

Do It Yourself 4

Polarimetric decompositions

The objectives of this fourth *Do It Yourself* concern the decomposition of POLSAR data using the H-A-alpha method.

1. H-A-ALPHA DECOMPOSITION

1.1 Data filtering

This incoherent decomposition method works with filtered T3 matrix images.

- Set the main input directory to `~/PSP_demo/DATA/Frisco`.
- Apply a 3*3 Lee speckle filter on the data (the small size of the filtering window is due to the fact that the original unfiltered data already result from an incoherent averaging)
- Visualize the resulting Pauli image (in the `~/PSP_demo/DATA/Frisco_LEE` directory)



Figure 1

1.2 Filtered data set decomposition

- From PolSARpro main widget, click Process→T3→Single data set→H/A/Alpha decomposition: the H-A-Alpha decomposition widget appears
- Select the options as indicated on the following figure (note the selection of the BMP output files)
- The additional averaging window size is set to 1 (no additional filtering)

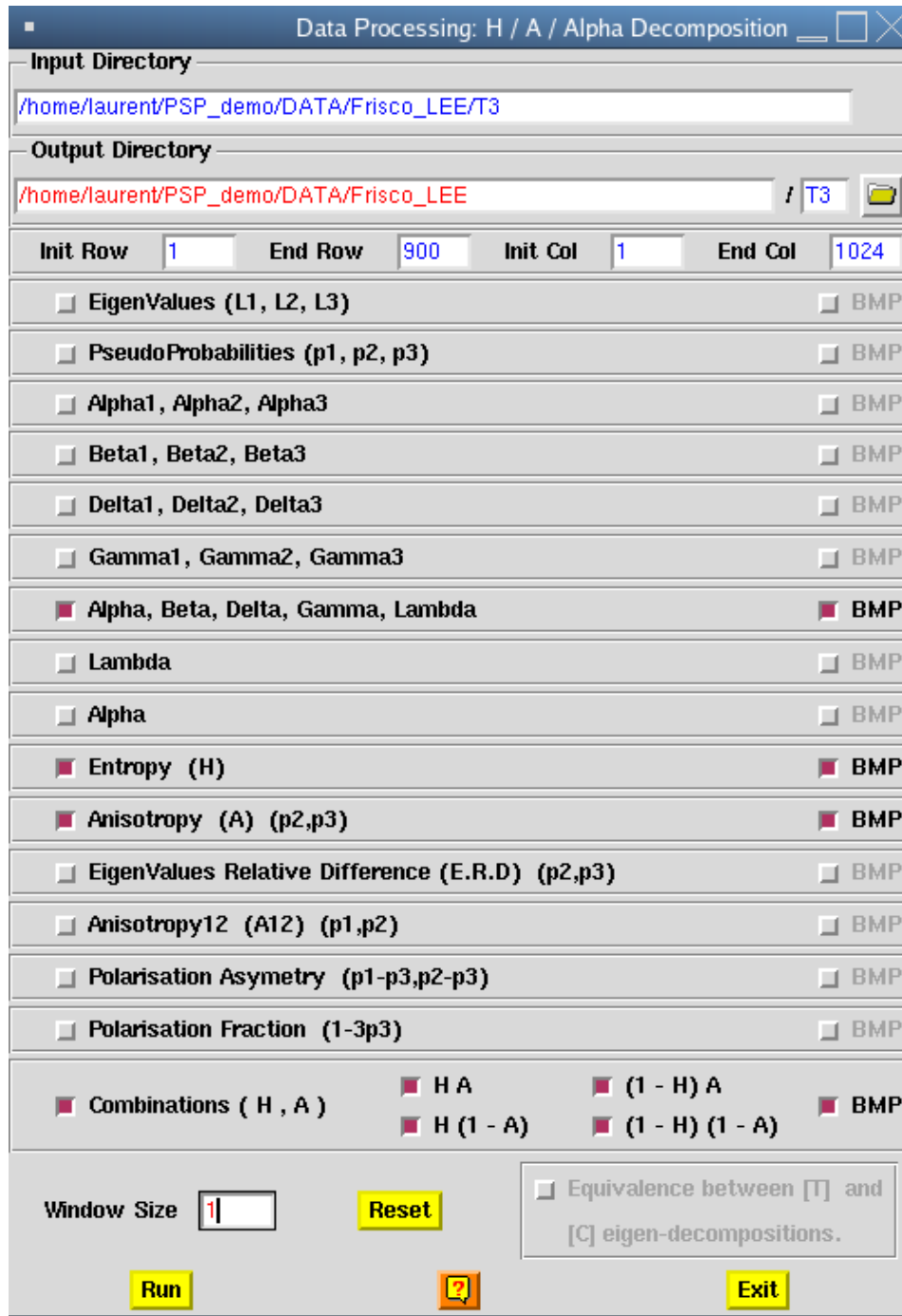


Figure 2

Binary and BMP files have been created in the ~/PSP_demo/DATA/Frisco_LEE/T3 directory.

Name	Size	File Type	Modified	Permissions
alpha.bmp	901.1 KB	BMP Image	2006-07-22 15:18	-rw-r--r--
anisotropy.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
beta.bmp	901.1 KB	BMP Image	2006-07-22 15:18	-rw-r--r--
combination_1mH1mA.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
combination_1mHA.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
combination_H1mA.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
combination_HA.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
delta.bmp	901.1 KB	BMP Image	2006-07-22 15:18	-rw-r--r--
entropy.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
gamma.bmp	901.1 KB	BMP Image	2006-07-22 15:18	-rw-r--r--
lambda_db.bmp	901.1 KB	BMP Image	2006-07-22 15:19	-rw-r--r--
PauliRGB.bmp	2.6 MB	BMP Image	2006-07-22 14:55	-rw-r--r--
config.txt	85 B	Plain Text Document	2006-07-22 14:55	-rw-r--r--
alpha.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
anisotropy.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
beta.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
combination_1mH1mA.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
combination_1mHA.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
combination_H1mA.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
combination_HA.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
delta.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
entropy.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
gamma.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
lambda.bin	3.5 MB	Unknown	2006-07-22 15:18	-rw-r--r--
T11.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T12_imag.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T12_real.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T13_imag.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T13_real.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T22.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T23_imag.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T23_real.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--
T33.bin	3.5 MB	Unknown	2006-07-22 14:55	-rw-r--r--

33 Items - 33 Files (82.6 MB Total) - No Folders

Figure 3

2. PARAMETER INTERPRETATION

All computed decomposition parameters may be visualized using PolSARpro viewer.

The entropy image provides information on the scattering degree of randomness.

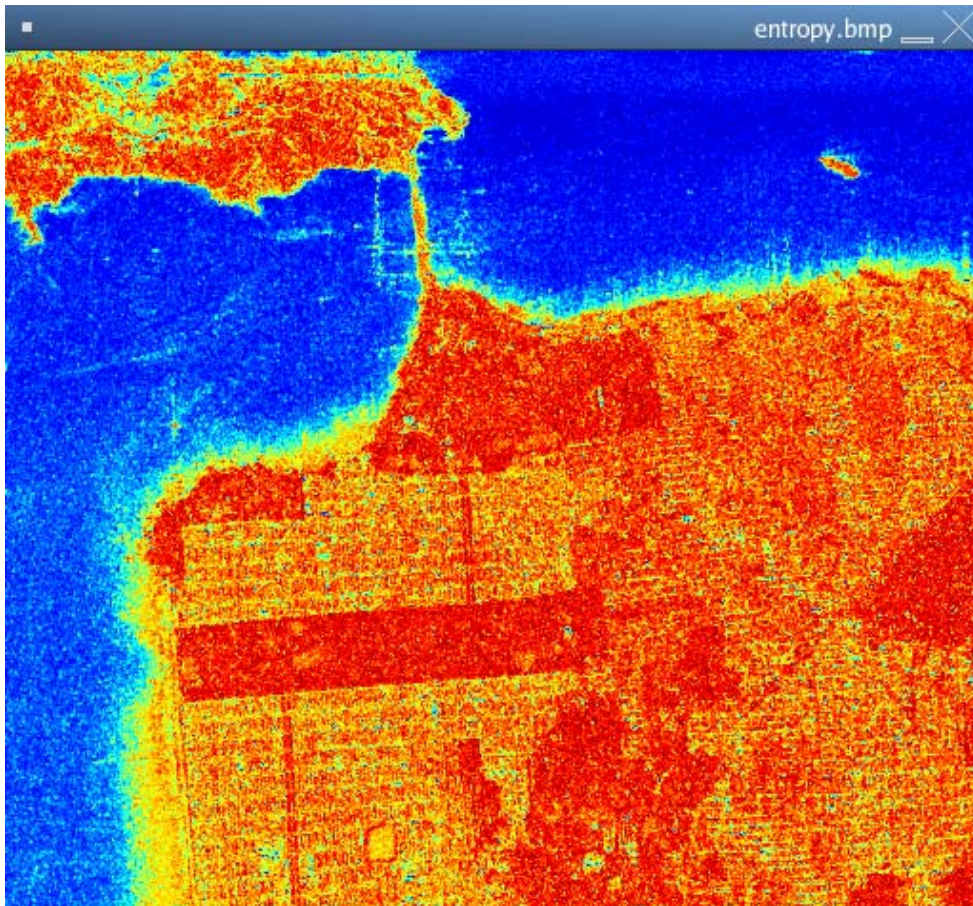


Figure 4 Entropy image.

Scattering over the sea is characterized by a low degree of randomness. The mixing of different scattering mechanisms over built up areas results in intermediate entropy values. On forested zones the scattering process is random.

The alpha parameter indicates the nature of the scattering: single or double bounce reflection or scattering over anisotropic media.

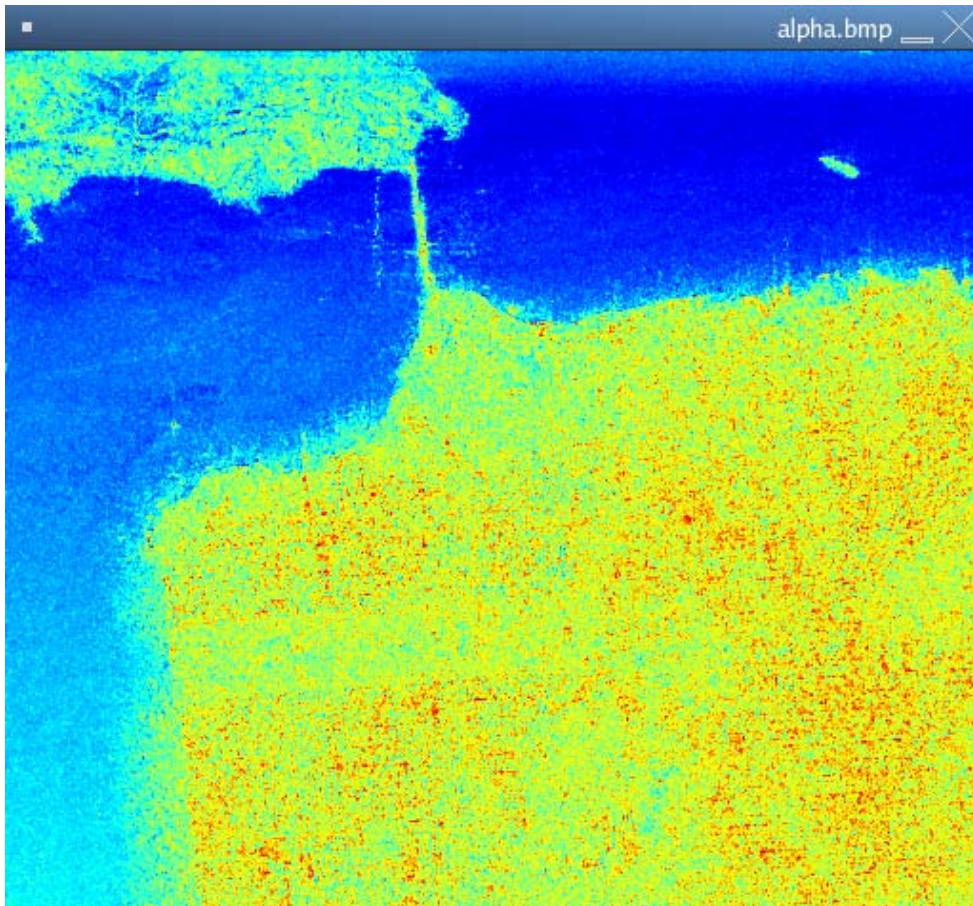


Figure 5 Alpha image

Low values over the sea indicate a single bounce reflection, characteristic for surfaces. Double bounce reflection can be found over built-up areas, due to the ground-wall interaction. Over vegetated areas, alpha reaches an intermediate values, depicting volumetric media.

The anisotropy provides information on the relative importance of secondary mechanisms.

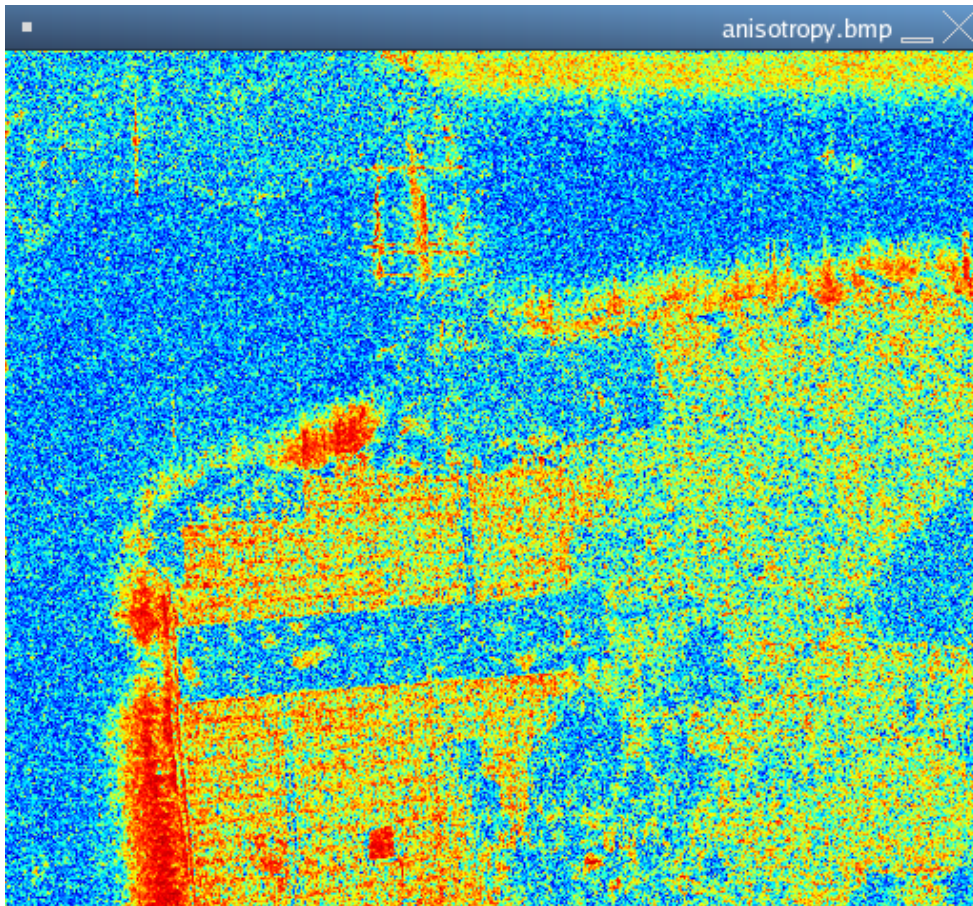


Figure 6 Anisotropy image

This parameter cannot be interpreted separately from the entropy.

It is then interesting to observe the different combinations between the entropy and the anisotropy.

Two combinations are displayed below.

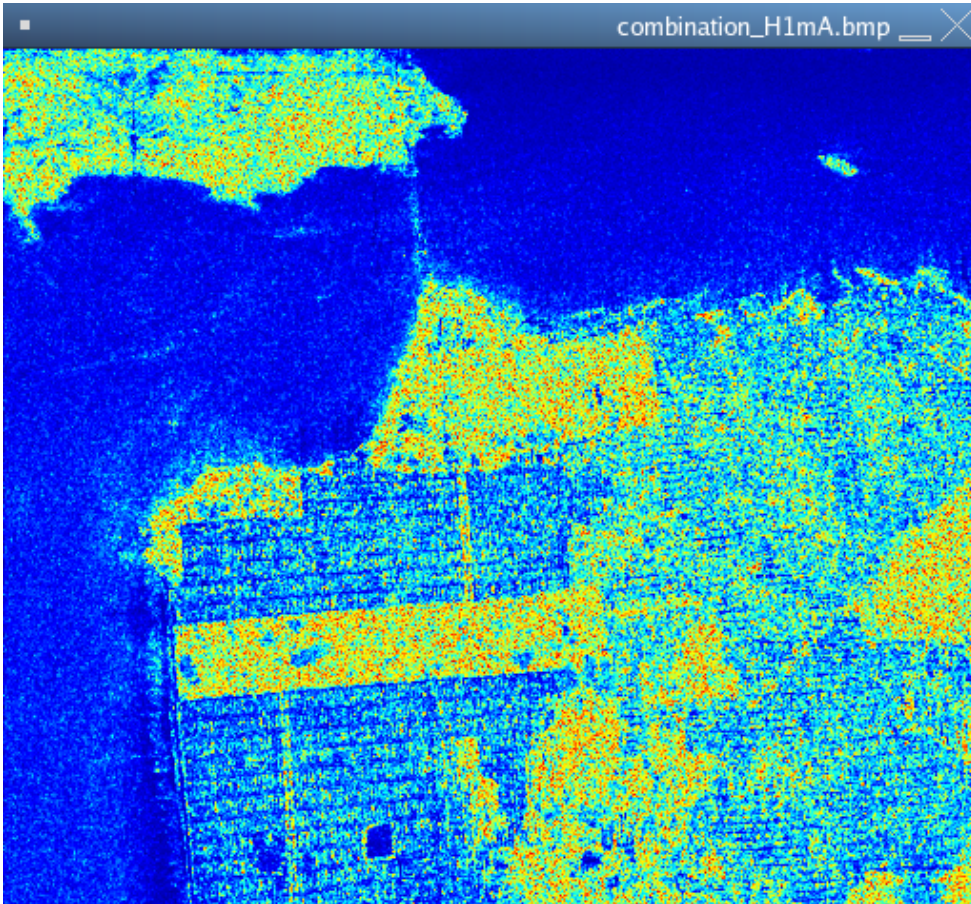


Figure 7 H(1-A)

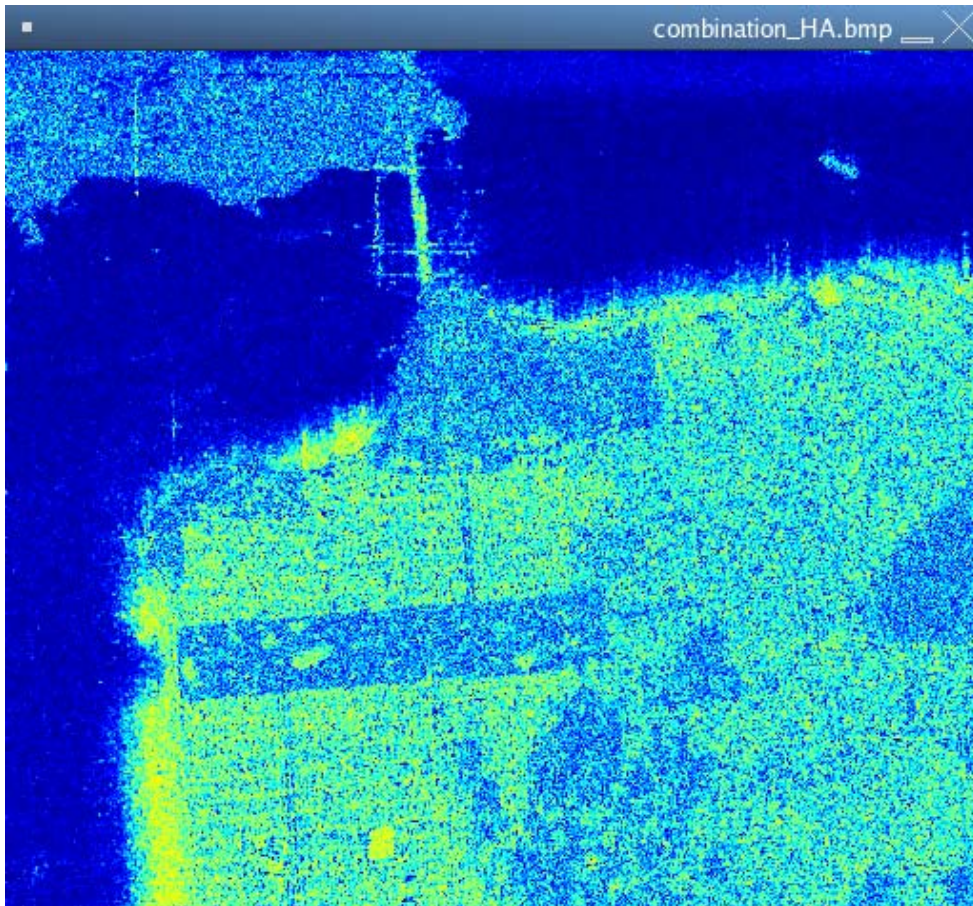


Figure 8 HA

A large value in the HA image corresponds to high entropy and anisotropy and can then be associated to two dominant eigenvalues or scattering mechanisms.

A large value of the $H(1-A)$ image correspond to eigenvalues with equivalent amplitudes and can then be associated to random scattering.