





→ 8th ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

10–14 September 2018 University of Leicester | United Kingdom

Multitemporal analysis using SAR

Magdalena Fitrzyk



Introduction



Input data: Sentinel-1 GRDH images over UK

S1B_IW_GRDH_1SDV_20180309T174910_20180309T174935_009958_0120AF_4CB8.SAFE S1B_IW_GRDH_1SDV_20180402T174911_20180402T174936_010308_012C0D_5BA1.SAFE S1B_IW_GRDH_1SDV_20180508T174912_20180508T174937_010833_013CEF_4F5C.SAFE S1B_IW_GRDH_1SDV_20180601T174913_20180601T174938_011183_014840_B8F6.SAFE S1B_IW_GRDH_1SDV_20180707T174916_20180707T174941_011708_015894_C5B7.SAFE

Output data: temporal backscatter signatures for various land cover types

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Data processing



Creating a subset of S1 GRDH images

Spatial subset depending on the AOI

Radiometric calibration

Conversion of image intensity to sigma0 providing the radar backscatter

Terrain correction

Compensate for geometric distortions caused by topographical variations of a scene and the tilt of satellite sensor

Creating a multitemporal stack

Collocation spatially overlapping products (based on geolocation)

Speckle filtering

Filtering the inherent salt and pepper like texturing called speckles

Linear to dB conversion

Compensate for very high dynamic range in visualisation

Stack statistics

Analysis of temporal backscatter signatures

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Data preparation



1. Opening the S1 data

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Data preparation





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Spatial subset





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Spatial subset - parameters



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Data check





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Radiometric Calibration



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Geocoding





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Geocoding



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Projected local incidence angle

Close

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Data check





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Spatial subset – batch processing with automatic processing graph



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Spatial subset - automatic processing graph



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Spatial subset – batch processing



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Spatial subset - batch processing



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Automatic Processing Graph - Calibration





VO Parameters Calibration	Charles Filter / Terrain Correction / LinearToFromdB	
Polarisations: VH		
Save as complex output Output sigma0 band Output gamma0 band		
Output beta0 band		
-	Load Graph Run Close H	<u>t</u> elp

save as e.g. Cal_TC.xml

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Spatial subset – batch processing



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5 Products

Help

Close

	В	atch Processing	9				Batch P	rocessing : Cal_	TC.xml	
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Open previously saved graph Cal_TC.xml

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Creating multitemporal stack

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- Product geolocation (if terrain corrected)
- Orbits (not terrain corrected)

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Multitemporal speckle filtering



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Close



I/O Parameters Processing Parameters	1/O Parameters Processi	ng Parameters
Source Product source: [1] Stack Target Product Name: Stack_Spk		Sigma0_VH_mst_09Mar2018 Sigma0_VV_mst_09Mar2018 Sigma0_VH_slv1_02Apr2018 Sigma0_VH_slv2_02Apr2018 Sigma0_VH_slv2_08May2018 Sigma0_VV_slv4_08May2018 Sigma0_VV_slv5_01Jun2018 Sigma0_VV_slv6_01Jun2018
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Multitemporal speckle filtering





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Conversion from linear to dB





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Conversion from linear to dB



	Converts bands to/from dB	×
ile Help		
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Dopen	n in SNAP	
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Sigma0 VH mst 09Mar2018 db in intensity db

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Linear vs dB comparison





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Scatterplots



Scatter Plot × Scatter Plot 17.5 € 15.0 2 12.5 X-Axis E 10.0 Auto minimax nte 7.5 £ 5.0 문 2.5 [3]Stack Spk 7jul2018_0 SigmaD VV mst 09Mar2018 db 💌 Auto min/max 6 7.5 10.0 (31Stack Spk 1.00 -12.5 3 sigmat VV skot trjul2018, db 👻 15.1 Invert plot colors .2011 -10 15 10 の図念 Sigma0_VV_mst_09Mar2018_db in intensity_db Scatter Plot X Scatter Plot 7.5 믕 5.0 30 ž 2.5 X-Axis Auto min/max 0.0 Mer -2.5 5 1 qp 8102m(20 2A5 40.0 -5.0 SIStack Spk Sigma0_VH_mst_09Mar2018_db 🗣 Auto min/max Mar Hite 13)Stack Spk db statuetto fele He demail 0 .22.5 25.0 Invert plot colors -35 -30 -25 -20 -15 -10 .5 .Ó 5 四日 金日 Sigma0_VH_mst_09Mar2018_db in intensity_db (F)



Select bands that
 you want to plot

Select your data stack

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RGB Composite



Right click on the product

	Select RGB-Image Channels	
Profile:		
Red:	\$3.Sigma0_VV_mat_09Mar2018_db	
Green:	\$3.Sigma0_VV_s1v2_02Apr2018_db	Dand calestian
Blue:	\$3.Sigma0_VV_slv4_08May2018_db	Band Selection
	Expressions are valid	be a second s
Stor	re RGB channels as virtual bands in current product	
	OK Cancel Help]

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RGB Composite



[3] Sigma0_VH_mst_09Mar2018_db × [3] RGB ×



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Stack averaging



Apply Orbit File Radiometric Speckle Filtering	, φ,λ 🔟 🚯 🚂 ΙΔυ	Σ
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Geometric	Stack Tools	Create Stack
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Stack averaging – RGB Composite





Dual Po	l Ratio Sigma0 VV+VH		Î
Red:	Sigma0_VV	-	
Green:	Sigma0_VH	-	
Blue:	Sigma0_VV/Sigma0_VH		

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Image statistics





Choose your band

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Time series analysis





Add your data products

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Time series analysis



→ Show plot at cursor position

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20jul18 ?

21May18

10-14 September 2018 | University of Leicester | United Kingdom

Acquisition Date

21Apr18

20Feb18

22Mar18

Time series analysis





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