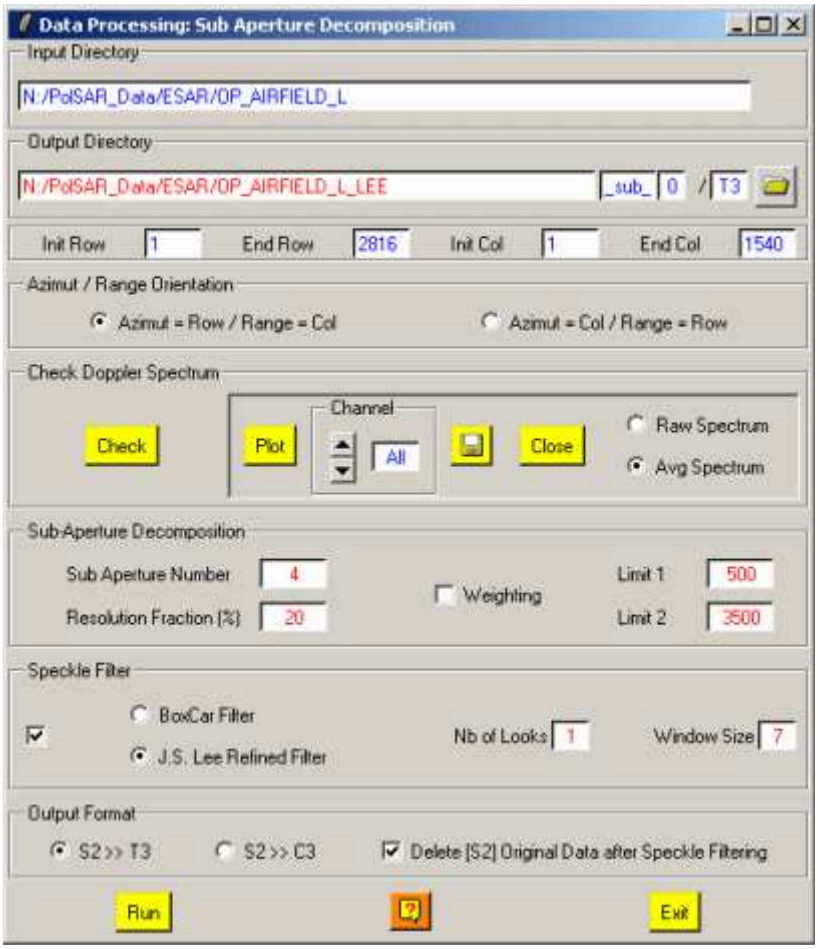
Sub-Aperture Decomposition



Description:

Using deconvolution, synthesized SAR images are decomposed into sub-aperture data sets, which correspond to the scene responses under different azimuthal look angles. A statistical analysis of the polarimetric parameters can then be conducted in order to clearly discriminate media showing a non-stationary behaviour during the SAR integration.

Further information about the scene characterisation can be found in :

L. Ferro-Famil, A. Reigber, E. Pottier, W.M. Boerner: "Scene Characterization Using Subaperture Polarimetric SAR Data", IEEE Transaction on Geoscience and Remote Sensing, Vol 41, n°10, October 2003.

Comments:

Parameters written in Red can be modified directly by the user from the keyboard.

Input/Output Arguments:

Input Directory — Indicates the location of the considered **Main Directory (MD)** containing the polarimetric data sets of the SAR image to be decomposed.

Output Directory — Indicates the location of the data output directory.

Output Image Number of Rows/Columns:

The output image numbers of rows and columns are initialised to the input data set dimensions.

Azimut / Range Orientation:

Indicates if the azimuthal direction is along the rows of the columns of the SAR image

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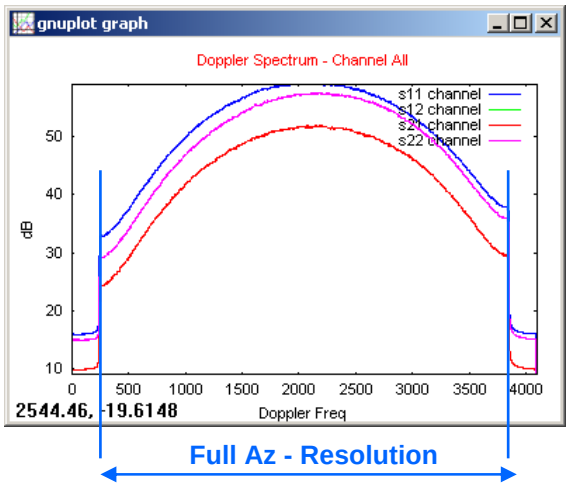
Check Doppler Spectrum:

Check — Apply a 1-D Fourier transform on each row or column corresponding to the azimuthal direction of the SAR image in order to get an estimation of the Doppler spectrum that is obtained by averaging all azimuthal spectrum over the entire image.
This averaged Doppler spectrum allows the user to check if a weithing process has been applied or not during the SAR data processing or if an azimuthal antenna pattern remains uncompensated in processed SAR data.

Plot — Open the Display Window and plot the estimated Doppler spectrum



Channel — Corresponds to the polarimetric channel to be displayed.
The different possibilities are : s11, s12, s21, s22 and all

Save the active Display Window image

Close Close the Display Window

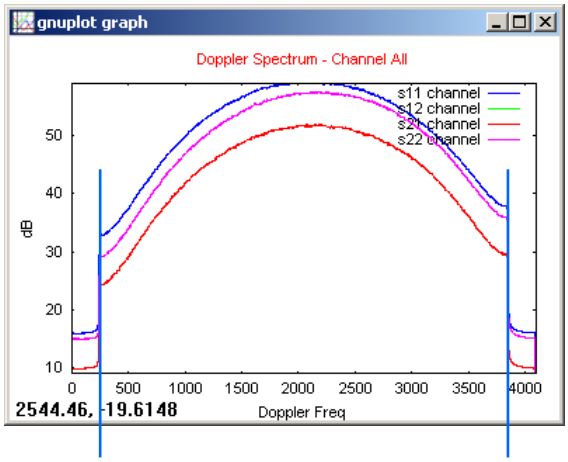
Sub-Aperture Decomposition:

Sub-Apertures Number Correspond of the Number of Sub-Apertures in which the initial polarimetric data set will be decomposed

Resolution Fraction(%) Define the width of each Doppler sub-spectrum. This corresponds to the azimuthal resolution affected to each output sub-aperture image.
Different examples of Resolution Fraction (**RF**) from 20% to 30% are provided below, in the case of **N = 4** sub apertures.

N = 4 RF = 30% N = 4 RF = 25% N = 4 RF = 20%

Weightening Indicate if a weithing process has been applied or not during the SAR data processing or if an azimuthal antenna pattern remains uncompensated in processed SAR data.
If weightening is selected, then the routine will automatically find the effective Doppler spectrum limits (limit1 and limit2) in order to estimate the correction function to be applied during the deconvolution process.
If weightening is not selected, the two limits values (limit1 and limit2) have to be entered. The X-axis corresponds to the 1-D FFT size used during the azimuthal spectrum determination process.



Limit 1 Limit 2

Speckle Filter:

If selcted, a Polarimetric Speckle filtering is applied on the (2x2) Sinclair monostatic (**[S2]**) raw binary data of the sub-aperture images. Two Polarimetric Speckle Filters

are proposed

Box Car Filter

This function filters **[S2]** polarimetric raw binary data sets using a Boxcar filter which performs incoherent averaging within a (N*N) sliding window (W).

Filtering Parameters

- **Window Size**: Users have to set the size of the (N*N) sliding window used to compute the local estimate of the average matrix. The default value of N is set to **7**.

Note : The default value of the **Output Directory** is set automatically to : **Main Directory_BOX / X3** where **X3** stands for **T3** or **C3** according to the data output format selected.

Input Directory

- MD / .
- MD / config.txt
- MD / s11.bin
- MD / s12.bin
- MD / s21.bin
- MD / s22.bin

Filter

Output Directory MD_BOX / X3

- MD_BOX / X3 /.
- MD_BOX / X3 / config.txt
- MD_BOX / X3 / X11.bin
- MD_BOX / X3 / X12_real.bin
- MD_BOX / X3 / X12_imag.bin
- MD_BOX / X3 / X13_real.bin
- MD_BOX / X3 / X13_imag.bin
- MD_BOX / X3 / X22.bin
- MD_BOX / X3 / X23_real.bin
- MD_BOX / X3 / X23_imag.bin
- MD_BOX / X3 / X33.bin

J.S. Lee Refined Filter

This function filters **[S2]** polarimetric raw binary data sets using the J.S. Lee refined filter which estimates local statistics within a (N*N) sliding window (W) and filters data in an adaptive way by minimizing a least square constraint.
This refined approach also includes the use of directional masks for the local statistics estimation.

Filtering Parameters

- **Number of Looks**: Users have to set the Input data equivalent number of looks used to compute the a priori input speckle noise variance. The default value of N is set to **1**.
- **Window Size**: Users have to set the size of the (N*N) sliding window used to compute the local estimate of the average matrix. The default value of N is set to **7**.

Note : The default value of the **Output Directory** is set automatically to : **Main Directory_LEE / X3** where **X3** stands for **T3** or **C3** according to the data output format selected.

Input Directory

- MD / .
- MD / config.txt
- MD / s11.bin
- MD / s12.bin
- MD / s21.bin
- MD / s22.bin

Filter

Output Directory MD_LEE / X3

- MD_LEE / X3 /.
- MD_LEE / X3 / config.txt
- MD_LEE / X3 / X11.bin
- MD_LEE / X3 / X12_real.bin
- MD_LEE / X3 / X12_imag.bin
- MD_LEE / X3 / X13_real.bin
- MD_LEE / X3 / X13_imag.bin

- MD_LEE / X3 / X22.bin
- MD_LEE / X3 / X23_real.bin
- MD_LEE / X3 / X23_imag.bin
- MD_LEE / X3 / X33.bin

Output Format:

This function is used to select the data output format.

[S2] >> [T3]	Raw Binary Data will be converted during processing to (3x3) complex Coherency **[T3]** matrix.
[S2] >> [C3]	Raw Binary Data will be converted during processing to (3x3) complex Covariance **[C3]** matrix.
Delete [S2] Original Data after Speckle Filtering	If selected, the (2x2) Sinclair monostatic (**[S2]**) raw binary data of the all sub-aperture images are deleted, in order to gain free space on the data disk.
