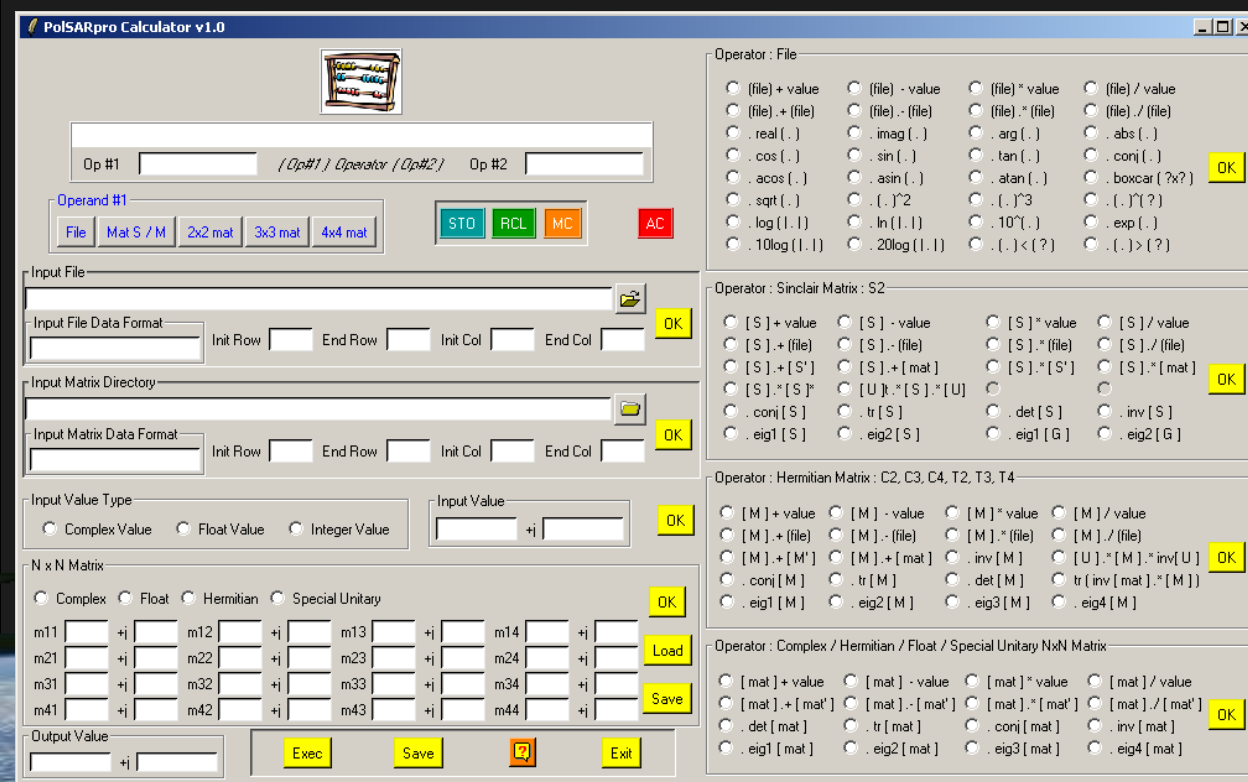
New lecture course
New topics
Re-design of the *Do It Yourself*

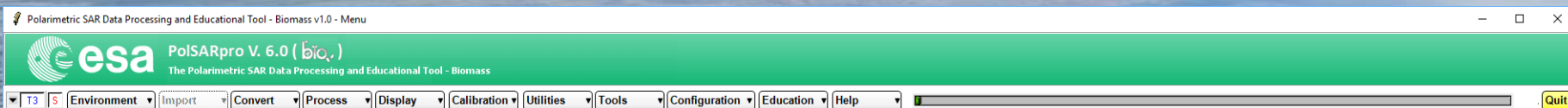
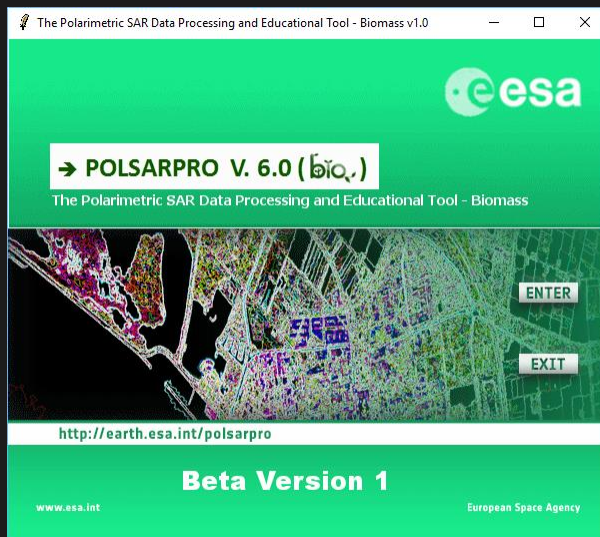
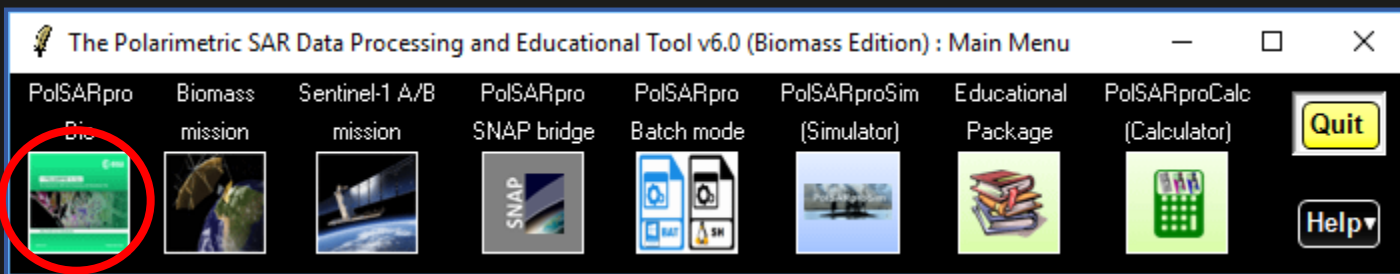




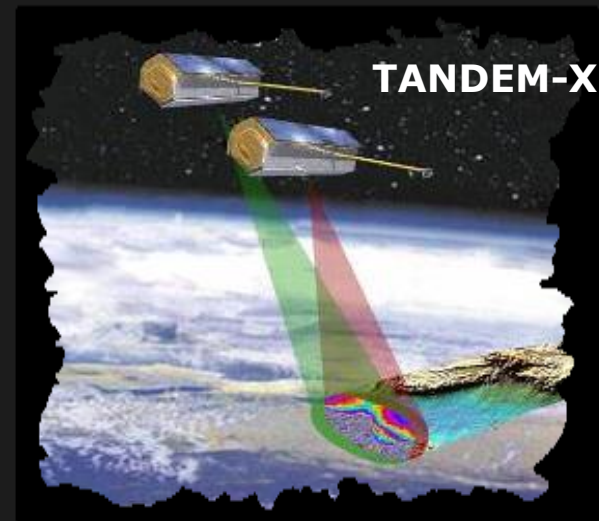
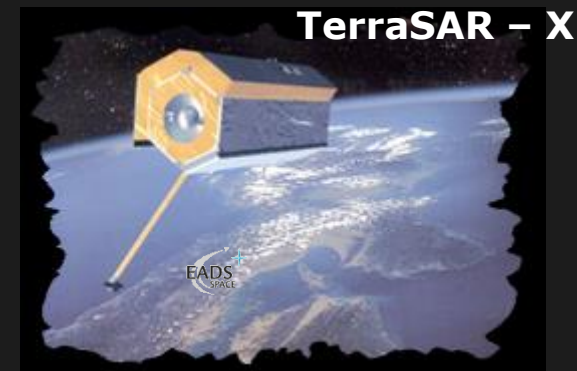
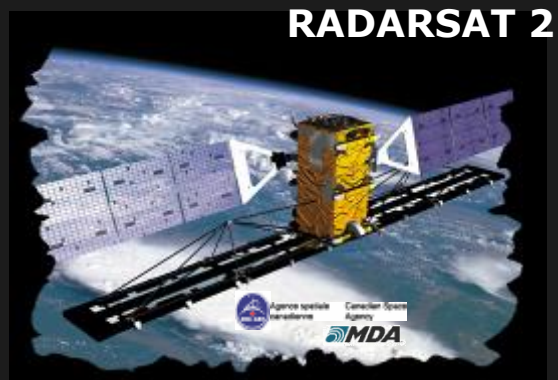
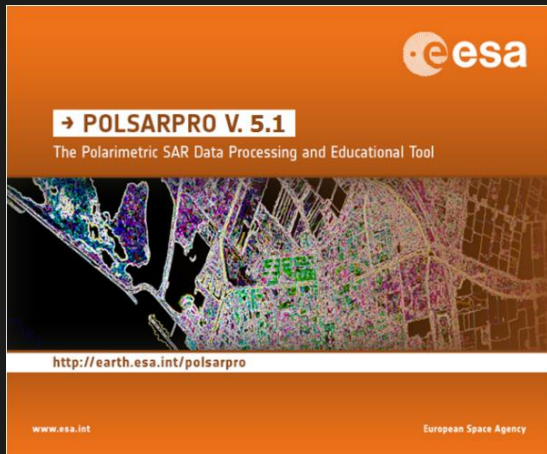
PoSARpro - Calc

This tool proposes a **Polarimetric Pocket Calculator** offering basic processing functionalities which are applied on a set of SAR Polarimetric datasets.





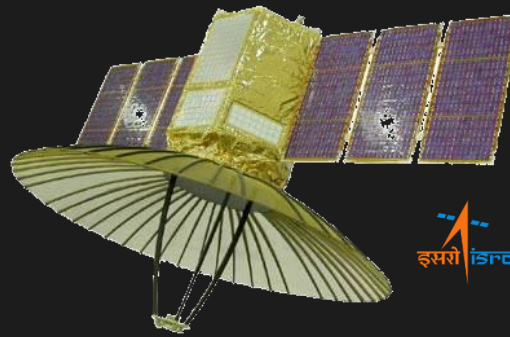
**PoISARpro v6.0
(Biomass Edition)
SOFTWARE**



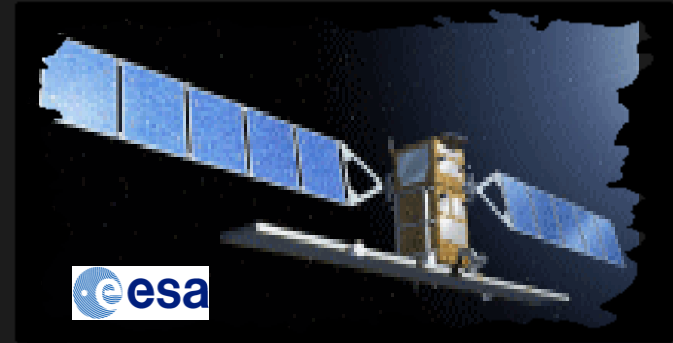
CURRENT

PoISARpro v5.2 Software offers the possibility to handle and convert polarimetric data from a range of well established **CURRENT** polarimetric spaceborne platforms.

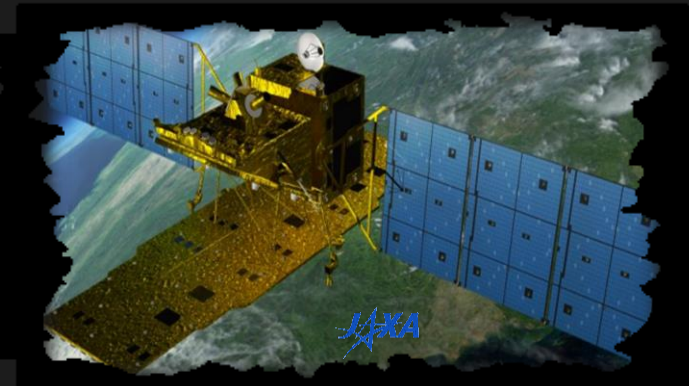
RISAT



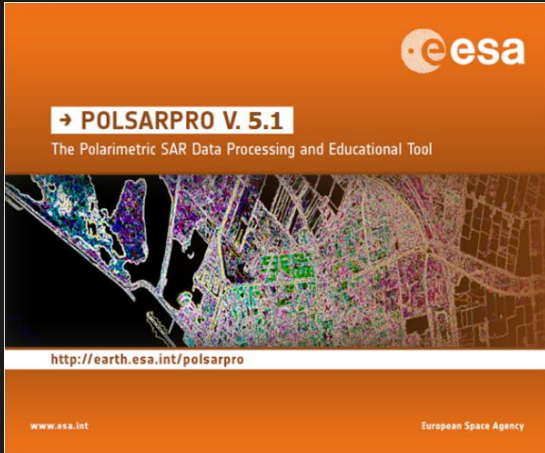
SENTINEL 1A / 1B



ALOS-2 – PALSAR-2



GaoFen 3 (GF3)



→ POLSARPRO V. 5.1

The Polarimetric SAR Data Processing and Educational Tool

<http://earth.esa.int/polsarpro>

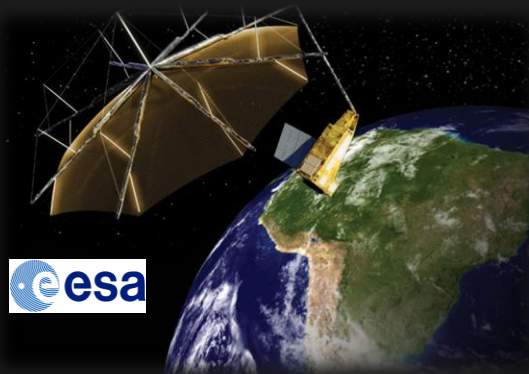
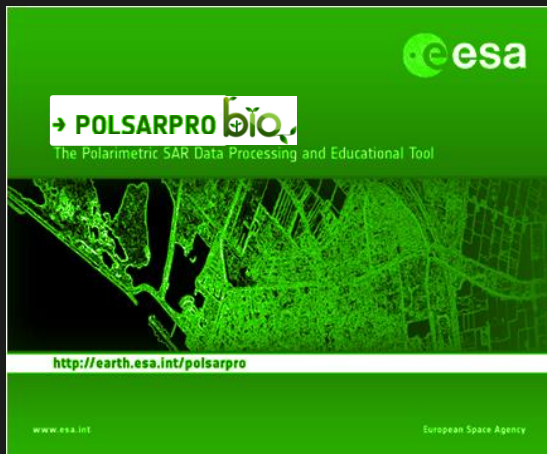
www.esa.int

European Space Agency

CURRENT

PoISARpro v5.2 Software offers the possibility to handle and convert polarimetric data from a range of well established **CURRENT** polarimetric spaceborne platforms.

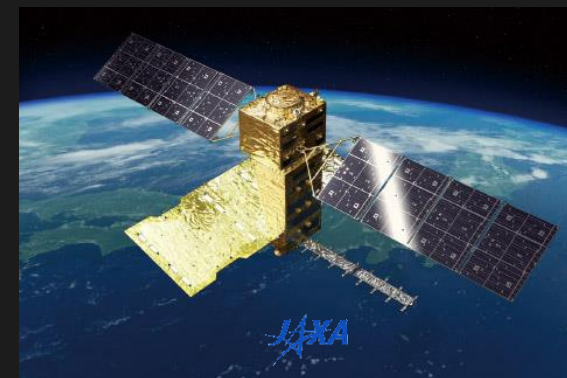
BIOMASS



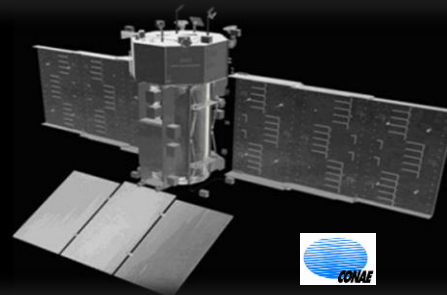
Radarsat Constellation Mission (RCM)



ALOS-4 - PALSAR-3



SAOCOM

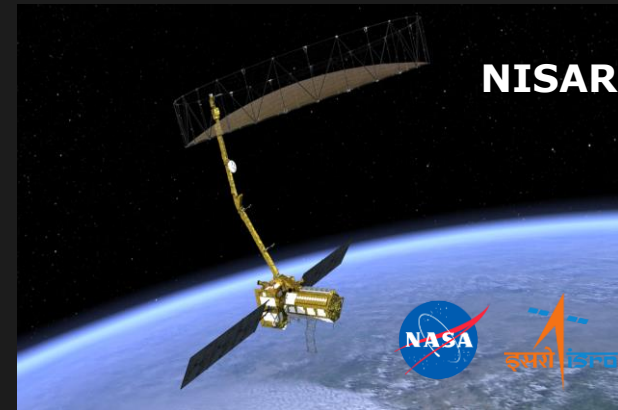


FUTURE

PoSARpro - Bio will offer the possibility to handle and convert polarimetric data of **FUTURE** polarimetric spaceborne platforms.

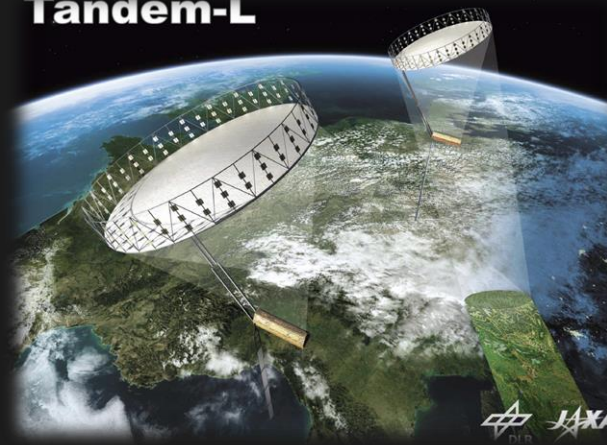


NovaSAR - S



NISAR

Tandem-L



FUTURE

PoISARpro - Bio will offer the possibility to handle and convert polarimetric data of **FUTURE polarimetric spaceborne platforms**.

External Softwares



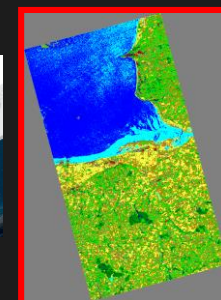
ESA - SNAP

Pre-Processing
Data Extract

Geo-Coding

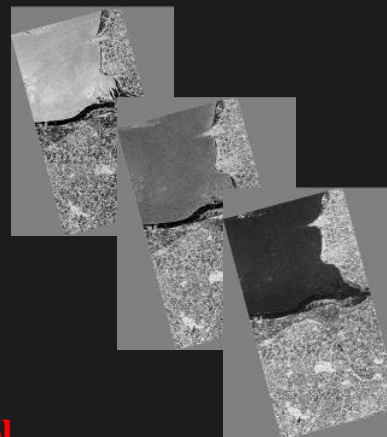
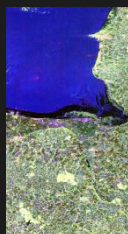
Terrain Correct - UTM Proj.

Post - Processing



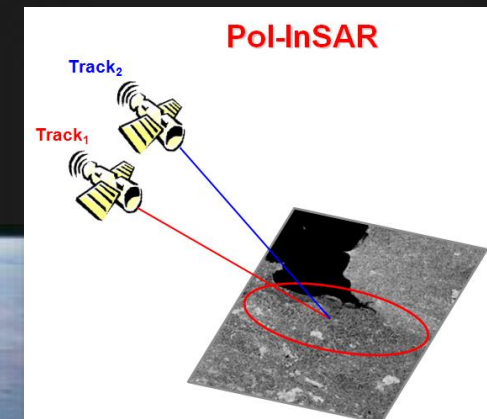
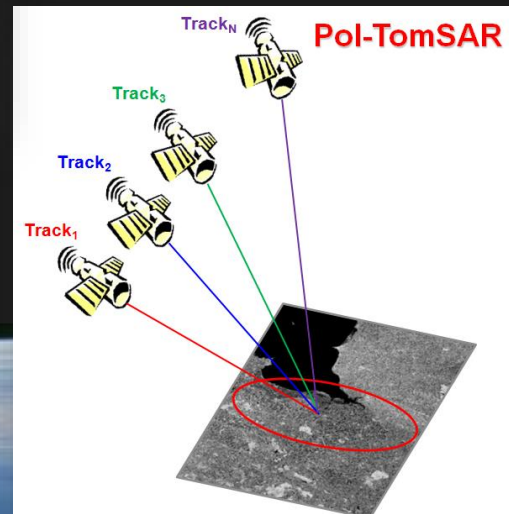
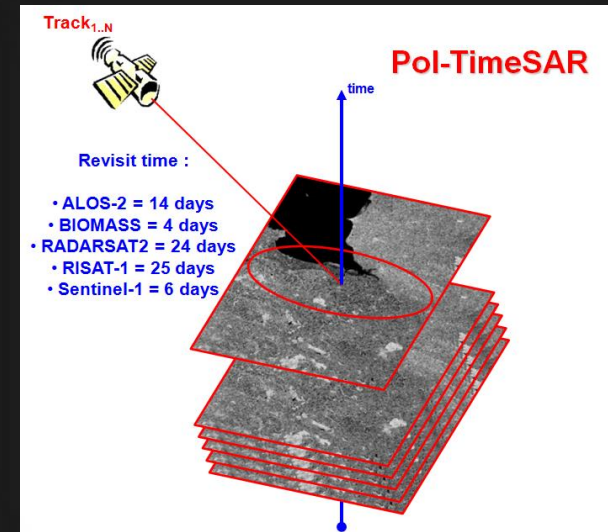
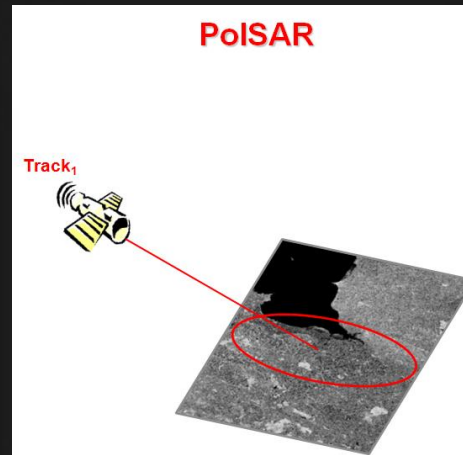
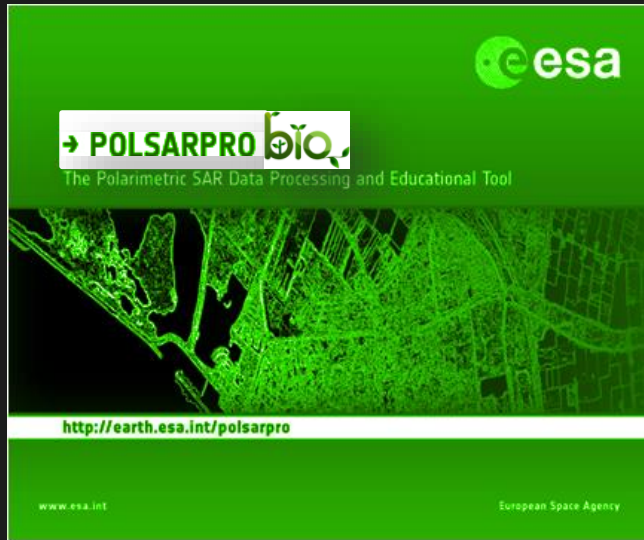
KML File generation

**POLARIMETRIC
DATA SETS**



Only valid for:
[C2] matrix: Dual-Pol
[T3] matrix: Quad-Pol

New functionalities



esa PoISARpro-bio
The Polarimetric SAR Data Processing and Educational Tool - Biomass

Environment | Import | **Process** | Display | Calibration | Utilities

Process options:

- Linear (+45 / -45)
- Circular (L / R)
- Elliptical (phi, tau)

Filtering and Decomposition:

- An-Yang Filter
- Box Car Filter
- Box Car - Edge Filter
- Gaussian Filter
- IDAN Filter
- Lee Refined Filter *New!*
- Lee Sigma Filter
- Lopez Filter
- Mean-Shift Filter
- Non Local Means Filter
- Scattering Model Based Filter
- P.W.F Filter
- SIRV Model Estimation
- KRO : Krogager Decomposition
- CAM : Cameron Decomposition
- HAA : H / A / Alpha Decomposition
- JRH : Huynen Decomposition
- RMB1 : Barnes 1 Decomposition *New!*
- RMB2 : Barnes 2 Decomposition
- SRC : Cloude Decomposition
- UHDx : Unified Huynen Decomposition
- WAH1 : Holm 1 Decomposition
- WAH2 : Holm 2 Decomposition
- AN3 : An & Yang 3 Component Decomposition
- AN4 : An & Yang 4 Component Decomposition
- BF4 : Bhattacharya & Frey 4 Component Decomposition
- FRE2 : Freeman 2 Component Decomposition
- FRE3 : Freeman 3 Component Decomposition
- NEU : Neumann 2 Component Decomposition
- NNED : Ariei 3 Component Decomposition
- ANNED : Ariei 3 Component Decomposition
- VZ3 : Van Zyl (1992) 3 Component Decomposition
- SIN4 : Singh 4 Component Decomposition
- YAM3 : Yamaguchi 3 Component Decomposition
- YAM4 : Yamaguchi 4 Component Decomposition
- L. Zhang 5 Component Decomposition
- Fuzzy Decomposition
- Lee Decomposition
- Wishart Decomposition
- Compact Polarimetric Decomposition

Classification and Analysis:

- H / A / Alpha Classification
- H / u / v Classification (Xu & Jin)
- H / A / Alpha - Wishart Classification
- Scattering Model Based - Wishart Classification
- Unified Huynen Classification
- Fuzzy - H / Alpha Classification *New!*
- Wishart Supervised Classification
- G.P.F. Supervised Classification
- Rule-Based Hierarchical Classification
- Basic Scattering Mechanism Identification
- SVM Supervised Classification
- Faraday Rotation Estimation
- Conformity Coefficient
- Scattering Predominance
- Scattering Diversity
- Degree of Purity
- Depolarisation Index
- Alpha Approximation (Praks & Colin)
- Entropy Approximation (Praks & Colin)
- Scattering Mechanism Entropy (Freeman)
- Scattering Mechanism Entropy (Van Zyl)
- Kozlov Anisotropy
- Lueneburg Anisotropy
- Polarized Point Scatterer Detection
- Reflectivity Ratio
- Differential Reflectivity (ZDR)

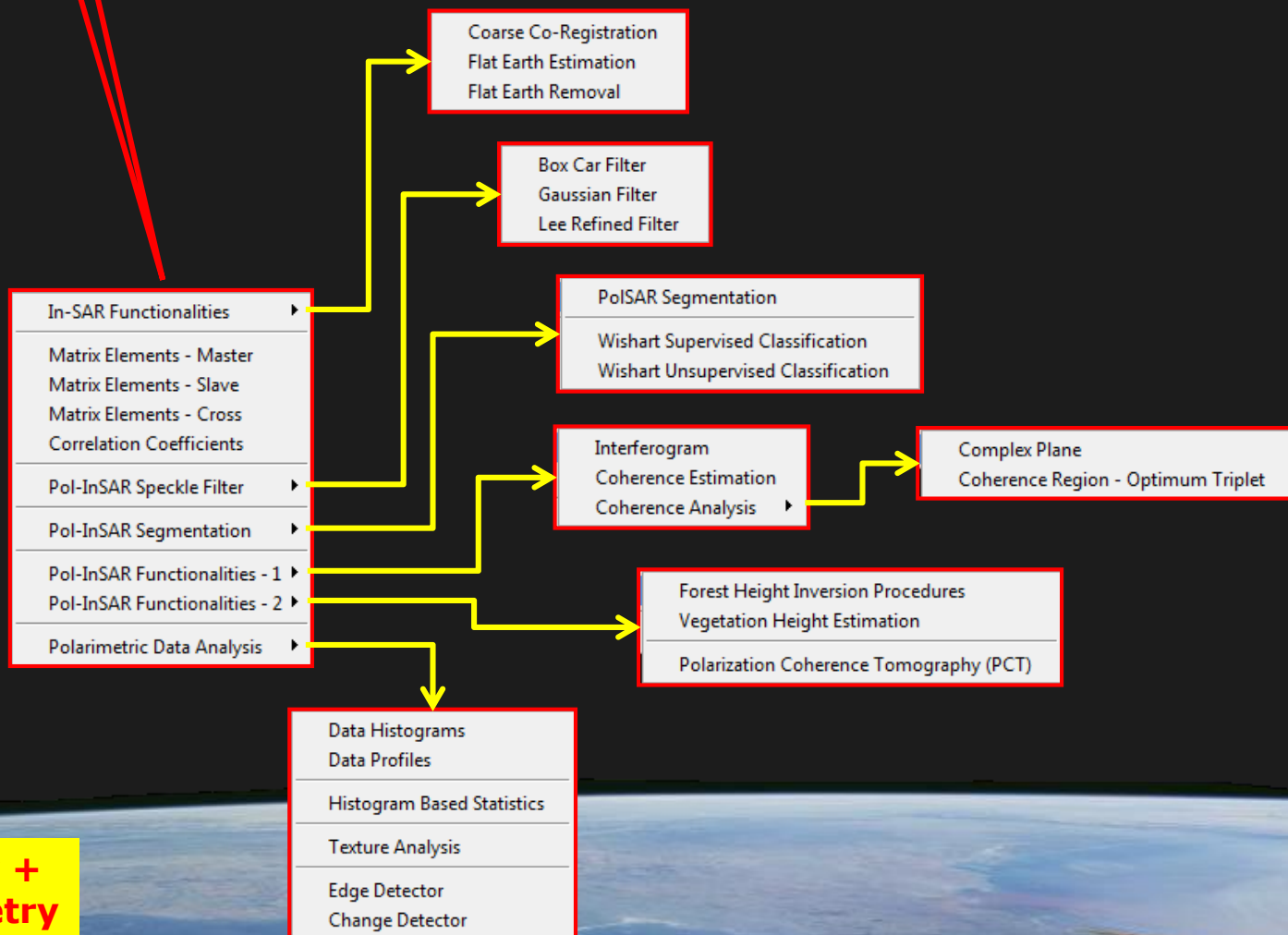
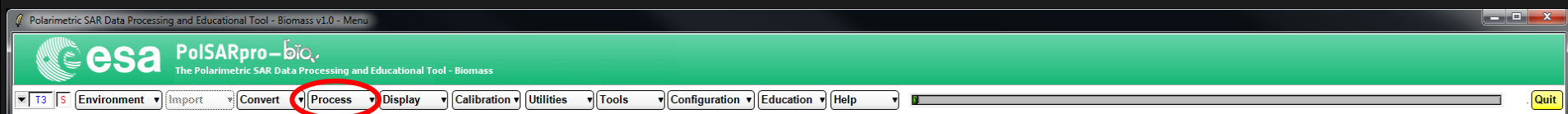
Other Tools:

- Matrix Elements
- Correlation Coefficients
- Elliptical Basis Change
- Polarimetric Speckle Filter
- H / A / Alpha Decomposition
- Polarimetric Decompositions
- Polarimetric Functionalities - 1
- Polarimetric Functionalities - 2
- Polarimetric Segmentation
- Polarimetric Data Analysis
- Polarimetric Data Clustering
- Batch Process
- Stokes Parameters
- Polarimetric Signature
- Polarisation Synthesis
- Polarimetric Signature
- Compact Polarimetric Mode
- Compact Decomposition
- Compact Classification
- O.P.C.E
- R.C.S Max
- Surface Inversion
- Roughness - Soil Inversion
- RVOG PoISAR Inversion
- Sub-Aperture Analysis
- DEM Estimation
- Polarisation Orientation Compensation
- Decomposition Applications

Input Data:

- Dual - PoISAR (Spp, C2)
- Quad - PoISAR (S2, C3, C4, T3, T4)

© E. Pottier - PoISARpro v6 (Biomass Edition)



Polarimetry + Interferometry

Pol-InSAR

Pol-TomoSAR processor

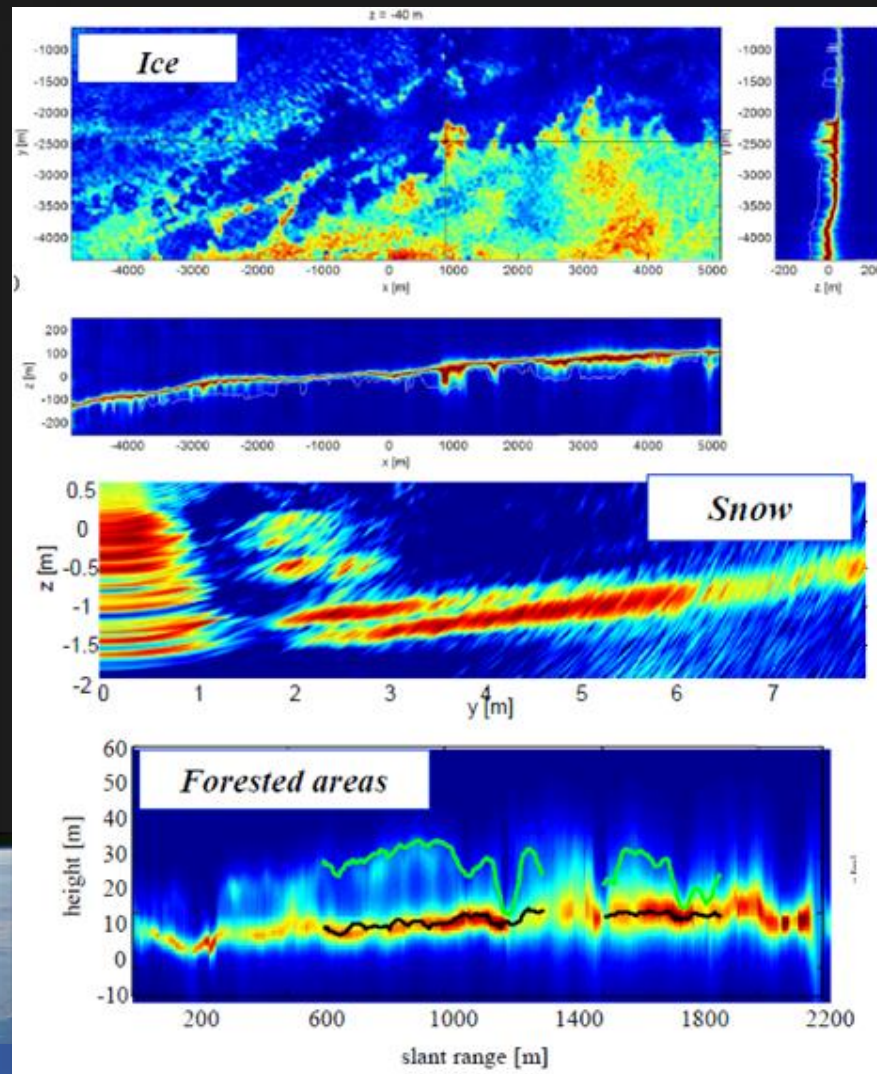
esa

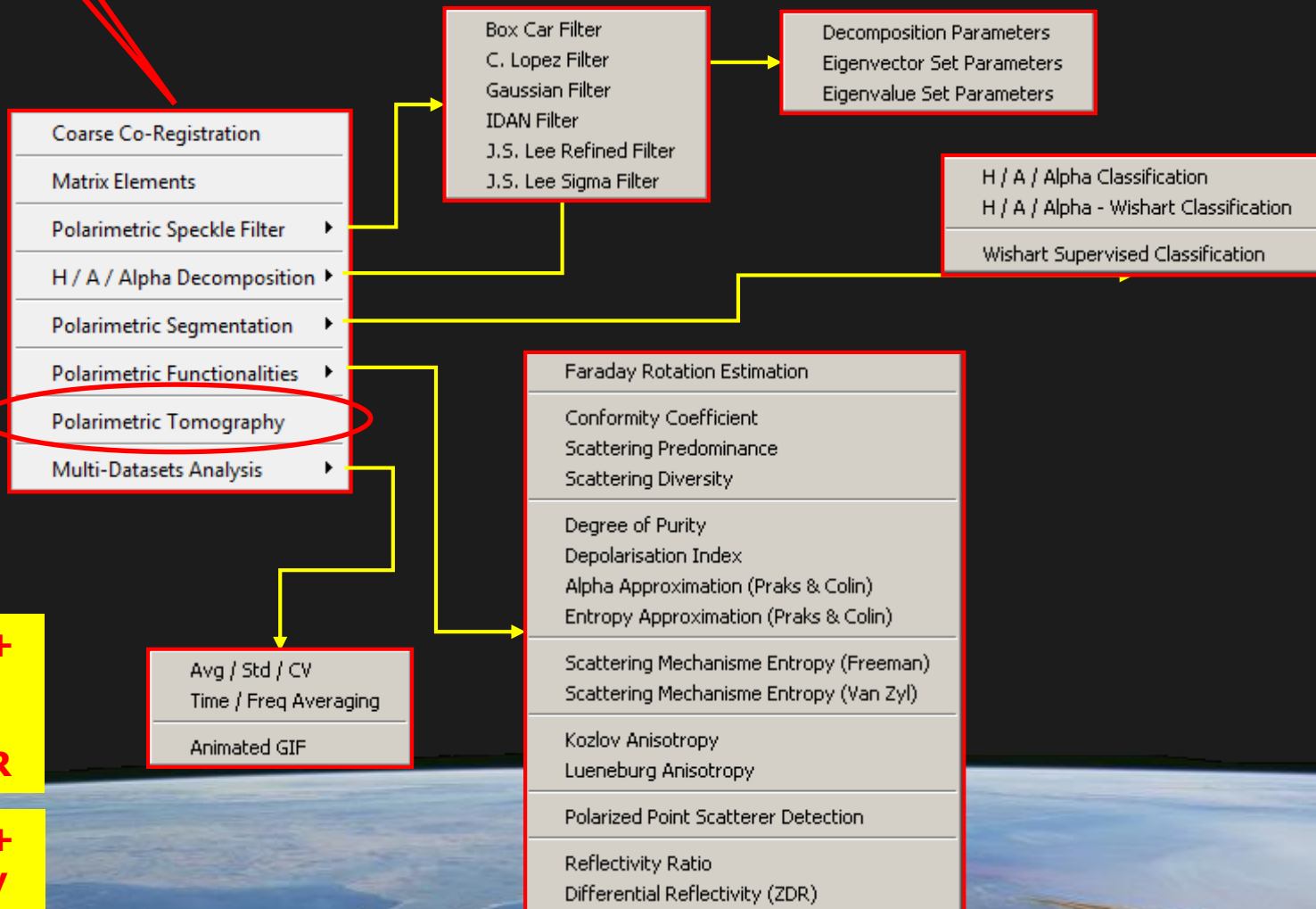
→ POLSARPRO bio

The Polarimetric SAR Data Processing and Educational Tool

<http://earth.esa.int/polsarpro>

www.esa.int European Space Agency





Polarimetry + Time series
Pol-TimeSAR

Polarimetry + Tomography
Pol-TomoSAR

SARSIM / SARSIM+ Data Bases

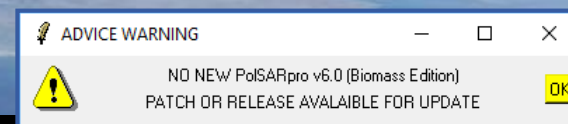
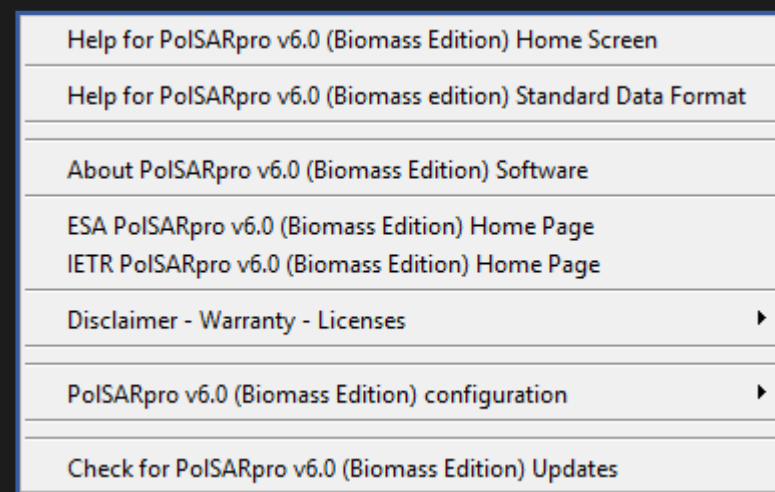
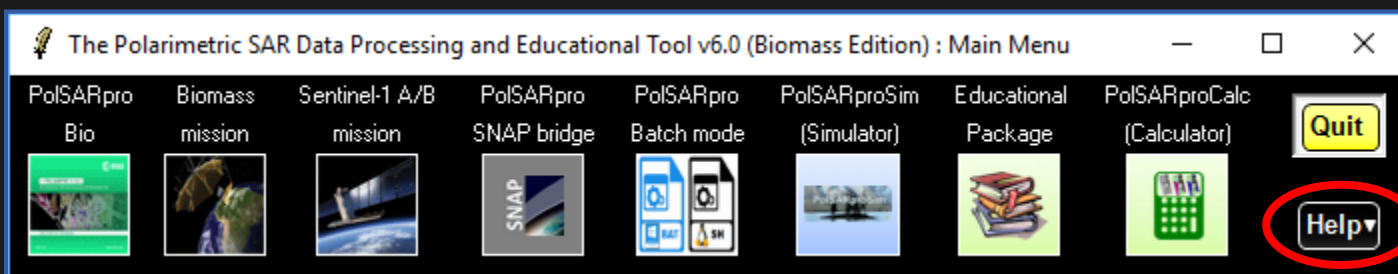
ESA study : L- and P-band SAR Tomography Synergies Consolidation Study

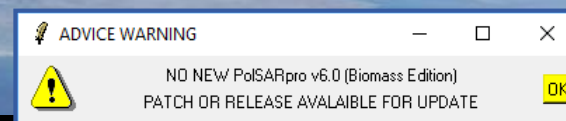
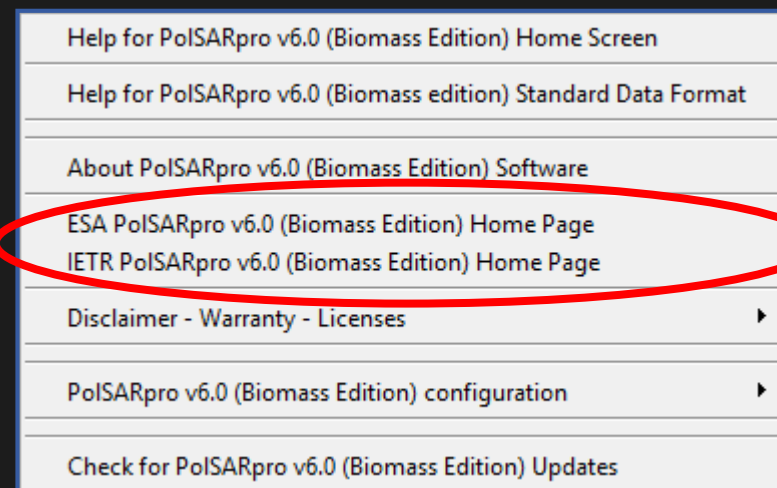
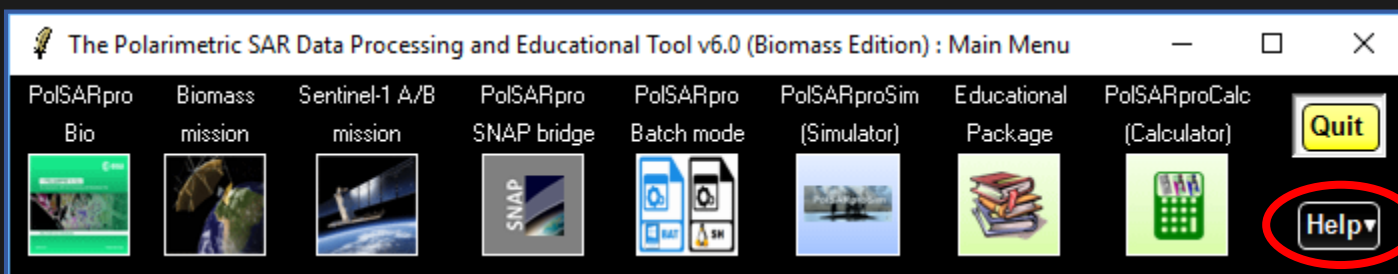


Goal : *Build a reference dataset for current and future researches on the application of SAR Tomography for the RS of boreal, temperate and tropical forests at P- and L-Band.*

Includes : *Stack of SLC SAR images (coregistered, phase calibrated and flattened) + ancillary data (kz maps, DTM ...) – ESA campaigns (afrisar, biosar)*







step science toolbox exploitation platform

esa

ESA STEP TOOLBOXES DOWNLOAD GALLERY DOCUMENTATION COMMUNITY THIRD PARTY PLUGINS

Search...

Home > Scientific Toolbox Exploitation Platform

multimission scientific toolboxes

ESA is developing **free open source toolboxes** for the scientific exploitation of **Earth Observation missions** under the the Scientific Exploitation of Operational Missions (SEOM) programme element. **STEP** is the ESA **community platform** for accessing the software and its documentation, communicating with the developers, dialoguing within the science community, promoting results and achievements as well as providing tutorials and material for training scientists using the Toolboxes.

The ESA toolboxes support the **scientific exploitation** for the **ERS-ENVISAT** missions, the **Sentinels 1/2/3** missions and a range of **National** and **Third Party** missions. The three toolboxes are called respectively Sentinel 1, 2 and 3 Toolboxes and share a common architecture called **SNAP**. They contain some functionalities of historical toolboxes such as BEAM, NEST and Orfeo Toolbox that were developed over the last years.

- SNAP Features
- Download
- Tutorials
- Community
- Documentation
- Developers
- Gallery
- Blog

The following results have been obtained thanks to the Sentinel Toolboxes :

2018

Mapping Urban Areas from Space (MUAS 2018)

THE ESA EARTH OBSERVATION OPEN WEEK EO Open Science and FutureEO

EO Open Science 2018

8th Advanced Land Training Course

2017

EO OPEN SCIENCE 2017

EO Open Science 2017

The screenshot shows a web browser window displaying the 'step science toolbox exploitation platform' website. The main navigation bar includes 'ESA', 'STEP', 'TOOLBOXES', 'DOWNLOAD', 'GALLERY', 'DOCUMENTATION', 'COMMUNITY', and 'THIRD PARTY PLUGINS'. The 'TOOLBOXES' menu is expanded, listing various toolboxes: SNAP, Sentinel 1 Toolbox, Sentinel 2 Toolbox, Sentinel-3 Toolbox, SMOS Toolbox, Proba-V Toolbox, **PoSARpro** (circled in red), Download, Community, and Useful Links. Below the navigation, the page title is 'PoSARpro v6.0 (Biomass Edition) Toolbox'. A search bar is visible in the top right. The main content area features a large image of a forest scene with a 3D cube overlaid, representing the software's capabilities. Text on the page describes the software as the new version of the ESA PoSARpro Toolbox, developed since 2003. It highlights the software's objective: to provide an educational tool for self-education in polarimetric SAR data analysis. The text also mentions that the software performs complete end-to-end processing and offers a dedicated interface for handling polarimetric data. On the right side of the page, there are sections for '2018' and '2017' featuring news items related to 'EO Open Science' and 'Advanced Land Training Course'.

The screenshot shows a web browser window displaying the ESA STEP website. The browser's address bar shows the URL: `step.esa.int/main/download/polsarpro-v6-0-biomass-edition`. The website header includes the ESA logo and the text "step science toolbox exploitation platform". A navigation menu contains the following items: ESA, STEP, TOOLBOXES, DOWNLOAD, GALLERY, DOCUMENTATION, COMMUNITY, and THIRD PARTY PLUGINS. The "DOWNLOAD" menu item is circled in red. Below the navigation menu, a sidebar lists various toolboxes, with "Download" also circled in red. The main content area is titled "PoSARpro v6.0 (Biomass Edition) Toolbox Download". It features a large image of a 3D cube representing a forest, with the text "POLARSARPRO V. 6.0 (Bio.)" and "The Polarimetric SAR Data Processing and Educational Tool - Biomass Edition" overlaid. Below the image, the text reads: "Both Windows (64 bits) and Linux versions can be downloaded from the website : <https://www.ietr.fr/polsarpro-bio/>". This URL is circled in red. Further down, there are links for "PoSARpro v6.0 (Biomass Edition) General Presentation" and "PoSARpro v6.0 (Biomass Edition) Main Menu Presentation". The right sidebar contains a search bar, the SEOM logo, and a "2018" section with a "Mapping Urban Areas from Space (MUAS 2018)" article. Below that is a "2017" section with an "EO OPEN SCIENCE 2017" article.

PoLSARpro v6.0 (Biomass Edition) | X

https://www.ietr.fr/polsarpro-bio/



ESA PoLSARpro v6.0 (Biomass Edition) Software

Version 6.0.1 released (2019/04/01)

The **ESA PoLSARpro v6.0 (Biomass Edition) Software** is the new version of the **ESA PoLSARpro Toolbox** (*The Polarimetric SAR data Processing and Educational Toolbox*) which has been developed since 2003 under different ESA-ESRIN contracts.

 Download Windows 64 bits Version (Read-me first )	License 
 Download Linux Version (Read-me first )	Legal 
	Credits 

Visit the **PoLSARpro v6.0 (Biomass Edition) FORUM** at the **ESA STEP** website

 For any help / request / comment, please contact : polsarpro.team@yahoo.com (c) E. Pottier (2019)
PIWIK Analytics

Do not to forget to visit the  **GaoFen-3 (GF-3)** and the  **San Francisco** webpages.

San Francisco | Institut d'Electroniq

https://www.ietr.fr/polsarpro-bio/san-francisco/

San Francisco Polarimetric SAR Datasets

	AIRSAR		ALOS-1 / PALSAR-1
	ALOS-2 / PALSAR-2		GAOFEN-3
	RADARSAT-2		RISAT
	SENTINEL-1A (2018/01/25)		SENTINEL-1B (2018/01/02)

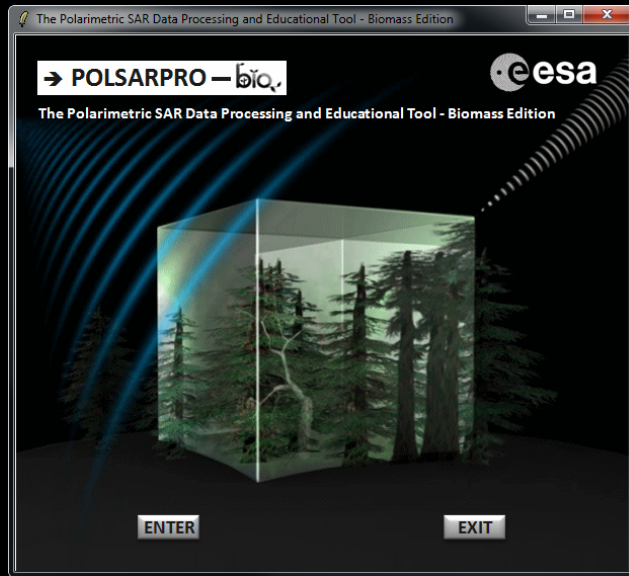
Courtesy of CNSA, CSA, ESA, IECAS, ISRO, JAXA, MDA, NASA-JPL, NSOAS

(c) E. POTTIER (2019)
PIWIK Analytics



Questions ?

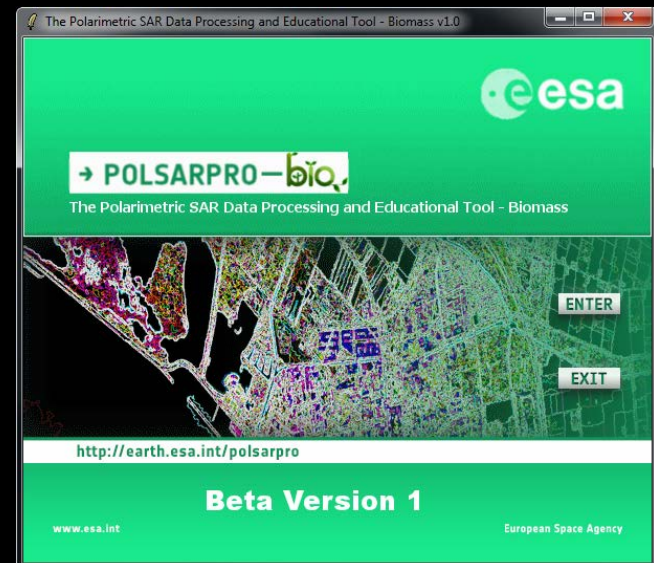
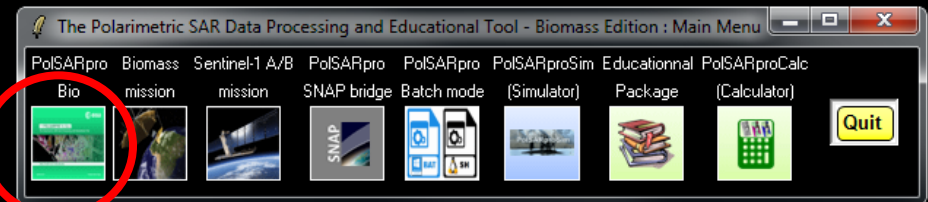




ENTRY SCREEN



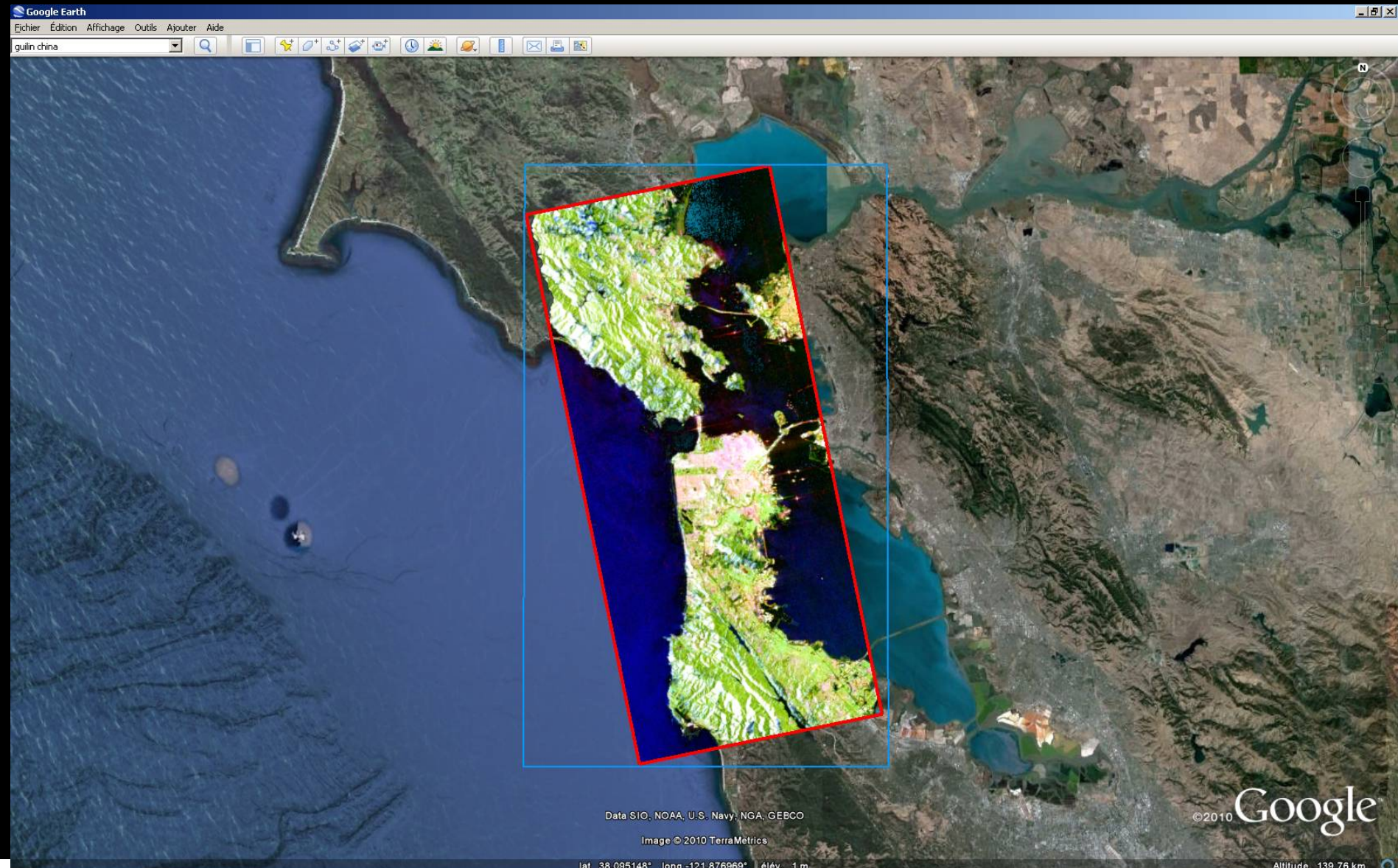
MAIN WINDOW





ALOS : Advanced Land Observing Satellite
PALSAR : Phase Array L-Band SAR

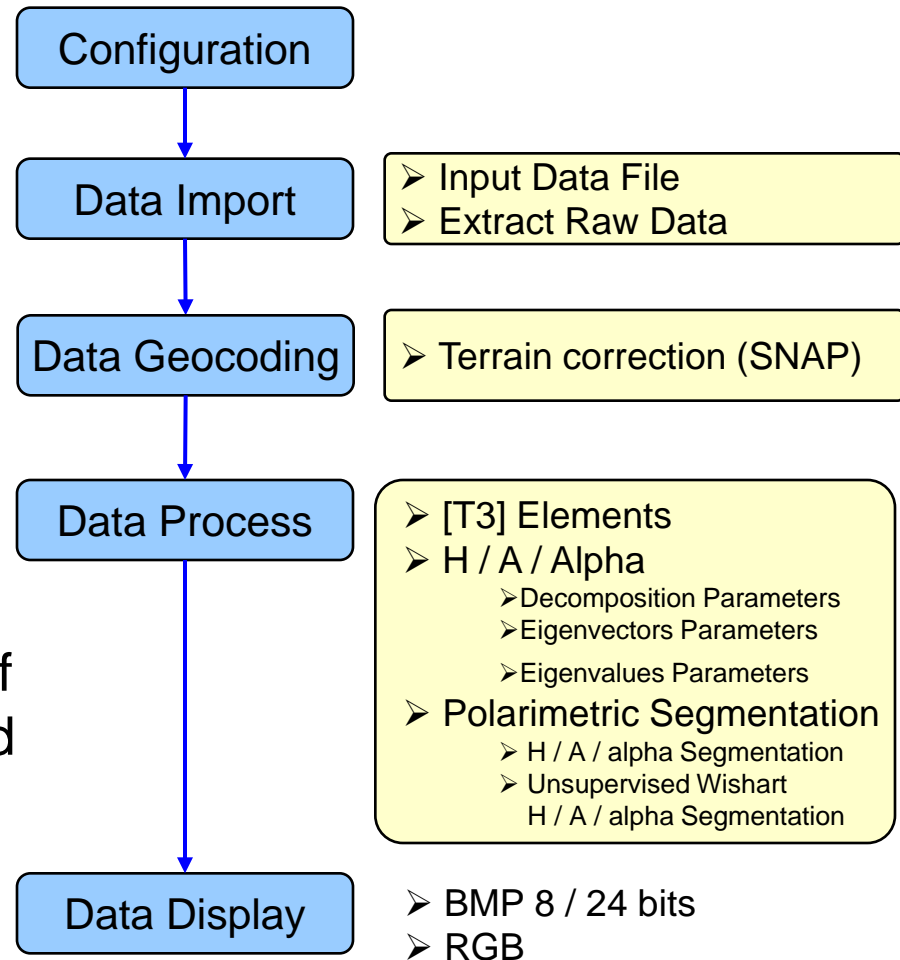


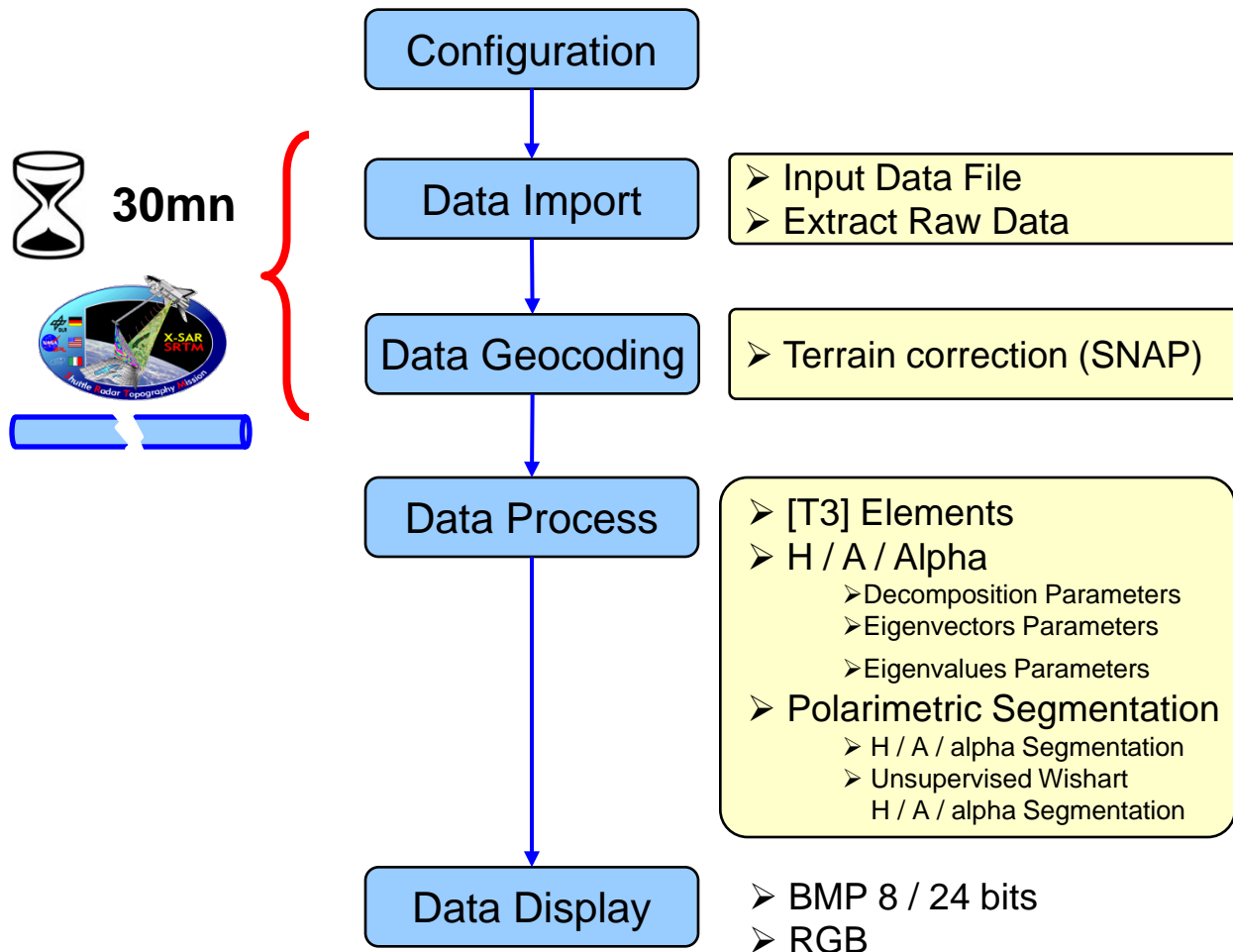


PoSARpro - Bio Software
 performs complete **end-to-end processing** without the need for
 any other software.

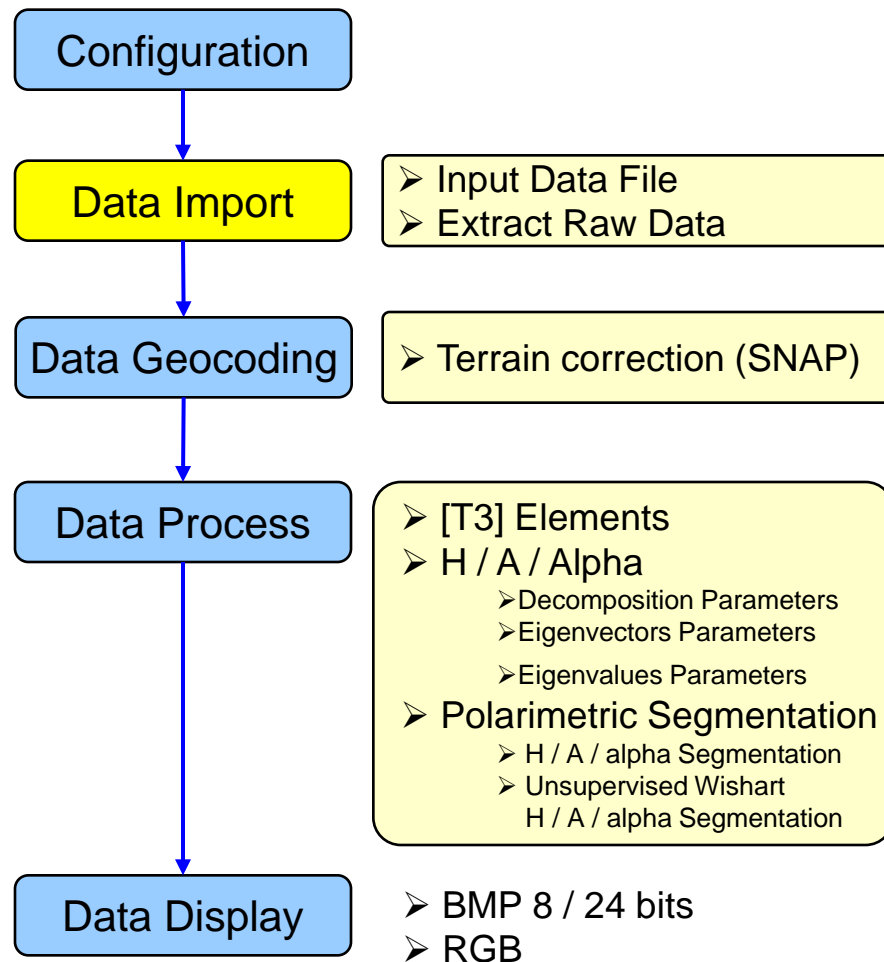
Data Processing Approach
 along a '**recommended**'
 and easy processing chain

Provide a **First Qualitative Analysis** of
 the fully polarimetric data set processed

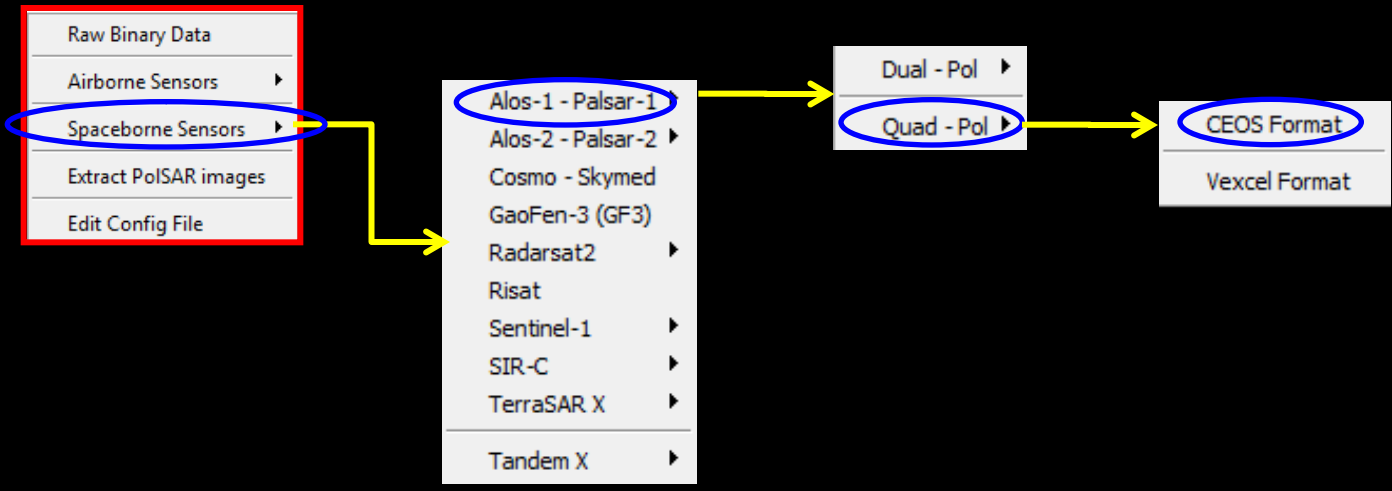
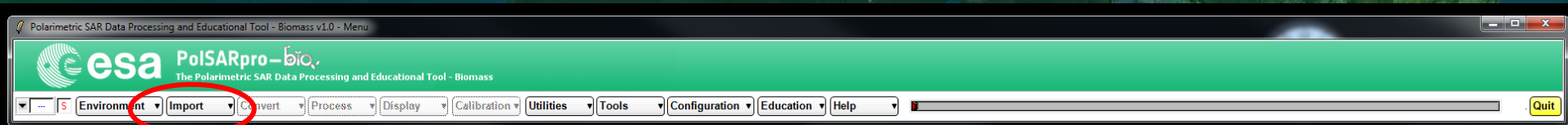


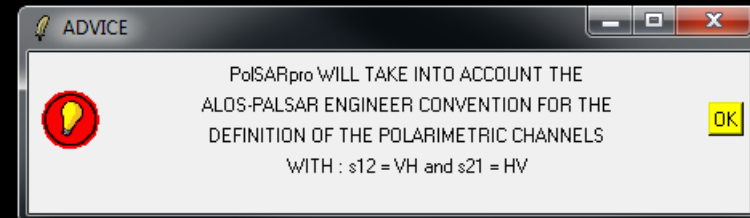
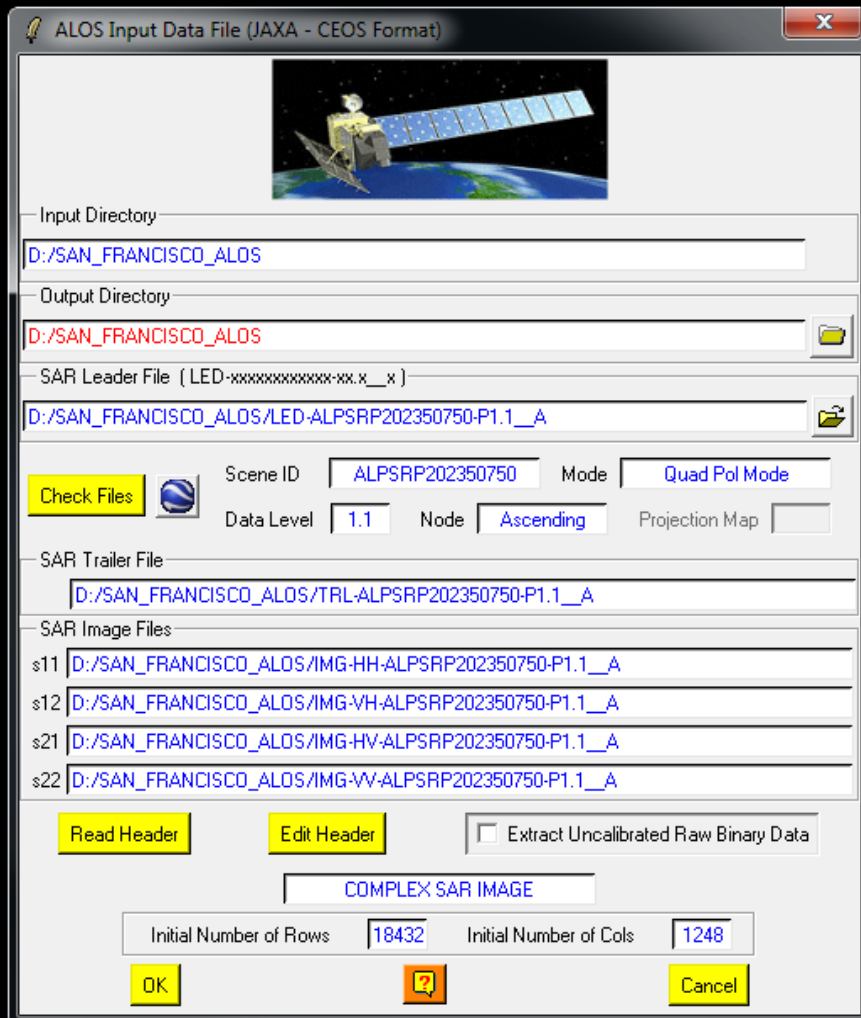
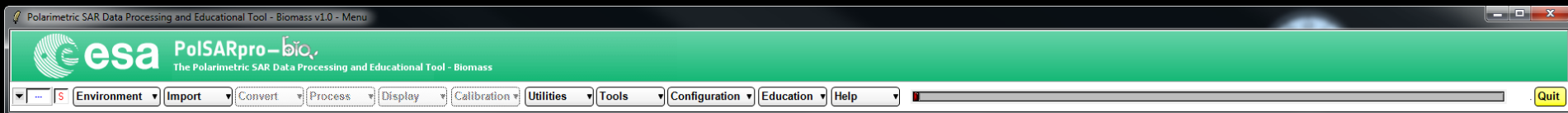


WHAT HAS BEEN DONE



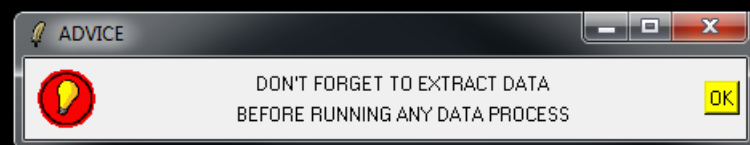
PoISARpro - Bio SOFTWARE

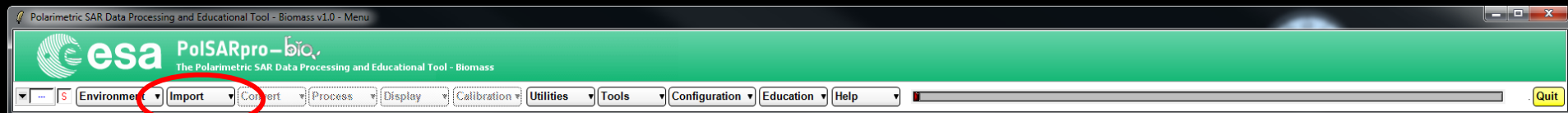




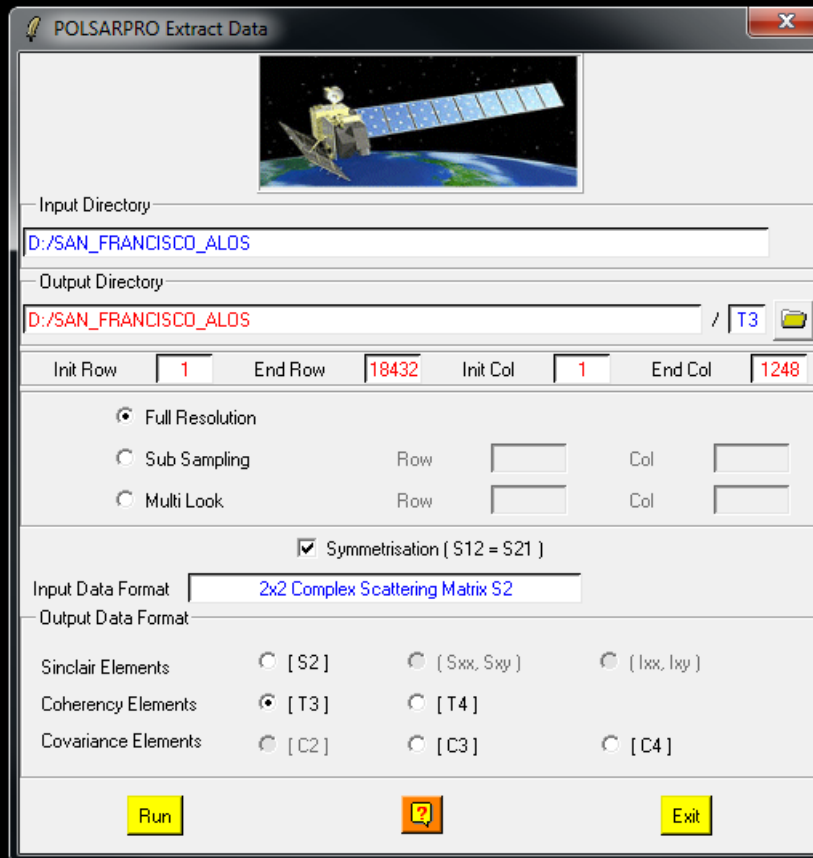
Do it Yourself:
Enter SAR Leader File
Check File

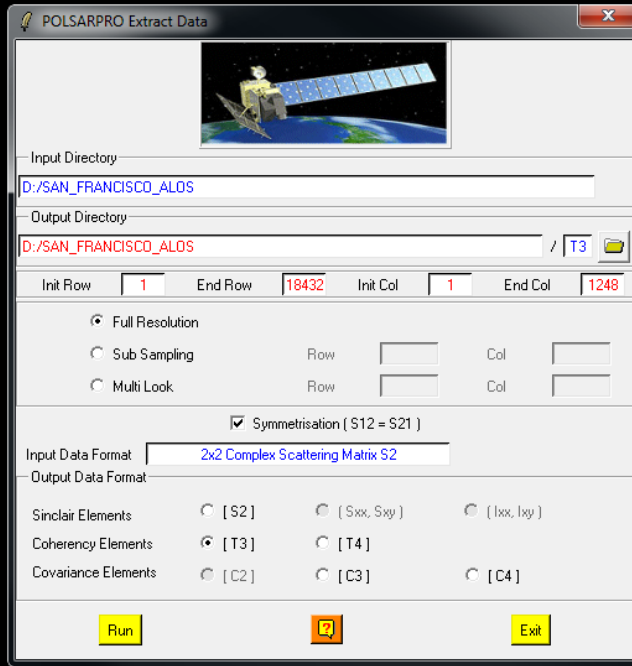
Do it Yourself:
Enter SAR Leader File
Read Header
OK



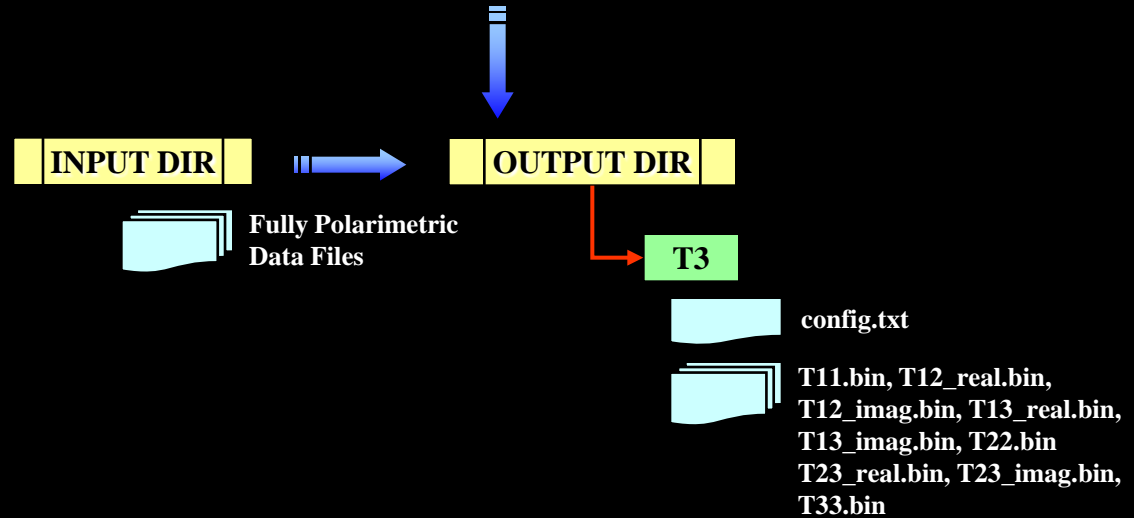


- Raw Binary Data
- Airborne Sensors ▶
- Spaceborne Sensors ▶
- Extract PoISAR images**
- Edit Config File





Convert ALOS Fully Polarimetric Data Files to Complex (3x3) Coherency Matrix [T3]



Do it Yourself:

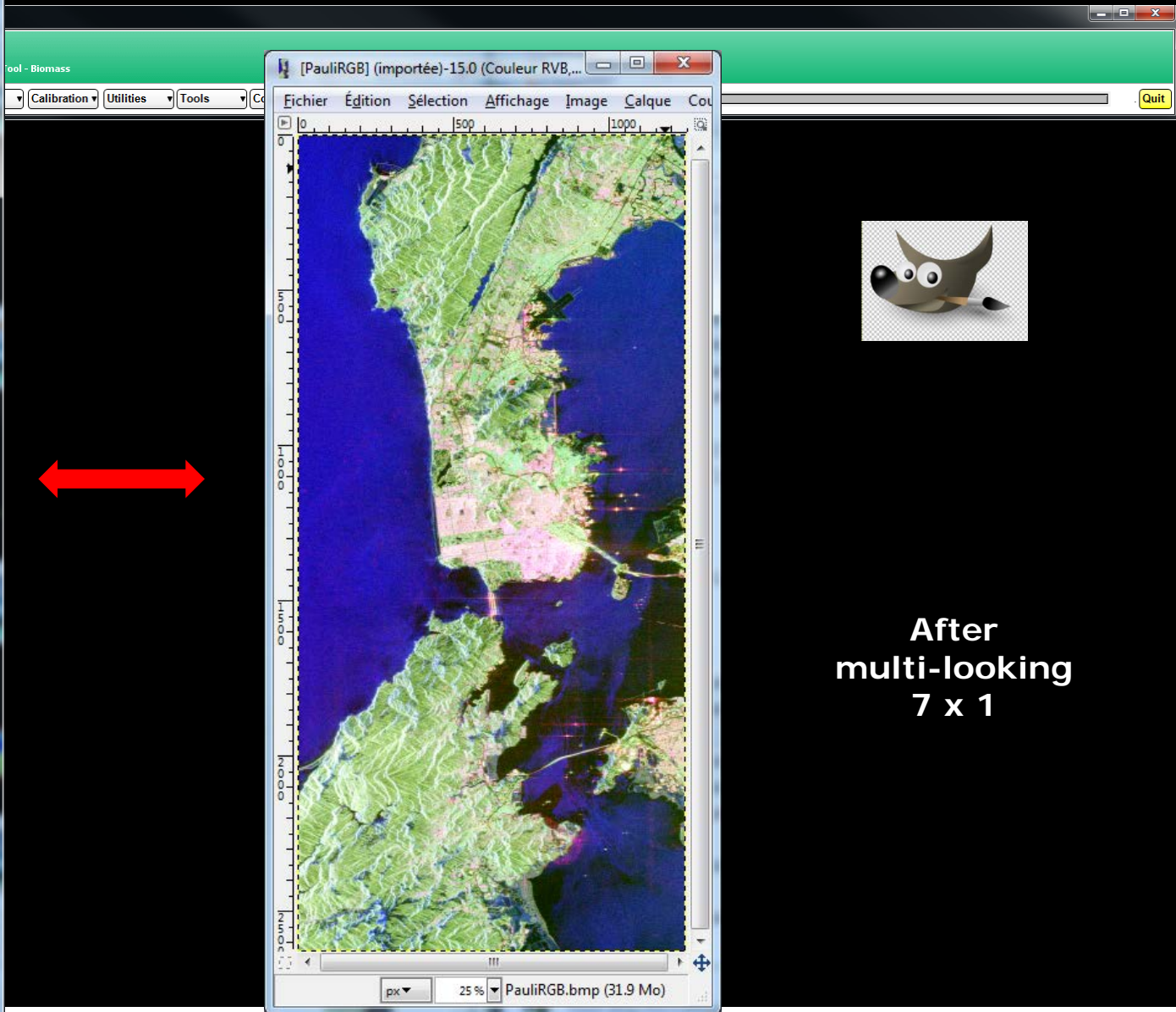
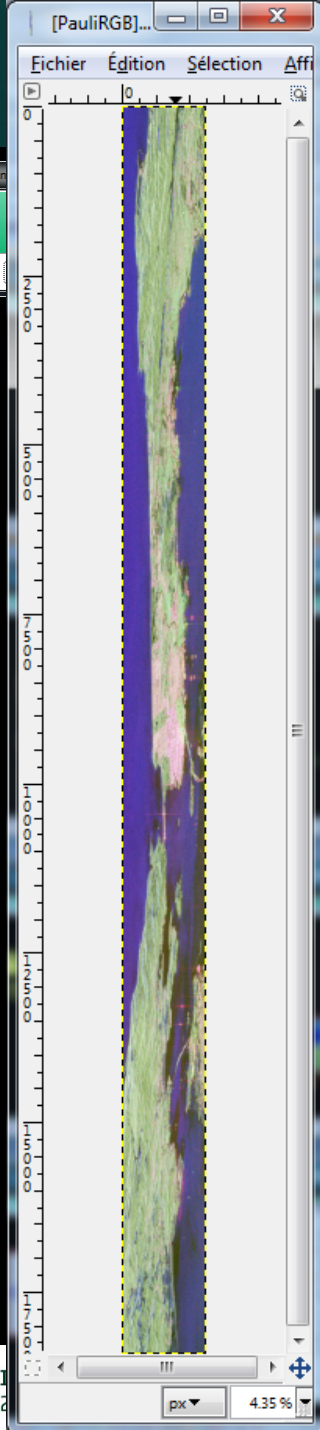
Full Resolution
Output Data Format = [T3]
Run

$$\underline{k}_{3P} = \frac{1}{\sqrt{2}} \begin{bmatrix} S_{11} + S_{22} & S_{11} - S_{22} & S_{12} + S_{21} \end{bmatrix}$$

$$\Rightarrow [T_3] = \langle \underline{k}_{3P} \cdot \underline{k}_{3P}^\dagger \rangle$$

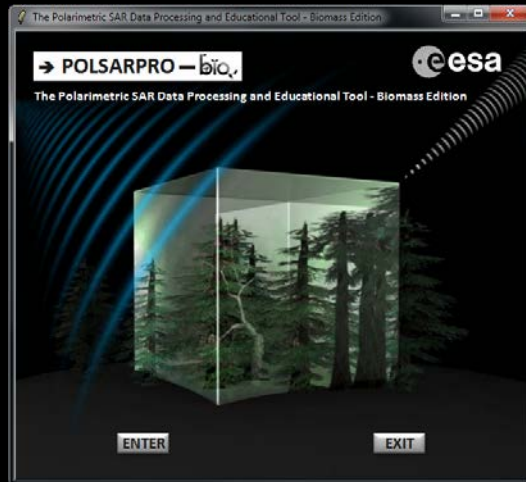
$$[T_3] = \begin{bmatrix} T_{11} & T_{12} & T_{13} \\ T_{12}^* & T_{22} & T_{23} \\ T_{13}^* & T_{23}^* & T_{33} \end{bmatrix}$$

Display Pauli-RGB Image



After
multi-looking
7 x 1



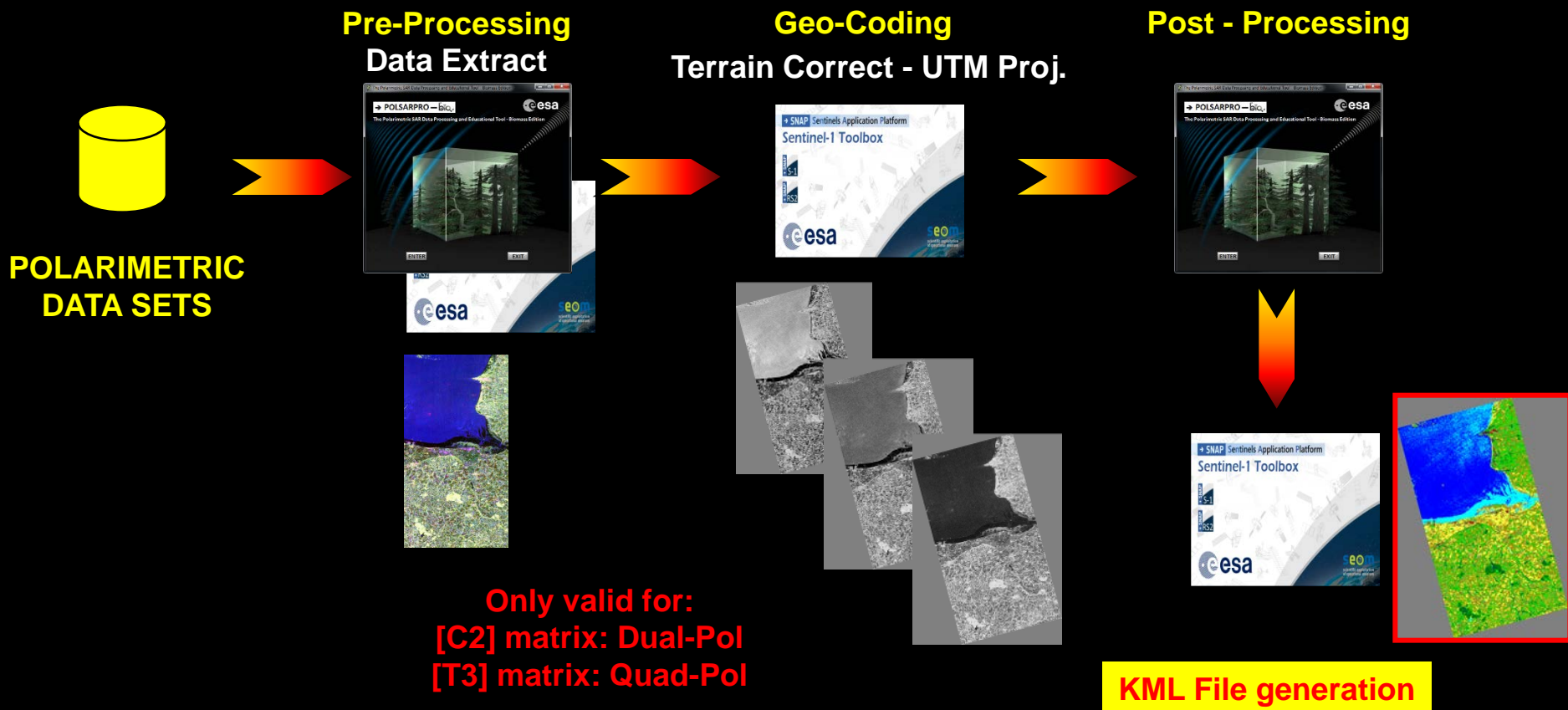


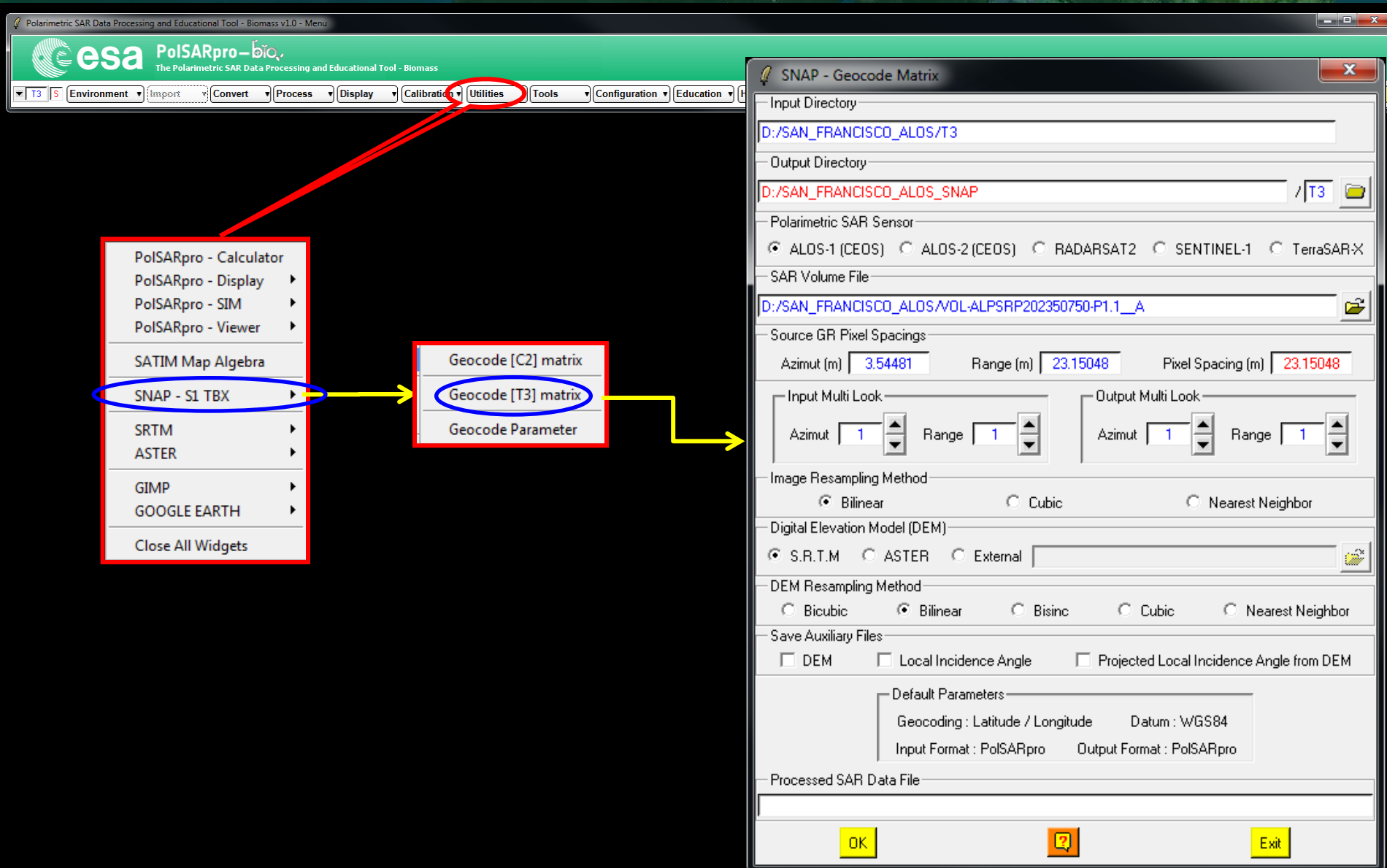
Polarimetric Data Processing



- S1 toolbox (split, deburst, merge ...)
- Geocoding toolbox
- Interferometric toolbox (co-registration, flat Earth estimation ...)

ESA - SNAP





The screenshot shows the PoISARpro software interface. The main menu bar includes: Environment, Import, Convert, Process, Display, Calibration, Utilities, Tools, Configuration, and Education. The Utilities menu is open, showing options like PoISARpro - Calculator, Display, SIM, Viewer, SATIM Map Algebra, SNAP - S1 TBX, SRTM, ASTER, GIMP, GOOGLE EARTH, and Close All Widgets. The SNAP - S1 TBX option is highlighted with a blue oval. A yellow arrow points from this option to a secondary menu box containing Geocode [C2] matrix, Geocode [T3] matrix, and Geocode Parameter. The Geocode [T3] matrix option is also highlighted with a blue oval. A second yellow arrow points from this option to the SNAP - Geocode Matrix dialog box. The dialog box contains the following fields and options:

- Input Directory:** D:/SAN_FRANCISCO_ALOS/T3
- Output Directory:** D:/SAN_FRANCISCO_ALOS_SNAP / T3
- Polarimetric SAR Sensor:** ALOS-1 (CEOS) (selected), ALOS-2 (CEOS), RADARSAT2, SENTINEL-1, TerraSAR-X
- SAR Volume File:** D:/SAN_FRANCISCO_ALOS/VOL-ALPSRP202350750-P1.1_A
- Source GR Pixel Spacings:** Azimut (m) 3.54481, Range (m) 23.15048, Pixel Spacing (m) 23.15048
- Input Multi Look:** Azimut 1, Range 1
- Output Multi Look:** Azimut 1, Range 1
- Image Resampling Method:** Bilinear (selected), Cubic, Nearest Neighbor
- Digital Elevation Model (DEM):** S.R.T.M (selected), ASTER, External
- DEM Resampling Method:** Bicubic, Bilinear (selected), Bisinc, Cubic, Nearest Neighbor
- Save Auxiliary Files:** DEM, Local Incidence Angle, Projected Local Incidence Angle from DEM
- Default Parameters:** Geocoding: Latitude / Longitude, Datum: WGS84, Input Format: PoISARpro, Output Format: PoISARpro
- Processed SAR Data File:** (empty)

Buttons for OK, Help, and Exit are located at the bottom of the dialog box.

Polarimetric SAR Data Processing and Educational Tool - Biomass v1.0 - Menu

esa PoISARpro-bio
The Polarimetric SAR Data Processing and Educational Tool

T3 | S Environment Import Convert Process Display

Quit

SNAP - Geocode Matrix

Input Directory
D:/SAN_FRANCISCO_ALOS/T3

Output Directory
D:/SAN_FRANCISCO_ALOS_SNAP / T3

Polarimetric SAR Sensor
 ALOS-1 (CEOS) ALOS-2 (CEOS) RADARSAT2 SENTINEL-1 TerraSAR-X

SAR Volume File
D:/SAN_FRANCISCO_ALOS/VOL-ALPSRP202350750-P1.1_A

Source GR Pixel Spacings
Azimut (m) 3.54481 Range (m) 23.15048 Pixel Spacing (m) 23.15048

Input Multi Look
Azimut 1 Range 1

Output Multi Look
Azimut 1 Range 1

Image Resampling Method
 Bilinear Cubic Nearest Neighbor

Digital Elevation Model (DEM)
 S.R.T.M ASTER External

DEM Resampling Method
 Bicubic Bilinear Bisinc Cubic Nearest Neighbor

Save Auxiliary Files
 DEM Local Incidence Angle Projected Local Incidence Angle from DEM

Default Parameters
Geocoding : Latitude / Longitude Datum : WGS84
Input Format : PoISARpro Output Format : PoISARpro

Processed SAR Data File

OK ? Exit

Display Pauli-RGB Image

Polarimetric SAR Data Processing and Educational Tool - Biomass v1.0 - Menu

 **PoISARpro-bio**
The Polarimetric SAR Data Processing and Education

T3 | S Environment | Import | Convert | Process | Display

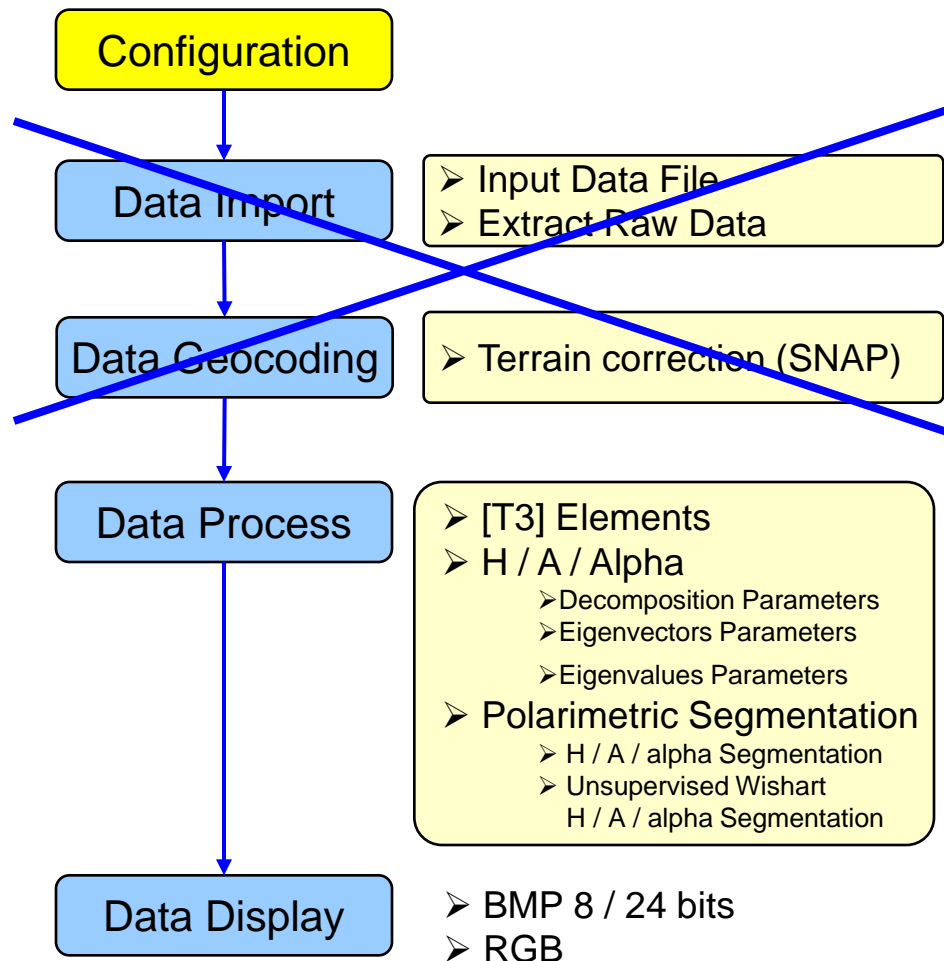
[PauliRGB] (importée)-16.0 (Couleur RVB, 1 calque) 2269x3010 - GIMP

Fichier Édition Sélection Affichage Image Calque Couleurs Outils Filtres Fenêtres Aide



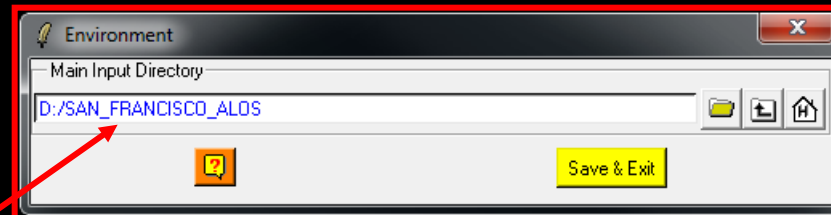
px 25 % PauliRGB.bmp (65.6 Mo)







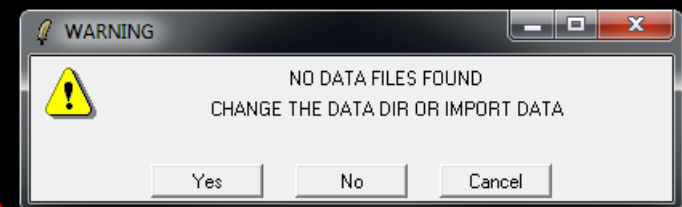
- Single Data Set (Pol-SAR)
- Dual Data Sets (Single Baseline Pol-InSAR)
- Multi Data Sets (Time series / Pol-TomSAR)

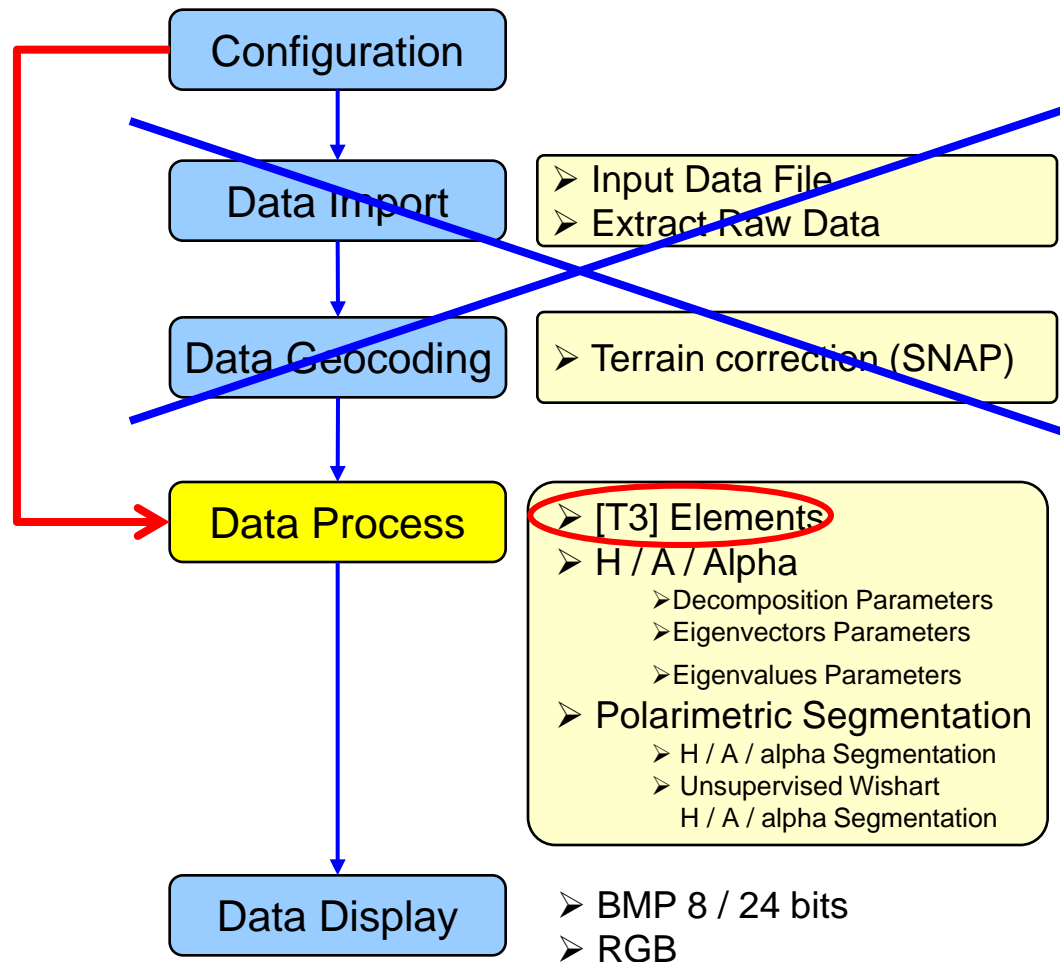


Configure Data Main Directory location

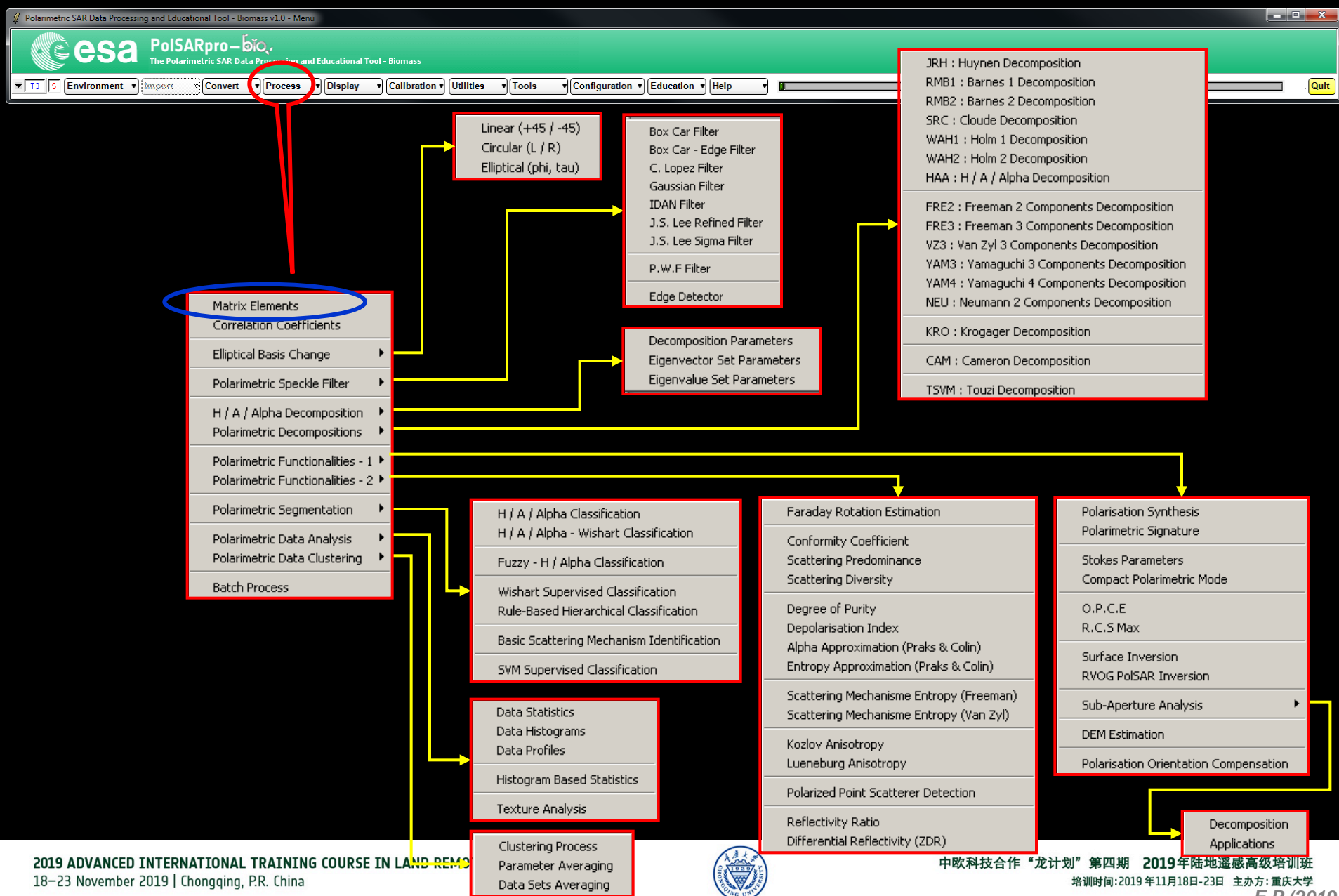
Input Data Directory :

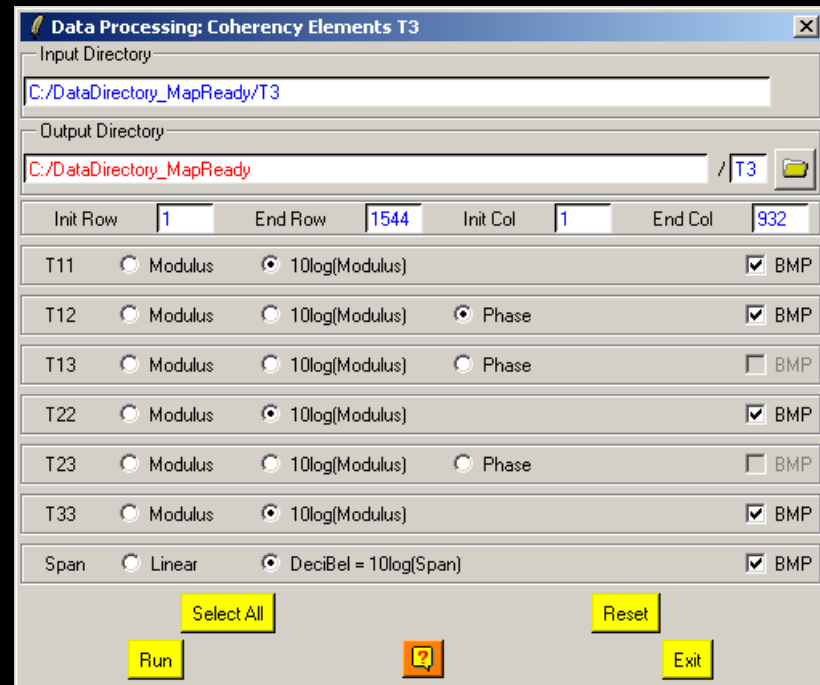
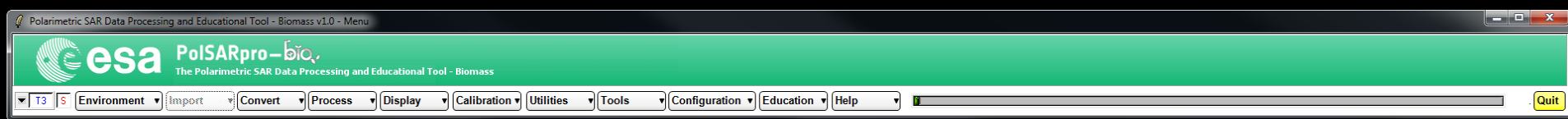
C:/.../SAN_FRANCISCO_ALOS-1_SNAP_save





PoISARpro - Bio SOFTWARE





DATADIR

T3

config.txt
[T3x3] Elements

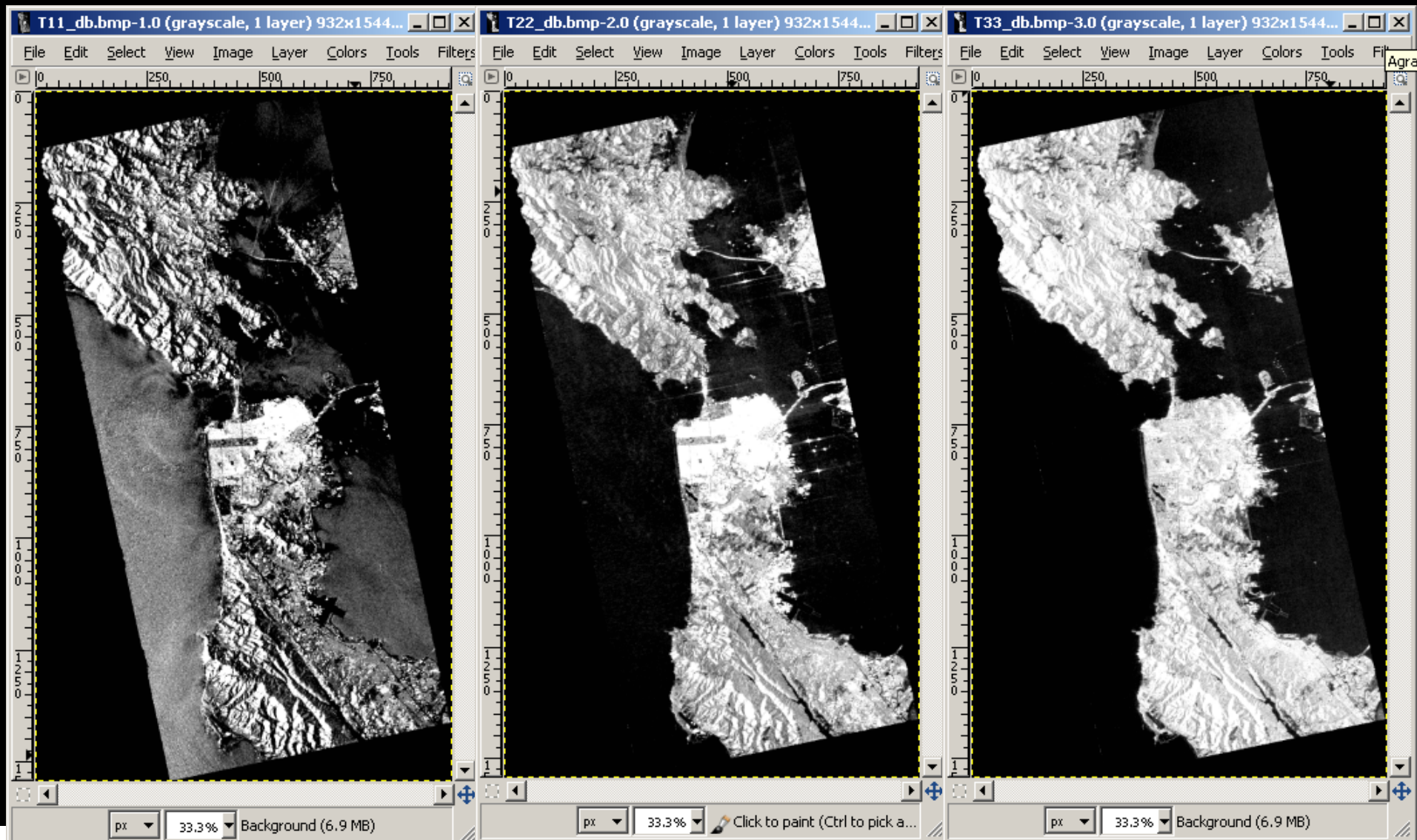
Txy_mod.bin
Txy_db.bin
Txy pha.bin
Txy_mod.bmp
Txy_db.bmp
Txy pha.bmp

Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

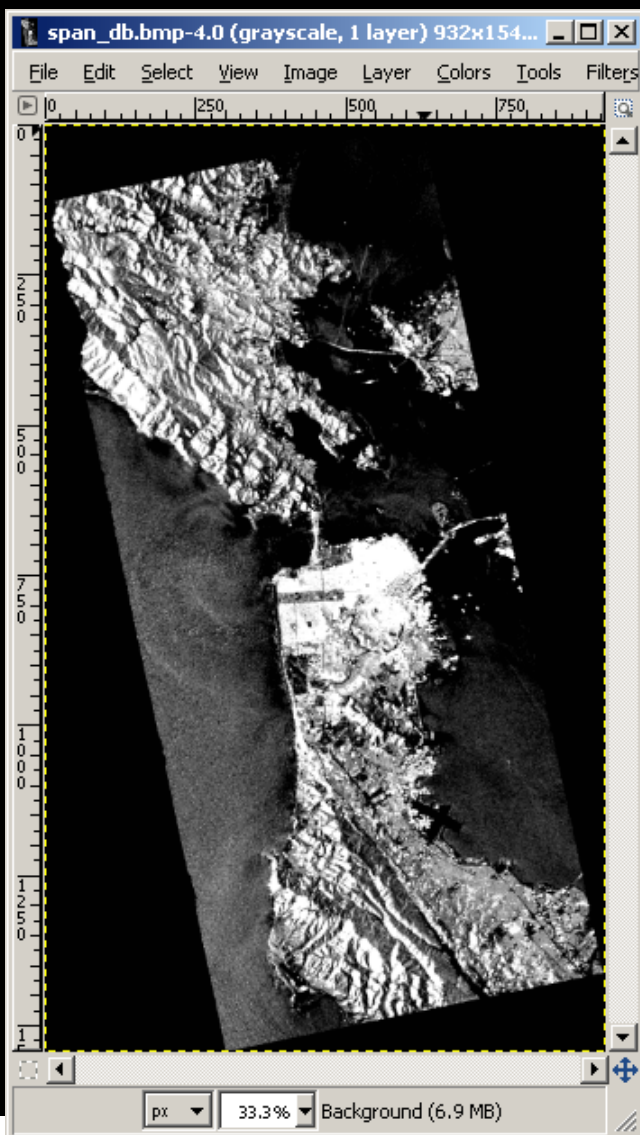
T11_dB

T22_dB

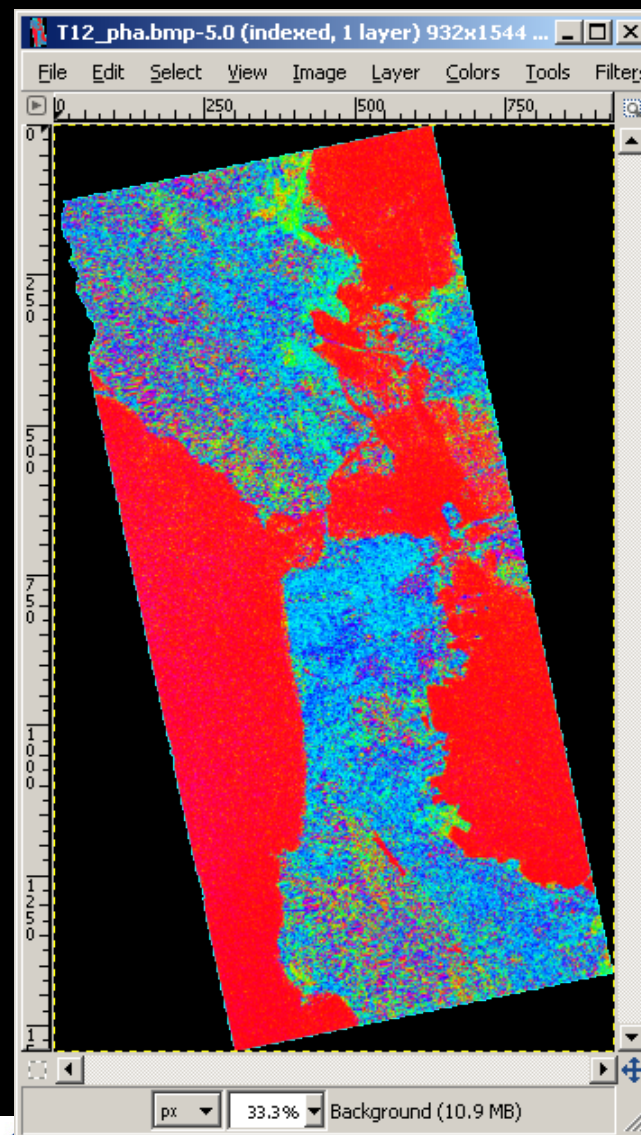
T33_dB

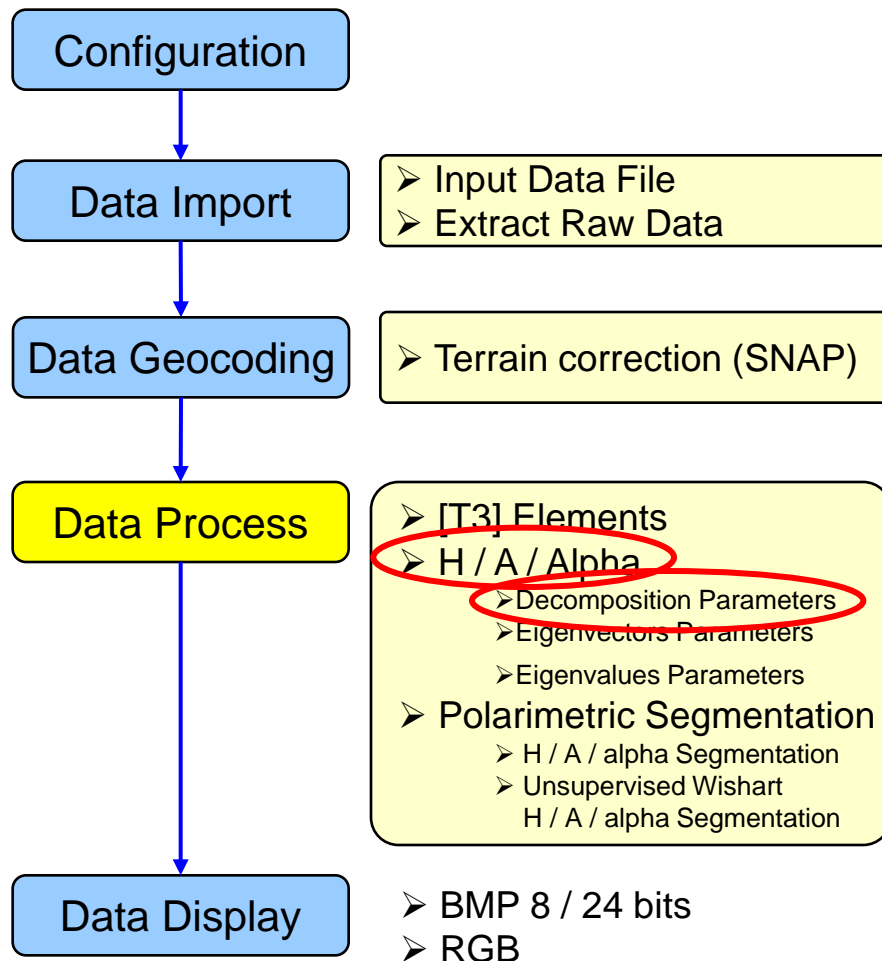


span_dB

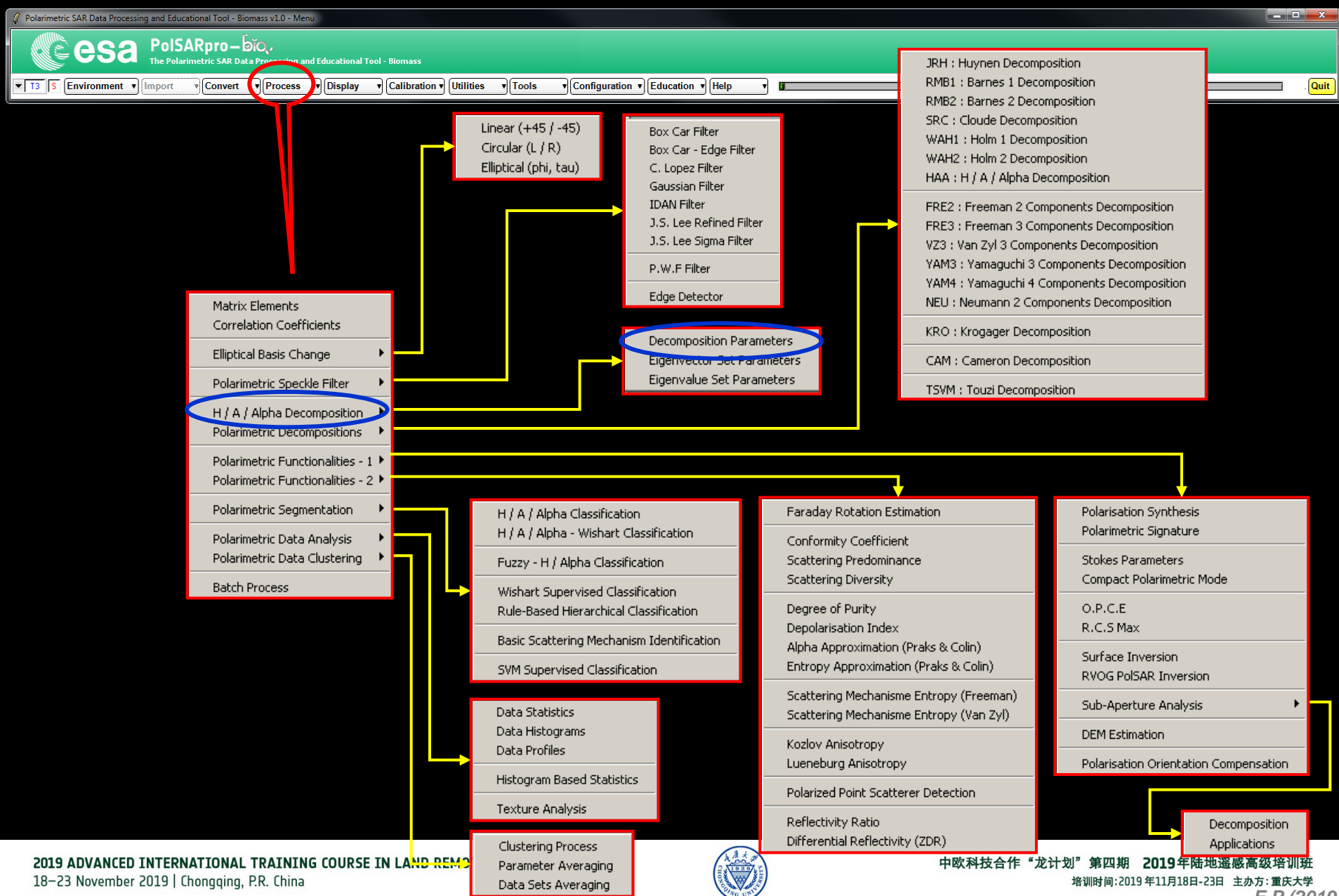


T12 pha





PoISARpro - Bio SOFTWARE





Do it Yourself:

Select some elements, set the parameters ($N_{win} = 3$) and view the corresponding BMP files (select BMP).

Data Processing: H / A / Alpha Decomposition Parameters

Input Directory:

Output Directory: / T3

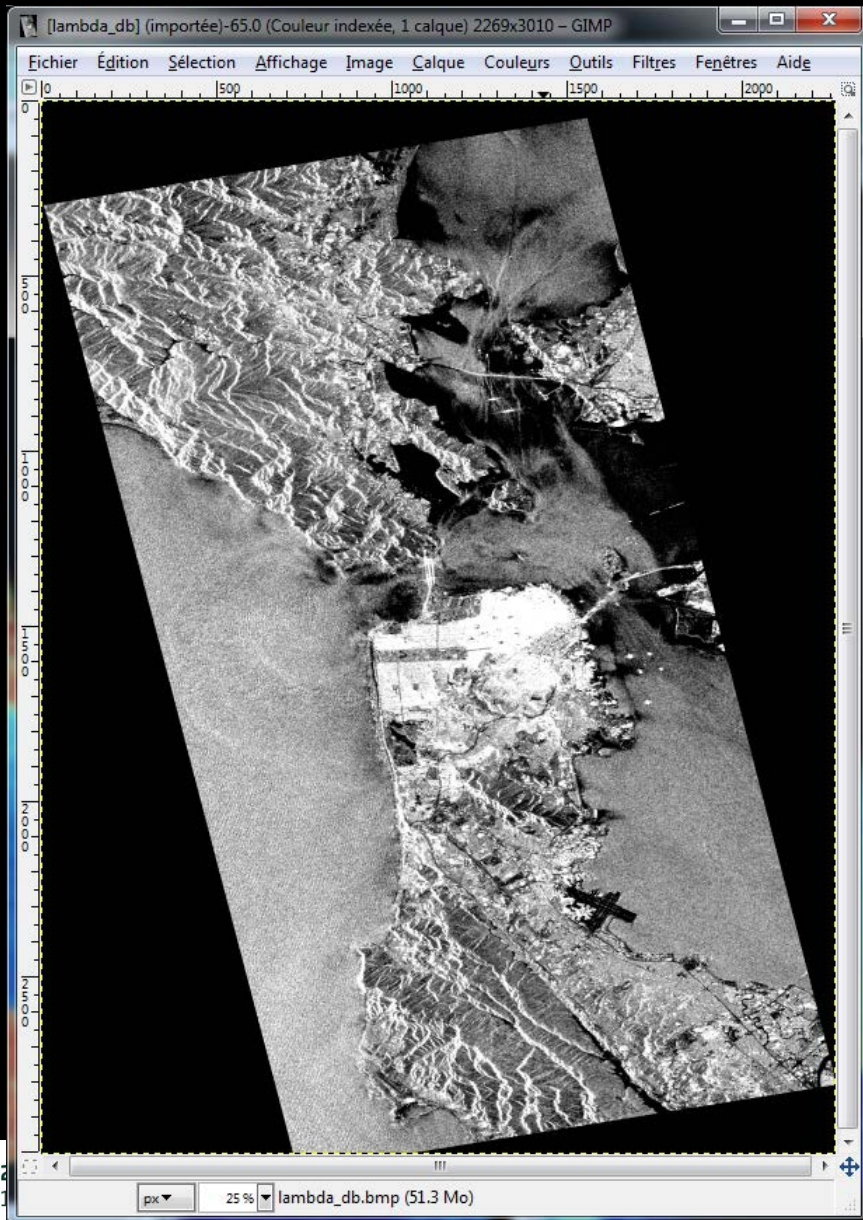
Init Row: End Row: Init Col: End Col:

<input checked="" type="checkbox"/> Alpha, Beta, Delta, Gamma, Lambda	<input checked="" type="checkbox"/> BMP
<input checked="" type="checkbox"/> Lambda	<input checked="" type="checkbox"/> BMP
<input checked="" type="checkbox"/> Alpha	<input checked="" type="checkbox"/> BMP
<input checked="" type="checkbox"/> Entropy (H)	<input checked="" type="checkbox"/> BMP
<input checked="" type="checkbox"/> Anisotropy [A]	<input checked="" type="checkbox"/> BMP
<input checked="" type="checkbox"/> Combinations (H , A)	<input checked="" type="checkbox"/> H A <input checked="" type="checkbox"/> (1 - H) A <input checked="" type="checkbox"/> H (1 - A) <input checked="" type="checkbox"/> (1 - H) (1 - A)

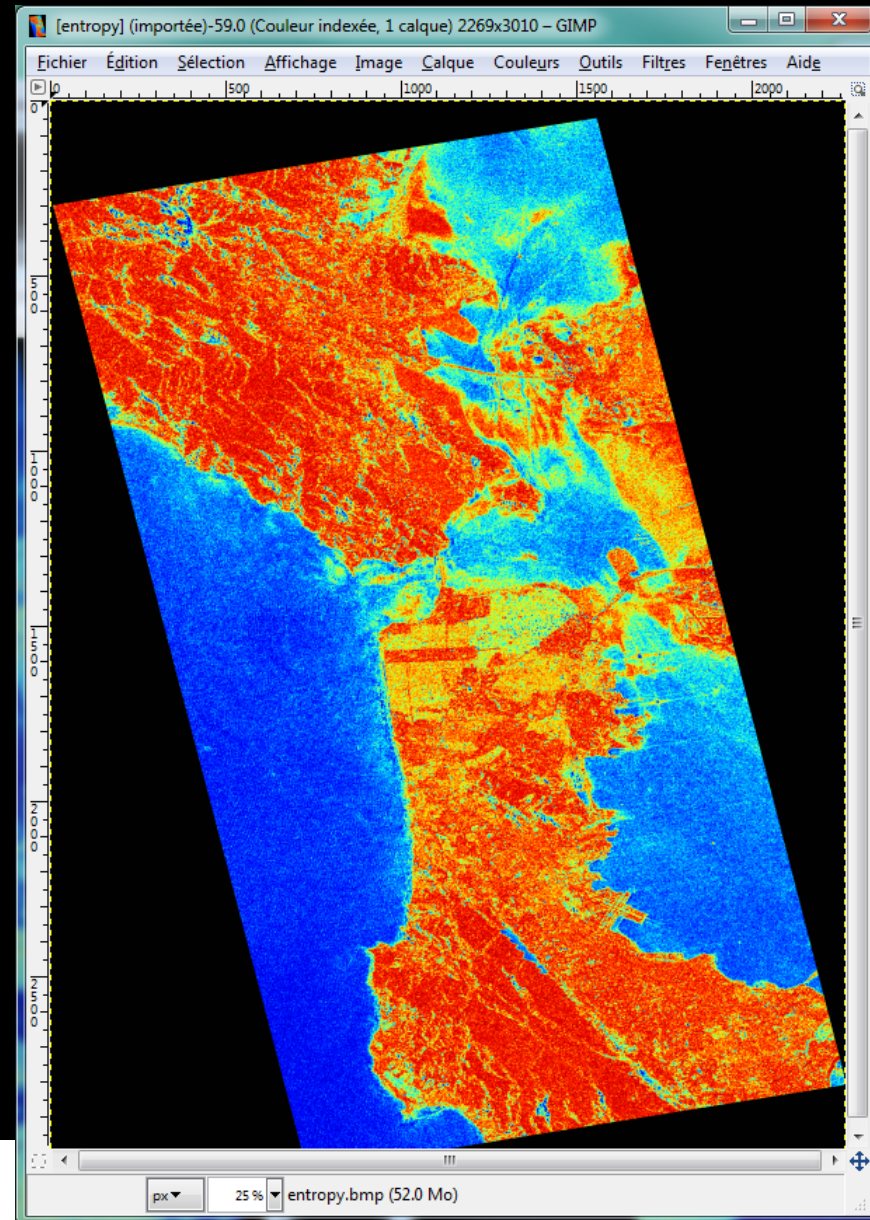
Window Size Row: Window Size Col:

Equivalence between [T] and [C] eigen-decompositions.

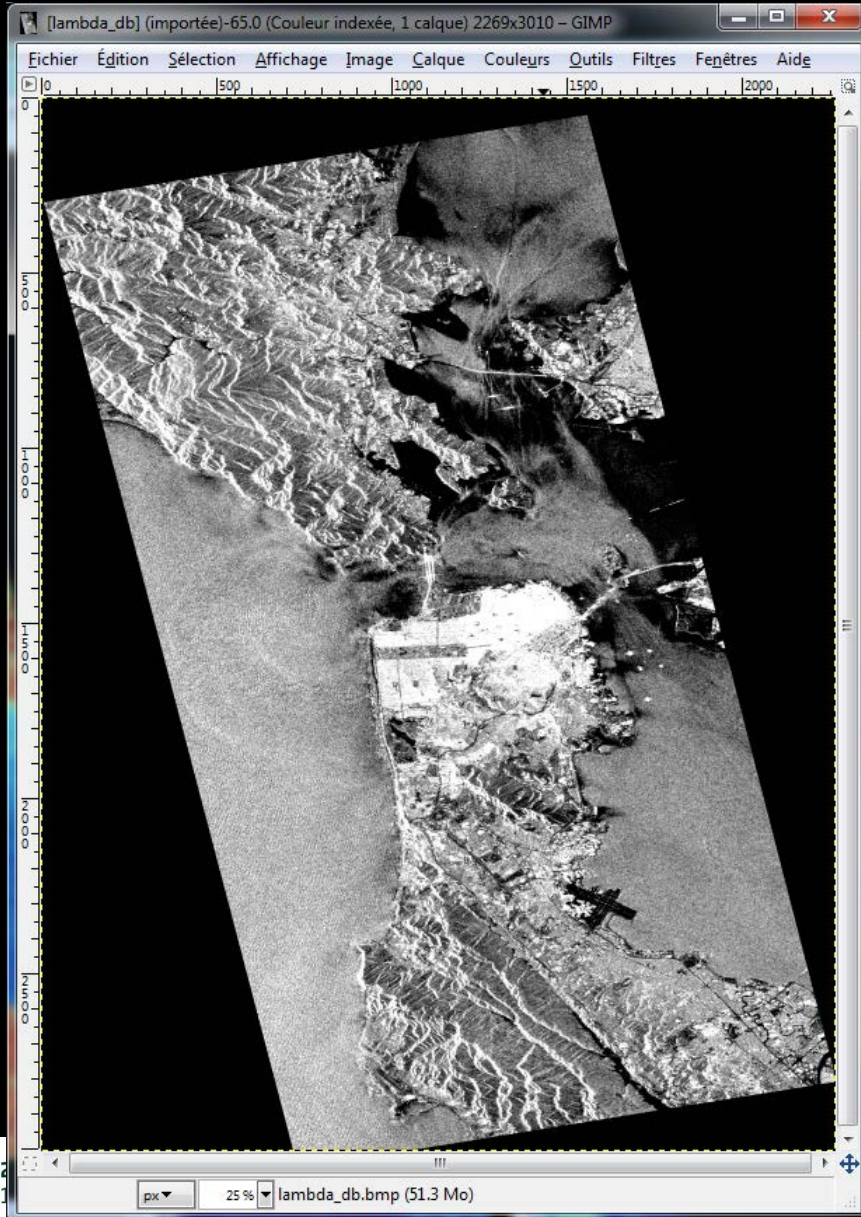
Lambda



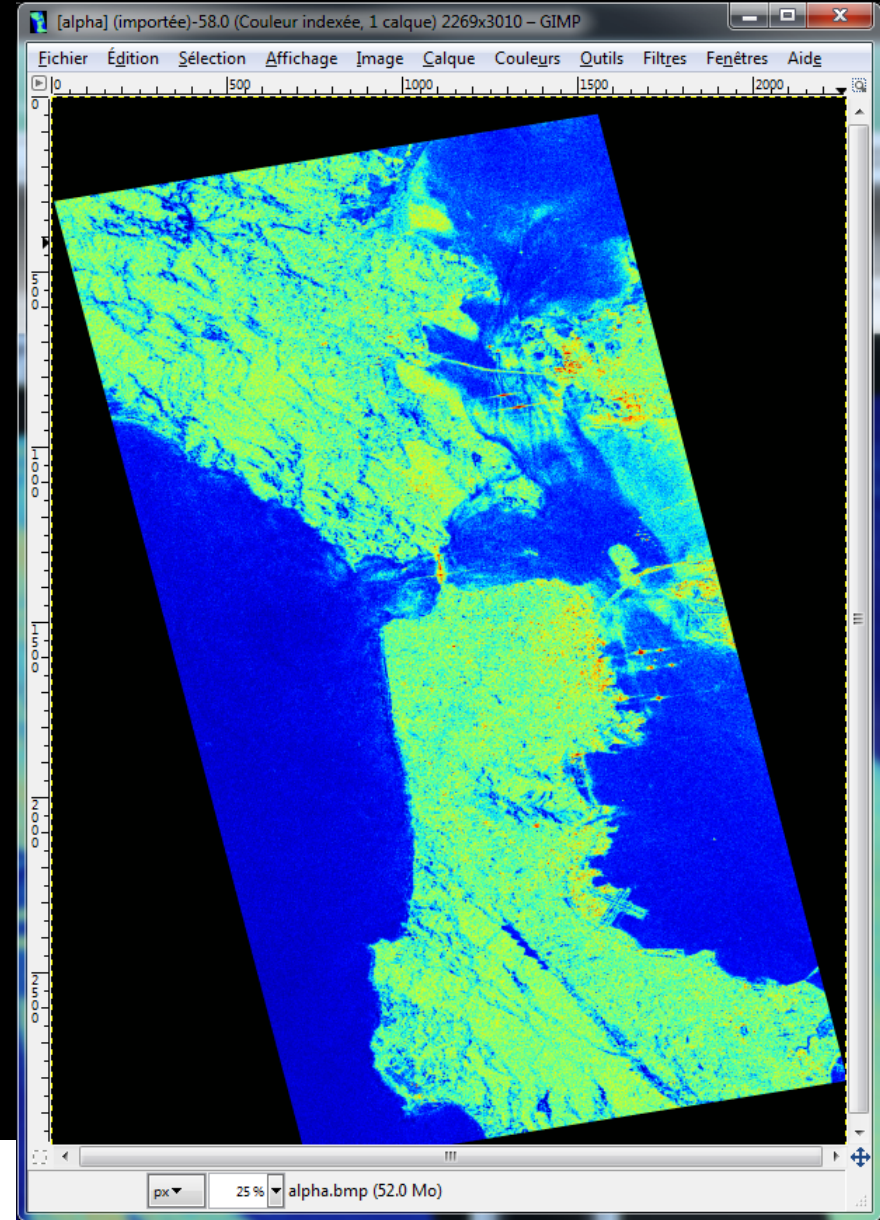
Entropy



Lambda



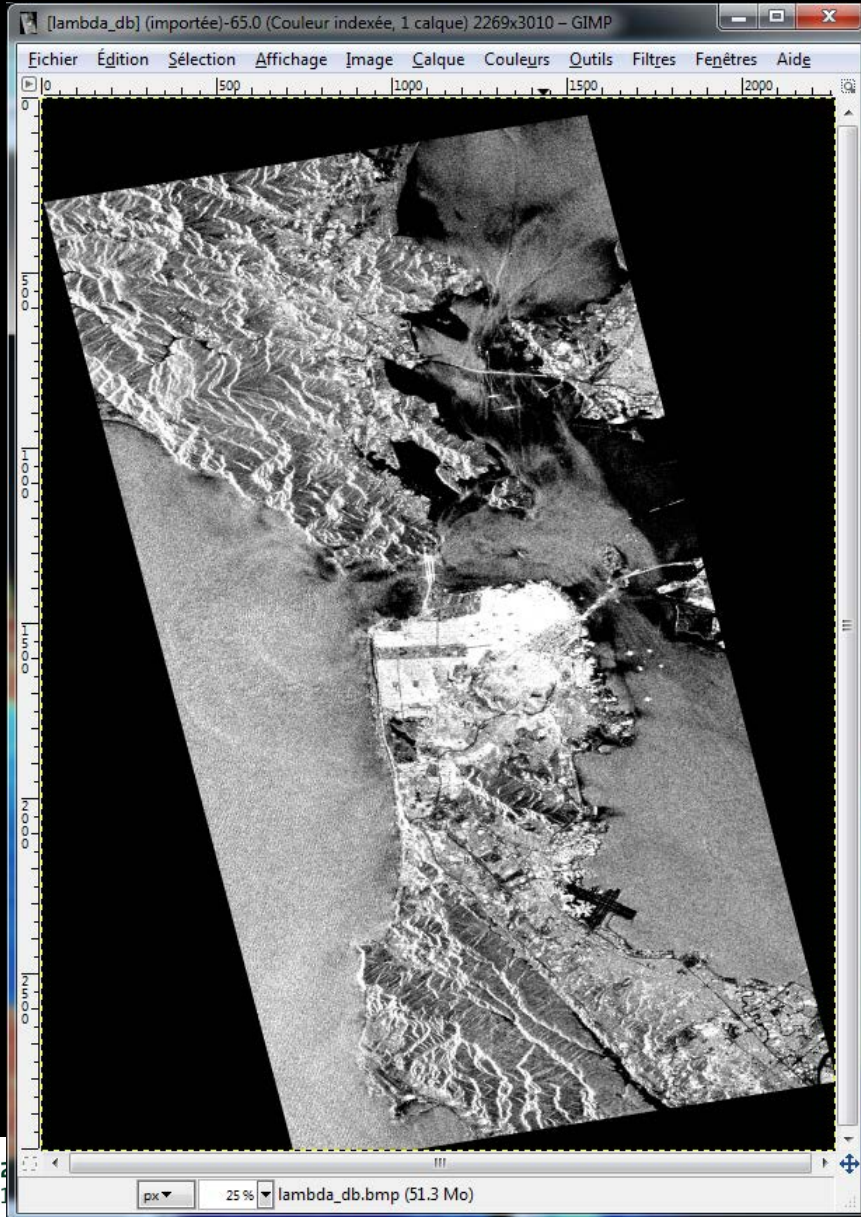
Alpha



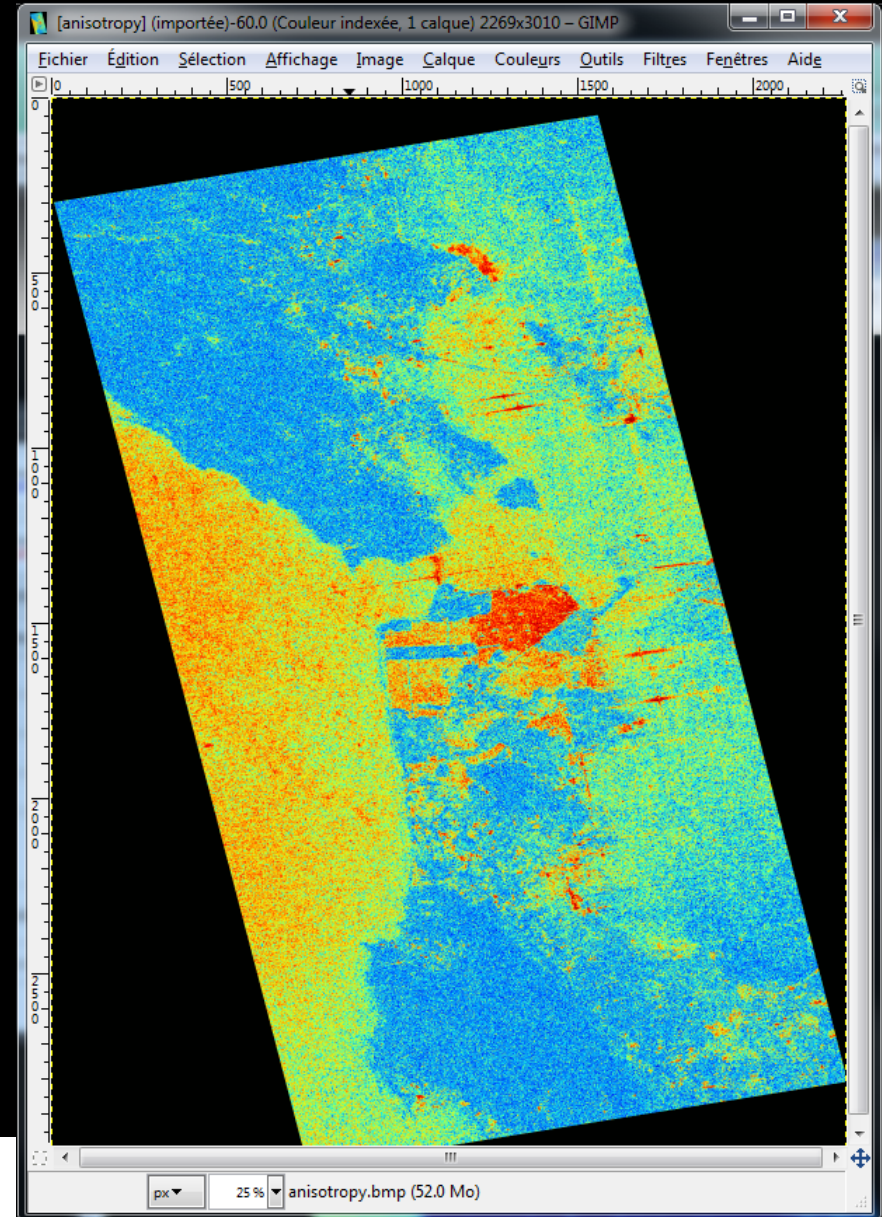
DECOMPOSITION PARAMETER



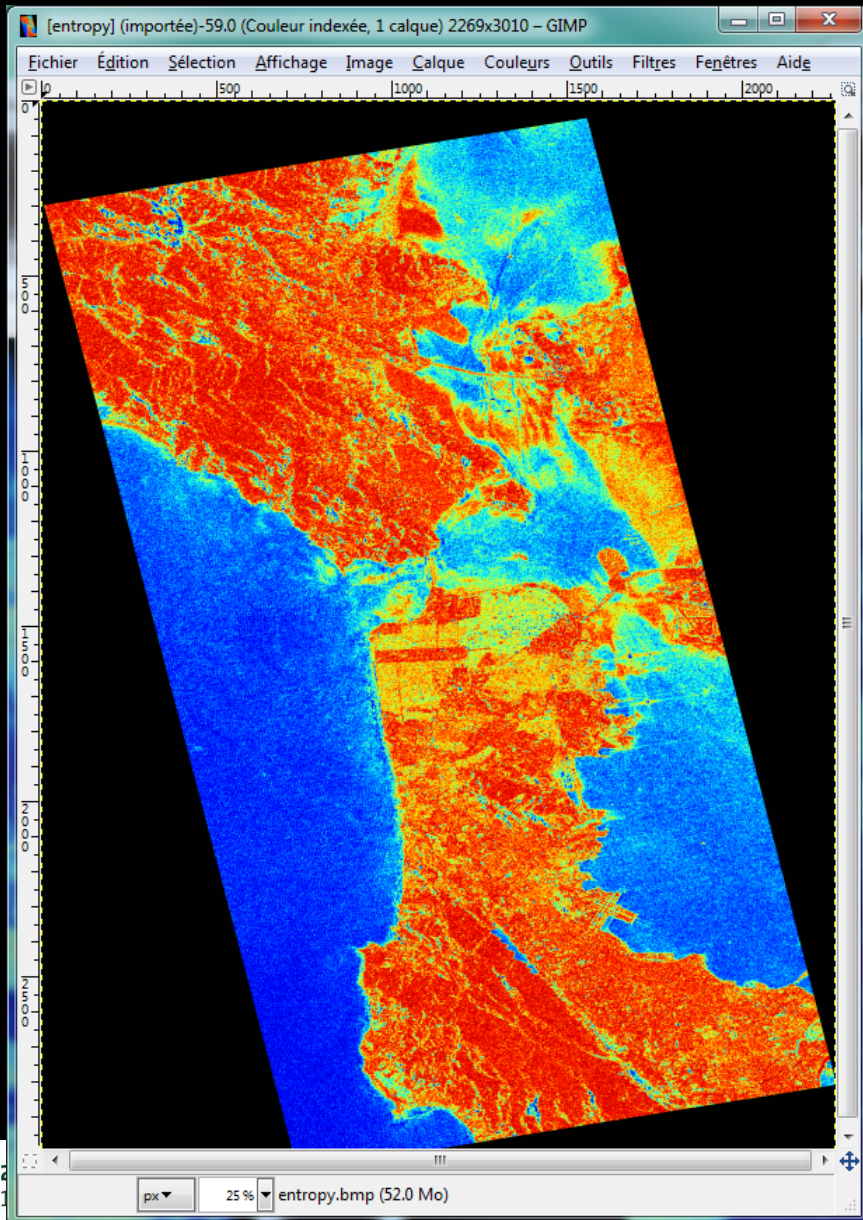
Lambda



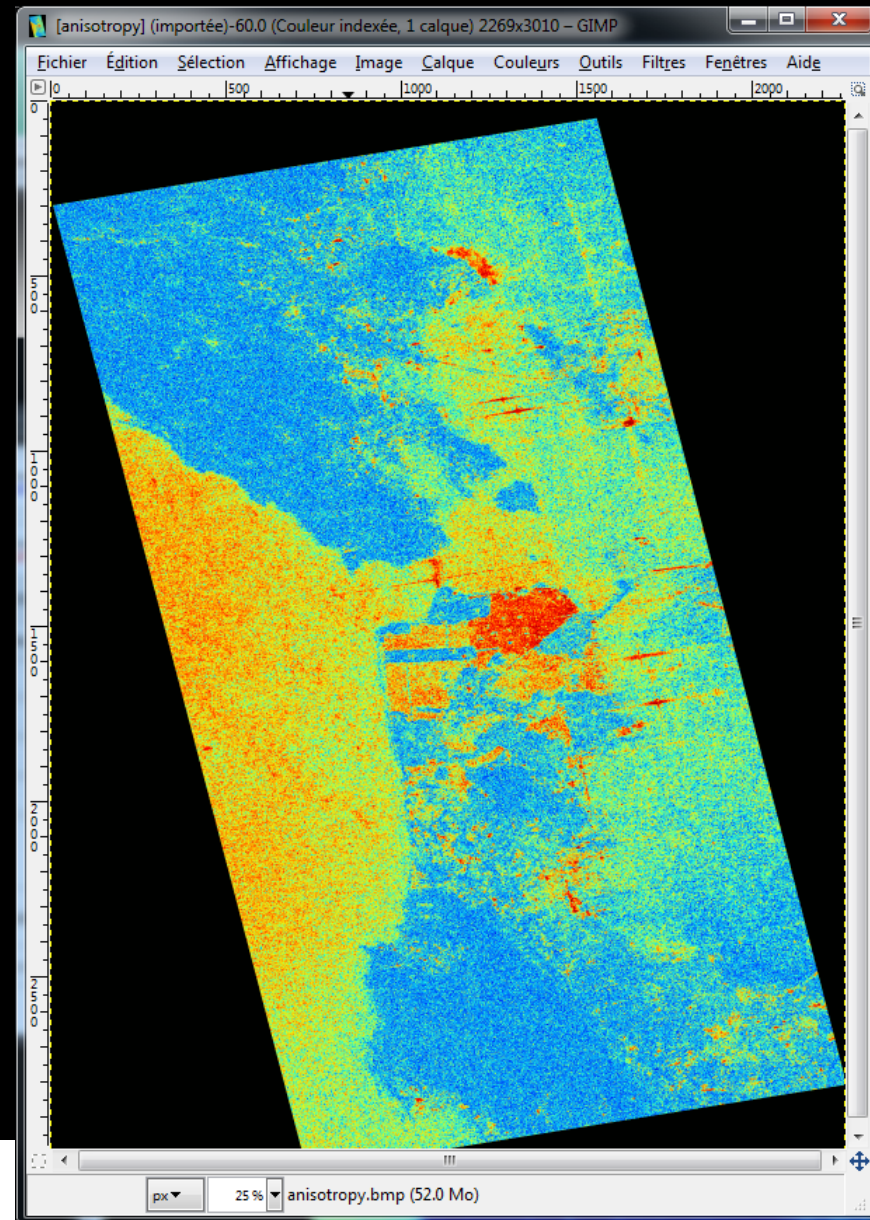
Anisotropy



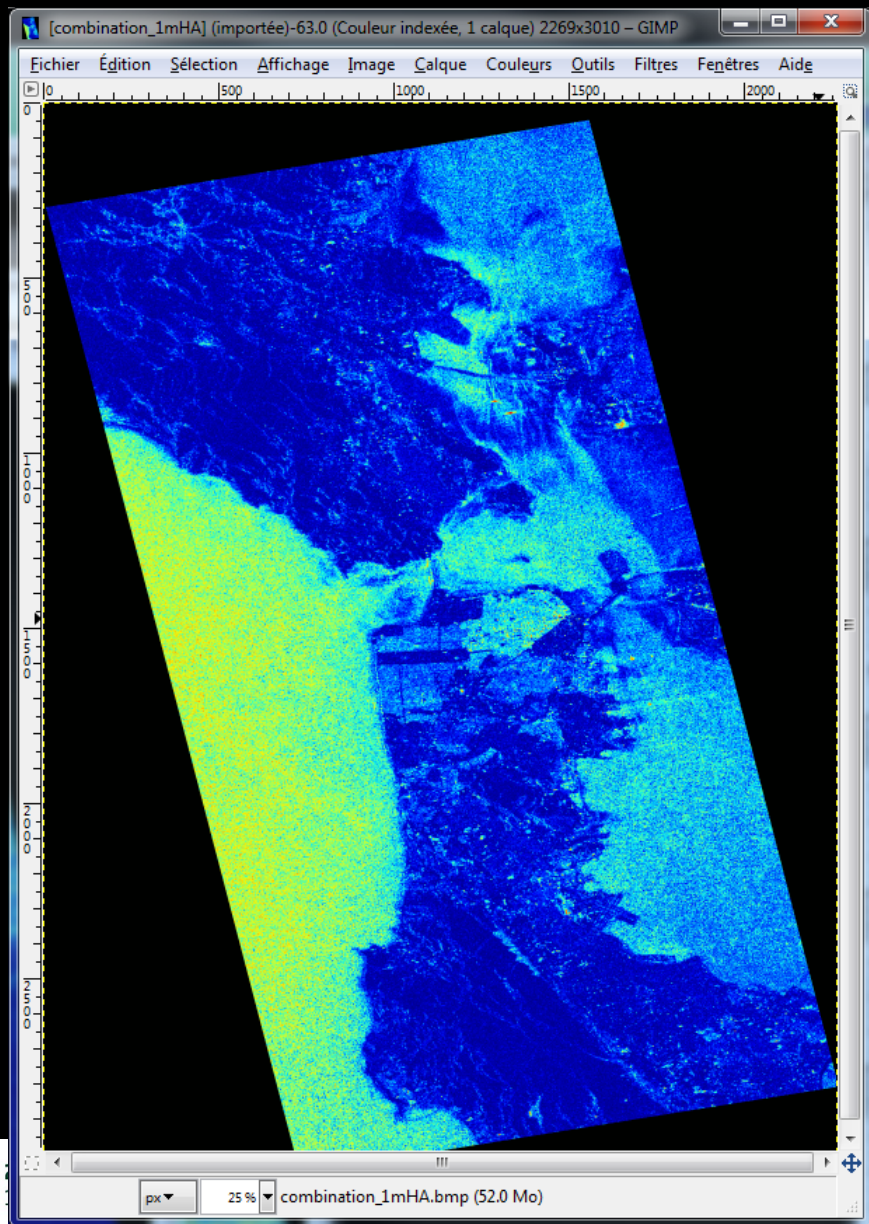
Entropy



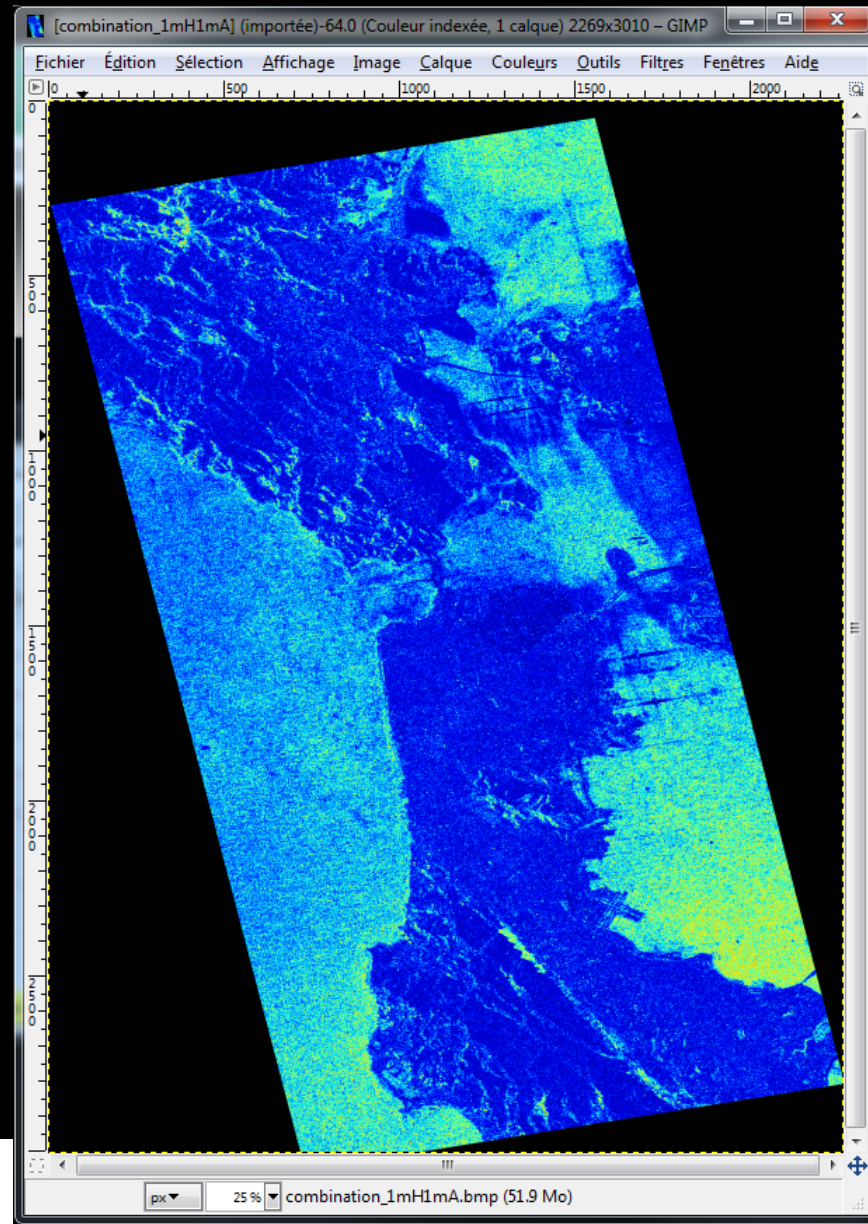
Anisotropy



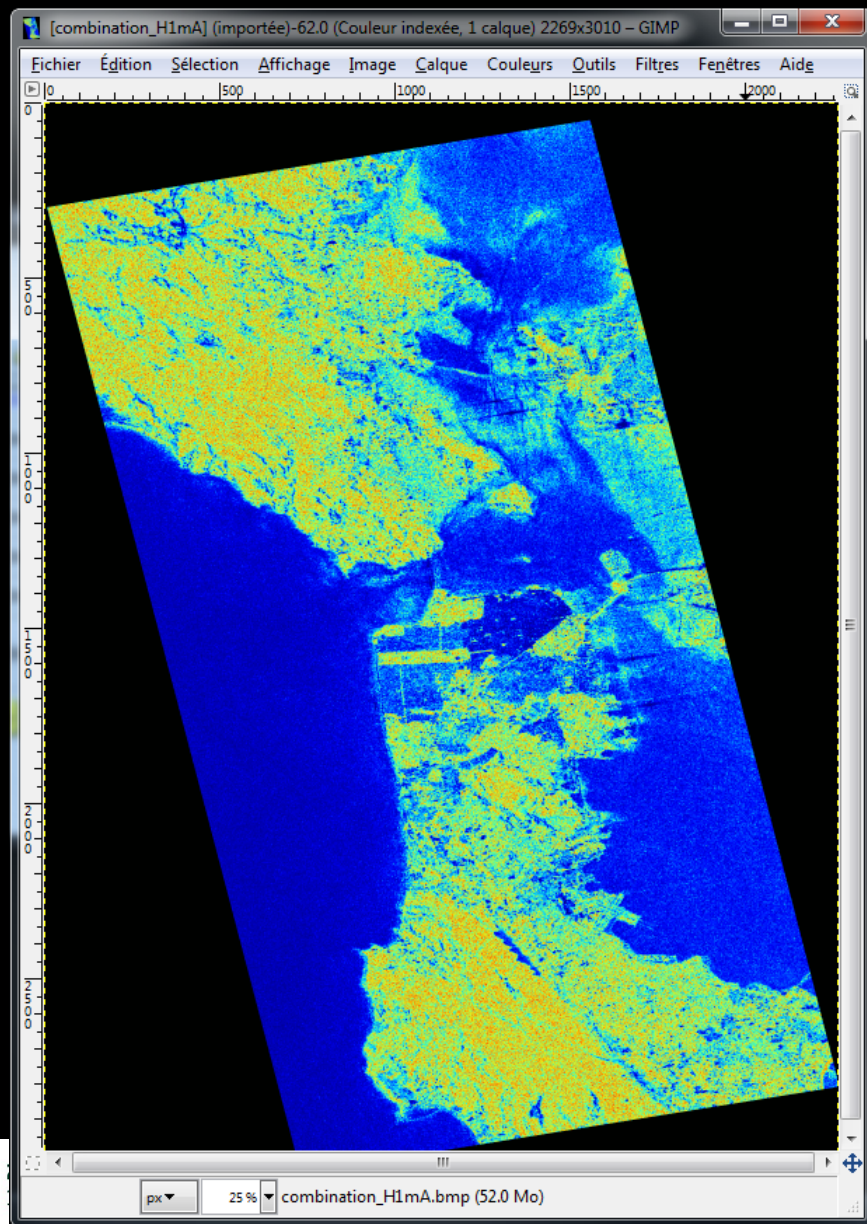
(1-H) A



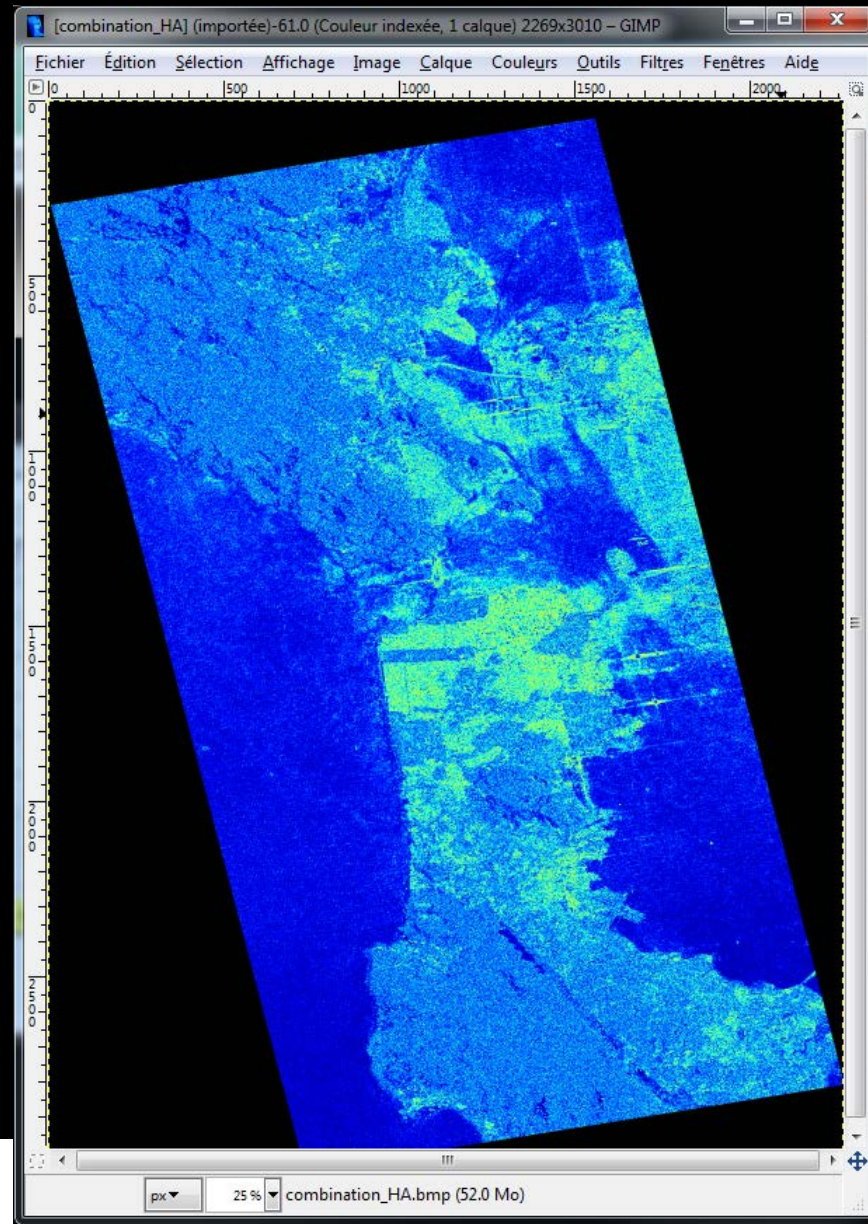
(1-H) (1-A)

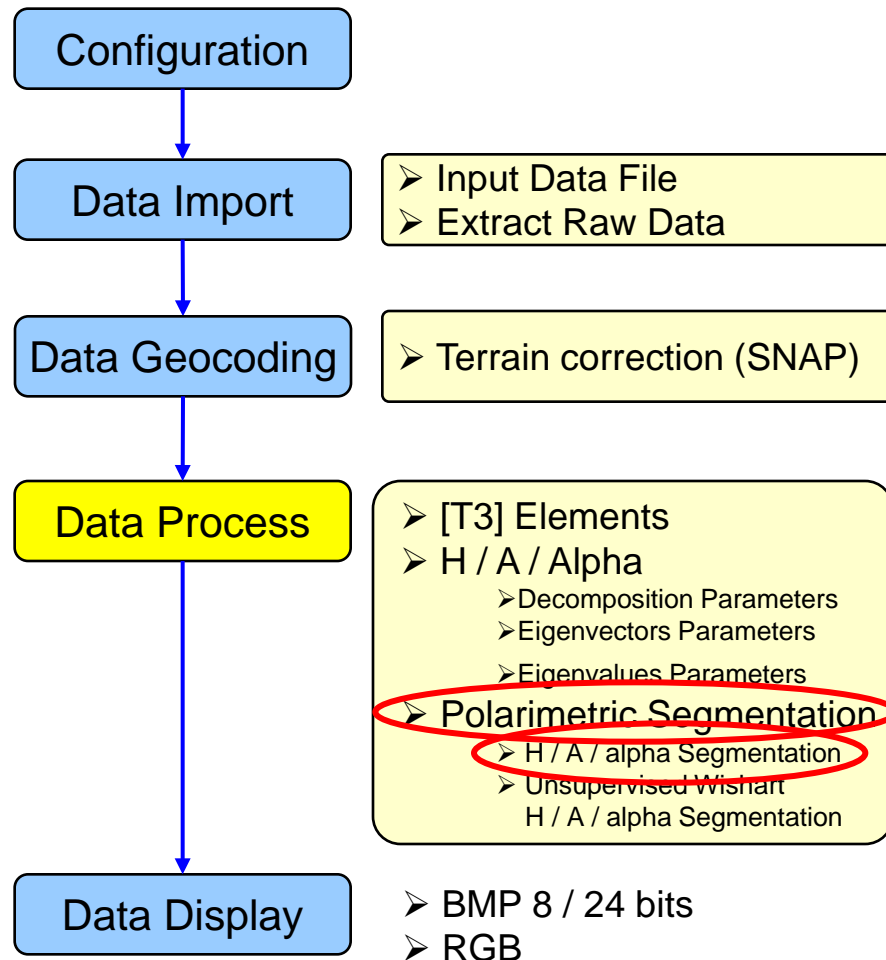


H (1-A)

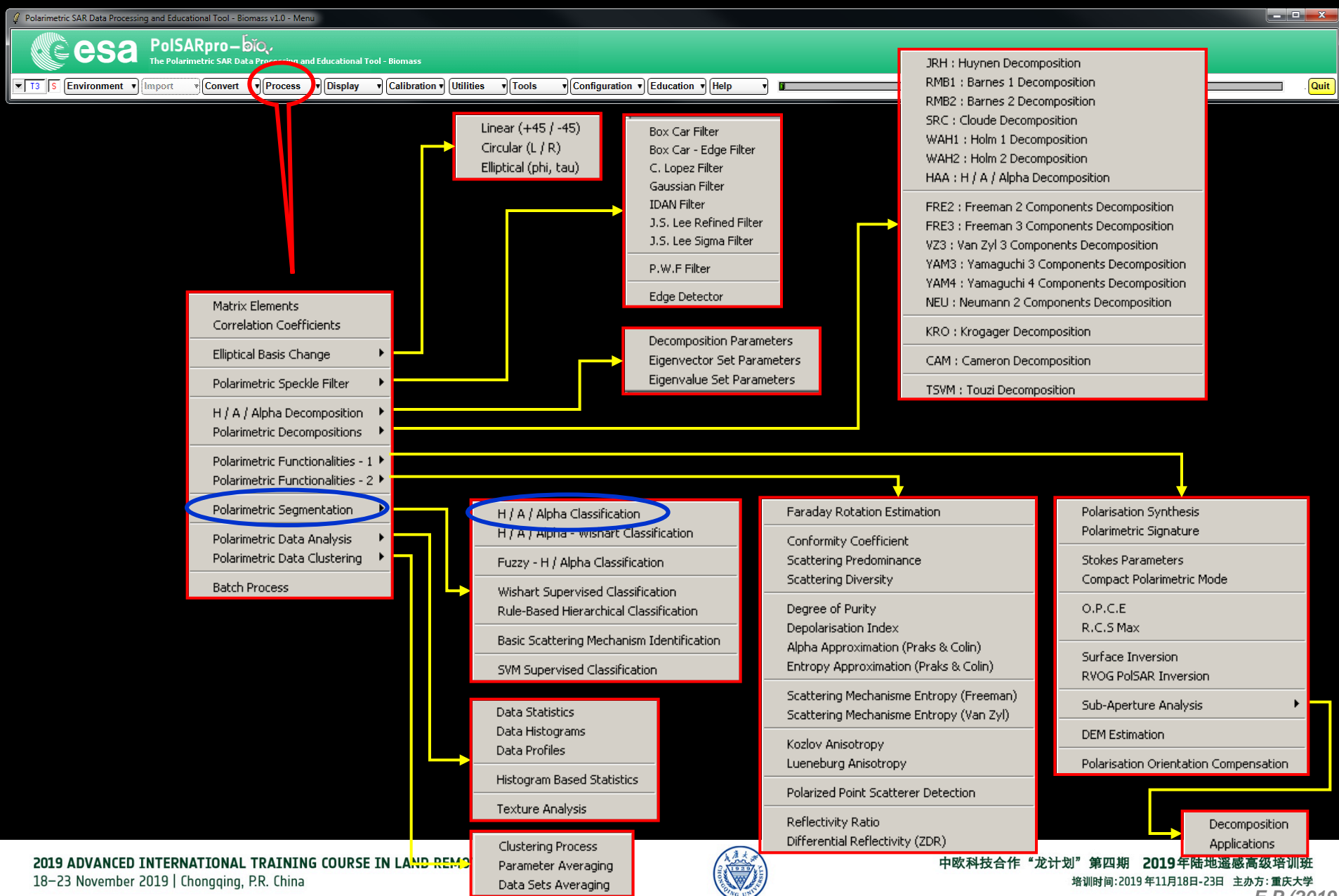


HA





PoSARpro - Bio SOFTWARE





Do it Yourself:
Select some elements, set the parameters (**Nwin = 3**) and view the corresponding BMP files.

Data Processing: H / A / Alpha Classification

Input Directory:

Output Directory: / T3

Init Row: End Row: Init Col: End Col:

Representation

- Anisotropy Entropy Alpha
- $HA + (1-H)A$ $H(1-A)$ $(1-H)(1-A)$
- Alpha (Hue) / Entropy (Sat) / Lambda (Light)

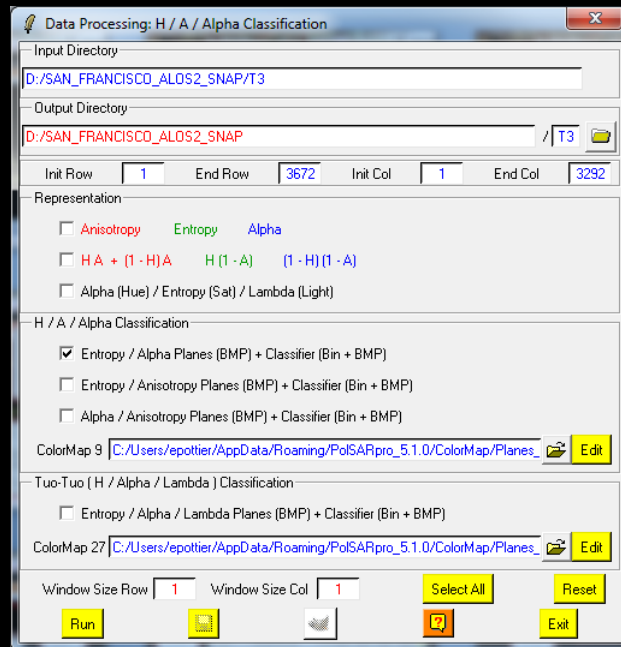
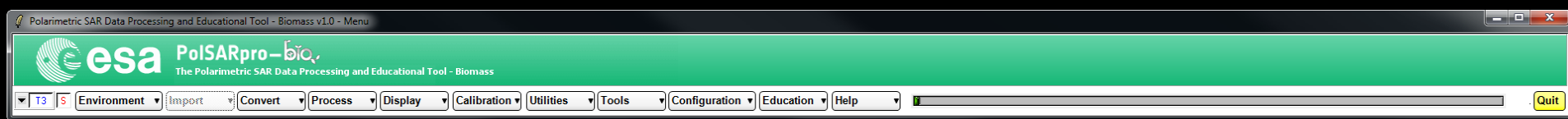
H / A / Alpha Classification

- Entropy / Alpha Planes (BMP) + Classifier (Bin + BMP)
- Entropy / Anisotropy Planes (BMP) + Classifier (Bin + BMP)
- Alpha / Anisotropy Planes (BMP) + Classifier (Bin + BMP)

Tuo-Tuo (H / Alpha / Lambda) Classification

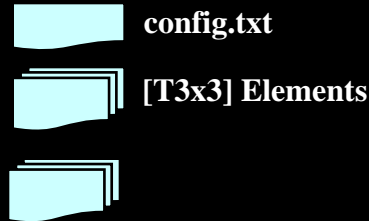
- Entropy / Alpha / Lambda Planes (BMP) + Classifier (Bin + BMP)

Window Size Row: Window Size Col:



Do it Yourself:
 Select some elements, set the parameters (**Nwin = 3**) and view the corresponding BMP files.

DATADIR

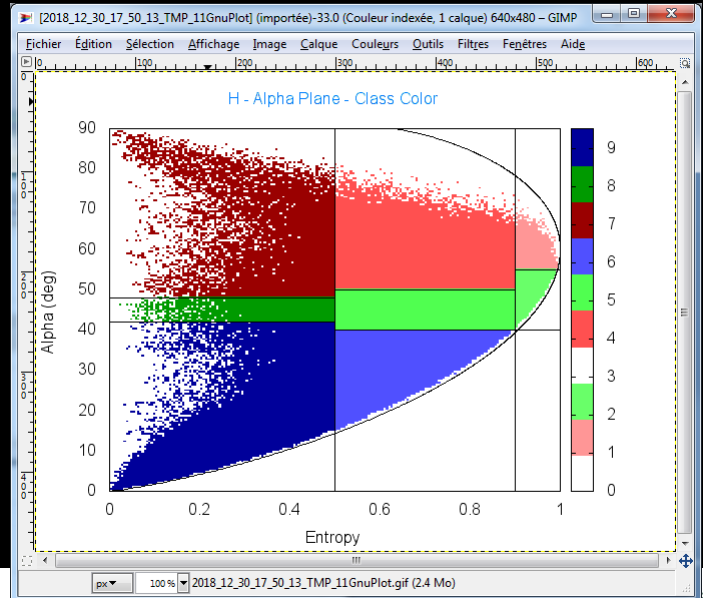
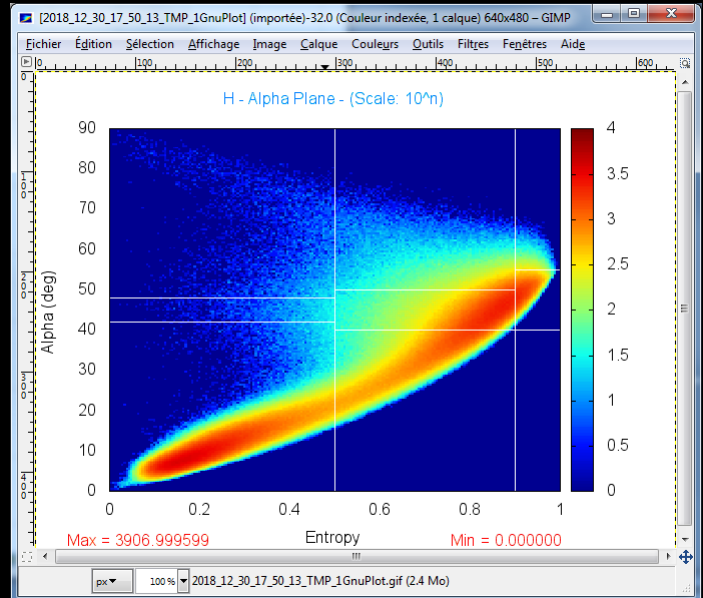
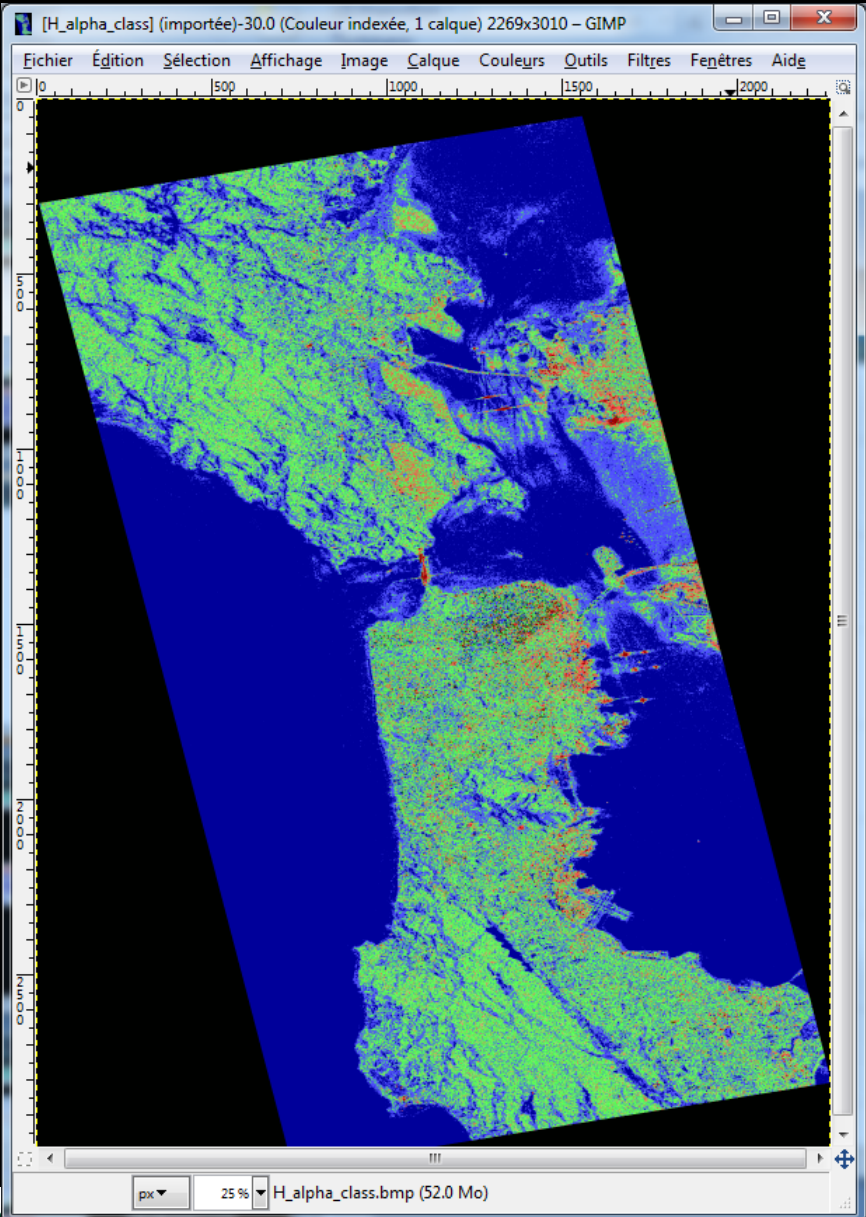


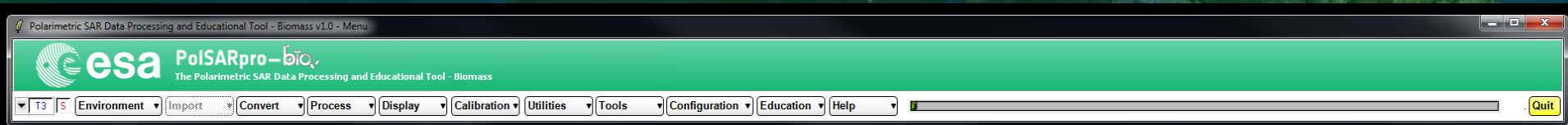
entropy.bin, anisotropy.bin, alpha.bin
 combination_HA.bin, combination_1mHA.bin,
 combination_H1mA.bin, combination_1mH1mA.bin
 H_A_class.bin, H_Alpha_class.bin, A_Alpha_class.bin



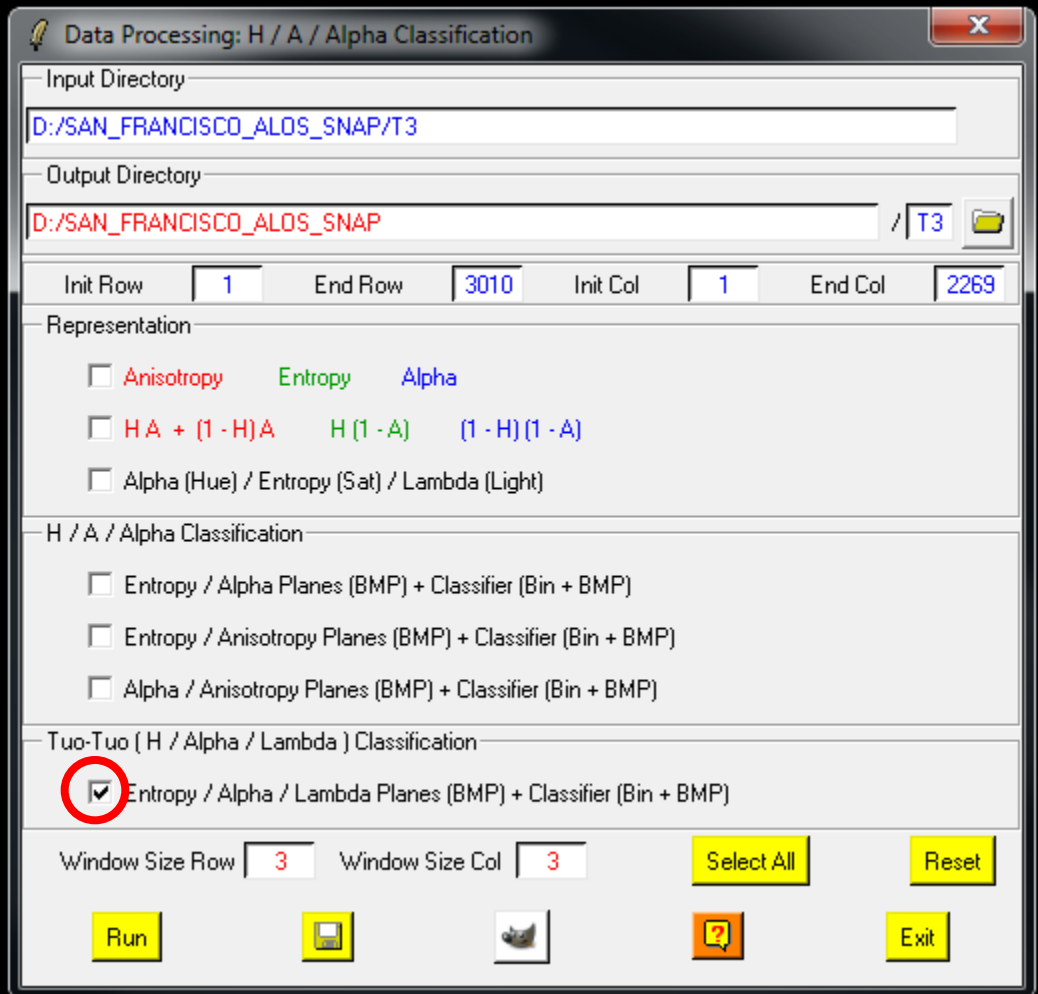
entropy.bmp, anisotropy.bmp, alpha.bmp
 combination_HA.bmp, combination_1mHA.bmp,
 combination_H1mA.bmp, combination_1mH1mA.bmp
 H_A_class.bmp, H_Alpha_class.bmp, A_Alpha_class.bmp
 H_A_occurrence.bmp, H_Alpha_occurrence.bmp,
 A_Alpha_occurrence.bmp, H_A_segmented.bmp,
 H_Alpha_segmented.bmp, A_Alpha_segmented.bmp
 HAlphaLambda_RGB.bmp, HAlpha_RGB.bmp
 HACombinations_RGB.bmp

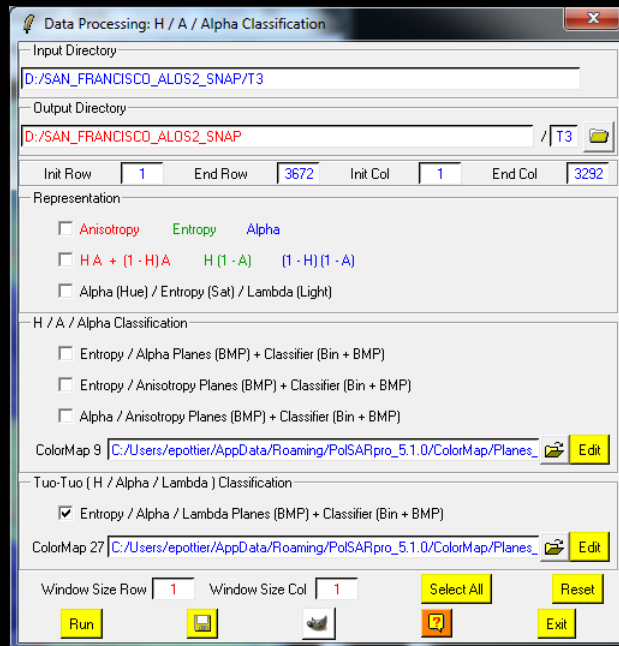
H / A / alpha CLASSIFICATION





Do it Yourself:
Select some elements, set the parameters (**Nwin = 3**) and view the corresponding BMP files.





Do it Yourself:
 Select some elements, set the parameters (**Nwin = 3**) and view the corresponding BMP files.

DATADIR

config.txt

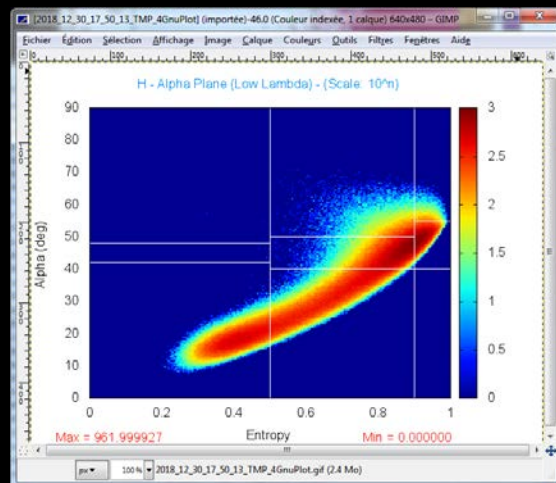
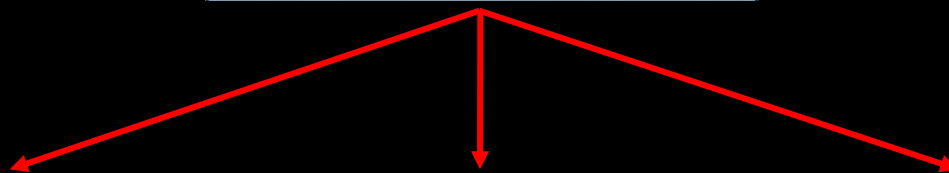
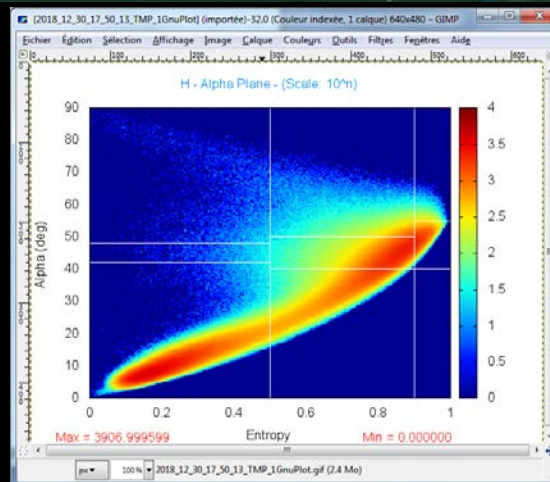
[T3x3] Elements



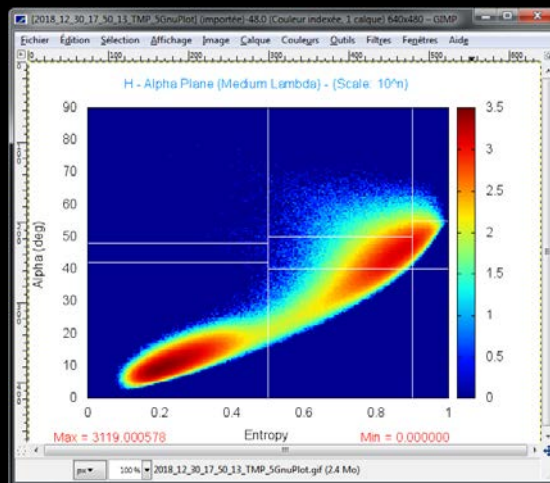
H_alpha_lambda_class1(2,3).bin,
 H_alpha_lambda_occurrence_class1(2,3).bin,
 H_alpha_lambda_segmented_class1(2,3).bin,
 H_alpha_lambda_class.bin,



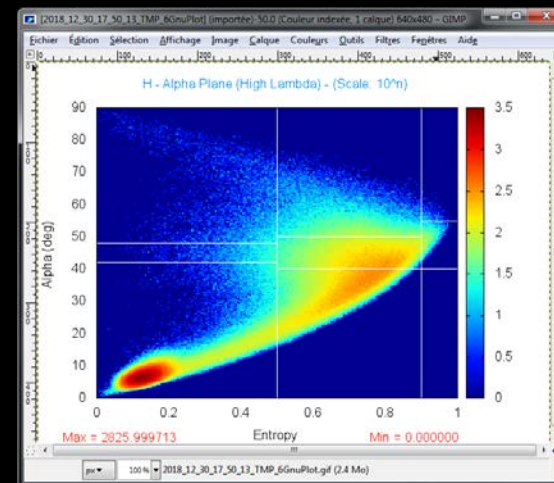
H_alpha_lambda_class1(2,3).bmp,
 H_alpha_lambda_occurrence_class1(2,3).bmp,
 H_alpha_lambda_segmented_class1(2,3).bmp,
 H_alpha_lambda_class.bmp,



Low λ

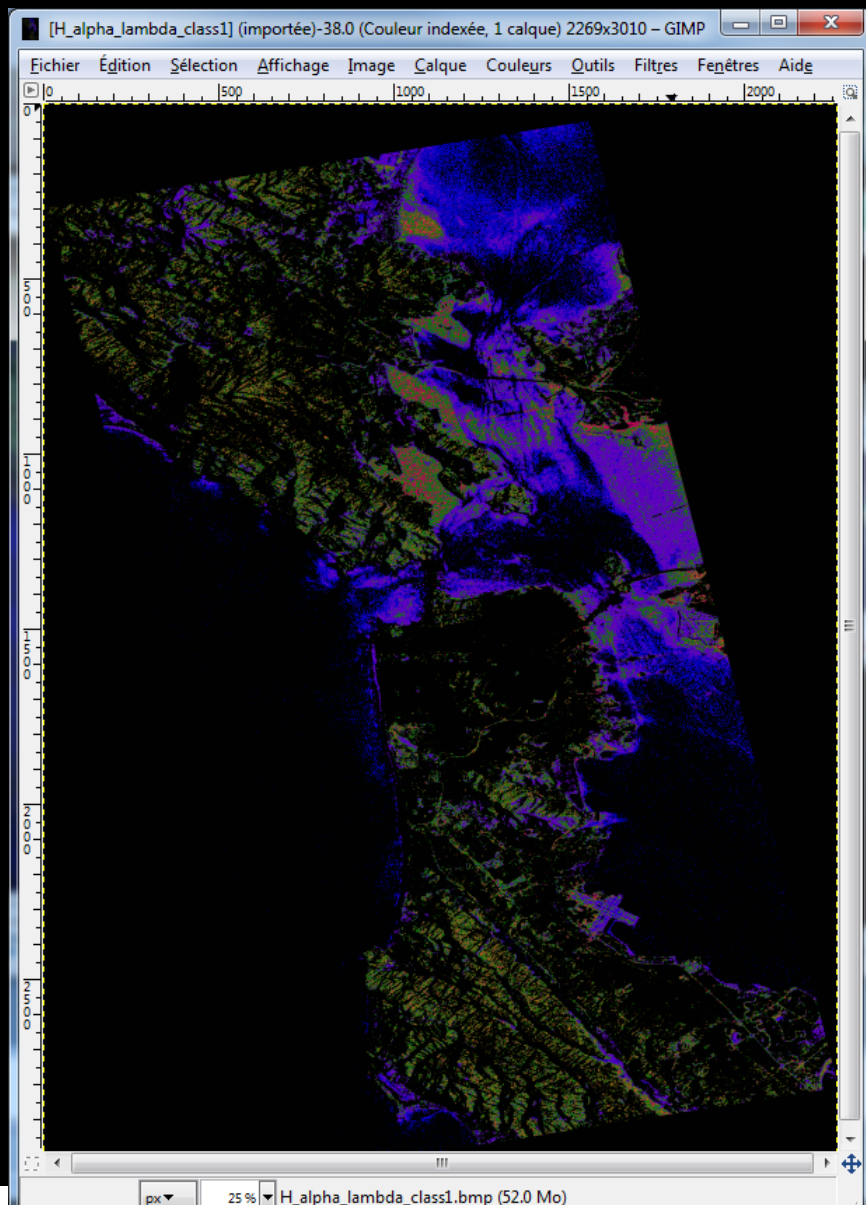


Medium λ

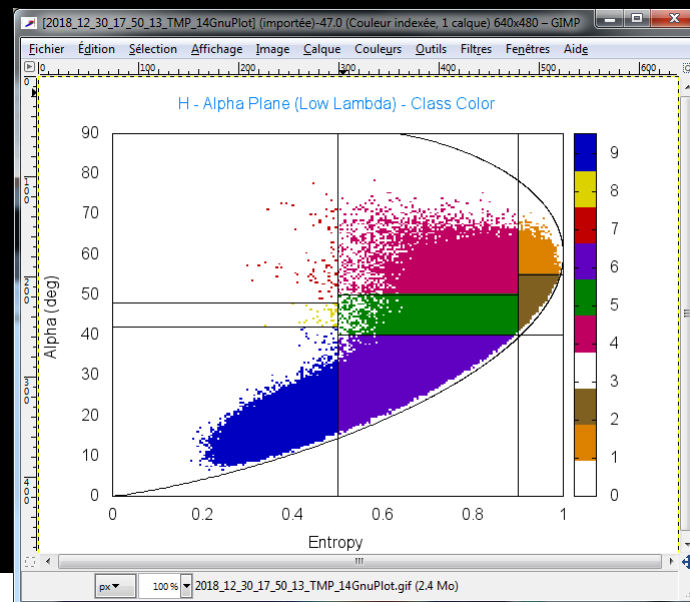
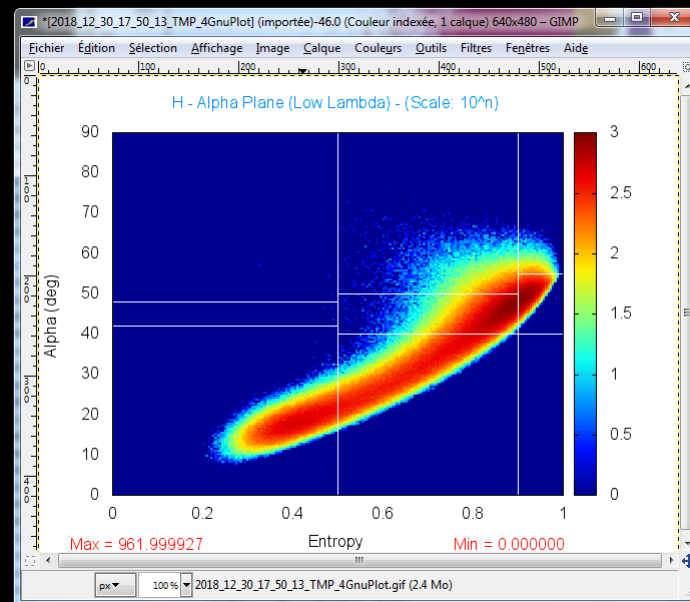


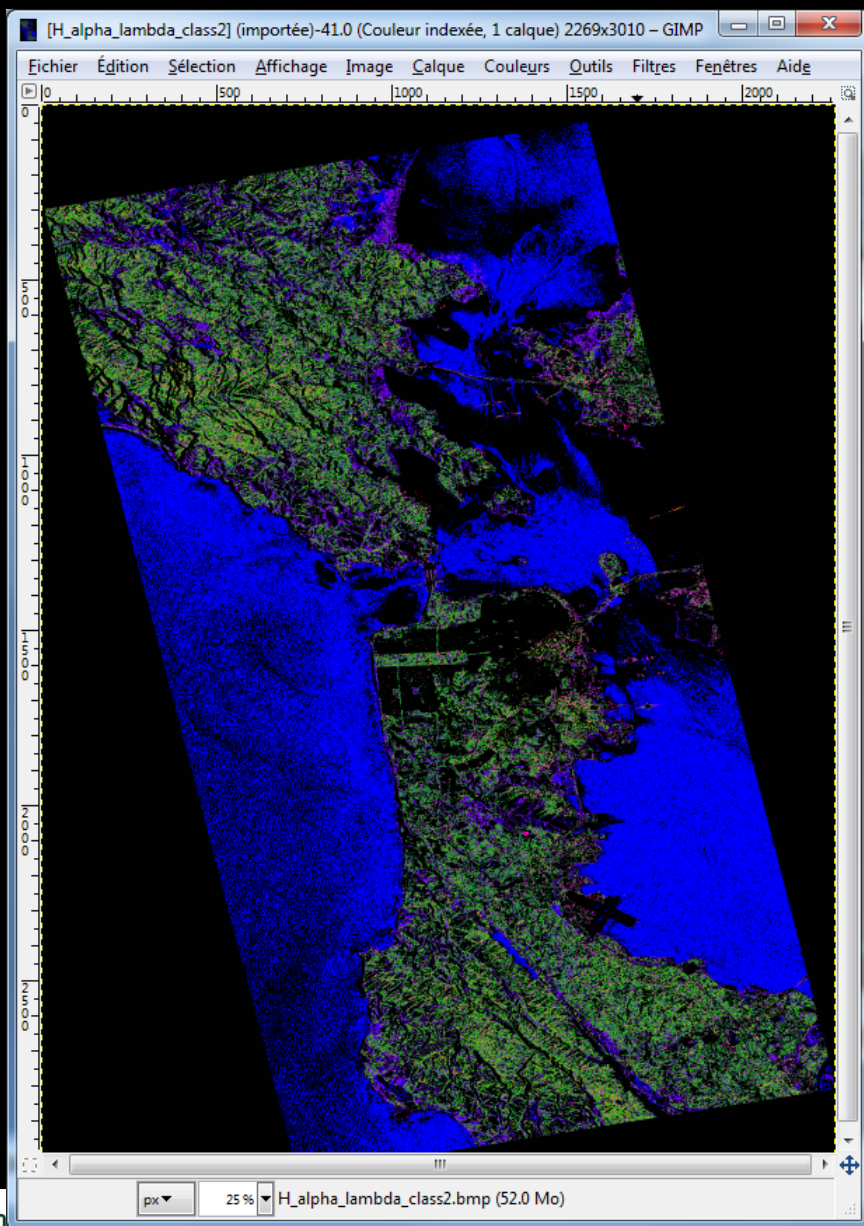
High λ

H / A / alpha CLASSIFICATION

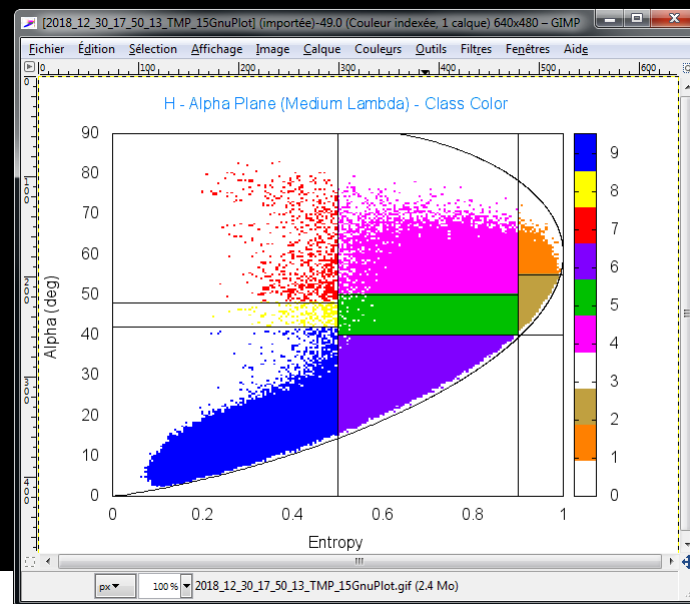
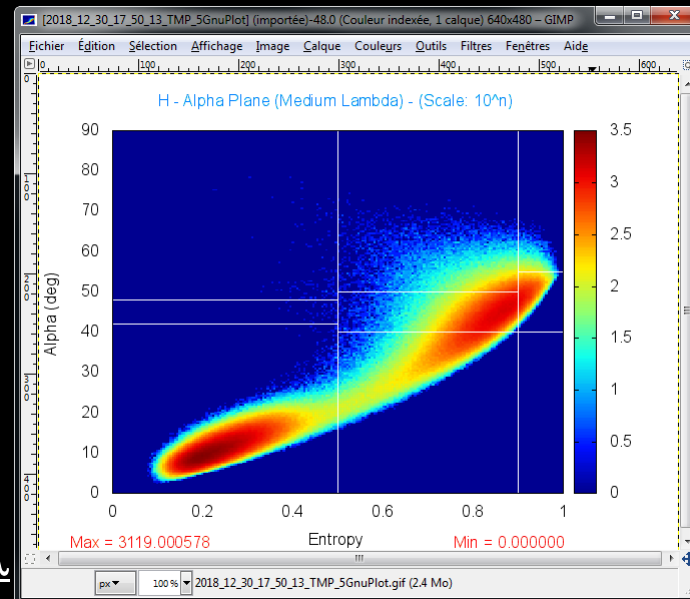


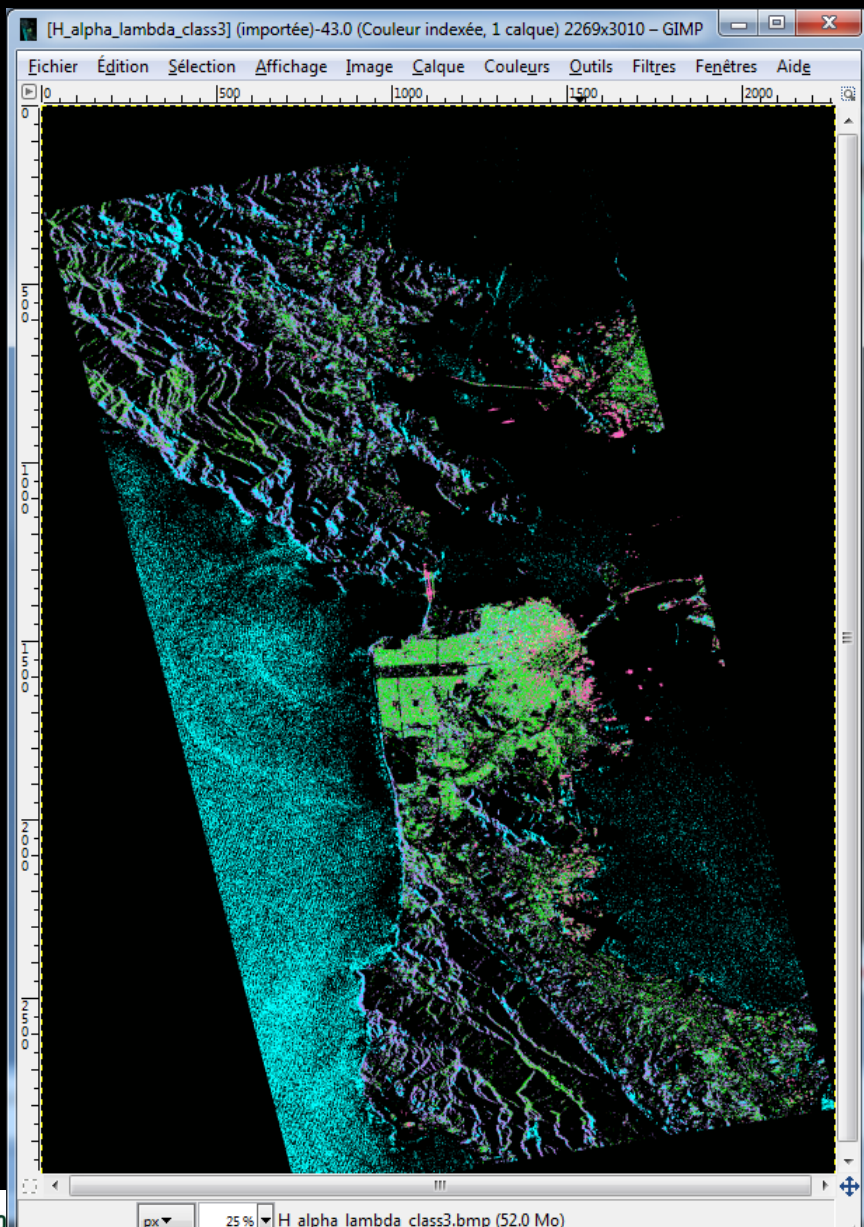
Low λ



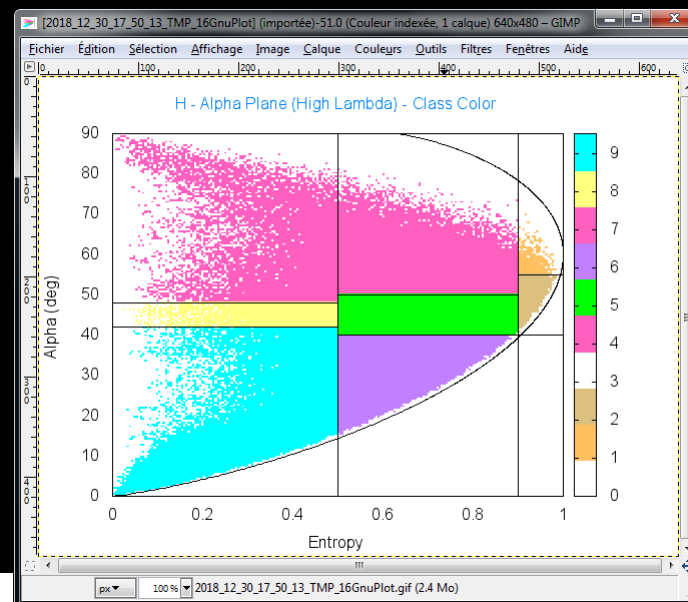
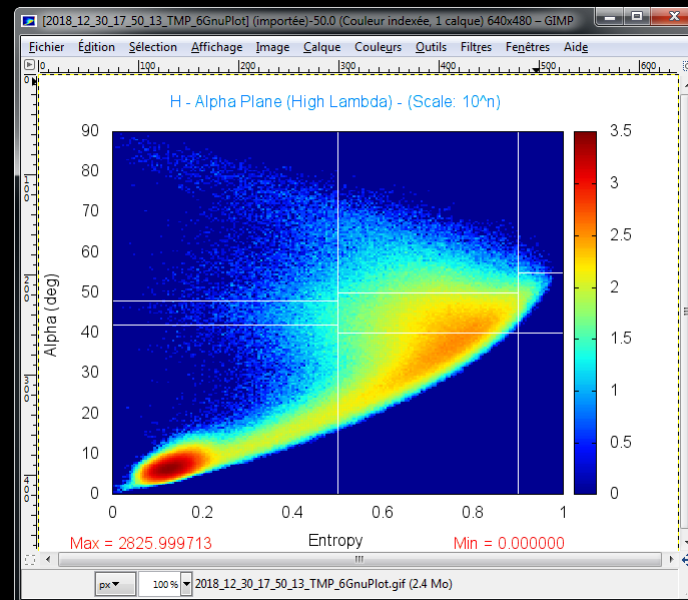


Medium λ

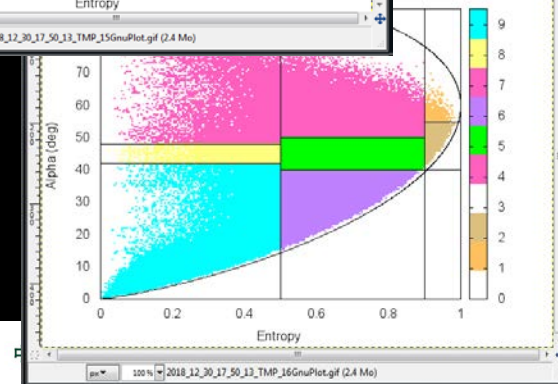
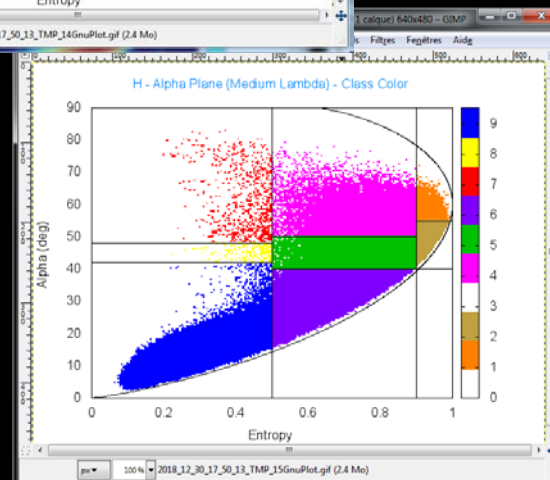
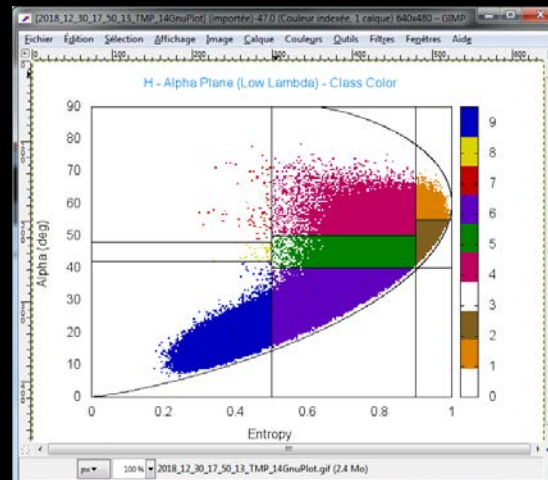
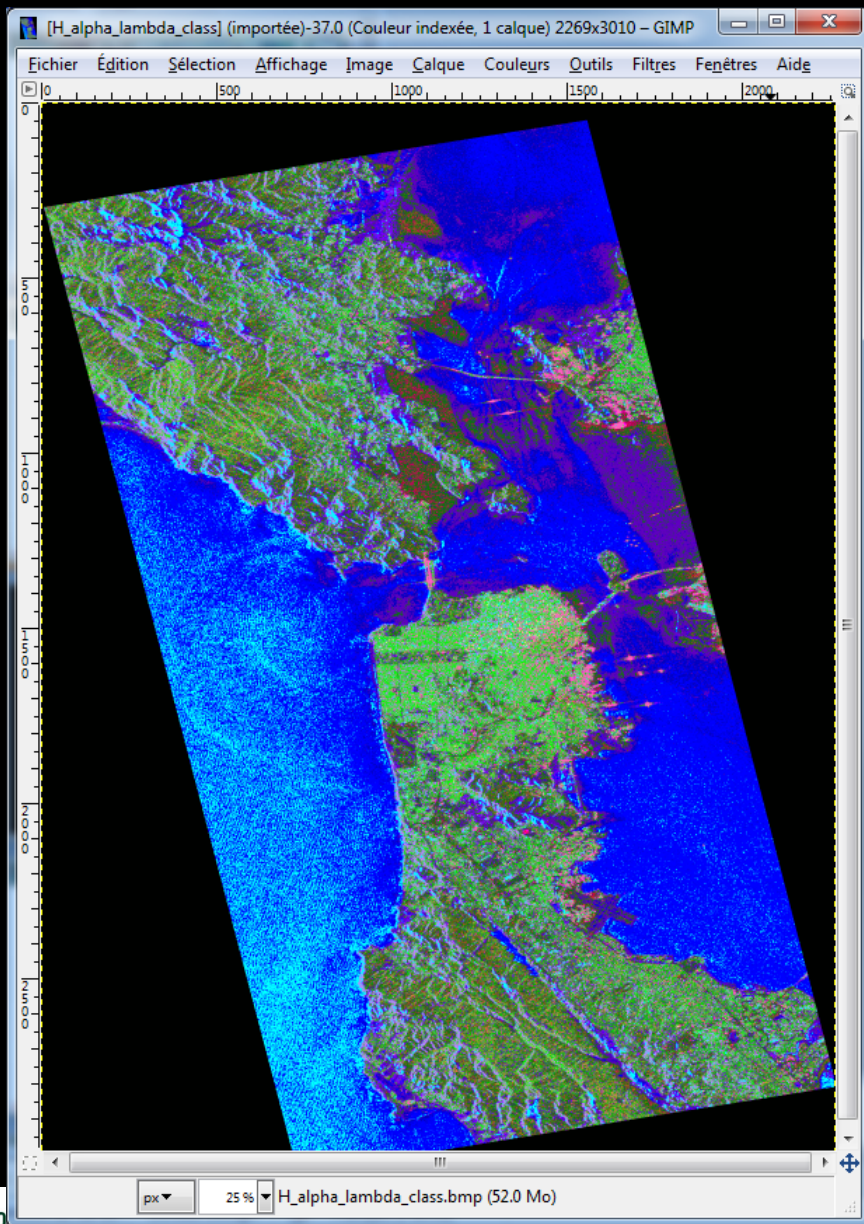




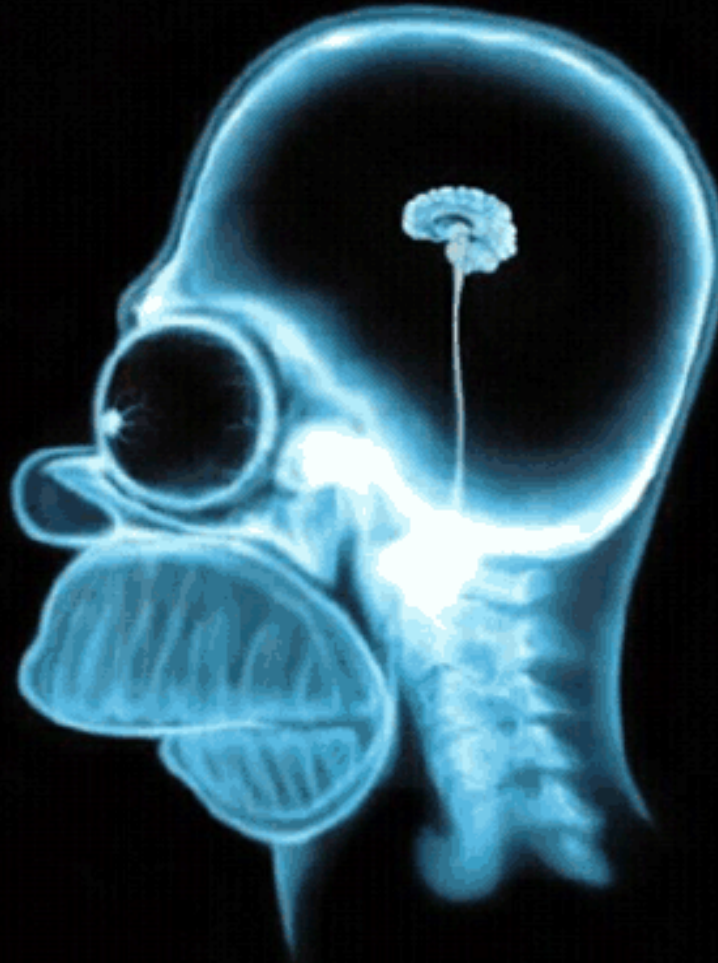
High λ



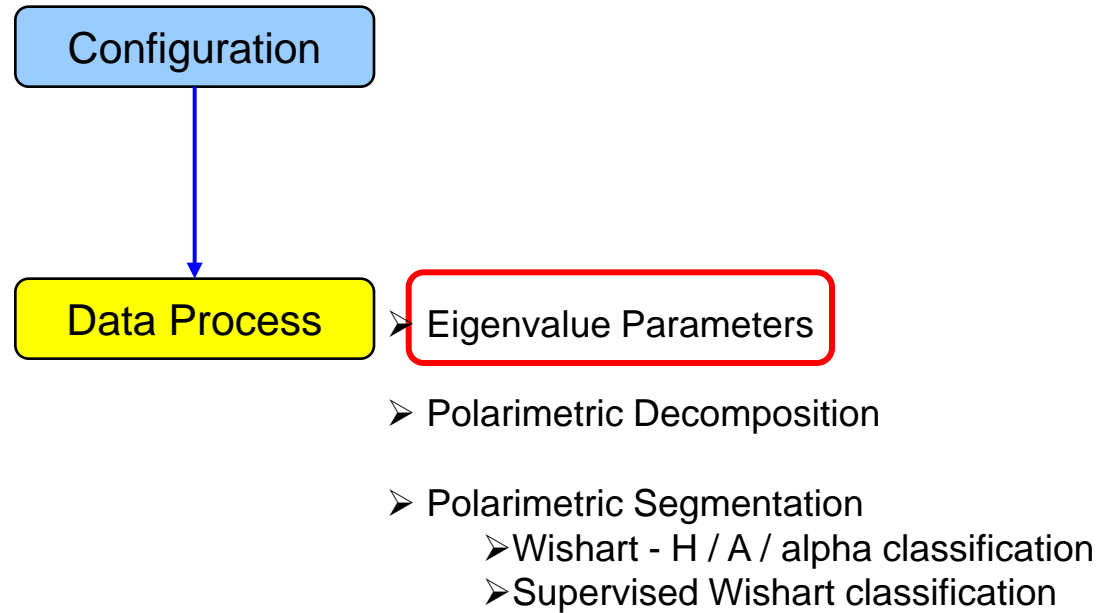
H / A / alpha CLASSIFICATION



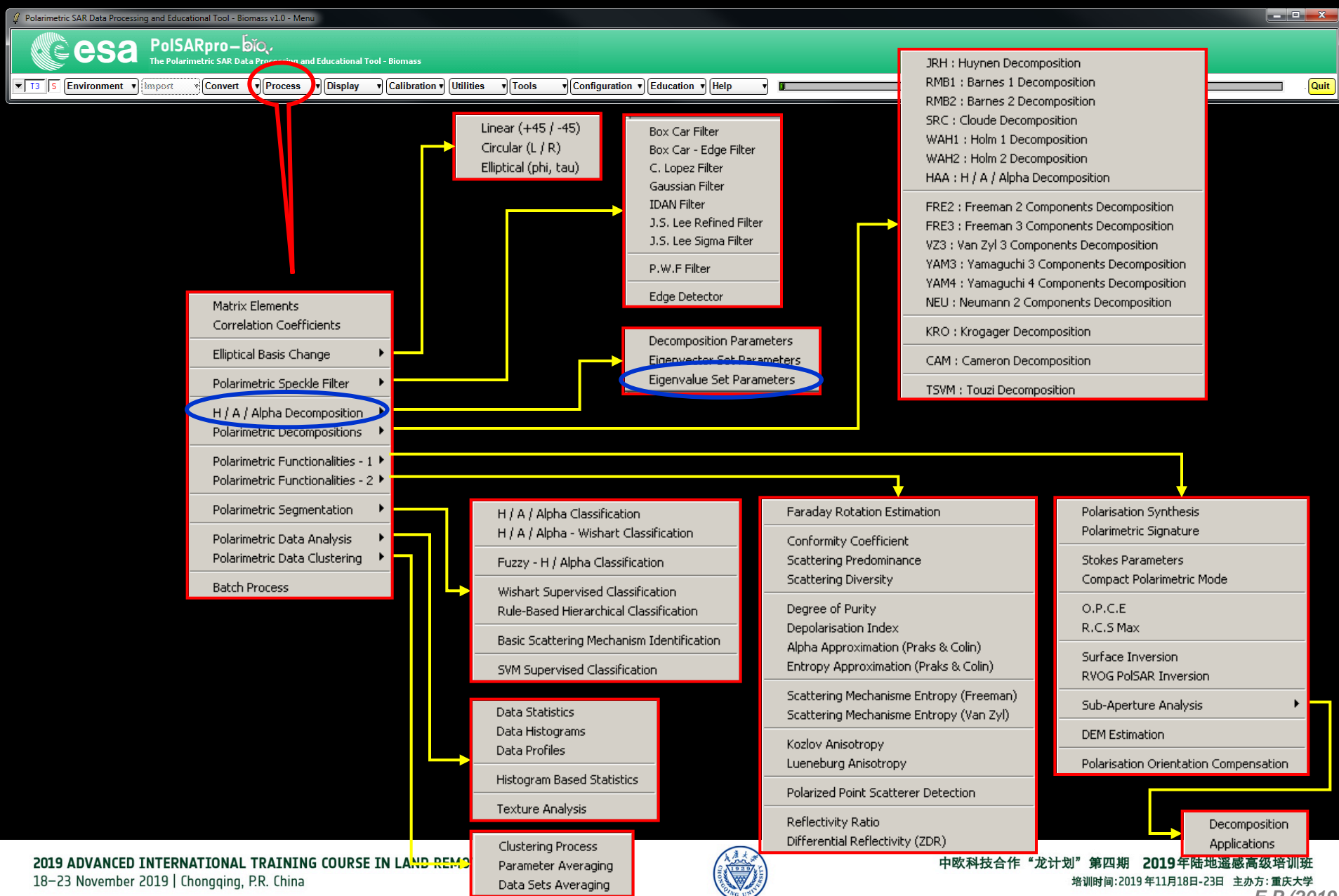
Questions ?



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PoISARpro v5.1 SOFTWARE



EIGENVALUE SET PARAMETER



Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

Window Size = 3

Data Processing: H / A / Alpha Eigenvalue Set Parameters

Input Directory: D:/SAN_FRANCISCO_ALDOS_SNAP/T3

Output Directory: D:/SAN_FRANCISCO_ALDOS_SNAP / T3

Init Row	End Row	Init Col	End Col
1	3010	1	2269

- Eigenvalues (L1 , L2 , L3) BMP
- Pseudo Probabilities (p1 , p2 , p3) BMP
- Anisotropy (A) (p2 , p3) BMP
- Anisotropy12 (A12) (p1 , p2) BMP
- Eigenvalues Relative Difference (S.E.R.D - D.E.R.D) BMP
- Polarisation Asymmetry (p1-p3 , 1-3p3) BMP
- Polarisation Fraction (1-3p3) BMP
- Lueneburg Anisotropy BMP
- Radar Vegetation Index (R.V.I) BMP
- Pedestal Height BMP
- Shannon Entropy (H = Hi + Hp) BMP

Window Size Row: 3 Window Size Col: 3

Equivalence between [T] and [C] eigen-decompositions.



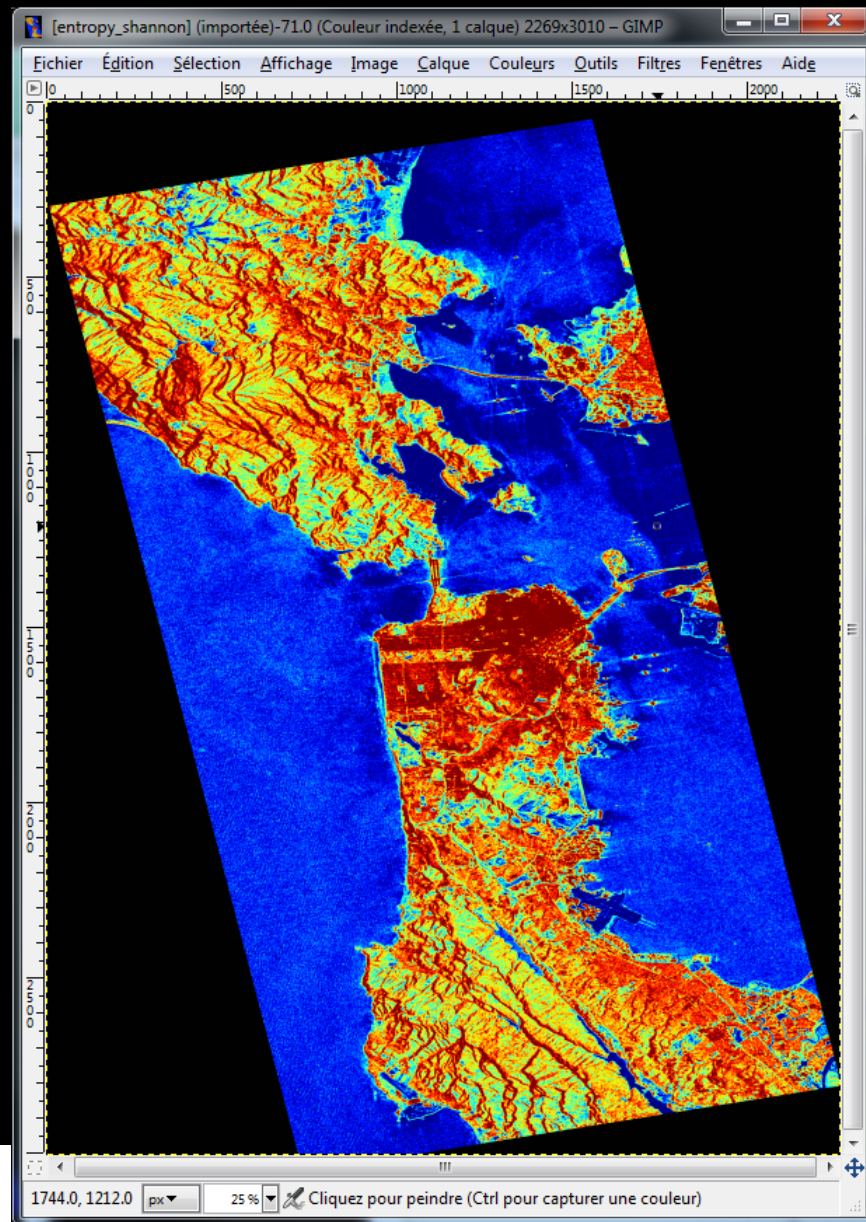
EIGENVALUE SET PARAMETER



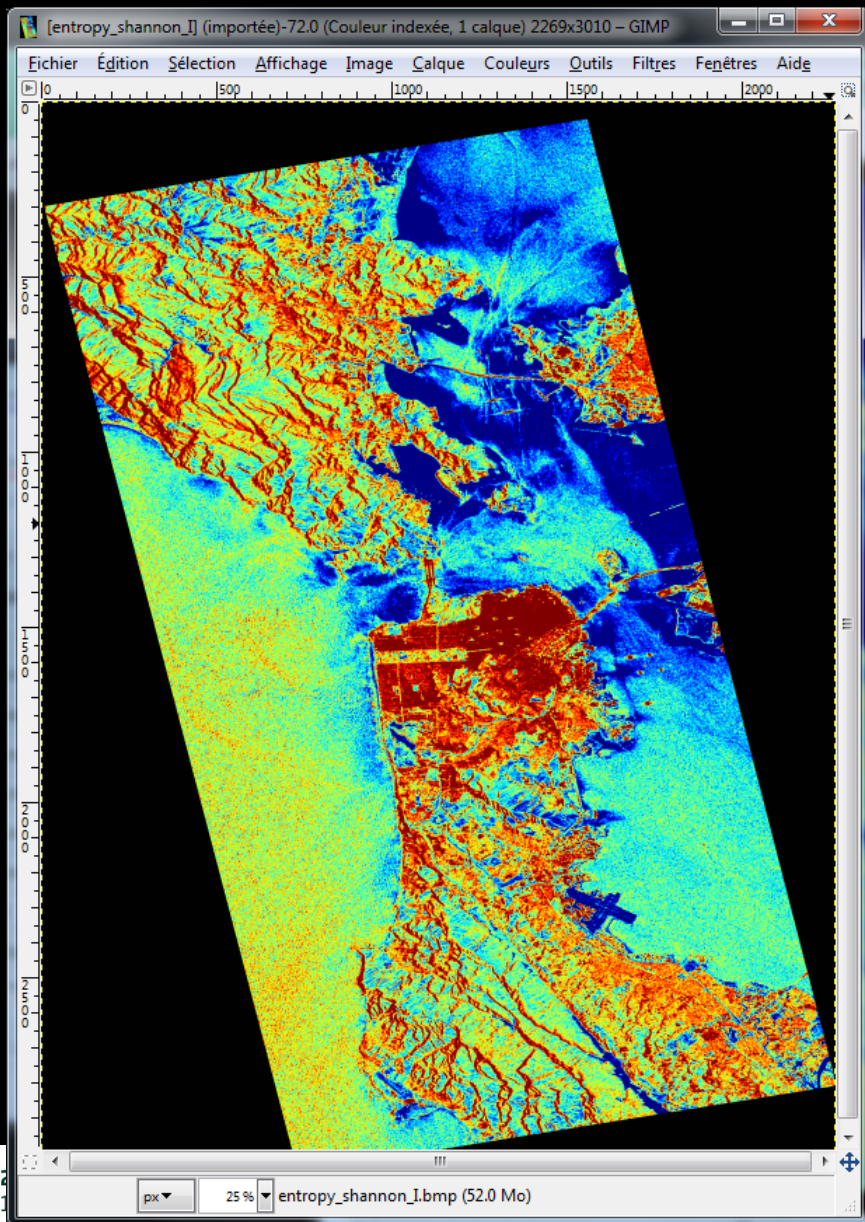
Pauli RGB



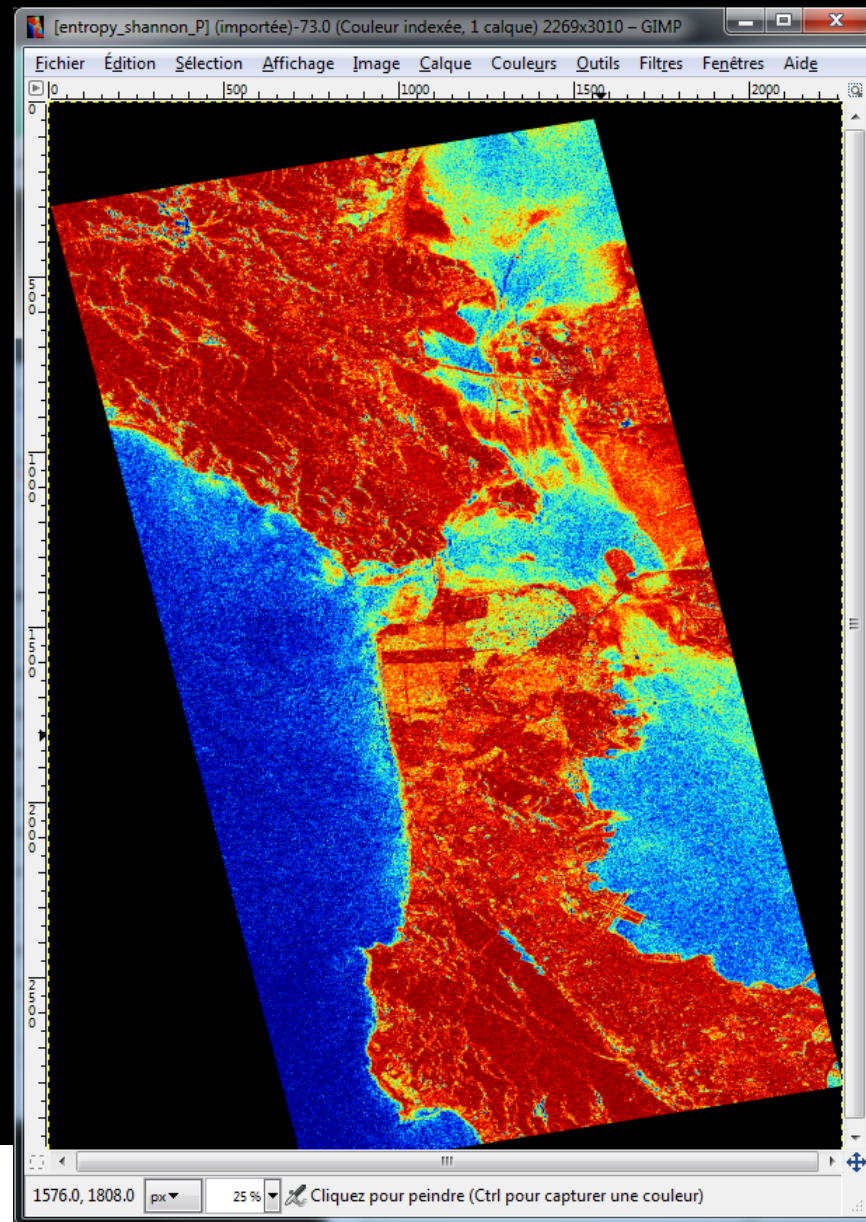
Entropy Shannon



Entropy I



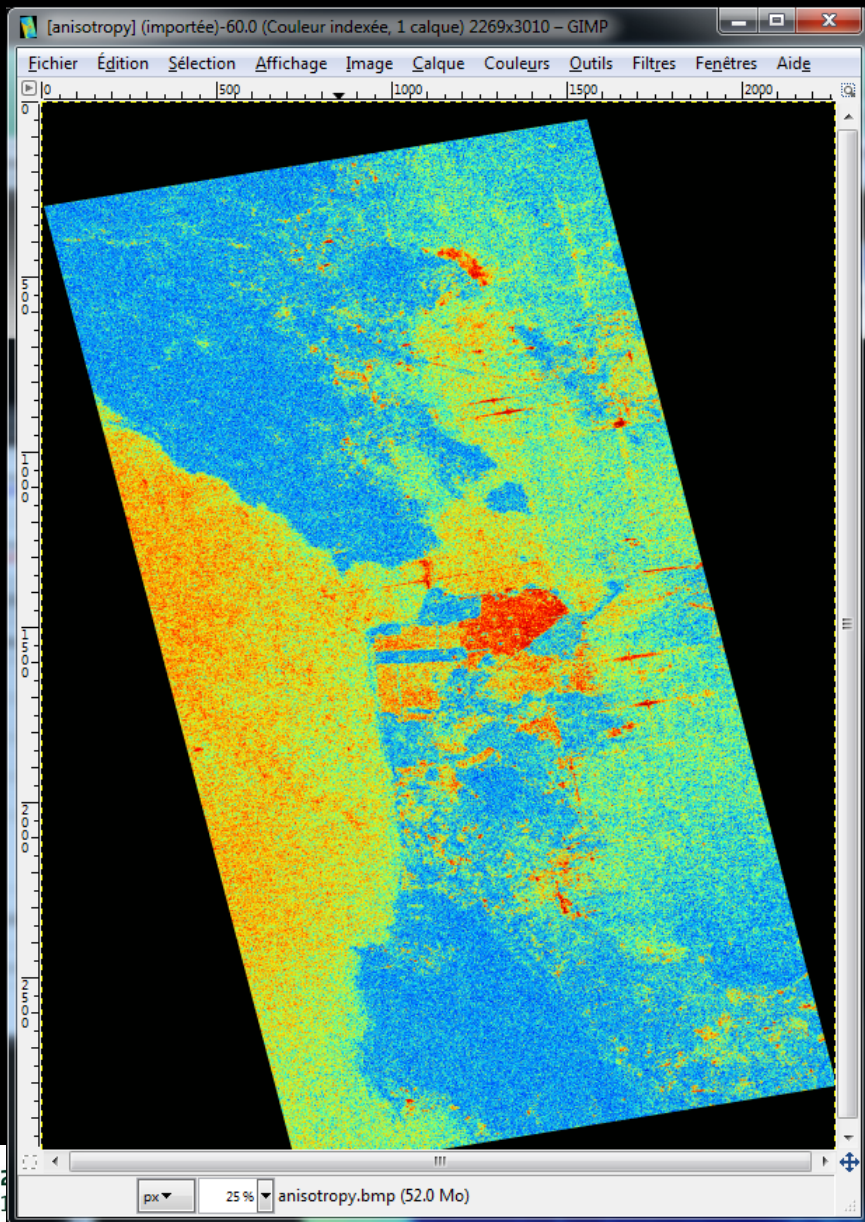
Entropy P



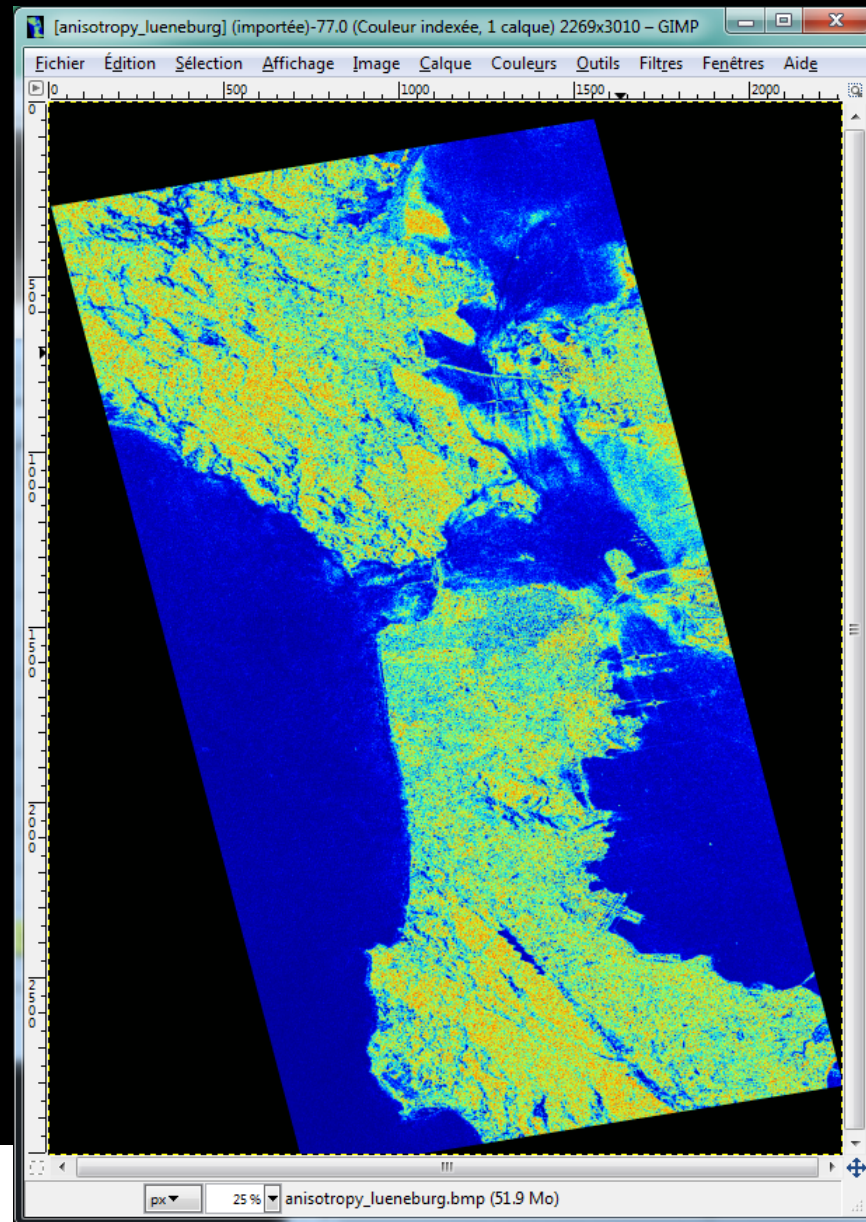
EIGENVALUE SET PARAMETER



Anisotropy



Lueneburg Anisotropy



Configuration



Data Process

- Eigenvalue Parameters
- Polarimetric Decomposition
- Polarimetric Segmentation
 - Wishart - H / A / alpha classification
 - Supervised Wishart classification

PoISARpro v5.1 SOFTWARE



Polimetric SAR Data Processing and Educational Tool - Biomass v1.0 - Menu

esa PoISARpro-bio
The Polimetric SAR Data Processing and Educational Tool - Biomass

Environment Import Convert **Process** Display Calibration Utilities Tools Configuration Education Help

Matrix Elements
Correlation Coefficients
Elliptical Basis Change
Polarimetric Speckle Filter
H / A / Alpha Decomposition
Polarimetric Decompositions
Polarimetric Functionalities - 1
Polarimetric Functionalities - 2
Polarimetric Segmentation
Polarimetric Data Analysis
Polarimetric Data Clustering
Batch Process

Linear (+45 / -45)
Circular (L / R)
Elliptical (phi, tau)

Box Car Filter
Box Car - Edge Filter
C. Lopez Filter
Gaussian Filter
IDAN Filter
J.S. Lee Refined Filter
J.S. Lee Sigma Filter
P.W.F Filter
Edge Detector

Decomposition Parameters
Eigenvector Set Parameters
Eigenvalue Set Parameters

H / A / Alpha Classification
H / A / Alpha - Wishart Classification
Fuzzy - H / Alpha Classification
Wishart Supervised Classification
Rule-Based Hierarchical Classification
Basic Scattering Mechanism Identification
SVM Supervised Classification

Data Statistics
Data Histograms
Data Profiles
Histogram Based Statistics
Texture Analysis

Clustering Process
Parameter Averaging
Data Sets Averaging

Faraday Rotation
Conformity Coe
Scattering Pred
Scattering Diver
Degree of Purity
Depolarisation I
Alpha Approxim
Entropy Approx
Scattering Mech
Scattering Mech
Kozlov Anisotropy
Lueneburg Anisotropy
Polarized Point Scatterer Detection
Reflectivity Ratio
Differential Reflectivity (ZDR)

DEM Estimation
Polarisation Orientation Compensation

Decomposition Applications

KRO : Krogager Decomposition
CAM : Cameron Decomposition
HAA : H / A / Alpha Decomposition
JRH : Huynen Decomposition
RMB1 : Barnes 1 Decomposition
RMB2 : Barnes 2 Decomposition
SRC : Cloude Decomposition
UHDx : Unified Huynen Decomposition
WAH1 : Holm 1 Decomposition
WAH2 : Holm 2 Decomposition
AN3 : An & Yang 3 Component Decomposition
AN4 : An & Yang 4 Component Decomposition
BF4 : Bhattacharya & Frey 4 Component Decomposition
FRE2 : Freeman 2 Component Decomposition
FRE3 : Freeman 3 Component Decomposition
NEU : Neumann 2 Component Decomposition
NNED : Ariei 3 Component NNED Decomposition
ANNED : Ariei 3 Component ANNED Decomposition
VZ3 : Van Zyl (1992) 3 Component Decomposition
SIN4 : Singh 4 Component Decomposition
YAM3 : Yamaguchi 3 Component Decomposition
YAM4 : Yamaguchi 4 Component Decomposition
MCSM5 : L. Zhang 5 Component Decomposition
TSVM : Touzi Decomposition
Aghababae Decomposition
2KR : Raney Decomposition
CPD : Compact-Pol Decomposition

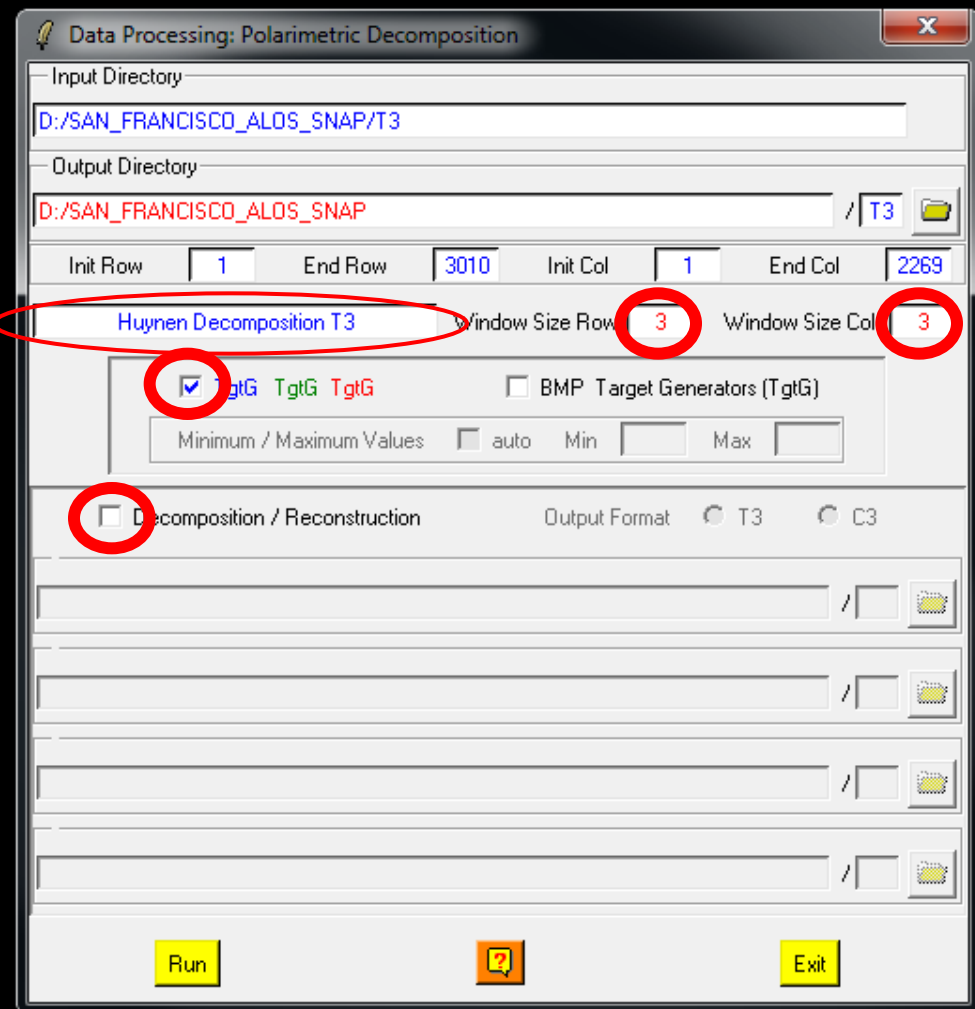




Do it Yourself:
Select a decomposition,
Select the pauli RGB generation.

Don't select Decomposition / Reconstruction

Window Size = 3



Pauli RGB



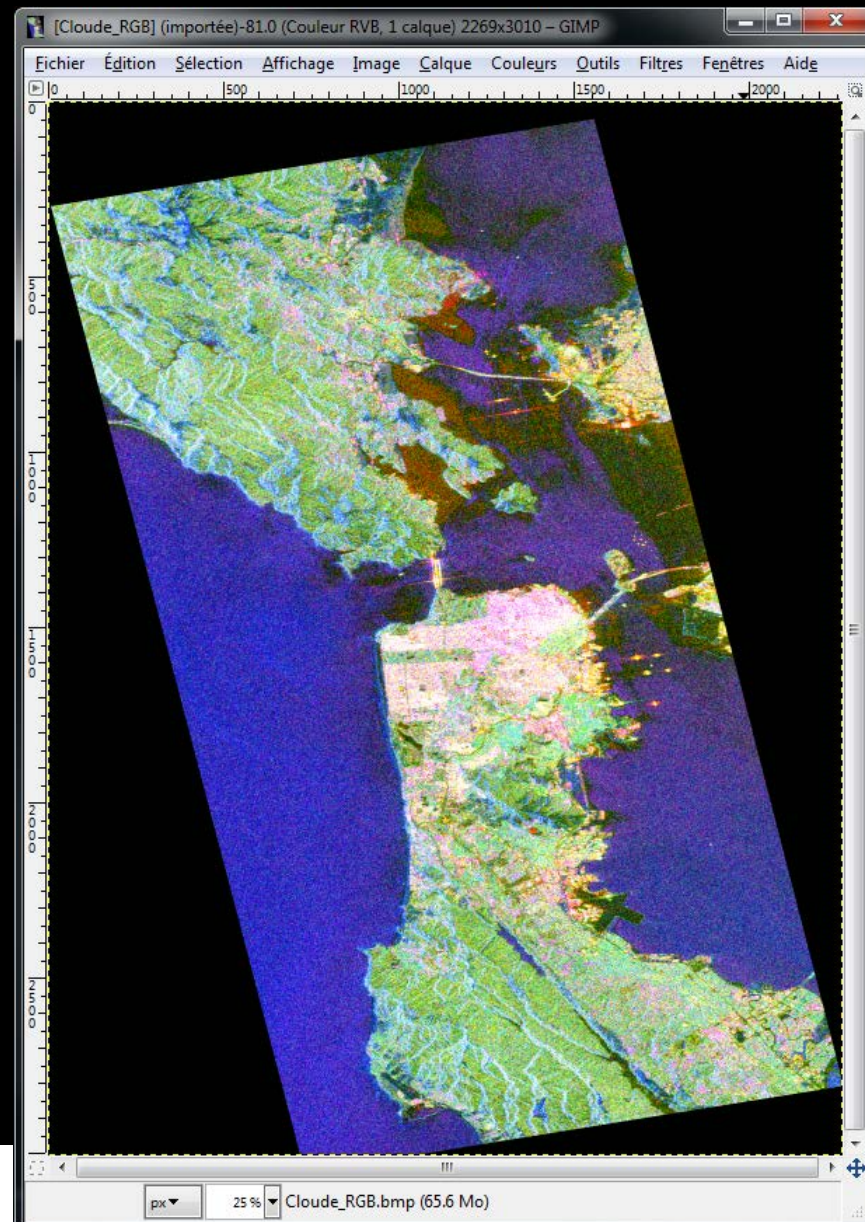
Pauli Huynen



Pauli RGB



Pauli Cloude



Pauli RGB



Pauli H-A-Alpha



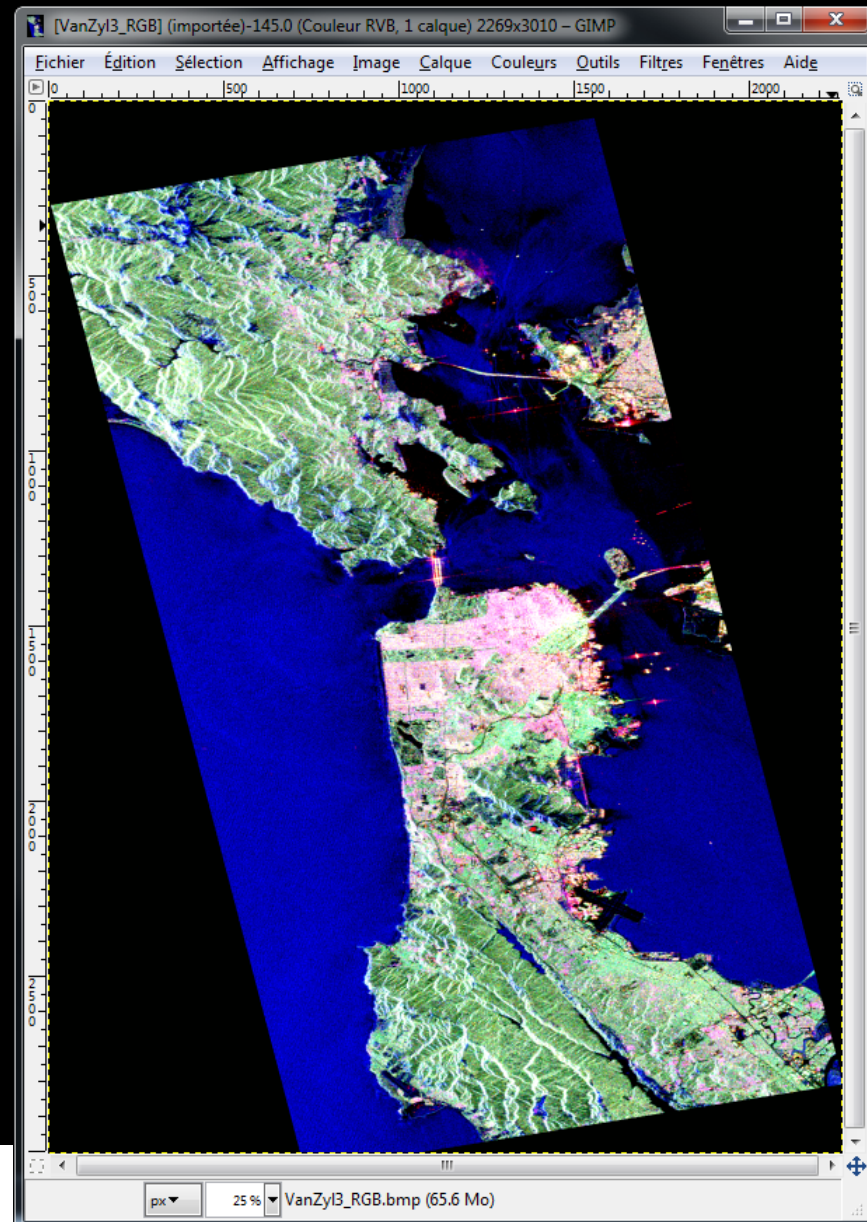
POLARIMETRIC DECOMPOSITION



Pauli RGB



Pauli Van Zyl 3



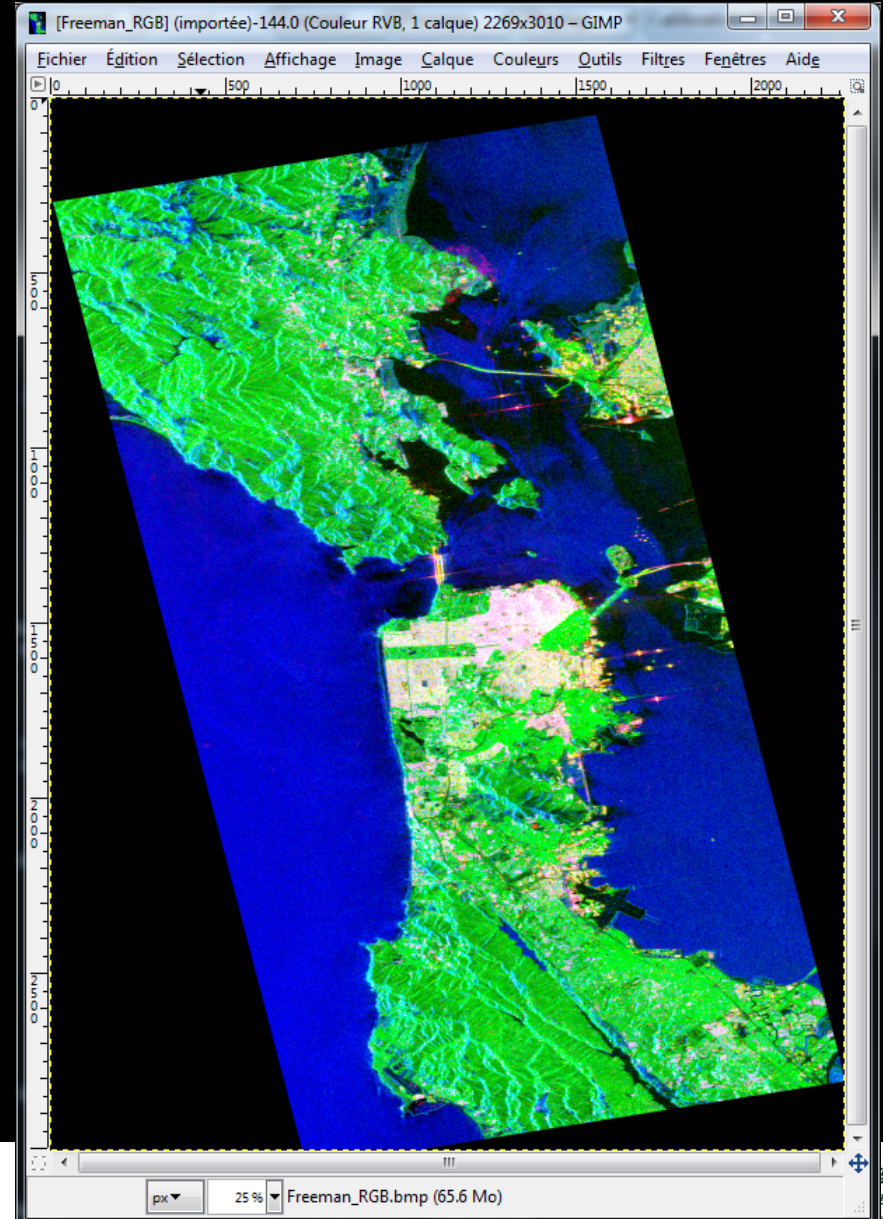
POLARIMETRIC DECOMPOSITION



Pauli RGB



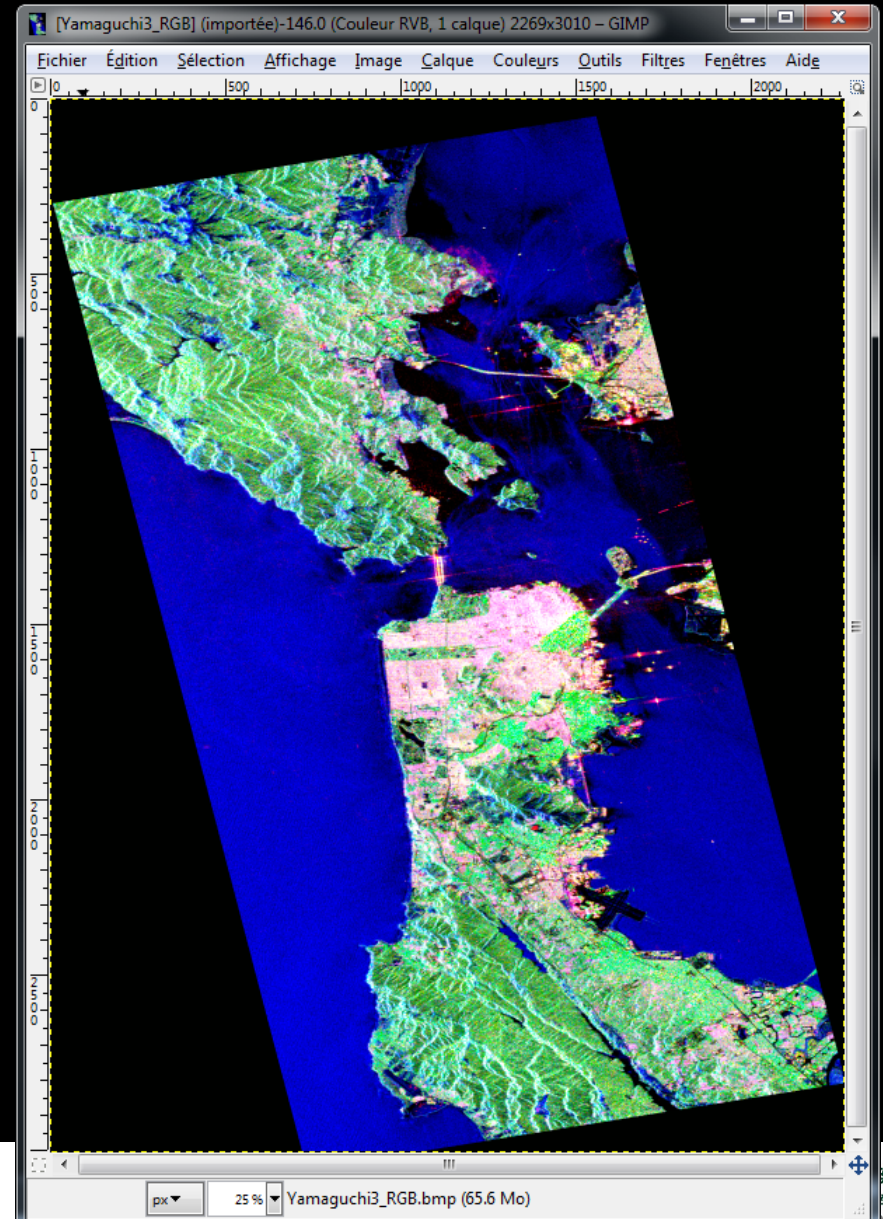
Pauli Freeman 3



Pauli RGB



Pauli Yamaguchi 3

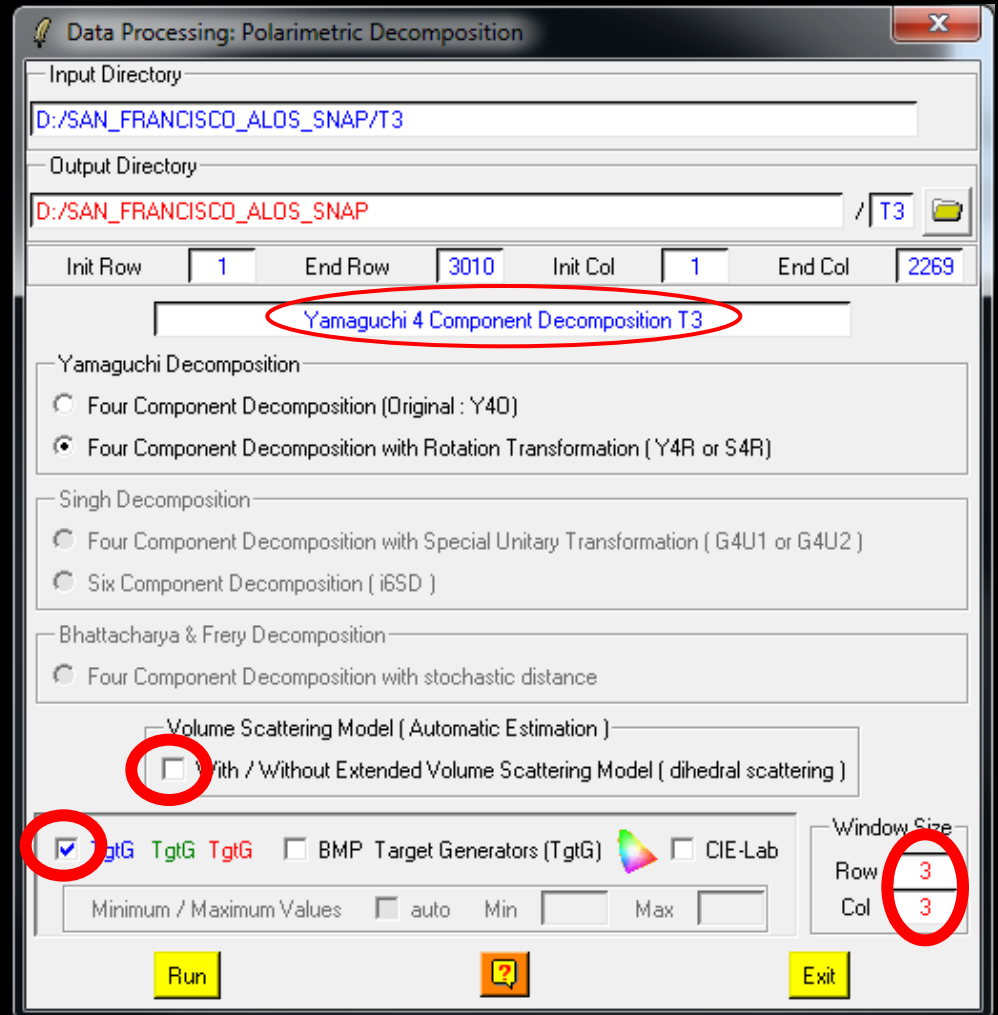




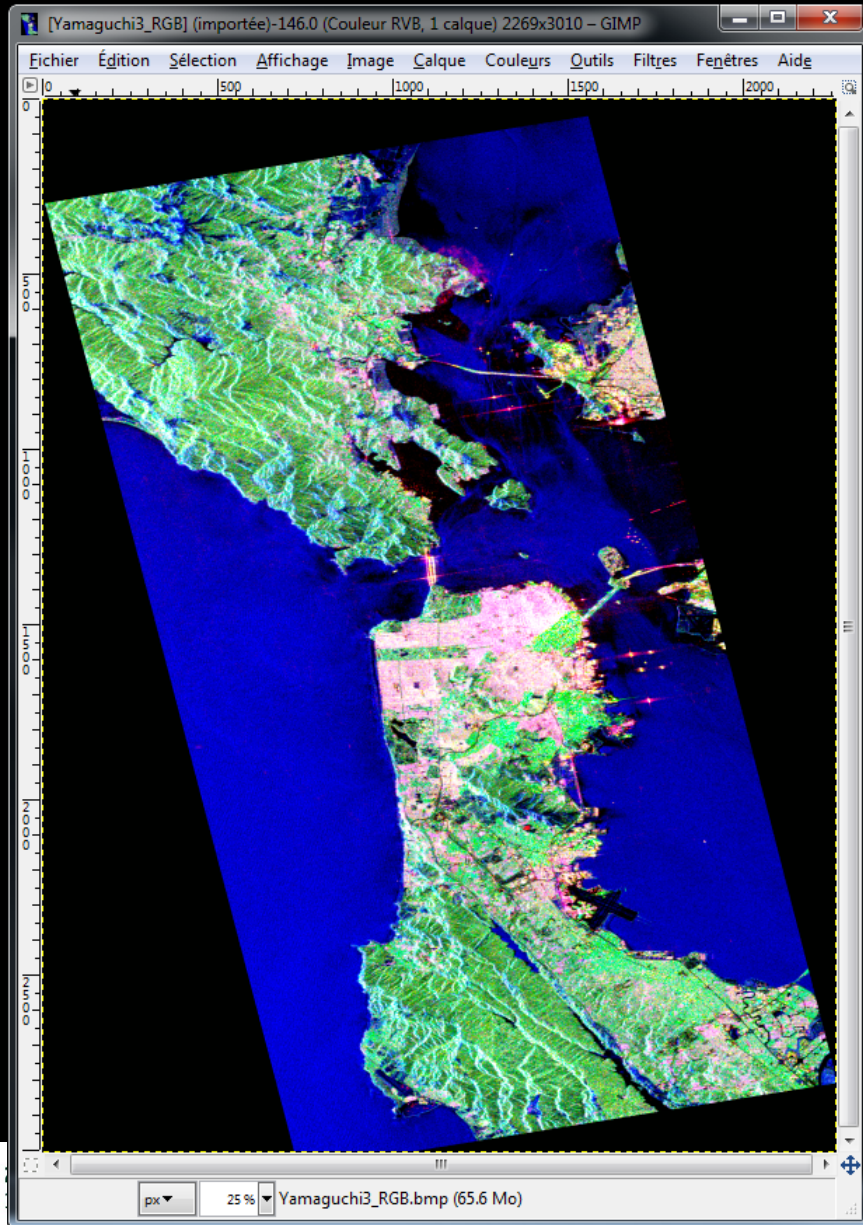
Do it Yourself:
Select a decomposition,
Select the pauli RGB generation.

Window Size = 3

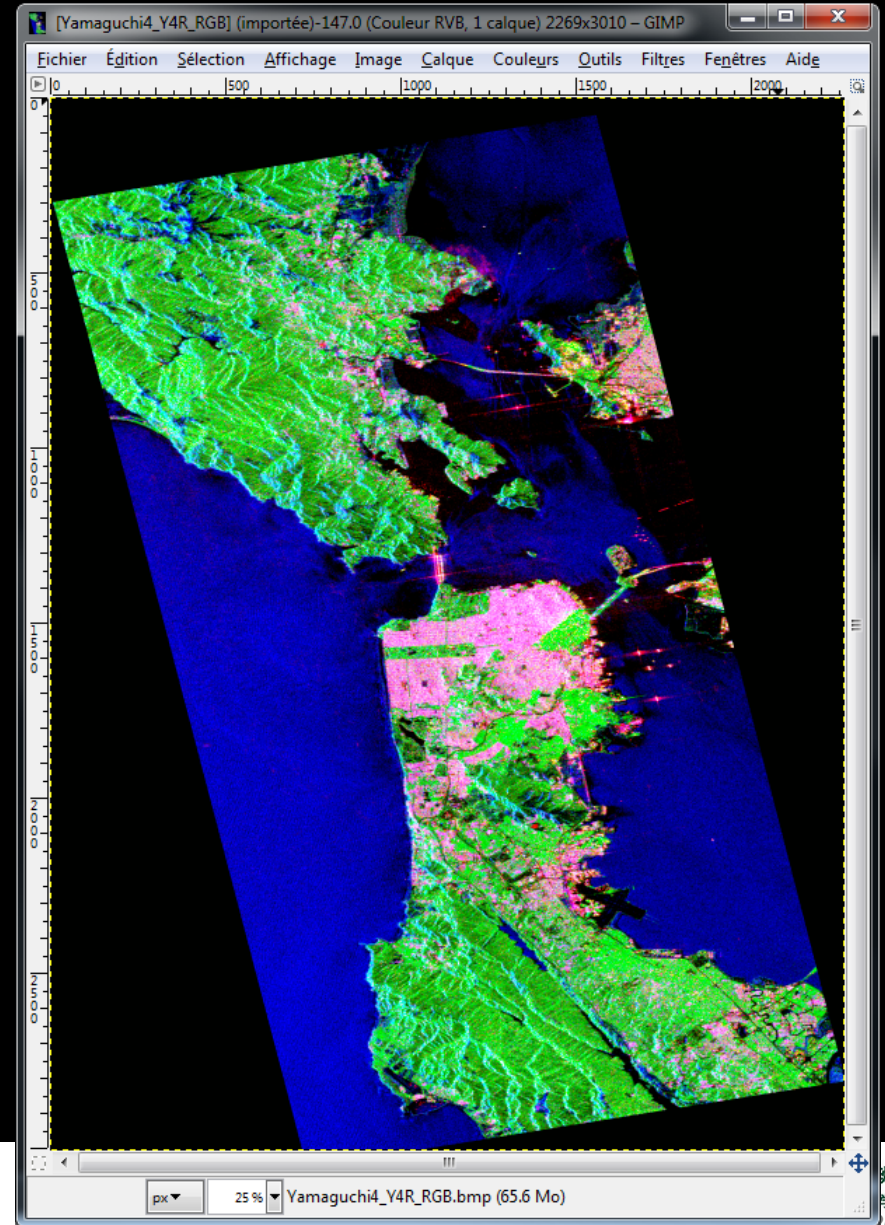
Yamaguchi Y40, Y4R, S4R
Singh G4U1, G4U2



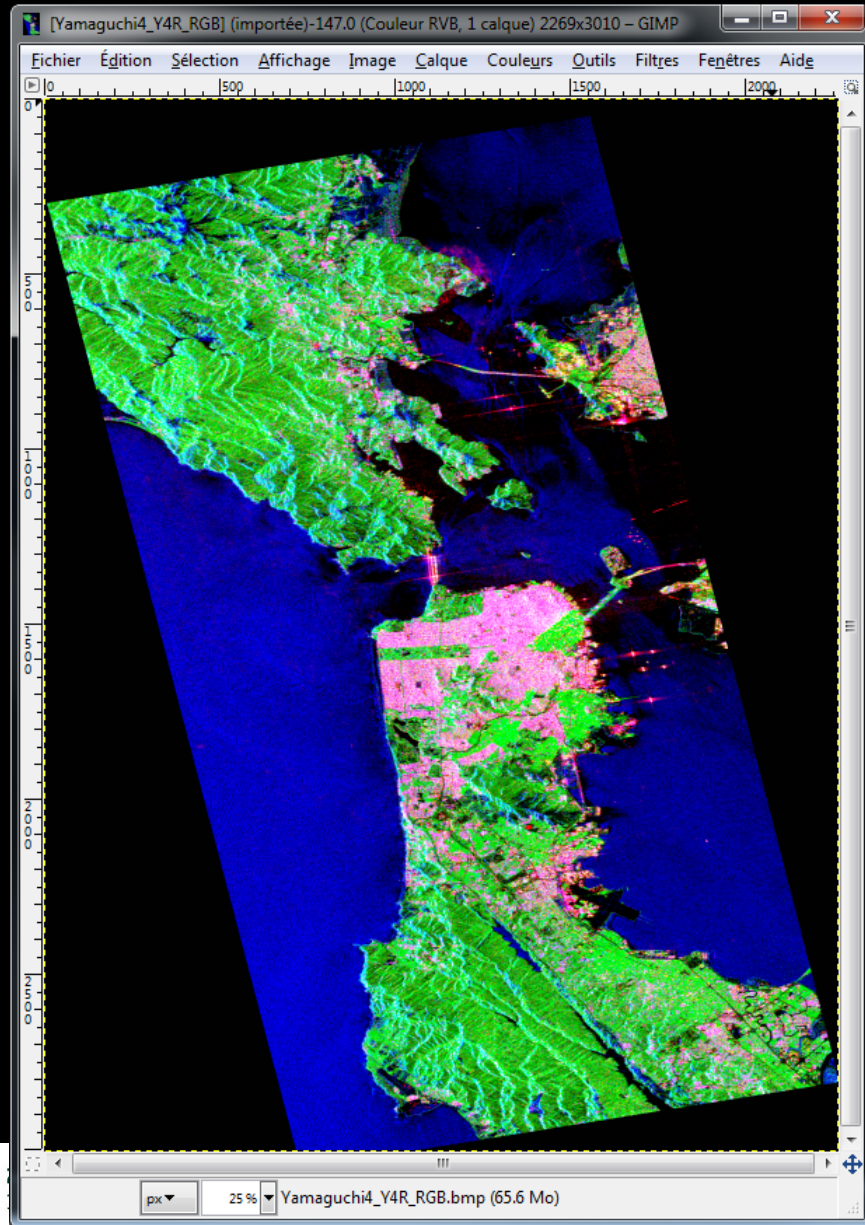
Pauli Yamaguchi 3



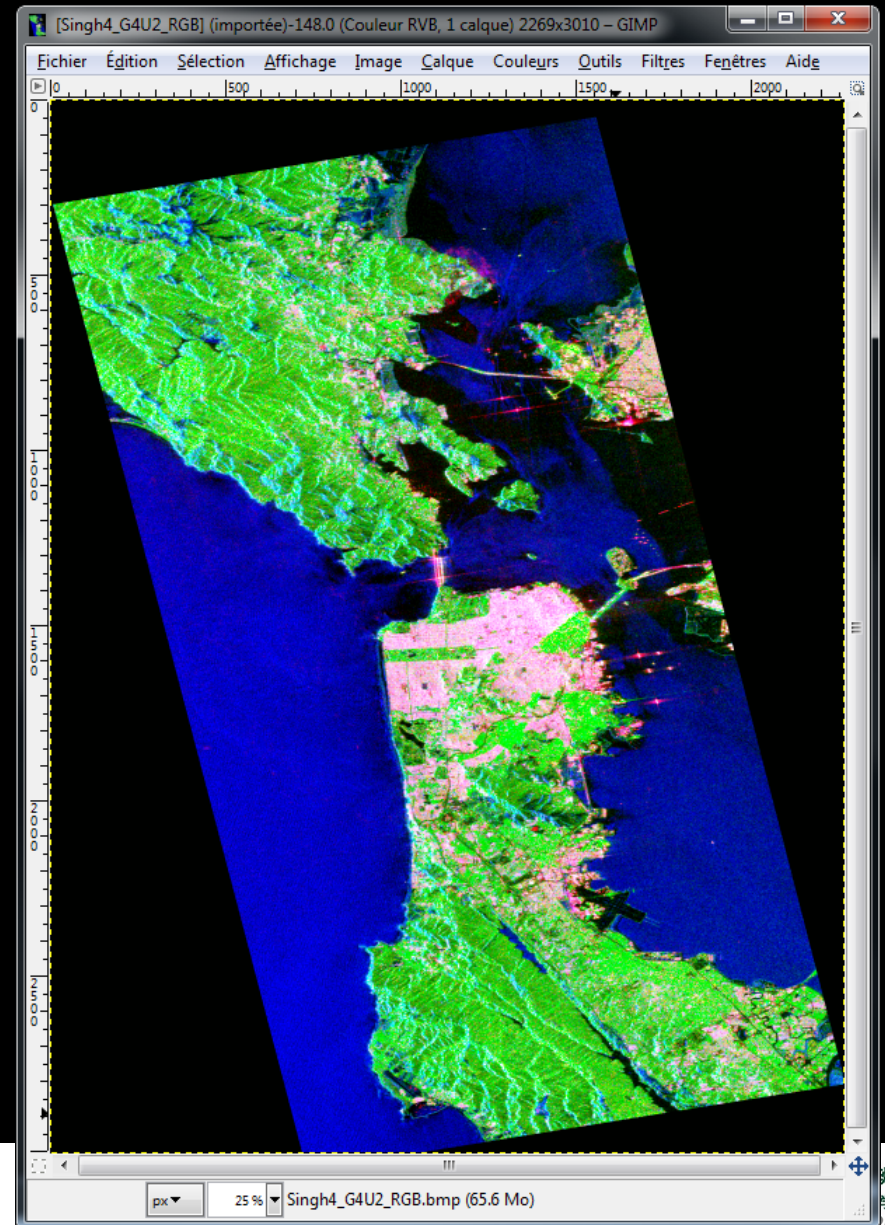
Pauli Yamaguchi Y4R

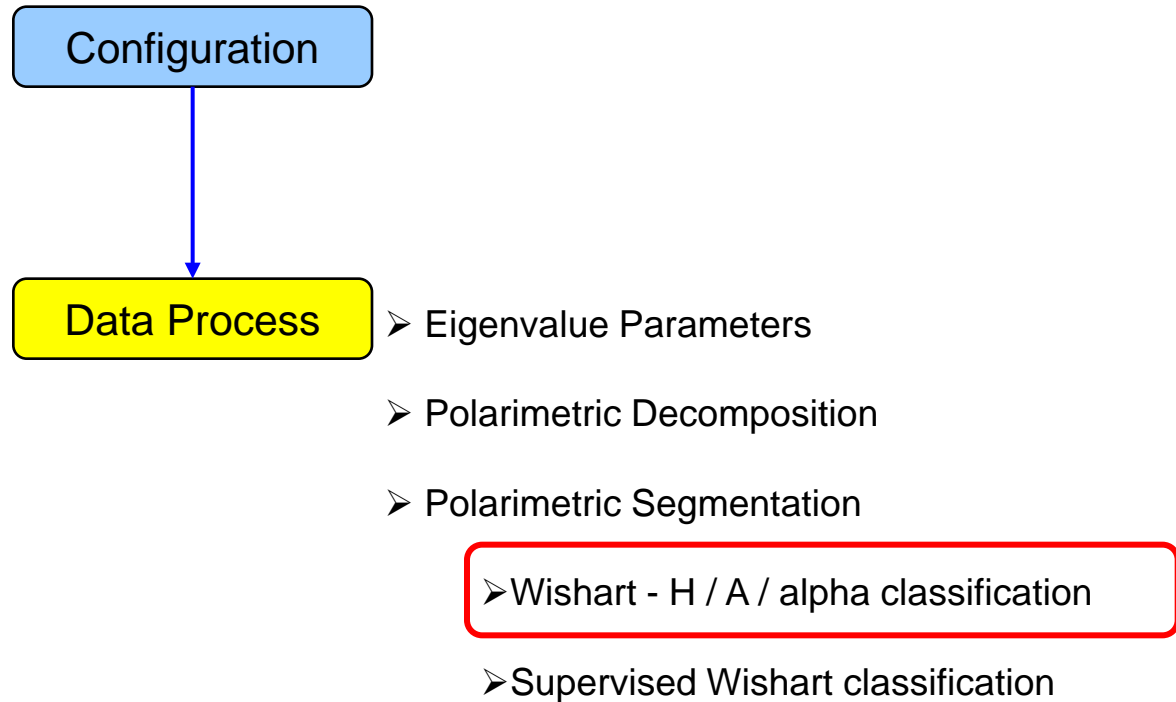


Pauli Yamaguchi Y4R

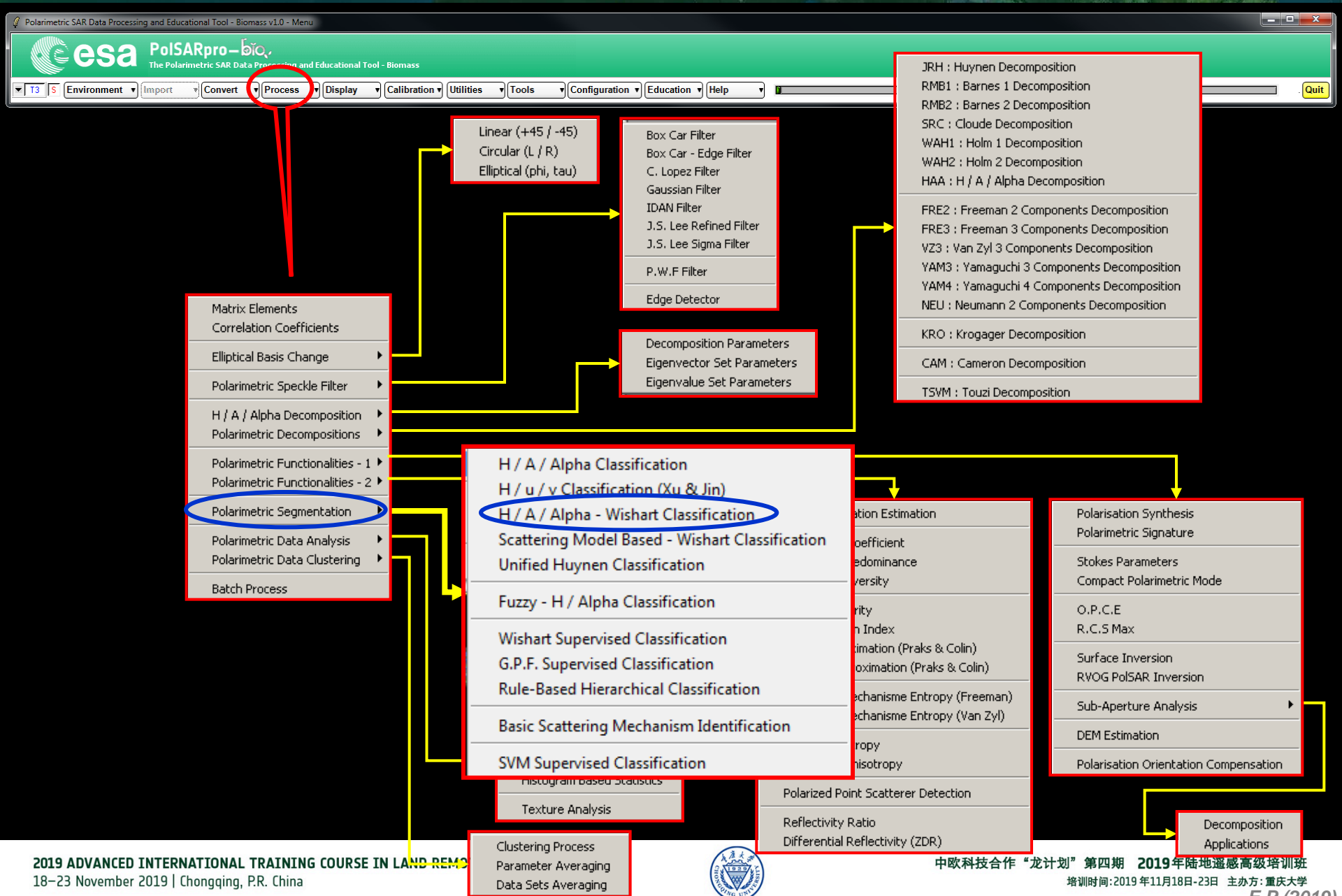


Pauli Singh - Yamaguchi G4U2





PoSARpro v5.1 SOFTWARE



WISHART - H/A/alpha CLASSIFICATION



Do it Yourself:
Set the parameters, run and view the corresponding BMP files.

Data Processing: Wishart H / A / Alpha Classification

Input Directory: D:/SAN_FRANCISCO_ALOS_SNAP/T3

Output Directory: D:/SAN_FRANCISCO_ALOS_SNAP / T3

Init Row: 1 End Row: 3010 Init Col: 1 End Col: 2269

Wishart H / A / Alpha Classification

% of Pixels Switching Class: 10 Window Size Row: 3

Maximum Number of Iterations: 10 Window Size Col: 3 BMP

Entropy: entropy Anisotropy: anisotropy Alpha: alpha **Update**

Color Maps

ColorMap 8: C:/Users/epottier/AppData/Roaming/PolSARpro_5.2.0/ColorMap/Wishart **Edit**

ColorMap 16: C:/Users/epottier/AppData/Roaming/PolSARpro_5.2.0/ColorMap/Wishart **Edit**

Loaded Colormap **Fauli** | IS11+S22| IS12+S21| IS11-S22|

Sinclair | IS11| |(S12+S21)/2| IS22|

Combine | Blue File Green File Red File

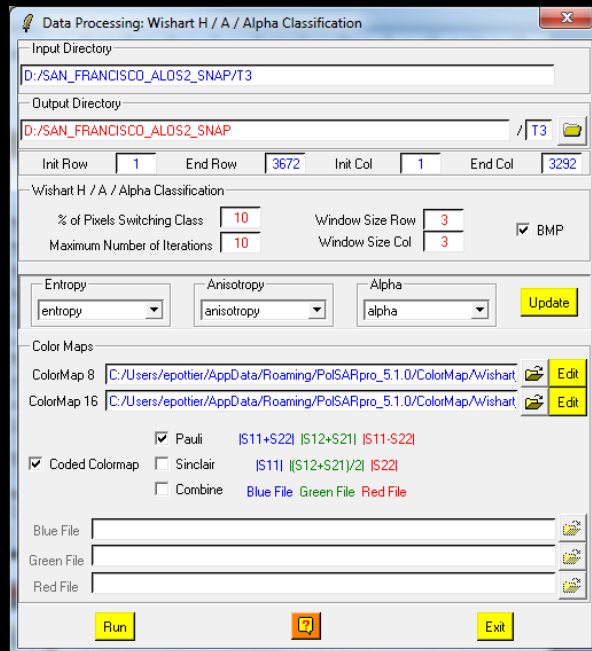
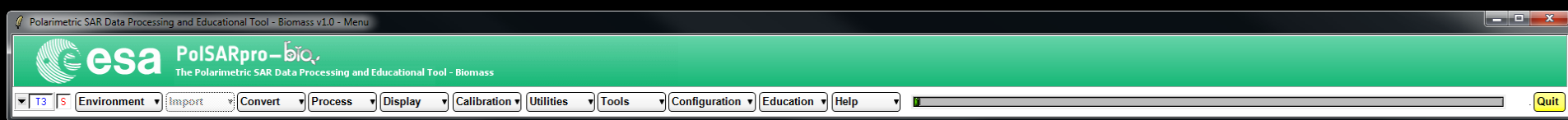
Blue File: _____ **+**

Green File: _____ **+**

Red File: _____ **+**

Run **?** **Exit**





DATADIR

config.txt

[T3x3] Elements

Wishart_H_alpha_class_X.bin
Wishart_H_A_alpha_class_X.bin

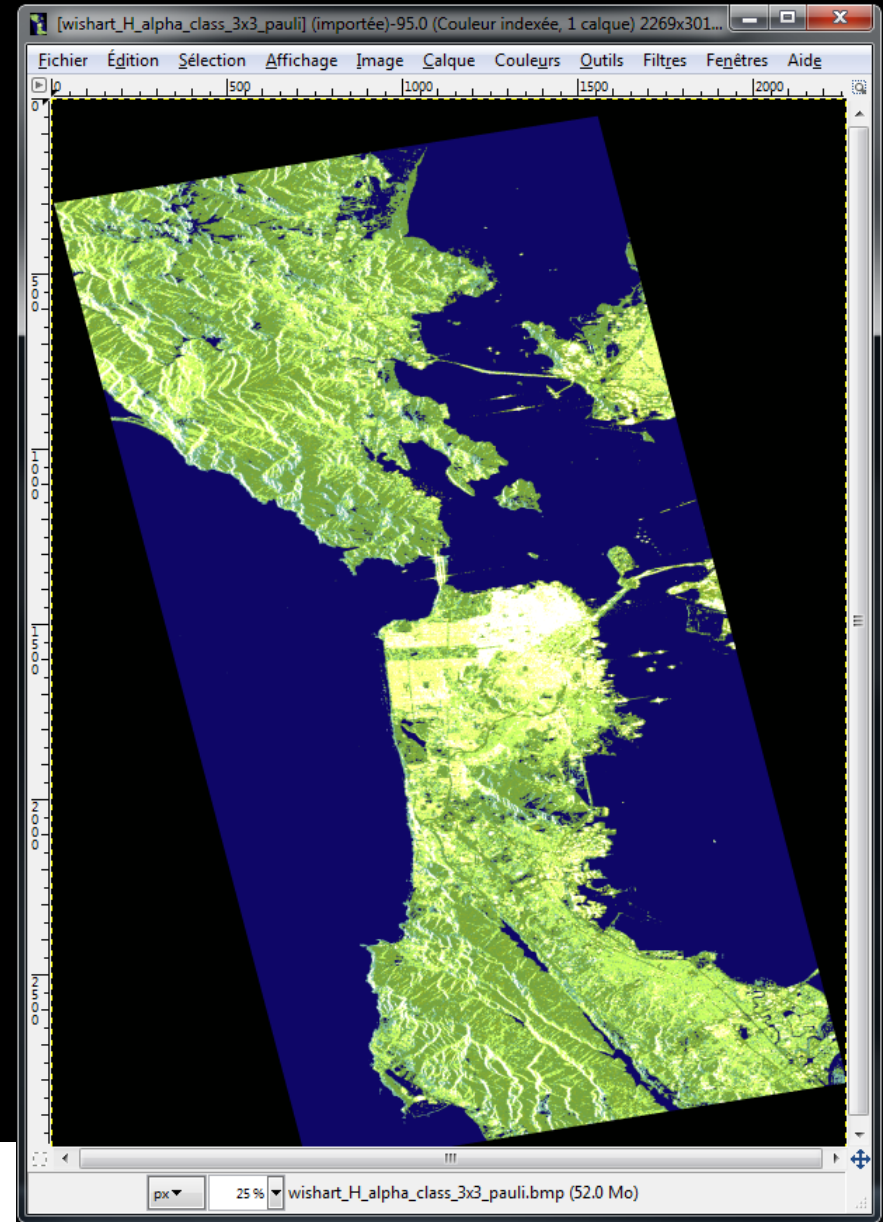
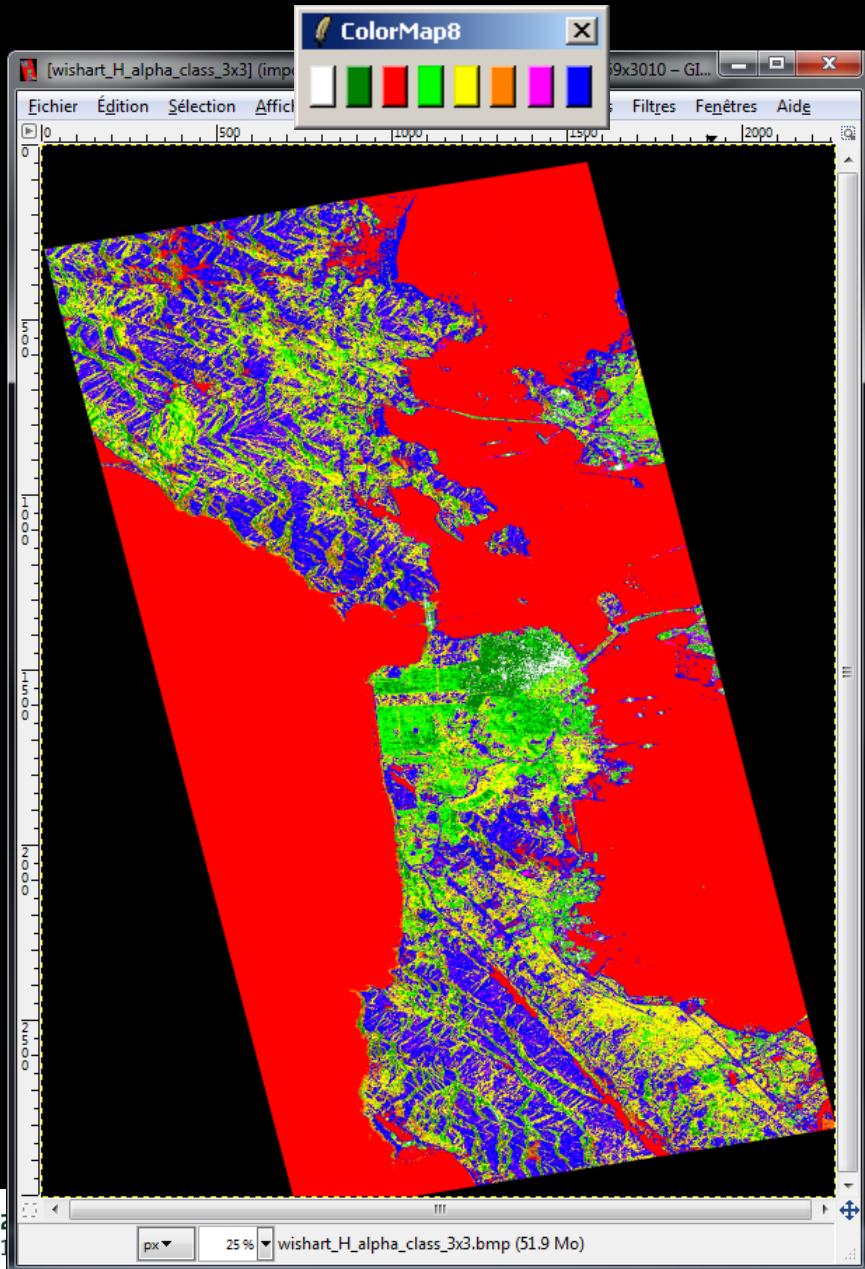
Wishart_H_alpha_class_X.bmp
Wishart_H_A_alpha_class_X.bmp

X = window size

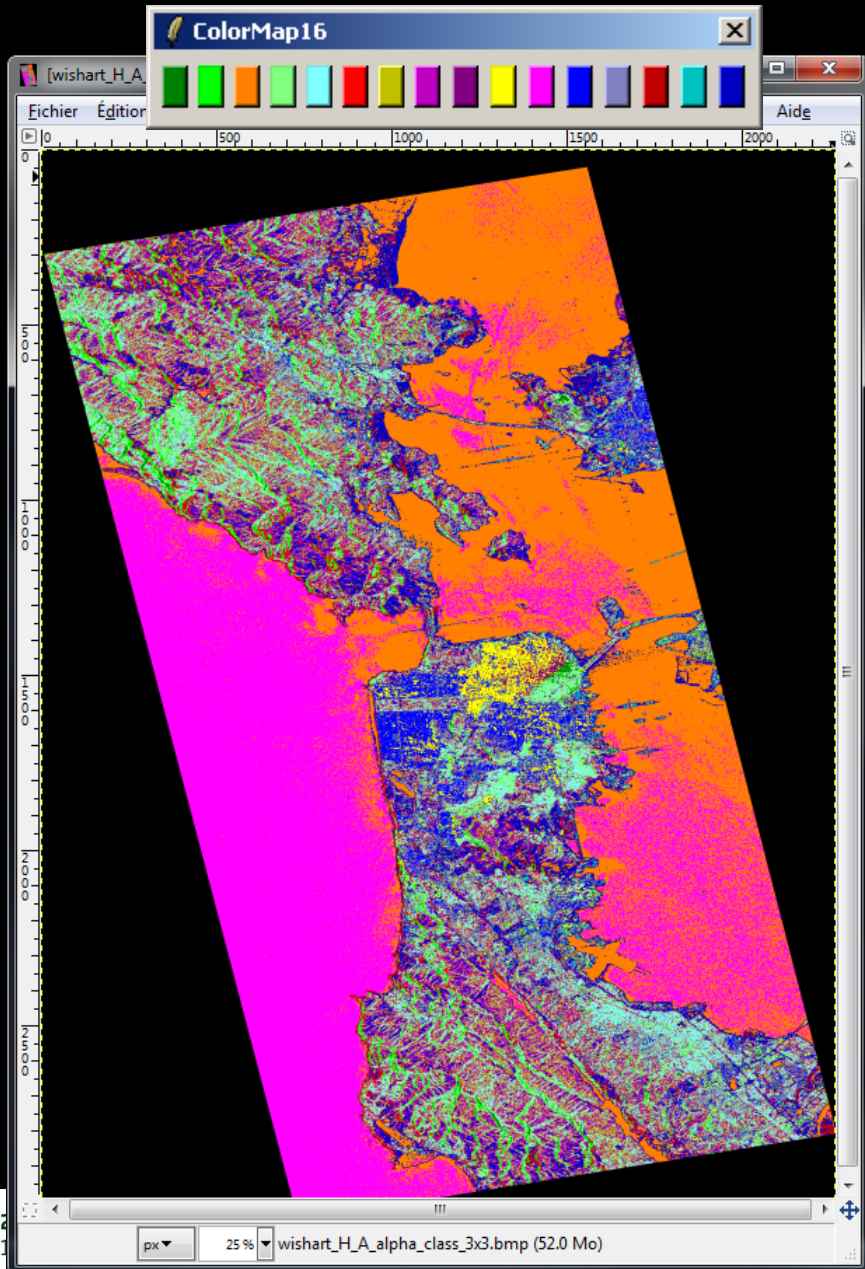
Do it Yourself:

Set the parameters, run and view the corresponding BMP files.

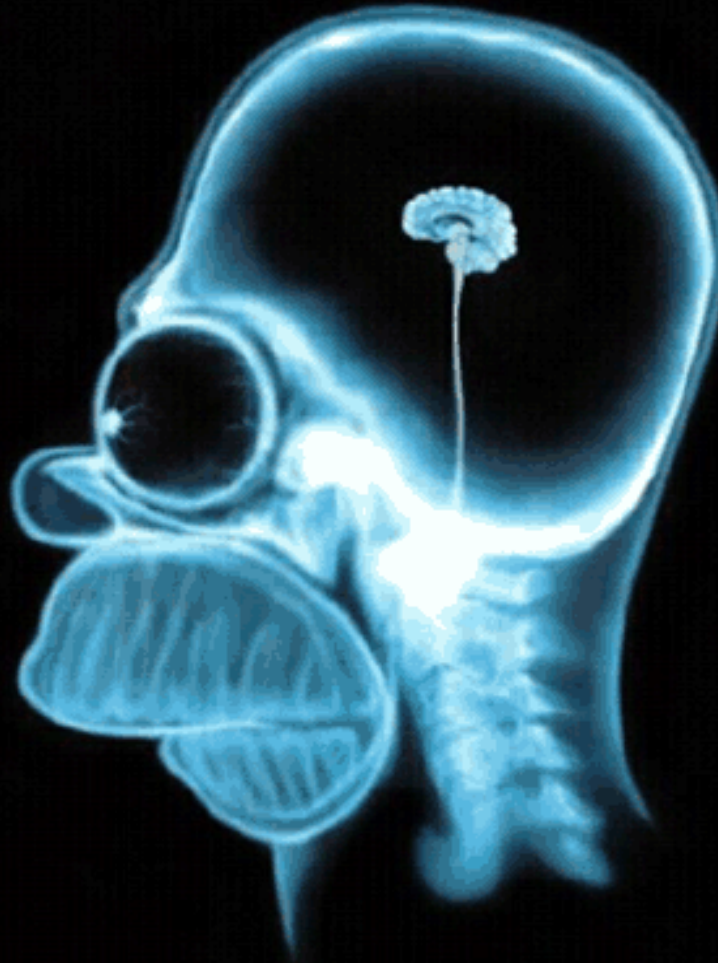
WISHART - H/A/alpha CLASSIFICATION



WISHART - H/A/alpha CLASSIFICATION



Questions ?



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