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Booklets

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Title: Interface Design for Monitoring and Estimation System for Flooding Through an Image Analysis of Remote Sensing (SAVUI)

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Editorial label ECORFAN: 607-8695
BCONIMI Control Number: 2020-40
BCONIMI Classification (2020): 120320-0040

Pages: 31
RNA: 03-2010-032610115700-14

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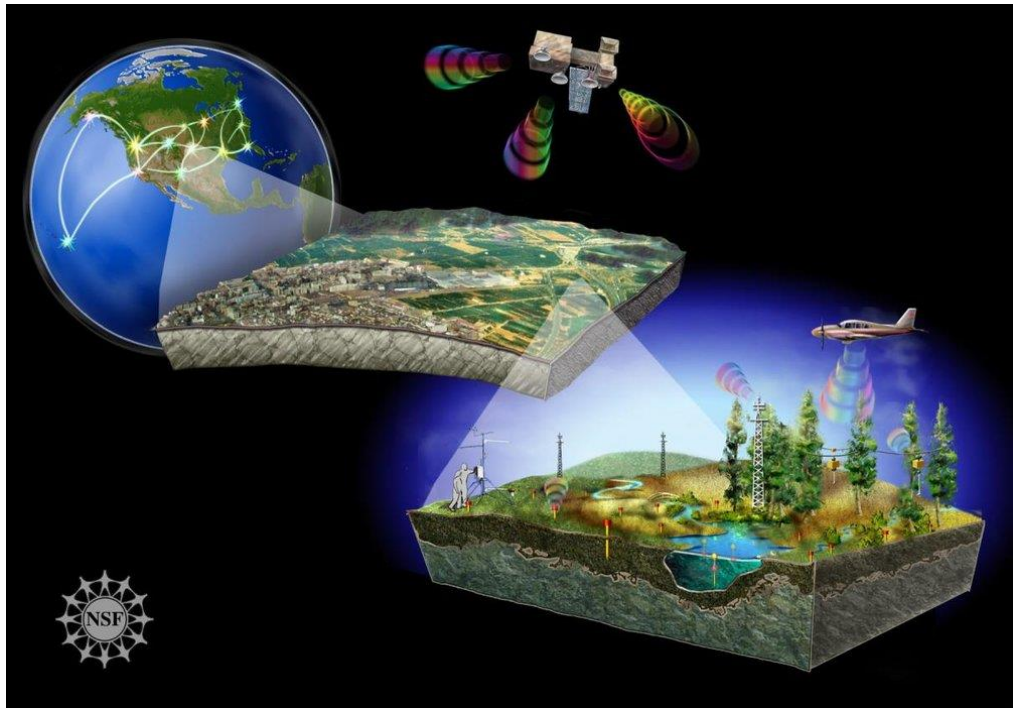
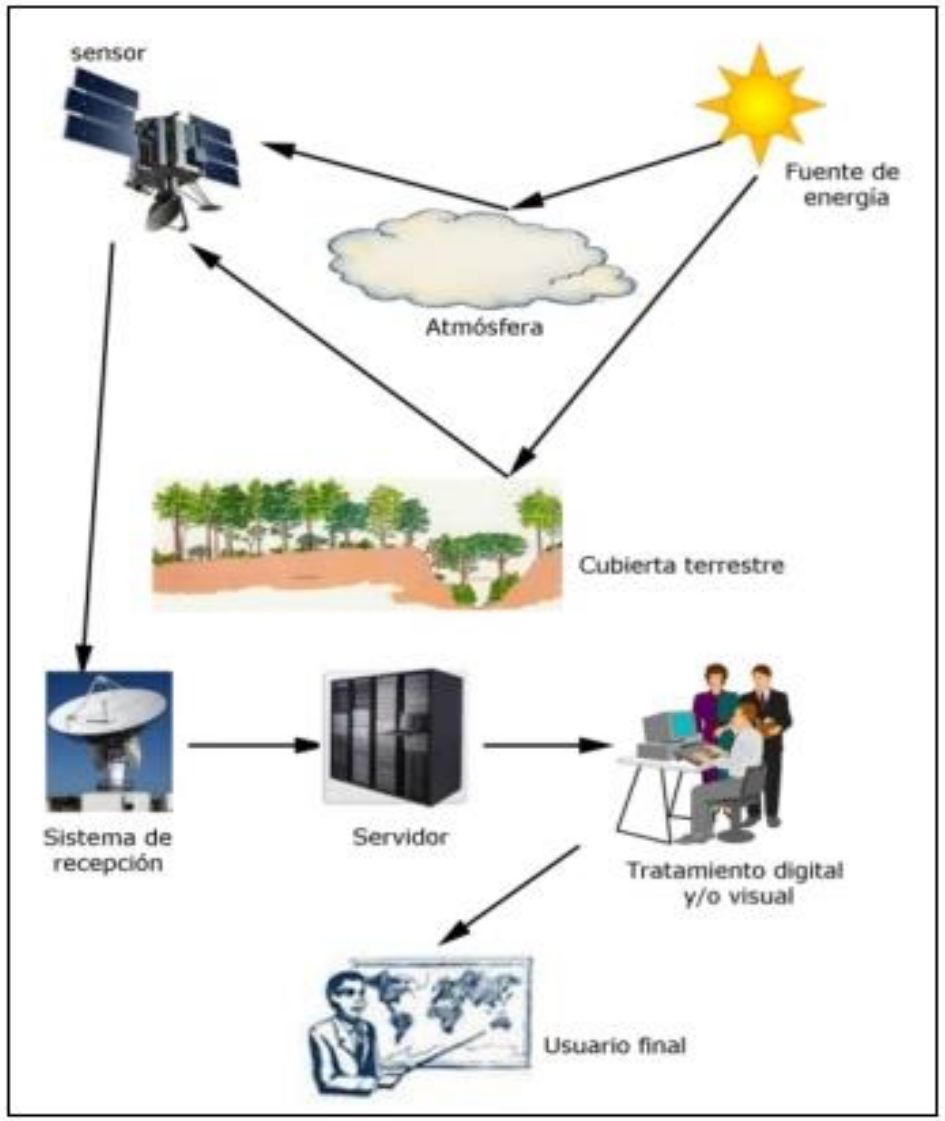
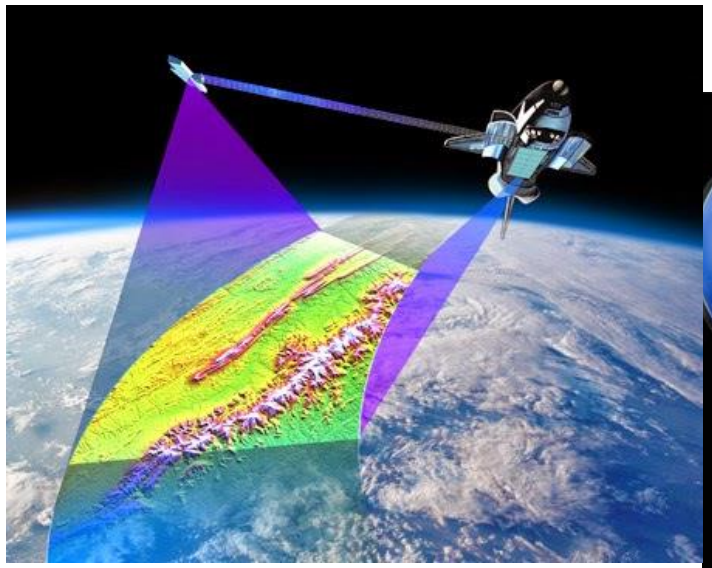
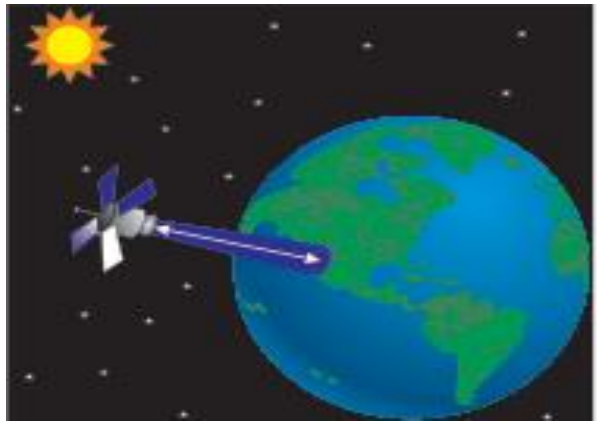
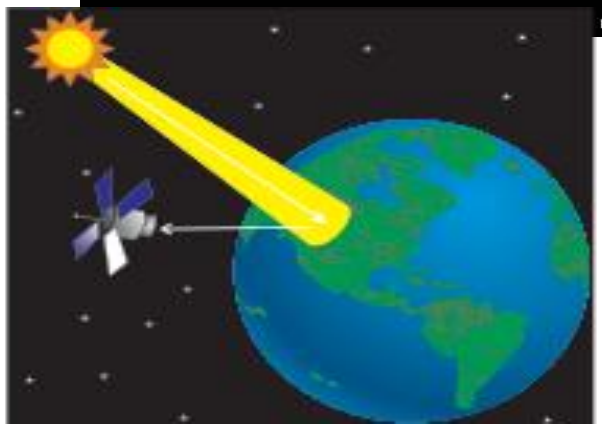


Introduction









Introduction

Rivers in Mexico

Figure 1: Principal rivers in Mexico

Greater rainfall in Mexico

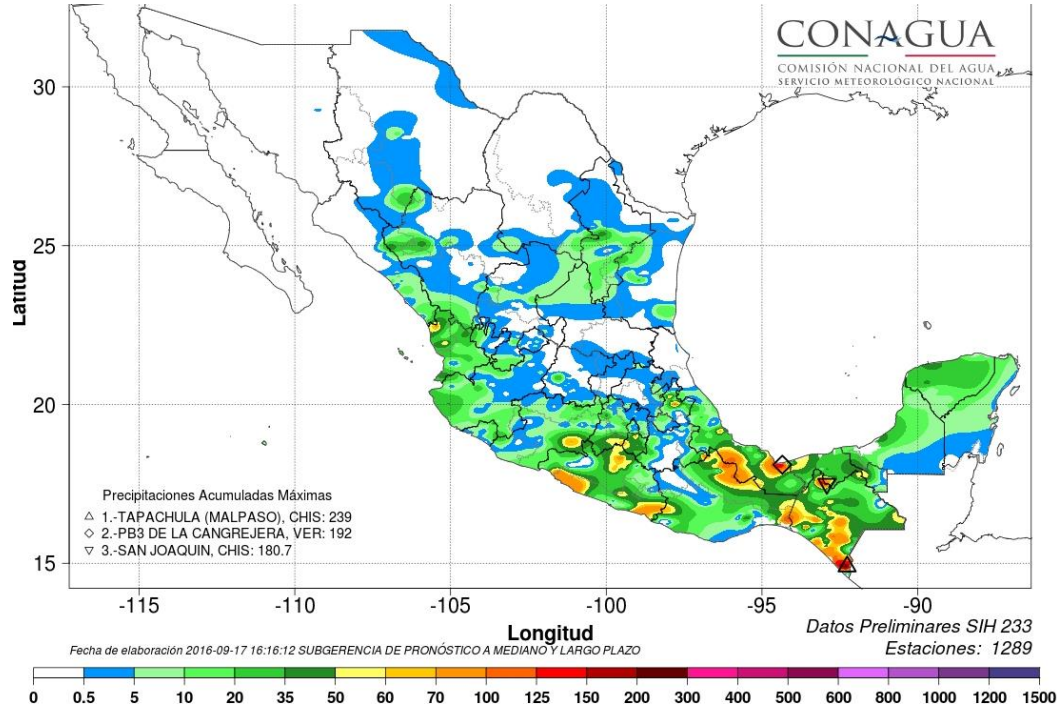


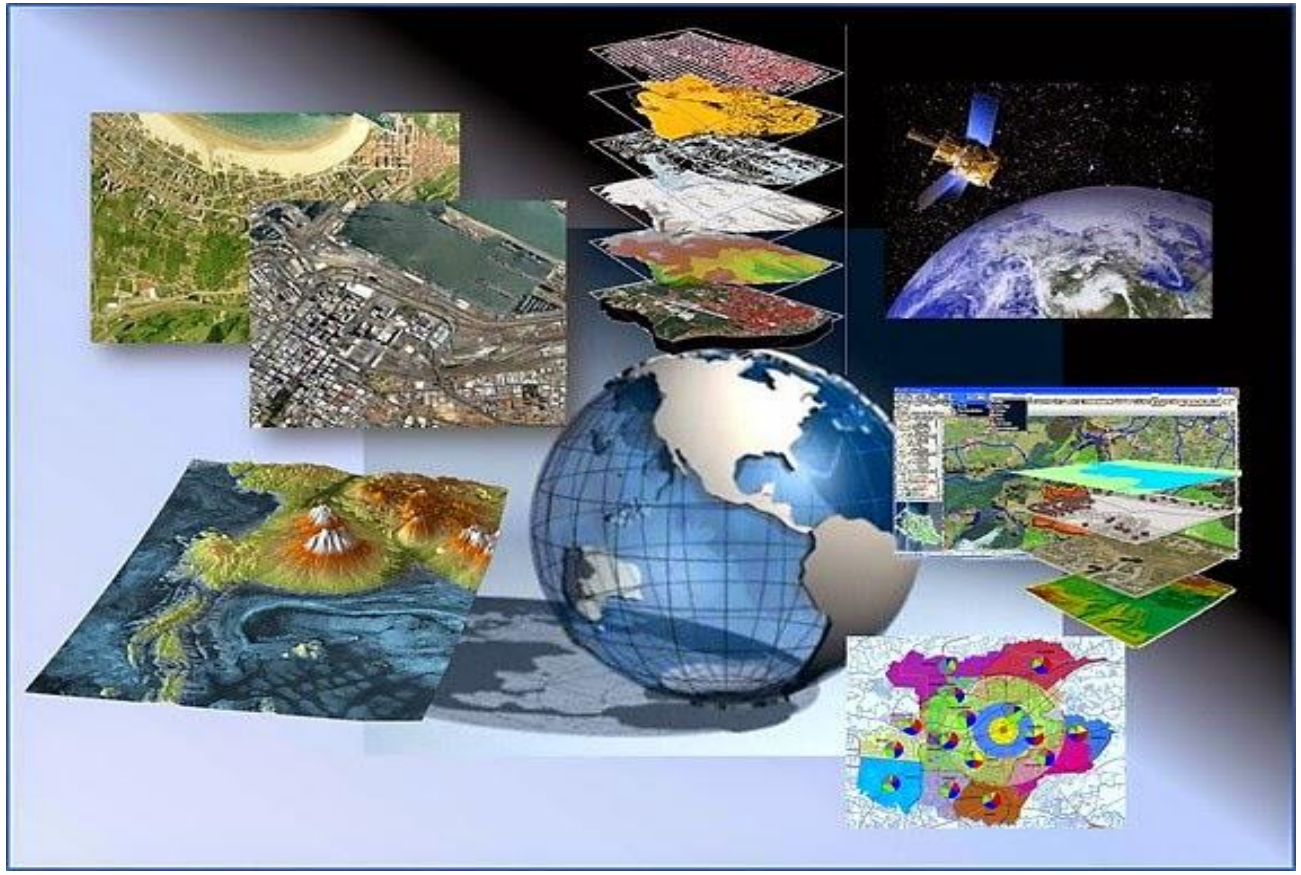
Figure 2: The states of Chiapas and Tabasco have the highest rainfall in Mexico with an average of 1800 mm per year [1].

Motivation

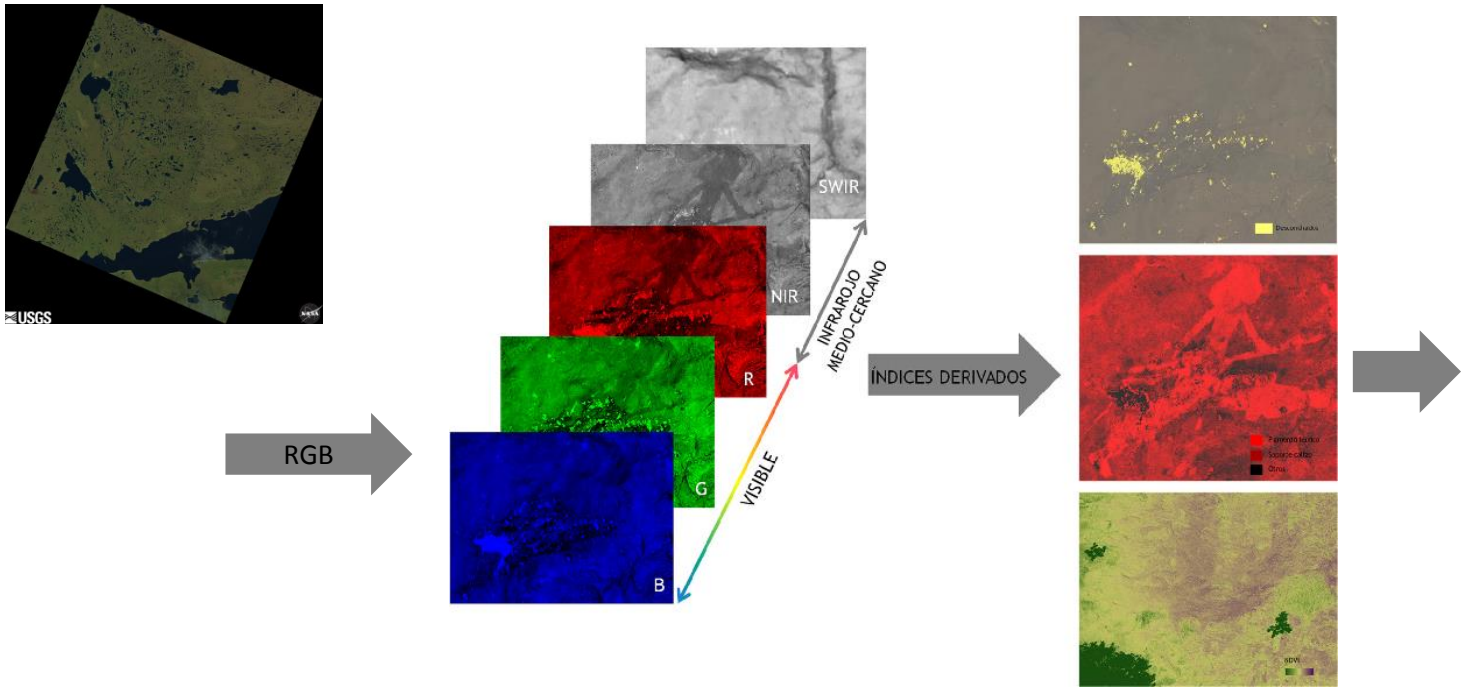
Floods are one of the most common natural phenomena in Mexico. Hundreds of river overflows occur every year.

Motivation

Multispectral remote sensing systems allow obtaining several characteristics of a scene of interest, which helps to classify, segment and analyze images.



Background (Multispesctral image)



BAND	wavelength	Spectrum zone
1	0.435-0.451	30 m Coastal/ Aerosol
2	0.452-0.512	30 m Azul
3	0.533-0.590	30 m Verde
4	0.636-0.673	30 m Roja
5	0.851-0.879	30 m NIR
6	1.566-1.651	30 m SWIR -1
7	2.107-2.294	30m SWIR-2
8	0.503-0.676	15m Pan
9	1.363-1.384	30m Cirrus
10	10.60-11.19	100 m TIR-1
11	11.50-12.51	100 m TIR-2

Figure 3: Multispectral image

Background
Synthetic Aperture Radar (SAR)

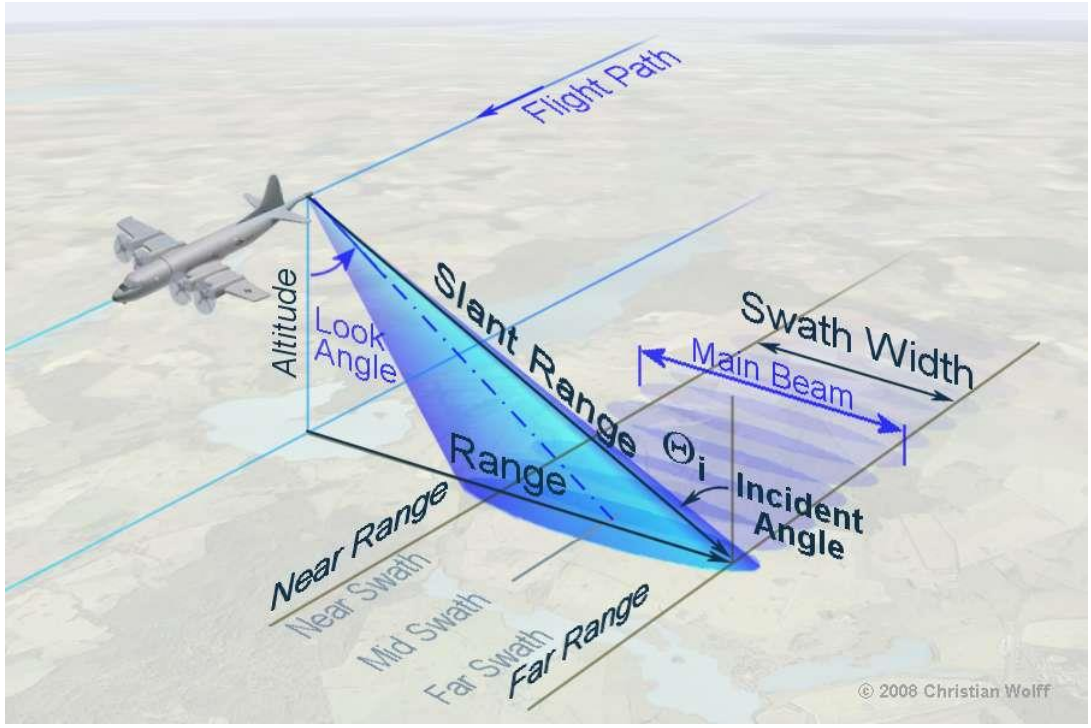
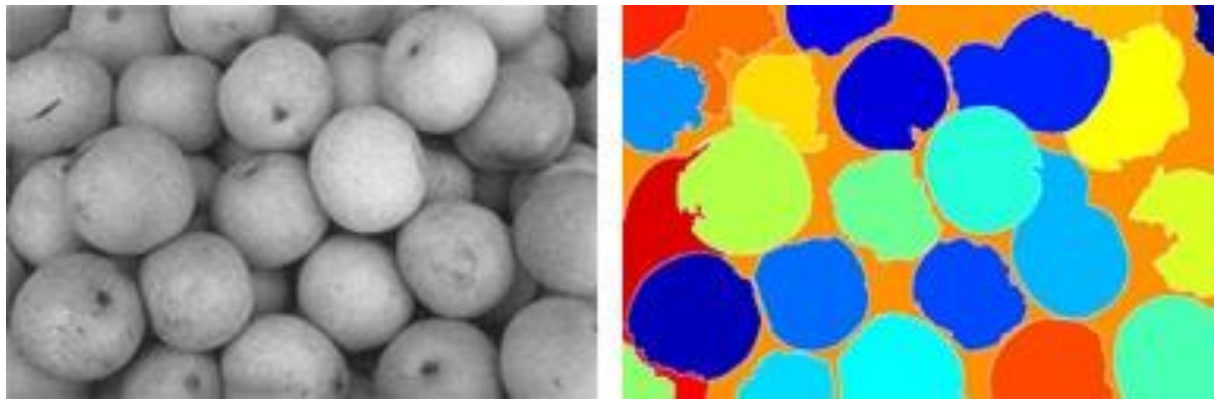


Figure 4: SAR configuration

Figure 5: SAR example

What is segmentation?

The goal of image segmentation is to cluster pixels into outstanding image regions, i.e., regions corresponding to individual surfaces, objects, or natural parts of objects [7-10].



(a) (b)

Figure 6: Example of segmentation; (a) corresponds to the original image, (b) segmented image.

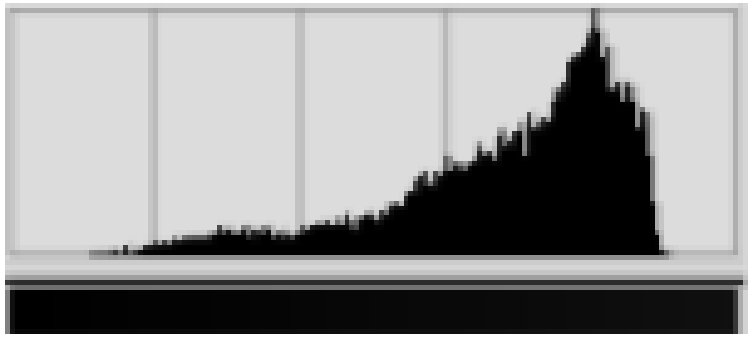
What is required for segmentation?

Gray-scale

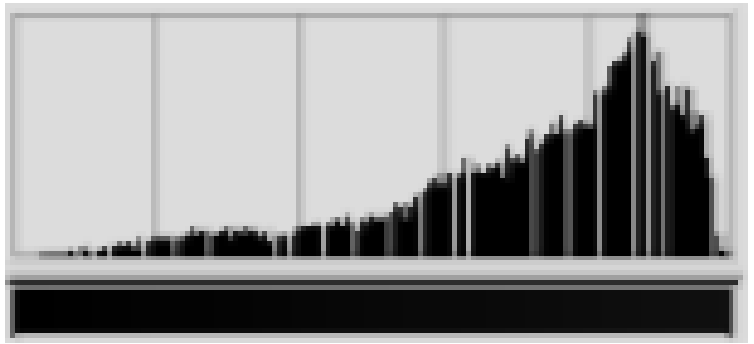
(a) (b)

Figure 7: Example of Gray scale image; (a) corresponds to the original image, (b) gray-scale image.

Normalize



(a)



(b)

Figure 8: Example of normalize image; (a) corresponds to the original histogram of an image, (b) histogram normalized of an image.

What is required for segmentation?

Median and Lee filter

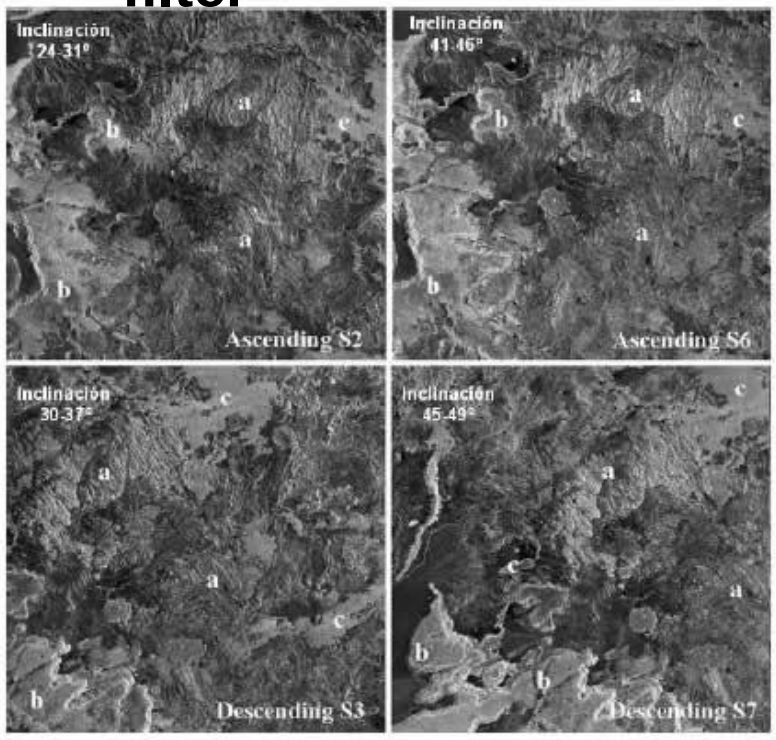


Figure 9: Example of application of LEE and median filter to SAR images.

Wavelet Transform

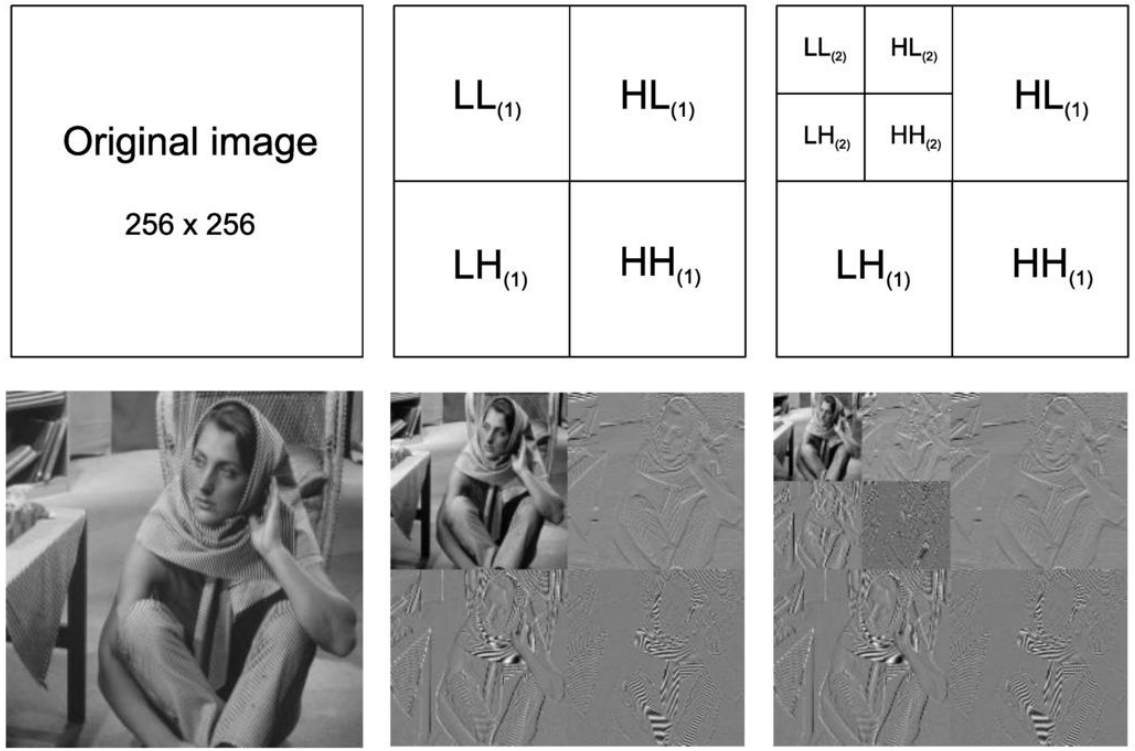
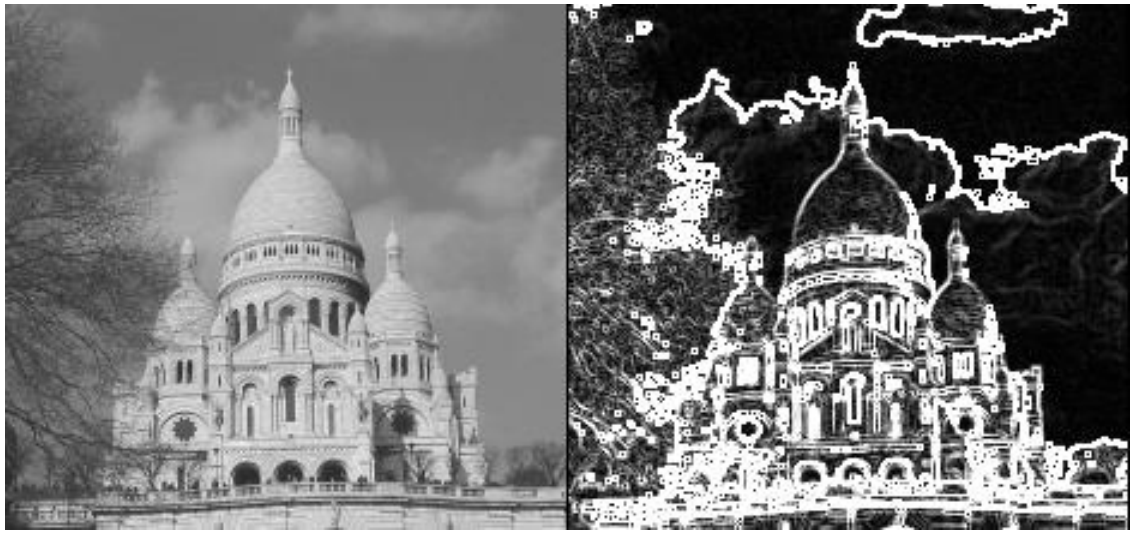


Figure 10: Example of wavelet transform in 2-D in different levels.

What is required for segmentation?

Sobel Filter



(a) (b)

Figure 11: Example of sobel filter; (a) corresponds to the original image, (b) edge extraction.

Binary Image

(a) (b)

Figure 12: Example of binary image; (a) corresponds to the original image, (b) binary image.

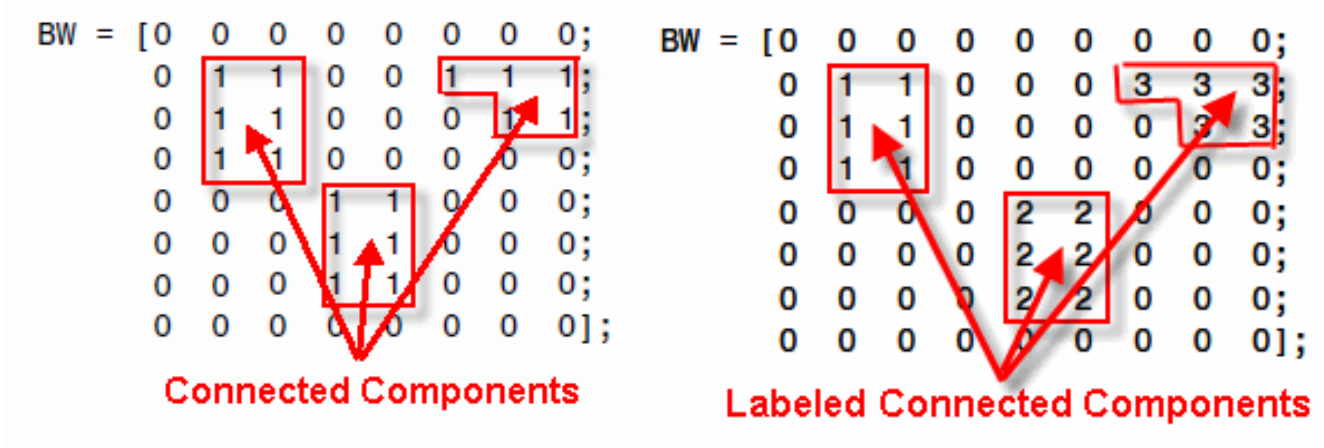
What is required for segmentation?

Dilation

(a) (b)

Figure 13: Example of dilation filter; (a) corresponds to the original image, (b) edge extraction.

Connected Components



(a) (b)

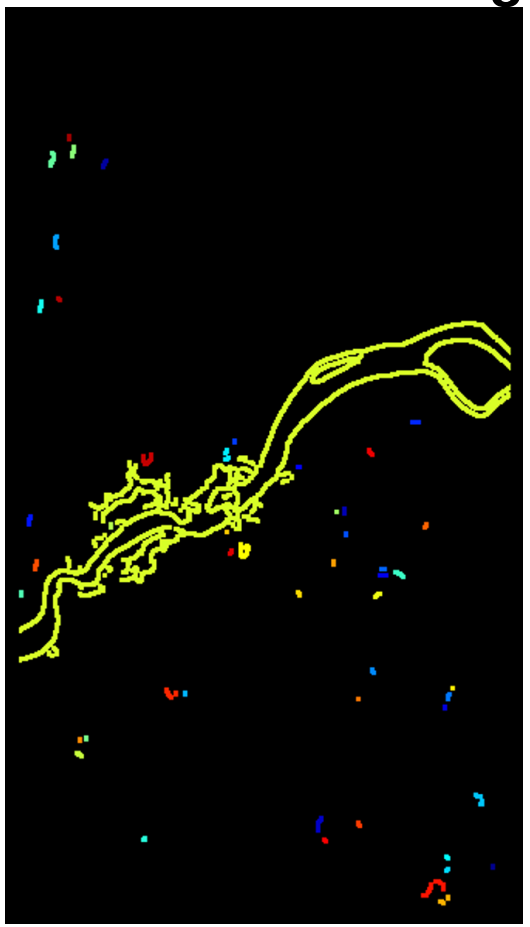
Figure 14: Connected components (a) Example of pixel grouping (connected components), (b) Labeled connected components.

What is required for segmentation?

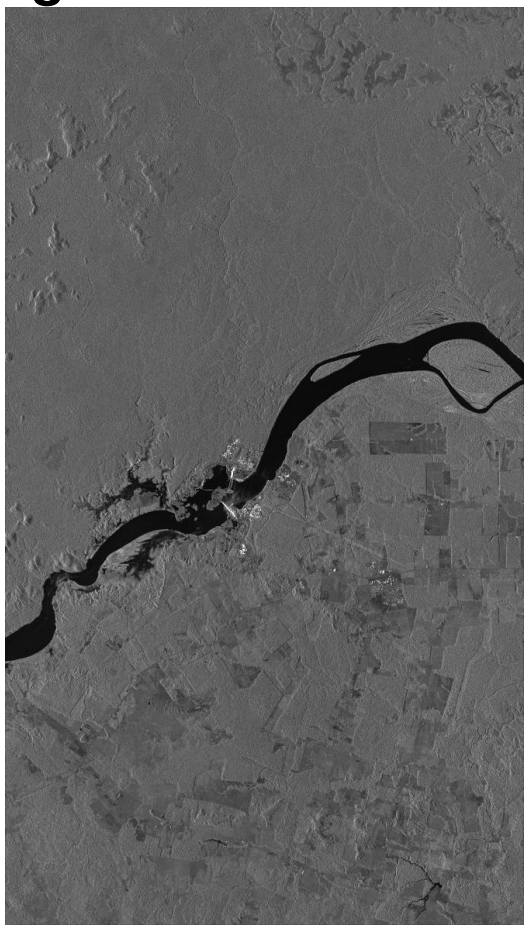
Mask

Figure 15: An example of Mask (ROI) in image processing.

Highlig



(a)



(b)

Figure 16: (a)Highlight image, (b) original image.

What is required for segmentation?

Projection

Figure 17: Projection of the highlight image (flooding) in the original image (without flooding).

Methodology

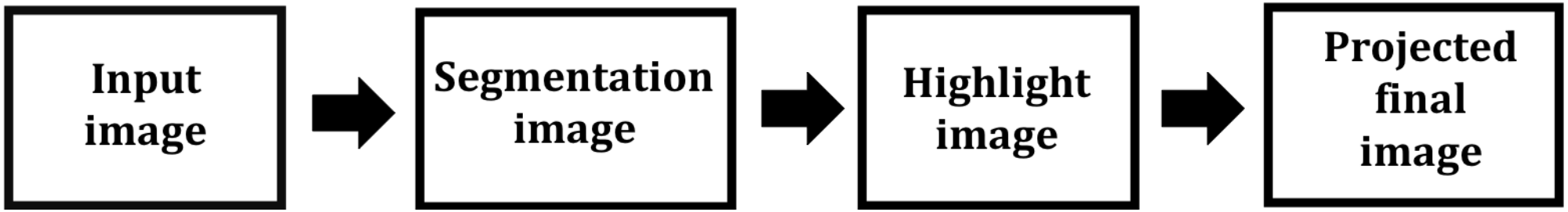


Figure 18: Flow Chart

Methodology

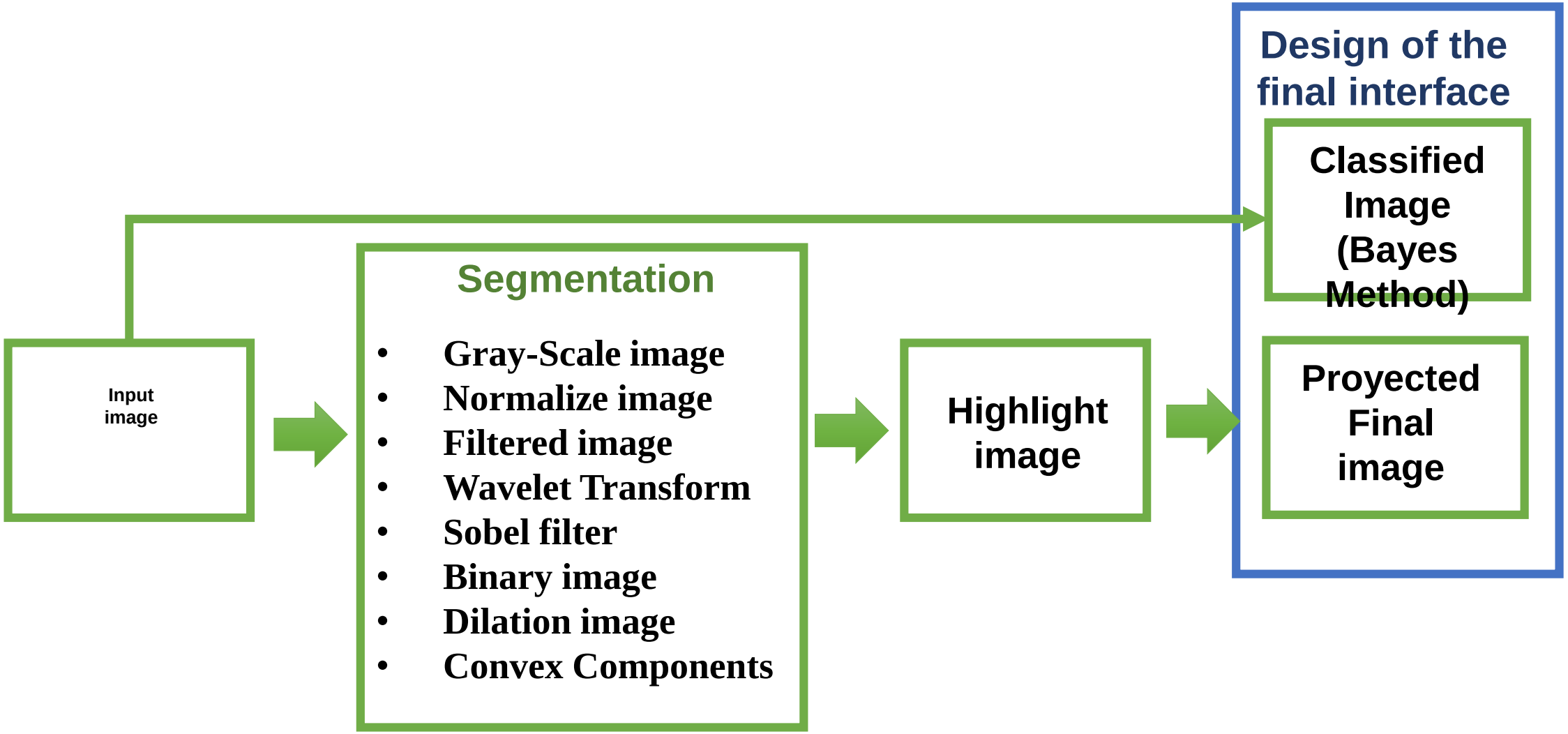


Figure 19: Final algorithm for the project.

Interface and Results

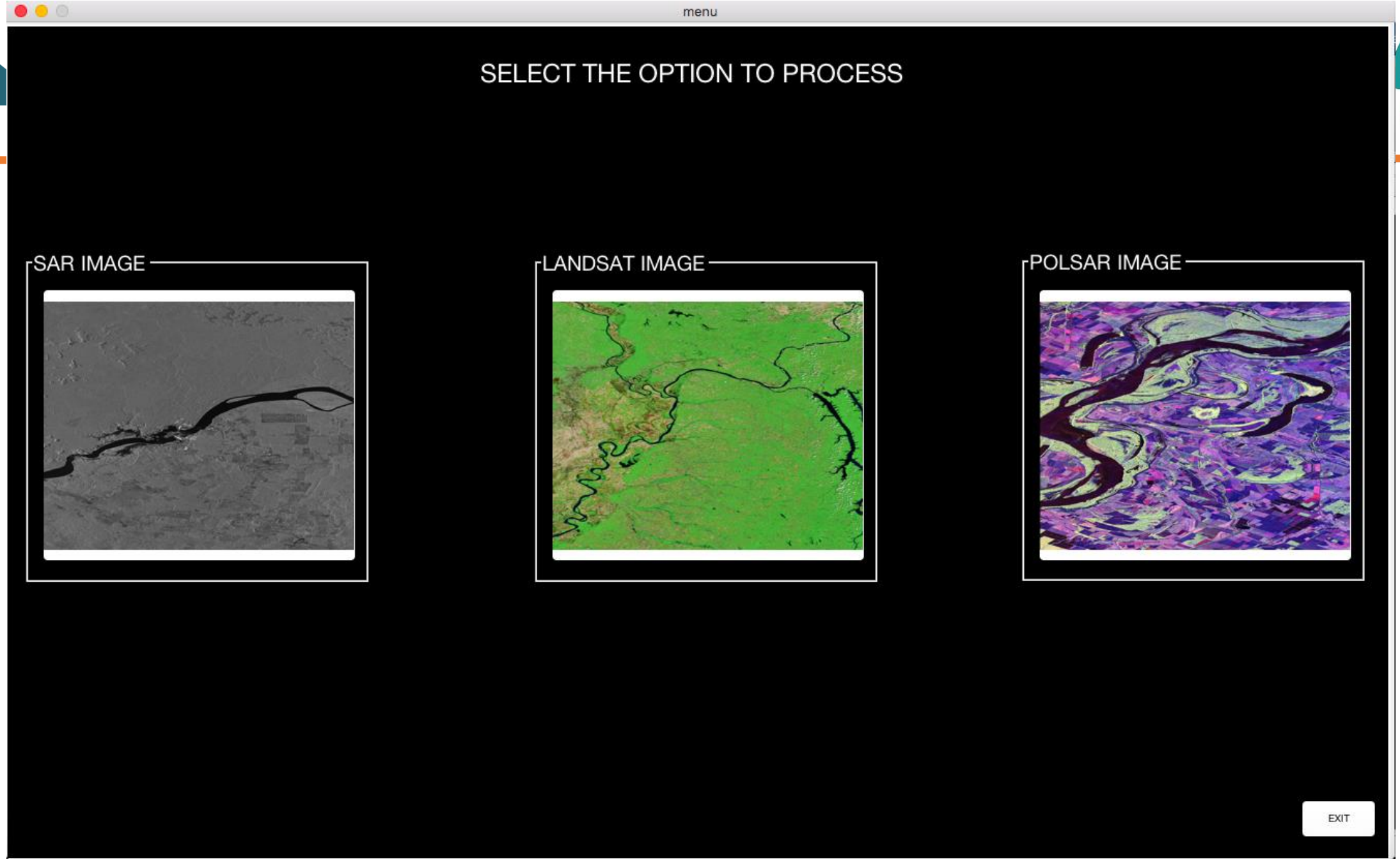


Figure 20: Interface, selection of the options

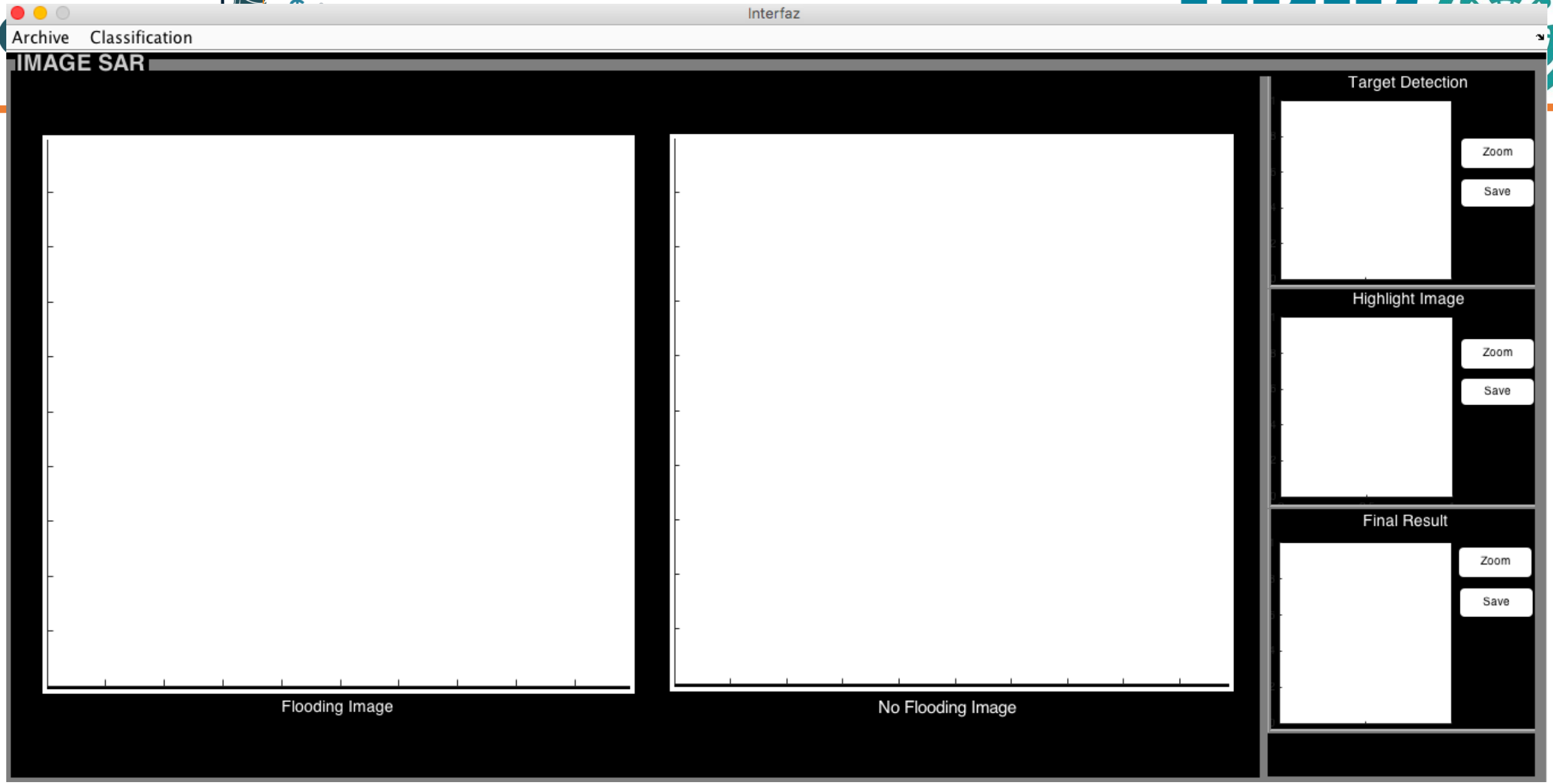


Figure 21: Image SAR interface (segmentation and projection of the flooding

Figure 22: Example of the image segmentation and projection.

Interface and Results

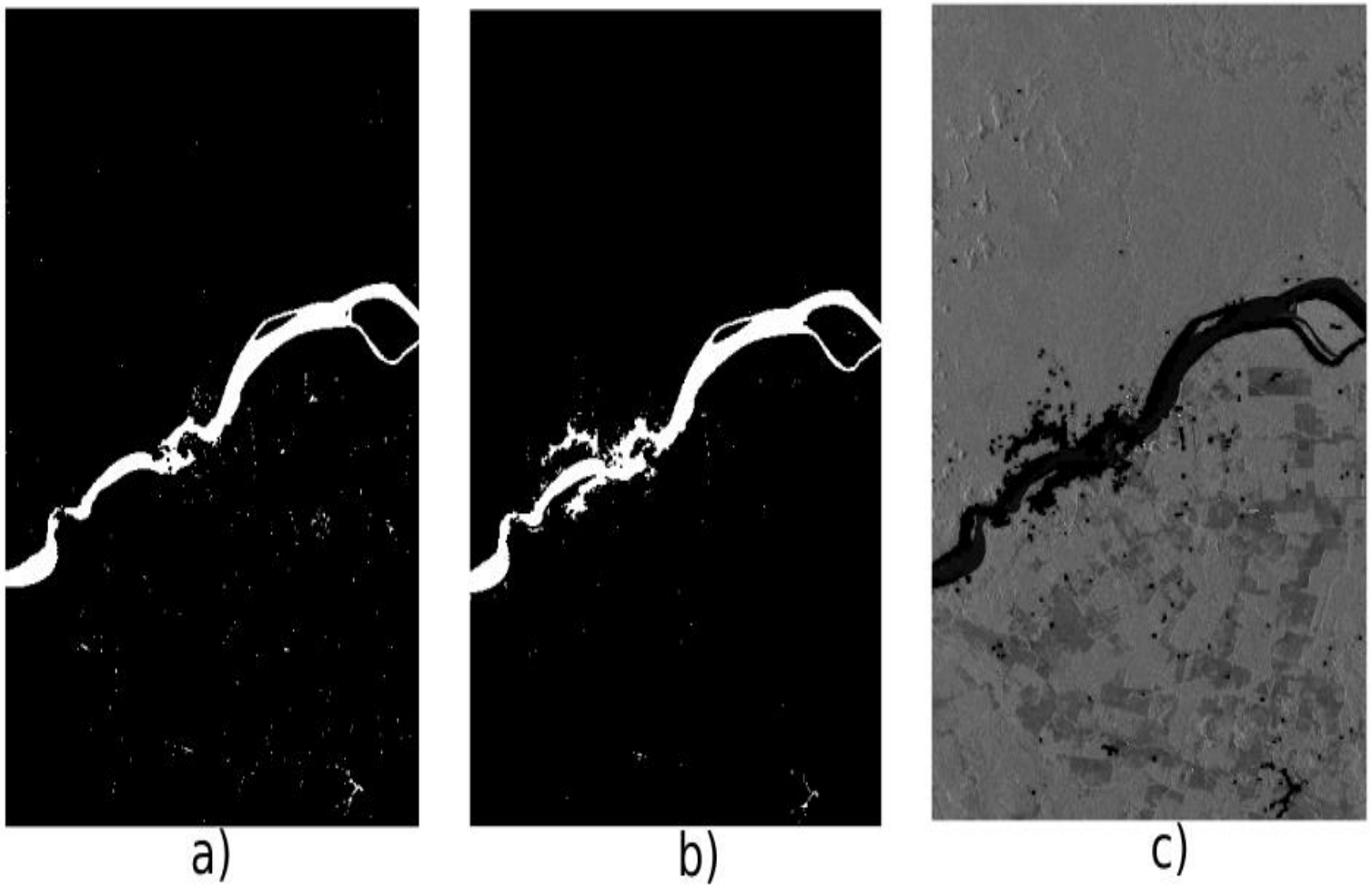


Figura 23 : Ejemplo de segmentación y proyección de imágenes

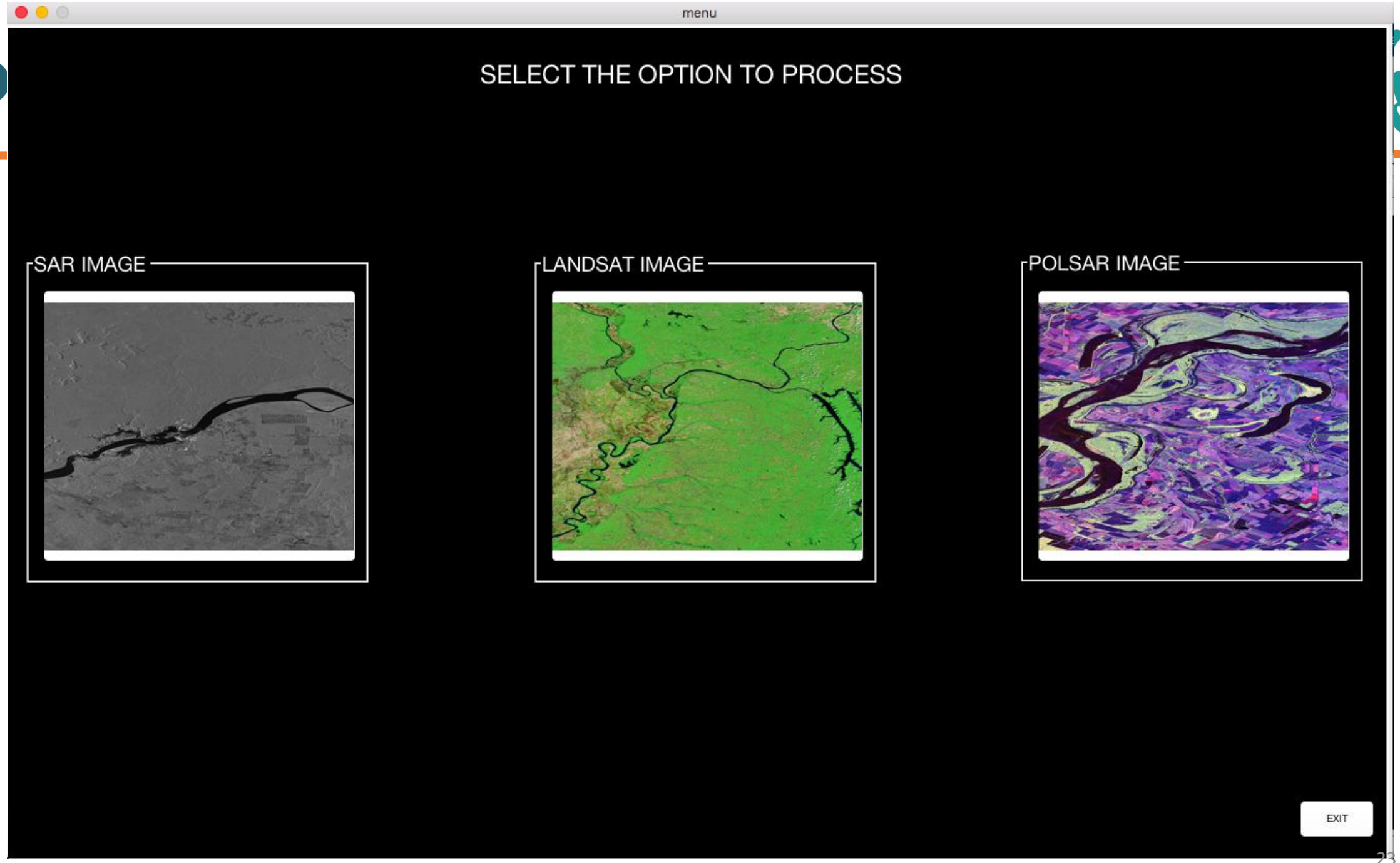
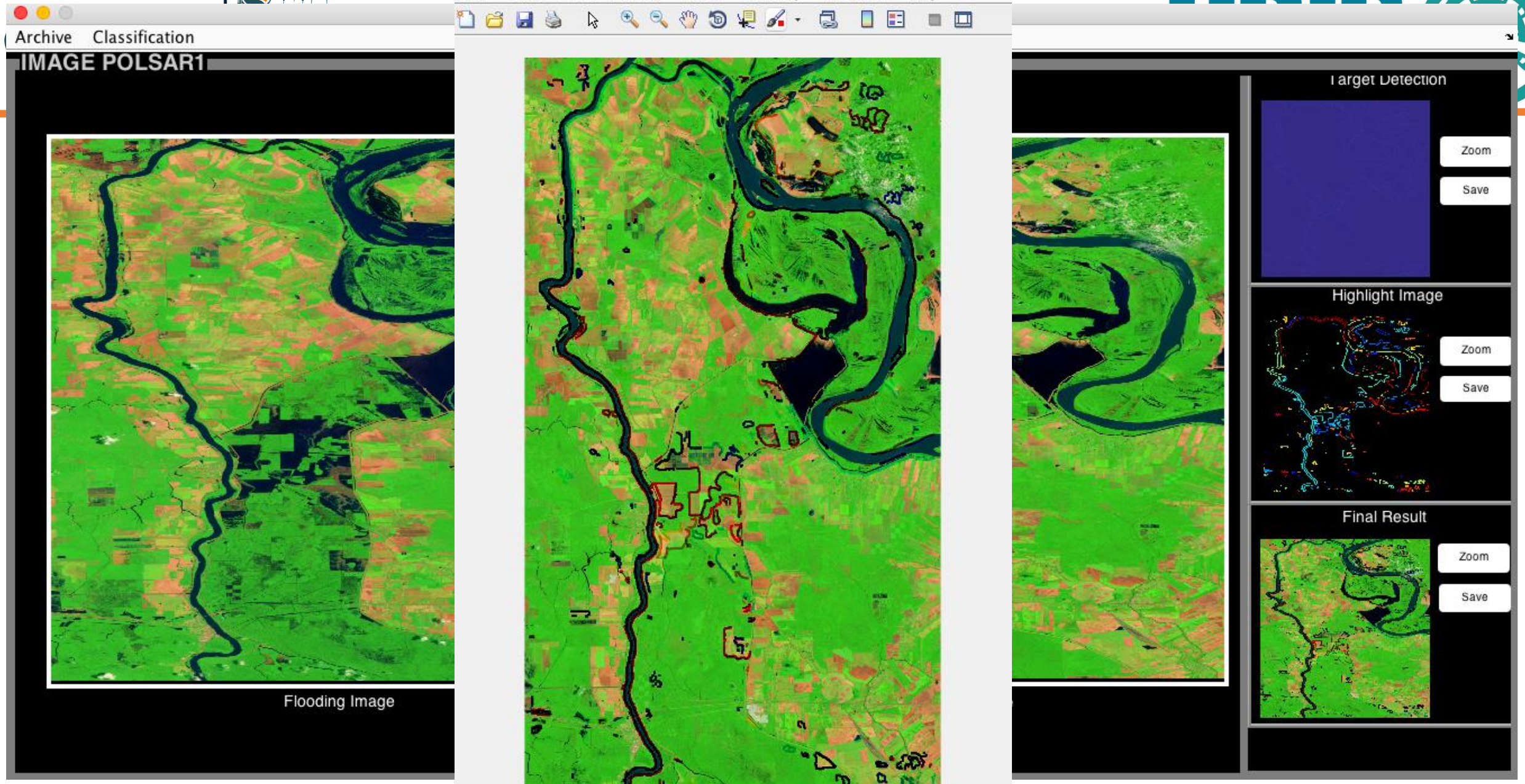


Figure 24: Interface, selection of the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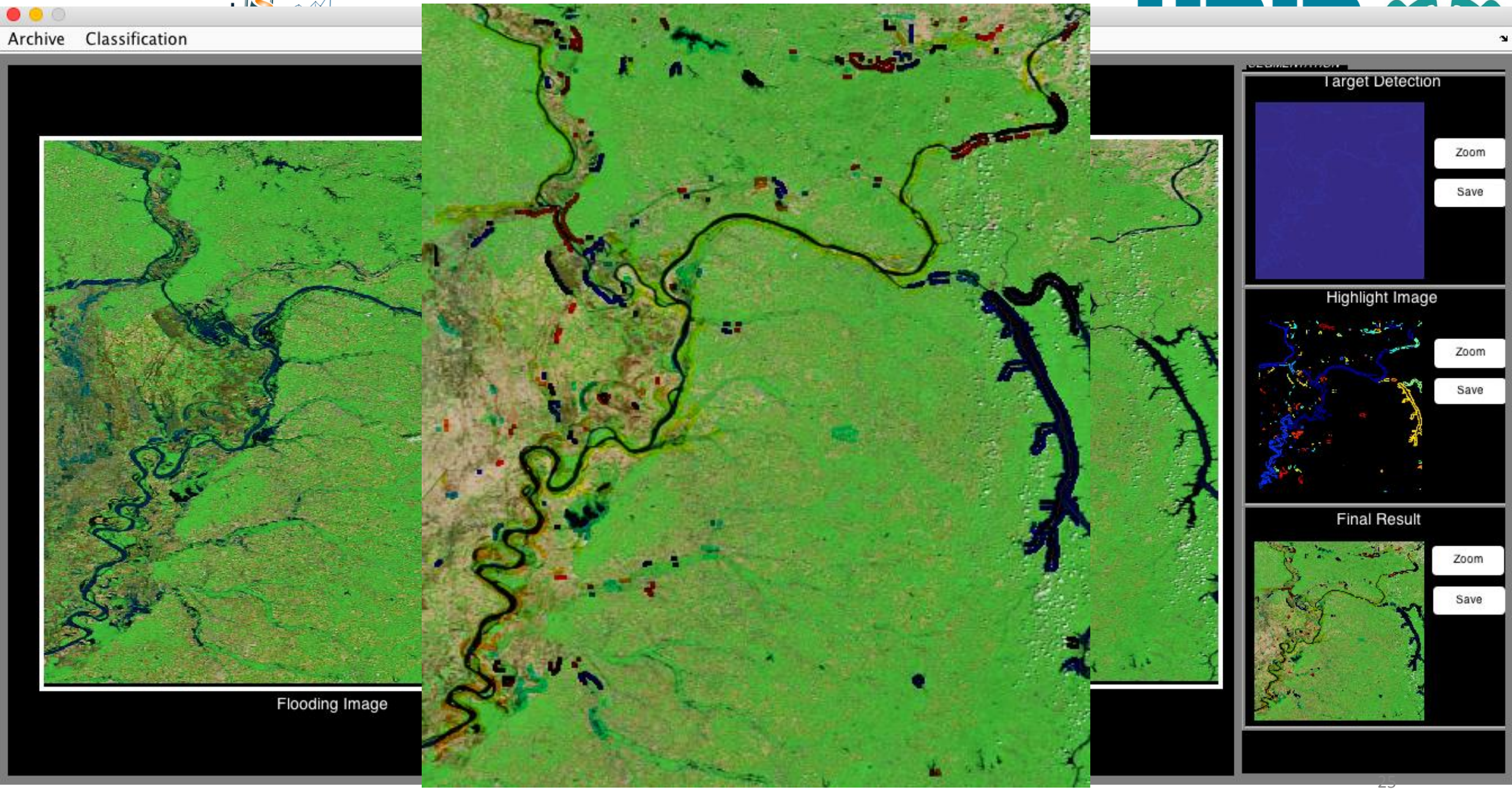
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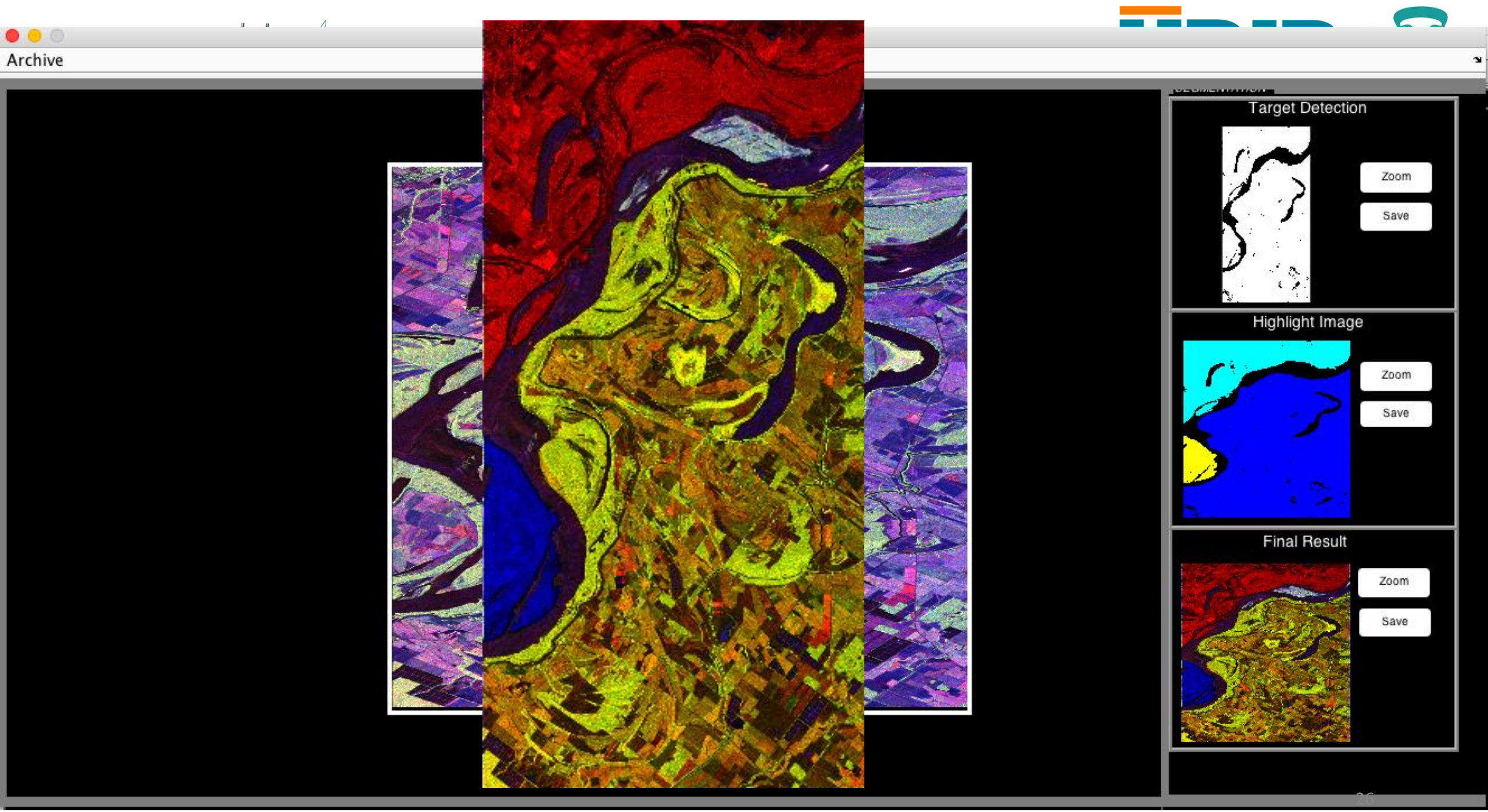
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Conclusions

In this research project shows a tool that process, segmented and detect flooding in SAR, Multispectral and POLSAR images, as well as the incorporation of an GUI interface in Matlab that will facilitate user-computer communication, this through a set of instructions (algorithms) of images, buttons, bar of tools and texts. The relevant about the GUI-interfaces is that it allows the user to have control of the activities or processes to enhancement, features extraction and segmentation images.

The differences to this project with a state of the art mentioned previously are the manipulations of multiple images (SAR, Multispectral and POLSAR), the comparative between the normal image and the flooding image for find the zones with more probability of flooding.

This software is the first part of an extended project, for future work, the second part is the use of artificial intelligence for detecting flooding, also the segmentation of water, cities, vegetation and other elements, the third part of the project is to develop a software with all the previous steps in open source and the use of QT for interface design.

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diseño de interfaz para el Sistema de monitoreo y estimación de inundAciones a traVés de Un análisis de Imágenes de percepción remota (SAVUI)

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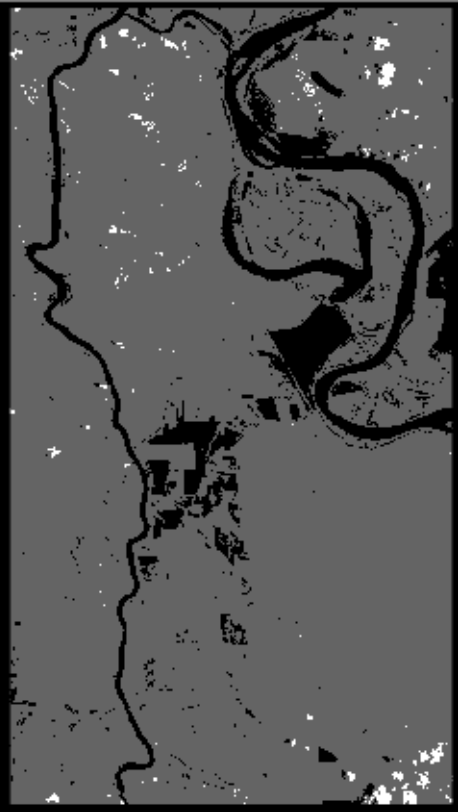

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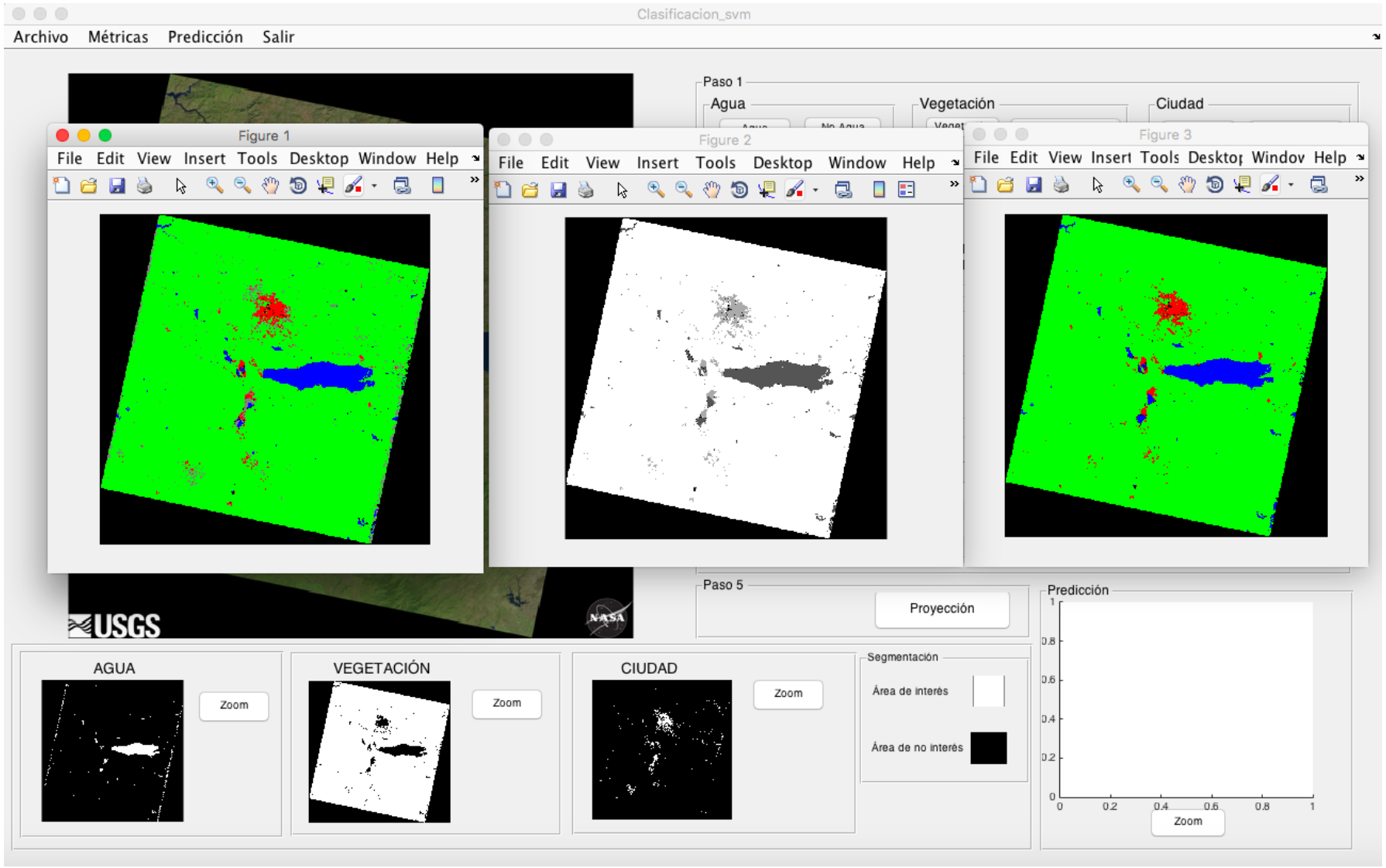
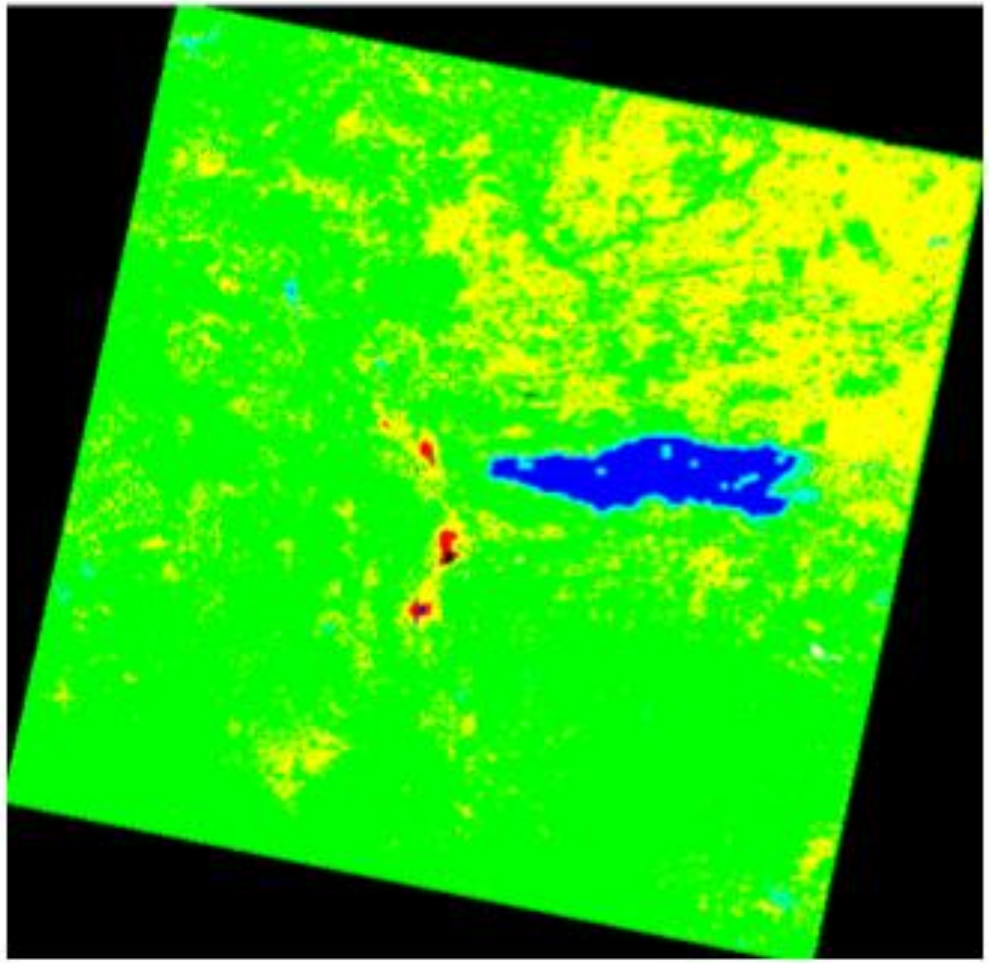
Water

Population

Land

Interfaz SVM





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