WORCAP2019
Workshop de Computação Aplicada
INPE - São José dos Campos - 17 a 19 de setembro de 2019

Processamento de Imagens de Sensoriamento Remoto para Resposta à Desastres: Uso de Imagens *CBERS-4* e Sentinel com ferramentas do INPE e da ESA

Laércio Namikawa
laercio.namikawa@inpe.br

Processamento Digital de Imagens Radar com Software Livre com Exemplos de Aplicações em Mapeamento para a Resposta à Desastres

OBJETIVO

Apresentar as técnicas de processamento de imagens radar de sensoriamento remoto para a identificação de danos em apoio a resposta à desastres, utilizando os softwares SNAP (ESA) e TerraView5 (INPE)

Conteúdo

1. Seleção e Download de Imagens
2. Recorte
3. Multilook
4. Calibração
5. Filtragem Speckle
6. Correção geométrica - correção terreno
7. Conversão para dB
8. Visualização Antes/Depois
9. Fatiamento para áreas inundadas
10. Calculo de Área
11. Exportação KML

Seguro | https://www.elobservador.com.uy/aumenta-5200-la-cantidad-personas-desplazadas-las-inundaciones-n1082940

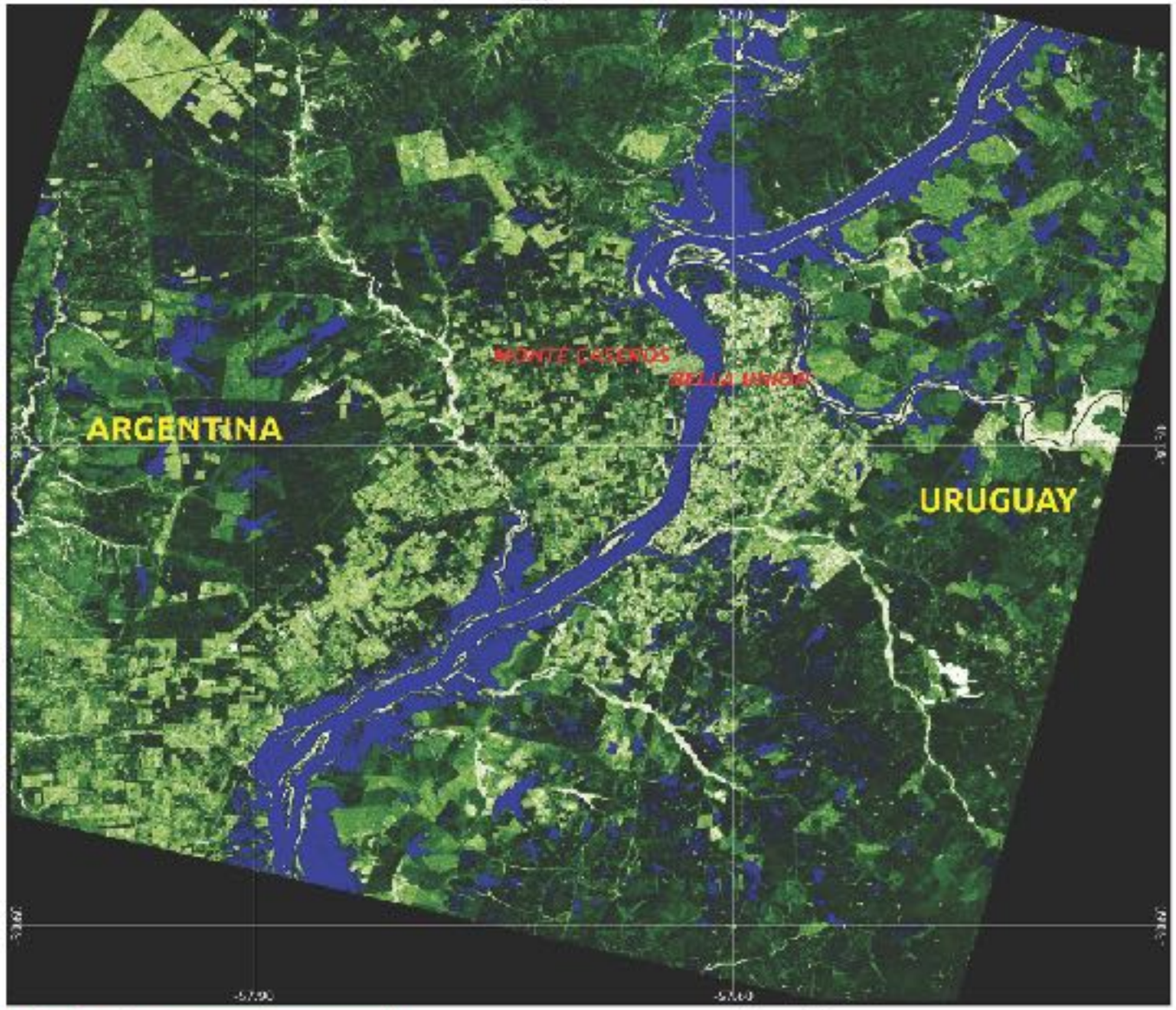
EL OBSERVADOR SECCIONES CROMO REFERI AGRO PADRES HOY OTV BLOGS M

Inundaciones. Archivo

El último relevamiento realizado este sábado por el Sistema Nacional de Emergencia (Sinae), da cuenta que hay 5.208 personas desplazadas de sus viviendas en todo el país, a causa de las inundaciones. De esa cantidad 1.407 son evacuadas y 3.801 son autoevacuadas.

Inundaciones en Uruguay
Flooding in Uruguay

June 8th, 2017
International Charter Call ID 614



Legend
International boundary

Data source

Mission: ALOS 2
SENSOR: SAR
POLARIZATION: HV
Pixel size: 12.5 m
Date of orbit image: June 8th 2017
The satellite data in this map were provided under the International Charter Space and Major Disasters.

Description of the event

Heavy rains caused severe flooding in Uruguay's Salto Department, Paysandú Department and Bella Unión city of the Artigas department displacing 3500 people. Uruguay's National Emergency System (SINAE) are visiting affected areas to assess the damage and prepare relief efforts. Many of the displaced people are already receiving food, shelter and medical care. Northern parts of Uruguay have been under a heavy rain warning since 24 May, and authorities expect further rain with flood waters set to continue rising.

Map development

This map was developed on 13-06-2017 by the Argentinian Space Agency (ALI @ CAFARTE - CONAE, Argentina).

This product was generated using digital techniques and requires no classification. There is no previous mapping in this project

disasterscharter.org/web/guest/home

Home About Activations News Library English Login

The International Charter Space and Major Disasters

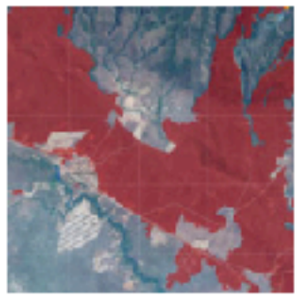
Providing satellite data to those affected by natural or man-made disasters through registered organisations, for use in monitoring and response activities. Read more

How the Charter Works ▸ How to become a user ▸

Latest Charter Activations

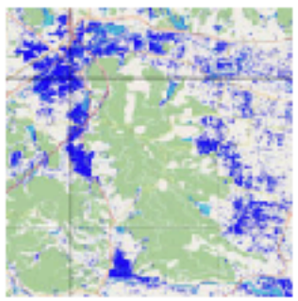
04 SEPTEMBER 2019

Hurricane Dorian in Bahamas ▸



02 SEPTEMBER 2019

Fire in Bolivia ▸

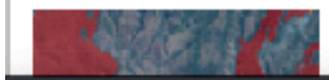


29 AUGUST 2019

Flood in Japan ▸

26 AUGUST 2019

Flood in Sudan ▸



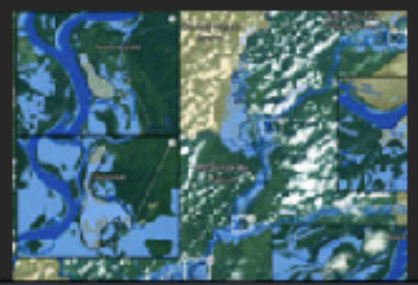
21 AUGUST 2019

15 AUGUST 2019

Recent Information

10 SEPTEMBER 2019

International Charter Newsletter - September 2019 - Issue 19 ▸



14 AUGUST 2019

Charter Value Added Products are now available via EUMETCast ▸

Charter activations

06 JUNE 2017

Flood in Uruguay

Browse activations on map

Location of Event:	Uruguay
Date of Charter Activation:	6 June 2017
Time of Charter Activation:	15:17:00
Time zone of Charter Activation:	UTC+03:00
Charter Requestor:	Sistema Nacional de Emergencias - Presidencia de la República
Activation ID:	536
Project Management:	CONAE

Heavy rains caused severe flooding in Uruguays' Salto Department, Paysandú Department and Bella Unión city of the Artigas department displacing 3500 people.

Uruguay's National Emergency System (SINAE) are visiting affected areas to assess the damage and prepare relief efforts. Many of the displaced people are already receiving food, shelter and medical care.

Northern parts of Uruguay have been under a heavy rain warning since 24 May, and authorities expect further rain with flood waters set to continue rising.

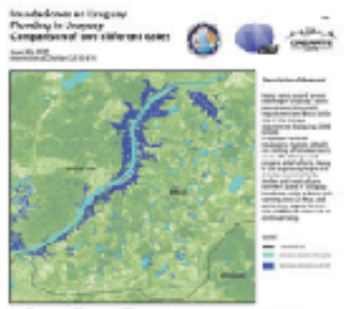
Products

Flooding in Uruguay

Source: CartoSat-2
Acquired: 20/06/2017

Copyright: CartoSat-2 data © ISRO (2017), all rights reserved

Map produced by CONAE



Comparison of flooding in Uruguay

Source: RADARSAT-2
Acquired: Pre-disaster: 22/02/2017
Post-disaster: 08/06/2017

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Activation 535 | Acquisitions (92) | Products (0)

Flood

Tuesday, June 6, 2017

Flood in Uruguay

+Info

Country: Uruguay

Extent: --- km²

Heavy rains caused severe flooding in Uruguays' Salto Department, Paysandú Department and Bella Unión city of the Artigas department displacing 3500 people.

Last update: Jul 28, 2017, 1:08 PM

Jan'00 - Sep'18

v1.3.3

Activation 535
Acquisitions (32)
Products (0)
Resolution
High
Low
Medium
Very high
Very low
Sensor
Optical
Radar
Show / hide all acquisitions images on the map
Sucre
Campo Grande
PARAGUAY
Asunción
Formosa
Resistencia
Corrientes
Posadas
La Rioja
Córdoba
Rosario
Buenos Aires
Montevideo
ARGENTINA
CHILE
Mar del Plata
Jan'00 - Sep'18
v1.3.3

Products

Inundaciones en Uruguay

Fuente: CartoSat-2
Adquirido: 20/06/2017

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Mapa producido por CONAF

Comparación de las inundaciones en Uruguay

Fuente: RADARSAT-2
Adquirido: Antes del desastre: 22/02/2017
Después de los desastres: 06/06/2017

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Inundación en Salto

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Inundaciones en Uruguay

Fuente: SPOT-6
Adquirido: 11/06/2017

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Inundaciones en Paysandu

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Inundaciones en Uruguay

Fuente: CartoSat-2
Adquirido: 10/06/2017

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Mapa producido por CONAF

Flooding in Monte Caseros and Bella Unión, Uruguay

Fuente: ALOS-2
Adquirido: 08/06/2017

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Map produced by CONAE

Inundaciones en el departamento de Salto, departamento de Paysandú y ciudad de Bella Unión

Fuente: CartoSat-2
Adquirido: 11/06/2017

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Flooding in Salto Department, Paysandú Department and Bella Unión City, Uruguay

Fuente: ALOS-2
Adquirido: 08/06/2017

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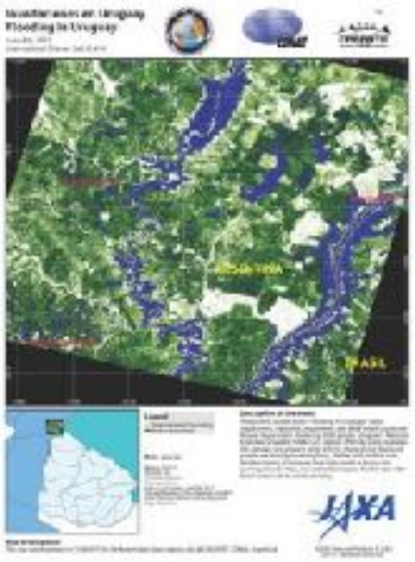
Map produced by CONAE



Flooding in Salto Department, Paysandú Department and Bella Unión City, Uruguay

Fuente: ALOS-2
Adquirido: 08/06/2017

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Map produced by CONAE

Inundaciones en Uruguay

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Adquirido: 10/06/2017

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Inundaciones en Uruguay

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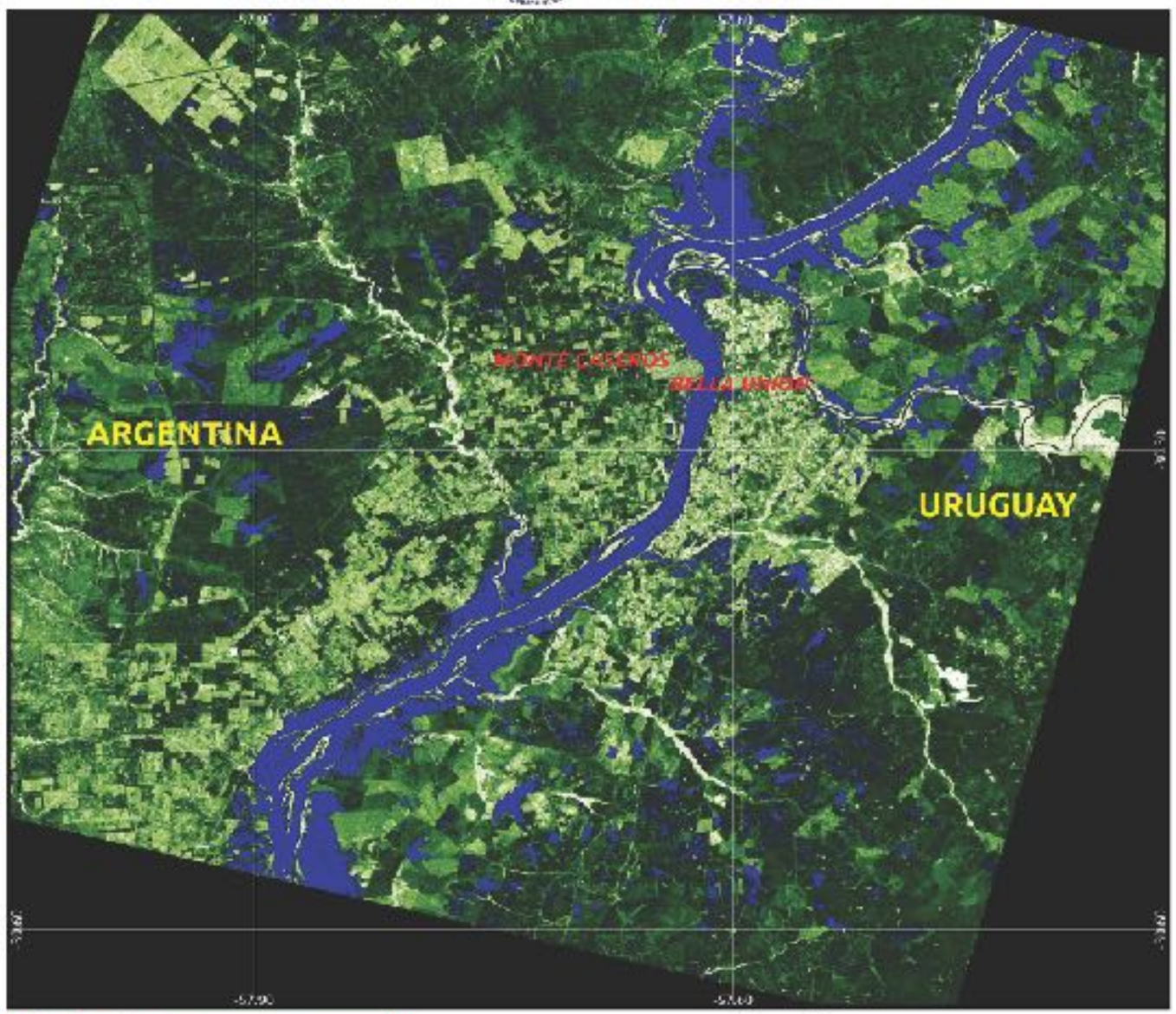
Inundaciones en Uruguay
Flooding in Uruguay

June 8th, 2017
International Charter Call ID 614



Legend
International boundary

Data source
Mission: ALOS 2
SENSOR: SAR
POLARIZATION: HV
Pixel size: 12.5 m
Date of crisis image: June 8th 2017
The satellite data in this map were provided under the International Charter Space and Major Disasters

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Data source

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SENSOR: SAR
POLARIZATION: HV
Pixel size: 12.5 m
Date of crisis image: June 8th 2017
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- Sentinel-3 Toolbox
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Search...

Home > Download > SNAP Download

SNAP Download

Here you can download the latest installers for SNAP and the Sentinel Toolboxes.

Data provision is available to all users via the **Sentinel Data Hub**.

Current Version

The current version is **7.0.0** (22.07.2019 **13:30 UTC**).

For detailed information about changes made for this release please have a look at the release notes of the different projects: SNAP, S1TBX, S2TBX, S3TBX, SMOS Box, PROBA-V Toolbox

We offer three different installers for your convenience. Choose the one from the following table which suits your needs. During the installation process, each toolbox can be excluded from the installation. Toolboxes which are not initially installed via the installer can be later downloaded and installed using the plugin manager. Please note that SNAP and the individual Sentinel Toolboxes also support numerous sensors other than Sentinel.

	Windows 64-Bit	Windows 32-Bit	Mac OS X	Unix 64-bit
Sentinel Toolboxes	These installers contain the **Sentinel-1, Sentinel-2, Sentinel-3** Toolboxes			
	Download	Download	Download	Download
SMOS Toolbox	These installer contains only the **SMOS Toolbox.** Download also the Format Conversion Tool (Earth Explorer to NetCDF) and the User manual.			
	Download	Download	Download	Download
All Toolboxes	These installers contain the **Sentinel-1, Sentinel-2, Sentinel-3** Toolboxes, **SMOS** and **PROBA-V** Toolbox			
	Download	Download	Download	Download

If you later decide to install an additional toolbox to your installation you can follow this step-by-step guide.

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scientific exploitation of operational missions

2018

Mapping Urban Areas from Space (MUAS 2018)

EO Open Science 2018

gLit Advanced Land Training Course

2017

EO Open Science 2017

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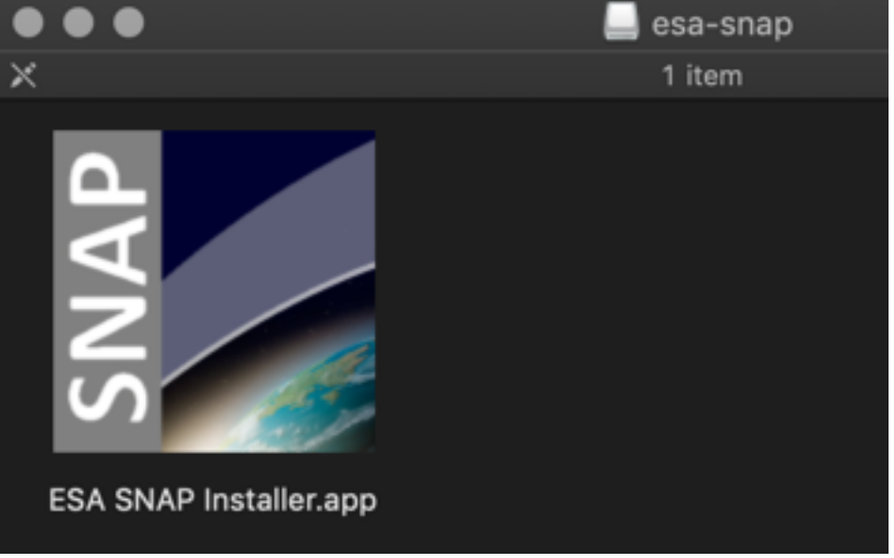

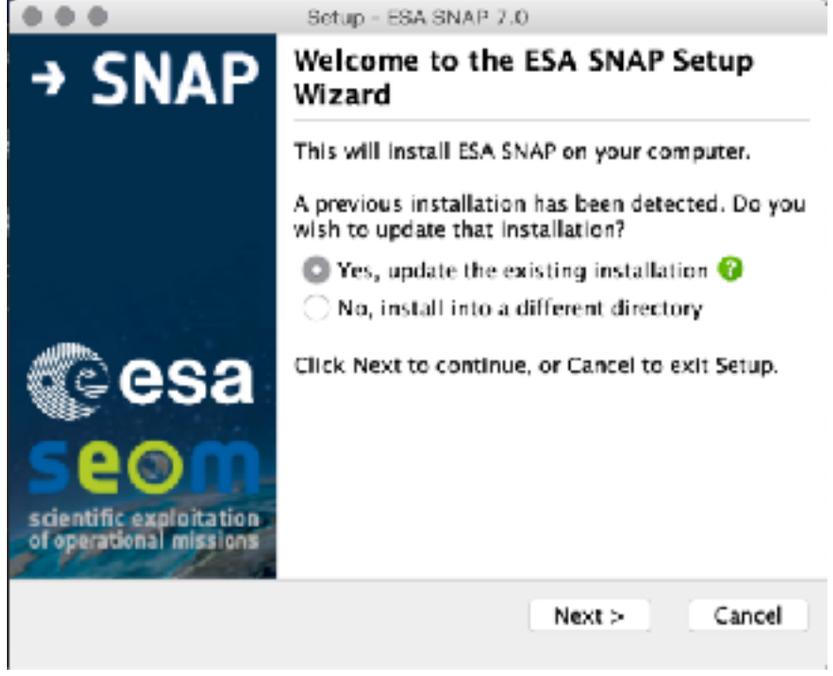

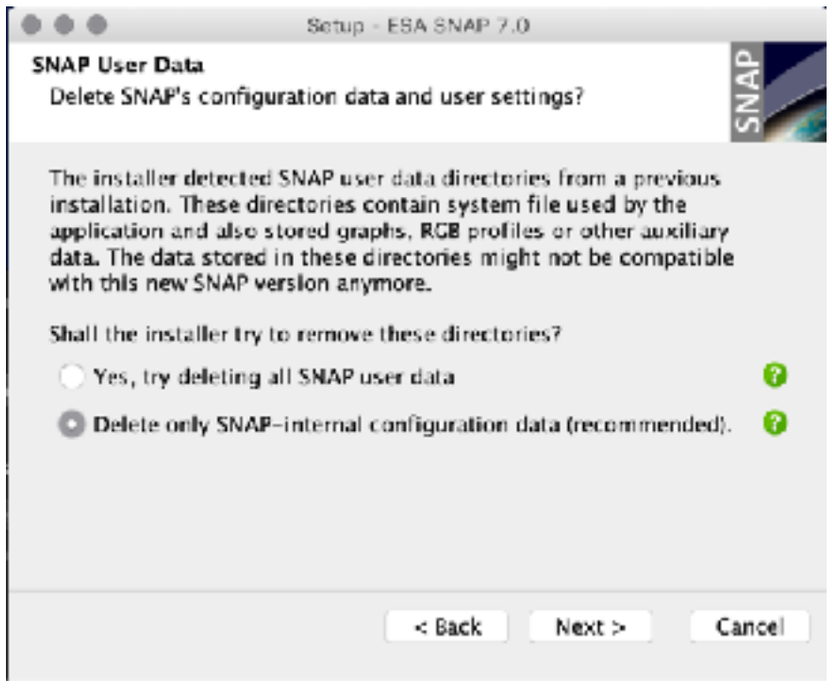

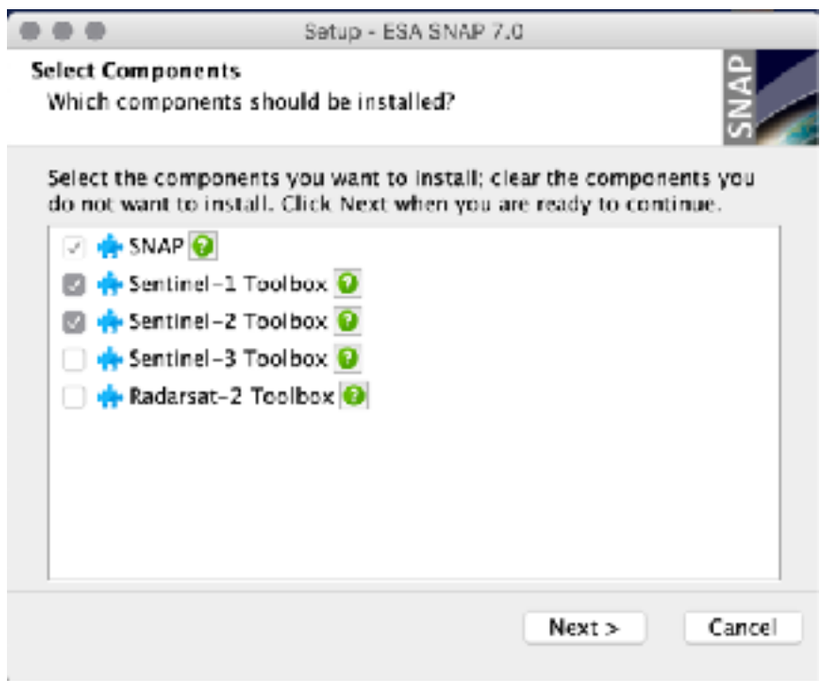

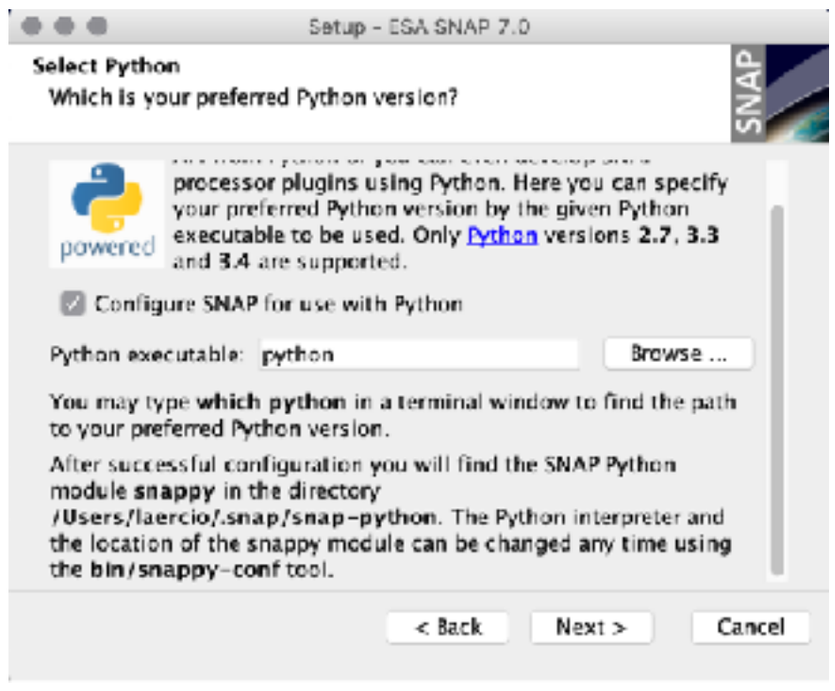

Instala SNAP

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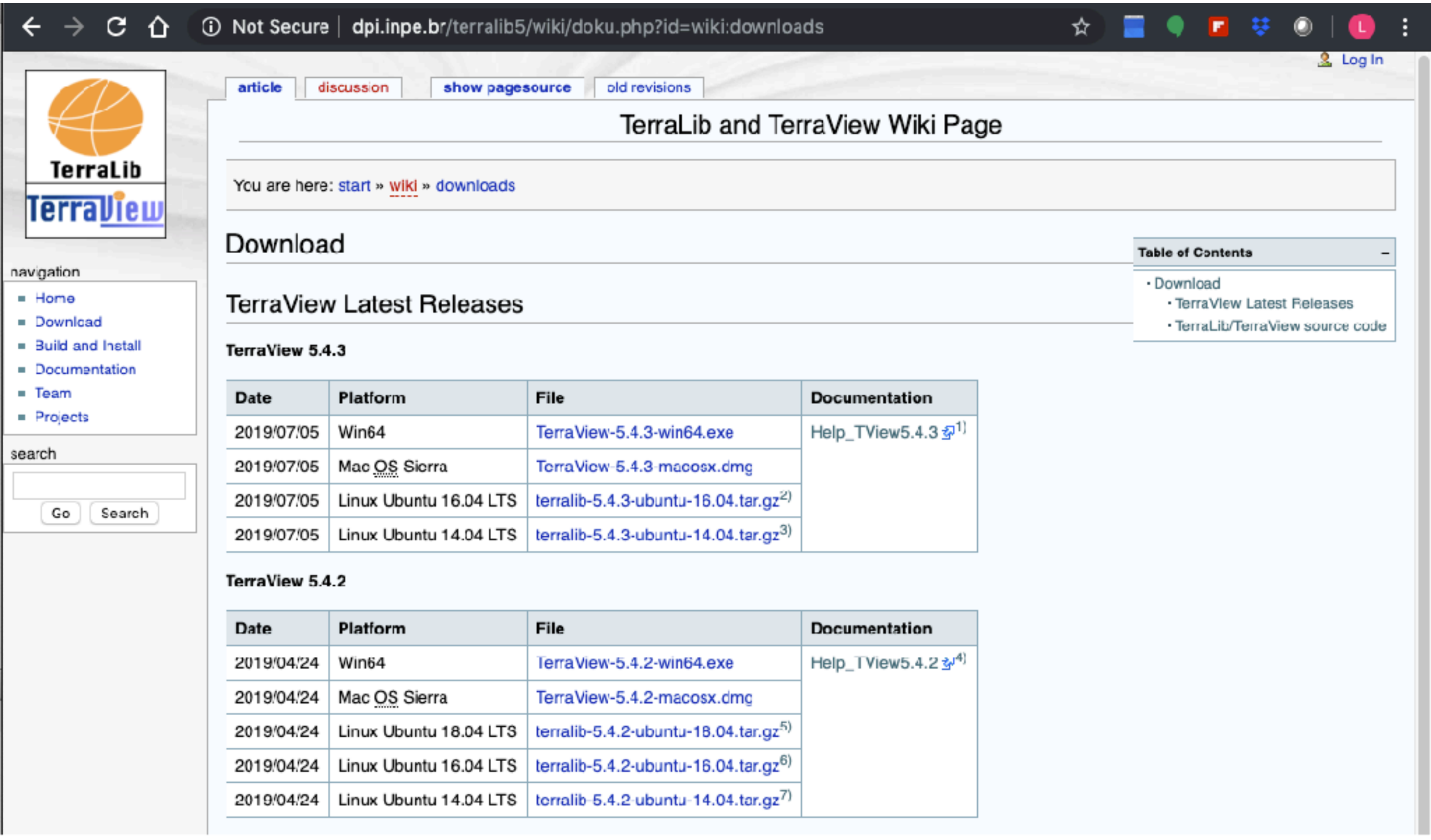
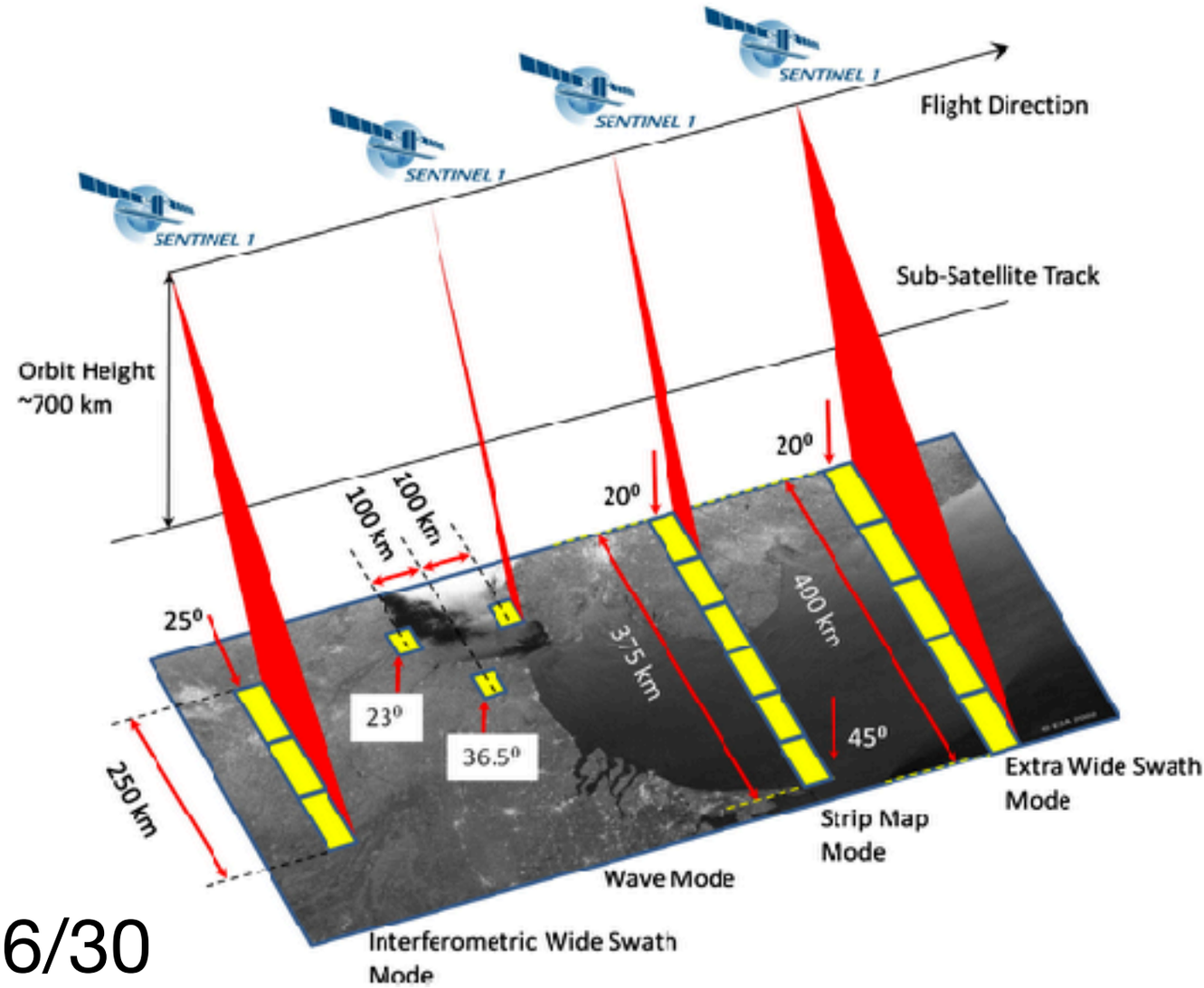


Seleção e Download de Imagens



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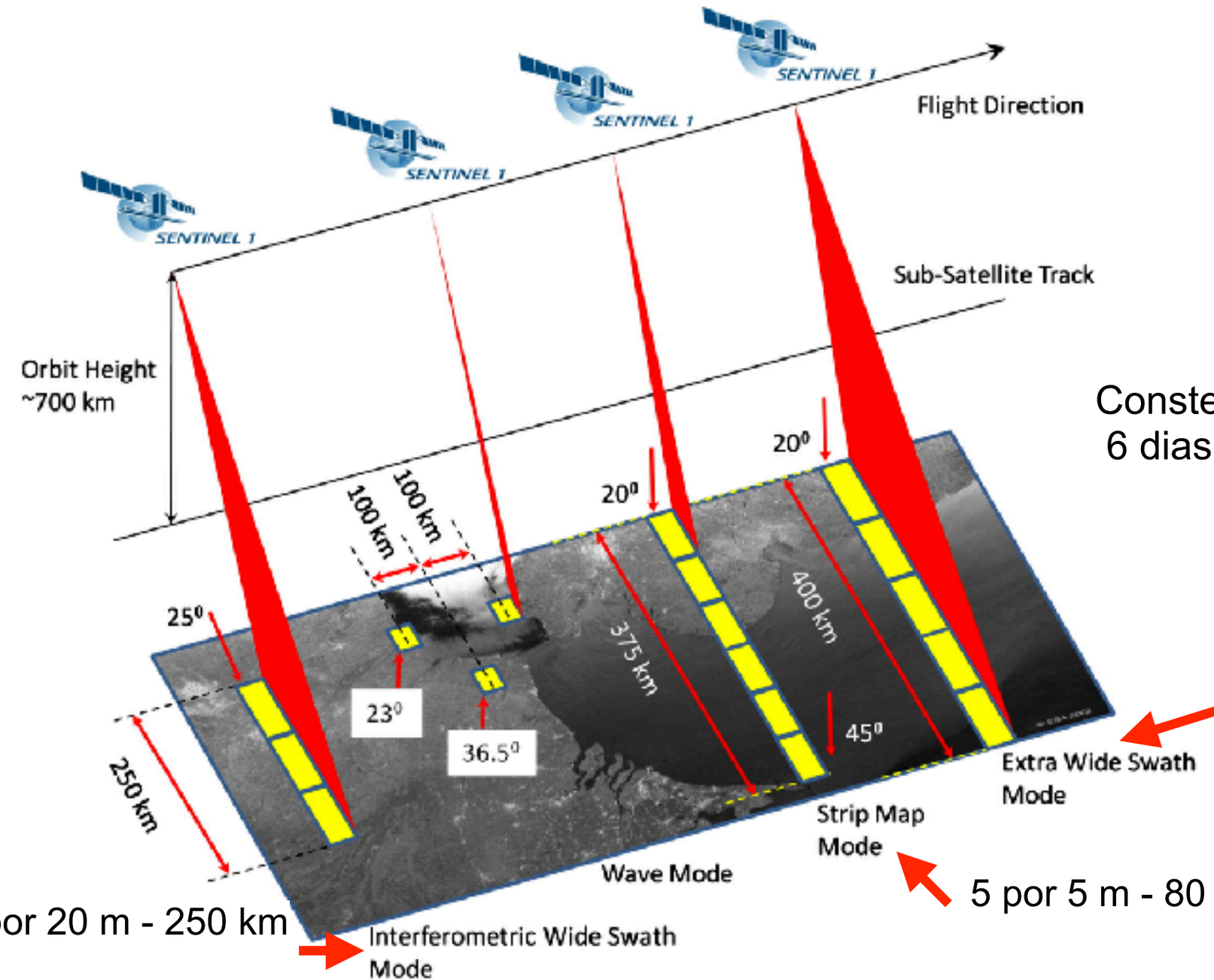
Data entre 2017/06/01 e 2017/06/30
Missão: Sentinel 1 - S1A e S1B .
Produto: GRD (Ground Range Detected - Projetado em Ground Range, valores em magnitude, não existe fase).
Modo: IW (Interferometric Wide Swath - Adquirido em 3 faixas, resolução espacial de 20x22 metros em Range x Azimute)

SENTINEL-1

C-band SAR: frequência central 5.405 GHz; right looking

Polarização Dual (HH+HV, VV+VH): transmite H ou V e recebe H e V



Constelação garante mesma órbita a cada 6 dias no equador (12 dias cada)

20 por 40 m - 400 km

5 por 5 m - 80 km

5 por 20 m - 250 km

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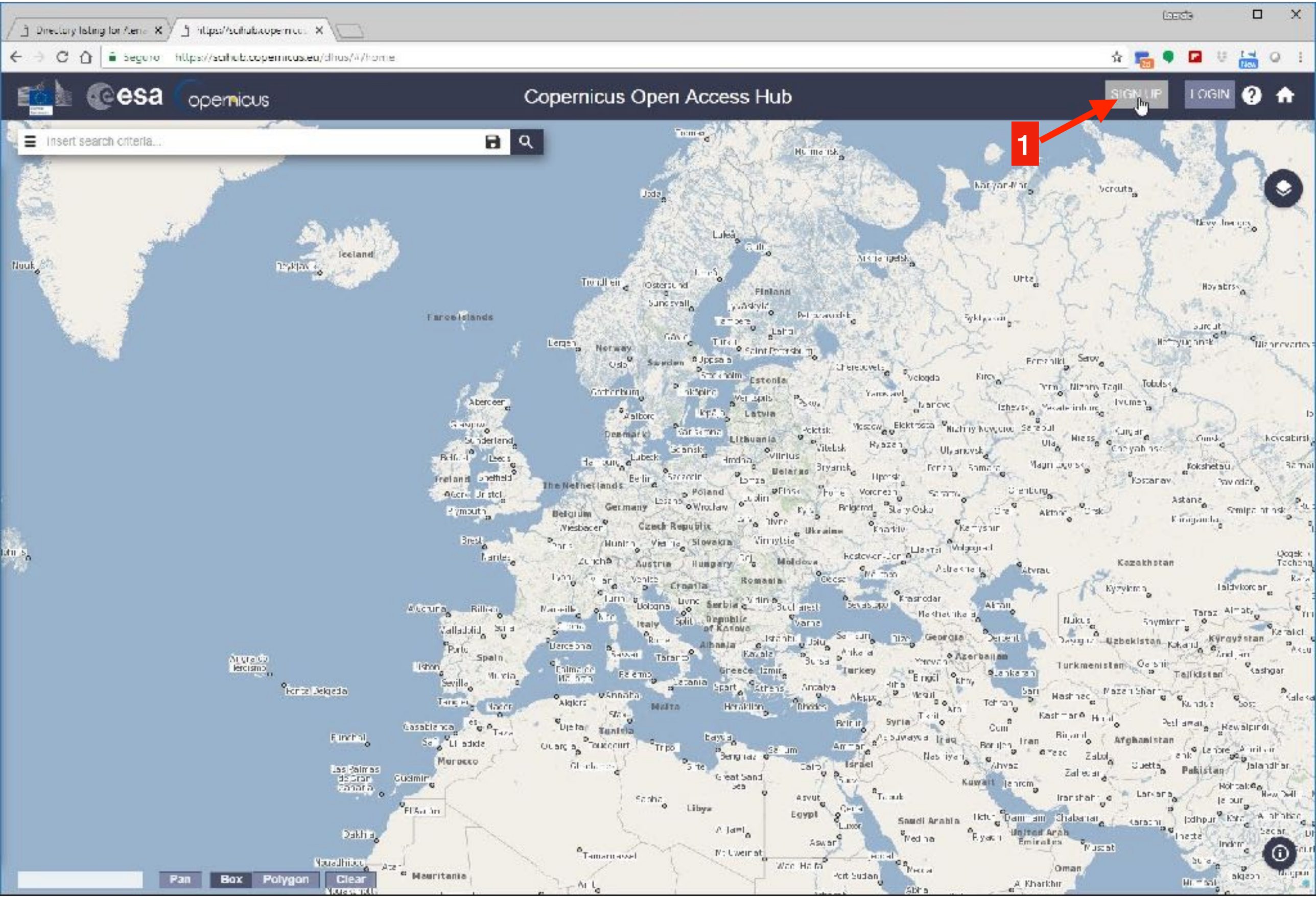

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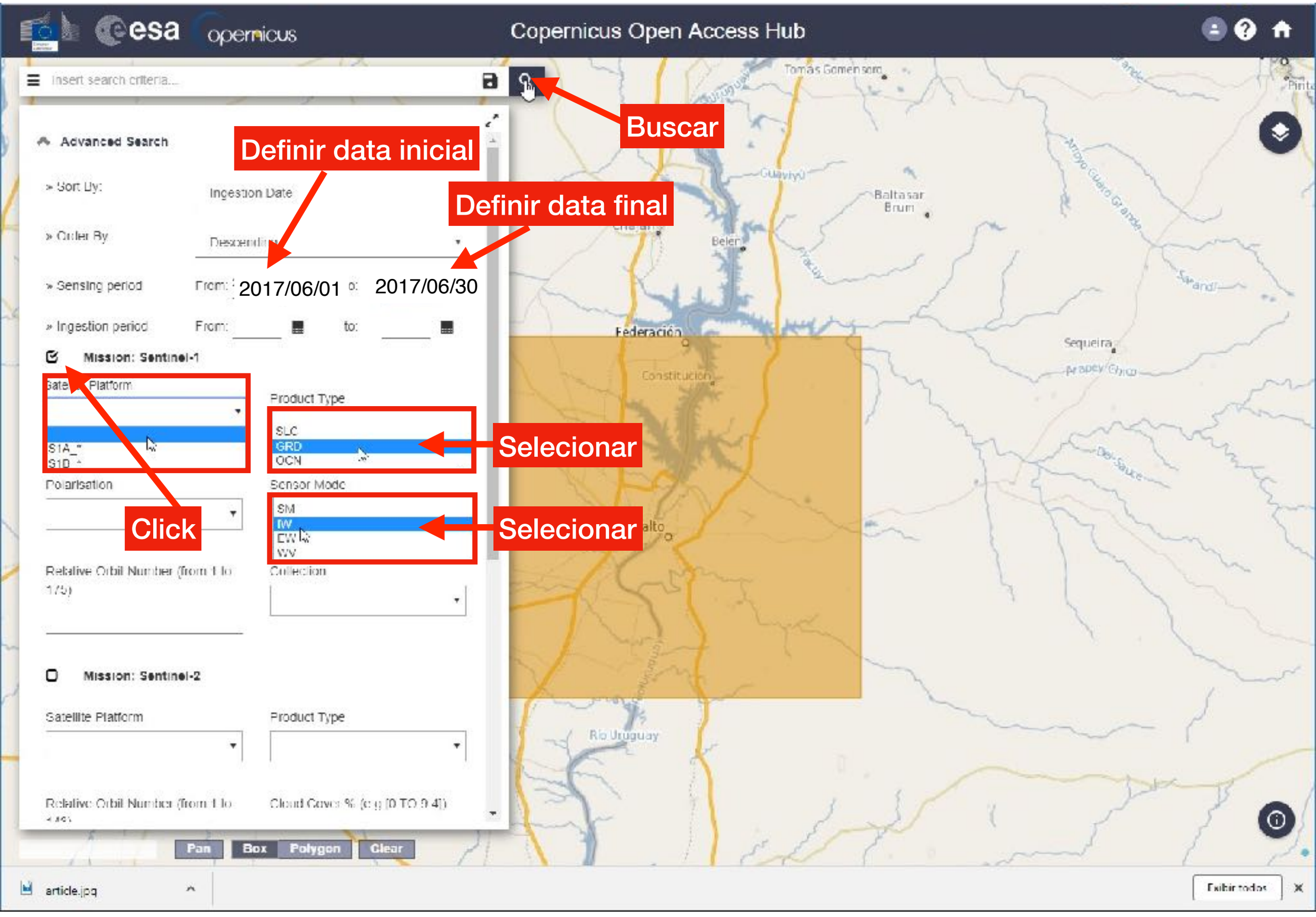
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» Sensing period
From: 2017/06/01
to: 2017/06/30
» Ingestion period
From:
to:
Mission: Sentinel-1
Platform
S1A_*
S1B_*
Product Type
SLC
GRD
OCN
Selecionar
Polarisation
Sensor Mode
SM
IW
EW
WV
Selecionar
Click
Relative Orbit Number (from 1 to 175)
Collection
Mission: Sentinel-2
Satellite Platform
Product Type
Relative Orbit Number (from 1 to 143)
Cloud Cover % (e.g. [0 TO 9.4])
Pan
Box
Polygon
Clear
Tomás Gomensoro
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S1B SAR-C S1B_IW_GRDH_1SDV_20170614T091321_20170614T091349_006044_00

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Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2017-06-14T09:13:24.492Z Size: 1.68

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S1B SAR-C S1B_IW_GRDH_1SDV_20170609T090457_20170609T090522_005971_00A7AB_8355

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Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2017-06-09T09:04:57.447Z Size: 1.68

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Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2017-06-09T09:05:22.547Z Size: 1.67

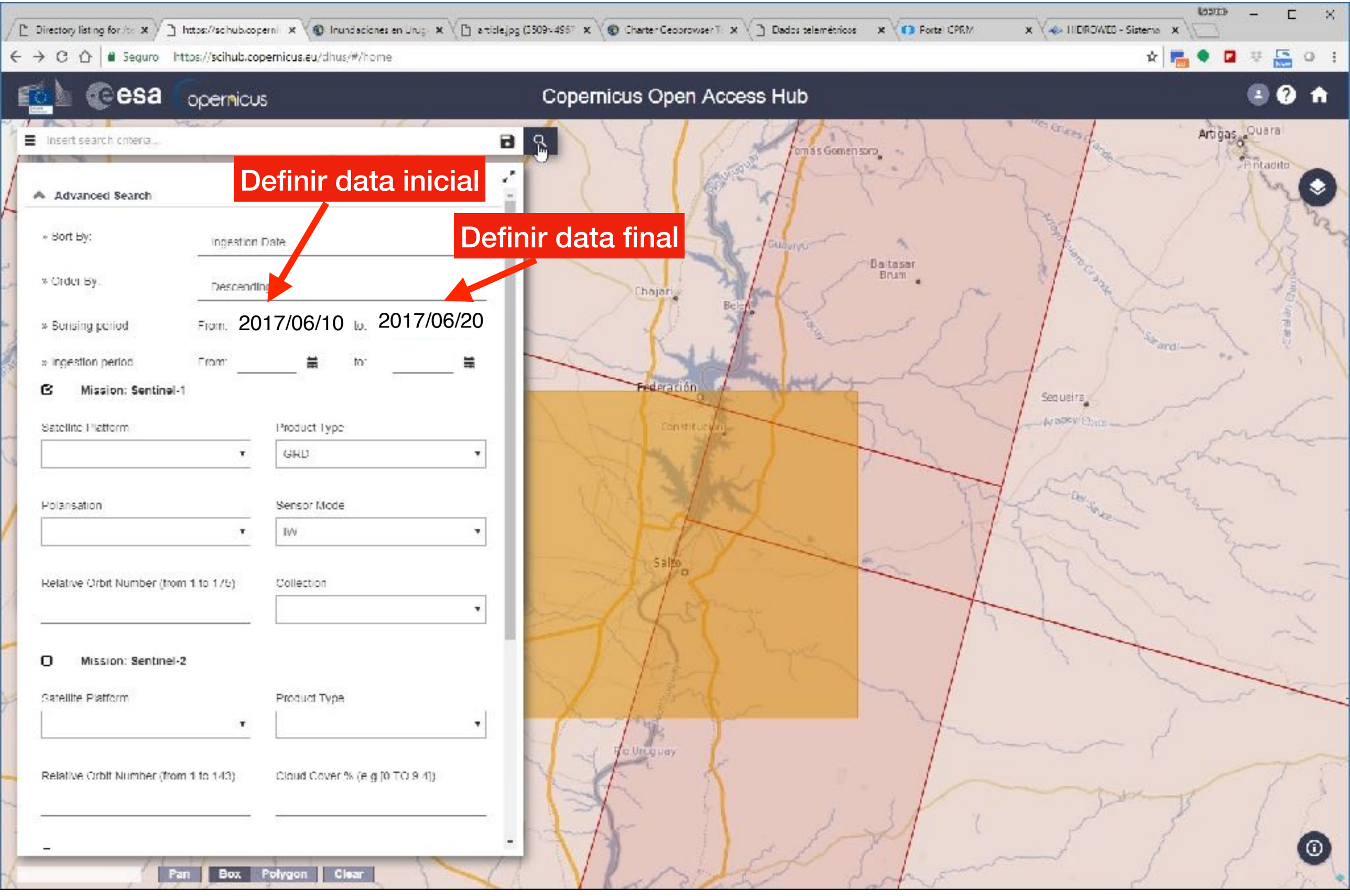
25 << < page 1 of 1 > >>

CLOSE

Imagem Acima de Salto, Uruguai

Artigas Quara Tomás Gomensoro Pintadito Baltasar Brum Belén Federación Constitución Sequeira Salto Villaguay Río Uruguay

Pan Box Polygon Clear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Dados telemétricos
Forte | CPRM
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Definir data final
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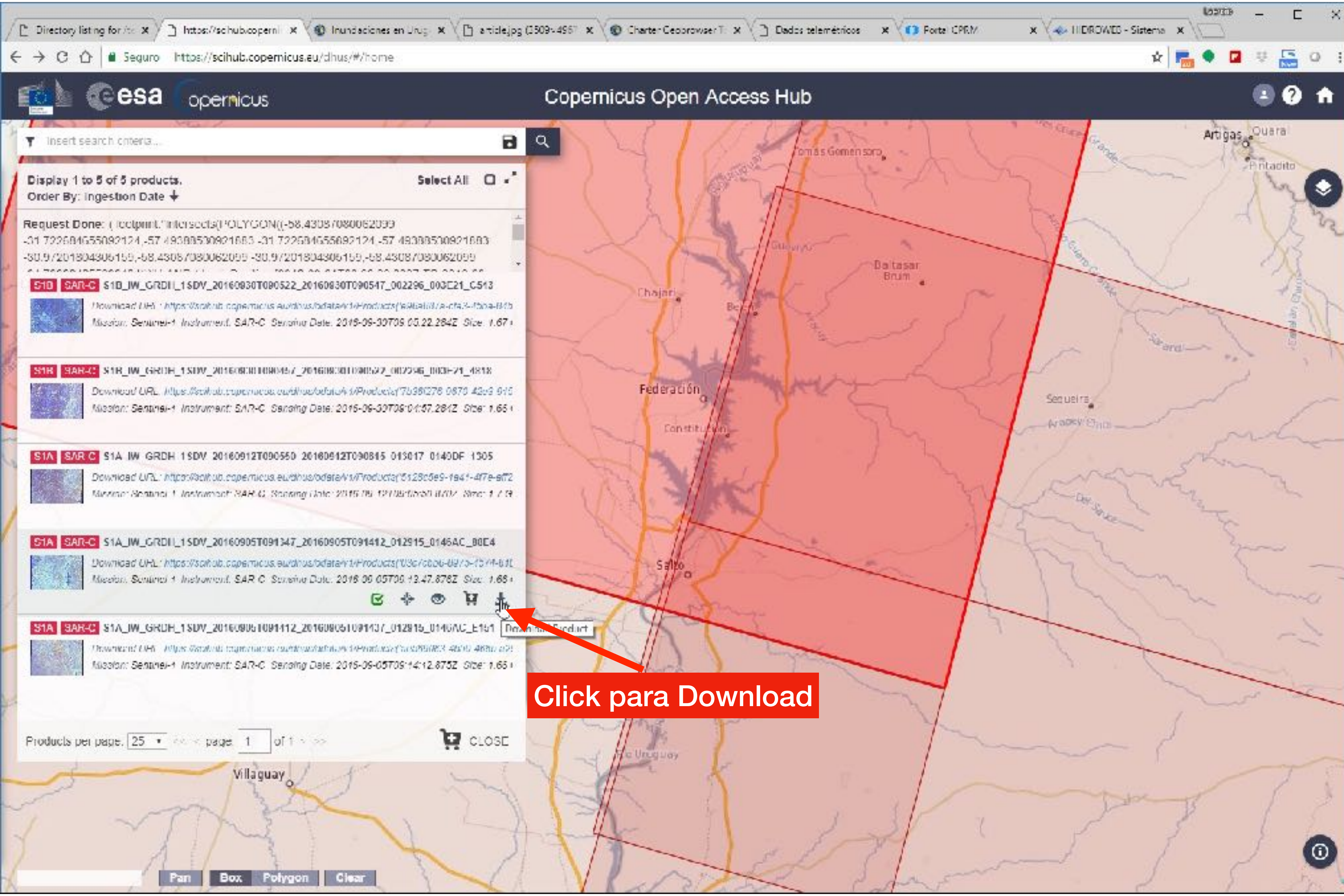
» Sort by: Ingestion Date
» Order By: Descending
» Sensing period From: 2017/06/10 to: 2017/06/20
» Ingestion period From: to:
Mission: Sentinal-1
Satellite Platform
Product Type
GRD
Polarisation
Sensor Mode
IW
Relative Orbit Number (from 1 to 175)
Collection
Mission: Sentinel-2
Satellite Platform
Product Type
Relative Orbit Number (from 1 to 143)
Cloud Cover % (e.g [0 TO 9.4])
Pan
Box
Polygon
Clear
Artigas
Quara
Tomás Gomensoro
Baltasar Brum
Chajarí
Federación
Constitución
Salto
Río Uruguay
Sequeira



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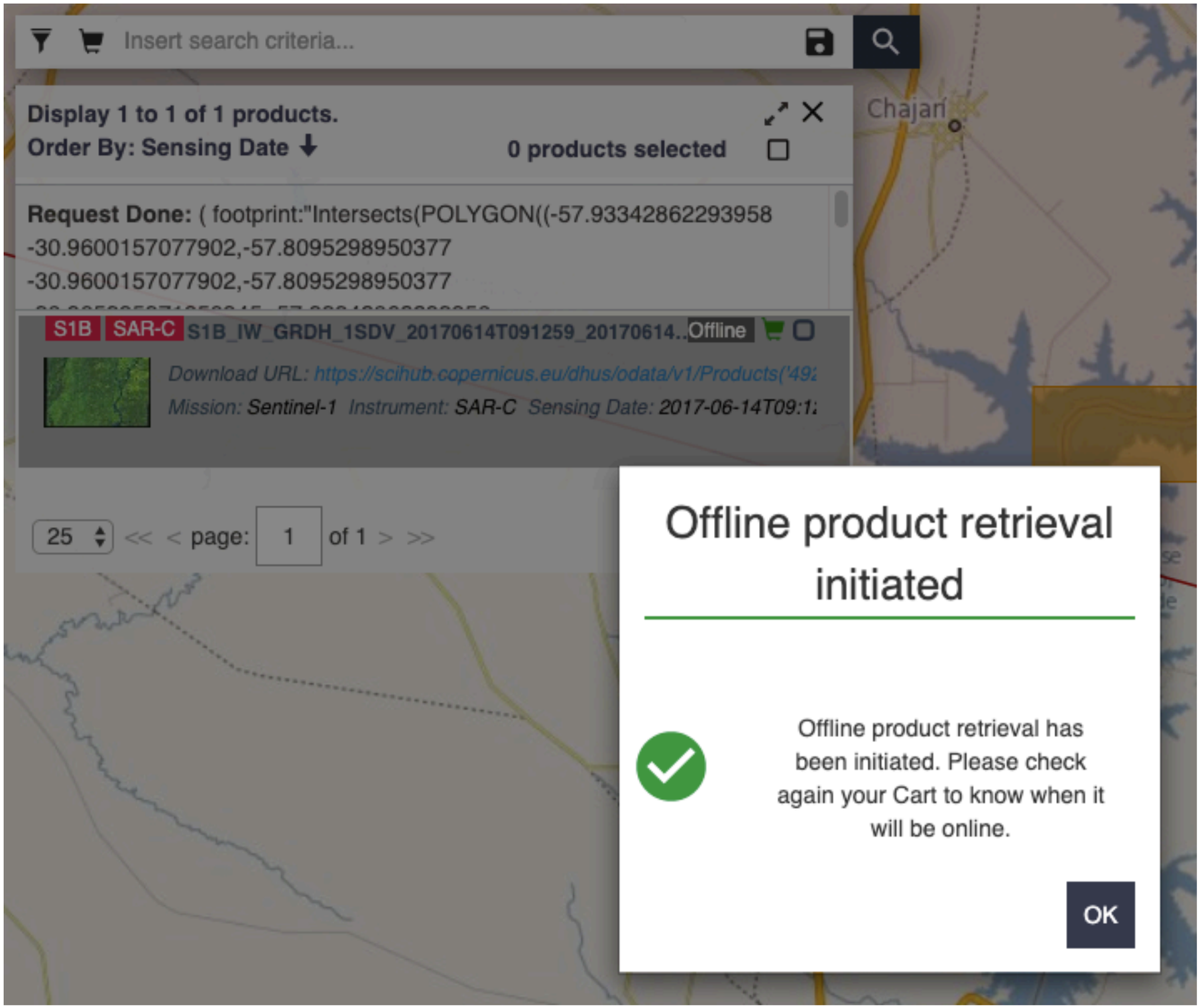
Order By: Ingestion Date
Select All
S1B SAR-C S1B_IW_GRDH_1SDV_20160930T090522_20160930T090547_002296_003E21_C513
S1A SAR-C S1A_IW_GRDH_1SDV_20160912T090550_20160912T090615_013017_014DDF_1305
S1A SAR-C S1A_IW_GRDH_1SDV_20160905T091347_20160905T091412_012915_0146AC_80E4
Products per page: 25
CLOSE
Federación
Salto
Villaguay
Pan
Box
Polygon
Clear
Click para Download

Evento
S1B_IW_GRDH_1SDV_20170614T091259_20170614T0*.dim



Satélite: SENTINEL-1B

Modo: IW-Interferometric Wide Swath

Produto: GRD-Ground Range Detected; High Resolution

Órbita-Missão-Produto

S1B_IW_GRDH_1SDV_20170614T091259_20170614T091324_006044_00A9CE_80EB

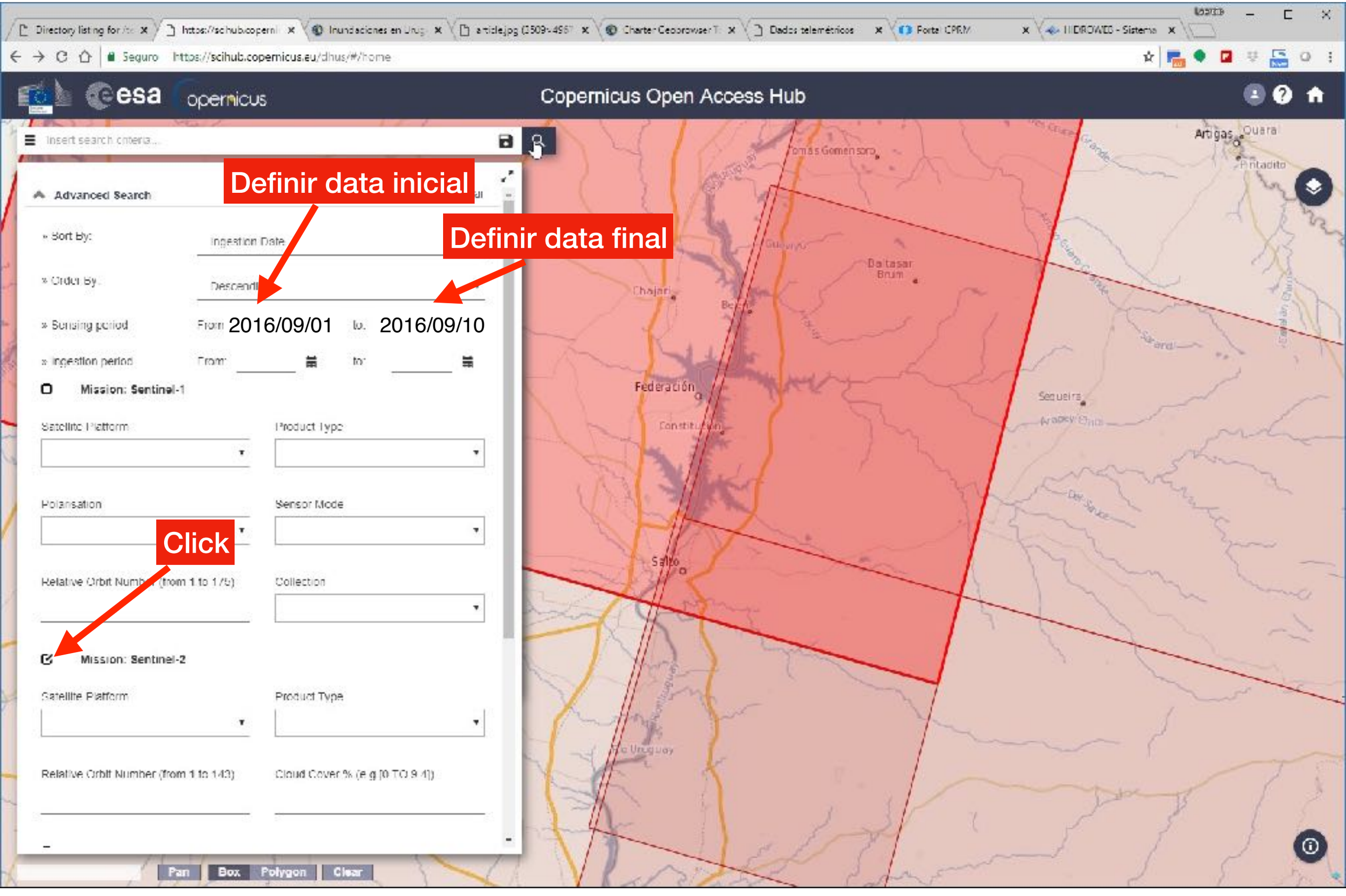
Processamento:
Nível 1

Classe: S-Padrão

Polarização: VV+VH

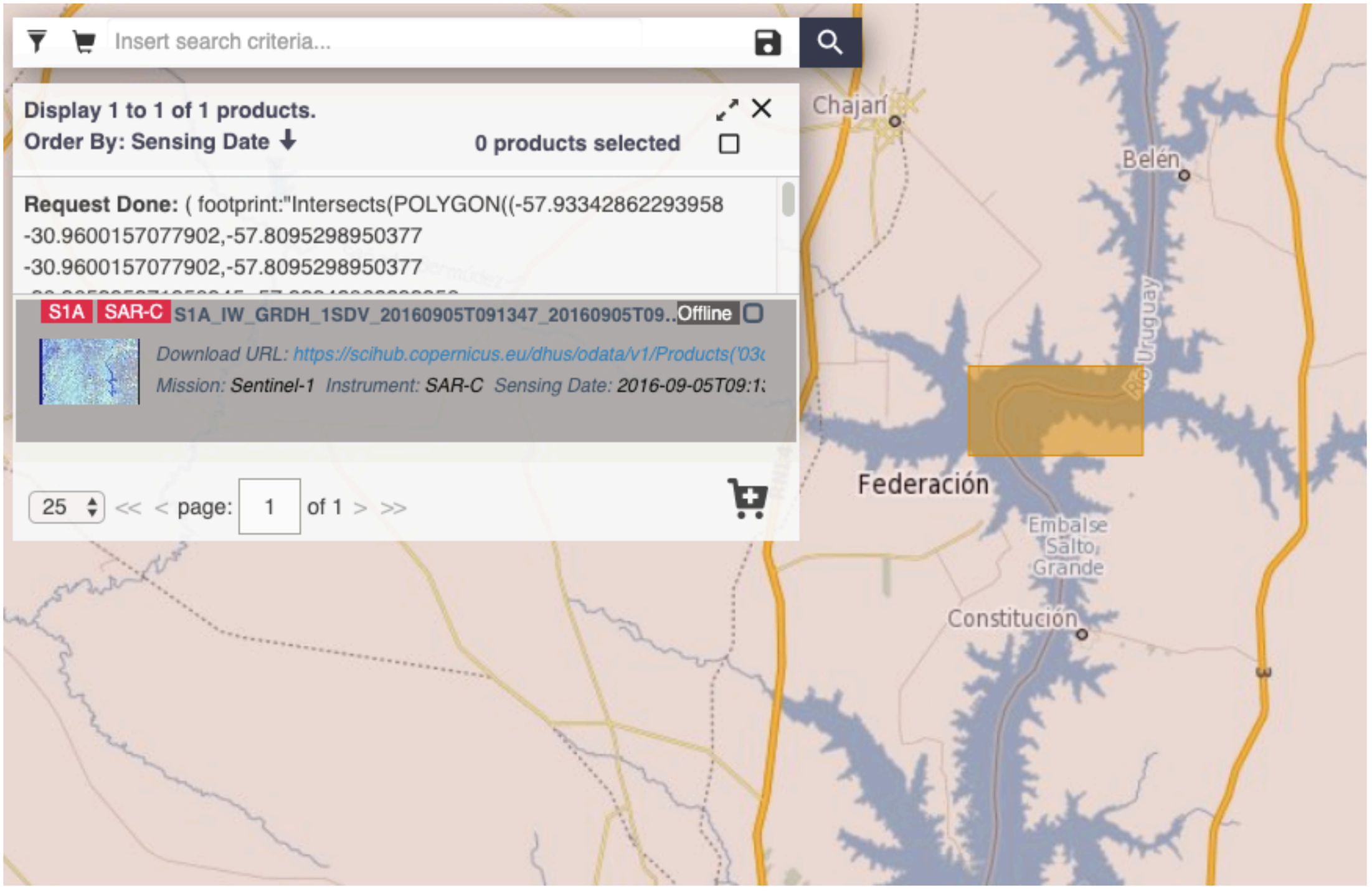
Data/Hora Início e Final

https://sentinel.esa.int/web/sentinel/user-guides/sentinel-1-sar/naming-conventions

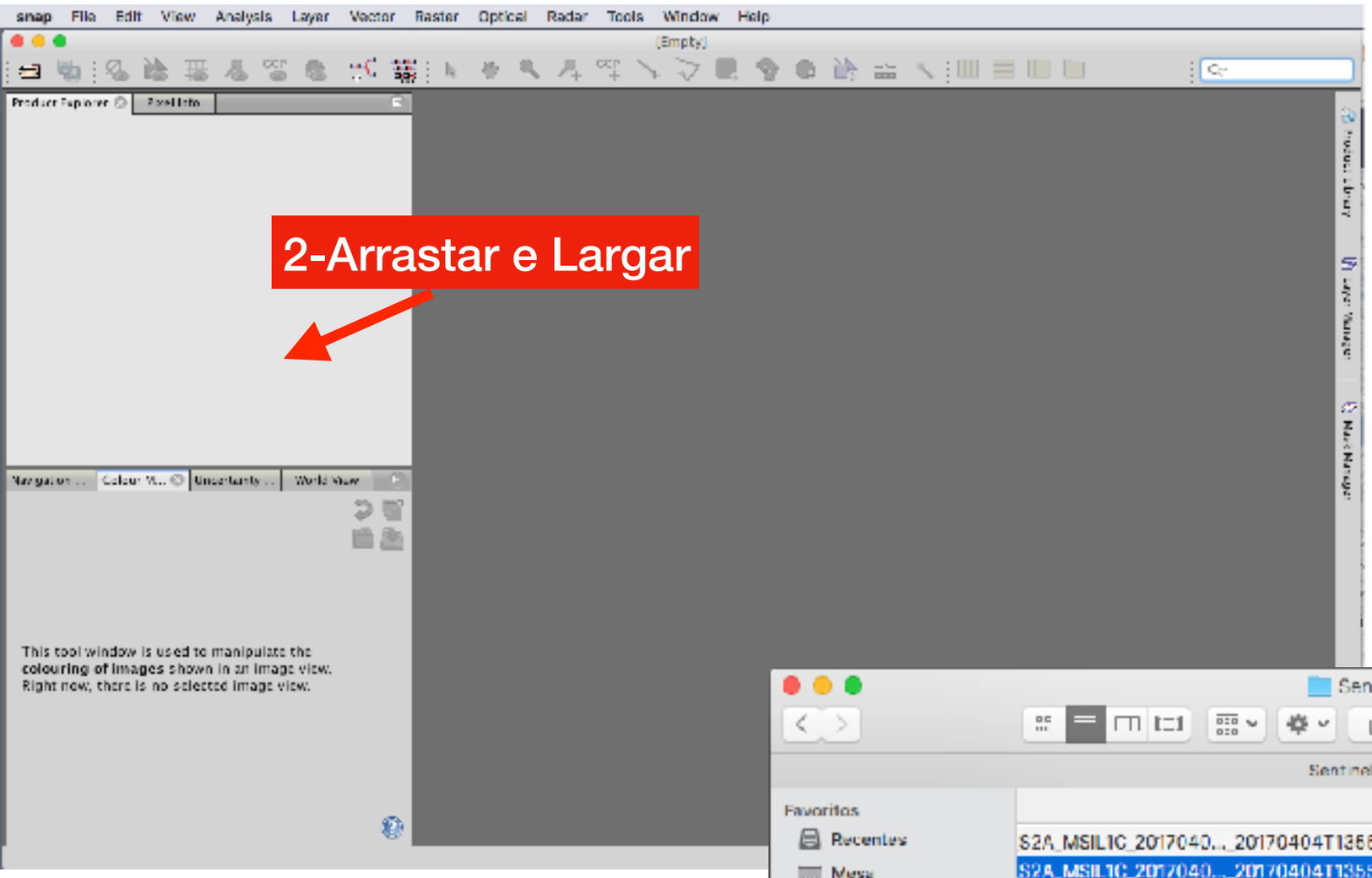

Directory listing for /
https://scihub.copernic
Inundaciones en Urug
article.jpg (3509×4967
Charte - Geobrowser T
Dados telemétricos
Forte | CPRM
HIDROWEB - Sistema
Seguro https://scihub.copernicus.eu/dhus/#/home
esa
copernicus
Copernicus Open Access Hub
Insert search criteria...
Advanced Search
Definir data inicial
Definir data final
» Sort By:
Ingestion Date
» Order By:
Descendi
» Sensing period
From 2016/09/01
to 2016/09/10
» Ingestion period
From:
to:
Mission: Sentinel-1
Satellite Platform
Product Type
Polarisation
Sensor Mode
Click
Relative Orbit Numb (from 1 to 175)
Collection
Mission: Sentinel-2
Satellite Platform
Product Type
Relative Orbit Number (from 1 to 143)
Cloud Cover % (e.g [0 TO 9.4])
Pan
Box
Polygon
Clear
Artigas
Quara
Pintadito
Tomás Gomensoro
Baltasar Brum
Chapicuy
Federación
Constitución
Sequeira
Salto
Río Uruguay

Pré Evento

S1A_IW_GRDH_1SDV_20160905T091347_20160905T0*.dim



Visualiza


snap File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
[Empty]
2-Arrastar e Largar
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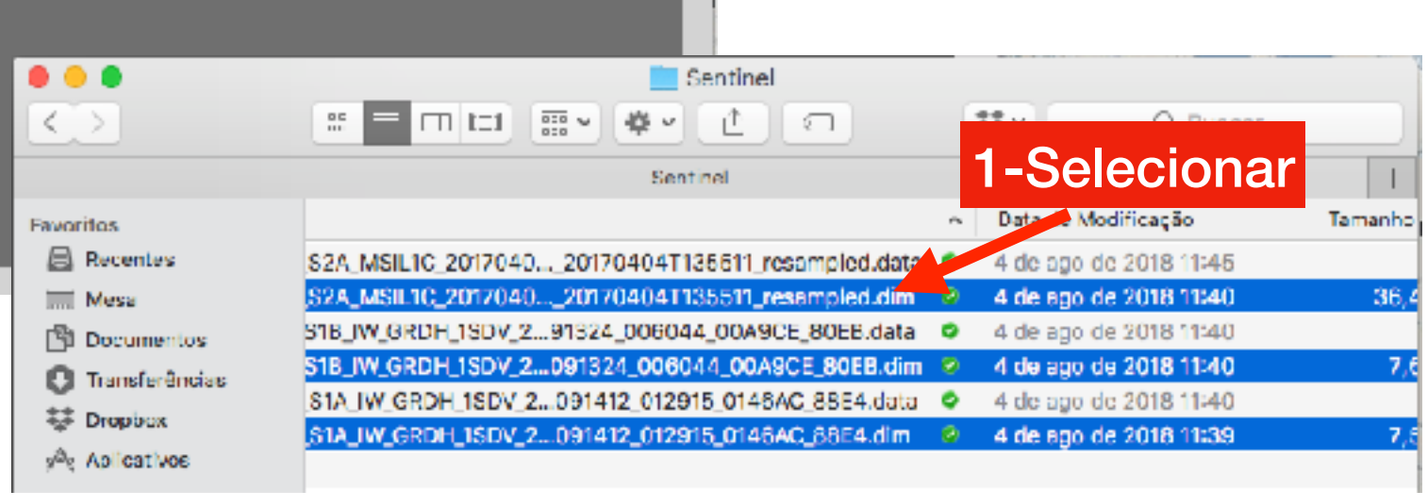
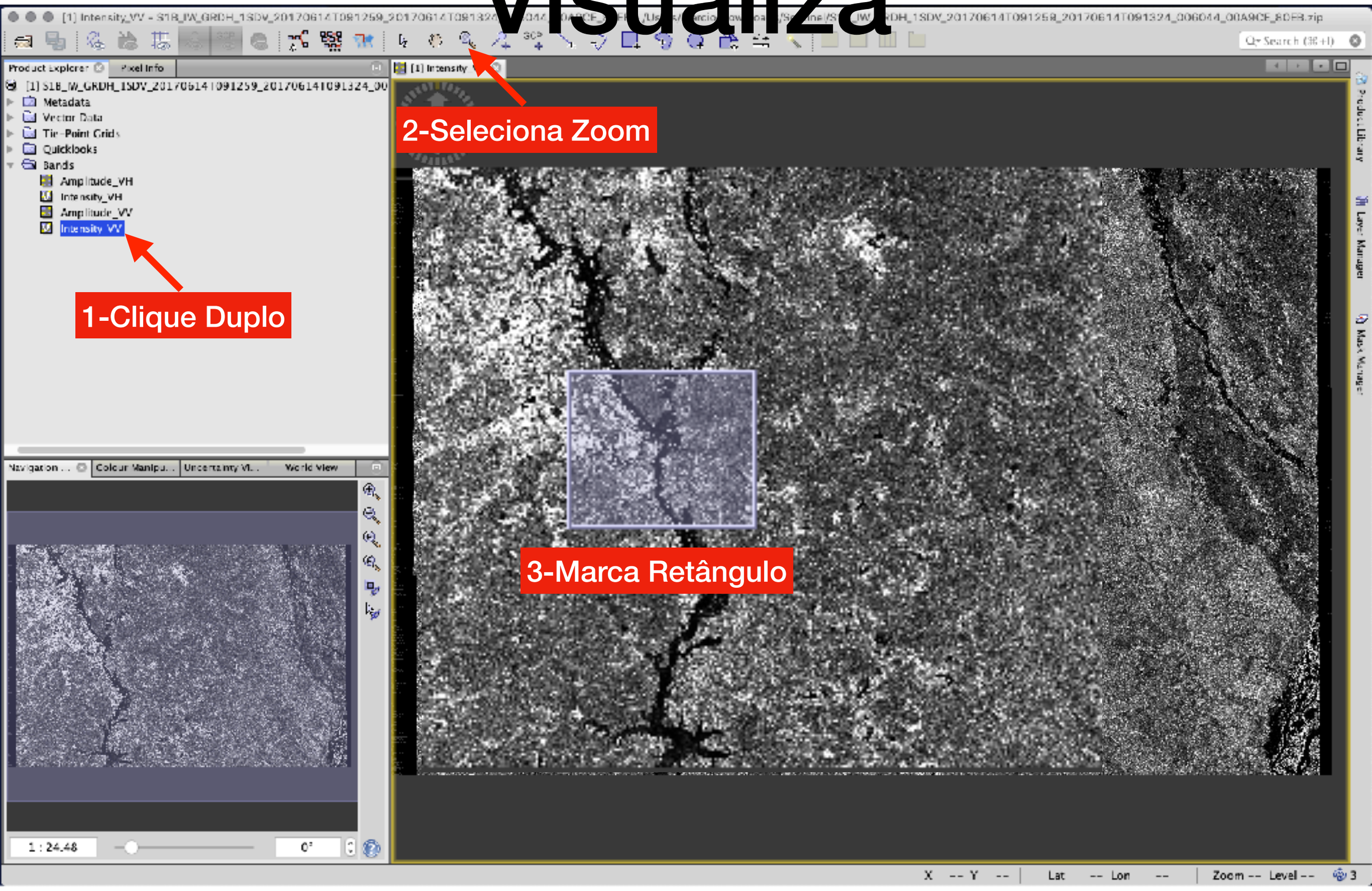
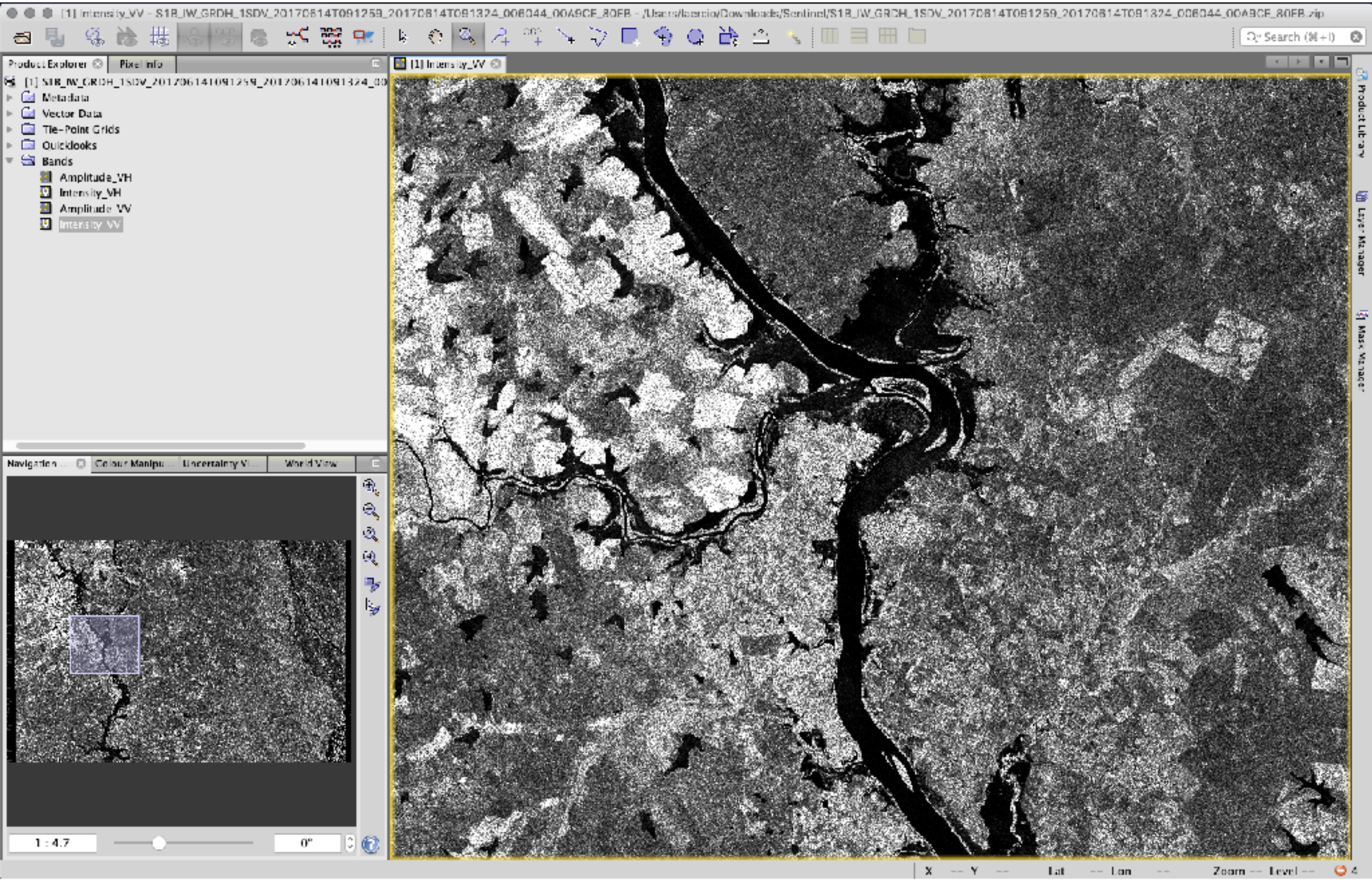
Right now, there is no selected image view.


Sentinel
1-Selecionar
Favoritos
Recentes
Mesa
Documentos
Transferências
Dropbox
Aplicativos
Data de Modificação
Tamanho
S2A_MSIL1C_20170404T135511_resampled.dim
4 de ago de 2018 11:40
S1B_IW_GRDH_1SDV_2...091324_006044_00A9CE_80EB.dim
4 de ago de 2018 11:40
S1A_IW_GRDH_1SDV_2...091412_012915_0146AC_85E4.dim
4 de ago de 2018 11:39

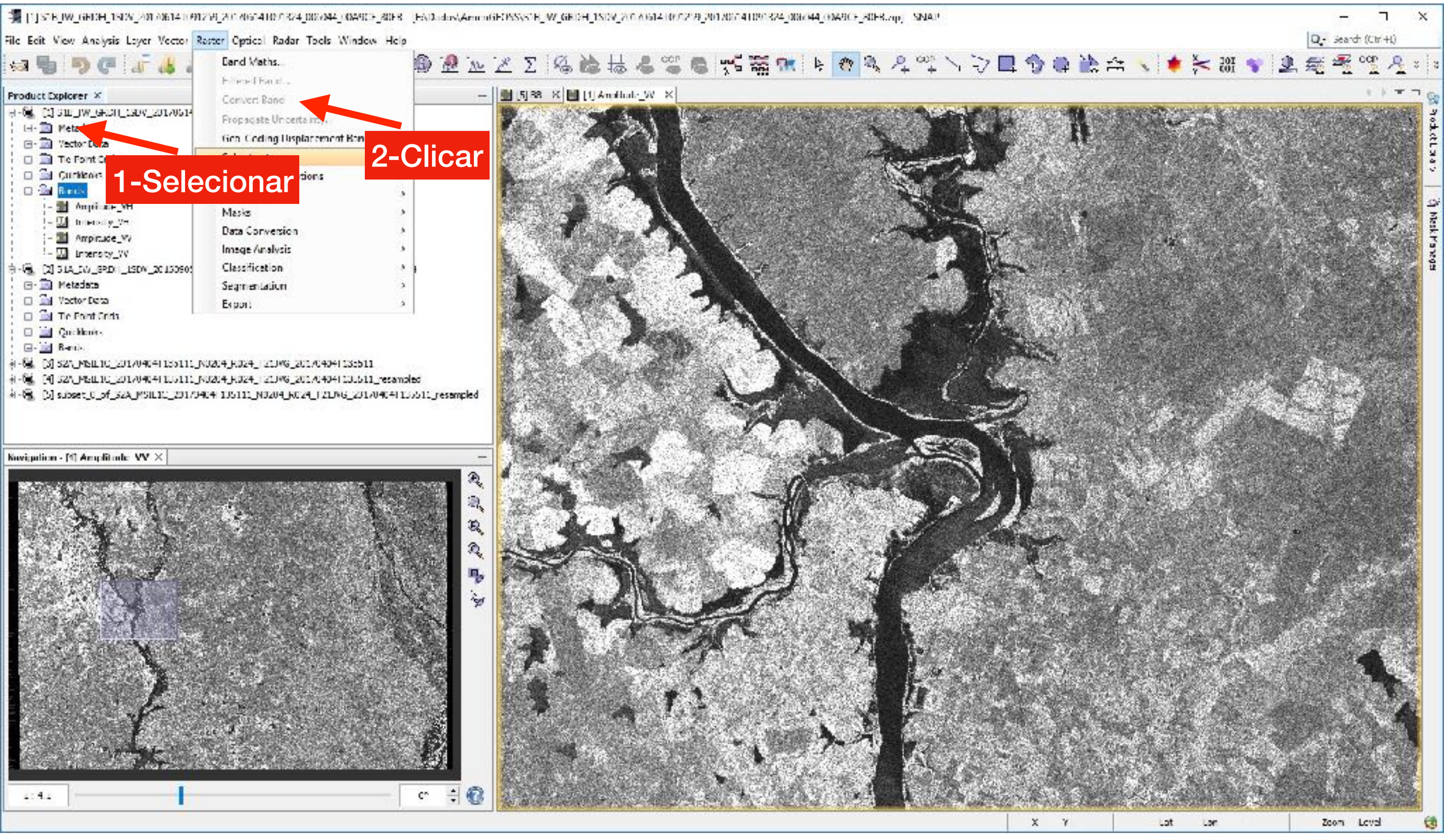
Visualiza


Product Explorer
Pixel Info
Metadata
Vector Data
Tie-Point Grids
Quicklooks
Bands
Amplitude_VH
Intensity_VH
Amplitude_VV
Intensity_VV
1-Clique Duplo
2-Seleciona Zoom
3-Marca Retângulo
Navigation
Colour Manipu..
Uncertainty Vi..
World View
1 : 24.48
0°
[1] Intensity
X -- Y --
Lat -- Lon --
Zoom -- Level --

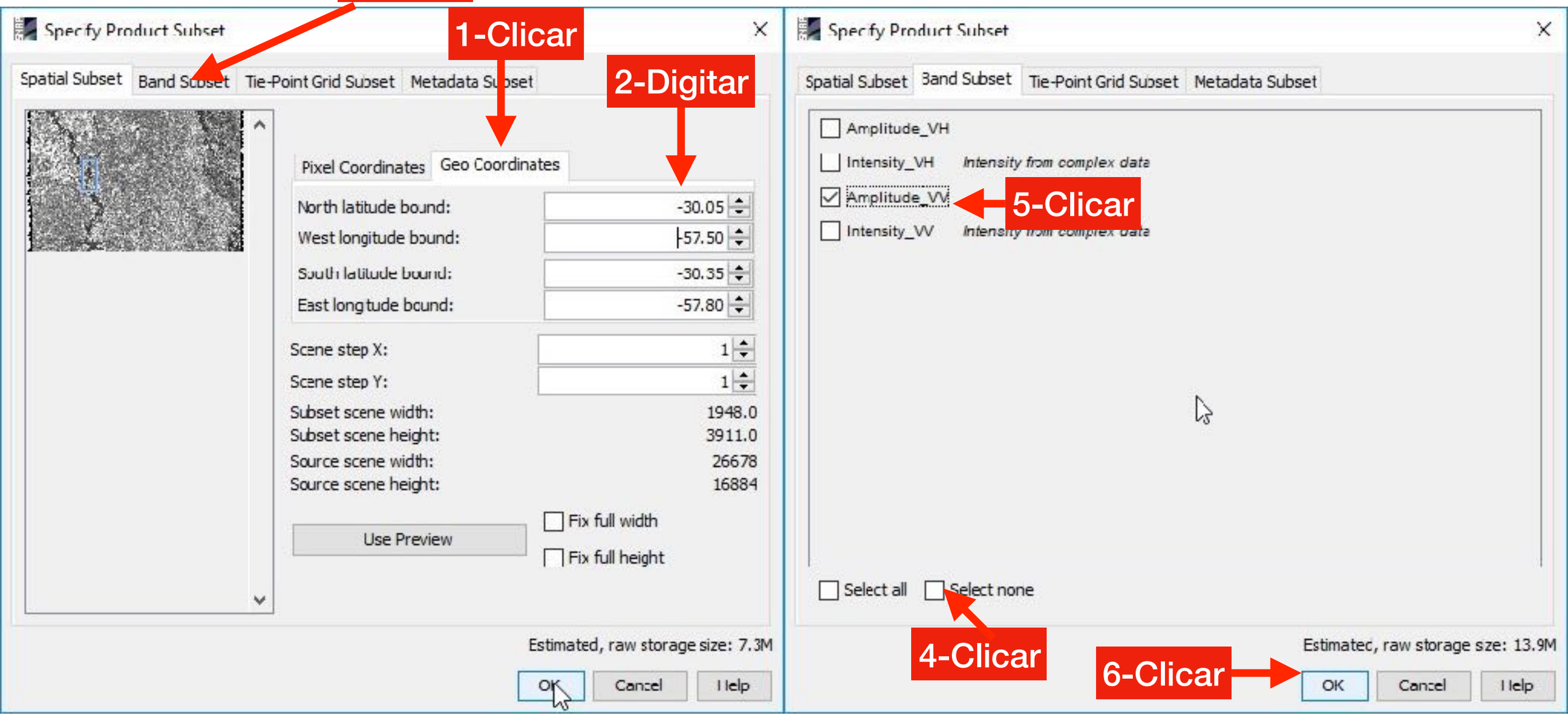

[1] Intensity_VV - S1B_IW_GRDH_1SDV_20170814T091259_20170814T091324_006044_00A9CF_80FB - /Users/lorenzo/Downloads/Sentinel/S1B_IW_GRDH_1SDV_20170814T091259_20170814T091324_006044_00A9CF_80FB.zip
Search (⌘+I)
Product Explorer
Pixel Info
[1] S1B_IW_GRDH_1SDV_20170614T091259_20170614T091324_00
Metadata
Vector Data
Tie-Point Grids
Quicklooks
Bands
Amplitude_VH
Intensity_VH
Amplitude_VV
Intensity_VV
Navigation
Colour Manipu...
Uncertainty Vi...
World View
1 : 4.7
0°
[1] Intensity_VV
Product Library
Layer Manager
Mask Manager
X -- Y -- Lat -- Lon -- Zoom -- Level --

Recorta

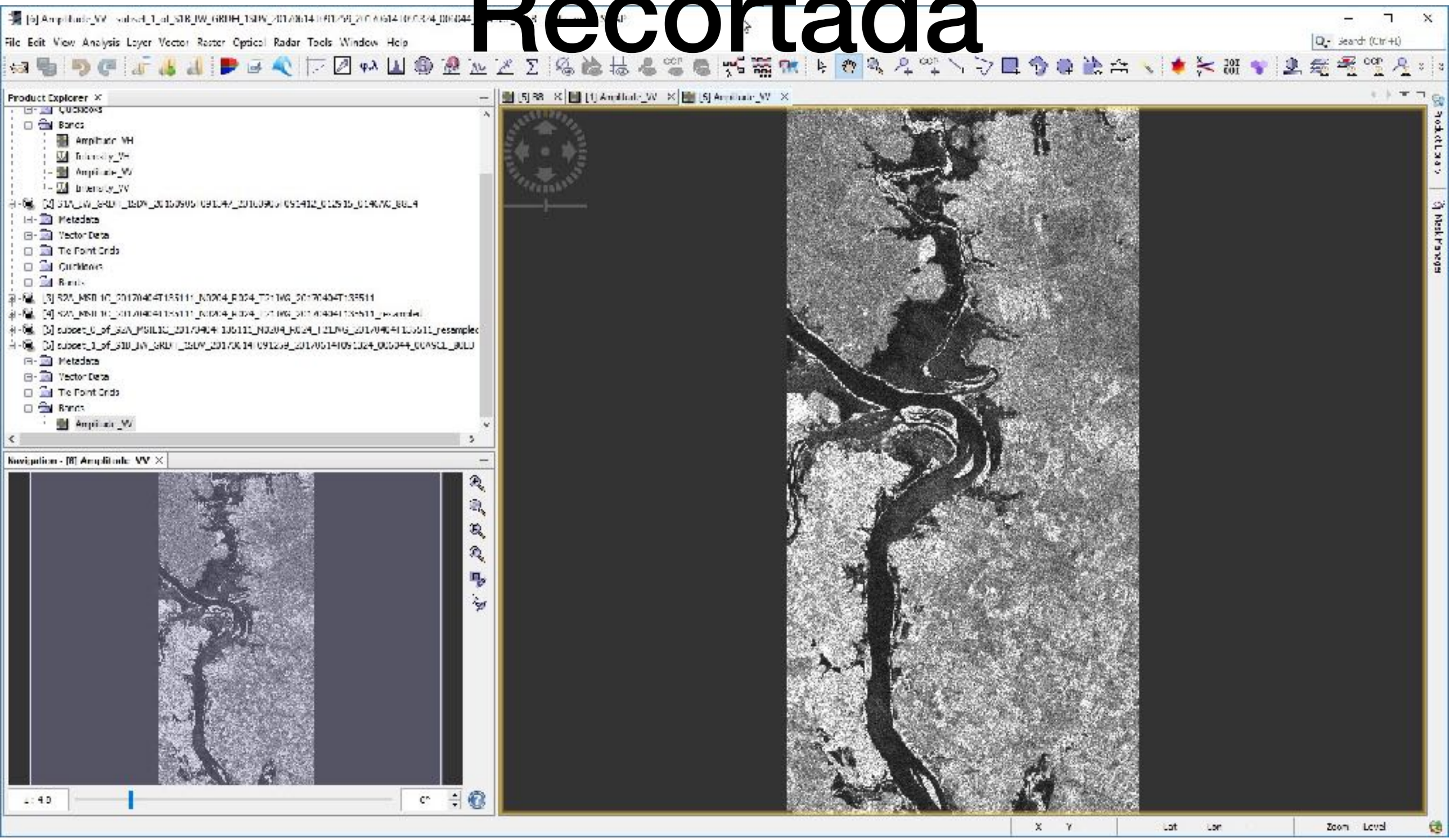
S1B_IW_GRDH_1SDV_20170614T091259_20170614T091324_006044_00A9CE_80EB



-30.05
-57.50
-30.35
-57.80

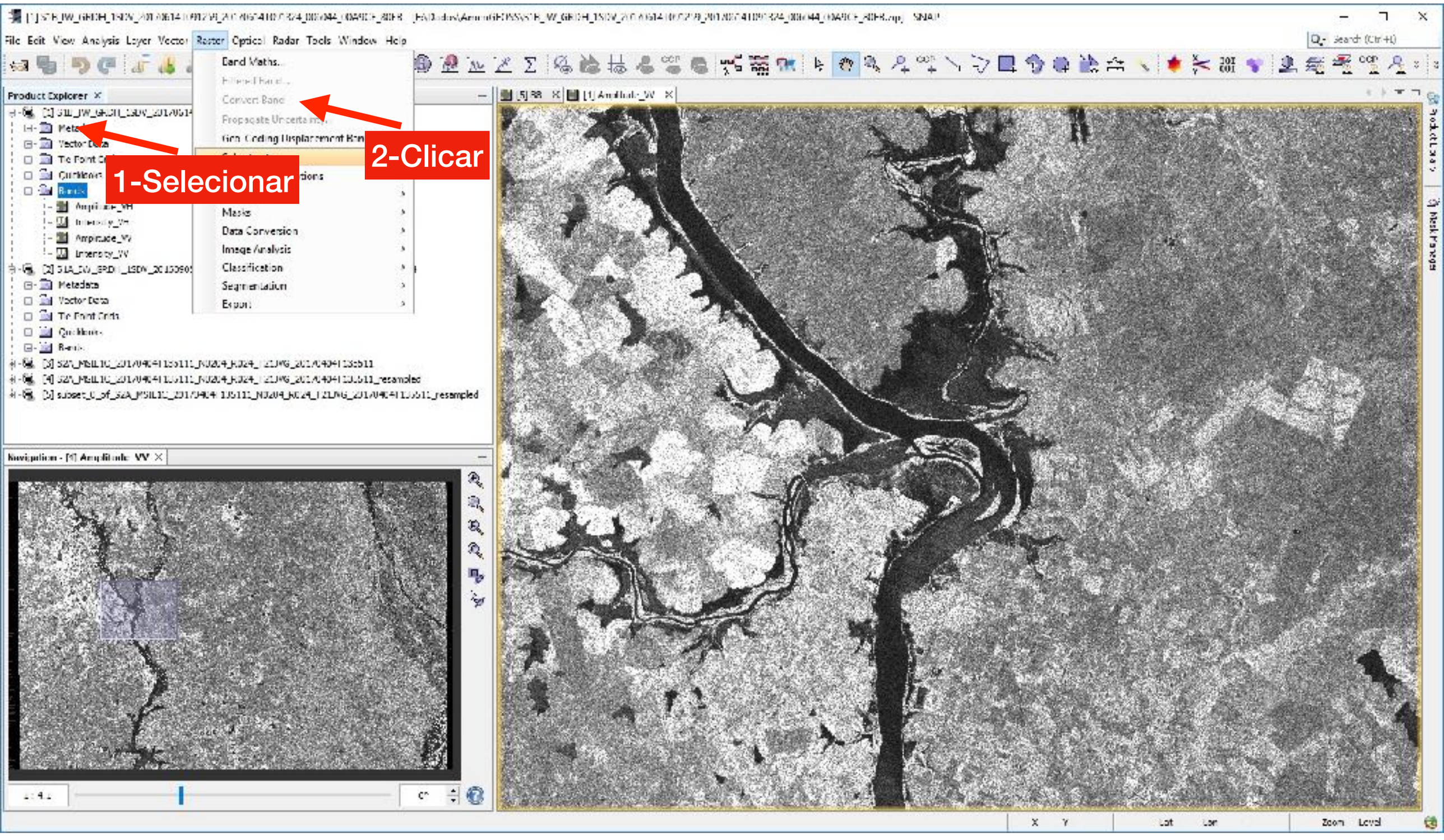


Recortada


File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Bands
Amplitude_VH
Intensity_VH
Amplitude_VV
Intensity_VV
Metadata
Vector Data
Tie Point Grids
Quicklooks
Bands
Metadata
Vector Data
Tie Point Grids
Bands
Amplitude_VV
Navigation - [8] Amplitude_VV
X
Y
Lat
Lon
Zoom Level

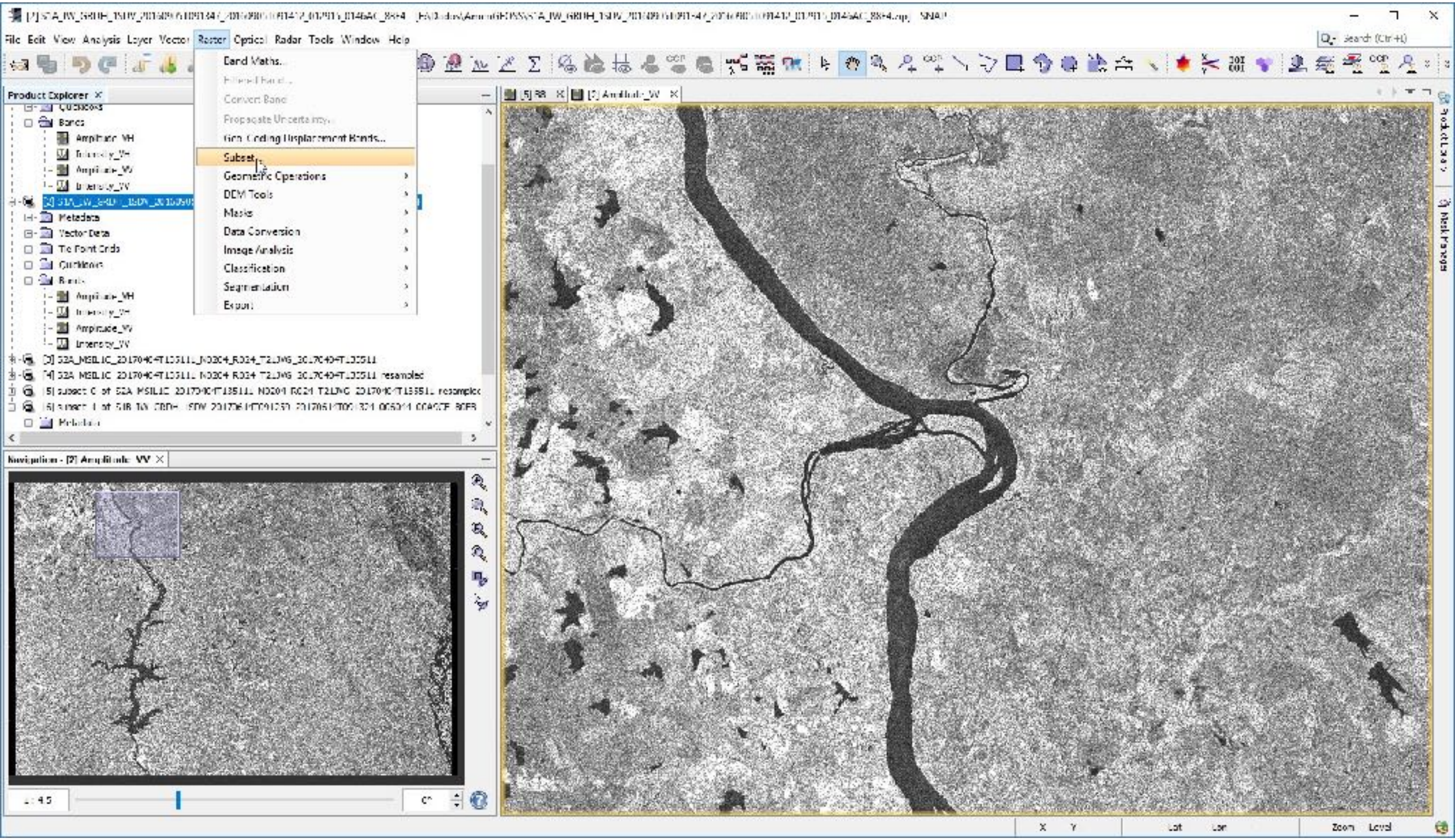
Recorta

S1A_IW_GRDH_1SDV_20160905T091347_20160905T091412_012915_0146AC_88E4

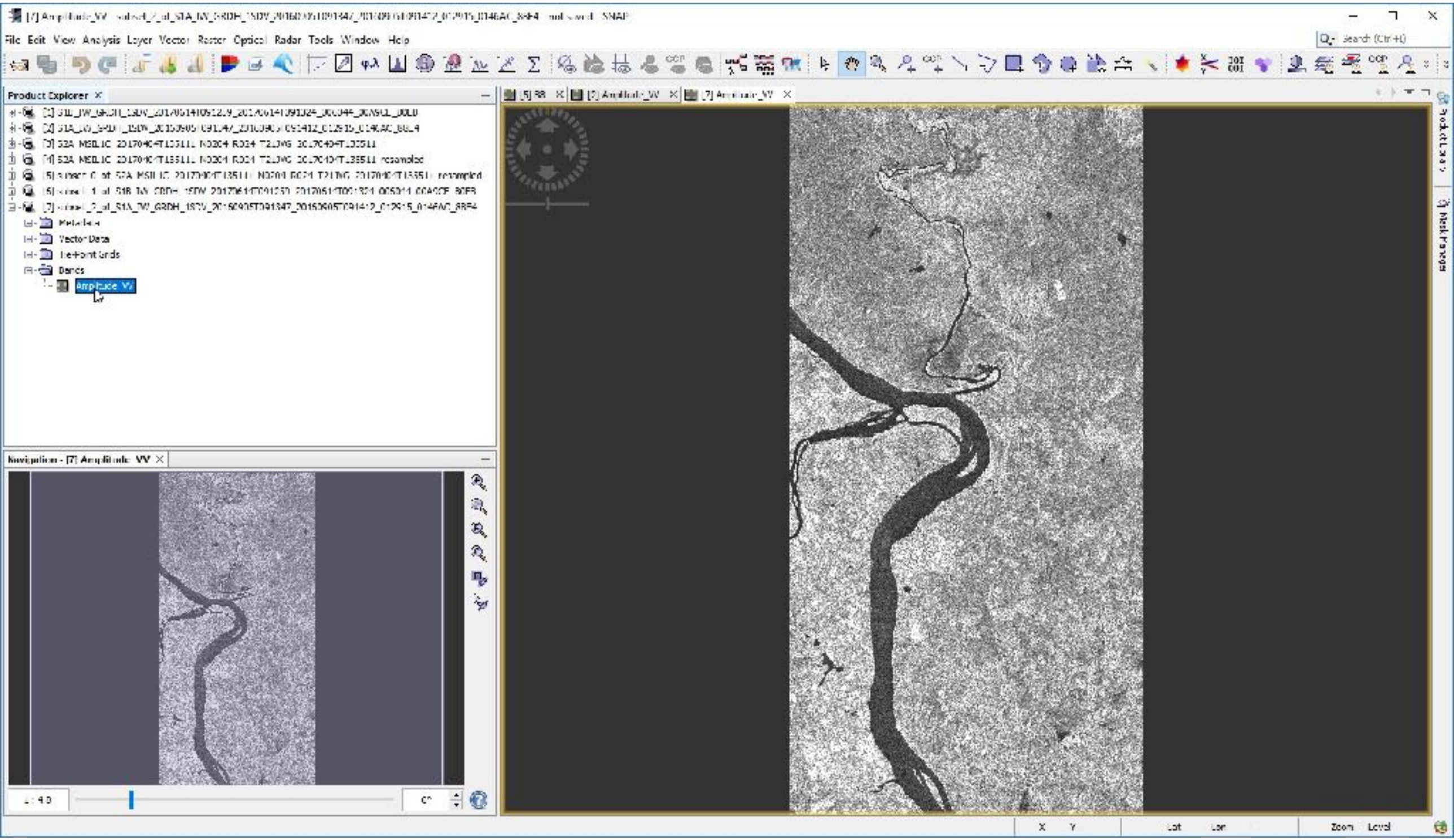


Recorta Pré Evento

S1A_IW_GRDH_1SDV_20160905T

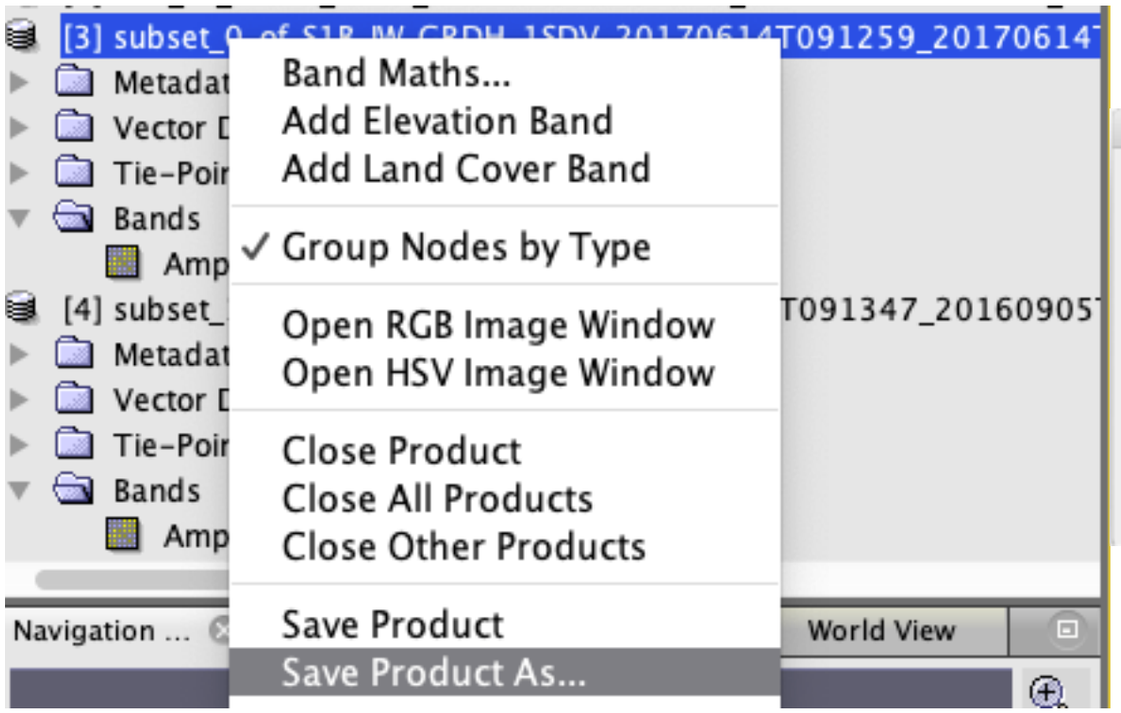


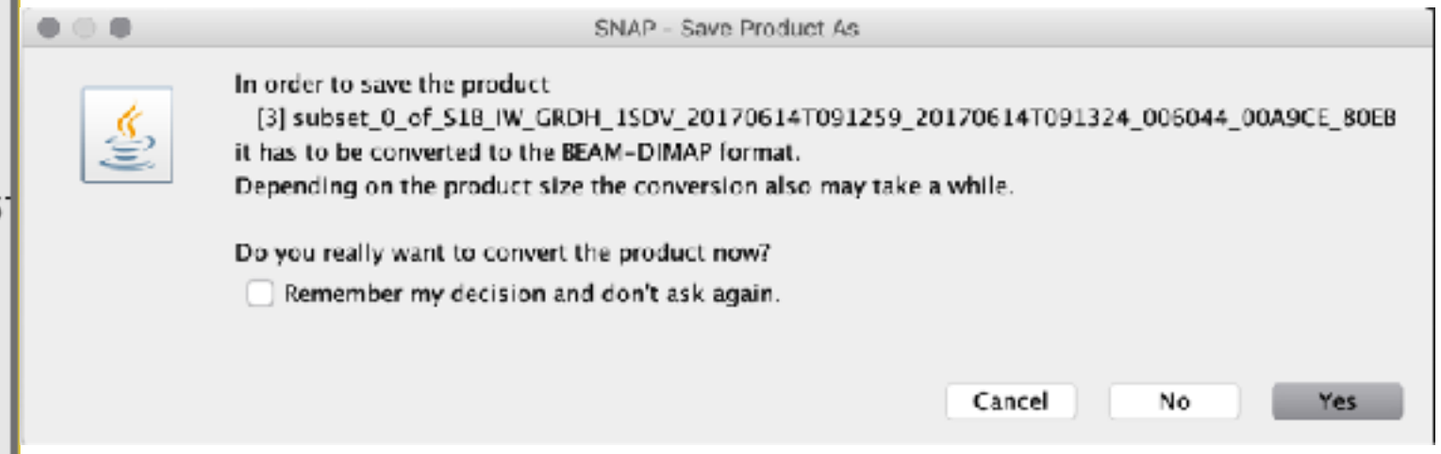
Recortada Pré Evento

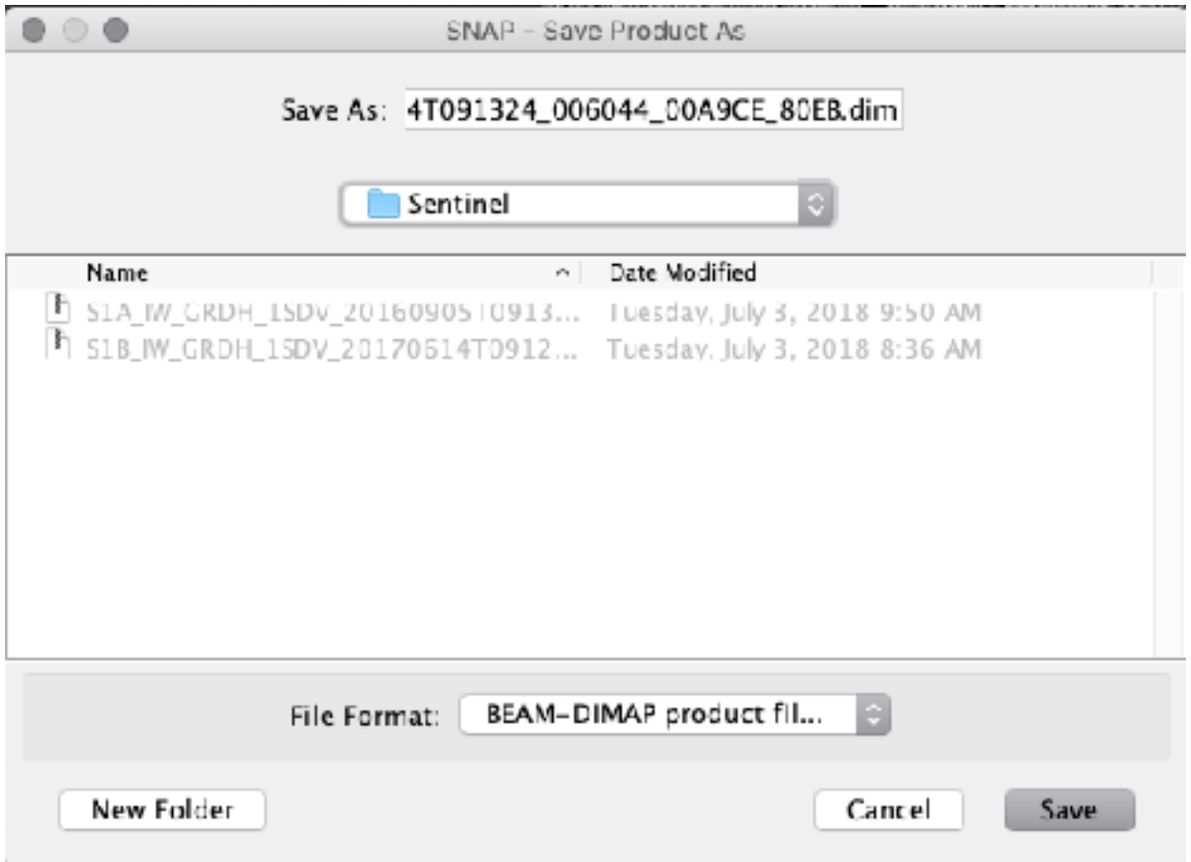


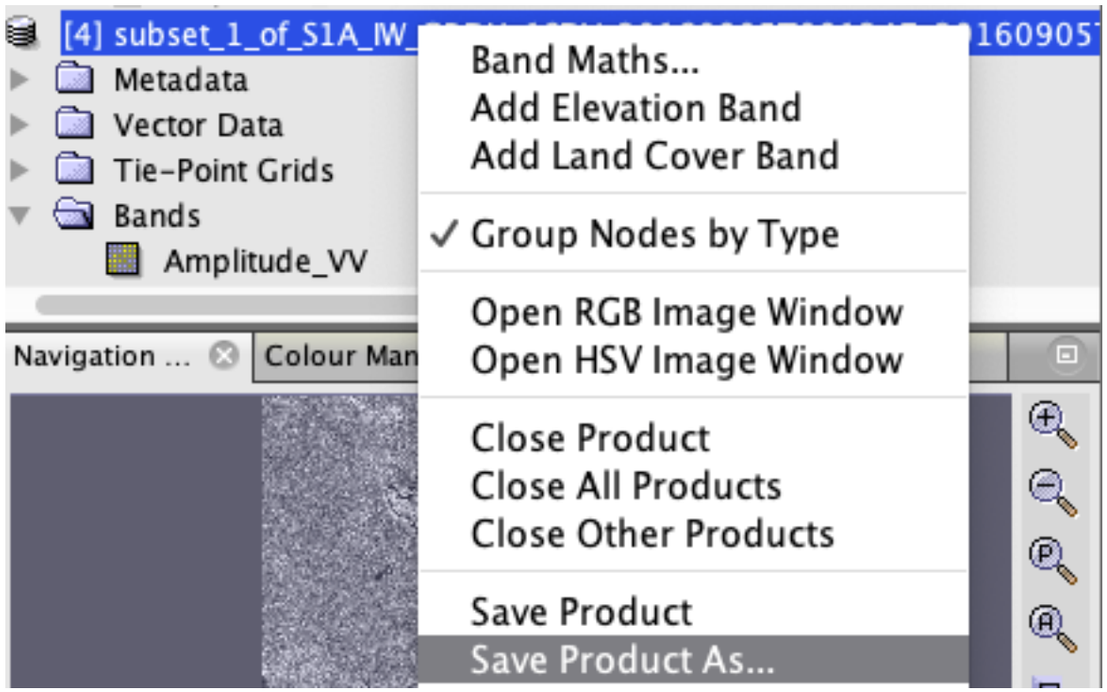
Recortadas Evento e Pré Evento

Salvando Recortes









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Amplitude_VV.img	Today 15:22	30,5 MB	NDIF Disk Image
▶ tie_point_grids	Today 15:22	--	Folder
▶ vector_data	Today 15:22	--	Folder
subset_0_of_S1B_IW_GRDH_1SDV_201706...614T091324_006044_00A9CE_80EB.dim	Today 15:22	7,6 MB	SNAP s...IMAP)
▼ subset_1_of_S1A_IW_GRDH_1SDV_201609...905T091412_012915_0146AC_88E4.data	Today 15:22	--	Folder
Amplitude_VV.hdr	Today 15:22	250 bytes	Radiance
Amplitude_VV.img	Today 15:22	30,5 MB	NDIF Disk Image
▶ tie_point_grids	Today 15:22	--	Folder
▶ vector_data	Today 15:22	--	Folder
subset_1_of_S1A_IW_GRDH_1SDV_201609...0905T091412_012915_0146AC_88E4.dim	Today 15:22	7,5 MB	SNAP s...IMAP)

S1A_IW_GRDH_1SDV_20160905T091347_...60905T091412_012915_0146AC_88E4.zip	3 July 2018 09:50	1,03 GB	ZIP archive
S1B_IW_GRDH_1SDV_20170614T091259_...0614T091324_006044_00A9CE_80EB.zip	3 July 2018 08:36	1,01 GB	ZIP archive
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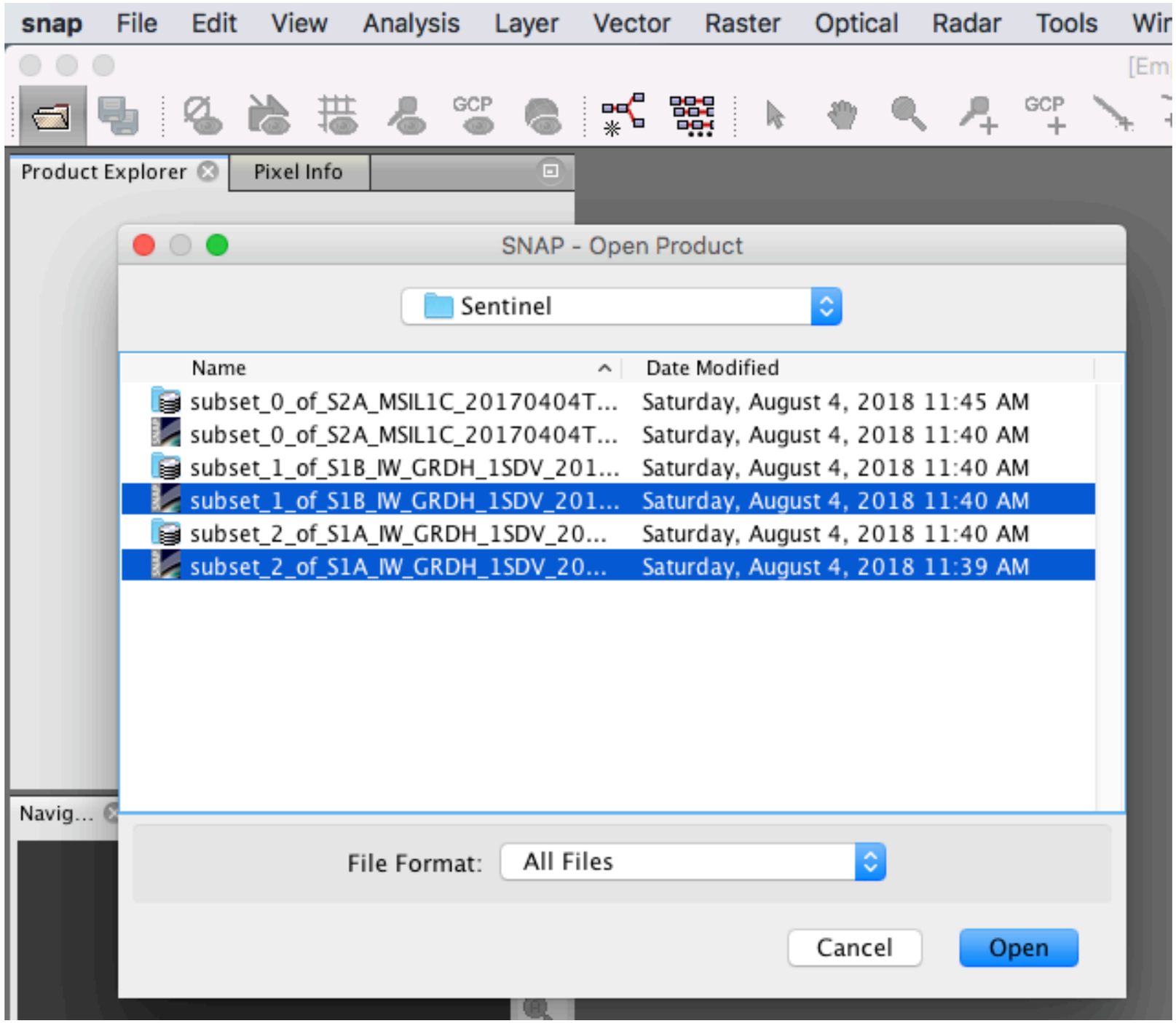
▶ subset_1_of_S1A_IW_GRDH_1SDV_201609...905T091412_012915_0146AC_88E4.data	Today 15:22	--	Folder
subset_1_of_S1A_IW_GRDH_1SDV_201609...0905T091412_012915_0146AC_88E4.dim	Today 15:22	7,5 MB	SNAP s...IMAP)
SubSets_Sentinel1.zip	Today 15:23	26,4 MB	ZIP archive

Mapeando Áreas Inundadas

S1A_IW_GRDH_1SDV_20160905T091347_20160905T091412_012915_0146AC_88E4 (Pre Evento)

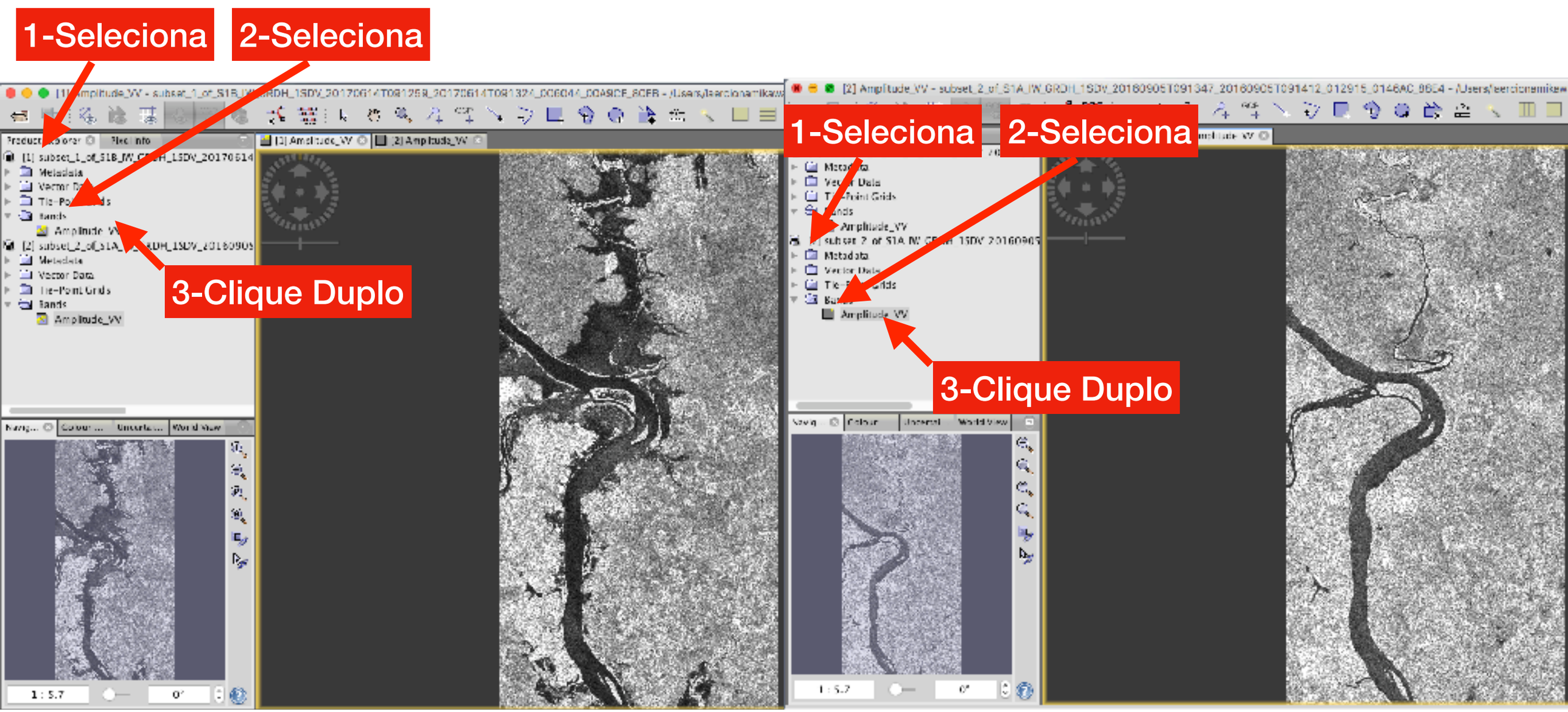
S1B_IW_GRDH_1SDV_20170614T091259_20170614T091324_006044_00A9CE_80EB (Evento)

Abrir as 2 imagens no SNAP



Ou Marca e Arrasta

Visualiza as Imagens



Gerando Imagem Multilook 3x3

Reduz o ruído através de uma composição de visadas múltiplas (simuladas neste caso, onde existe somente uma visada)

Repetir para o outro recorte

Multilook

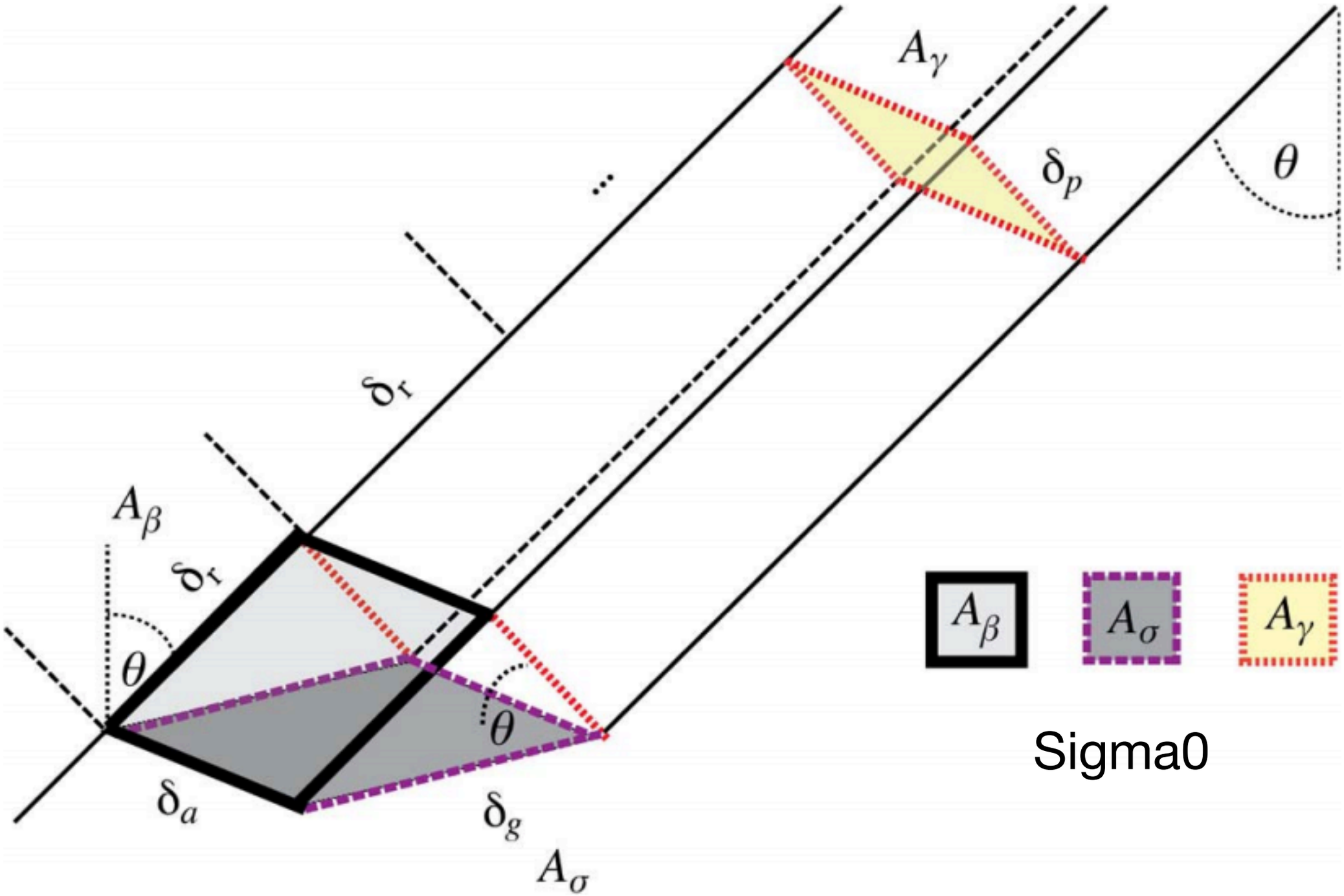
Antes

Depois

Espalhamento

- Retorno ao Radar (Retroespalhamento - Backscattering)
- Medidas Normalizadas:
    - Razão entre Potência Retroespalhada (Ps) e Potência Incidente (Pi)
- Coeficiente de Retroespalhamento: razão por área de referência
    - No ângulo de visada: Beta0
    - No plano tangente ao modelo elipsoidal: Sigma0
    - No plano perpendicular ao ângulo de visada: Gama0

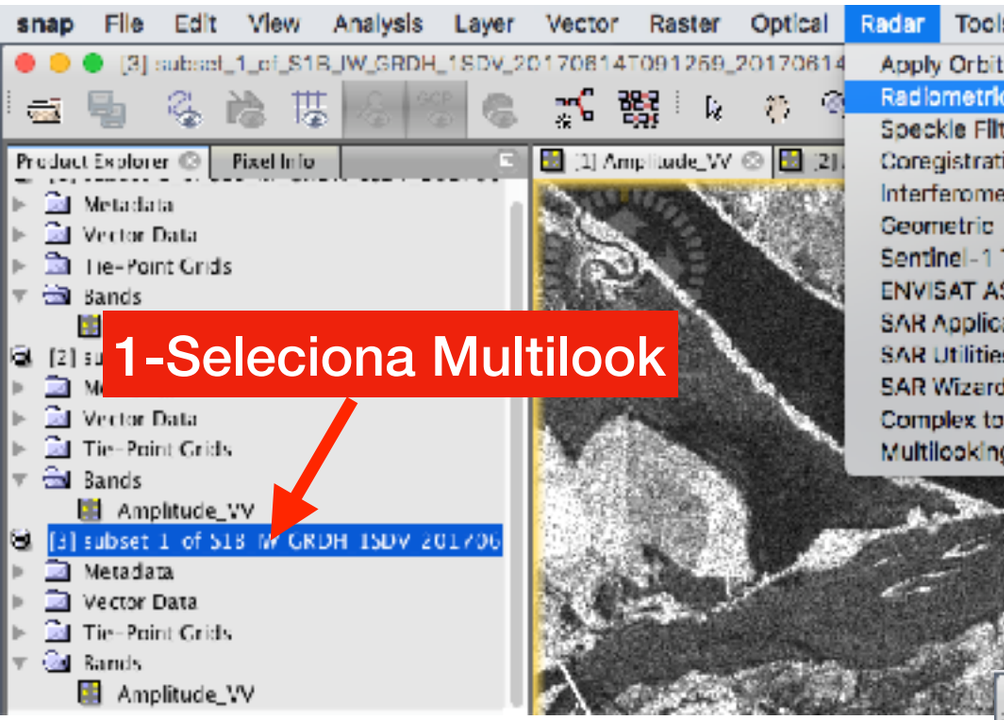
Unidades de Área (m^2)

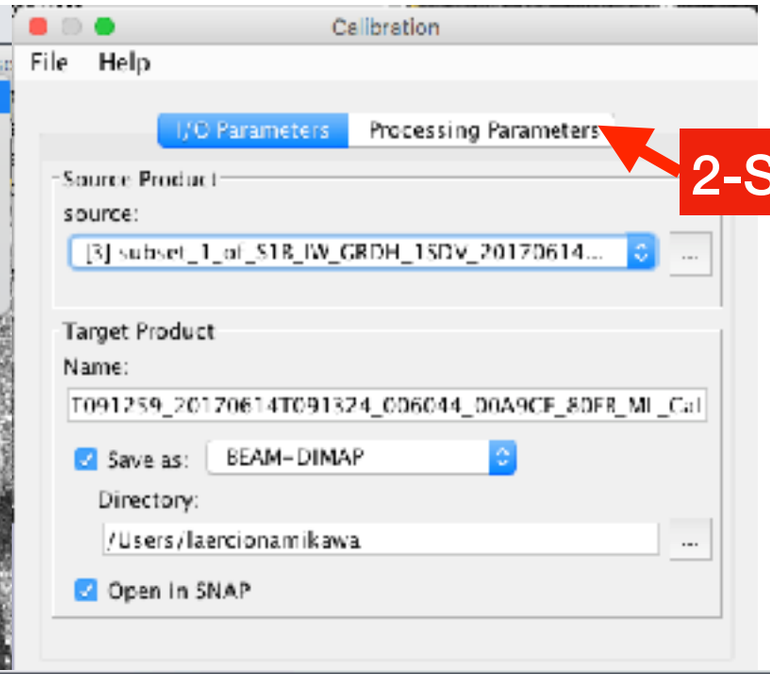


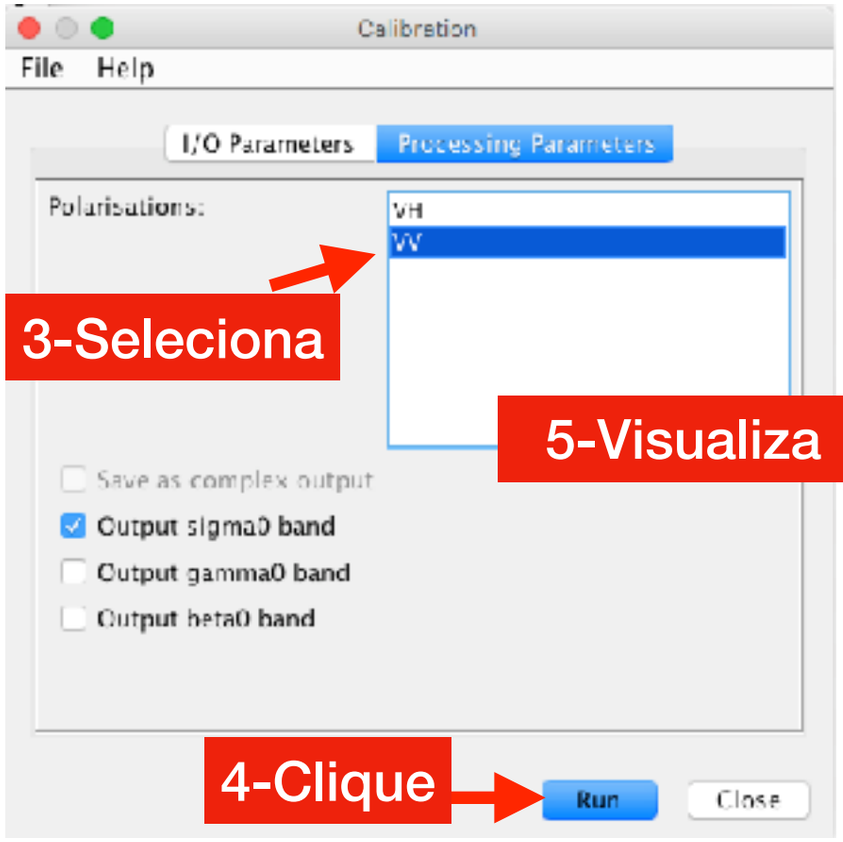
Flattening Gamma: Radiometric Terrain Correction for SAR Imagery. David Small
IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 49, NO. 8, AUGUST 2011

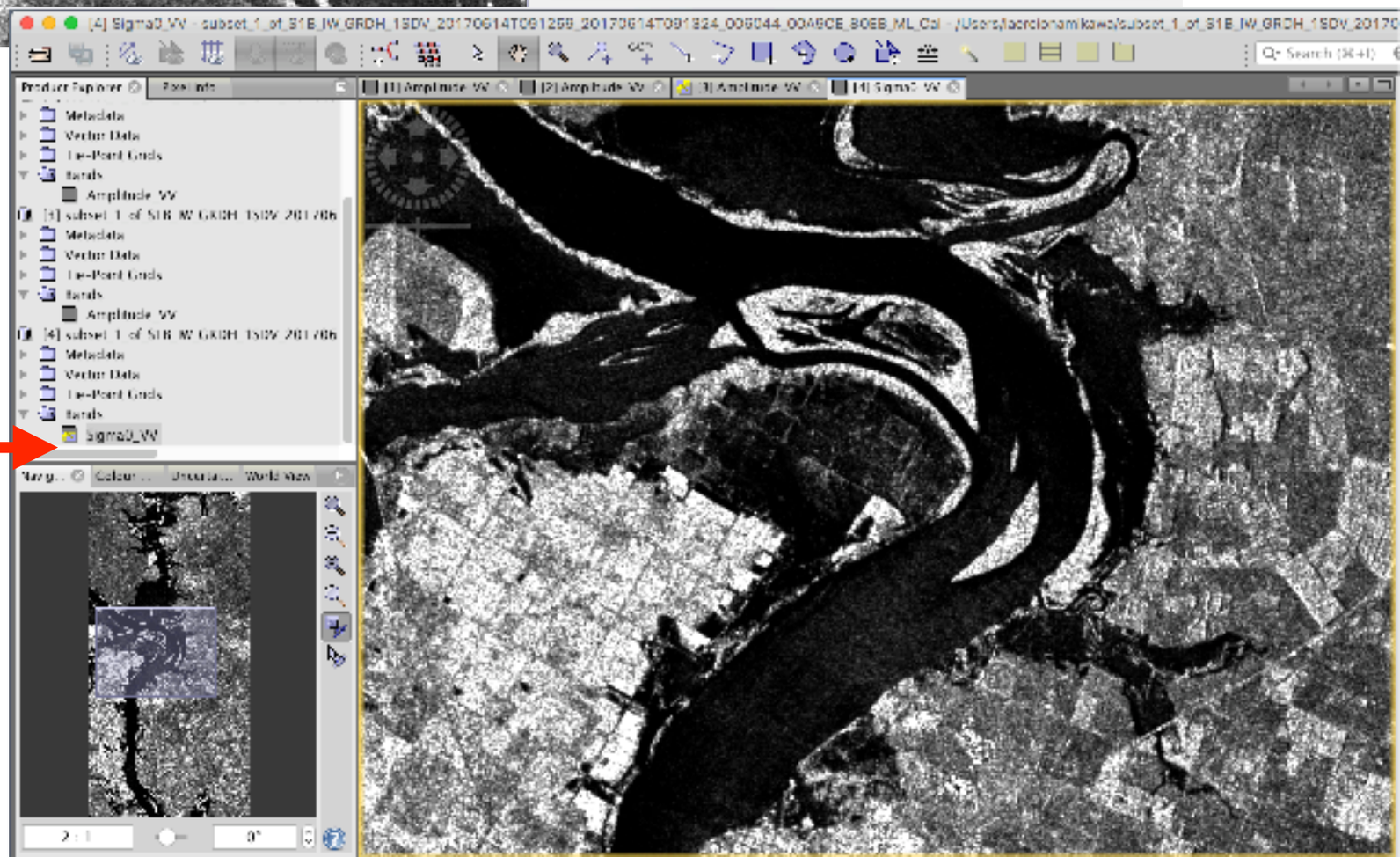
Calibrando Imagens
Saída em Sigma0

Imagem calibrada apresenta o valor de retorno do radar (backscattering) sem influências “externas" e permite comparações quantitativas



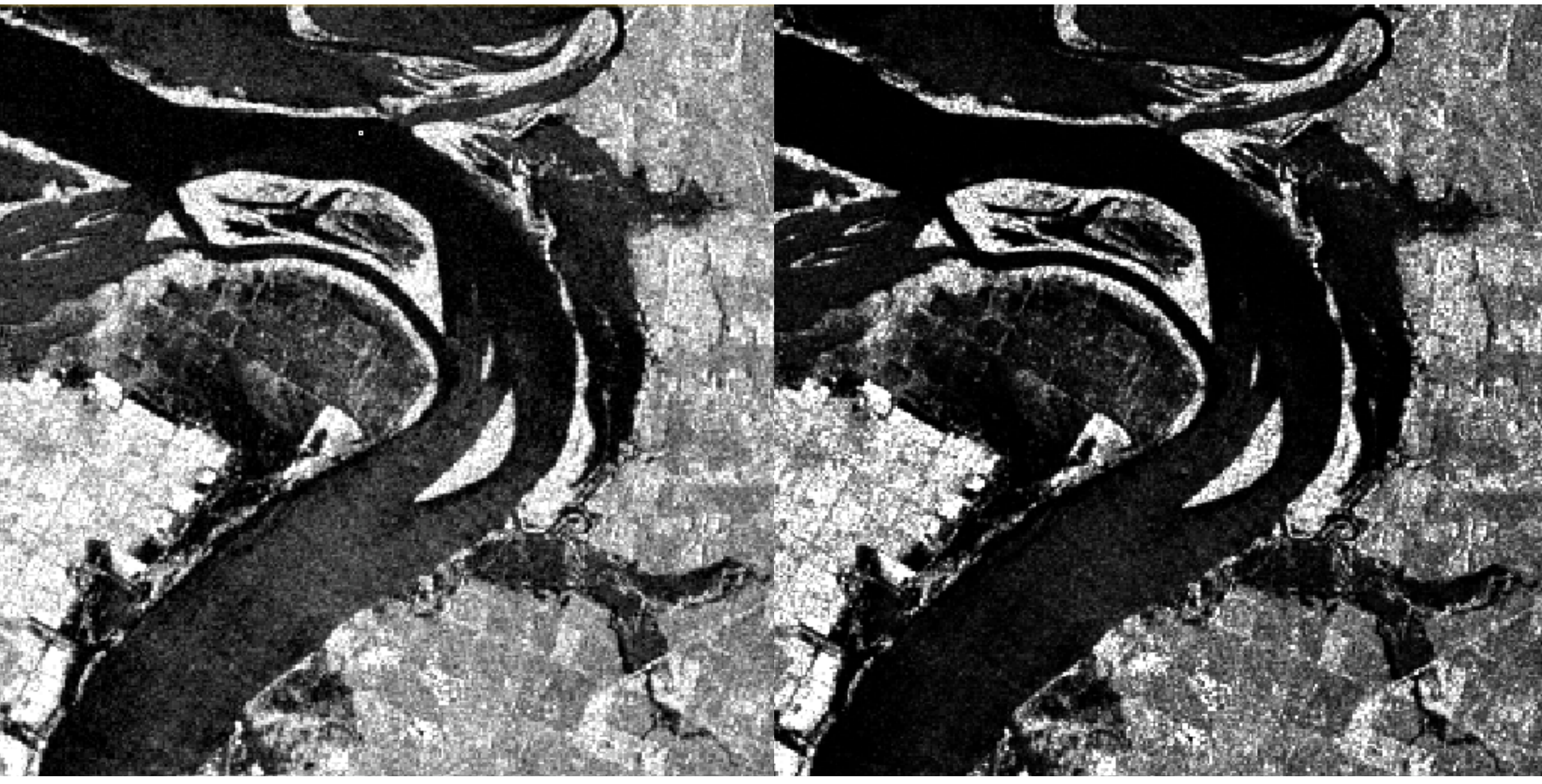






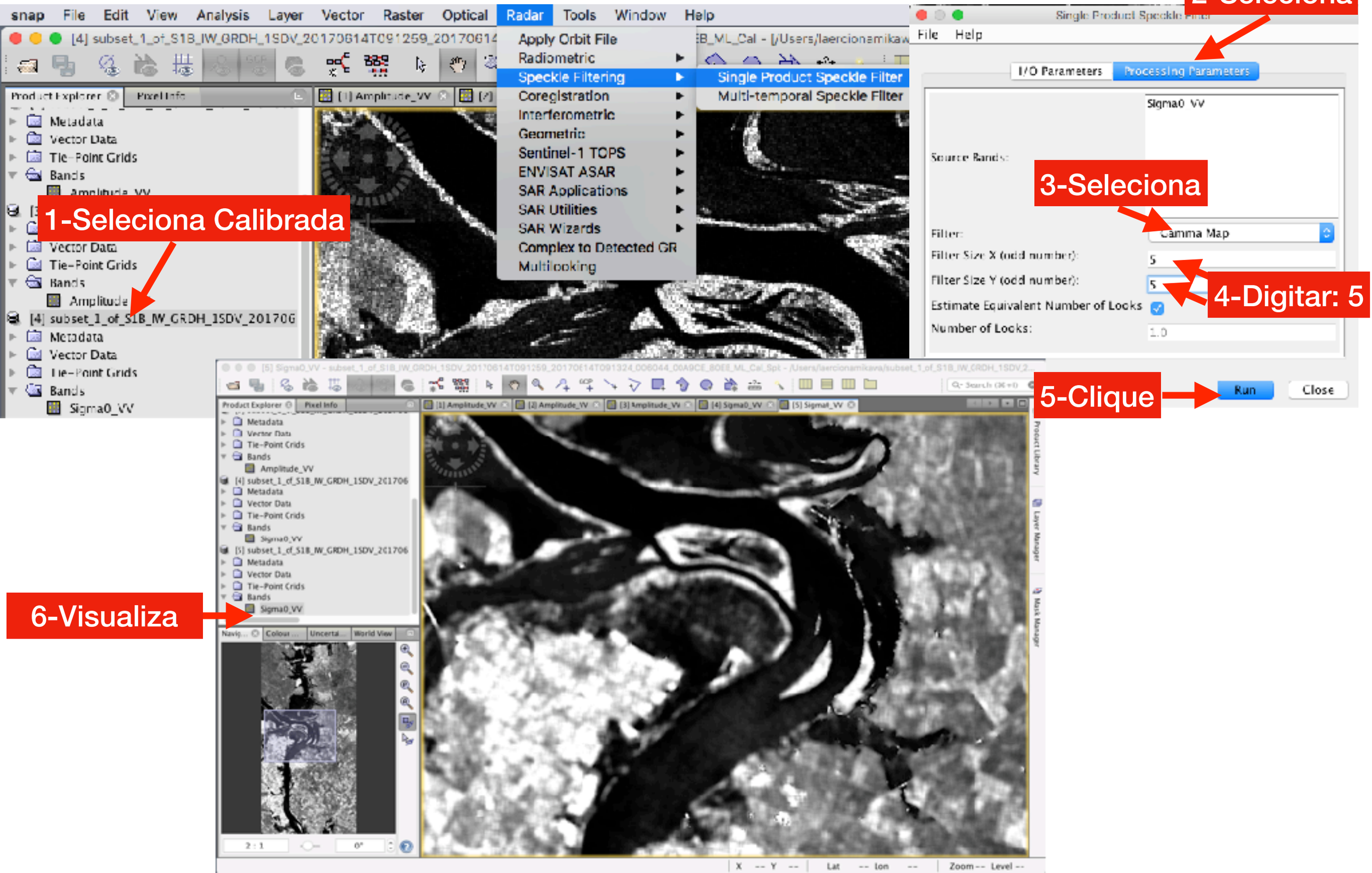
Sem Calibração

Calibrada



Repetir para o outro recorte

Filtro Ruído Speckle



Filtro Speckle

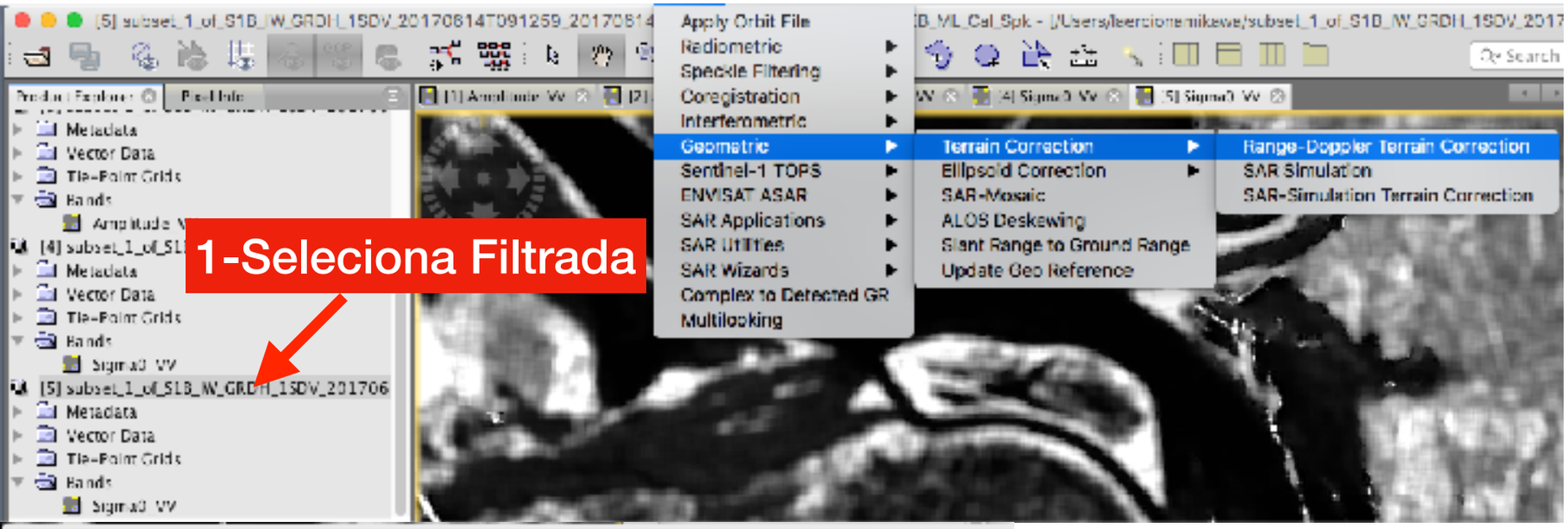
Sem Filtro

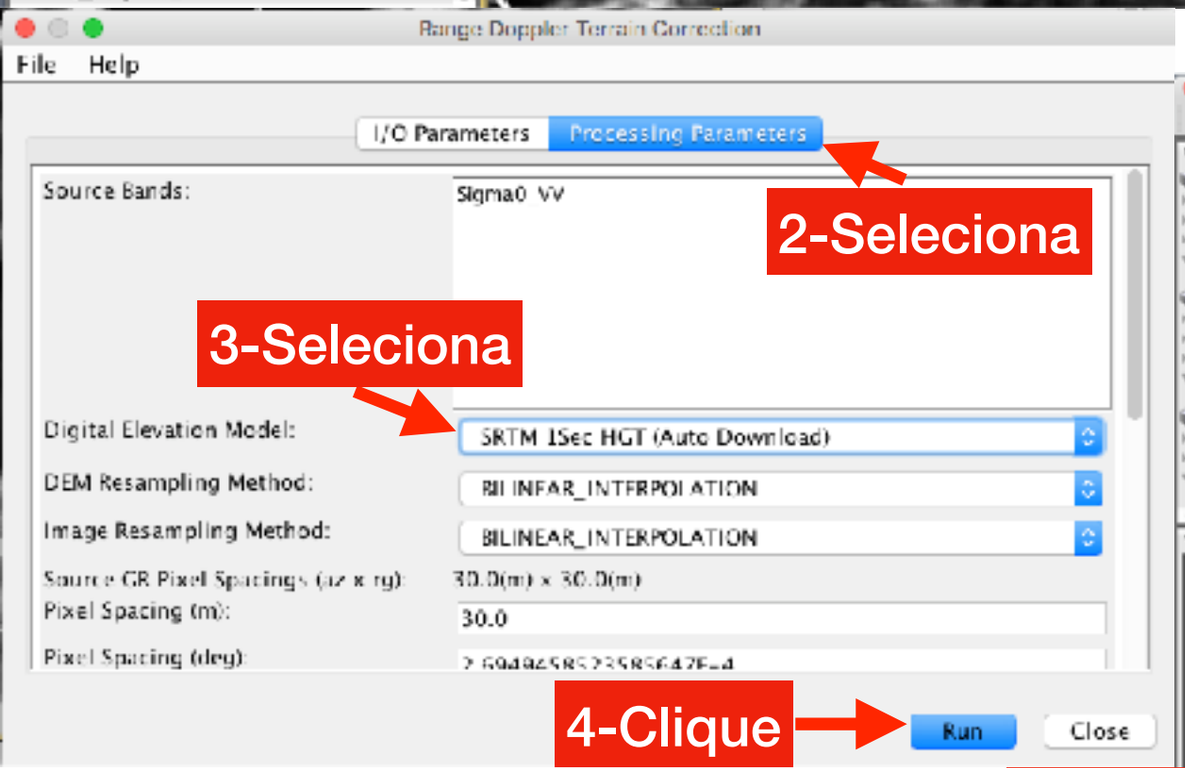
Com Filtro

Repetir para o outro recorte

Correção Geométrica

Considera a Projeção devido ao Relevo





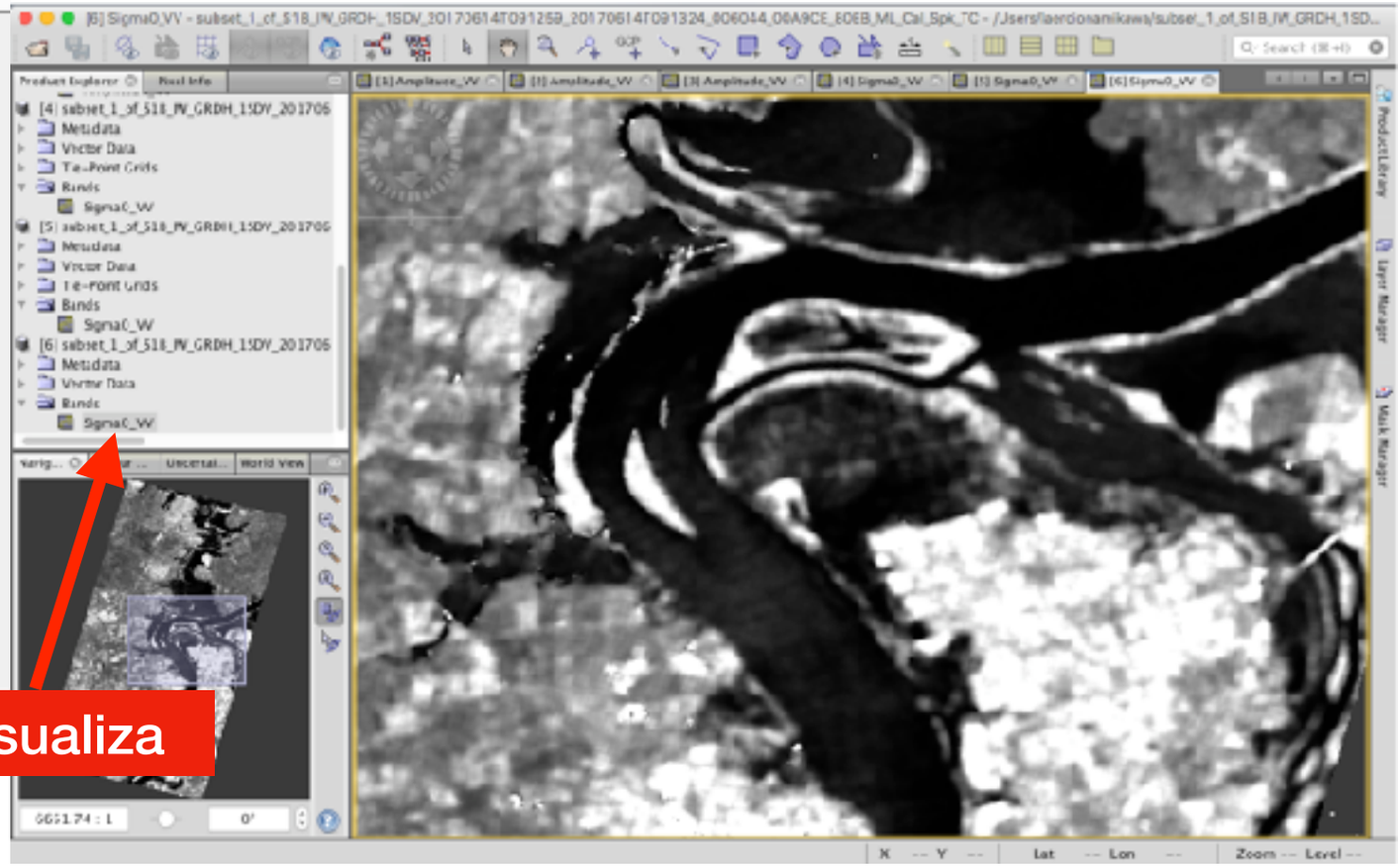


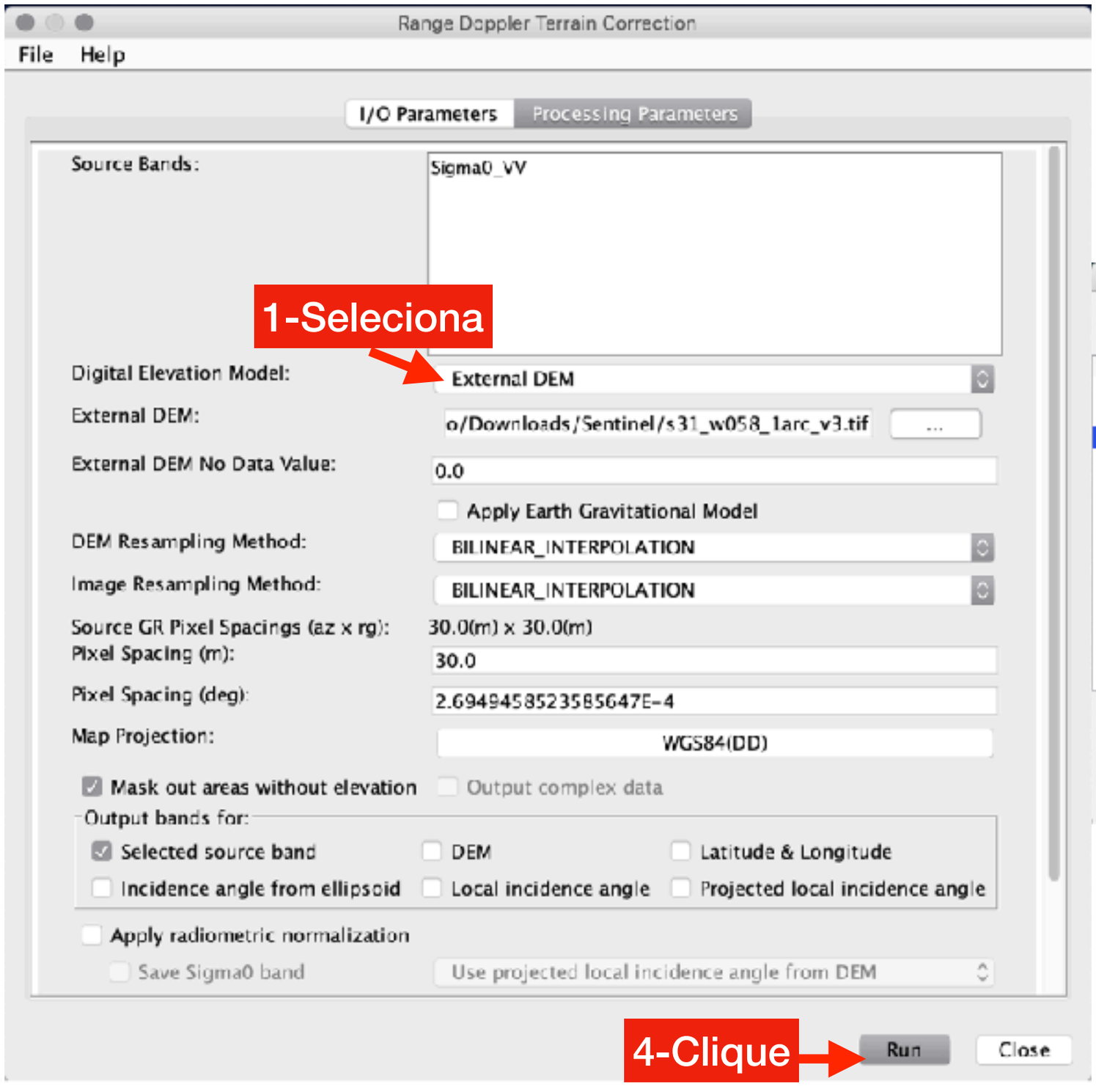
Imagem Corrigida

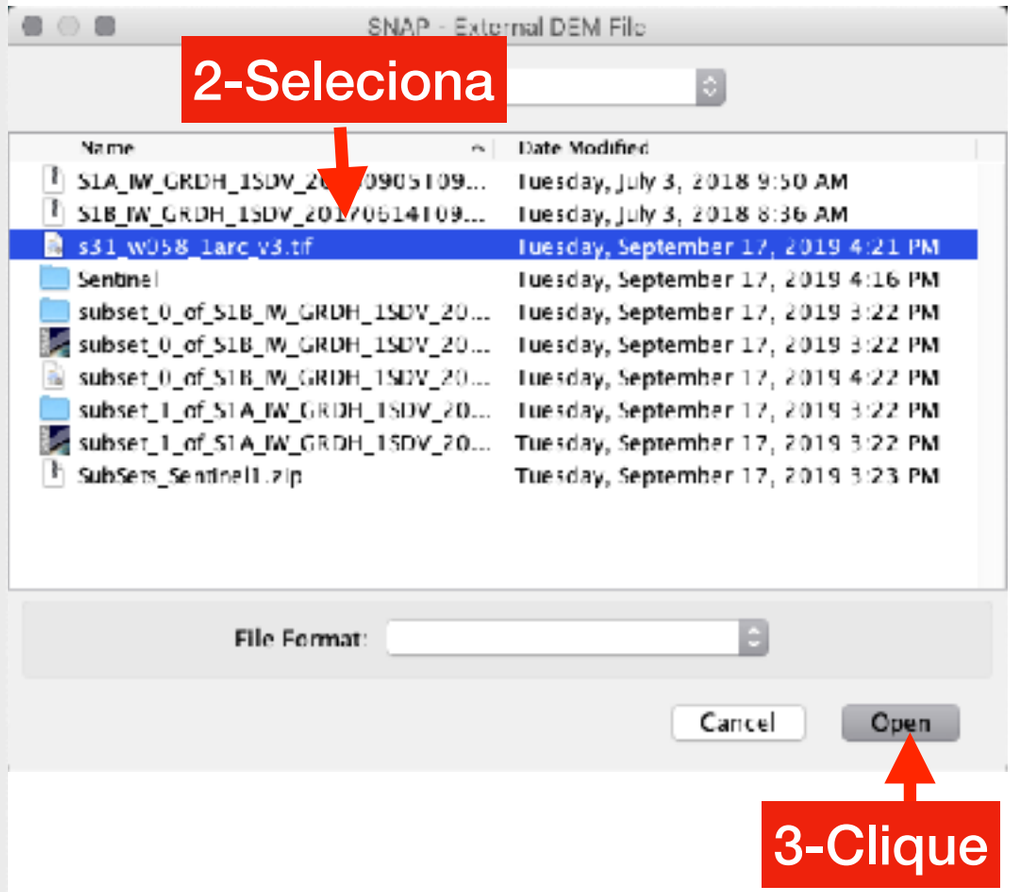
Antes

Depois

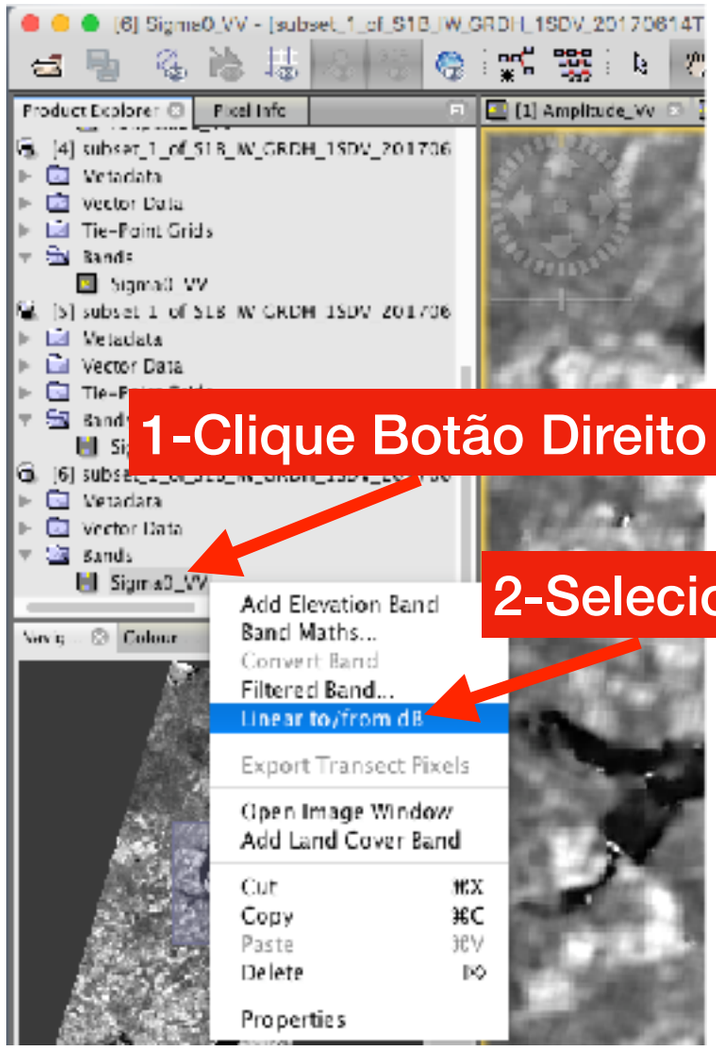
Repetir para o outro recorte

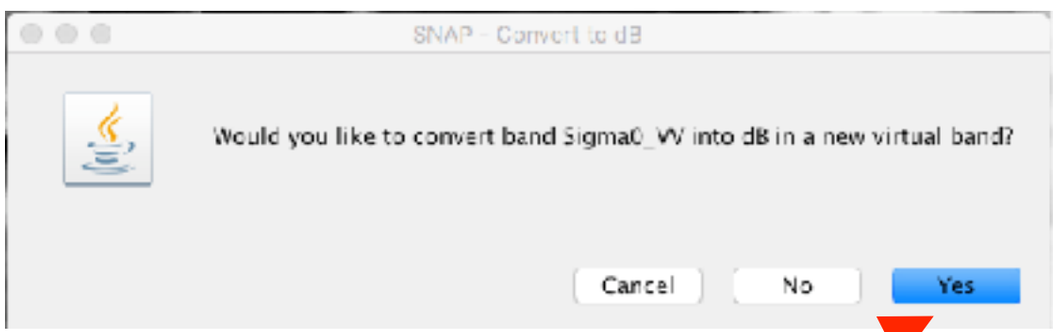
Correção geométrica
Com Arquivo DEM (Offline)

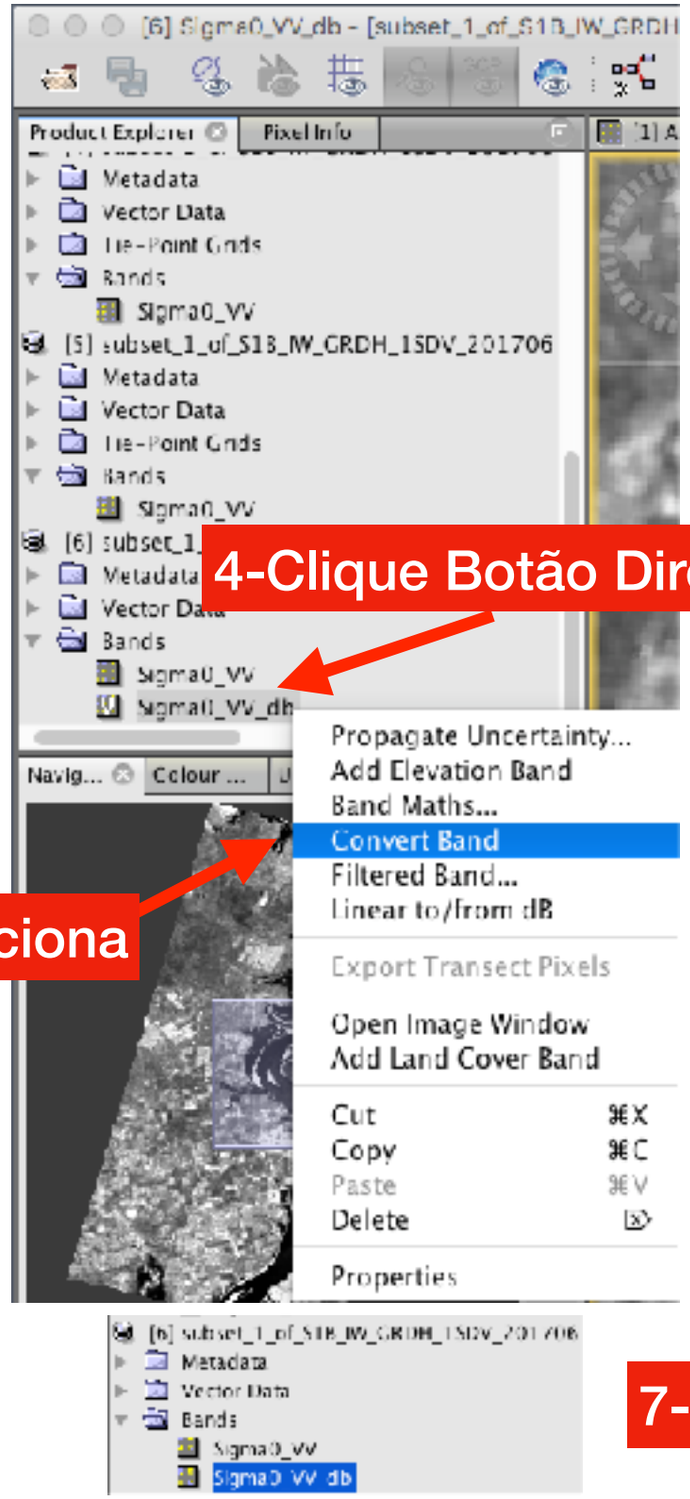




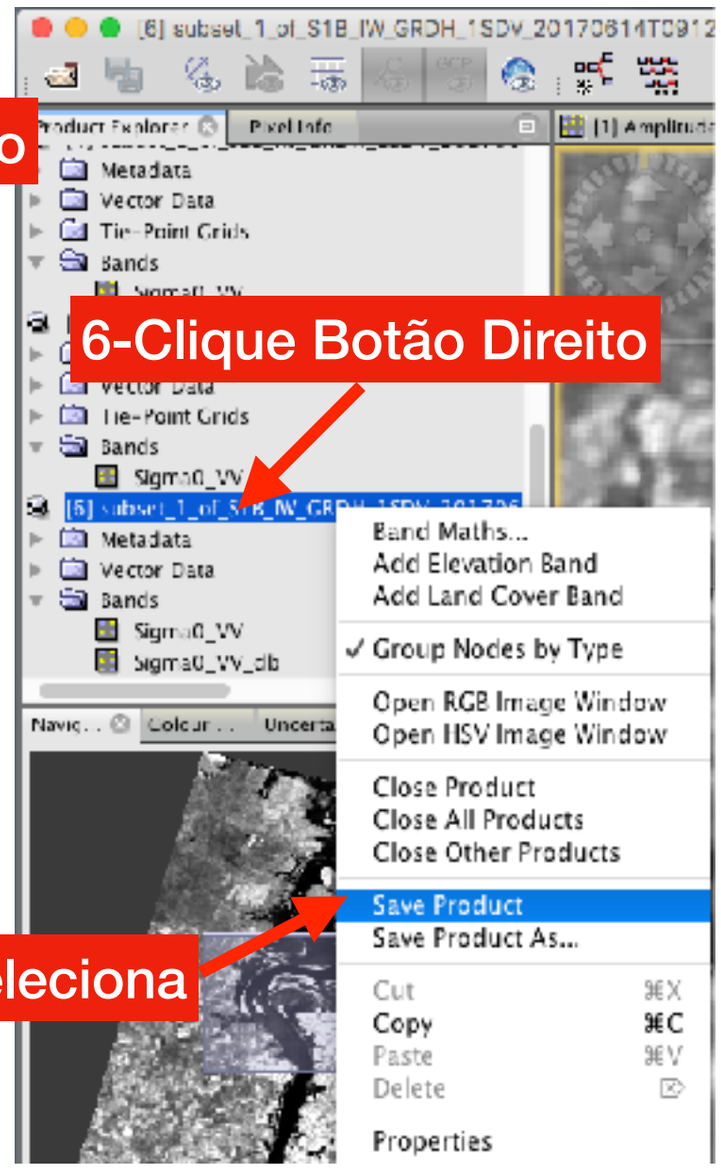
Converte para Decibel

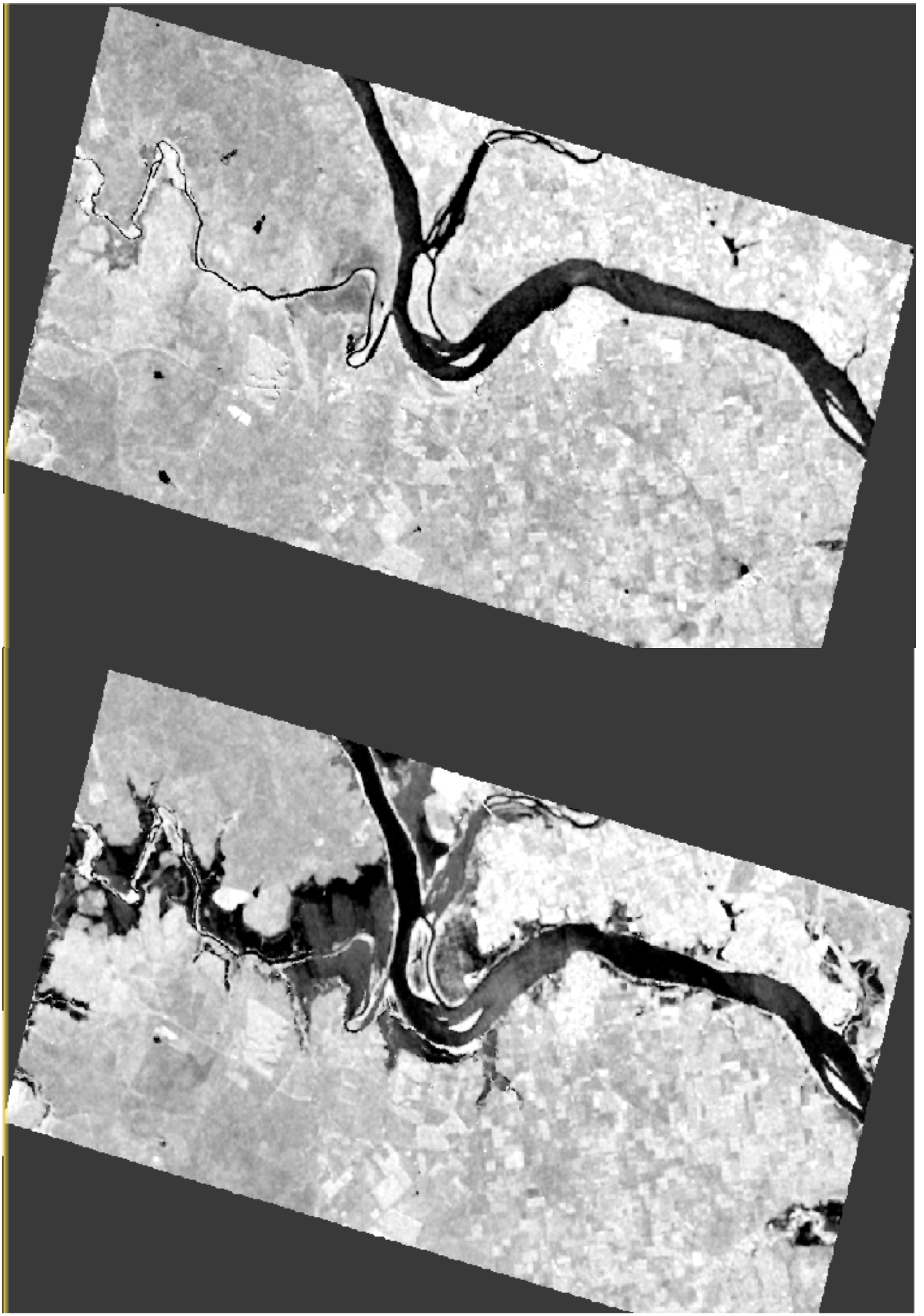




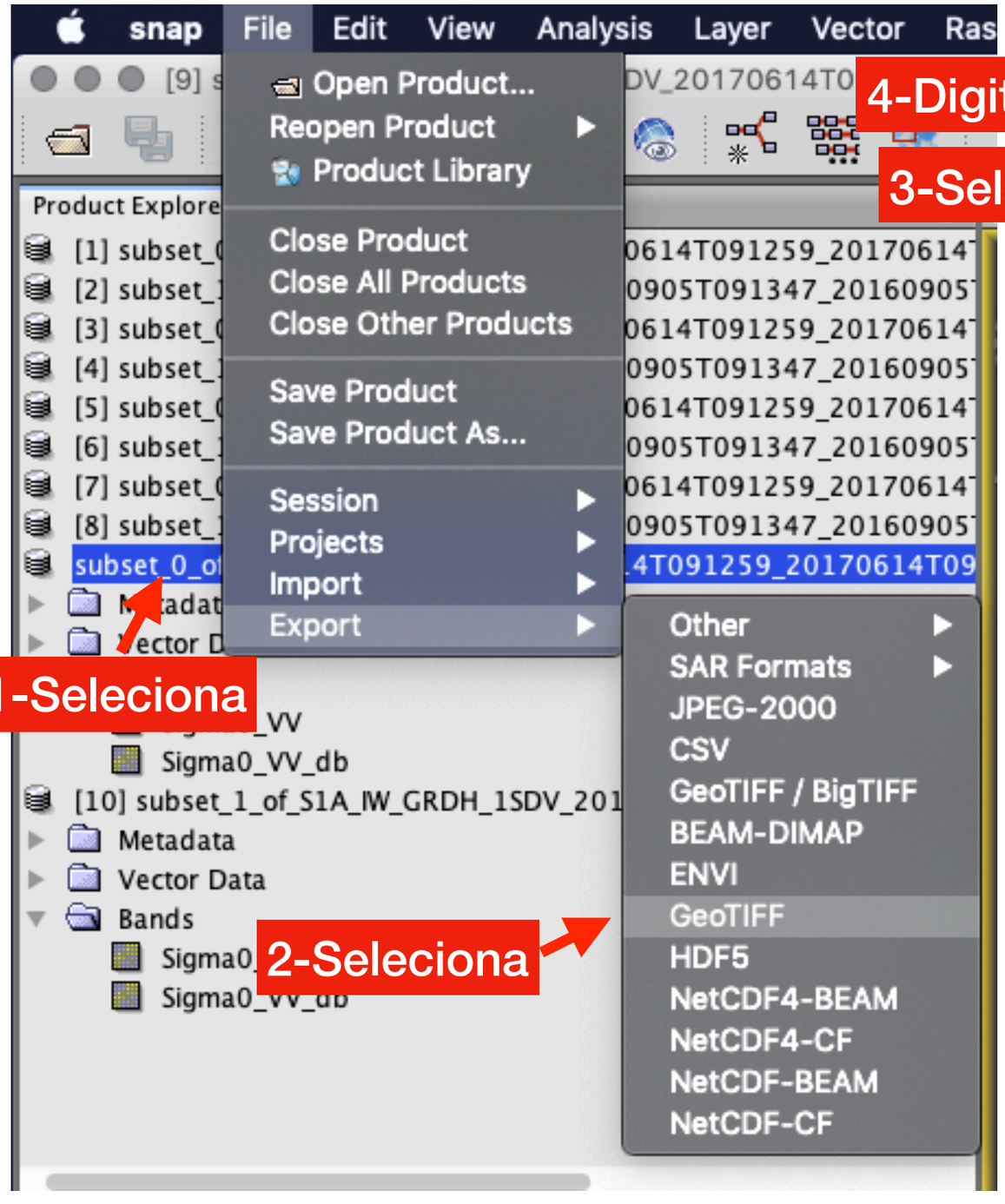


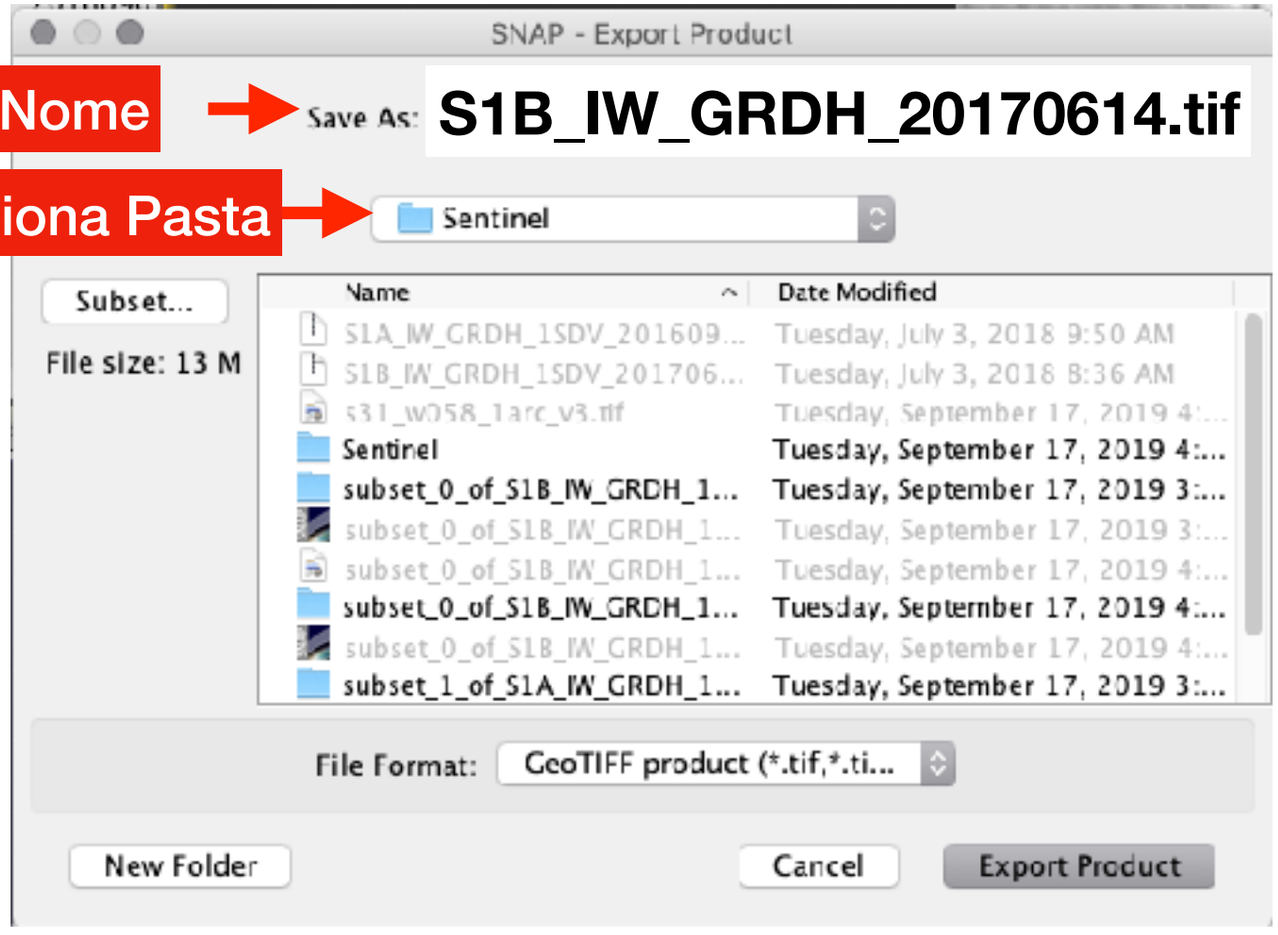
Repetir para o outro recorte





Exportação para GeoTIFF





Repetir para a Imagem Pré Evento (2016)
Nome: S1B_IW_GRDH_20170614.tif

Estimativa de Área Inundada no TerraView

Abrir Imagem

Visualizar em monocromático e colorida

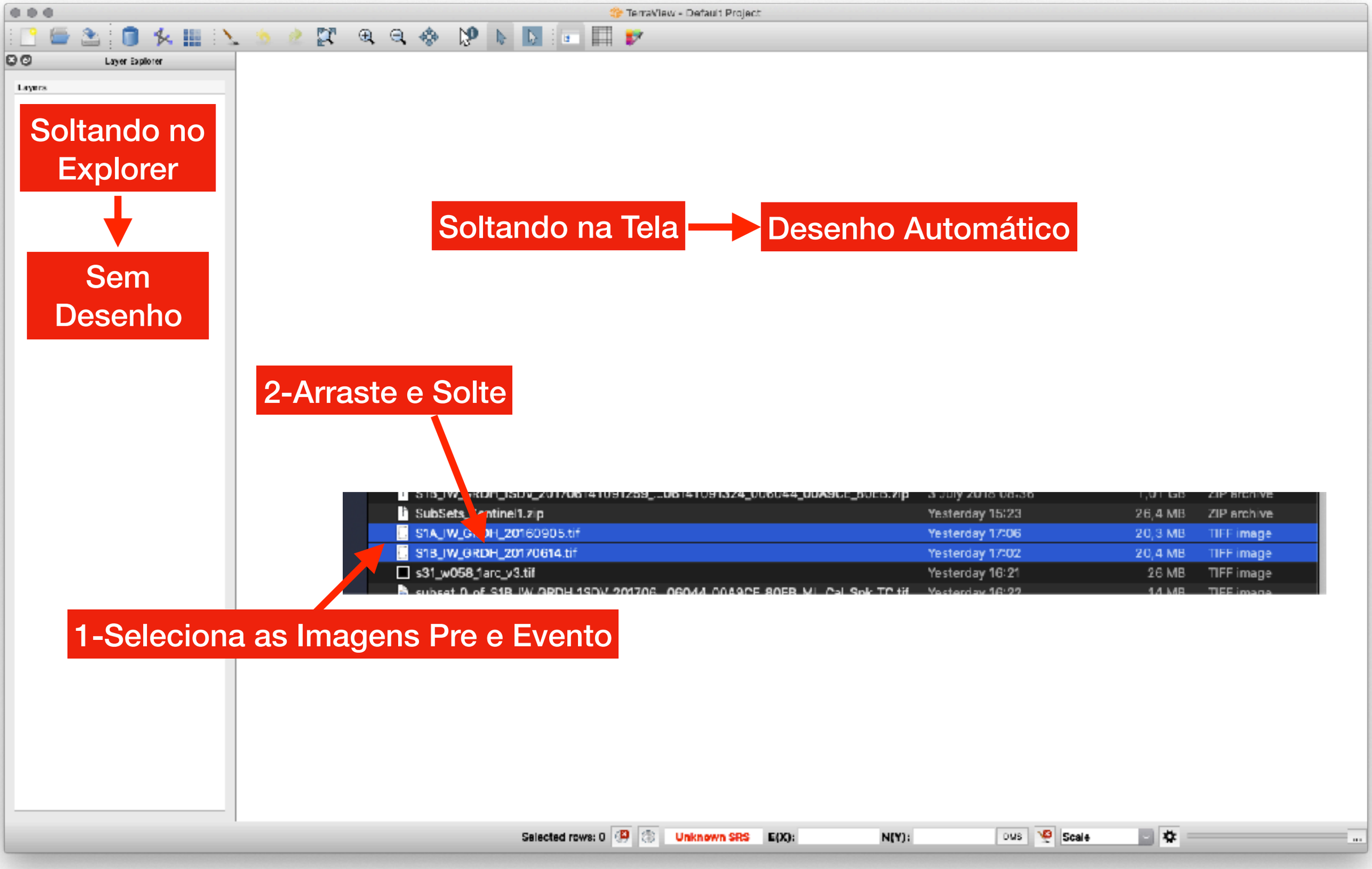
Fatiamento

Vetorização

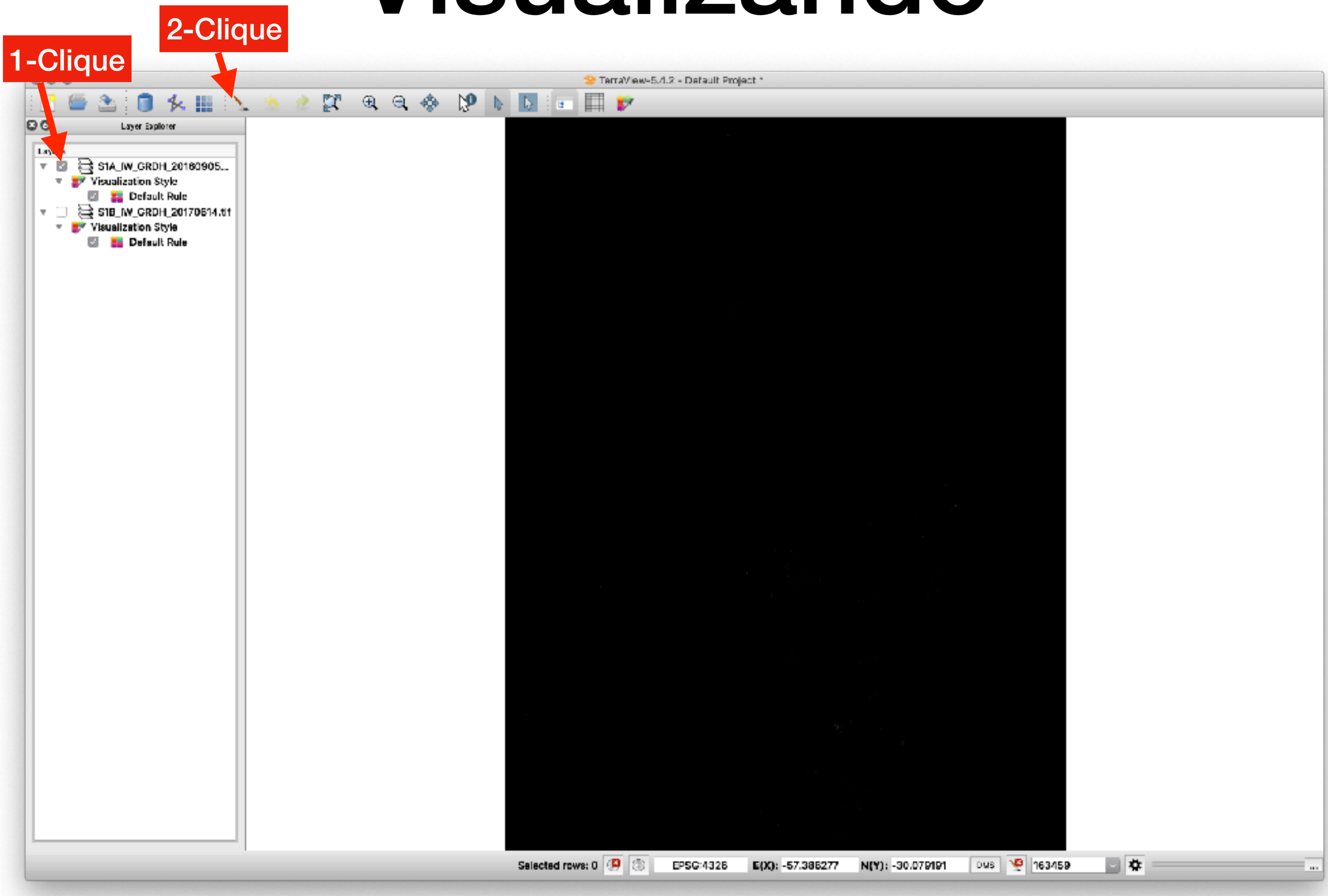
Cálculo

Exportação KML - Visualiza no Google Earth

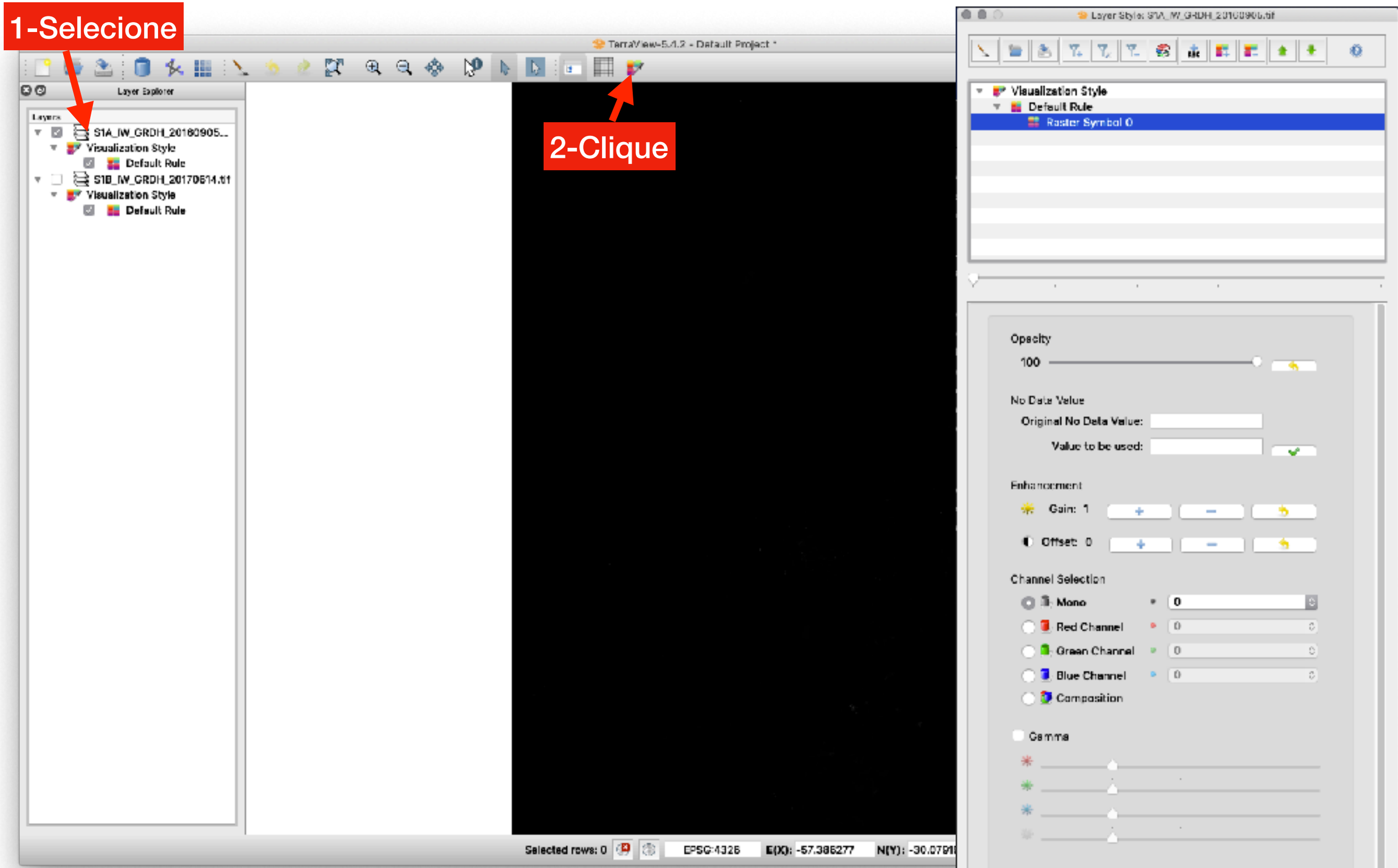
Abrindo as Imagens GeoTIFF Exportadas



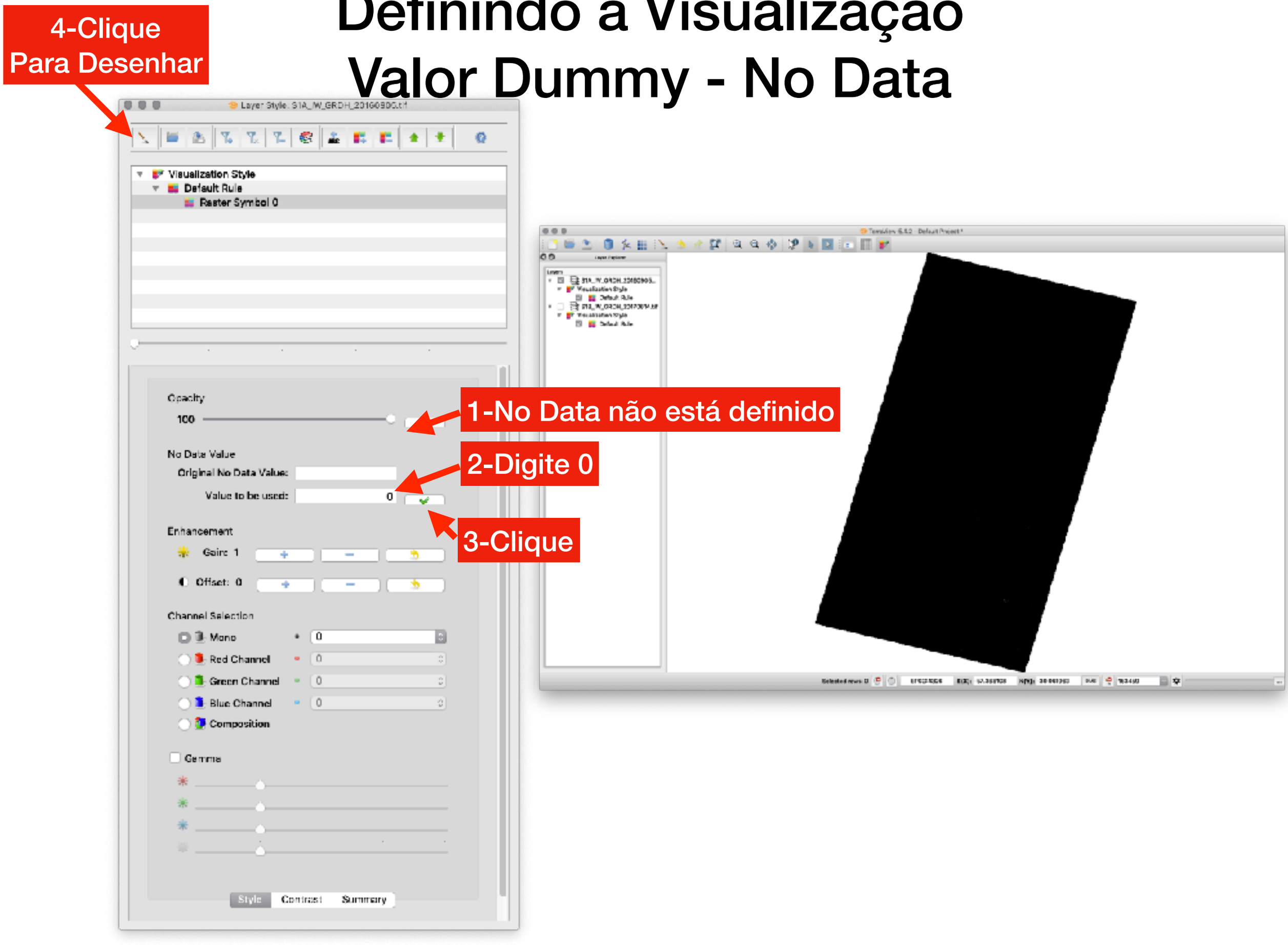
Visualizando



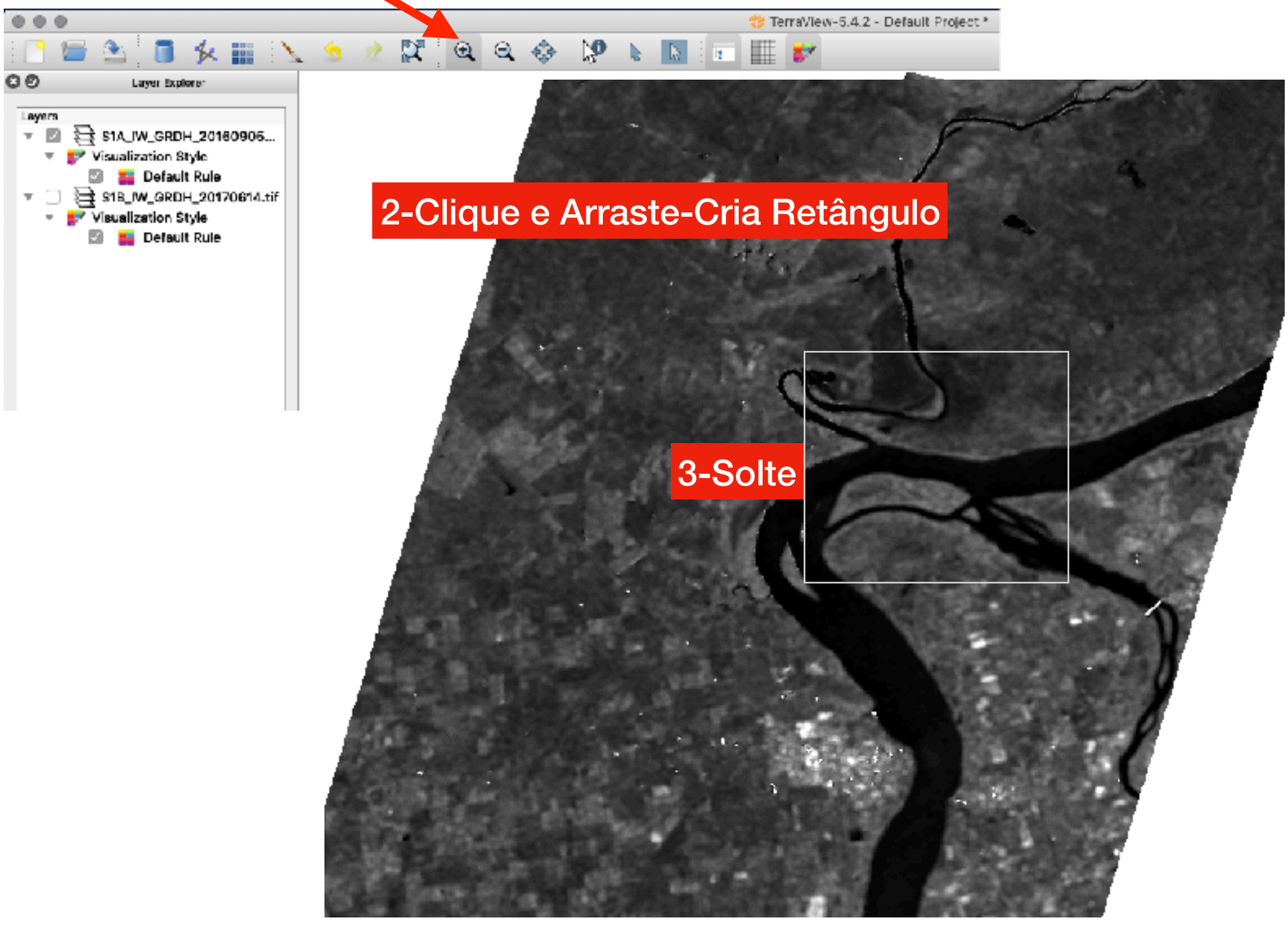
Definindo a Visualização



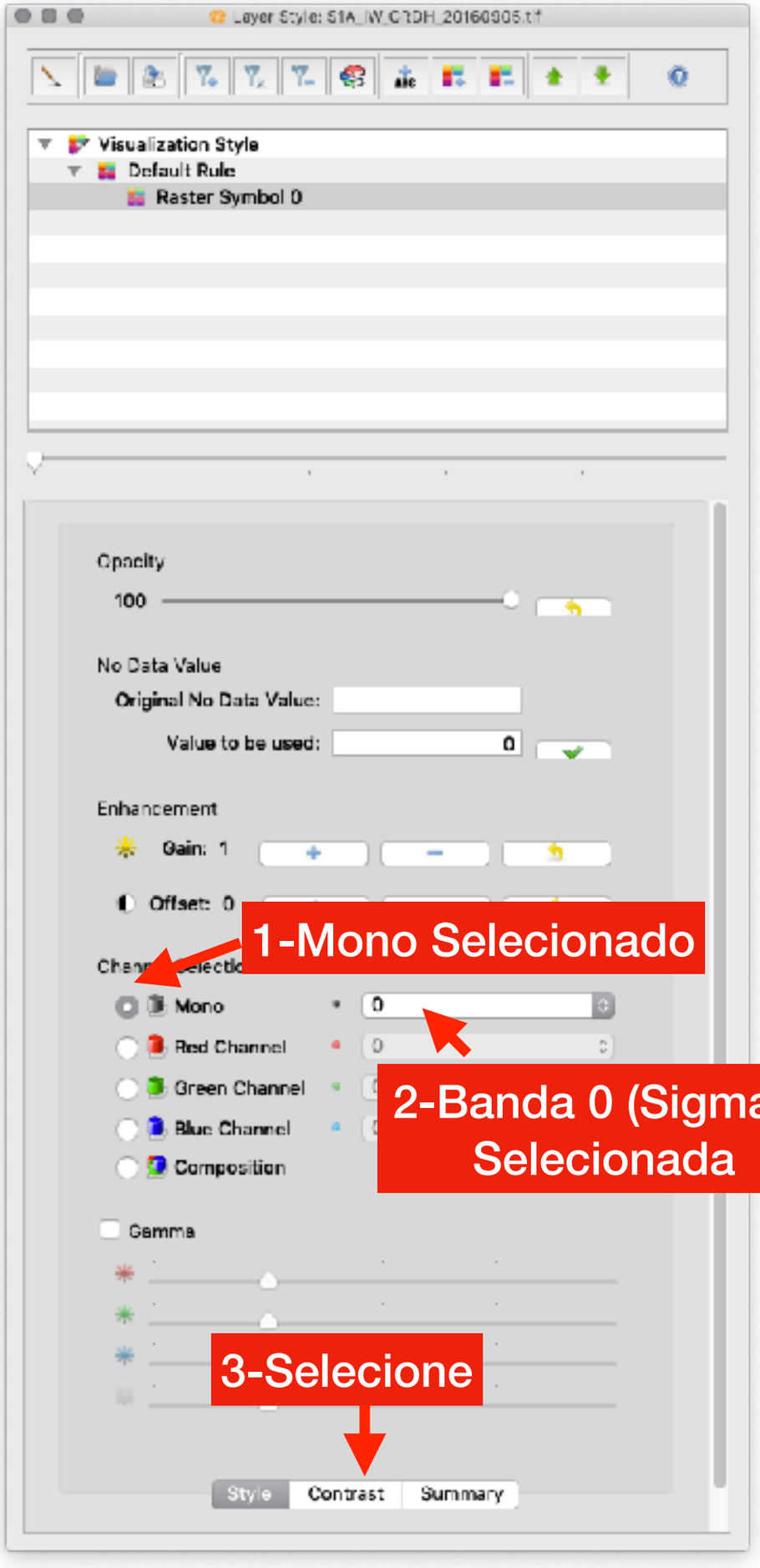
Definindo a Visualização
Valor Dummy - No Data

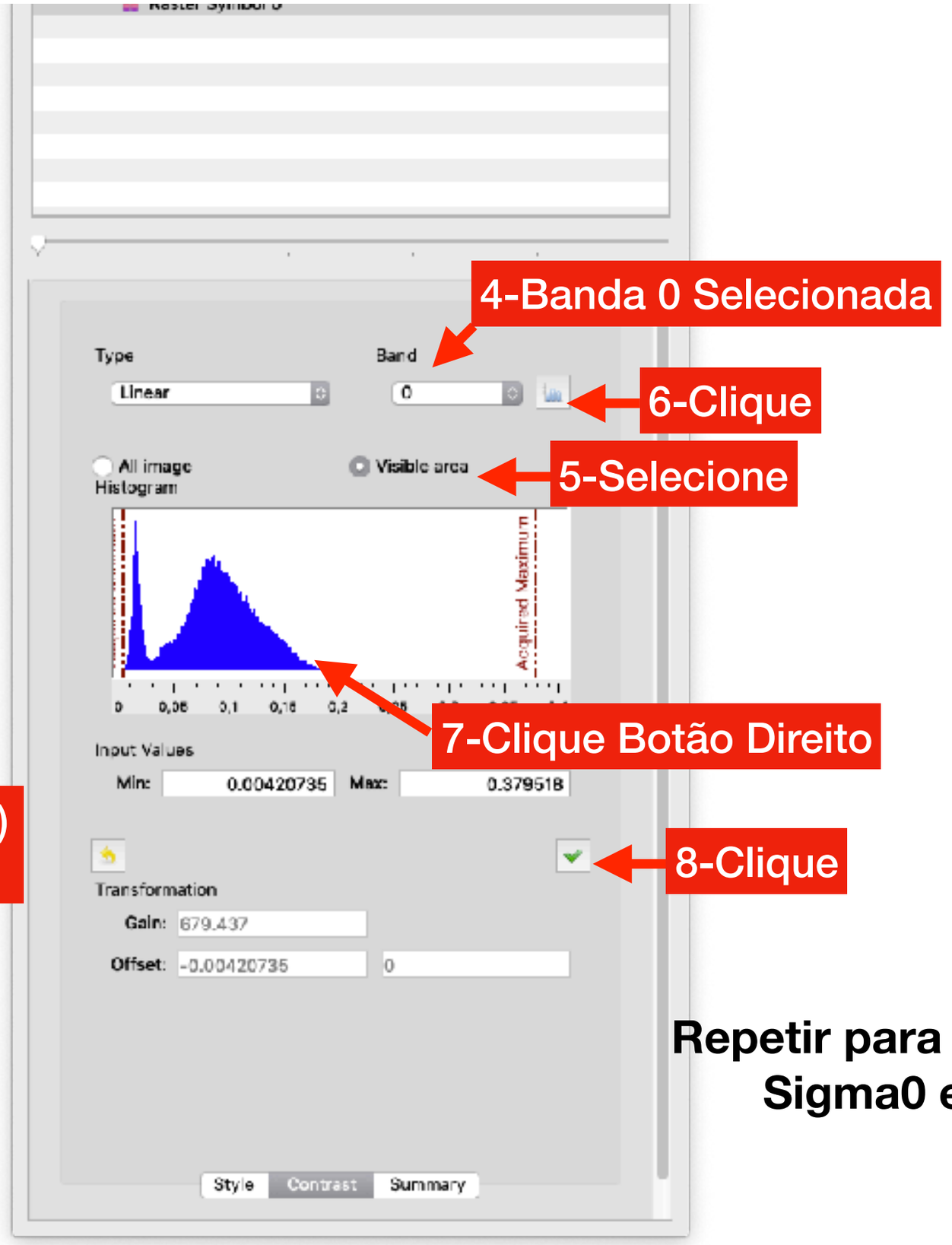


Definindo a Visualização Ampliando

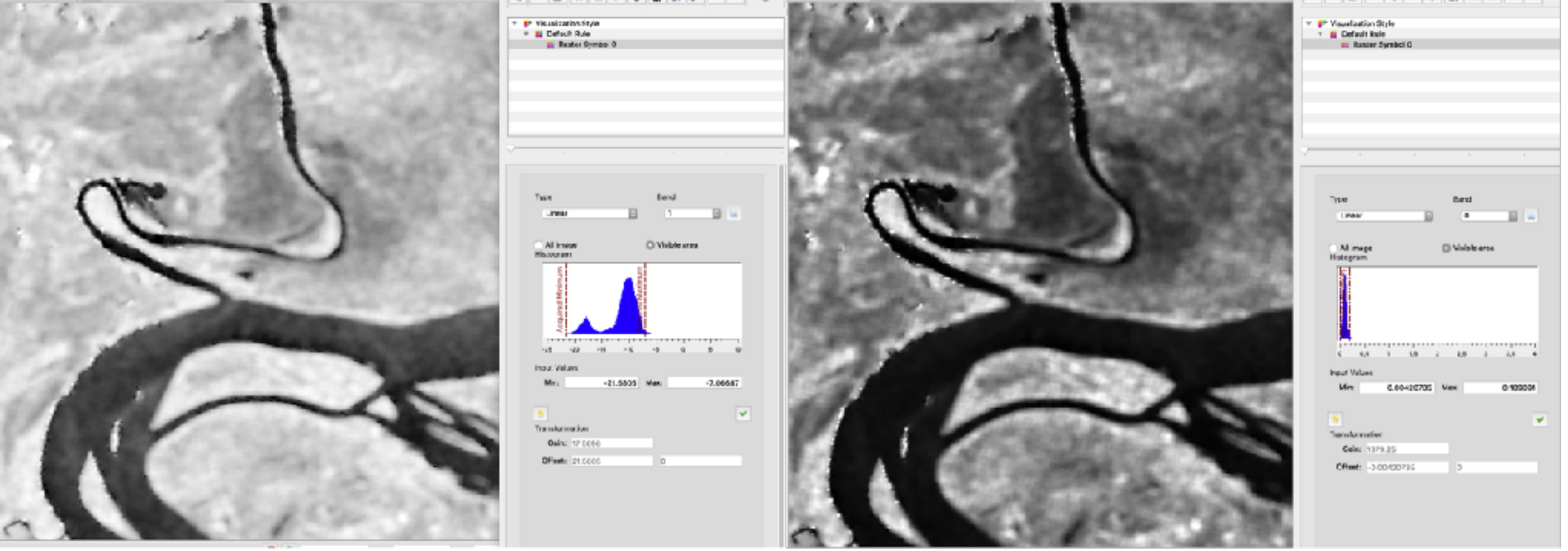


Definindo a Visualização Contraste

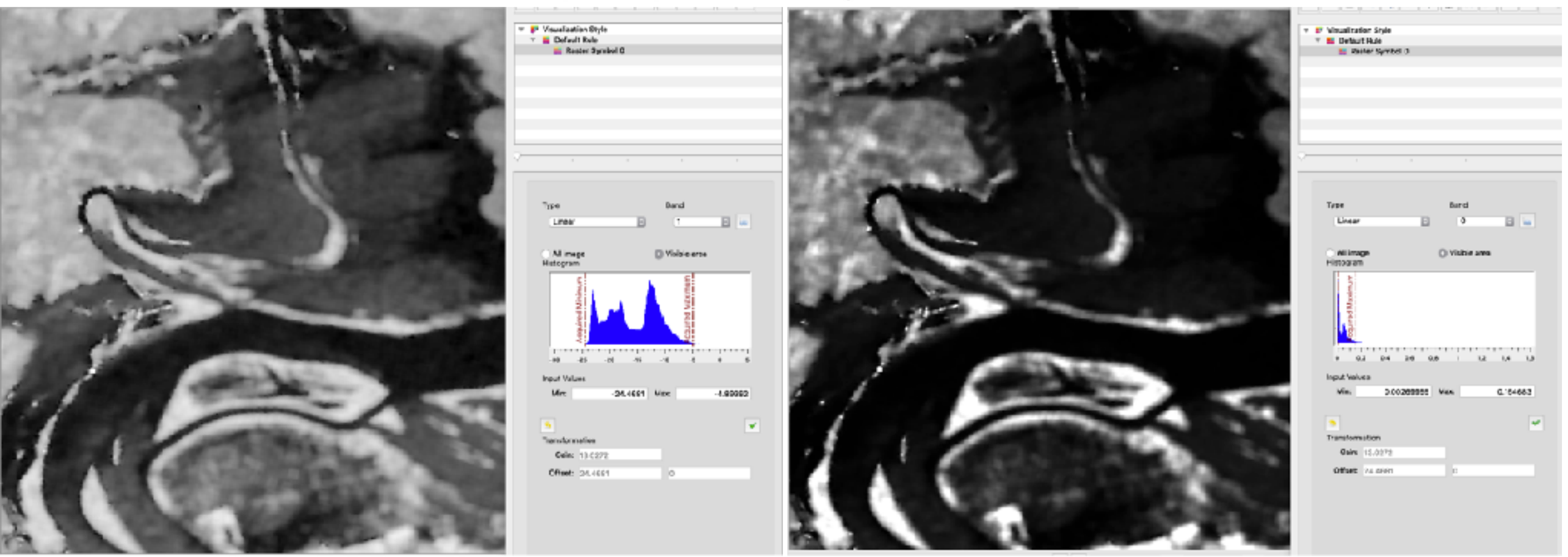




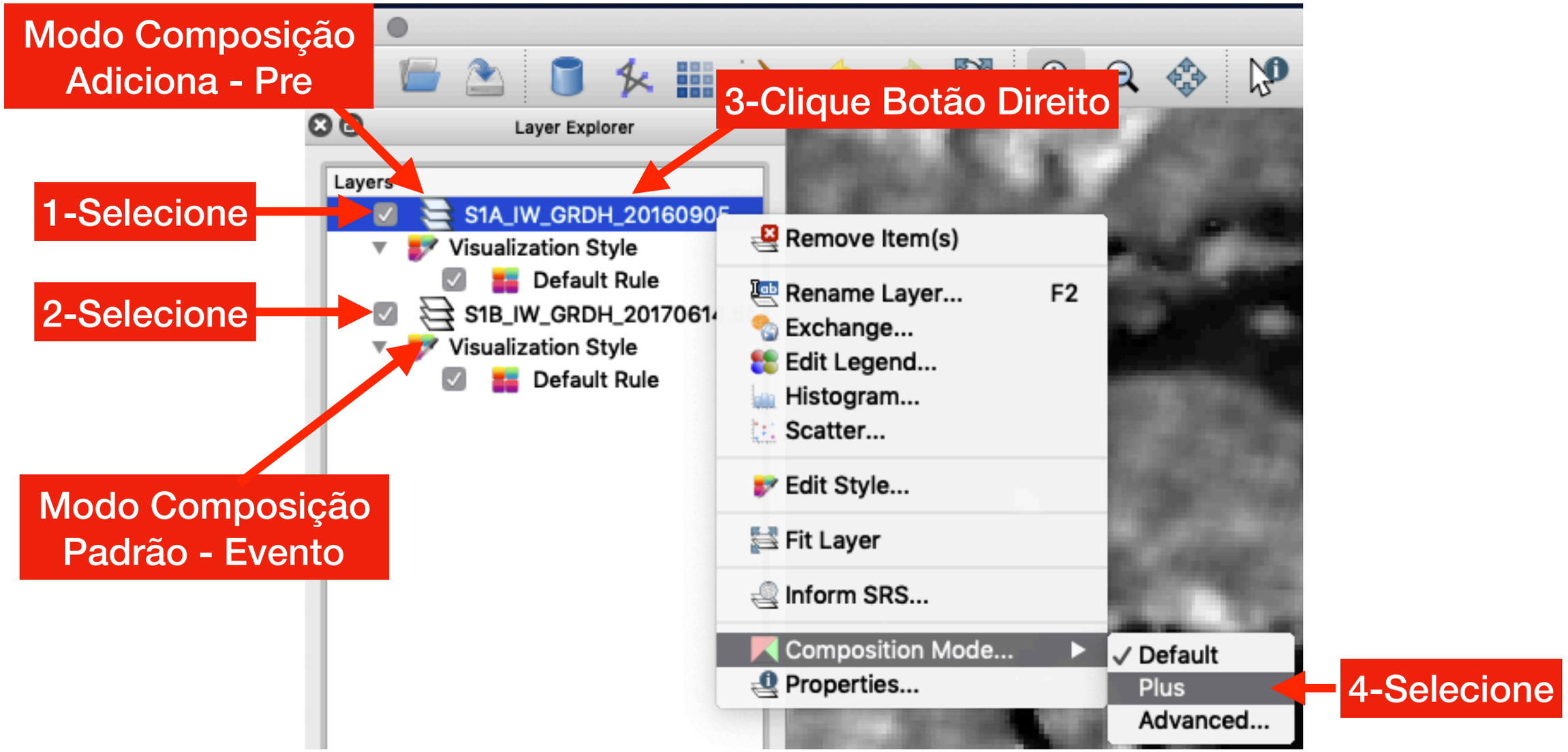
Repetir para a Banda 1 Sigma0 em dB



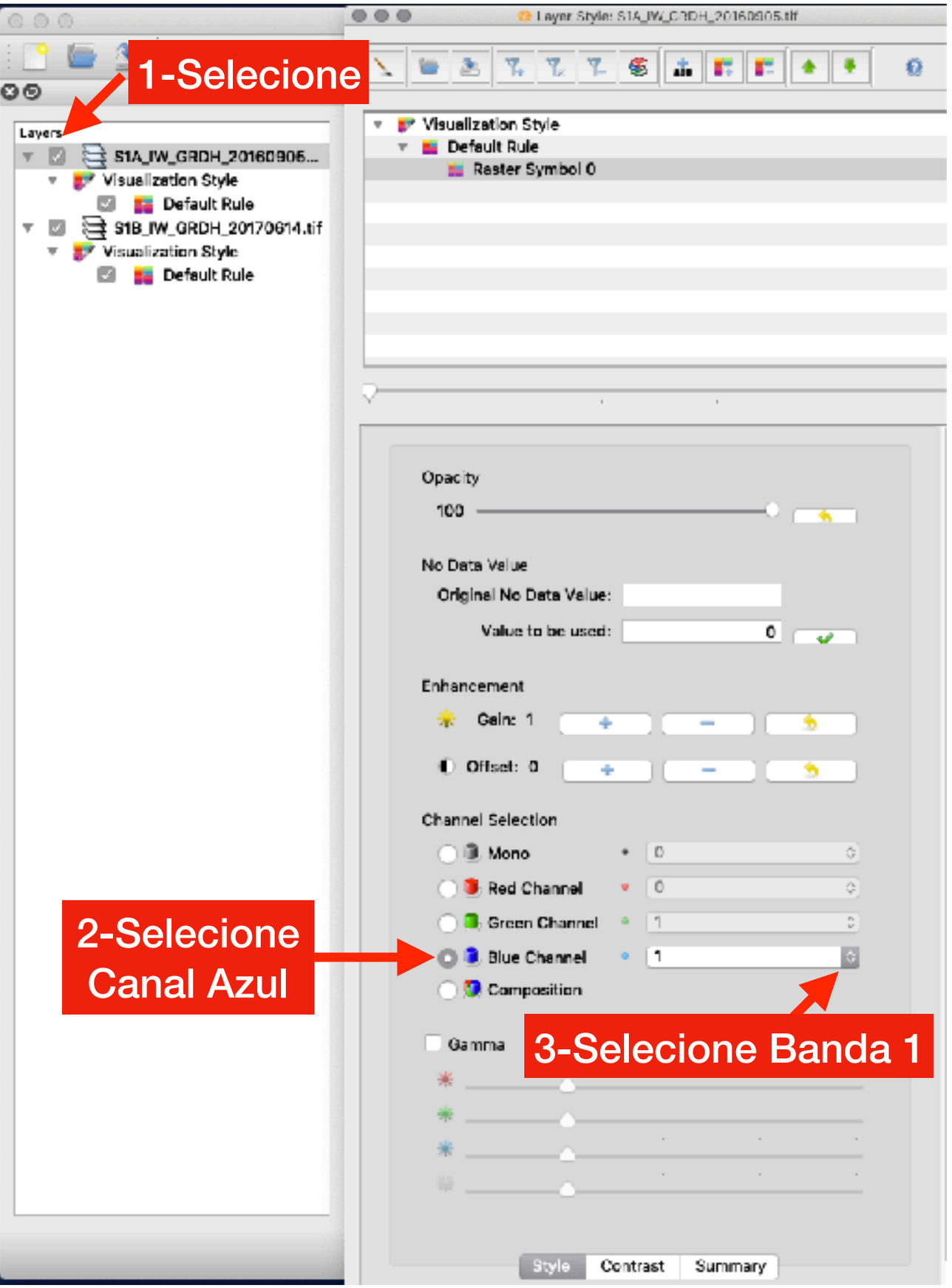
Repetir para a Imagem de 2017



Definindo a Visualização
Áreas Inundadas em Azul

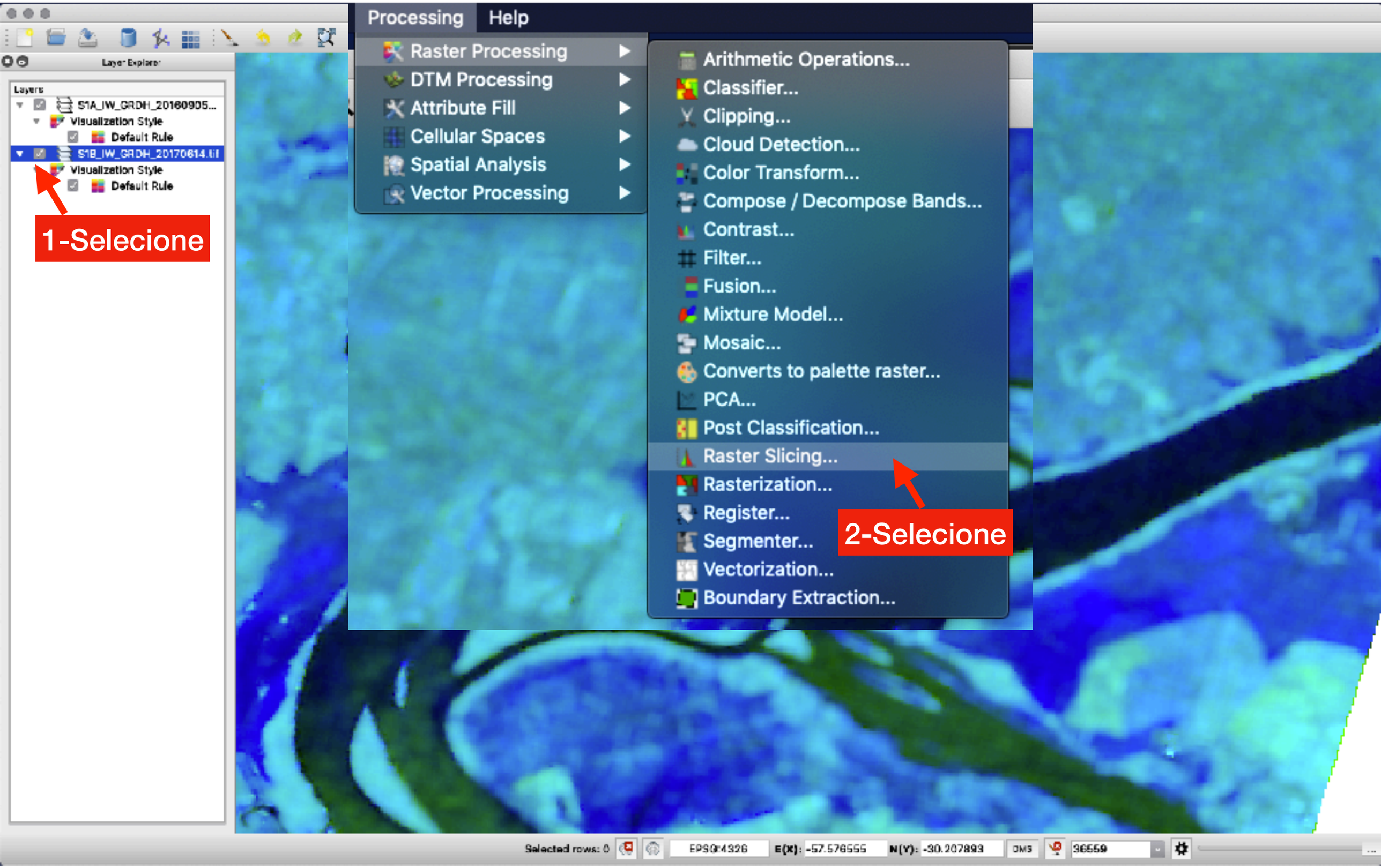


Repetir para a Banda 1
Sigma0 em dB

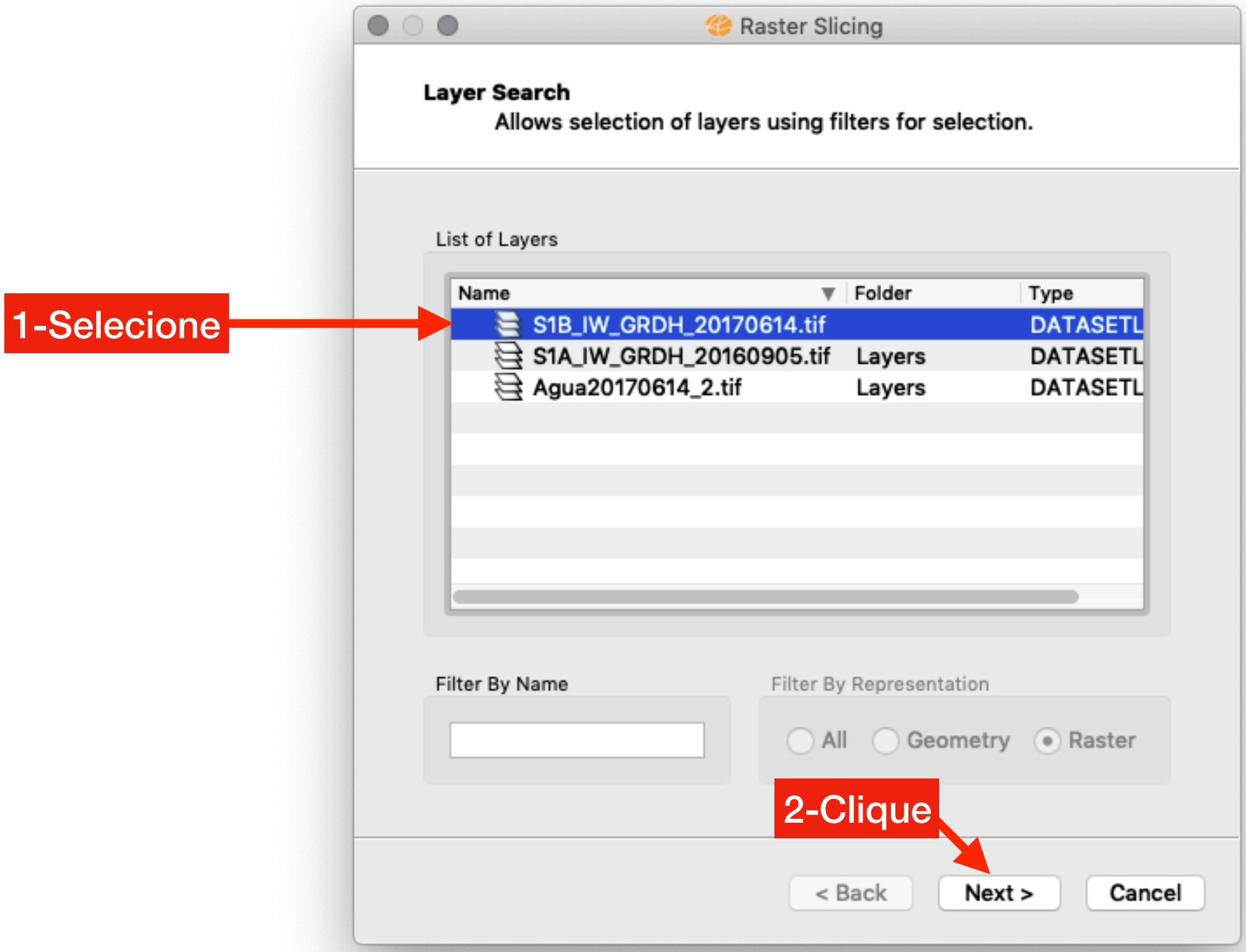

1-Selecione
Layers
S1A_IW_GRDH_20160905...
Visualization Style
Default Rule
S1B_IW_GRDH_20170614.tif
Visualization Style
Default Rule
Visualization Style
Default Rule
Raster Symbol 0
Opacity
100
No Data Value
Original No Data Value:
Value to be used:
0
Enhancement
Gain: 1
Offset: 0
Channel Selection
Mono
Red Channel
Green Channel
Blue Channel
Composition
Gamma
2-Selecione
Canal Azul
3-Selecione Banda 1
Style
Contrast
Summary


Layer Explorer
4-Selecione
Layers
Visualization Style
Default Rule
S1B_IW_GRDH_20170614.tif
Visualization Style
Default Rule
Visualization Style
Default Rule
Raster Symbol 0
7-Clique
Opacity
100
No Data Value
Original No Data Value:
Value to be used:
0
Enhancement
Gain: 1
Offset: 0
Channel Selection
Mono
Red Channel
Green Channel
Blue Channel
5-Selecione
Canal Verde
6-Selecione Banda 1
Style
Contrast
Summary

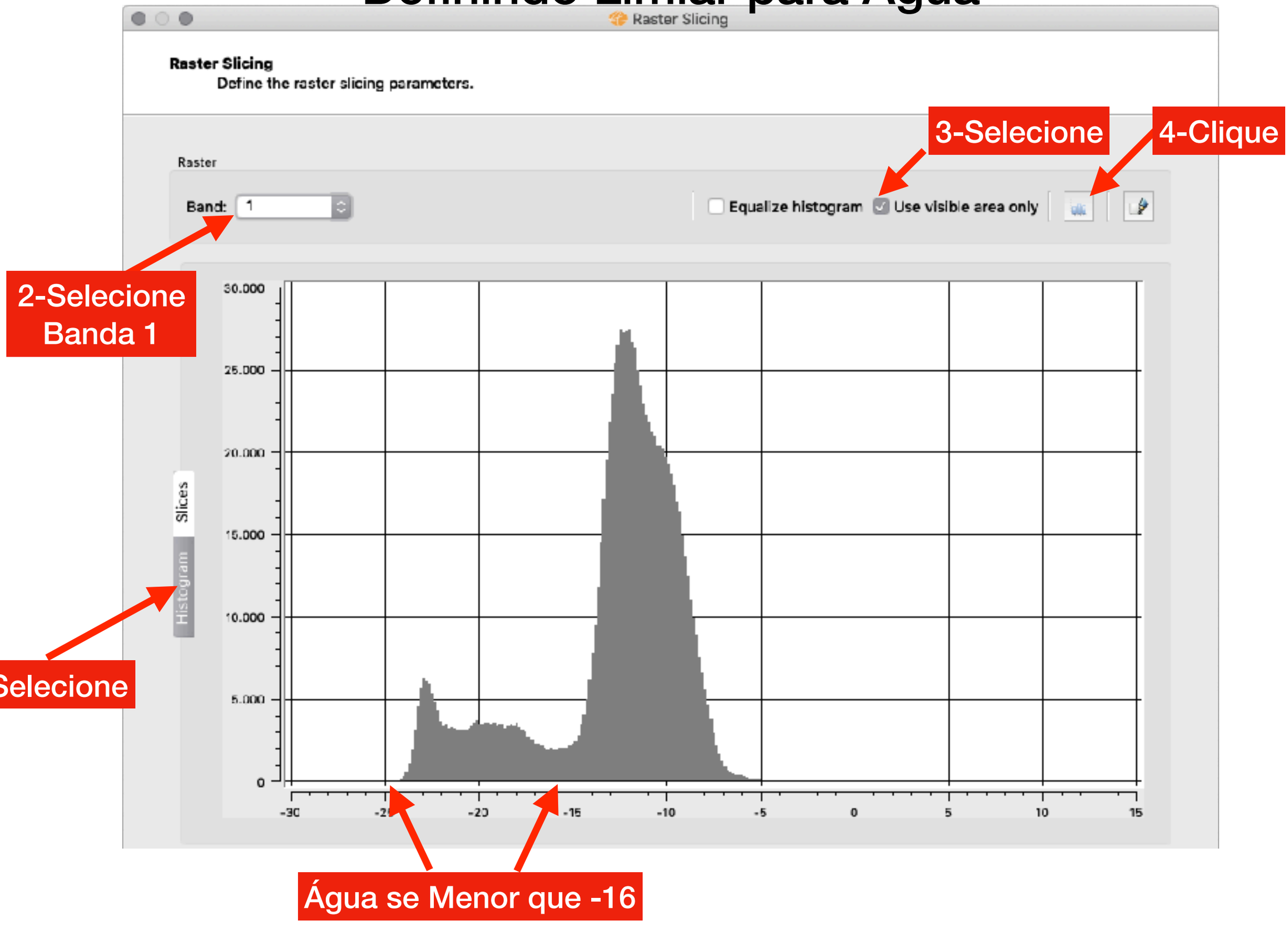
Fatiamento da Imagem do Evento



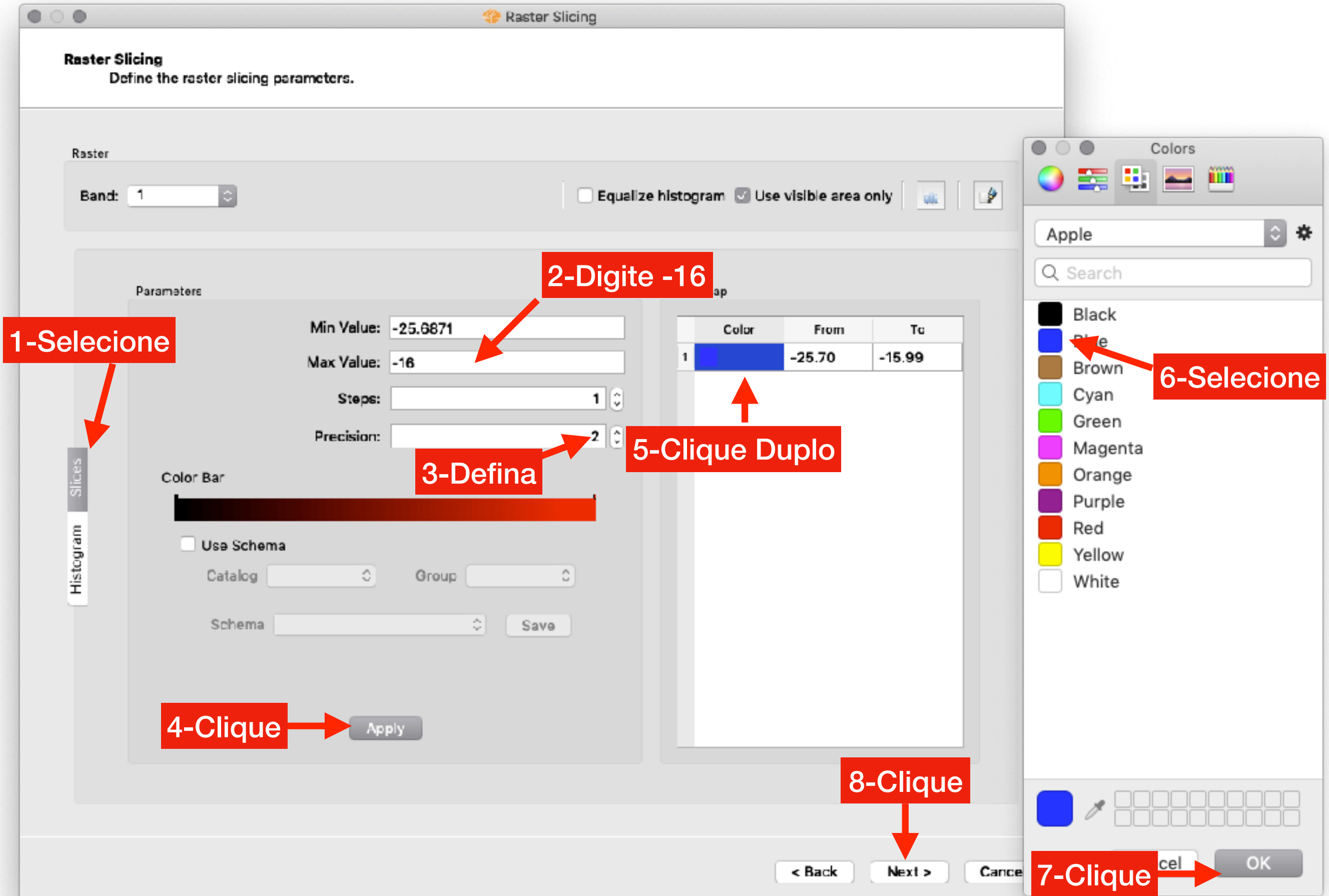
Fatiamento
Definindo Imagem Evento para Fatiar



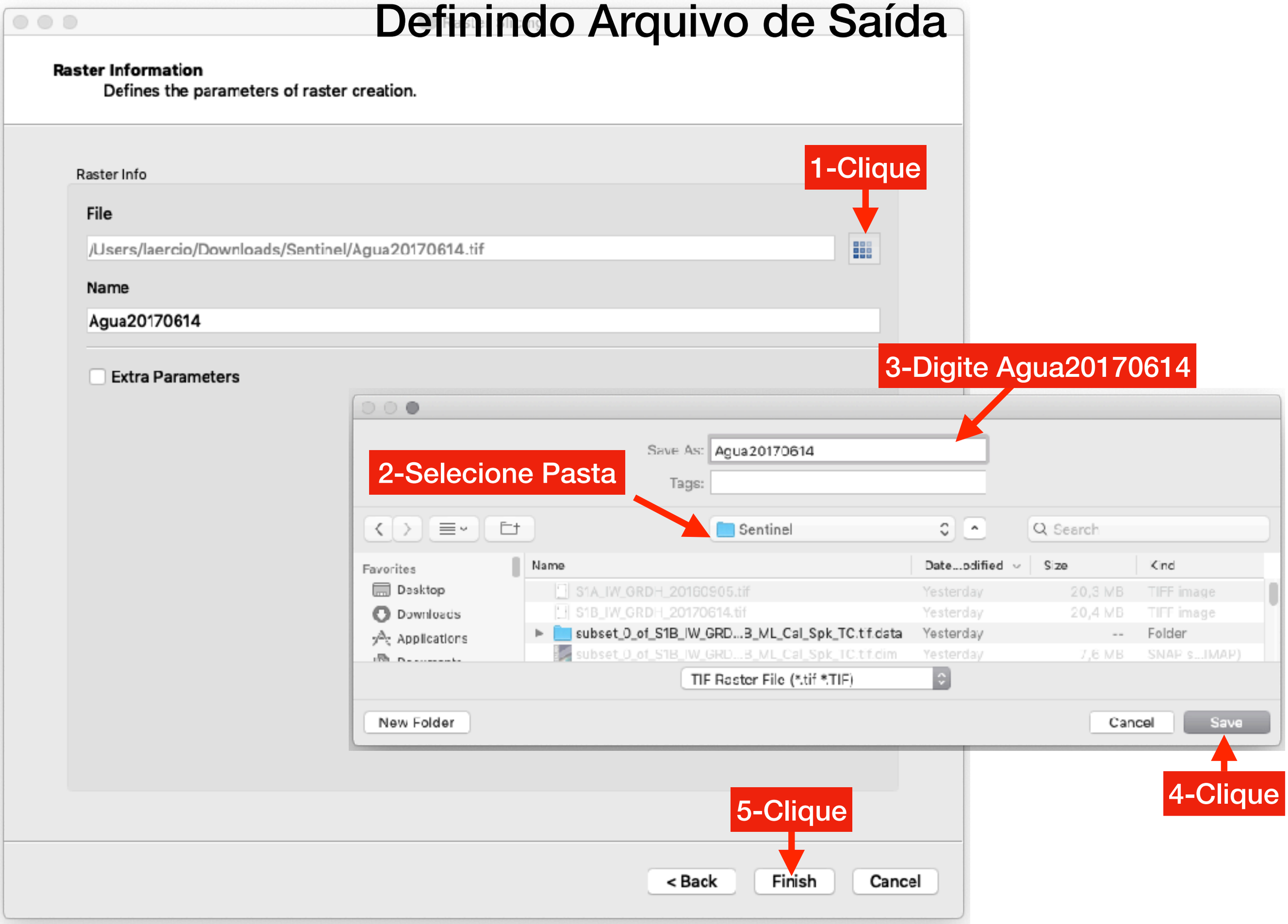
Fatiamento
Definindo Limiar para Água



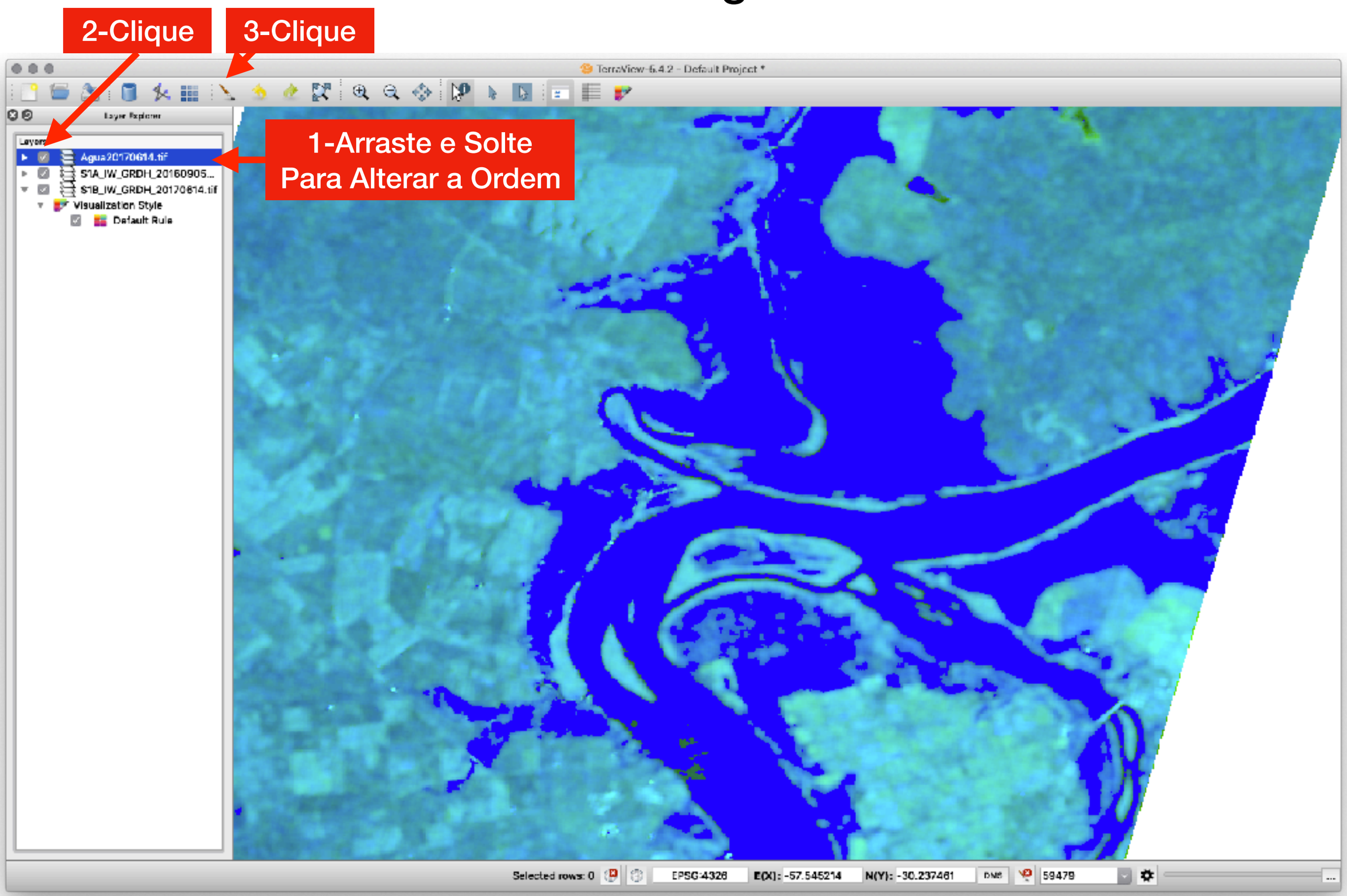
Fatiamento
Definindo Cor



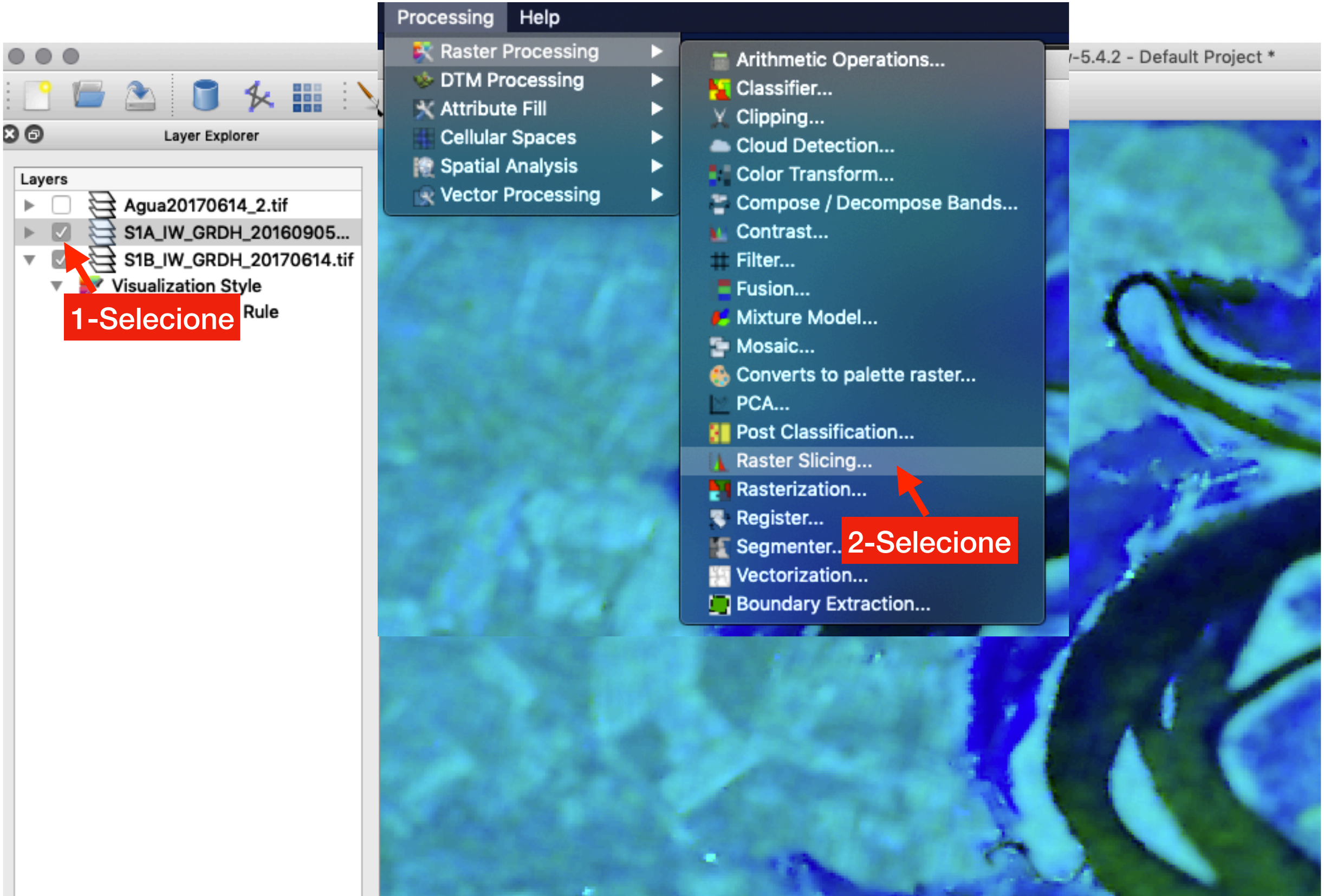
Fatiamento
Definindo Arquivo de Saída



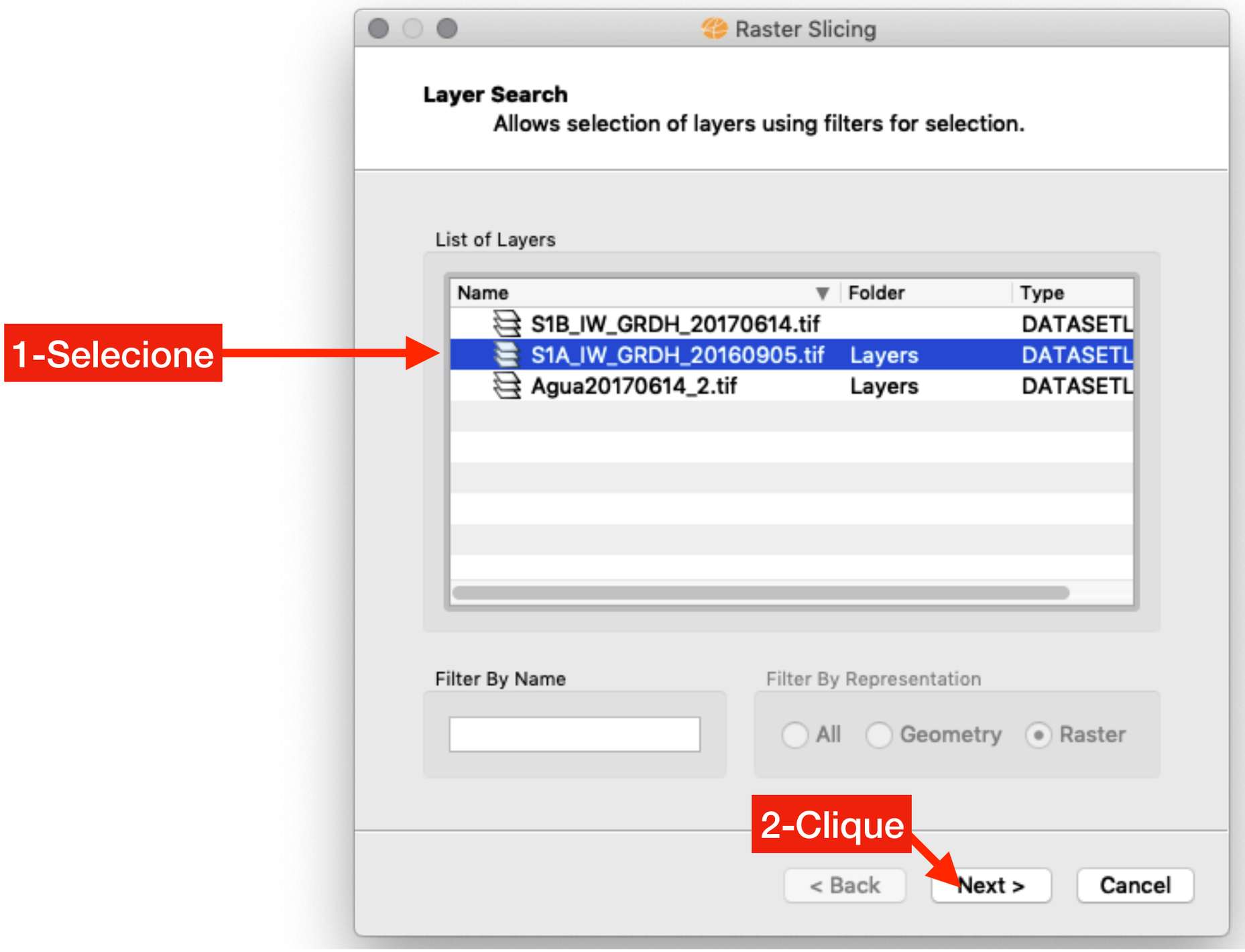
Fatiamento
Visualizando Imagem Fatiada



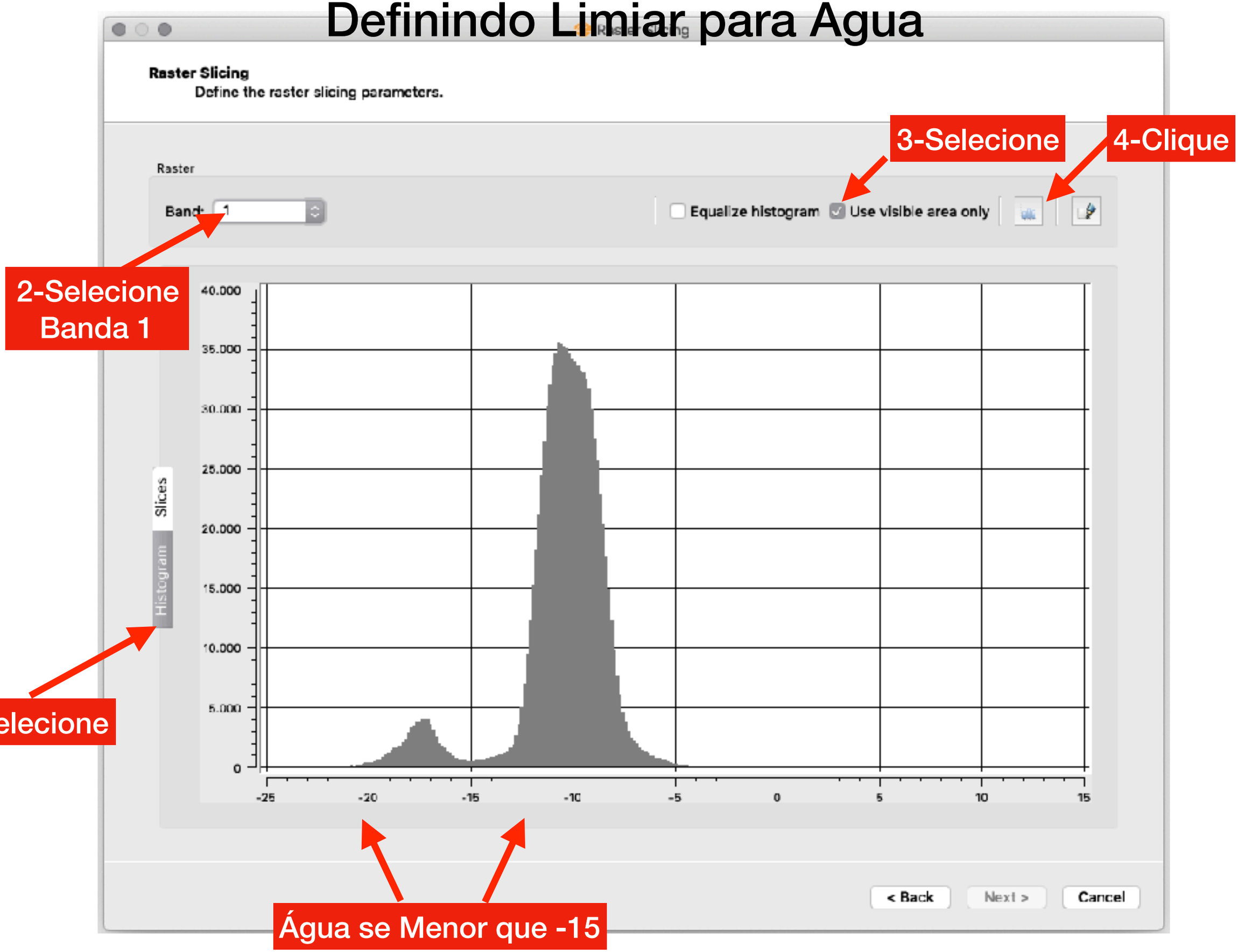
Fatiamento da Imagem Pré Evento



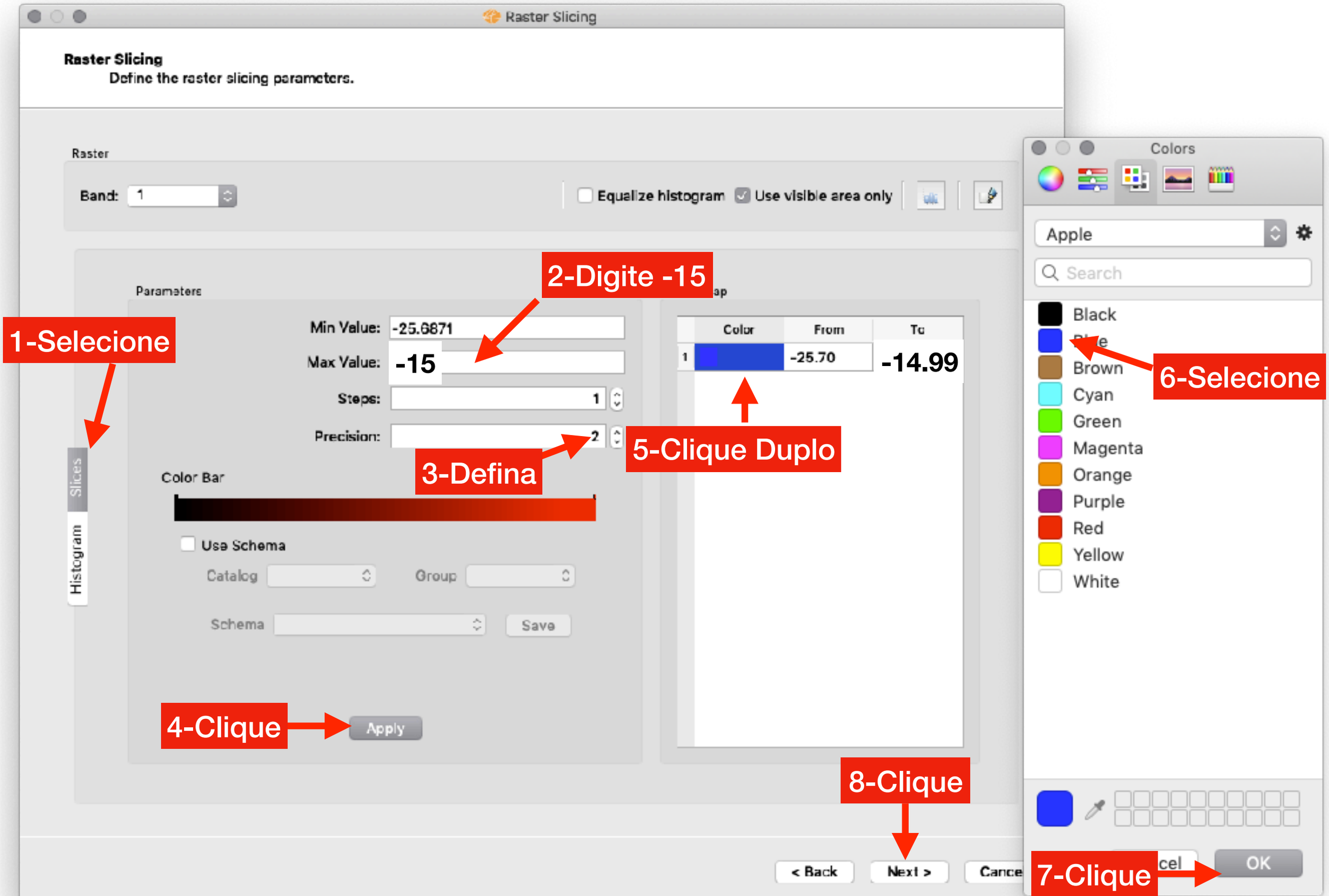
Fatiamento
Definindo Imagem Pré Evento para Fatiar



Fatiamento
Definindo Limiar para Água

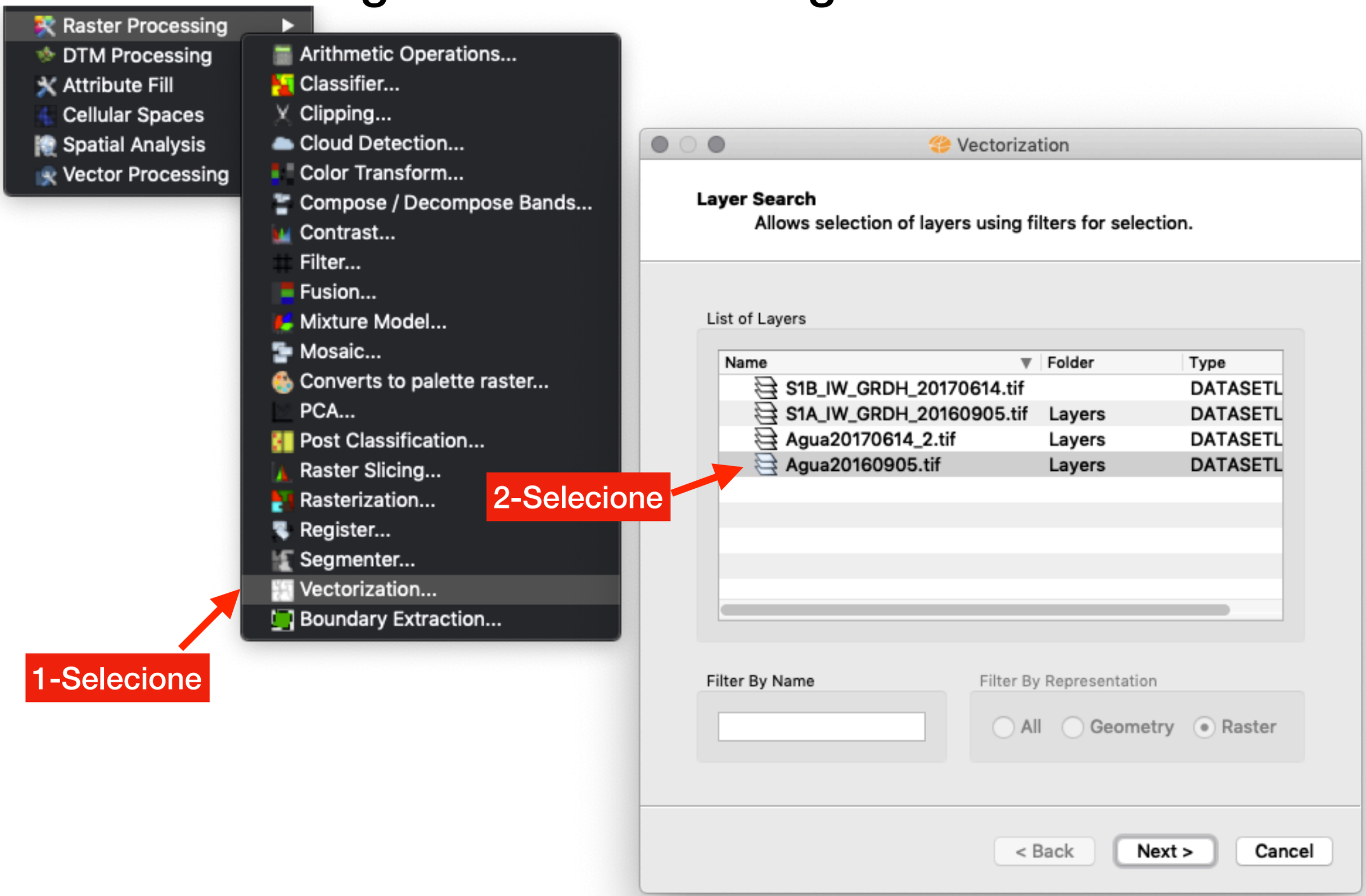


Fatiamento
Definindo Cor

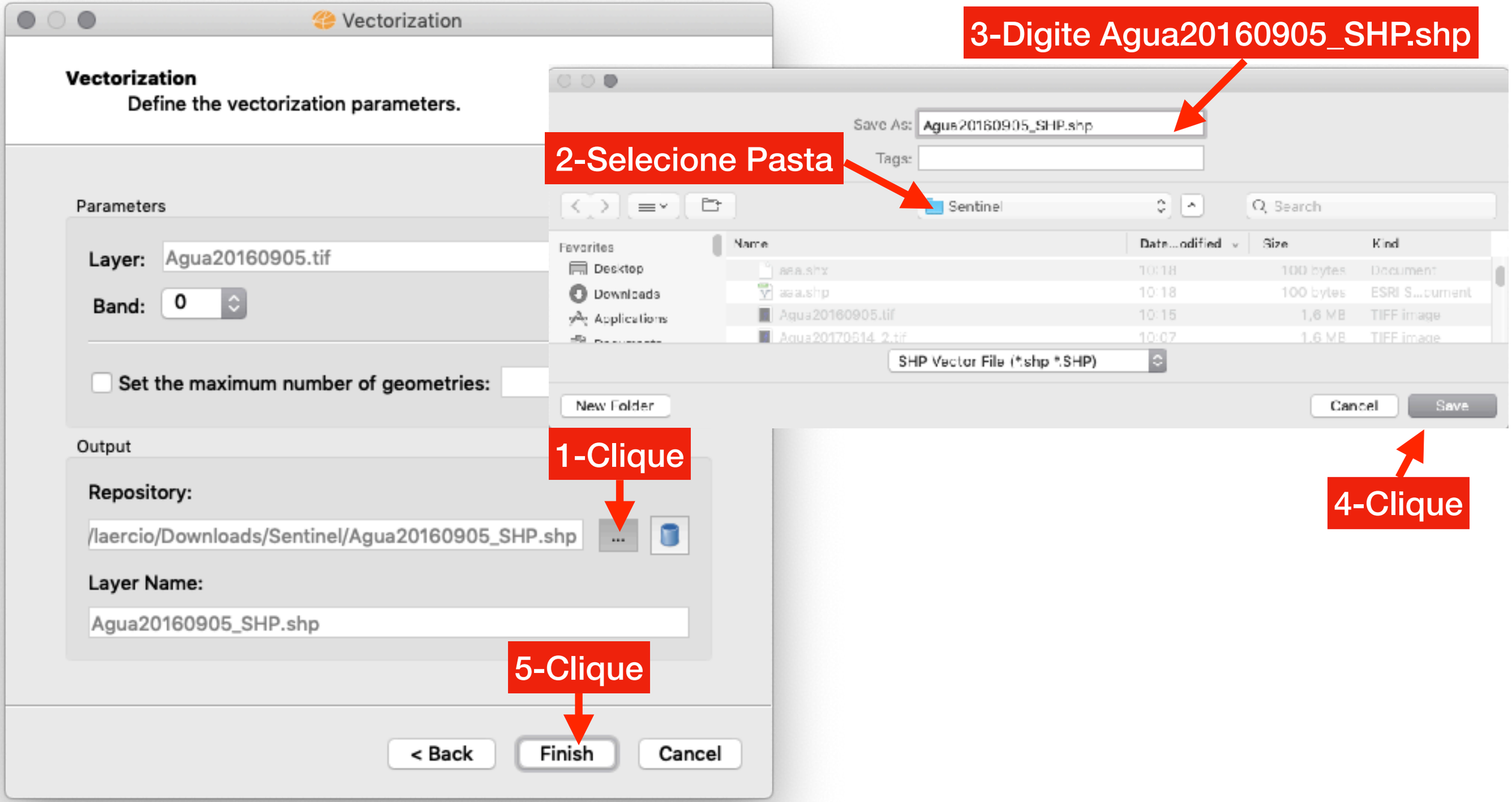


Fatiamento
Definindo Arquivo de Saída

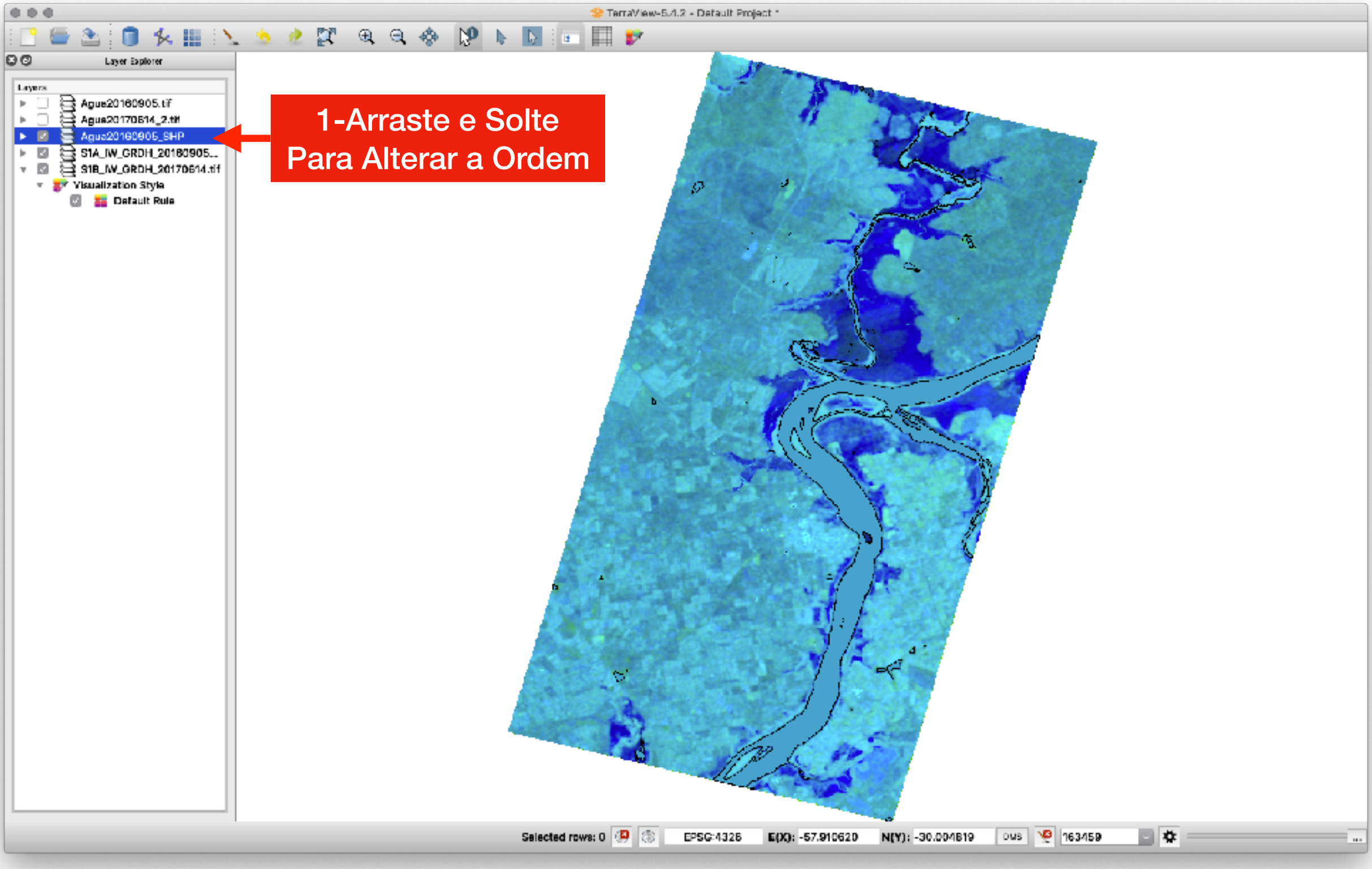
Vetorizando
Imagem Fatiada com Água Pré Evento



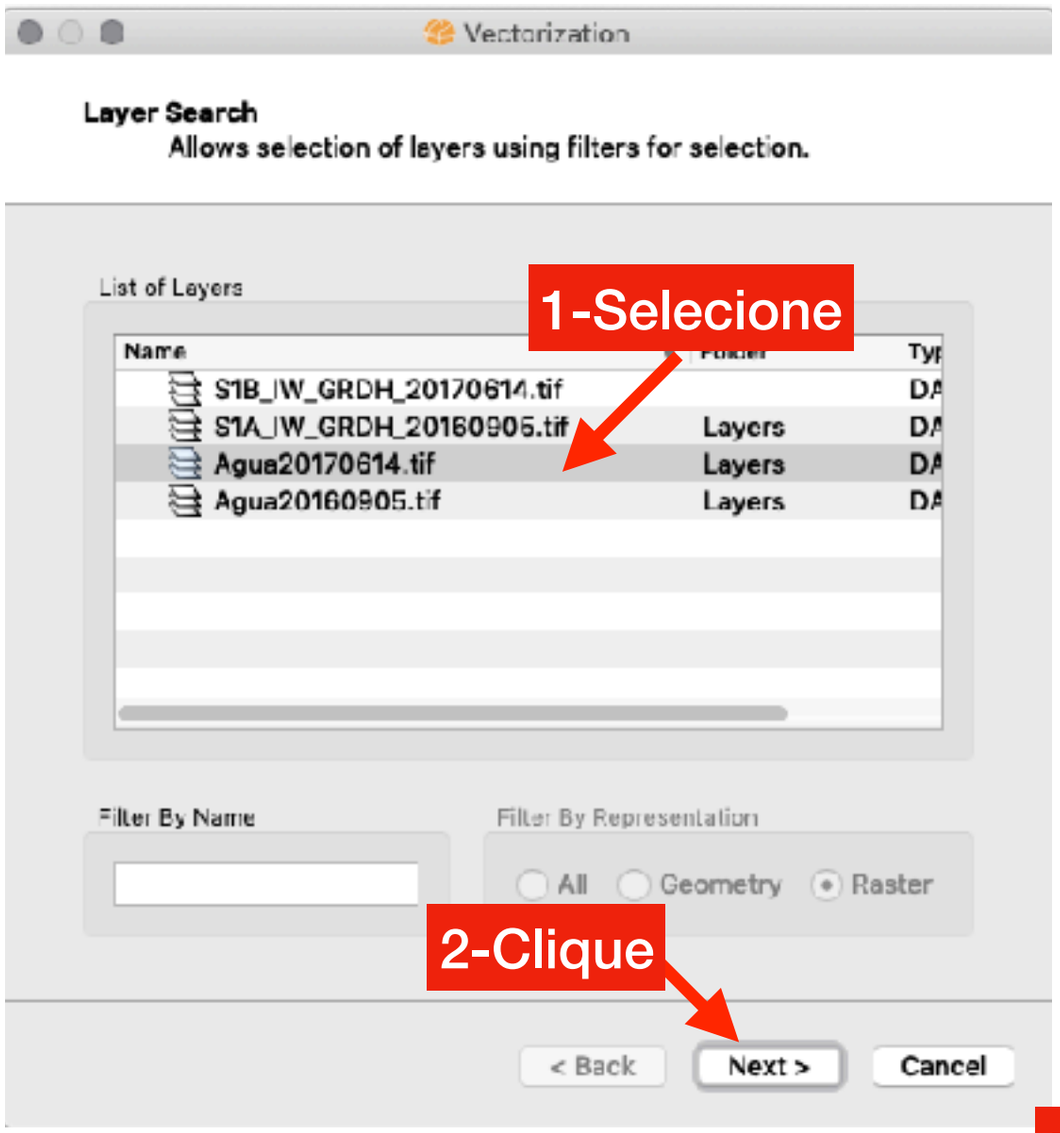
Vetorização
Definindo Arquivo de Saída

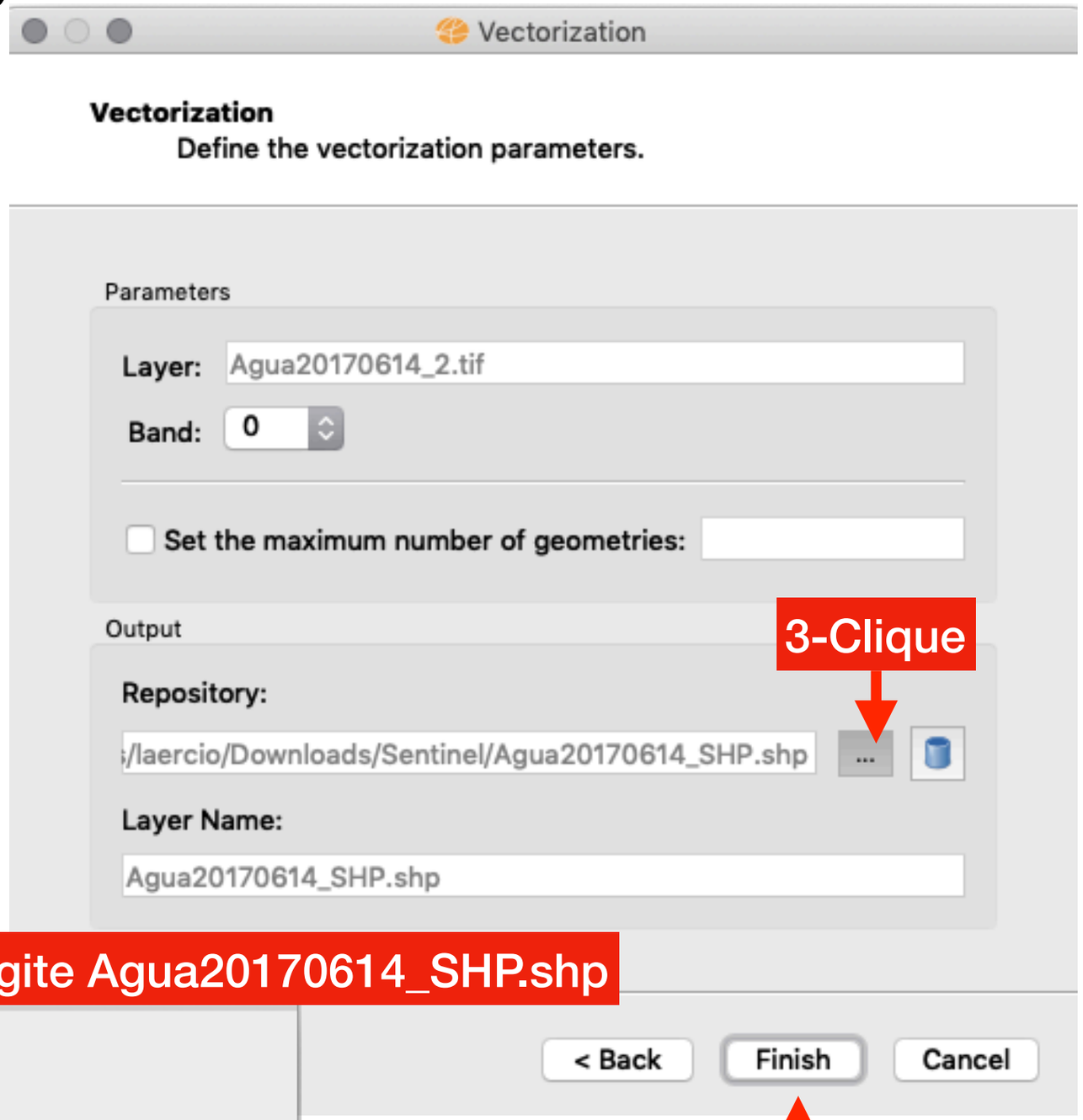


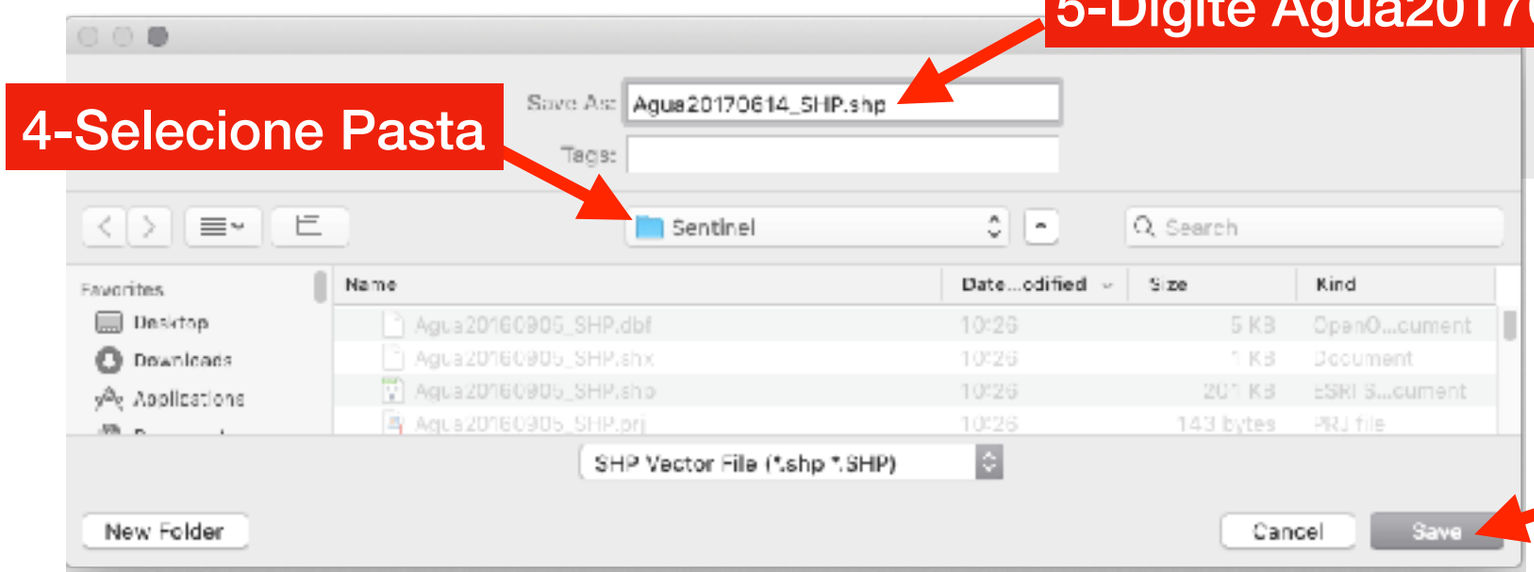
Visualizando a Vetorização
Limites da Água Pré Evento



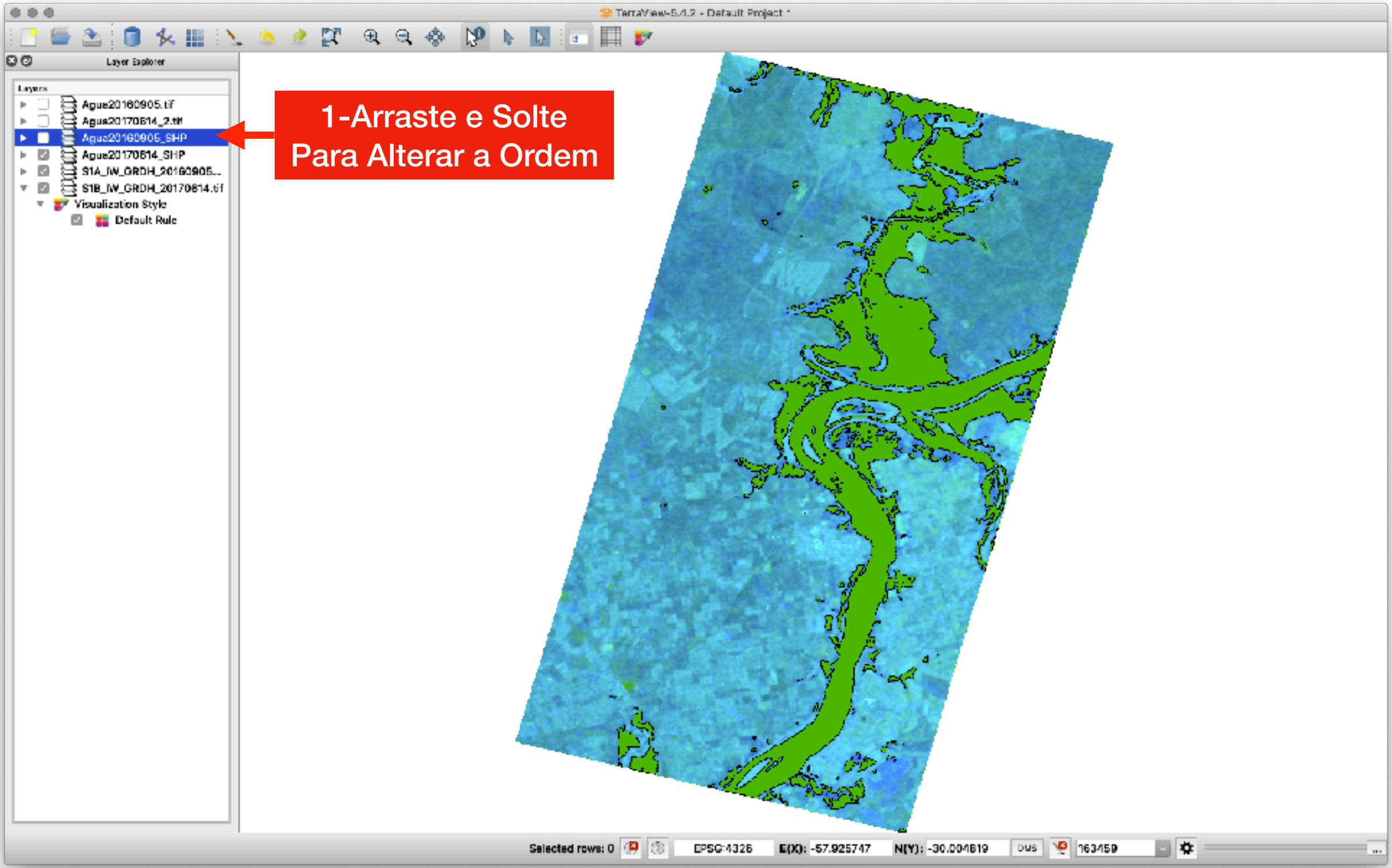
Repetir a Vetorização
Para Água do Evento



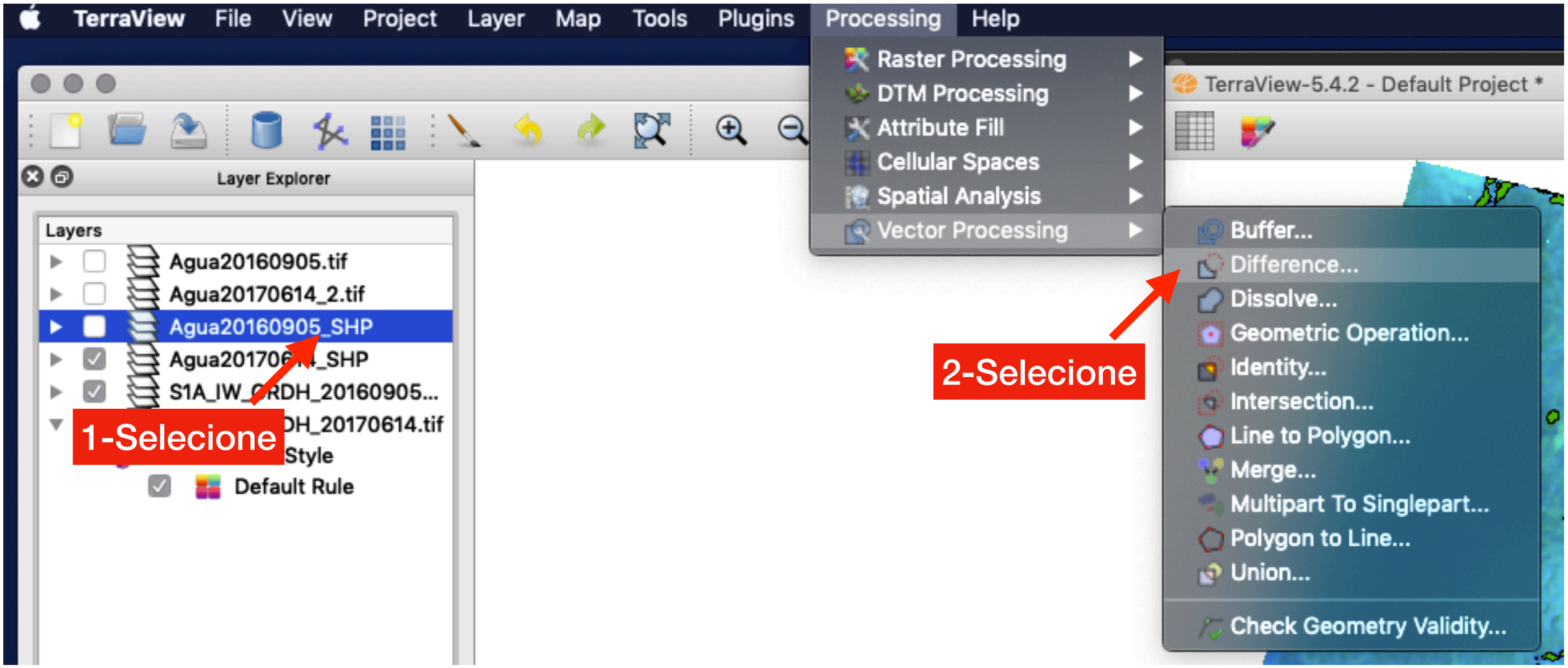




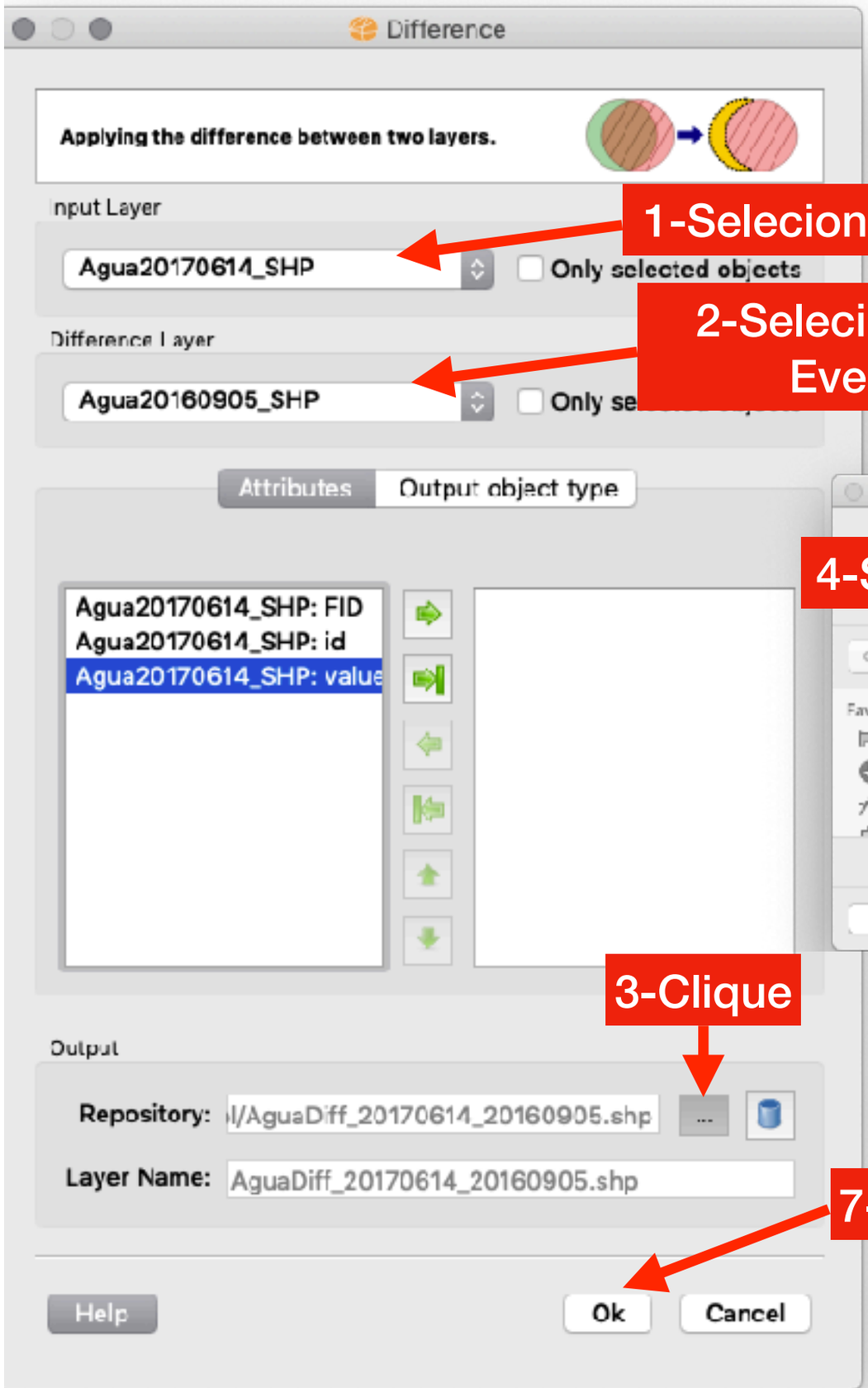
Visualizando a Vetorização
Limites da Água Evento



Definir Área Inundada
Diferença entre Água do Pré e do Evento



Definir Área Inundada
Diferença entre Água do Pré e do Evento

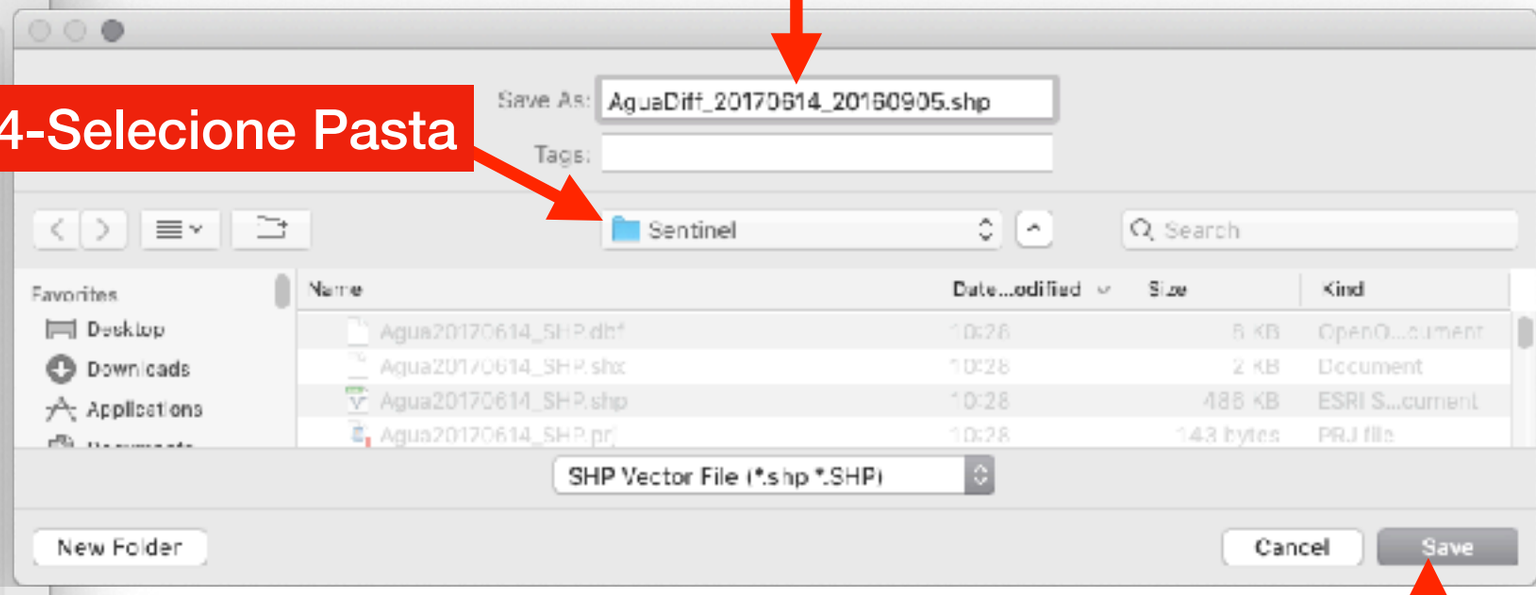


1-Selecione Evento

2-Selecione Pré Evento

3-Clique

5-Digite AguaDiff_20170614_20160905.shp

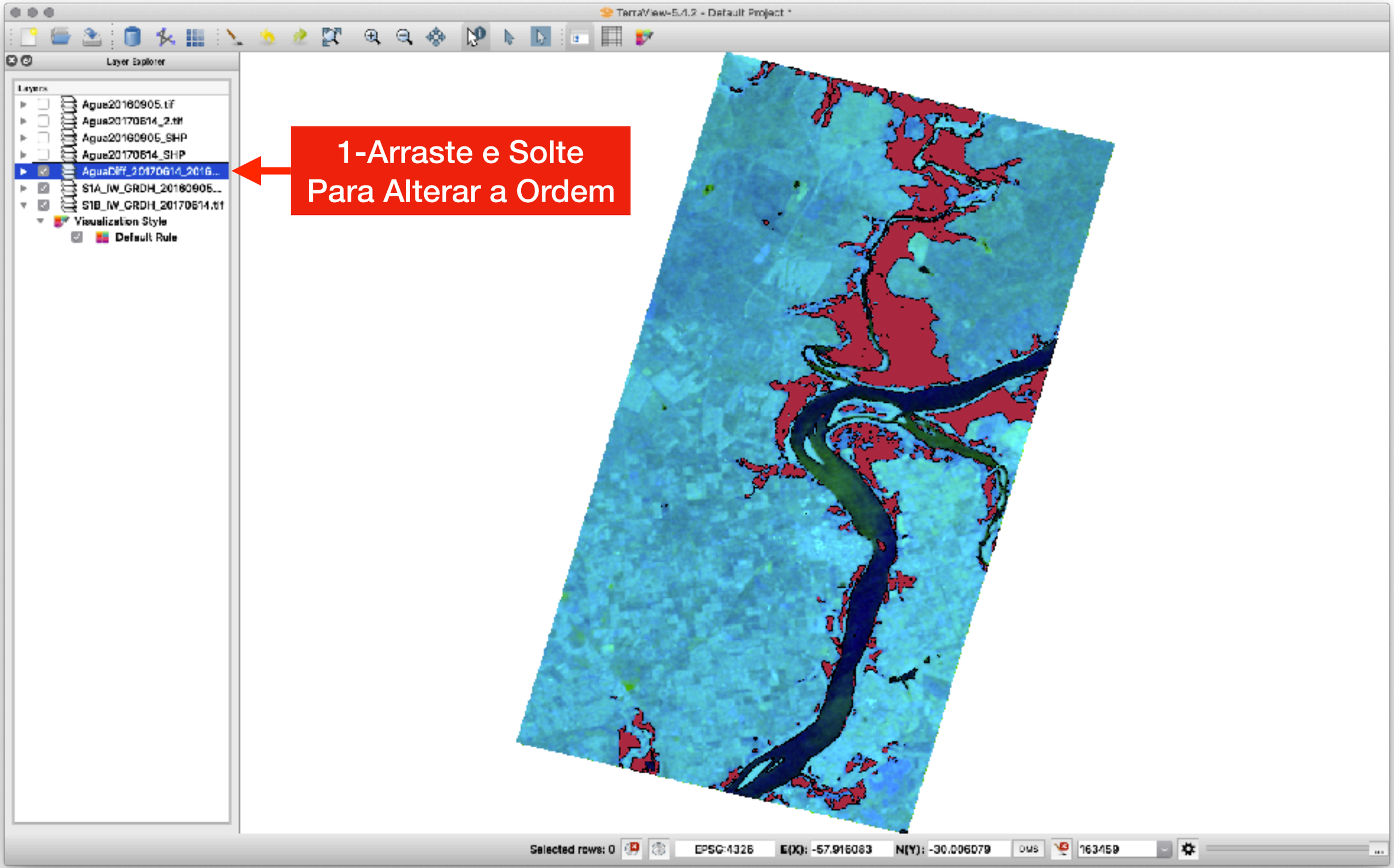


4-Selecione Pasta

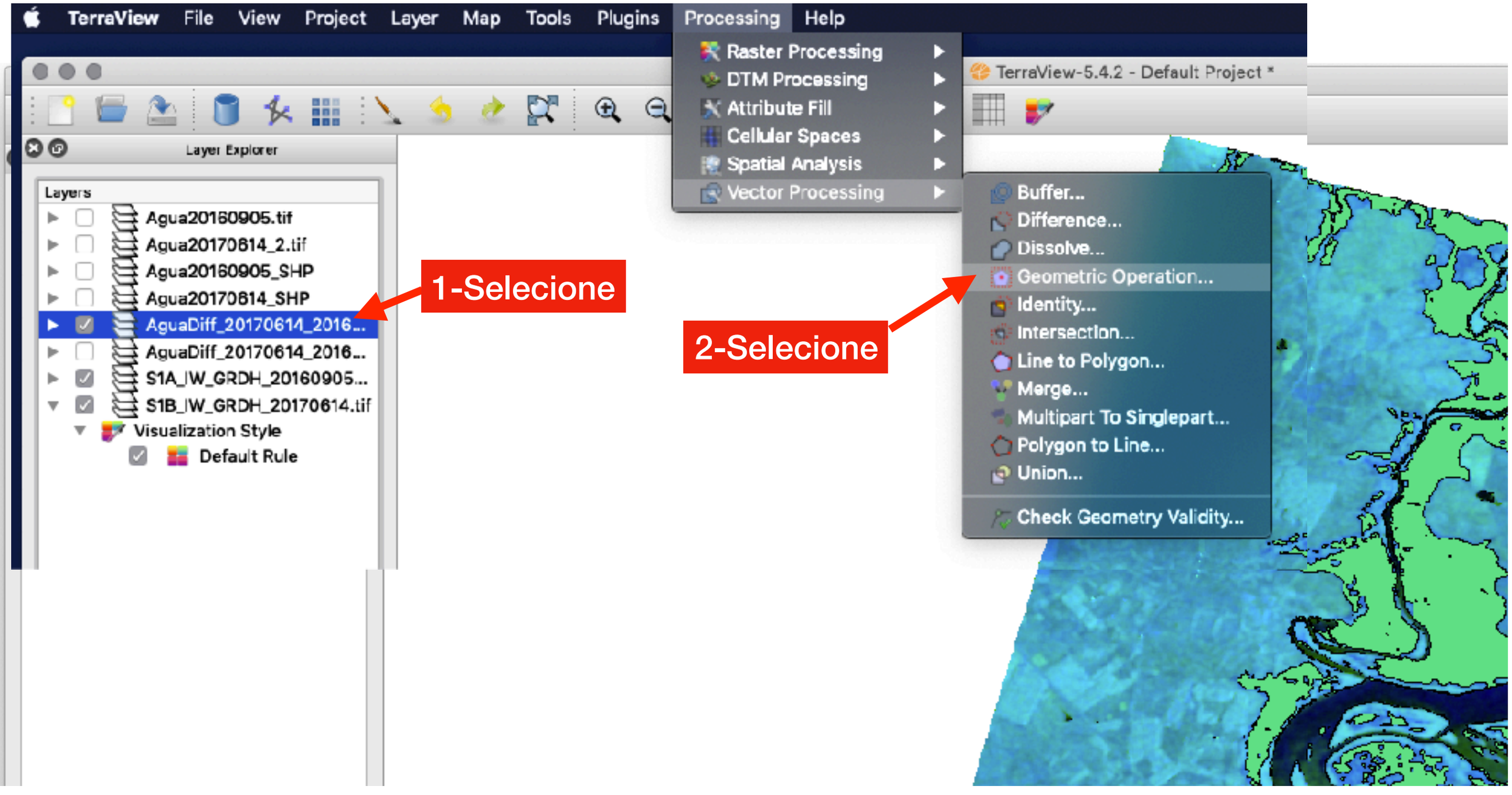
6-Clique

7-Clique

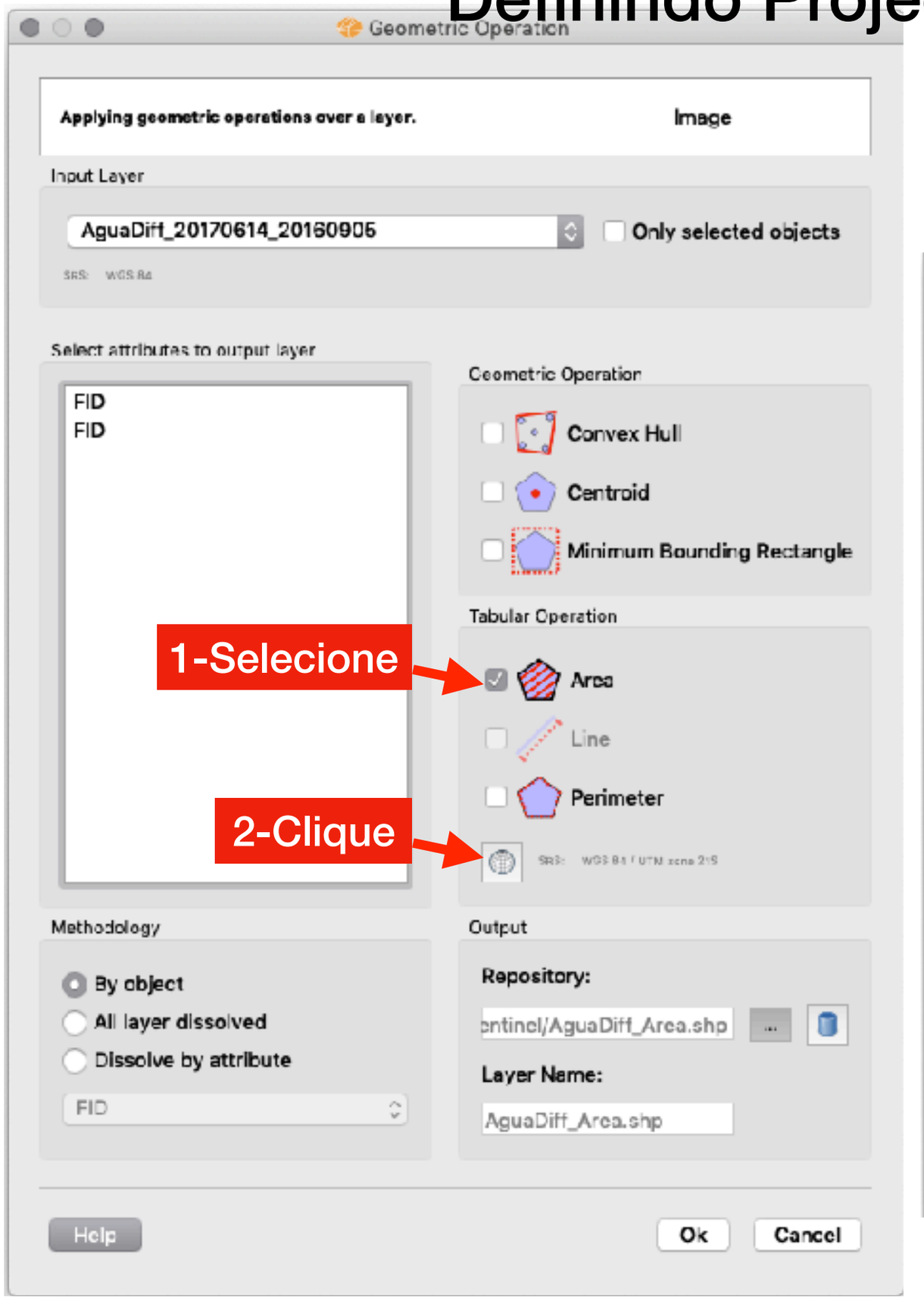
Visualizando a Diferença

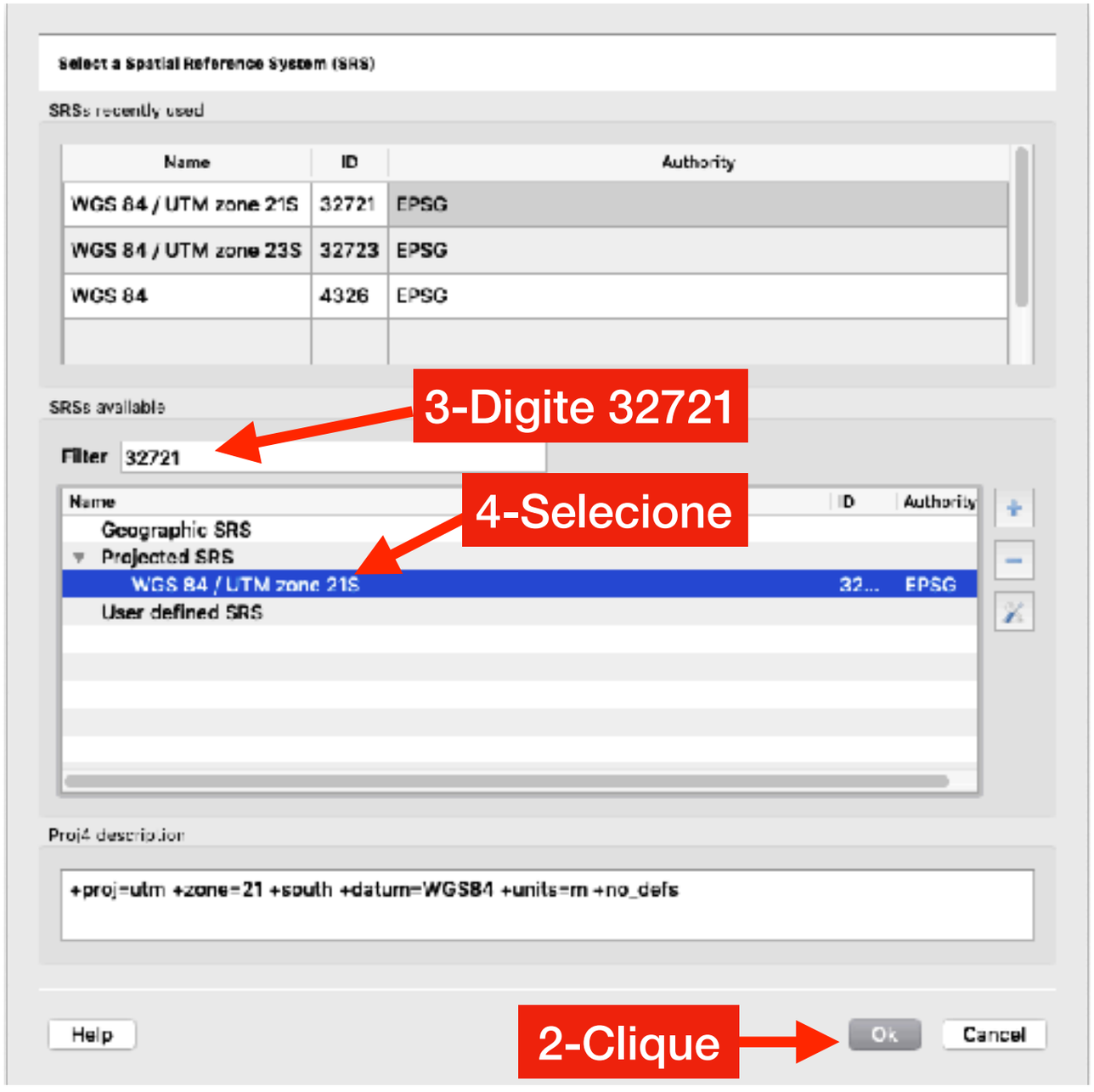


Calculando Área Inundada



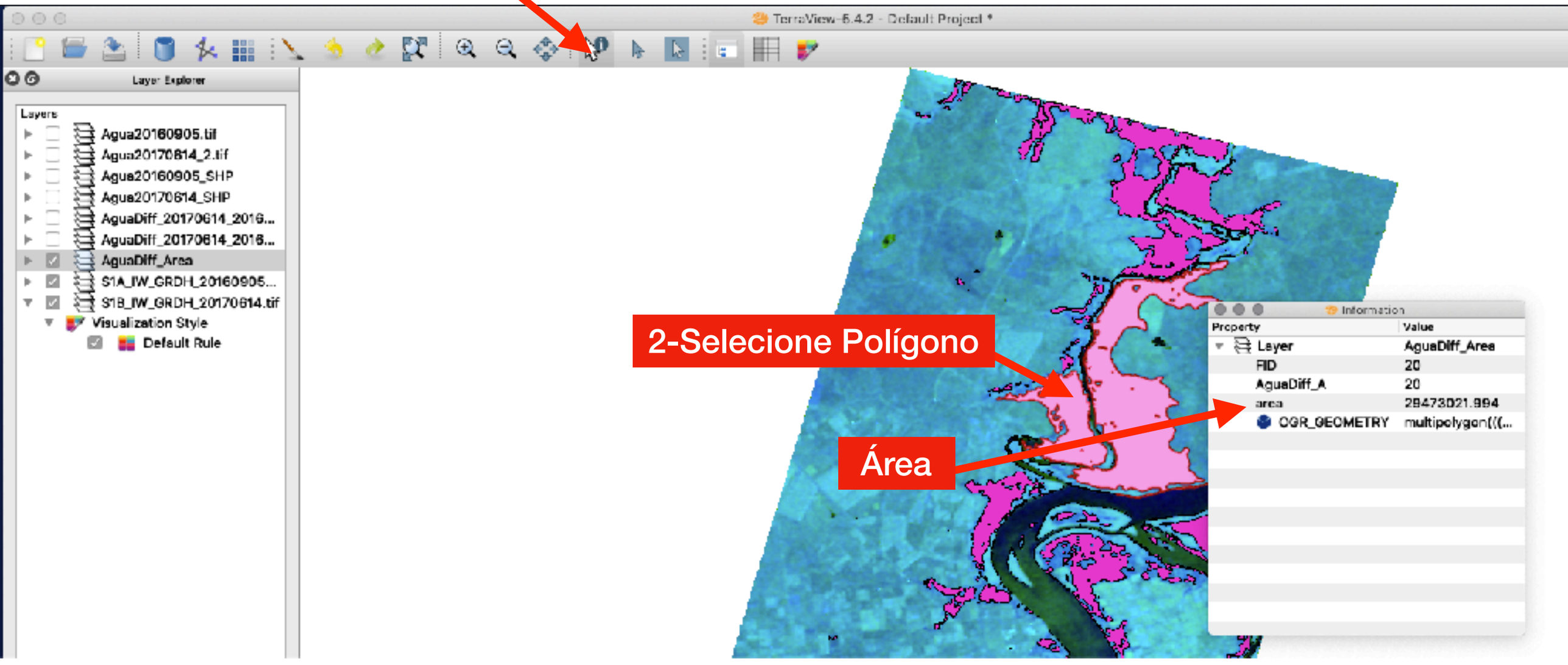
Calculando Área Inundada
Definindo Projeção para Cálculo



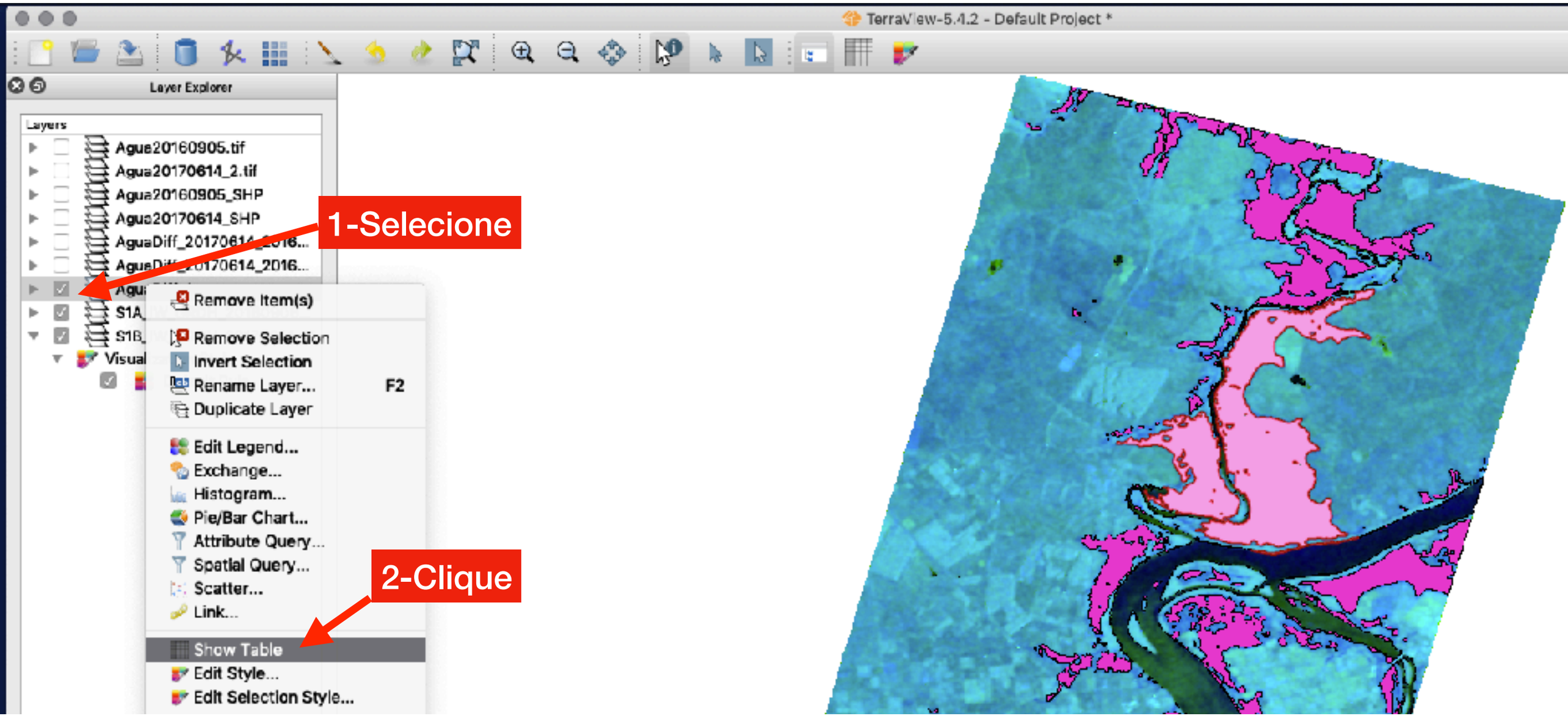


Calculando Área Inundada
Definindo Arquivo de Saída

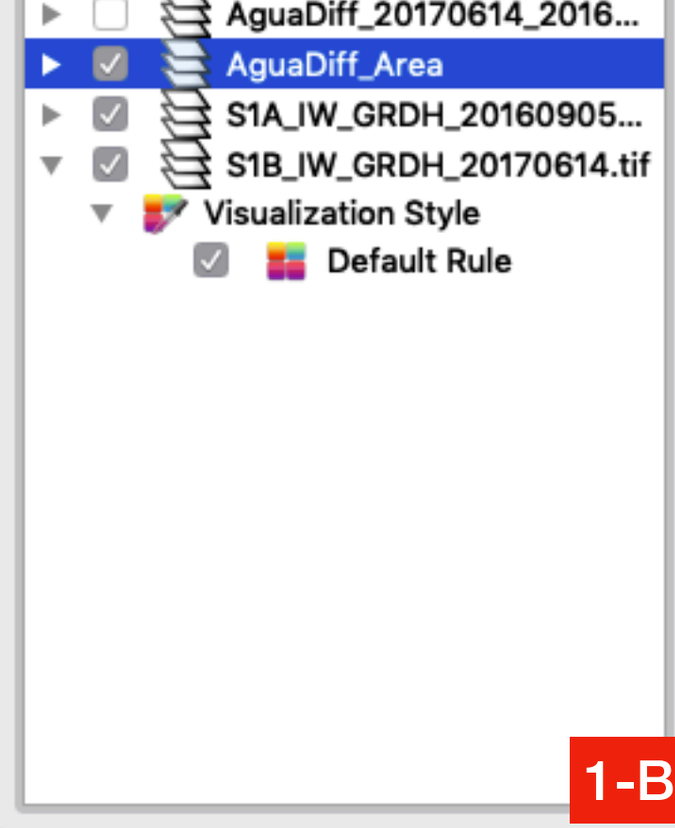
Calculando Área Inundada
Área de Polígono



Calculando Área Inundada
Área de Todos os Polígonos



Calculando Área Inundada
Área: Estatística



1-Botão Direito

	FID	AguaDiff_A	area
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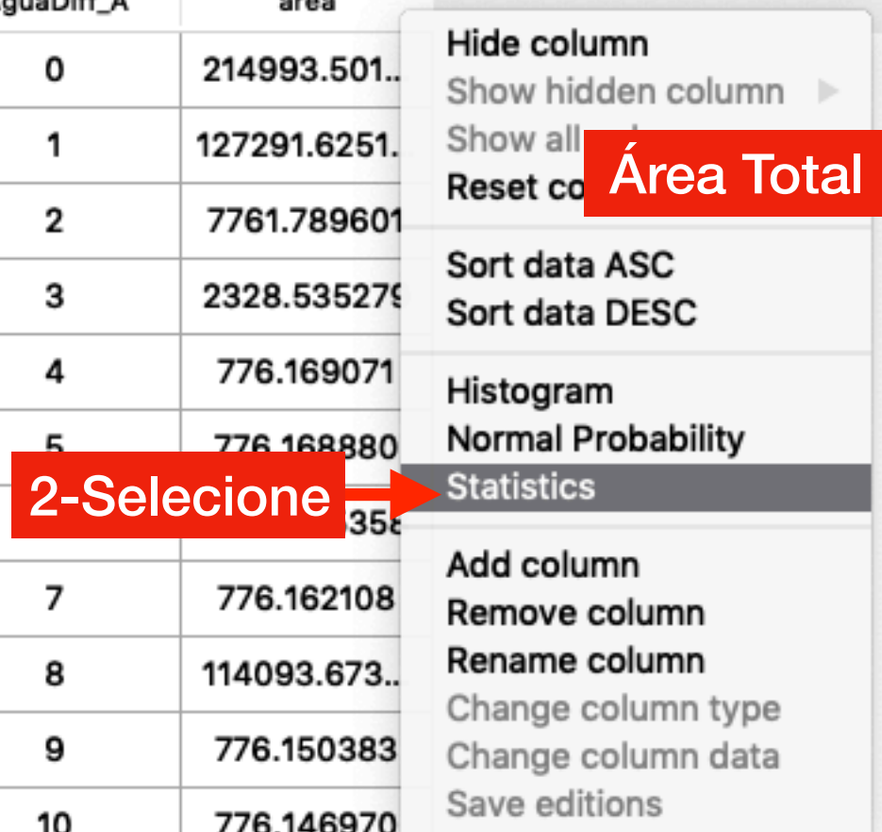
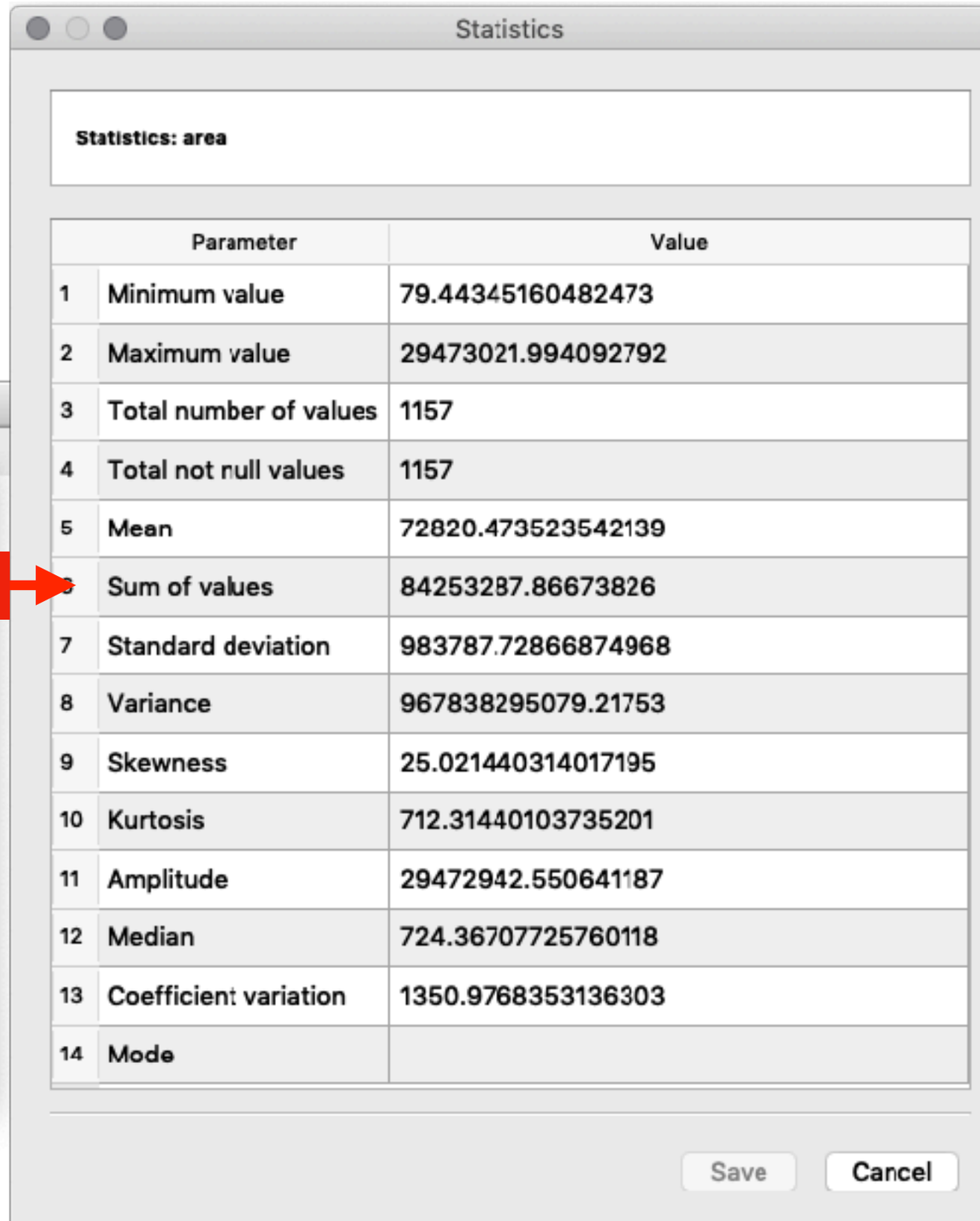
2	1	1	127291.6251.
3	2	2	7761.789601
4	3	3	2328.535279
5	4	4	776.169071
6	5	5	776.168880
7	6		358
8	7	7	776.162108
9	8	8	114093.673...
10	9	9	776.150383
11	10	10	776.146970
12	11	11	1974474.24...
13	12	12	667.234954

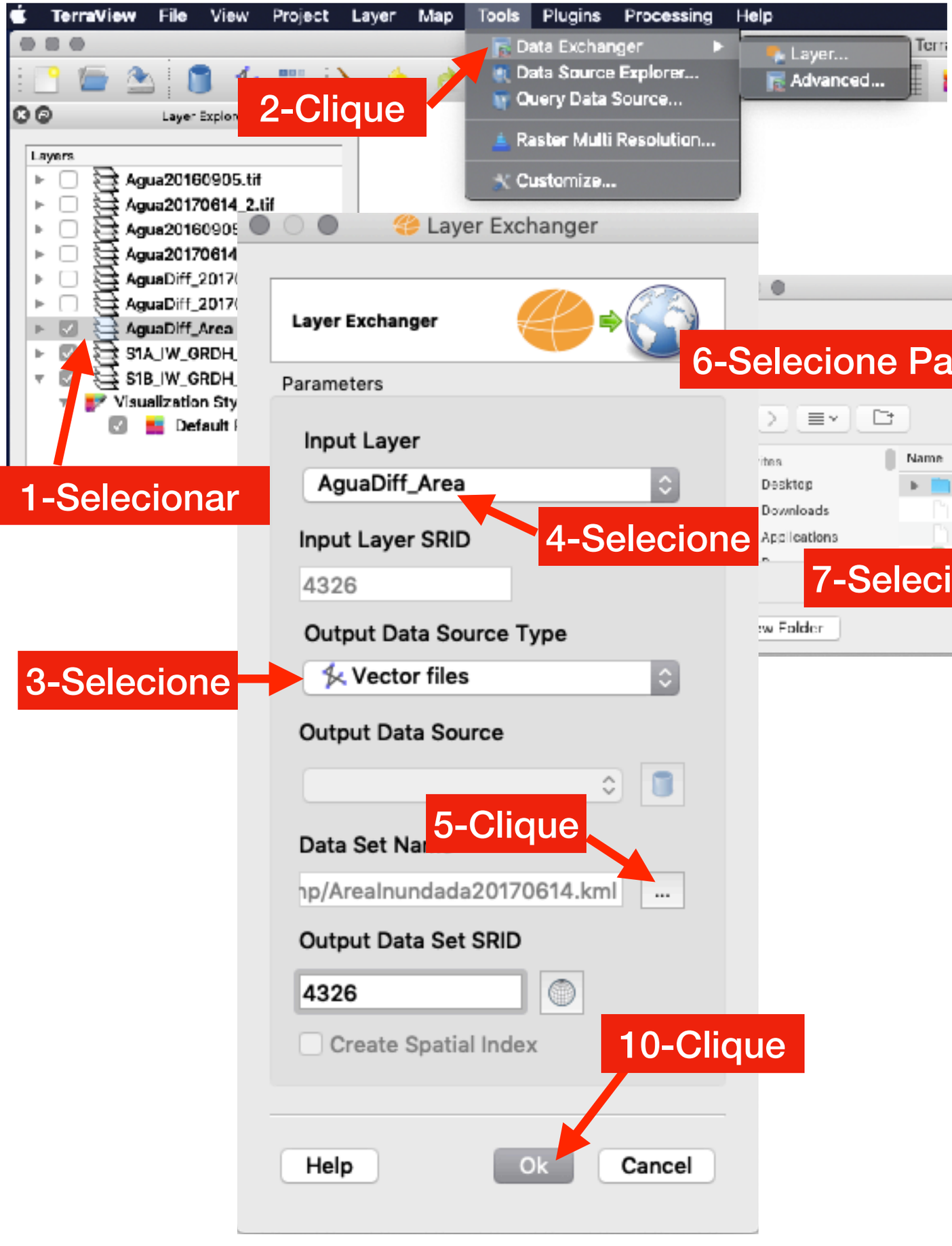


2-Selecione

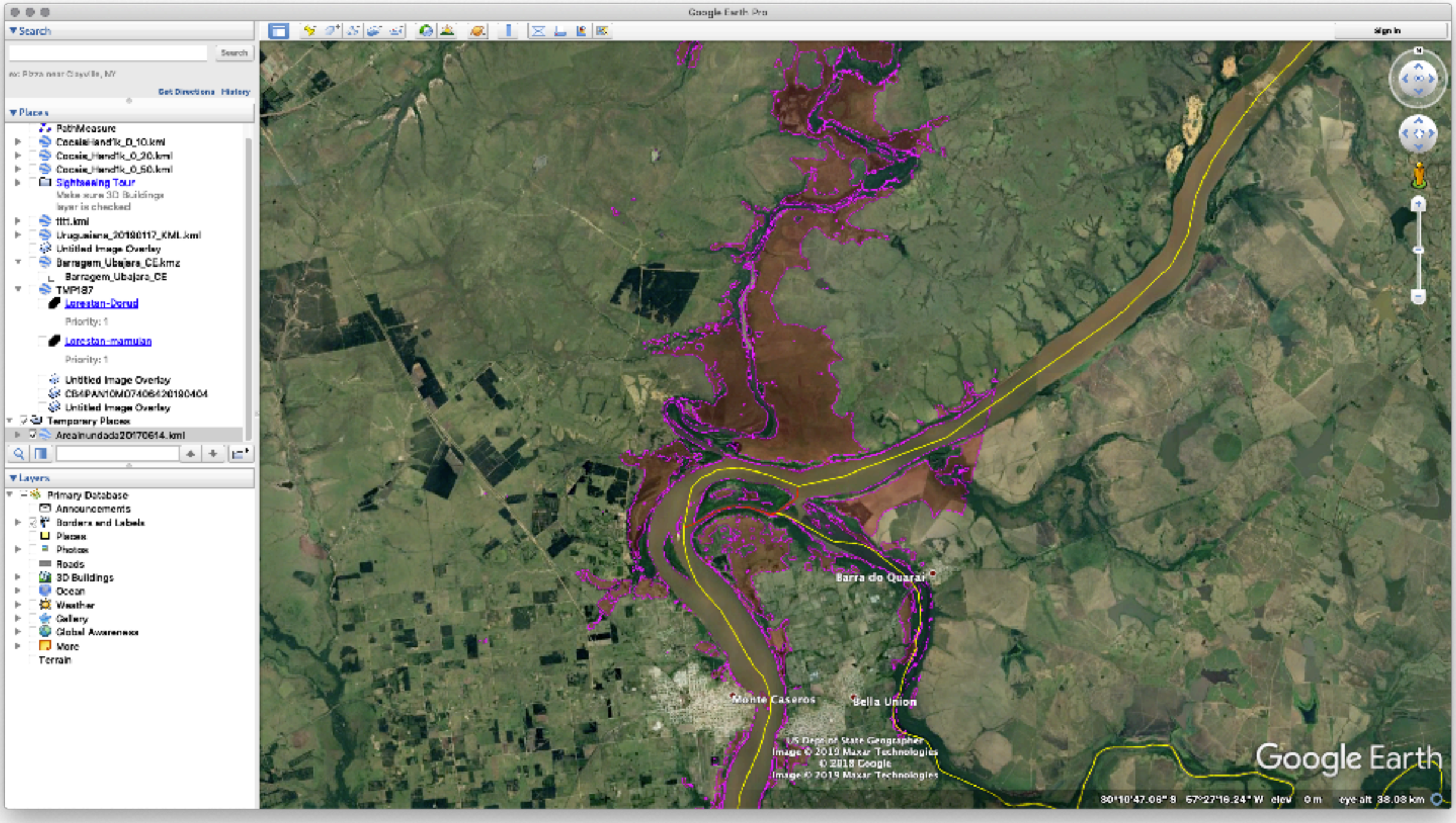
Área Total

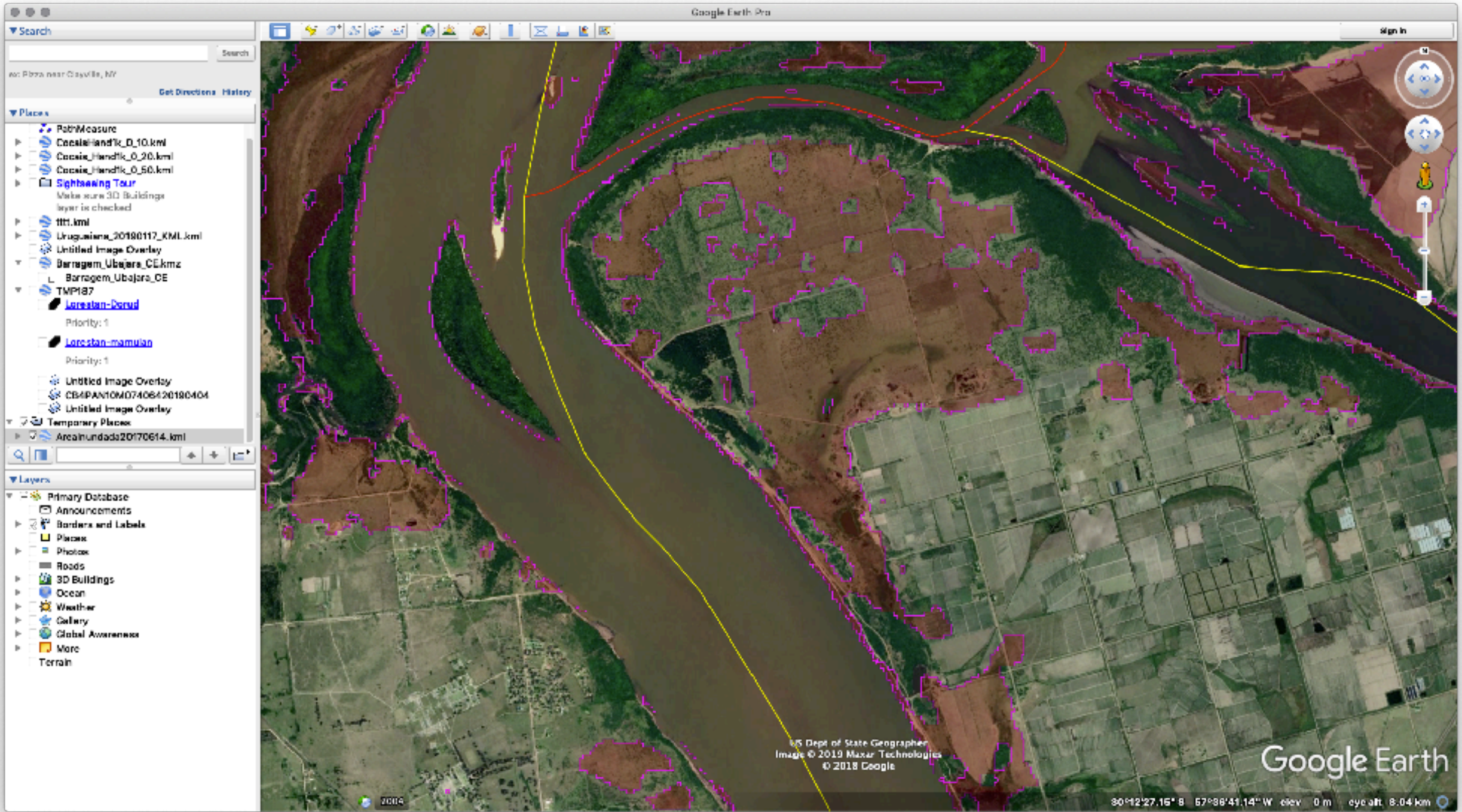


Exportar KML



Visualiza KML




Google Earth Pro
Search
Search
Get Directions
History
Places
PathMeasure
CocaisHandTk_0_10.kml
Cocais_HandTk_0_20.kml
Cocais_HandTk_0_50.kml
Sightseeing Tour
Make sure 3D Buildings layer is checked
ttt1.kml
Uruguaiana_20190117_KML.kml
Untitled Image Overlay
Barragem_Ubajara_CE.kmz
Barragem_Ubajara_CE
TMP187
Loreston-Dorud
Priority: 1
Loreston-mamulan
Priority: 1
Untitled Image Overlay
CB4PAN10M0740642019040 4
Untitled Image Overlay
Temporary Places
Arealnundada20170614.kml
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
More
Terrain
Sign In
US Dept of State Geographer
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2004
Google Earth
30°12'27.16" S 57°36'41.14" W elev 0 m eye alt 8.04 km