Do It Yourself 1

Getting started with PolSARpro

The objectives of this first *Do It Yourself* concern the import of various POLSAR data formats to PolSARpro as well as the visualization of basic polarimetric quantities.

Remark:

The following data manipulations have been realized on an “IEEE little endian convention” machine (a PC). Users working on an “IEEE big endian convention” computer will have to toggle the IEEE conversion option wherever it is proposed.

1. BASIC SETUP

Sample data sets, delivered with the PolSARpro software, have been stored at a specific location ~/PSP_demo/Sample_data, where ~ represents the home directory /home/laurent.

The ~/PSP_demo/DATA directory has been created to host the data sets converted to the PolSARpro format.

It can be seen on **Figure 1** that the ~/PSP_demo/Sample_data contains data sets acquired with various sensors.

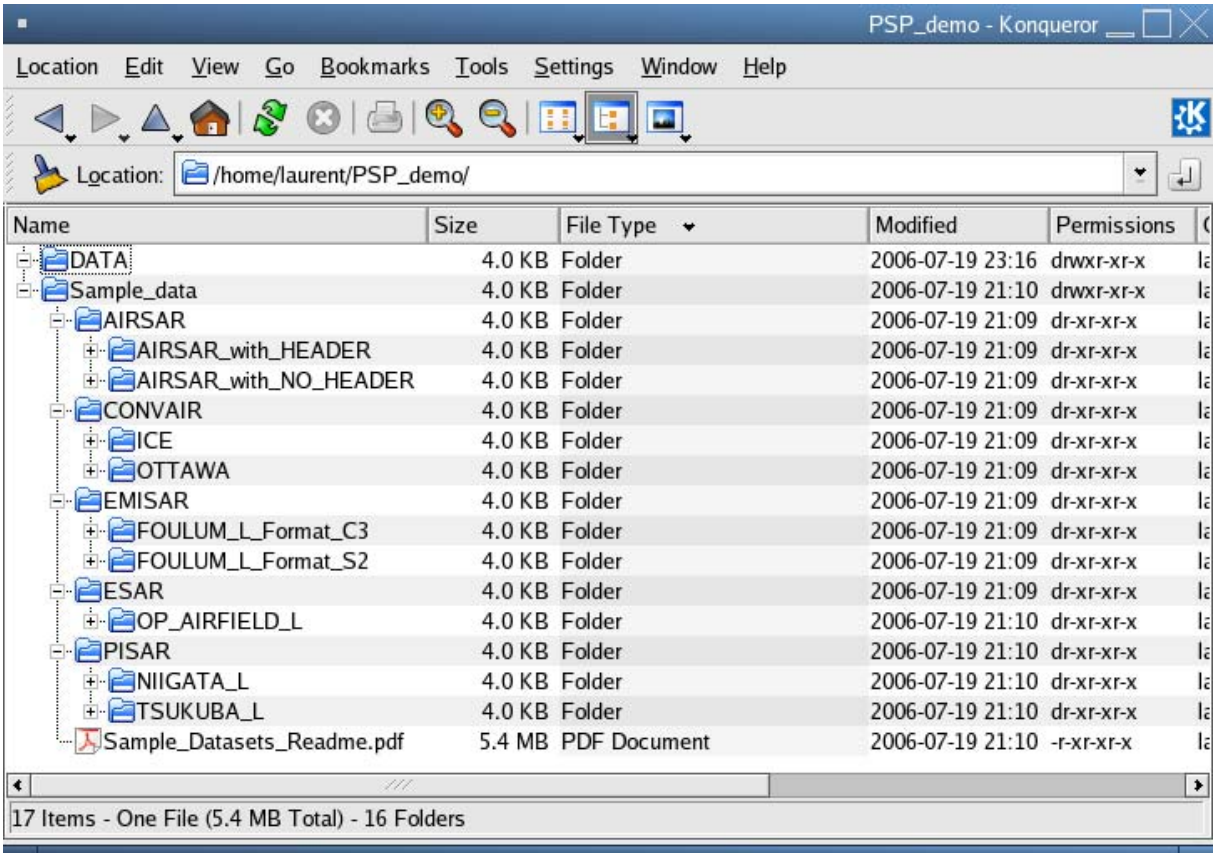

Figure 1 Basic directory setup

2. SENSOR SPECIFIC DATA SET IMPORT

2.1 Flevoland data import

2.1.1 Main input directory selection

PolSARpro is run and the full version is selected.

Figure 2 Main PolSARpro widget

- From the main PolSARpro widget represented, click Environment: the main input directory window appears.
- It is recommended to unselect the ENVI config option in order to avoid the creation of numerous header files.
- Then set the input directory to the Flevoland data set directory: ~/PSP_demo/Sample_data/AIRSAR/AIRSAR_with_HEADER/FLEVOLAND.
- The main input directory is a key basic internal variable for PolSARpro and its value may change during the processing. It is then recommended to let this window open when using PolSARpro.

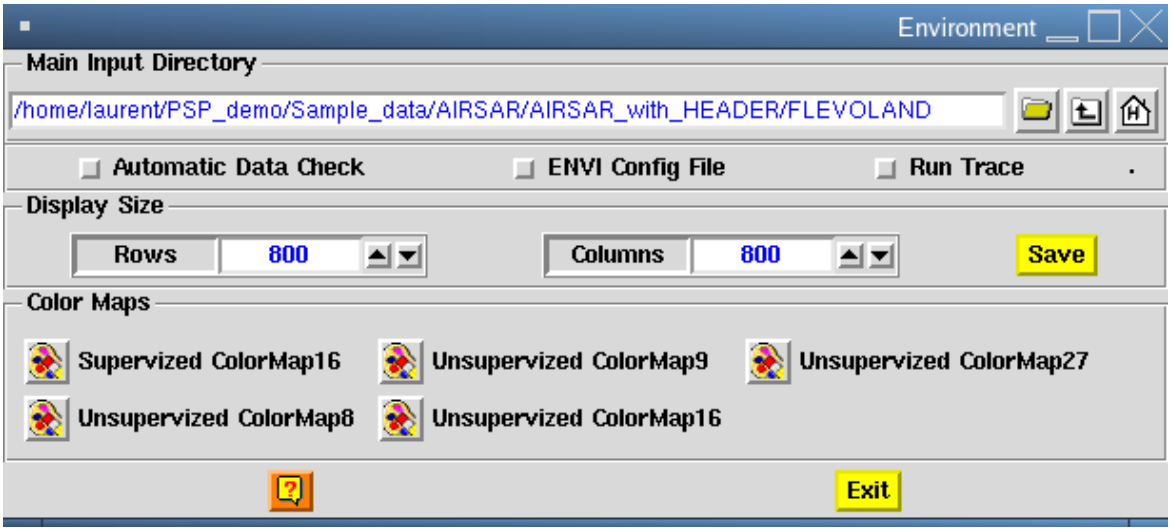

Figure 3 Main input directory widget with the Flevoland data settings

2.1.2 Declaration of input data type

Click Import → Airborne Sensor → AirSAR : The AirSAR import interface appears

- The Flevoland data set has been acquired by the AirSAR sensor prior to 1993 : select the appropriate v3.56 option
- The polarimetric data format is Multilook Complex : select the MLC option
- Set the input Stokes parameter file to ~/PSP_demo/Sample_data/ AIRSAR/AIRSAR_with_HEADER/FLEVOLAND/FLEVOL.STK. Depending on the operating system, you may have to unselect the STK filter to do enter the file name.
- Read the header information by pressing the Read Header button: the image number of rows and columns appear.
- Click OK.

Figure 4 AirSAR import declaration interface with Flevoland data settings

2.1.3 Data import

Now that the data format has been specified, it is possible to extract and convert the POLSAR information.

- On PolSARpro main widget, click Import → Extract → Full Resolution : the extraction widget appears
- In order to extract data to a specific directory, set the Output Directory value to ~/PSP_demo/DATA/Flevoland/
- In this windows, click Full resolution to convert the whole data set.

- Since we are dealing with incoherent Stokes data, [T3] and [C3] matrix formats are the only conversion possibilities. Let the [T3] option selected
- Click Run

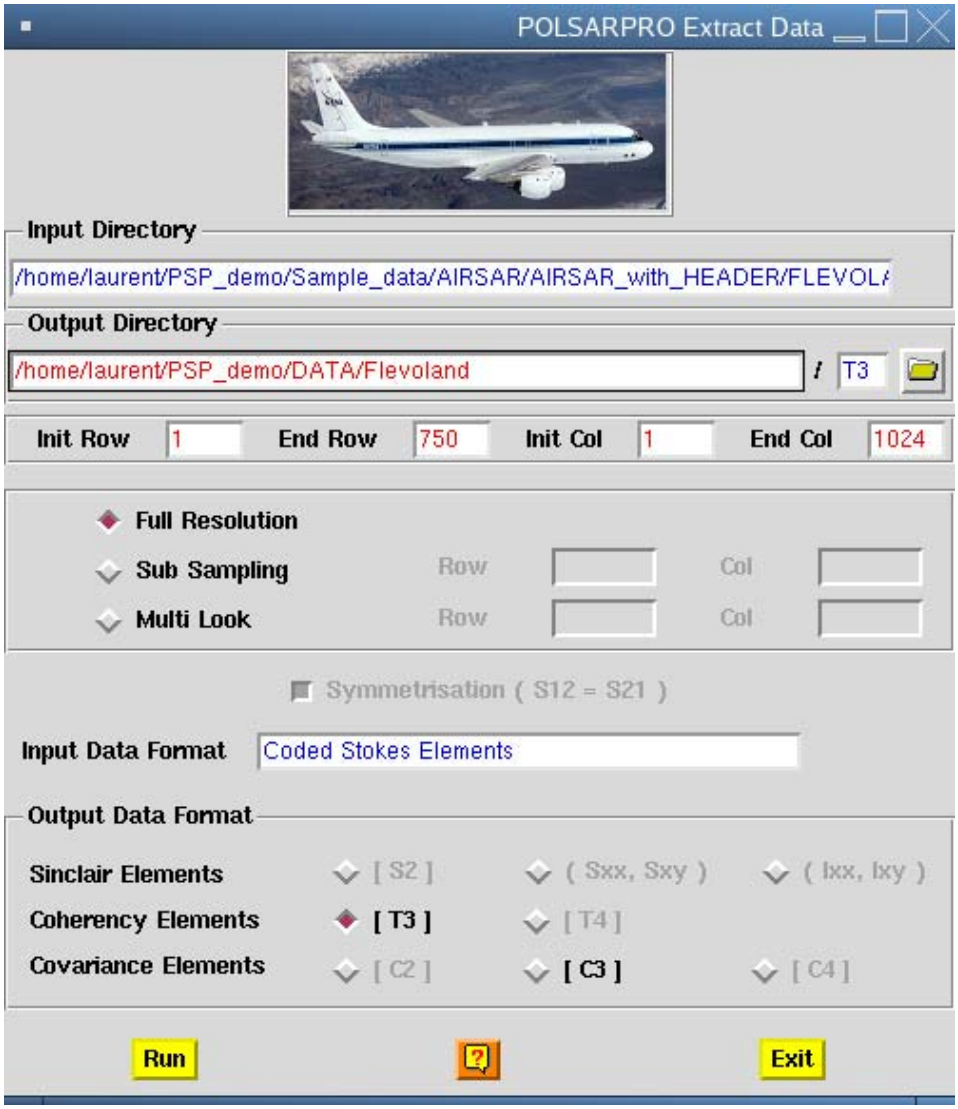

Figure 5 AirSAR data extraction interface.

Check that the ~/PSP_demo/DATA/Flevoland/ ~/PSP_demo/DATA/Flevoland/T3 directories have been created and contain the desires polarimetric data files.

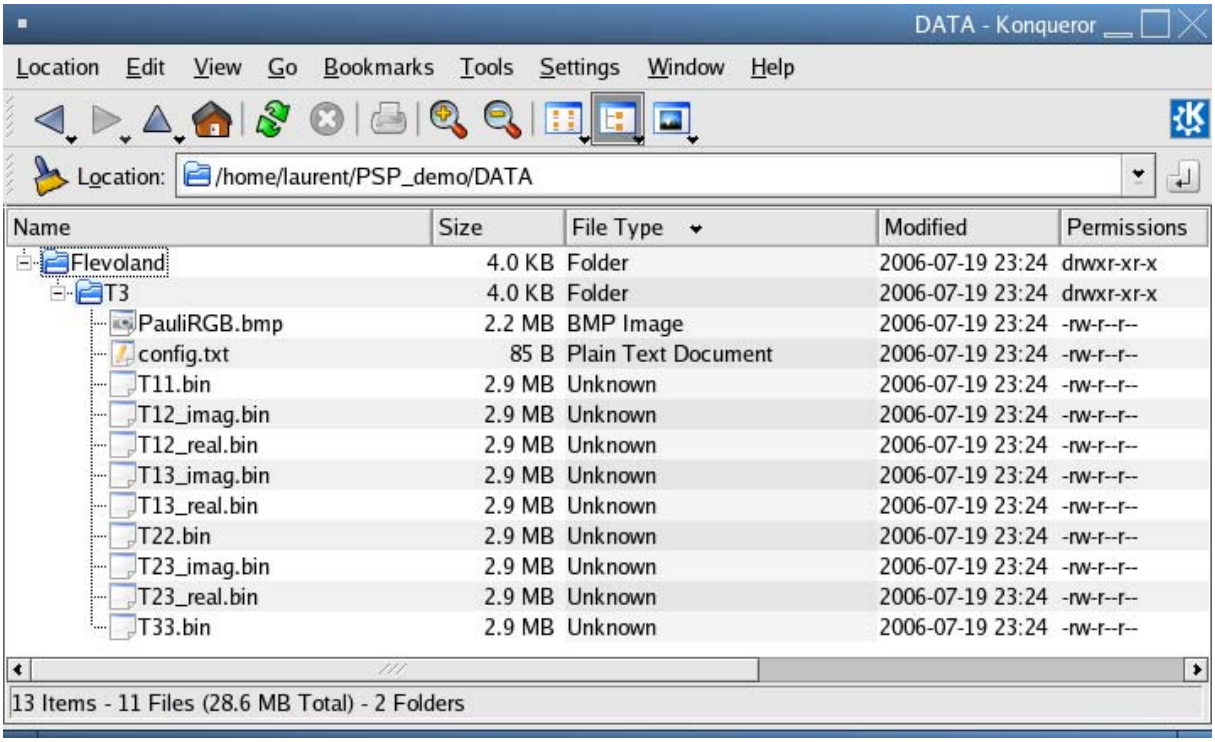

Figure 6 Created Flevoland directory and files

2.1.4 Visualization of polarimetric quantities

As it can be observed in **Figure 6**, an image file, PauliRGB.bmp, was created during the conversion. It can be viewed using PolSARpro viewing facilities or with any other image display tools.

Figure 7 PauliRGB.bmp image

PolSARpro offers the possibility to display polarimetric SAR information.

An image of the T11 polarimetric intensity channel can be created as follows:

- Check that the current main input directory is set to ~/PSP_demo/DATA/Flevoland/.
- On PolSARpro main widget click Display→T3→create BMP file
- Set the input file to ~/PSP_demo/DATA/Flevoland/T11.bin.
- Select, the float (real float values), 10*log(Mod) (log scale display) and the gray color palette options.
- Select the automatic (automatic min and max value setting) and enhanced contrast (reduced dynamic) options
- The output format is set to 8-bit BMP.
- Run
- The output ~/PSP_demo/DATA/Flevoland/T11_dB.bmp image is presented in **Figure 8**.

Figure 8 T11_dB image

Note that the PolSARpro viewer permits to visualize the numerical range of the observed image (from -29.87 dB to -15.94 dB).

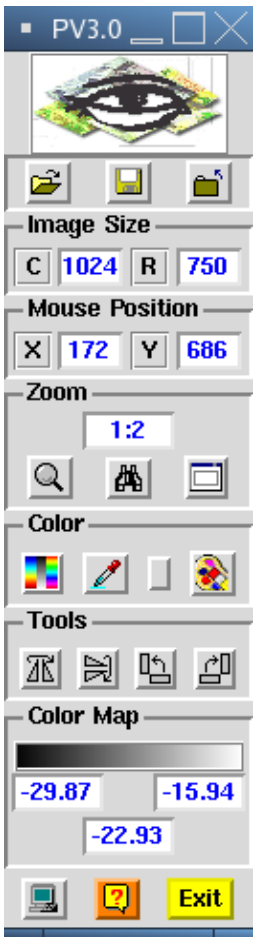

Figure 9 PolSARpro viewer with an image numerical range.

2.2 San-Francisco data set import.

A similar manipulation can be applied to the other sample data sets and is summarized in the following for the San-Francisco data set.

- The input directory is set to ~/PSP_demo/Sample_data/AIRSAR/AIRSAR_with_no_HEADER/SAN_FRANCISCO

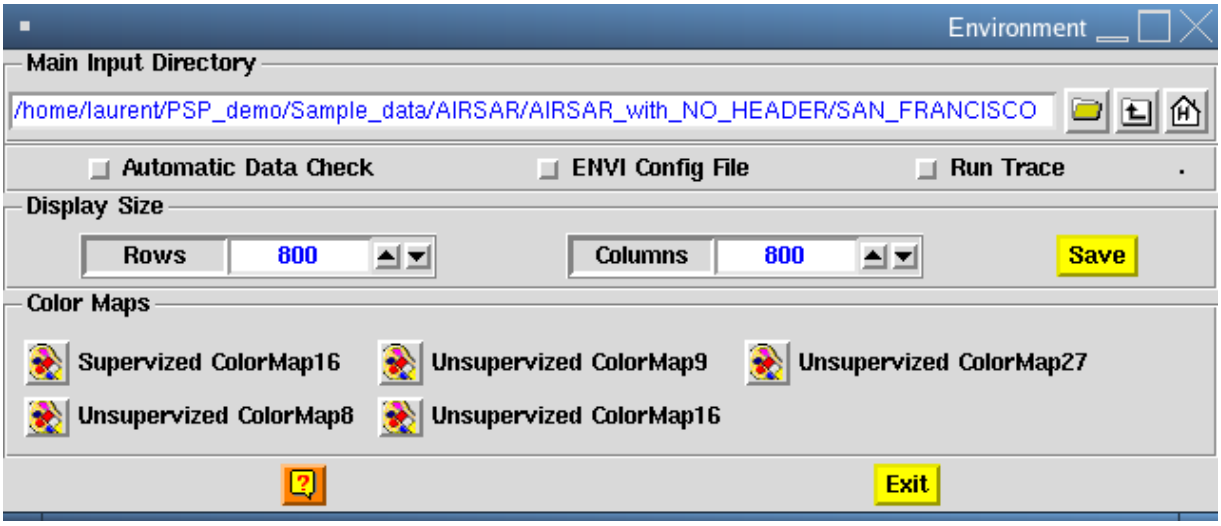

Figure 10

- The data format declaration id led similarly to the Flevoland data case. Note that clicking on the Read Header button leads to a warning indicating that the data set contains no header information. In this case, the image row and column numbers have to be provided by the user.

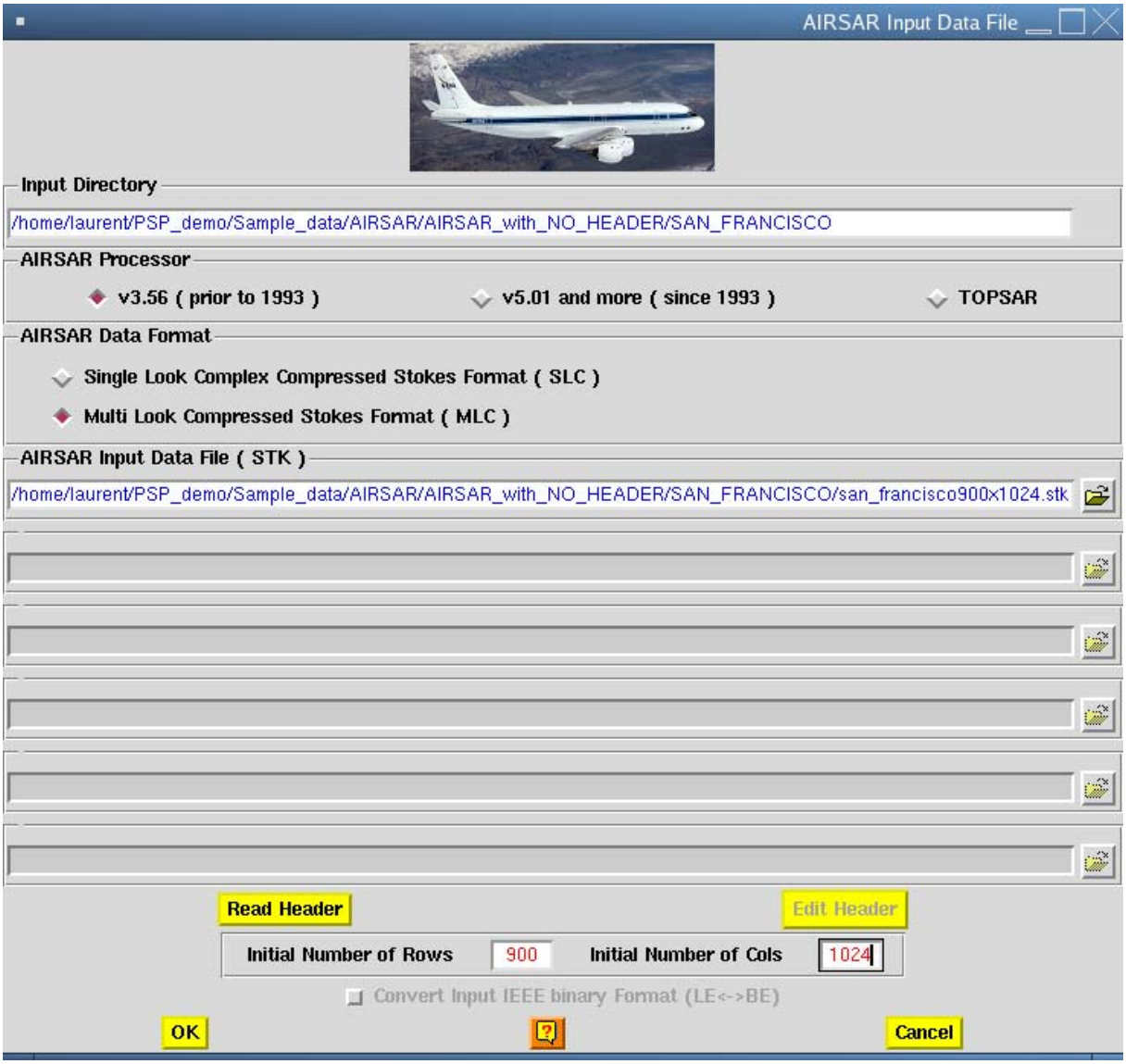

Figure 11 I

- After a full resolution extraction to [T3] matrices, the Pauli color coded image is given by the following figure.

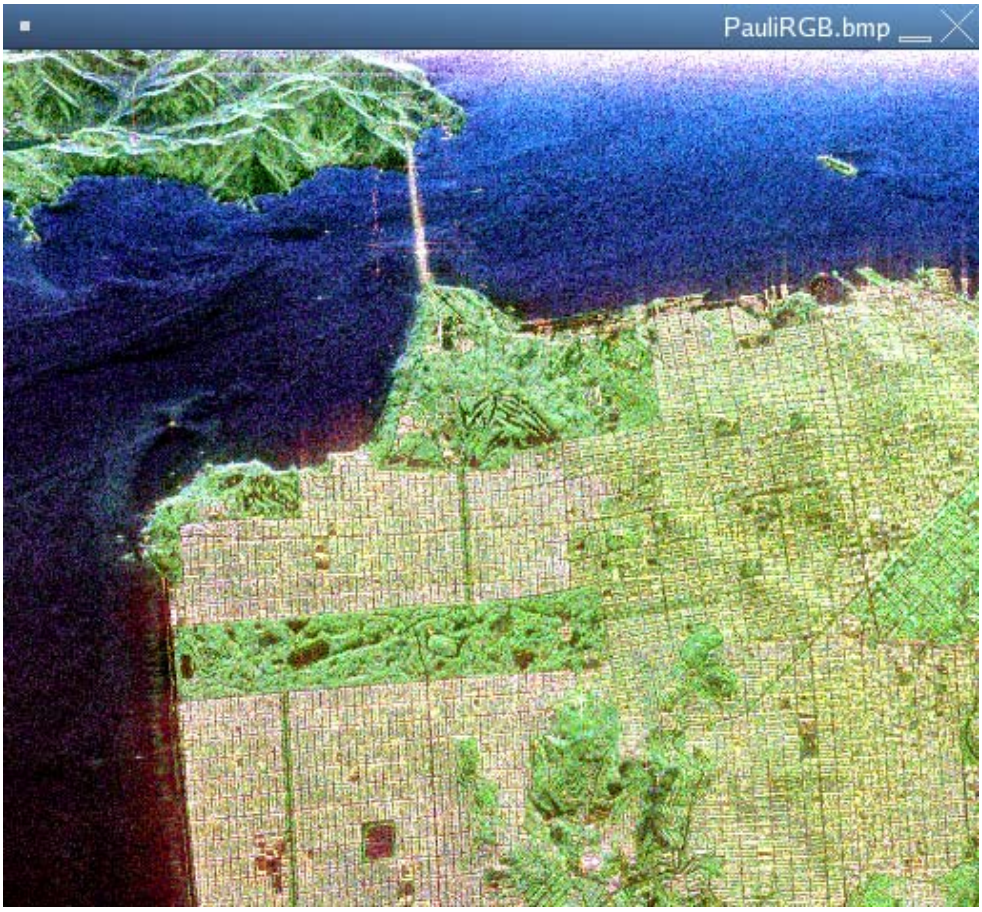

Figure 12

2.3 Oberpfaffenhofen data set import.

- The input directory is set to ~/PSP_demo/Sample_data/ESAR/OP_AIRFIELD_L/
- The data format declaration is represented in the following figure. The data files do not contain any header information and the row and column numbers have to be set manually (from the provided .asc file).

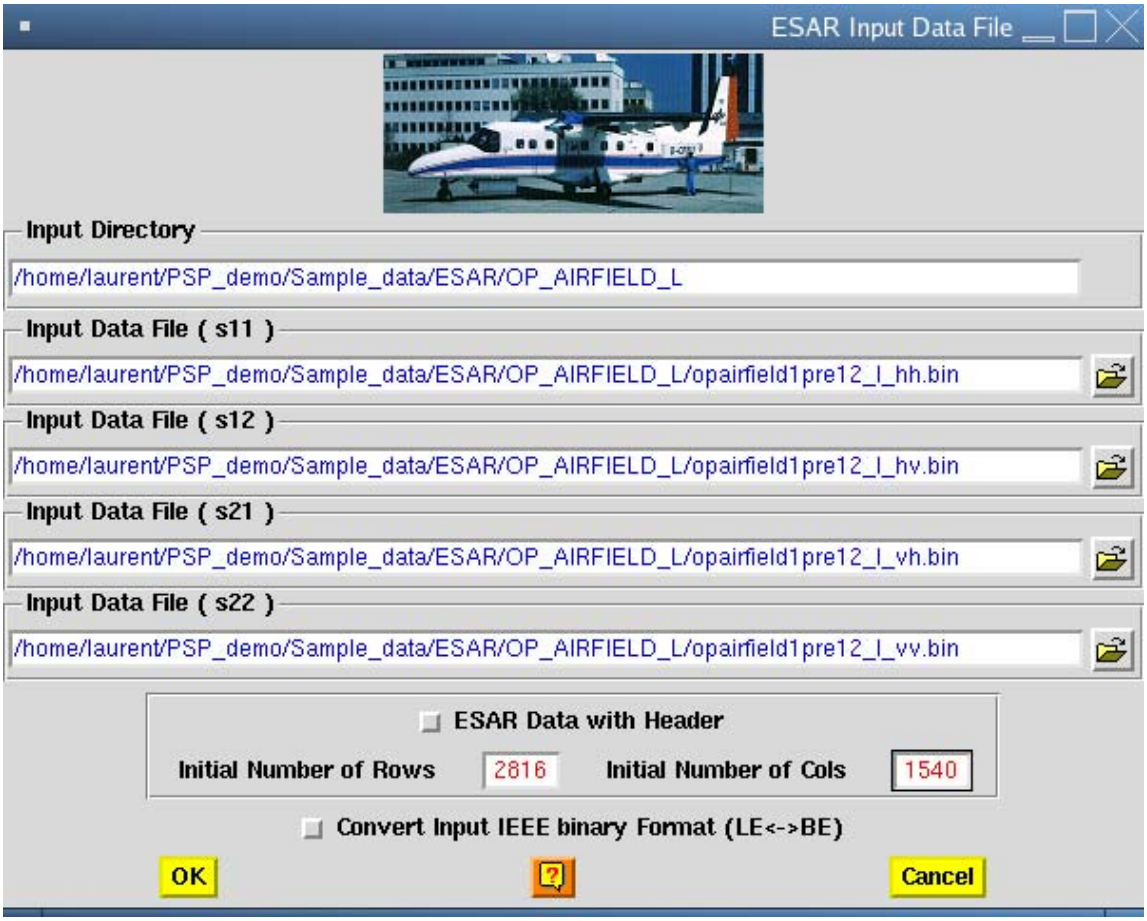

Figure 13 I

- After a full resolution extraction to coherent [S] matrices, the Pauli color coded image is given by the following figure.

Figure 14

3. FINAL DATA DIRECTORY ORGANIZATION

The final organization of the data directory is represented in the following figure

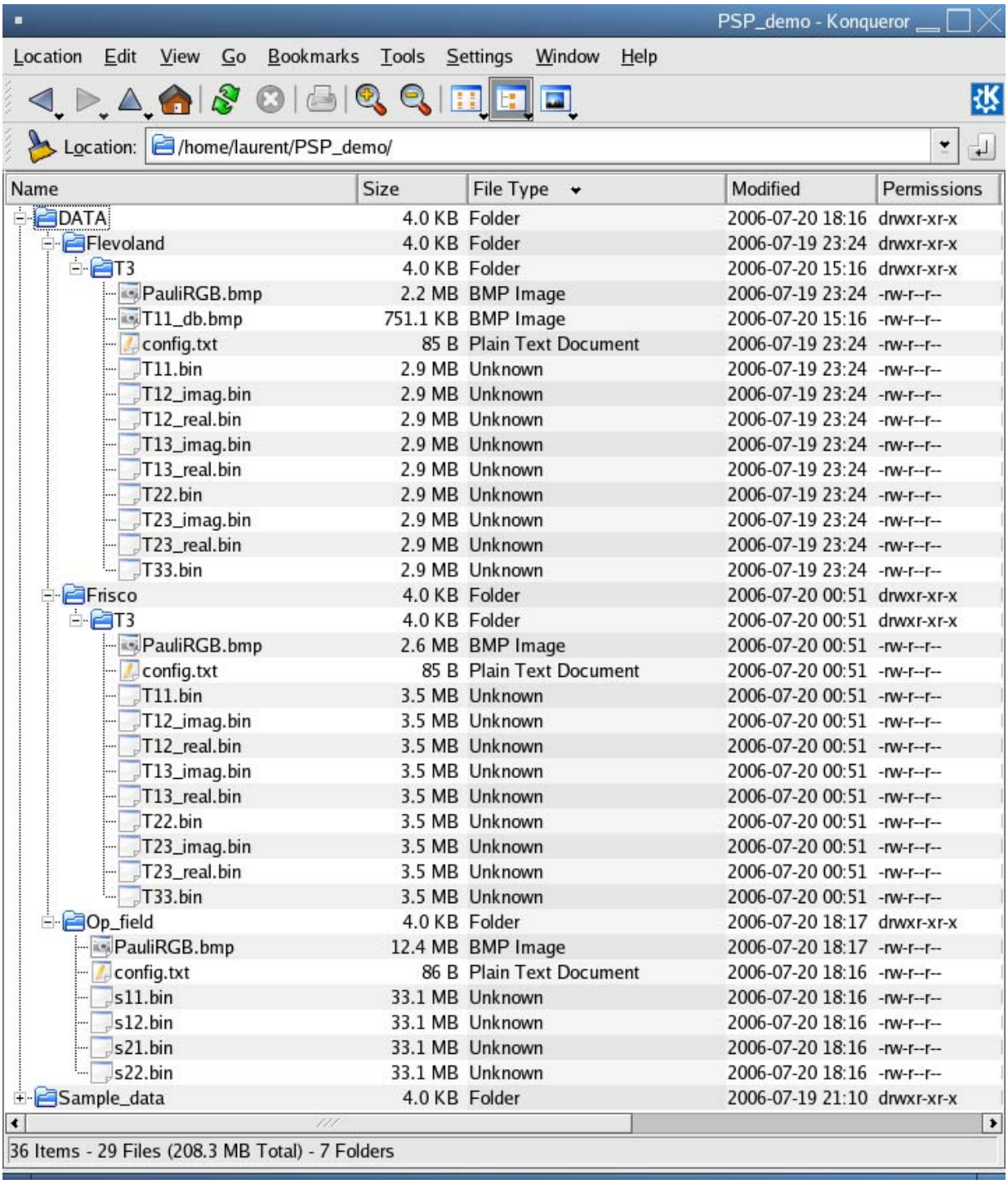

Figure 15

The remaining sample data sets may be converted to PolSARpro format in a similar way