

## **PolSARPro & Land Retrievals**

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**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





## Land cover classification from PolSAR data with PolSARPro



## Outlines

## I. Introduction

## II. GF-3 PoISAR dataset

**III. Practical** 

#### 1.1 General technique framework for remote sensing image classification



#### 1.2 Classification system and legend defining

#### **Classification system**

- It is an abstract representation of the situation in the field using well defined diagnostic criteria
- One define it as: "The ordering or arrangement of objects into groups or sets on the basis of their relationships"

#### A classification system is

- scale independent: the classes should be applicable at any scale or level of detail;
- source independent: independent of the means used to collect information, whether it be through satellite imagery, aerial photography, field survey or using a combination of sources.

Remote sensing classification legend

 It is the application of a classification system in a specific area using a defined mapping scale and specific data set

**Classification legend is** 

- Scale and cartographic representation dependent;
- Data and mapping methodology dependent.

#### **1.3 Classification method introduction through PolSARPro**



#### **1.4 Feature selection and transformation**

#### Features available in PolSARPro:

(1) Matrix elements, eg. [T3]

Data Processing: Coherency Elements T3					×		
- Input Dir	ectory						
C:/DataDi	rectory_MapRe	eady/T3					
- Output D	irectory ——						
C:/DataDi	rectory_MapRe	eady				/	тз 🖻
Init Ro	w 1	End Row	1544	Init Col	1	End Col	932
T11	C Modulus	10log(Mo	dulus)				BMP
T12	O Modulus	C 10log(Mo	dulus)	Phase			💌 BMP
T13	C Modulus	C 10log(Mo	odulus)	O Phase			🗖 ВМР
T22	C Modulus	10log(Mo	odulus)				💌 BMP
T23	C Modulus	C 10log(Mo	odulus)	C Phase			🗖 ВМР
T33	C Modulus	10log(Mo	dulus)				🔽 BMP
Span	C Linear	OeciBel :	= 10log(Sp	oan)			🔽 BMP
	Sel	ect All			Res	et 🛛	
	Run		2			Exit	

#### (2) Polarimetric decomposition features eg. H/A/Alpha decomposition

🥼 Data Processing: I	H / A / Alpha De	compositi	on Parame	eters			×
C:/DataDirectory	andu/T2						,
Duted Directory_Maph	eauy/15						
Output Directory							
U:/DataDirectory_MapH	eady					/[13	
Init Row 1	End Row	1544	Init Col	1	End Col	9	32
🔲 Alpha, Beta, De	elta, Gamma, Lamb	da				Г	BMP
🗖 Lambda						Г	BMP
🔽 Alpha						◄	BMP
Entropy ( H )						◄	BMP
Anisotropy (A)						◄	BMP
Combinations (	H.A)	☑ НА ☑ Н (1 - А)		▼ (1 · H	i) A i) (1 - A)	<b>V</b>	вмр
Window ize 1			Reset	Equival	ence betwe en-decompo	en [ T ] ositions.	and
Run		2			Exit		

All the elements can be used as features

### **1.4 Feature selection and transformation**

#### Features available in PolSARPro:

## (2) Polarimetric decomposition features and many others provided by PolSARPro:



JRH : Huynen Decomposition
RMB1 : Barnes 1 Decomposition
RMB2 : Barnes 2 Decomposition
SRC : Cloude Decomposition
WAH1 : Holm 1 Decomposition
WAH2 : Holm 2 Decomposition
HAA : H / A / Alpha Decomposition

FRE2 : Freeman 2 Components Decomposition
FRE3 : Freeman 3 Components Decomposition
VZ3 : Van Zyl 3 Components Decomposition
YAM3 : Yamaguchi 3 Components Decomposition
YAM4 : Yamaguchi 4 Components Decomposition
NEU : Neumann 2 Components Decomposition

KRO : Krogager Decomposition

TSVM : Touzi Decomposition

## But it does not mean the more the better for classification:

#### Dimension disaster problem:

- With fixed training samples, accuracy increases with dim to one maximum acc., then decreases
- The key reason is there are correlations between features, and more feature needs more training samples to solve the classification model.

#### **PorSARPro solution:**

•

SVM supervised classification, lets you to choose features.

### **1.5 Classifier training and testing**

- "spectral classes " and "informative classes"
  - Spectral classes
    - Classes can be spectrally separated, optical remote sensing
    - Classes can be separated by polarmteric mechanism or PolSAR data itself
  - Informative classes: useful for real applications

But,

Without training it is harder to get informative classes



Supervised classification

#### Un-supervised classification

SARSEC CES

#### 2.1 The Specifications of GF-3 Satellite



Advantages:

- High spatial resolution (1 m)
- Multi imaging mode (12 types)
  - **Universal application (Ocean, Disaster reduction**, **Meteorology**)

1二)田瓜像(笑工)			
条带成像模式	Parameter	Specification	
滑块聚束成像模式	Orbit altitude	755 km	
;规入射角 星各成像模式均可以通过卫星侧摆实现左右侧视	Orbit type	Sun synchronization repeating orbit	
	Revisit cycle	29 days	
	Band	С	
	Incidence angle	10° ~ 60°	

#### 2.1 The Specifications of GF-3 Satellite

NO	Mode	Incidence	Resolution	Width	Polarization	Spotlight
	mode	angle	(m)	(Km)	r olarization	
1	SL	20-50	1	10	Single -	
2	UFS	20-50	3	30	Single	
3	FSI	19-50	5	50	Dual	Rotation Center
4	FSII	19-50	10	100	Dual	Stripmap
5	SS	17-50	25	130	Dual	
6	QPSI	20-41	8	30	Full	
7	QPSII	20-41	25	40	Full	
8	NSC	17-50	50	300	Dual	
9	WSC	17-50	100	500	Dual	
10	GLO	17-53	500	130	Dual	return to swath
11	WAV	20-41	10	5	Full	swath 1
12	EXT	10-60	25	80	Dual	swath 3

#### 2.2 Practical Data of GF-3

- GF-3 PolSAR Data
  - Observation Mode:

QPSI (Quad Polarization Strip I)

• Observation Date:

Aug. 03. 2017.

- Pixel Spacing(azimuth×range):
   5.01 m × 4.50 m.
- Center incidence angle:

48.8°



Calibrated and Multi-look (2 × 2) processed Result (Pauli RGB)

#### 2.3 GF-3 PolSAR PauliRGB and the key landcover types



#### Subset Test Area

#### 2.3 GF-3 PolSAR PauliRGB and the key landcover types



#### Subset Test Area

#### 2.3 GF-3 PolSAR PauliRGB and the key landcover types



Subset Test Area

#### 2.3 GF-3 PolSAR PauliRGB and the key landcover types



Subset Test Area

Grass





- •[T3] elements
- Decomposition parameters
- •H/A/alpha classification
- •H/A/alpha WISHART classification
- •SVM supervised classification



## PolSARpro - Bio SOFTWARE



#### [T3] ELEMENTS



Quit



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

PolSARpro-bio





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Quit



Do it Yourself: Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files (select BMP).

🧳 Data Processing: H / A / A	lpha Decompositi	ion Parameter	s		×
- Input Directory					
D:/SAN_FRANCISCO_ALOS_S	NAP/T3				
- Output Directory					
D:/SAN_FRANCISCO_ALOS_S	NAP				T3 🖻
Init Row 1 En	d Row 3010	Init Col	1	End Col	2269
🔽 Alpha, Beta, Delta, Gam	ma, Lambda				💌 BMP
🔽 Lambda					🔽 BMP
🔽 Alpha					🔽 BMP
Entropy ( H )					🔽 BMP
🔽 Anisotropy (A)					🔽 BMP
	🔽 НА		💌 (1 - H) A		
I Lombinations ( H , A )	🗹 H (1 -	A)	🗹 (1 · H) (1	- A)	M RWL
Window Size Row 1	Window Size Col	1	Select All		Reset
🗖 Equivale	nce between [ T ] a	nd [C]eigen-	decomposition	s.	
Run		2		Exit	



#### [T3] ELEMENTS



T11\_dB





### [T3] ELEMENTS



span\_dB





T12\_pha



## PolSARpro - Bio SOFTWARE





T3 S Environment • Import

Convert Process Display Calibration Utilities Tools Configuration Education Help

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

🦉 Data Processing: H / A / A	Ipha Decomposition Parameter	s	
- Input Directory			
D:/SAN_FRANCISCO_ALOS_S	NAP/T3		
Output Directory			
D:/SAN_FRANCISCO_ALOS_S	NAP		' T3 😑
Init Row 1 Er	nd Row 3010 Init Col	1 End Col	2269
🔽 Alpha, Beta, Delta, Gan	nma, Lambda		🔽 ВМР
🔽 Lambda			🔽 ВМР
🔽 Alpha			💌 ВМР
🔽 Entropy ( H )			💌 ВМР
🔽 Anisotropy (A)			🔽 ВМР
	🔽 HA	🔽 (1 - H) A	
Combinations (H, A)	🔽 H (1 - A)	🔽 (1 · H) (1 · A)	ј✔ ВМР
Window Size Row 3	Window Size Col 3	Select All	Reset
📕 Equivale	nce between [T] and [C]eigen-	decompositions.	
Bun	2	Exit	

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#### Entropy

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#### Lambda









## **WRASEC ·e**esa

#### Lambda



#### Anisotropy





## Serverse Cesa

#### Entropy



#### Anisotropy







(1-H) A





low to medium entropy

## low entropy and low anisotropy

1 MECHANISM

- 0

Tapez une question

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combination 1mH1mA.bmp

Microsoft Office 2010

== <u>\_\_</u>\_\_\_

Eichier Edition Affichage Image Outils ?

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Zoom : 🕀

(1-H) (1-A)

#### H (1-A)



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## high entropy and low anisotropy

high entropy and high anisotropy



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#### H / A / alpha CLASSIFICATION



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

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T3 S Environment • Import

🖉 Data Processing: H / A / Alpha Classification 📃 📃 📥			
- Input Directory			
D:/SAN_FRANCISCO_ALOS_SNAP/T3			
- Output Directory			
D:/SAN_FRANCISCO_ALOS_SNAP			
Init Row 1 End Row 3010 Init Col 1 End Col 2269			
- Representation			
🗖 Anisotropy Entropy Alpha			
🗖 H A + (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 3 Window Size Col 3 Select All Reset			
Run 📃 🛥 📿 Exit			



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Quit

#### H / A / alpha CLASSIFICATION



Data Processing: H / A / Alpha Classification				
- Input Directory				
D:/SAN_FRANCISCO_ALOS2_SNAP/T3				
- Output Directory				
D:/SAN_FRANCISCO_ALOS2_SNAP				
Init Row 1 End Row 3672 Init Col 1 End Col 3292				
- Representation				
T Anisotropy Entropy Alpha				
□ H A + (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)				
ColorMap 9 [C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Planes_ 😅 Edit				
— Tuo-Tuo ( H / Alpha / Lambda ) Classification				
Entropy / Alpha / Lambda Planes (BMP) + Classifier (Bin + BMP)				
ColorMap 27 C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Planes_ 😰 Edit				
Window Size Row 1 Window Size Col 1 Select All Reset				
Run 🔜 💜 💟 Exit				

Do it Yourself: Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

#### DATADIR



[T3x3] Elements

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

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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\_occurence.bmp, H\_Alpha\_ occurence.bmp, A\_Alpha\_ occurence.bmp, H\_A\_segmented.bmp, H\_Alpha\_ segmented.bmp, A\_Alpha\_ segmented.bmp HAlphaLambda\_RGB.bmp, HAAlpha\_RGB.bmp HACombinations\_RGB.bmp



#### H / A / alpha CLASSIFICATION





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Polarimetric SAR Data Processing and Educational Tool - Biomass v1.0 - Menu PolSARpro – مترح, The Polarimetric SAR Data Processing and Educational Tool - Biomass

T3 S Environment • Import

Convert V Process Display Calibration Utilities Tools Configuration Education Help

Do it Yourself: Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

🖉 Data Processing: H / A / Alpha Classification
- Input Directory
D:/SAN_FRANCISCO_ALOS_SNAP/T3
- Output Directory
D:/SAN_FRANCISCO_ALOS_SNAP
Init Row 1 End Row 3010 Init Col 1 End Col 2269
Representation
🗖 Anisotropy Entropy Alpha
□ H A + (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 1 Window Size Col 1 Select All Reset
Run 🔜 🥥 Exit



\_\_\_\_

Quit



🖉 Data Processing: H / A / Alpha Classification				
- Input Directory	_			
D:/SAN_FRANCISCO_ALOS2_SNAP/T3				
- Output Directory	_			
D:/SAN_FRANCISCO_ALOS2_SNAP	)			
Init Row 1 End Row 3672 Init Col 1 End Col 3292	Ī			
Representation	_			
🗖 Anisotropy Entropy Alpha				
🗔 H A + (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)				
ColorMap 9 [C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Planes_ 😂 Edit				
— Tuo-Tuo ( H / Alpha / Lambda ) Classification	_			
Entropy / Alpha / Lambda Planes (BMP) + Classifier (Bin + BMP)				
ColorMap 27 C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Planes_ 🗃 Edit				
Window Size Row 1 Window Size Col 1 Select All Reset				
Run 🔜 🜌 🛛 Exit				

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



H\_alpha\_lambda\_class1(2,3).bmp, H\_alpha\_lambda\_occurence\_class1(2,3).bmp, H\_alpha\_lambda\_segmented\_class1(2,3).bmp, H\_alpha\_lambda\_class.bmp,



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Medium  $\lambda$ 

0.8

Min = 0.000000

2.5

2

1.5

0.5

1

H - Alpha Plane (High Lambda) - (Scale: 10<sup>n</sup>)



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High  $\lambda$ 









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H - Alpha Plane (High Lambda) - (Scale: 10<sup>n</sup>) 90 80 2.5 70 2 60 Alpha (deg) 50 **High**  $\underline{\lambda}$ 1.5 40 30 20 0.5 10 0 0.4 0 0.2 0.6 0.8 Entropy Max = 583.000102 Min = 0.000000

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# H / alpha / Lambda CLASSIFICATION Surger CESa











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### WISHART - H/A/alpha CLASSIFICATION

Tools

Configuration 
 Education 
 Help



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

esa

T3 S Environment • Import

PolSARpro-Dio

The Polarimetric SAR Data Processing and Educational Tool - Biomass

Convert 
 Process 
 Display 
 Calibration 
 Utilities

🖉 Data Processing: Wishart H / A / Alpha Classification
- Input Directory
D:/SAN_FRANCISCO_ALOS_SNAP/T3
- Output Directory
D:/SAN_FRANCISCO_ALOS_SNAP
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 1
Maximum Number of Iterations 10 Window Size Col 1
Entropy Anisotropy Alpha
entropy  Interesting Update Update
Color Mans
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
E Buli 1811+8221 1812+8211 1811-8221
Upded Colormap     Sinclair     S111 I(S12+S21)/21 [S22]
Combine Blue File Green File Red File
Blue File
Green File
Red File
Bun 😰 Exit



\_ 🗆 X

Quit

### WISHART - H/A/alpha CLASSIFICATION



Input Directory      D:/SAN_FRANCISCO_ALOS2_SNAP/T3      Output Directory      United Directory      Direc	0
D:/SAN_FRANCISCO_ALOS2_SNAP/T3 Output Directory	
	0
D:/SAN_FRANCISCU_ALUS2_SNAP /13	-
Init Row 1 End Row 3672 Init Col 1 End Col 32	292
Wishart H / A / Alpha Classification	
% of Pixels Switching Class 10 Window Size Row 3	5
Maximum Number of Iterations 10 Window Size Col 3	
Entropy Anisotropy Alpha	_
entropy  anisotropy  alpha  Updat	te
Color Maps	
ColorMap 8 C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Wishart 😂 🖪	Edit
ColorMap 16 C:/Users/epottier/AppData/Roaming/PolSARpro_5.1.0/ColorMap/Wishart	Edit
Coded Colormap C Sinclair  S11  ((S12+S21)/2)  S22	
Combine Blue File Green File Red File	
Blue File	<u>م</u>
Green File	
Red File	<i>``</i>
	_
Run (2) Exit	

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



config.txt



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



### WISHART - H/A/alpha CLASSIFICATION WISHER . CCCSA







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### WISHART - H/A/alpha CLASSIFICATION WISHART - H/A/alpha CLASSIFICATION







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#### **SVM** supervised classification



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**SVM** supervised classification

Step-1: Define classification system & classification legend

#### Classification system: Legend:

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## **Step-2: Speckle Filter**

Dsplay
 Vilities

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 PolSARpro-bio,
 The Polarimetric SAR Data Processing and Educational Tool

T3 S Environment Maport Convert Process

Tools
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An-Yang Filter
Box Car Filter
Box Car - Edge Nilter
Gaussian Filter
IDAN Filter
Lee Refined Filter
Lee Sigma Filter
Lopez Filter
Mean-Shift Filter
Non Local Means Filter
Scattering Model Based Filter
P.W.F Filter
SIRV Model Estimation
Skou-Skriver Restoration

🖉 Speckle Filter					x	
- Input Directory						
J:/GF3_Data_Directory/T3						
- Output Directory						
J:/GF3_Data_Directory_BOX / T3 🥃						
Init Row 1 End	Row 1892	Init Col	1	End Col	1373	
	BOXCAR Spe	ckle Filter				
C [S2] >> [T3] C	[S2] >> [C3]	C [S2]>:	> [T4]	C [S2]>>	) [C4]	
Number of Looks 1 Window Size Row 3 Window Size Col 4						
🔲 System Noise Filtering ( HV / VH )						
Run	2			Exit		

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Quit



### **Step-2: Speckle Filter**





WINASEC .Cesa

## **Step-3: Features Extraction**

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

 المالية CSA
 PolSARpro – كَانَرْ،

The Polarimetric SAR Data Processing and Educational Tool - Biomass

ilities v Tools v Configuration v Education v Help



Decomposition Parameters
Eigenvector Set Parameters
Eigenvalue Set Parameters
Diversity Index

#### **Polarization features:**

- entropy.bin
- > anisotropy.bin
- ➤ alpha.bin

Data Processing: H / A / Alpha Decomposition Parameters	C X
Input Directory	
J:/GF3_Data_Directory_BOX/T3	
Output Directory	
J:/GF3_Data_Directory_BOX	/ 13 🖻
Init Row 1 End Row 1892 Init Col 1 End C	ol 1373
🗌 Alpha, Beta, Delta, Gamma, Lambda	🗖 BMP
🗌 Lambda	🔲 ВМР
V Alpha	🔽 BMP
Entropy (H)	🔽 BMP
Anisotropy (A)	🔽 BMP
HA (1-H)A	П рмр
□ Combinations (H, A) □ H (1 · A) □ (1 · H) (1 · A)	j DMF
Window Size Row 1 Window Size Col 1 Select All	Reset
Equivalence between [T] and [C] eigen-decompositions.	
Run 🛛 😰	t

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Display

Calibration 
 Utilities

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CSA PolSARpro-bio, The Polarimetric SAR Data Port

▼ T3 S Environment ▼ Import ▼ Convert ▼ Process

Tools
 Configuration 
 Education 
 Help

Matrix Elements	
Correlation Coefficients	
Elliptical Basis Change	۲
Polarimetric Speckle Filter	۲
H / A / Alpha Decomposition	۲
Polarimetric Decompositions	۲
Polarimetric Functionalities - 1	۲
Polarimetric Functionalities - 2	۲
Polarimetric Segmentation	•
Polarimetric Data Analysis	•
Polarimetric Data Clustering	•
Batch Process	-

H / A / Alpha Classification H / u / v Classification (Xu & Jin) H / A / Alpha - Wishart Classification Scattering Model Based - Wishart Classification Unified Muynen Classification Fuzzy - H / Alpha Classification Wishart Supervised Classification G.P.F. Supervised Classification

Rule-Based Hierarchical Classification

Basic Scattering Mechanism Identification

SVM Supervised Classification

- 1. Select the training sample data.
- 2. Select the classification features
- 8. Select the Kernel function
- 4. Run Classification

Data Processing: SVM Supervised Classification				
- Input Directory				
J:/GF3_Data_Directory_B0X/T3				
- Output Directory				
J:/GF3_Data_Directory_BOX	/ 🖪 📄			
Init Row 1 End Row 1892 Init Col 1 End Col	1373			
- Step 1 - Training Areas				
Areas File J:/GF3_Data_Directory_B0X/T3/svm_training_areas.txt 🧊 🚘	Graphic Editor			
- Step 2 · Classification Configuration				
🔽 BMP 🔽 Confusion Matrix 📥 CM	Editor			
— Step 3 · Color Maps				
ColorMap 16 C:/Users/Administrator/AppData/Roaming/PolSARpro_5.1.1/ColorMap/Supervised_ColorMap11 😰 Edit				
☐ Pauli [S11+S22] [S12+S21] [S11-S2 ☐ Coded Colormap ☐ Sinclair [S11] [S12+S21]/2] [S22]	22			
- Step 4 - SVM Parameter Setting				
Input Polarimetric Indicators Sampling option Output SVM parameters				
C T3	🗖 ВМР			
Other Select If important unbalanced training point Useful but time consum	ince 🔲 BMP			
Step 5 - Kernel Parameter				
RBF     RECOMMANDED     Polynomial	C Linear			
Cost 100 Gamma = 1/sigma Optimisation parameters Degree 2				
Setup and Run	<b>3</b>			
4 Step 6 - Run Classification				
**************************************				

NRSCC



· eesa

Quit

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Quit



Class Probability

Polynomial

Degree 2

Mean Hyperplane Distance BMP

Useful but time consumina

Exit

🗖 BMP

C Linear

#### 1. Select the training sample data.



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✓ Training sampling 500

If important unbalanced training point

■ RECOMMANDED

Optimisation parameters

Setup and Run

Other Select

Cost 100

-Step 5 - Kernel Parameter

C RBF

Gamma = 1/sigma

Step 6 - Run Classification



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中欧科技合作"龙计划"第四期 2019年陆地遥感高级培训班 培训时间:2019年11月18日-23日 主办方:重庆大学 E.P (2019)

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#### **1. Select the training sample data.** Basic operation:

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- → 1. Add a new class 1.
- 2. Select first area for class1
  - Click 'Select area', draw a polygon
  - ② Click 'Select area', stop drawing;
  - (3) Click 'Delete area' .
  - 3. Select second area for class1;
  - 4. ....
  - 5. Add a new class 2.
  - 6. Select first area for class2;Select second area for class2;....
  - 7. ....
  - ►8. Save configuration





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olarimetric SAR Data Processing and Educational Tool - Biomass v1.0 - Menu	_ <b>D</b> <mark>_ X</mark>
Import     Convert     Process     Display     Calibration     Utilities     Tools     Configuration     Education     Help     Import	Quit
🕼 Data Processing: SVM Supervised Classification	
Input Directory 2. Select the classification features	
J./GF3_Data_Directory_B0X/T3	
Output Directory	
J:/GF3_Data_Directory_BOX	
Init Row 1 End Row 1892 Init Col 1 End Col 1373 - Step 1 - Training Areas Add or remove polarimetric indicator (No complex file !)	
Areas File J:/GF3_Data_Directory_B0X/T3/sym_training_areas.txt 🔐 Graphic Editor Graphic Editor	
Step 2 · Classification Configuration	
BMP Confusion Matrix CM Editor mask_valid_pixels.bin	
- Step 3 · Color Maps T11. bin	
ColorMap 16 C:/Users/Administrator/AppData/Roaming/PolSARpro_5.1.1/ColorMap/Supervised_ColorMap11 🖉 Edit 112_mag.bin	
Pauli  S11+S22   S12+S21   S11-S22  T13_imag.bin	
□ Sinclair  S11   (S12+S21)/2   S22  T13_real.bin	
- Step 4 · SVM Parameter Setting	
Input Polarimetric Indicators Sampling option Output SVM parameters	
Class Probability BMP Class Probability Exit and Save	
Other Select ✓ If important unbalanced training point Useful but time consuming	
Step 5 - Kernel Parameter	
C RBF RECOMMANDED © Polynomial C Linear	
Lost 100 Gramma = 1/sigma Copumscion parameters Degree 2	
Step 6 - Run Classification	



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#### Classification result vs. GF-3 PolSAR Pauli-RGB image





# Thanks