Quad-pol Viewer
User Guide

Ver. 0.1.2.0

September 2010

Research Institute of Systems Planning, Inc.

■Revision history

Ver.	Release date	Comments
0.1.1.0	October 2009	Initial release of this document for Quad-pol Viewer 0.1.1.0
0.1.2.0	September 2010	Globalization.

Table of Contents

1. INTRODUCTION 1

1.1. SYSTEM REQUIREMENTS 1
1.2. AVAILABLE DATA 1
1.3. THE DATA BEING USED IN THIS DOCUMENT 2

2. SCREEN STRUCTURE 3

3. OPERATIONS 4

3.1. STARTING/EXITING 4
3.2. OPENING FILE 4
3.3. ZOOMING/PANNING 5
3.4. SAVING 5
3.5. COPYING WINDOW 5
3.6. CLOSING FILE 5
3.7. ABOUT (ABOUT QUAD-POL VIEWER) 6

4. PROCESSES 7

4.1. STRETCH 7
4.2. SIGNATURE 8
4.3. CHANGING BASIS 10
4.4. HV / PAULI 11
4.5. EIGENVALUE ANALYSIS 13
4.6. 4 COMPONENT DECOMPOSITION 15

1. Introduction

Quad-pol Viewer allows users to browse through any full polarimetry product, which data is acquired by the Phased Array L-band Synthetic Aperture Radar (PALSAR) on the Advanced Land Observing Satellite (ALOS) ("Daich" in Japanese).

References:

Y. Yamaguchi, *Radar polarimetry from basics to applications*, IEICE, Dec. 2007

A. Sato, Y. Yamaguchi, and H. Yamada, "A study on detection of urban area using four-component decomposition with deorientation," *Technical report of IEICE.*, vol. 109, no. 181, SANE2009-61, pp. 47-52, Aug. 2009

1.1. System Requirements

Your computer must meet the following requirements.

Table 1-1 System Requirements

	Minimum	Recommended
CPU	Dual Core	Quad Core or better
Memory	2 GB	3 GB or more
Hard Drive Space	5 MB without data	5 MB without data
Screen Resolution	1024x768 pixels or higher	1280x1024 pixels or higher
OS	Windows XP 32bit .NET Framework 3.0 or later	Windows Vista 32bit
Mouse	mouse with a scroll wheel	mouse with a scroll wheel

1.2. Available Data

The following data are available for Quad-pol Viewer.
You can import and brows T3 data generated by PolSARpro.

Table 1-1 Available Data List

	Level	remarks
ALOS-PALSAR	JAXA 1.1 (CEOS) Polarimetry mode	
	ERSDAC 1.1 (VEXCEL) Polarimetry mode	
	ERSDAC 4.1 (CEOS) Polarimetry mode	Geo-code Geo-reference
PolSARpro	-	T3 data generated by PolSARpro (http://earth.esa.int/polsarpro/)

1.3. The Data Being Used in This Document

The data being used in this document are sample data downloaded from the ERSDAC website (http://www.palsar.ersdac.or.jp/e/product/p_product.html).

(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

2. Screen Structure

Quad-pol Viewer consists of the following windows:

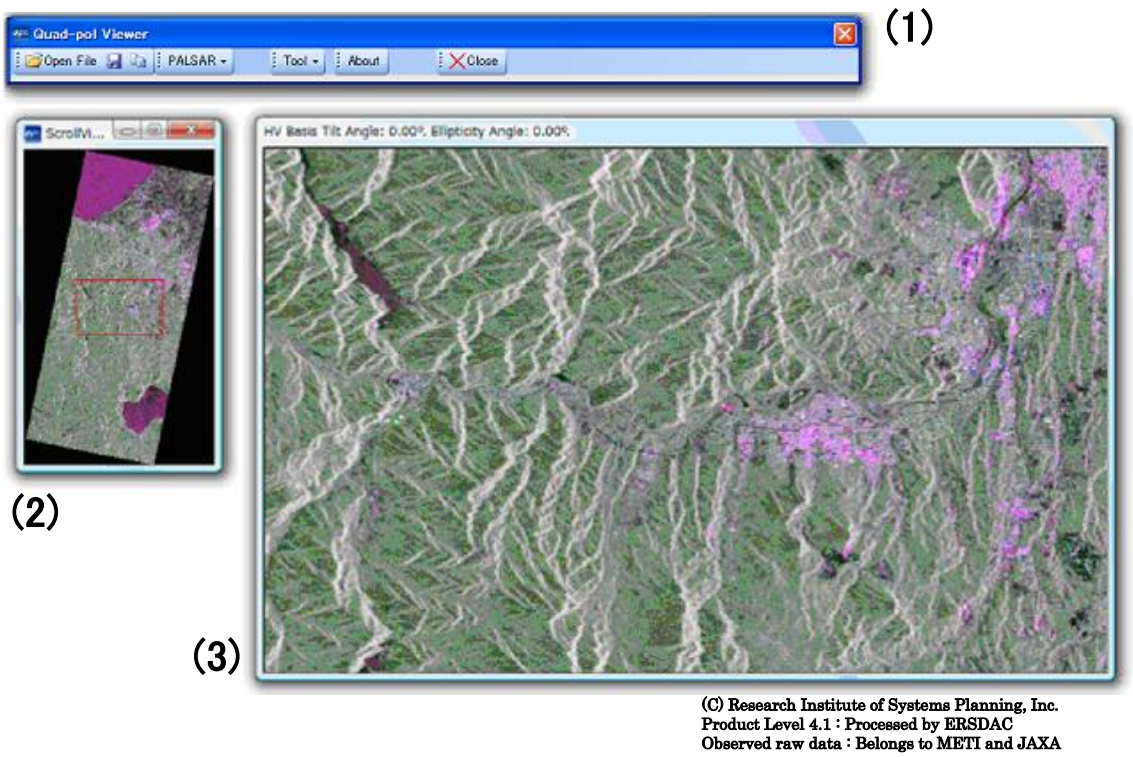


Figure 2-1　Screen Structure

(1) Control window

Use this to choose menu commands and command buttons: File, Save, Copy, PALSAR, Tool, About, and Close.

This window appears at startup.

(2) Scroll View window

Use this to display an image of the full extent of the data and show the area of the image displayed in the Image View window as a rectangle which bounds are displayed in red color.

(3) Image View window

Use this to display detailed image of an area shown as a rectangle in the Scroll View window.

You can copy the Image View window to compare with the result of different process.

3. Operations

3.1. Starting/Exiting

To start Quad-pol Viewer, do one of the following:

- Double-click **Quad-pol Viewer** icon on the desktop.
- Click **Start** > **Program Files** > **Quad-pol Viewer** > **Quad-pol Viewer**.

To exit Quad-pol Viewer, click the close button on the Control window.

3.2. Opening File

To open the full polarimetry data file:

1. Click the **Open** Open File icon in the Control window, then the **File Open** dialogue box appears.
2. Choose file type from the files of type drop-down list.
3. Specify the name, directory and drive for the full polarimetry data you want to open.
4. Click the **OK** button.

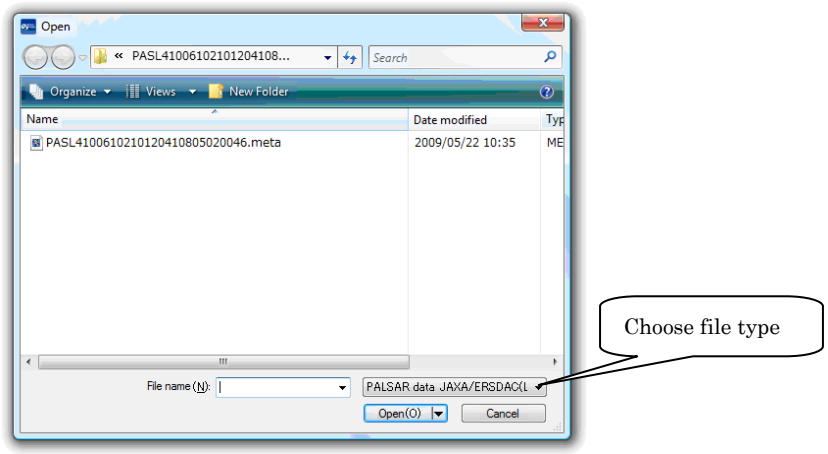


Figure 3-1 File Open Dialogue Box

To open a file provided from ERSDAC, select leader file (*.meta).
To open a file provided from JAXA, select leader file (LED*).
To open a file generated by PolSARpro, choose “T3(config.txt)” type and select “config.txt” file.

3.3. Zooming/Panning

To zoom in, scroll mouse wheel away from you.
To zoom out, scroll mouse wheel towards you.

To change the center point of the image in the Image window, do one of the following:

- Hold the left mouse button down in the Image window, drag the mouse/image to the desired location, then release the button to change the viewing area in the Image window.
- Hold the left mouse button down on the red color rectangle in the Scroll View window, drag the mouse/view to the desired location, then release the button to change the viewing area in the Image window.
- Double-click on the Image View window or the Image window, so that the point you double-clicked on becomes the new center point in the Image window.

3.4. Saving

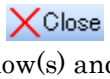
To save the image to PNG file:

1. Click the **Save to PNG**  icon in the Control window, then the **File Save** dialogue box appears.
2. Specify the name, directory and drive.
3. Click the **OK** button.

3.5. Copying Window

Click the **Copy**  icon in the Control window, then the Image View window is copied and new Image View window appears.
A comparison can be made between the results of different processes.
Users are unable to reprocess to the new Image View window. The new window is synchronized with the copied Image View window at the zooming or panning.

3.6. Closing File

Click the **Close** 

icon in the Control window to close the Scroll View window, the Image View window(s) and the data file, enabling to open another data file.

3.7. About (About Quad-pol Viewer)

Click the **About** About icon in the Control window, then the **About Quad-pol Viewer** dialogue box appears.

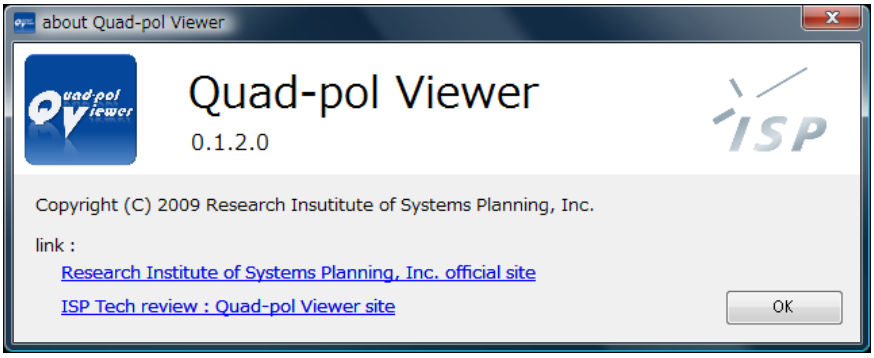
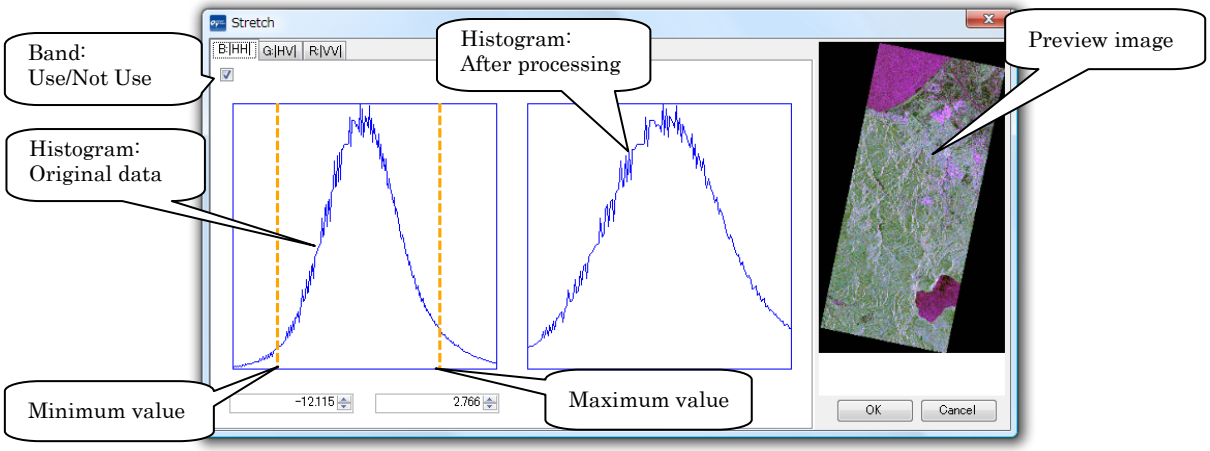


Figure 3-2 About Quad-pol Viewer

4. Processes

4.1. Stretch

Select **Tool** > **Stretch** in the Control window, then the **Stretch** dialogue box appears.



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-1 Stretch Dialogue Box

To select the band (blue, green or red), click the tab.

If you decide not to use a band, uncheck the check box. You can select a band subset.

To specify the minimum/maximum value, do one of the following:

- Click and drag the line of the minimum/maximum value.
- Enter the minimum/maximum value into the text box.

When you check/uncheck the check box or change the minimum/maximum value, the preview image and the histogram of the processing result are updated.

Click the **OK** button, the specified parameters will be applied to the Scroll View window and the Image View window.

4.2. Signature

Select **PALSAR** > **Signature** in the Control window to change to the Signature mode.

Click or click and drag in the Image View window, then the **Signature** dialogue box appears. Click or click and drag again to update the contents of the **Signature** dialogue box.

You can move the image of the signature around your viewpoint by the click and drag of a mouse in the signature panel.

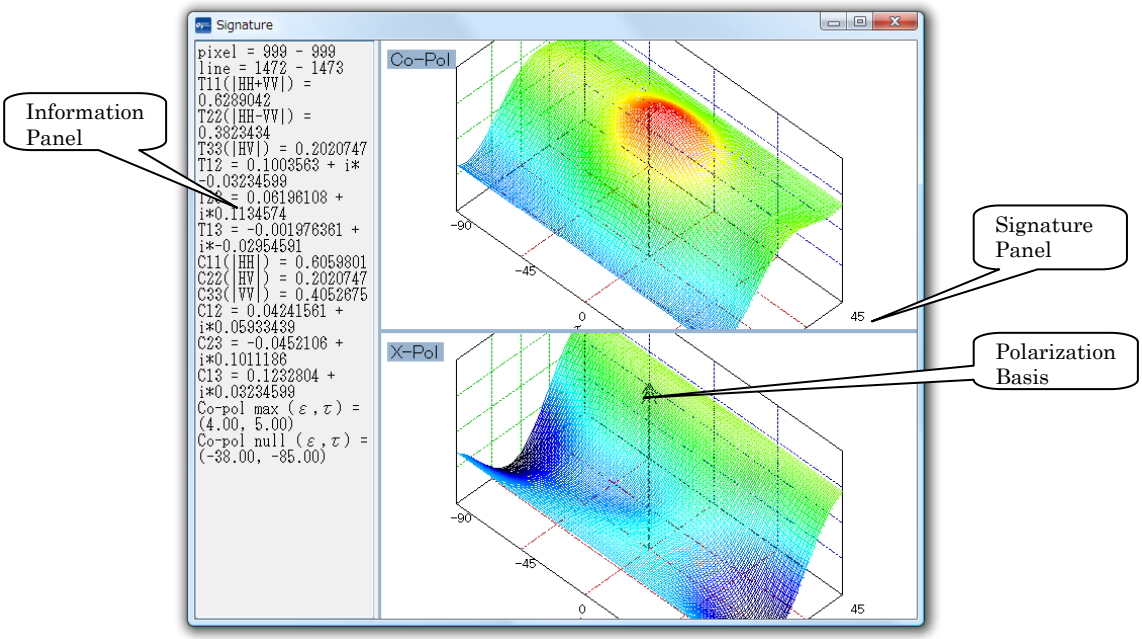


Figure 4-2 Signature Dialogue Box

Table 4-1 Operation in The Signature Mode

Mouse Operation	Description	Remarks
Click	The information of the desired point is displayed.	The desired point is indicated by red color arrow in the Scroll View window and the Image View window.
Click and Drag (Rectangle)	The information of the average of the desired area is displayed.	The desired area is shown as white color rectangle and indicated by red color arrow in the Scroll View window and the Image View window.
The displayed information depends on the executed process. If the window size is not one, the average values are displayed.		

Table 4-2 Information List

Item	Description	Remarks
pixel	Pixel (Column) No.	
line	Line (Row) No.	
α	Alpha angle	only α-Entropy
Entropy	Entropy	only α-Entropy
Z*n*(…)	Percentage of each segment	only α-Entropy
Total	Total power	only 4 Component Decomposition
P*n*	Power and percentage of each component	only 4 Component Decomposition
Deorientation Angle	Deorientation Angle	only 4 Component Decomposition with Deorientation
T*nn*	Coherency matrix elements	
C*nn*	Covariance matrix elements	
Co-pol max/null	Max/Min angles of Co-pol Signature	Calculated with simple algorithm

4.3. Changing Basis

Select **PALSAR > Basis Change** in the Control window, then the **Polarization Basis Parameters Setting** dialogue box appears.

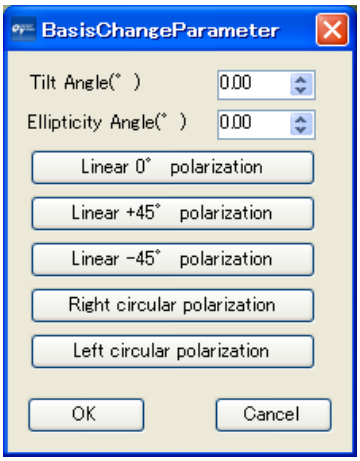
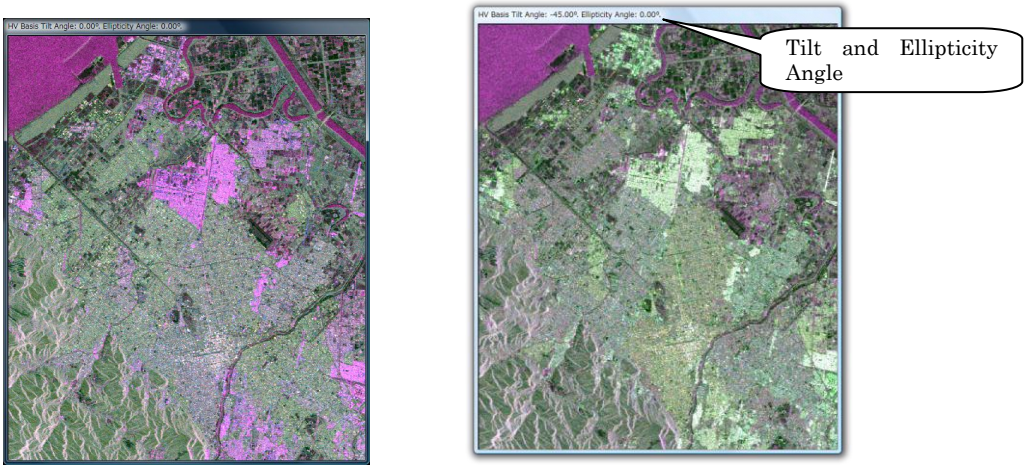


Figure 4-3 Polarization Basis Parameters Setting Dialogue box

Click the OK button to apply the new polarization basis.



Linear (Tilt Angle: 0 deg.) ※Default　　Linear (Tilt Angle: -45 deg.)

(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-4 Changing the Polarization Basis (HV Basis)

You can change the polarization basis in following processes:

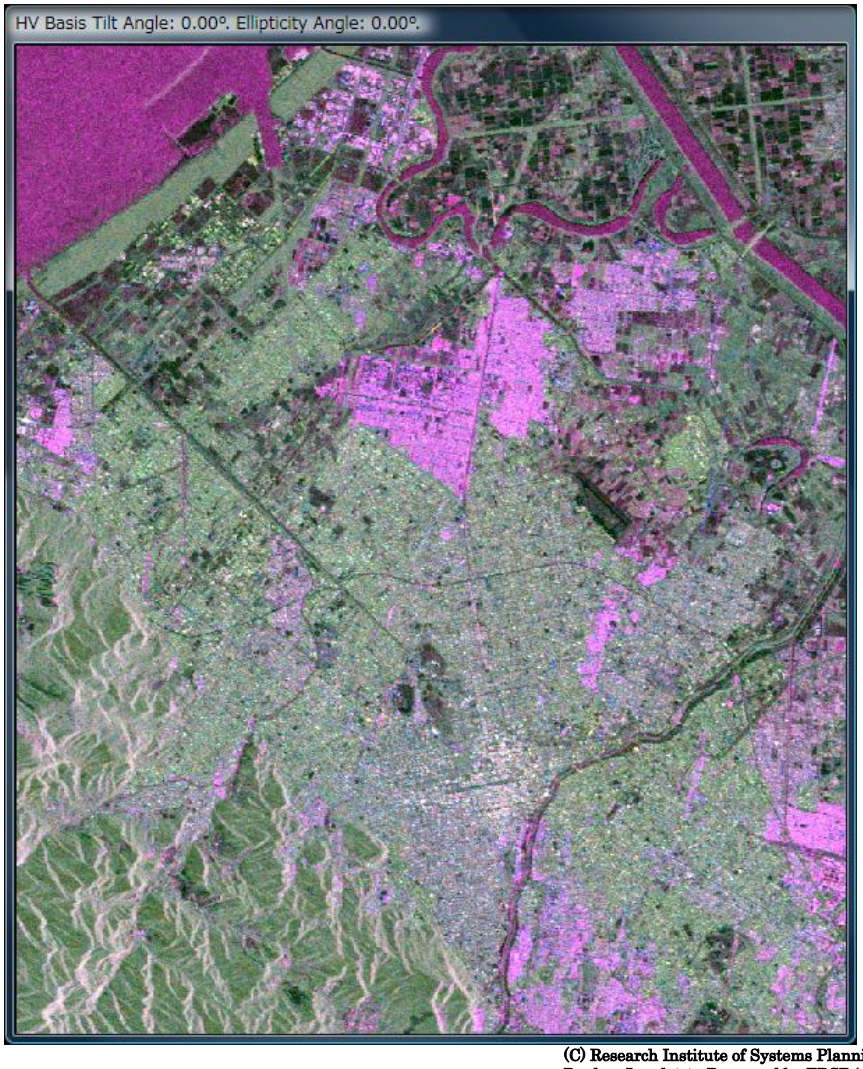
- HV basis
- Pauli basis
- Eigenvalue Analysis(α -Entropy Decomposition)
- 4 Component Decomposition

4.4. HV / Pauli

The first image after loading the polarimetory data is the image applied the default basis, HV basis or Pauli basis.

Select **PALSAR** > **HV Basis** or **Pauli Basis** in the Control window, then the selected basis is applied.

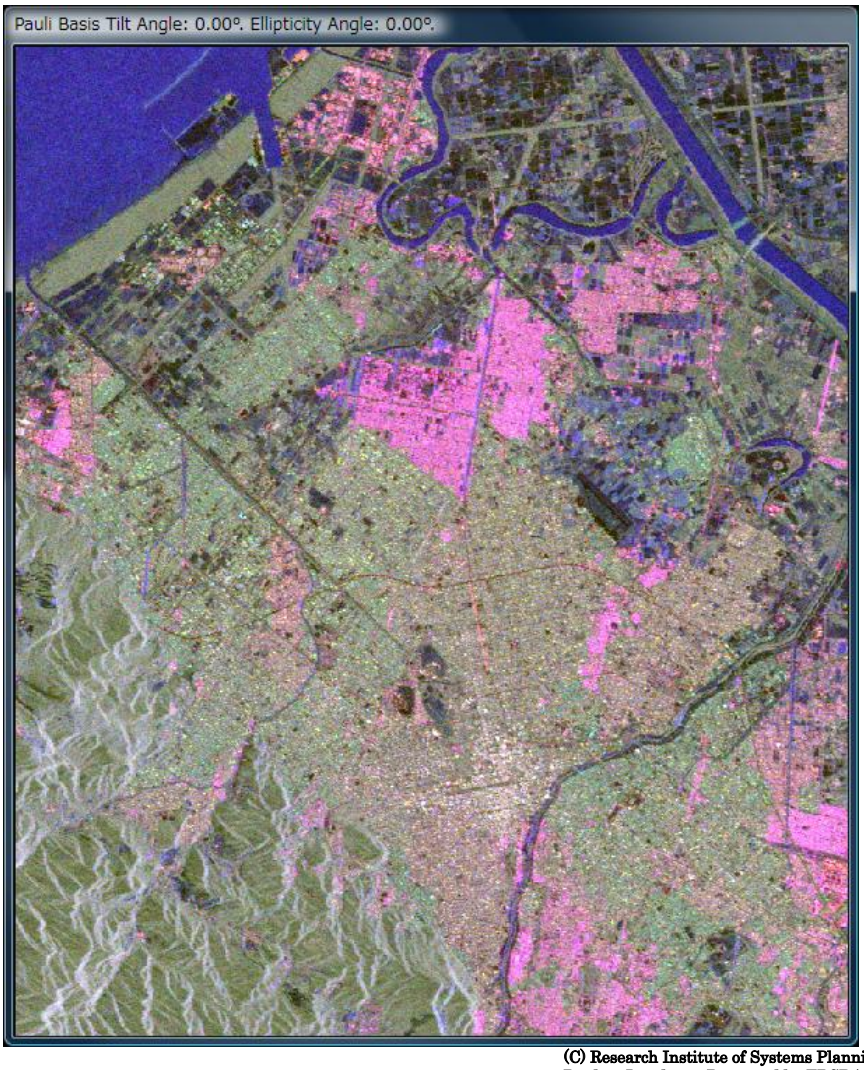
HV:　R:HH, G:HV, B:VV



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-5　HV Basis

Pauli : R:HH-VV, G:HV, B:HH+VV



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-6 Pauli Basis

The default basis depends on the data type.

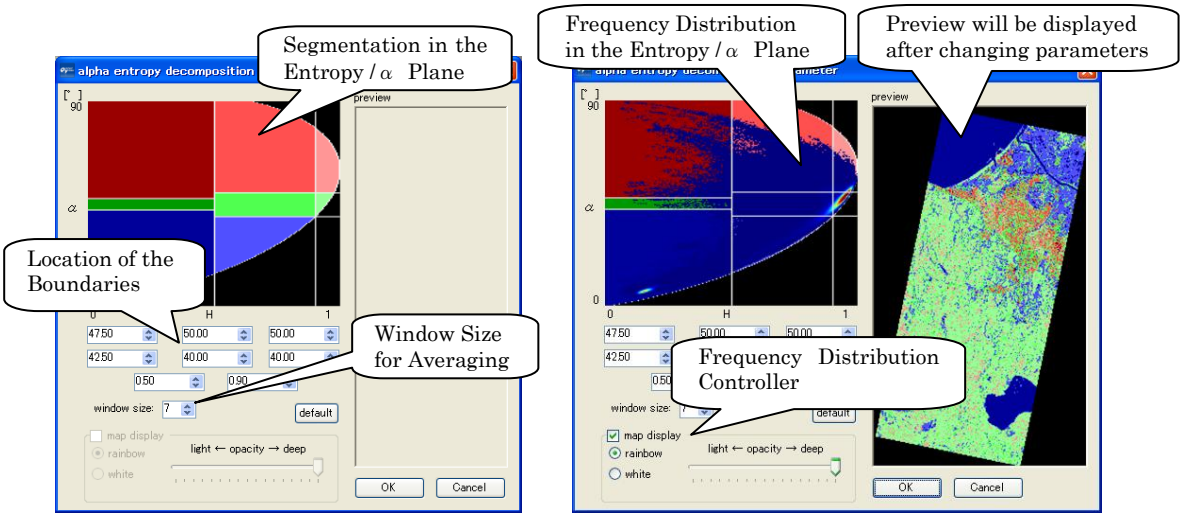
Table 4-3 Default Basis

Default Basis	Data Type	Remarks
HV basis	ERSDAC 4.1 (CEOS) Polarimetory mode	
Pauli basis	ERSDAC 1.1 (VEXCEL) Polarimetory mode JAXA 1.1 (CEOS) Polarimetory mode T3 data generated by PolSARpro	

4.5. Eigenvalue Analysis

The image of data classified based on the alpha angle and entropy is displayed.

Select **PALSAR** > **α-Entropy** in the Control window, then the **Eigenvalue Analysis (α -Entropy Decomposition) Parameters Setting** dialogue box appears.



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-7 Eigenvalue Analysis (α -Entropy Decomposition) Parameters Setting Dialogue Box

To change the location of the boundaries, click and drag the boundary line or enter the boundary value in the text box.

To change the color of the segment, double-click in the segment, then the **Color Setting** dialogue box appears, and select new color.

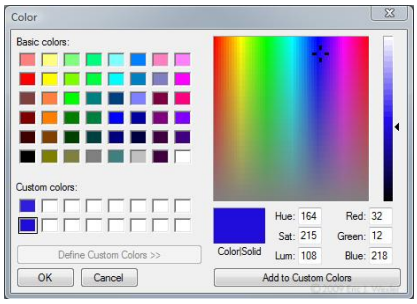


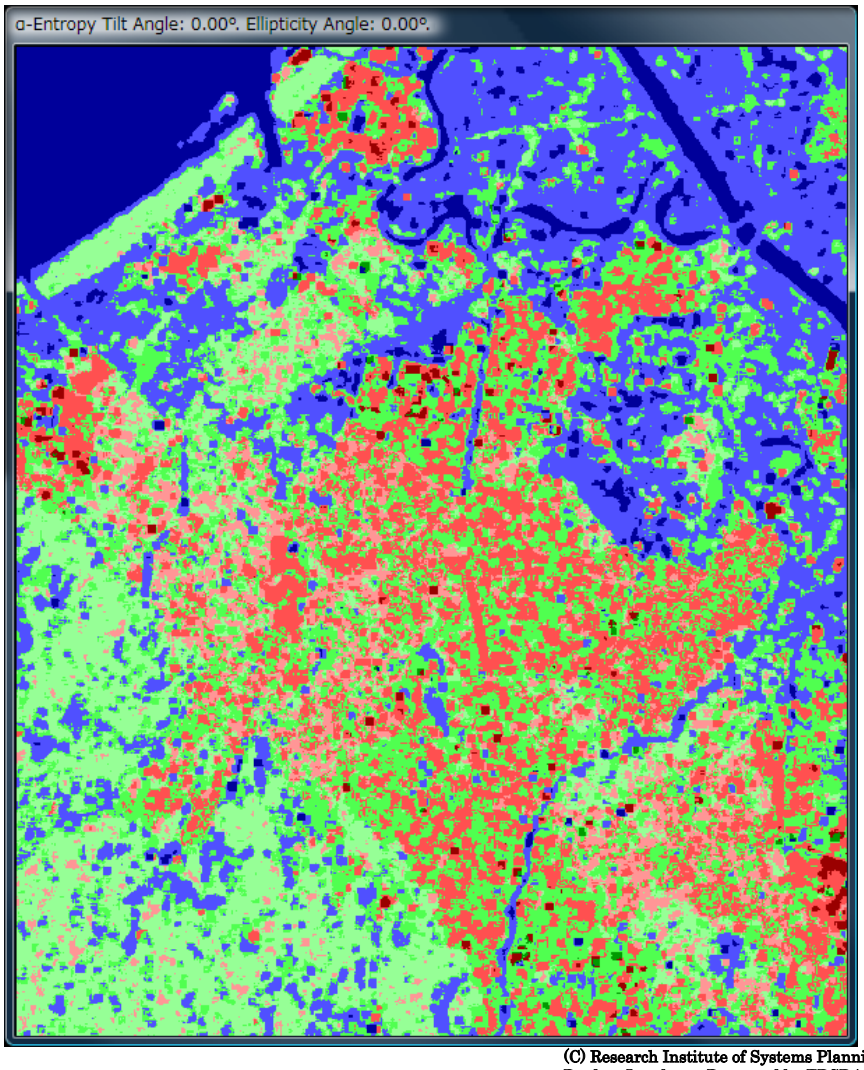
Figure 4-8 Color Setting Dialogue Box

After changing parameters, you select **PALSAR** > **α-Entropy** again, then the dialogue box appears and the frequency distribution is displayed in the dialogue box.

To change the color (rainbow/white) and transparent rate of the frequency distribution, check the **rainbow/white** radio button and slide the bar in the **Frequency** panel.

When you change the location of the boundary or the color of the segment, the preview image is updated automatically. You can check the result before clicking the **OK** button.

If you change the Window Size, the result is not same as preview.



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-9　Eigenvalue Analysis (α –Entropy Decomposition)

4.6. 4 Component Decomposition

The image is displayed as a following composite:

- Red: Double bounce scattering
- Green: Volume scattering
- Blue: Surface scattering
- White/Black(Trans.): Helix scattering

Select **PALSAR > 4 Component Decomposition** in the Control window, then the **4 Component Decomposition Parameters Setting** dialogue box appears.

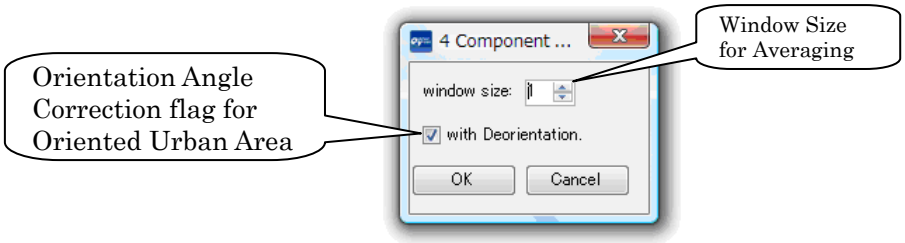
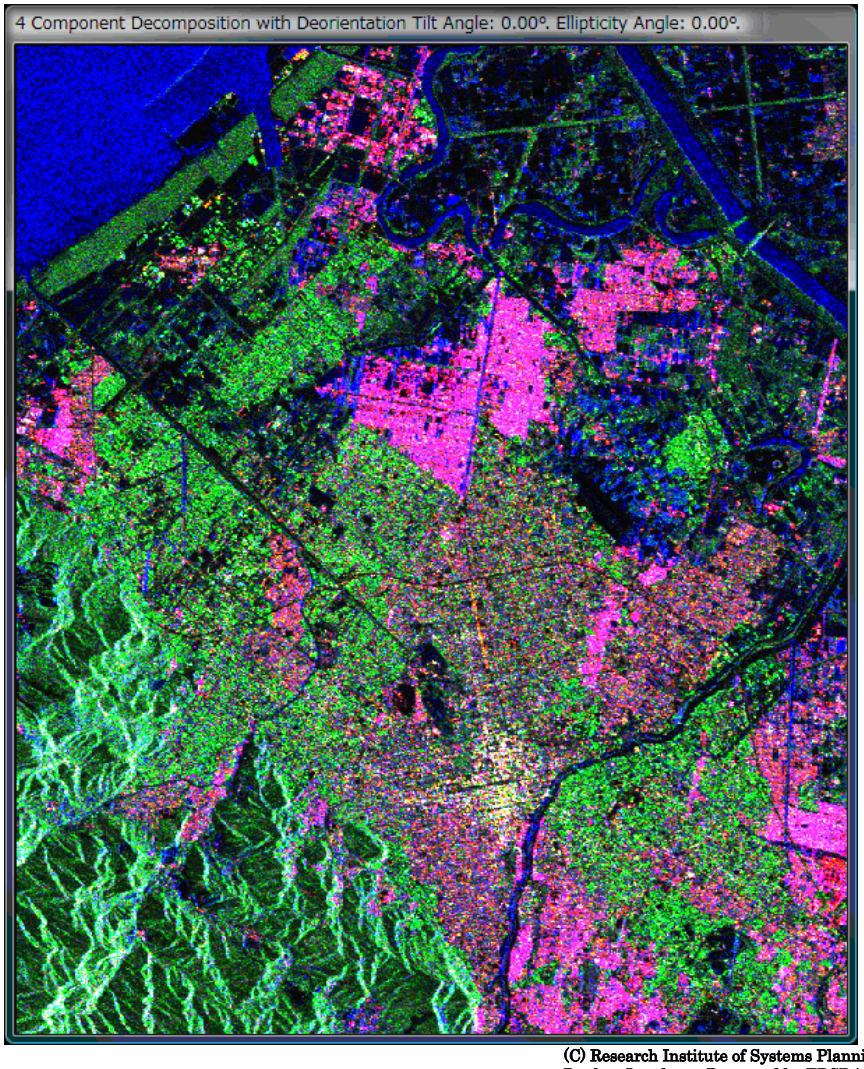


Figure 4-10 4 Component Decomposition Parameters Setting Dialogue Box

To estimate and correct the polarization orientation angle shifts induced by the oriented urban area in the azimuth direction, check the **with Deorientation** check box.



(C) Research Institute of Systems Planning, Inc.
Product Level 4.1 : Processed by ERSDAC
Observed raw data : Belongs to METI and JAXA

Figure 4-11　4 Component Decomposition

Contact information for Quad-pol Viewer:

http://remote-sensing.isp.jp/Quad-pol/
E-Mail : quad-pol@ml.isp.co.jp

©2009 Research Institute of Systems Planning, Inc./ISP

Research Institute of Systems Planning, Inc./ISP
ISP Corporate Headquarters: Kasuya bldg. 2-9, Sakuragaoka-cho,
Shibuya-ku, Tokyo 150-0031, Japan
http://www.isp.co.jp/