



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

**BATHYMETRIC MODELS DERIVED FROM SATELLITE IMAGES OF HIGH RESOLUTION
IN “SAN ANDRÉS, PROVIDENCIA Y SANTA CATALINA” ARCHIPELAGO (2013-2016)**

Lieutenant Commander
Gustavo Adolfo Gutiérrez Leones
Head of Hydrography Area
Oceanographic and Hydrographic Research Center of Caribbean
National Hydrographic Service of Colombia
ggutierrez@dimar.mil.co

GEBCO SCIENCE DAY
Valparaiso – Chile, September 12th 2016

SAN ANDRÉS

Archipelago

NO CLASIFICADO



Dímar
Dirección General Marítima
Autoridad Marítima Colombiana



NO CLASIFICADO

THE PROBLEM



INSUFFICIENT DATA



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2016 Google
Image © 2016 DigitalGlobe

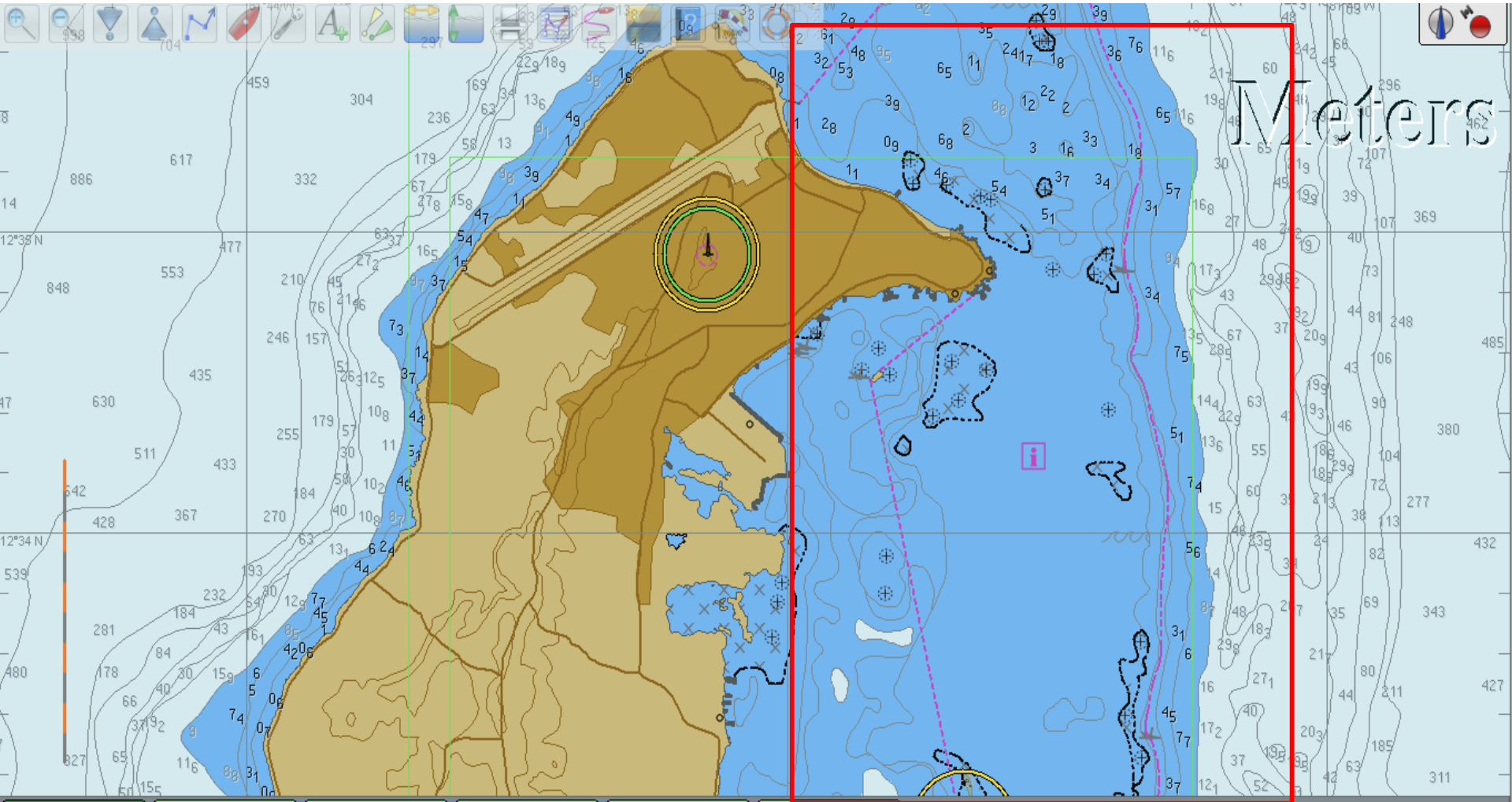
Google earth

Guía turística 1970 Fechas de imágenes: 12/13/2015 17 P 424155.49 m E 1390106.14 m N elevación 0 m alt. ojo 6.33 km



THE PROBLEM

INSUFFICIENT DATA



THE MAIN REASONS

Of the problem



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

DIFFICULT ACCESS

It is not possible to conduct hydrographic operation with the traditional methodology



THE SOLUTION

The project



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

BATHYMETRIC MODELS DERIVED FROM SATELLITE IMAGES OF HIGH RESOLUTION IN "SAN ANDRÉS, PROVIDENCIA Y SANTA CATALINA" ARCHIPELAGO. (2013-2016)



DOP Methodology – Depth of Penetration Improving

PhD (c) Alexander Ariza

MBA (c) Osman Roa

Remote Sensing and Geographical applications

La Información Geográfica de Colombia

OBJECTIVE

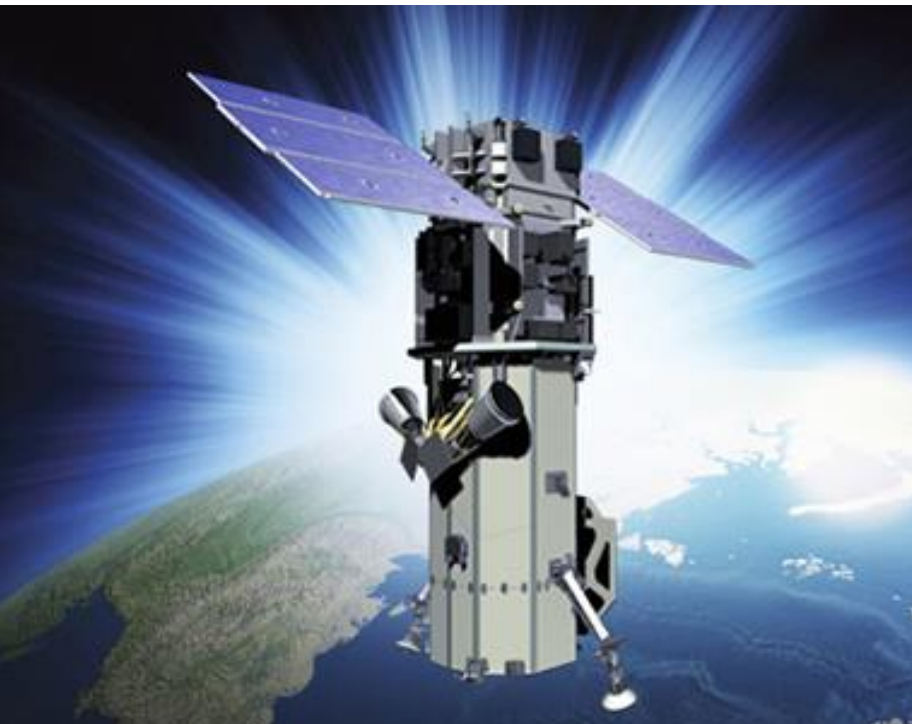


Propose an methodological design to obtain bathymetric model derived from satellite images of HR, to updating cartography in difficult access areas.

DATA Sources



WorldView 3



<http://www.satimagingcorp.com/satellite-sensors/worldview-3/>

2 m

LANDSAT 8

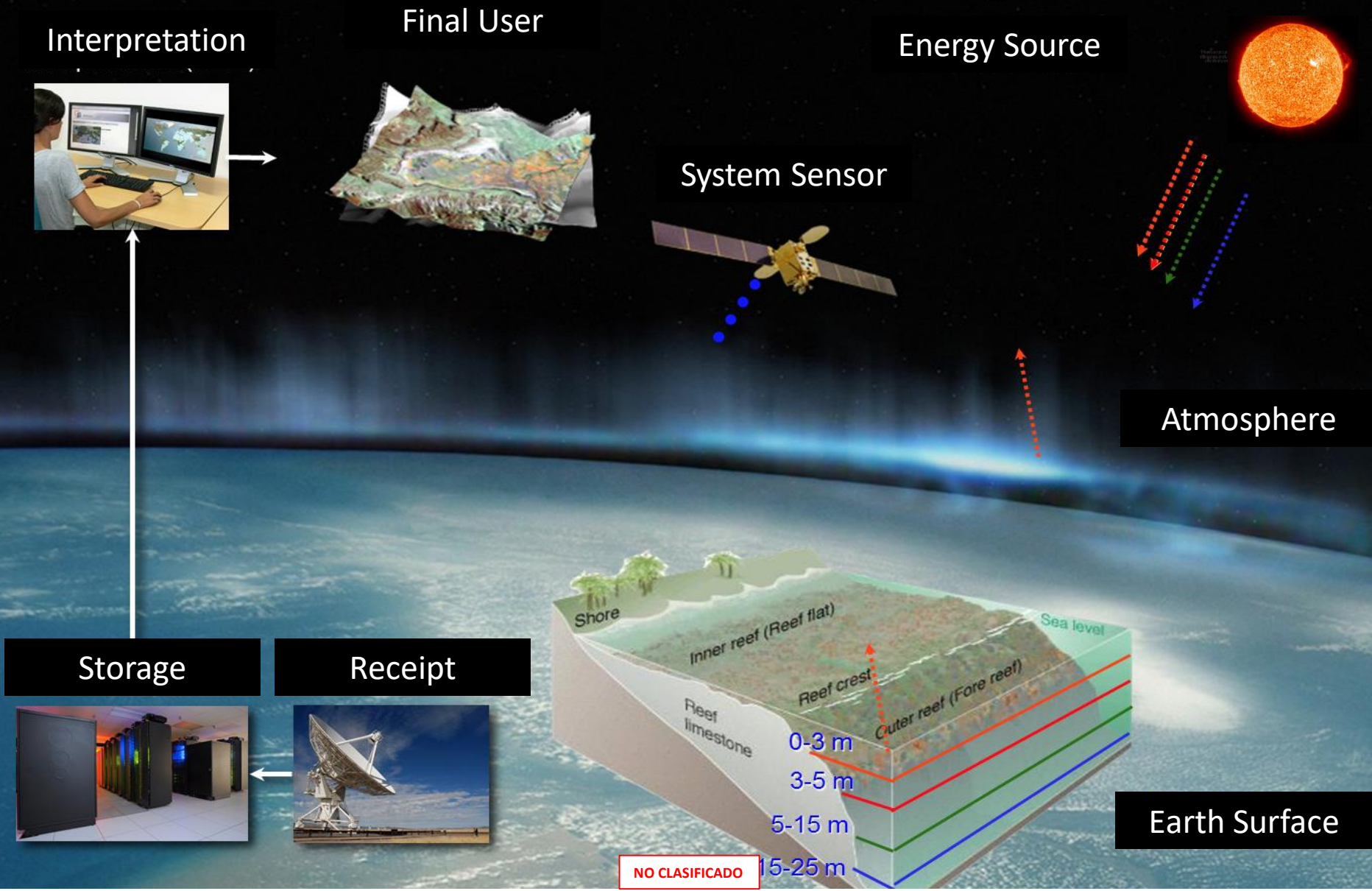


<https://svs.gsfc.nasa.gov/10812>

30 m



Conceptual base



DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

Methodology development by NOAA as part of “Coastwatch” program, they provide teledetection data of Caribbean sea and Gulf of Mexico.

BILKO-UNCESCO (Jupp, 1988).

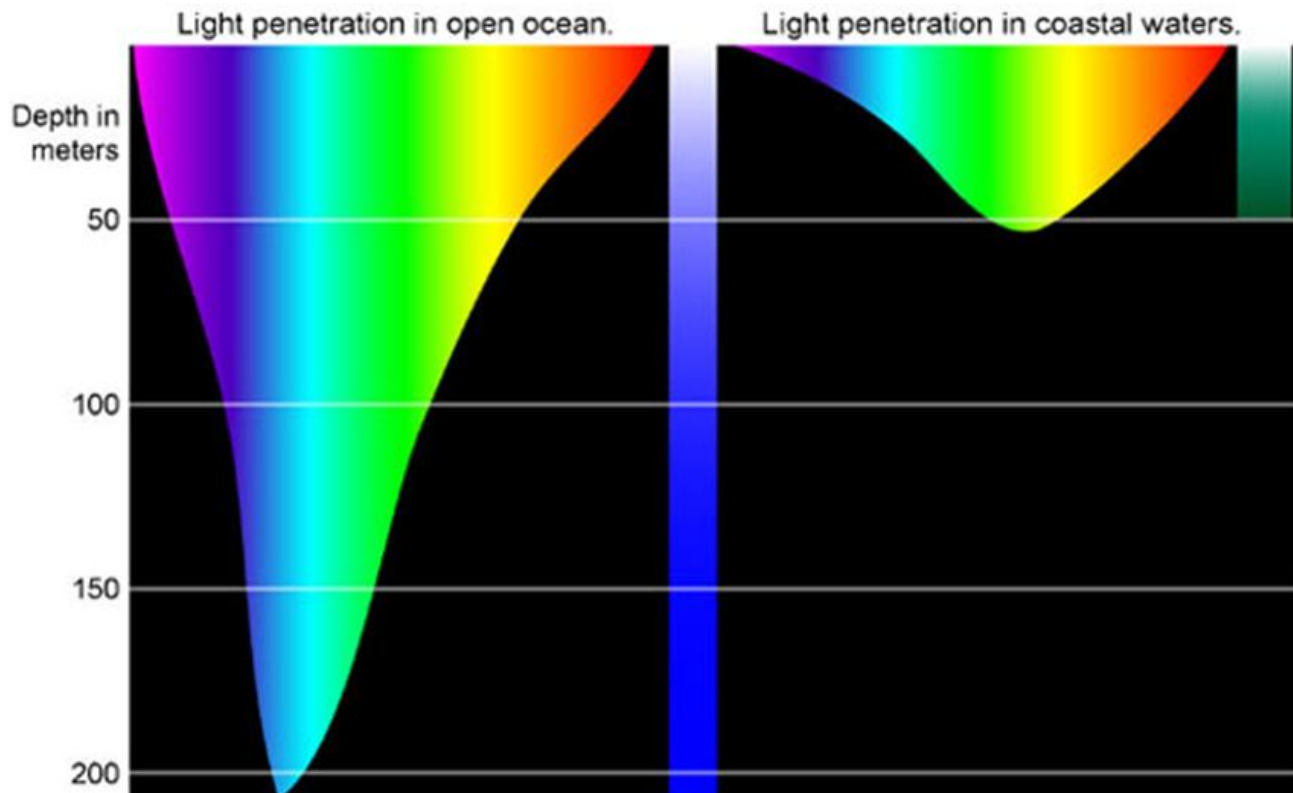


Imagen cortesía de [Kyle Carothers](#), NOAA-OE

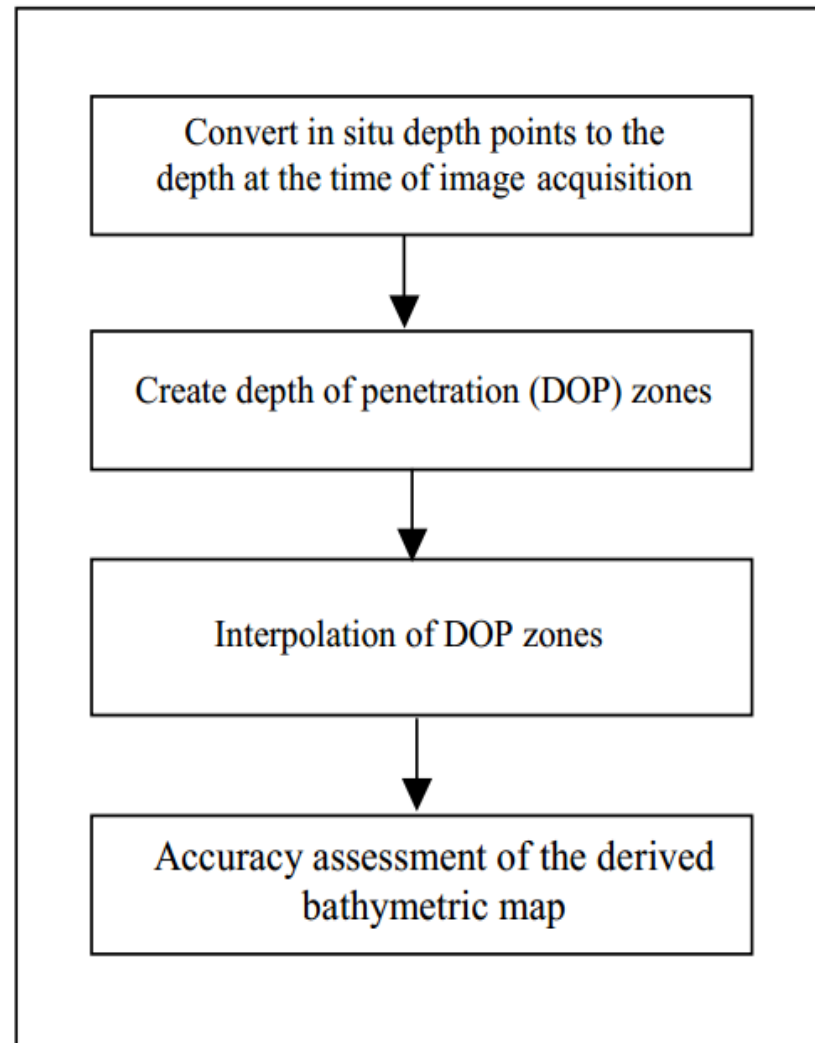
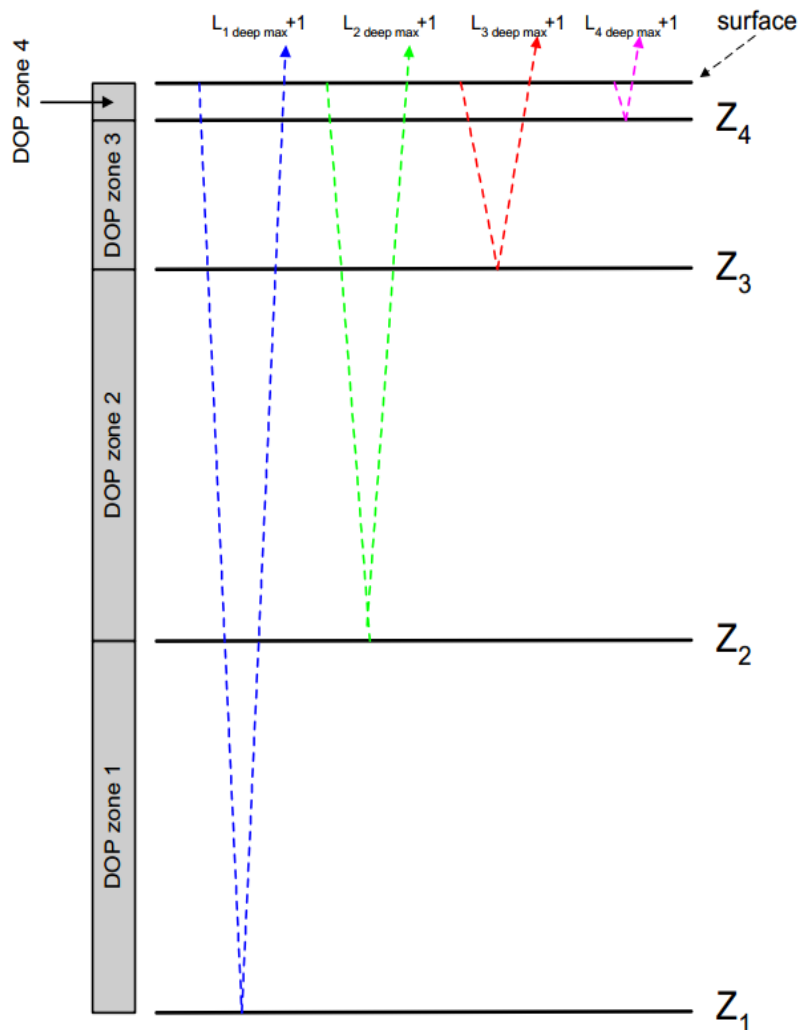
DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



NO CLASIFICADO

DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

Data recollection campaign



NO CLASIFICADO

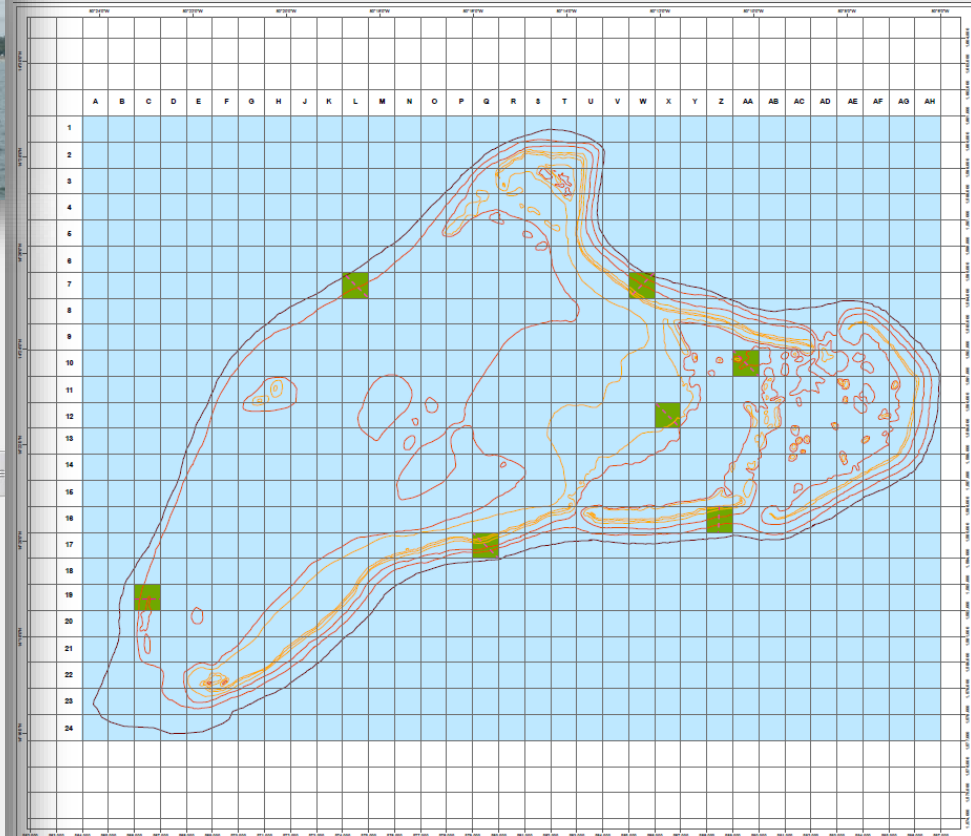
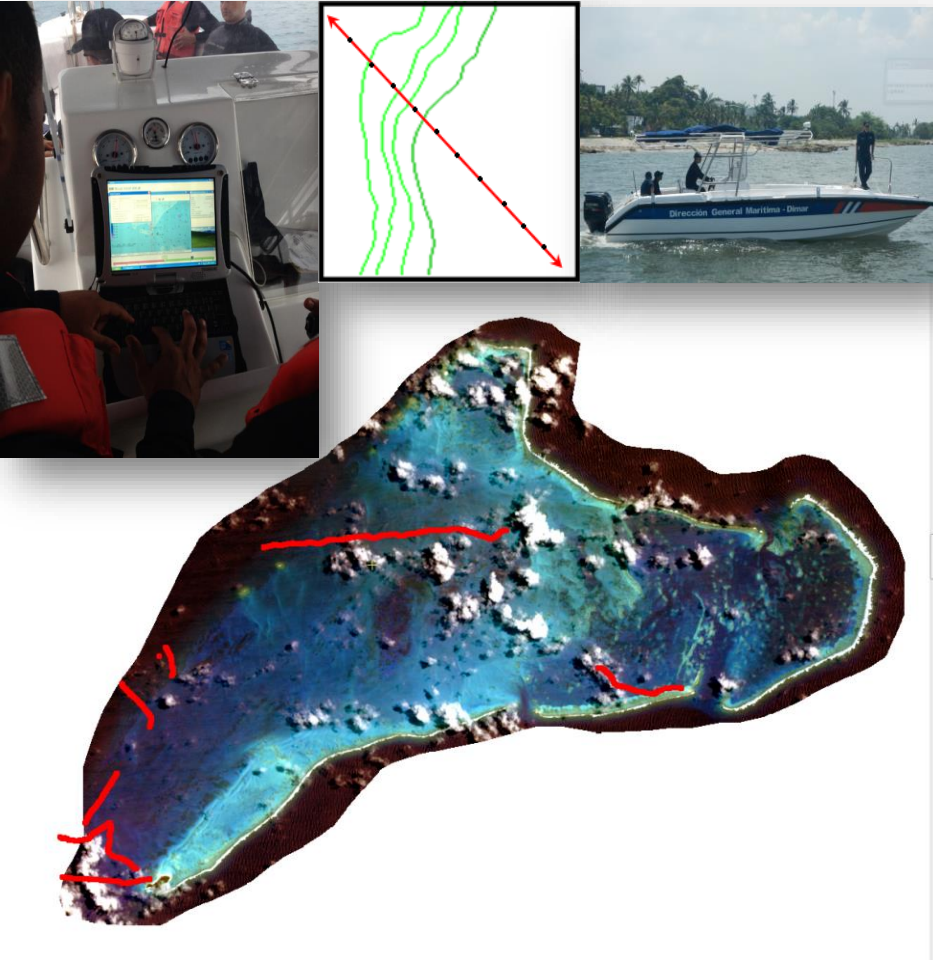
DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



Location of bathymetric tracks, and DOP over images.
“Serrana Cays” Island.

NO CLASIFICADO

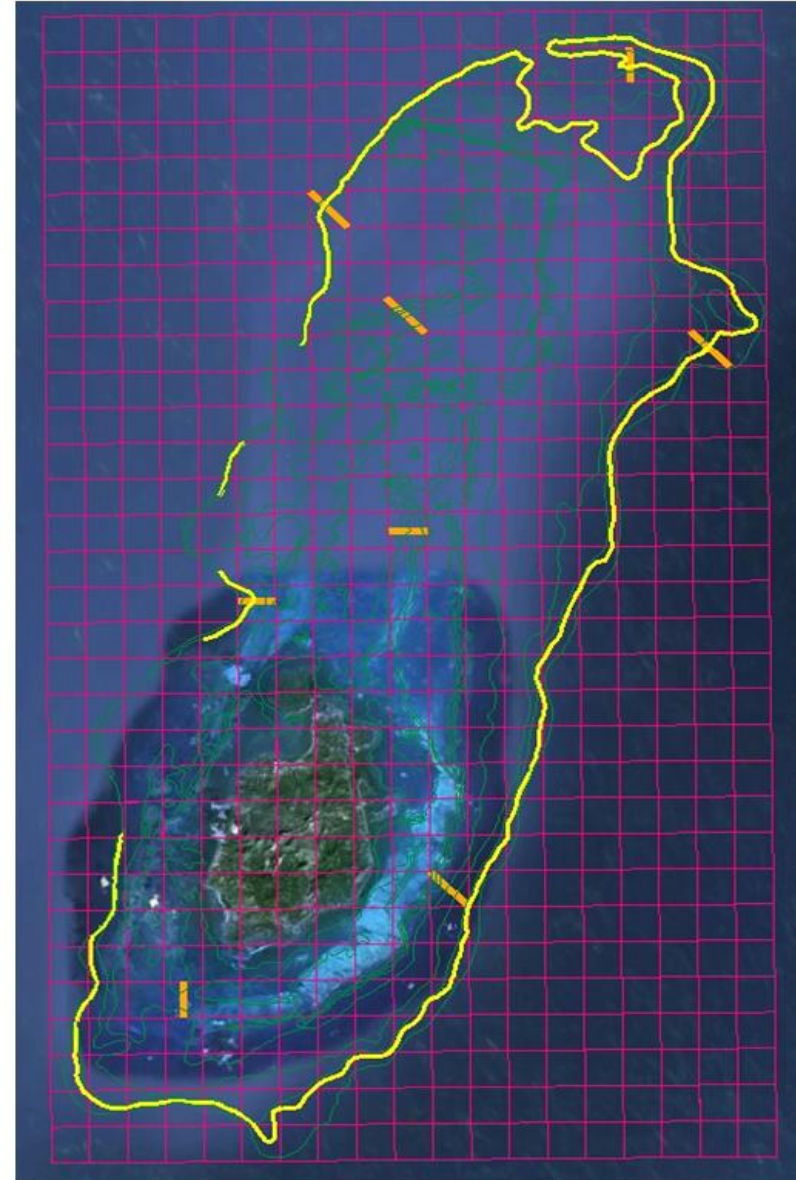
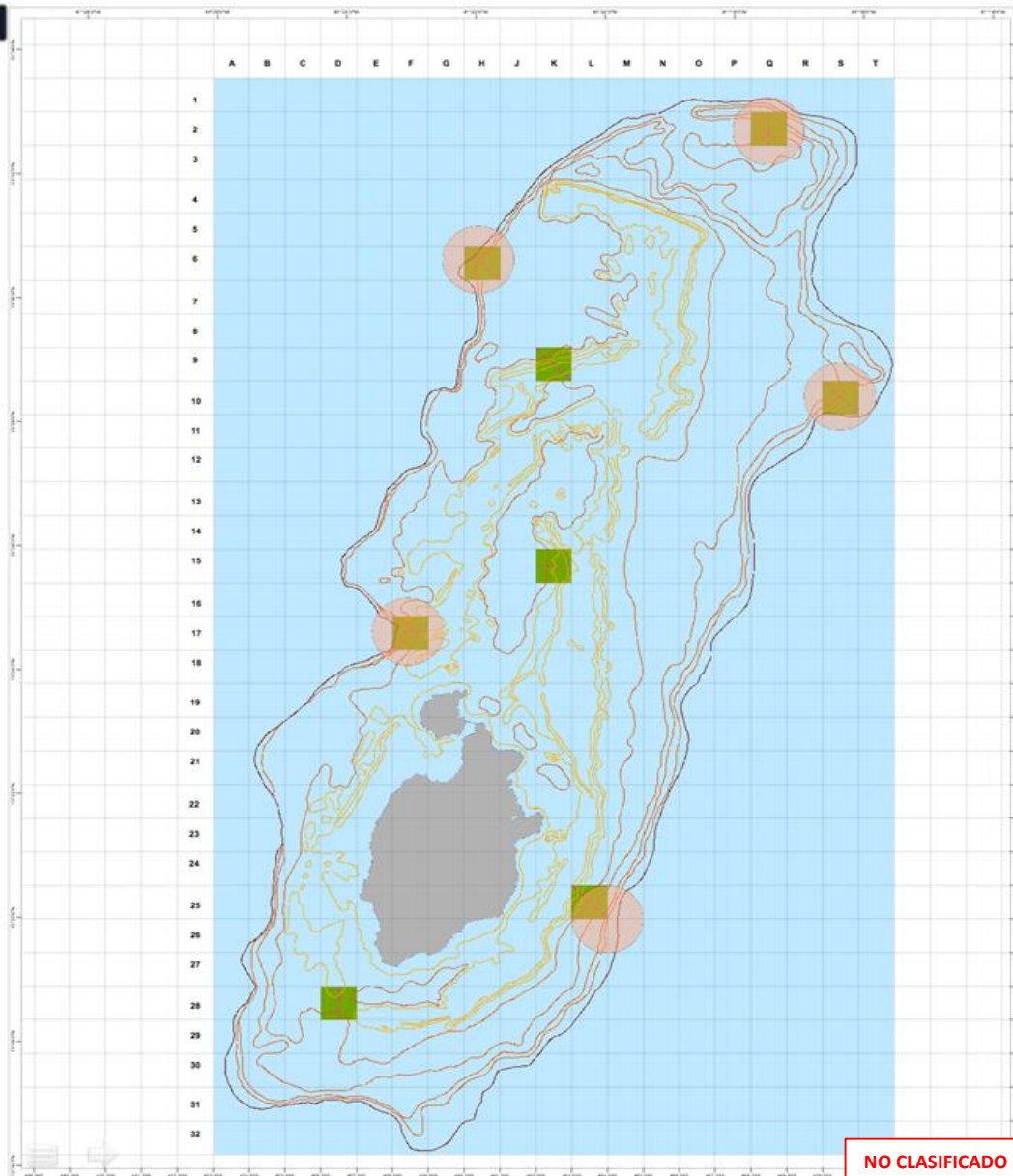
DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

PHASE 1

**RADIOMETRY TO
DEFINE THE
DOP ZONES**

NO CLASIFICADO

DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



Grupo CMF
PR

Percepción Remota y
Aplacaciones Geográficas

NO CLASIFICADO

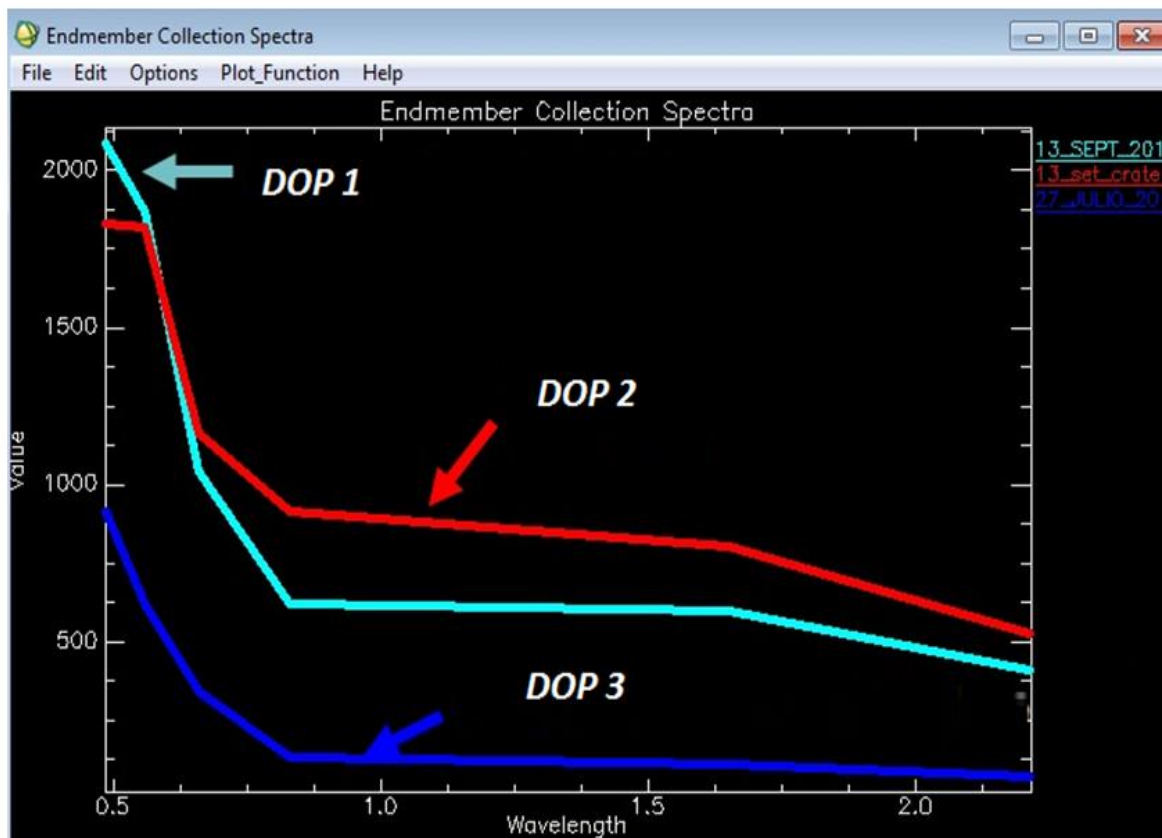
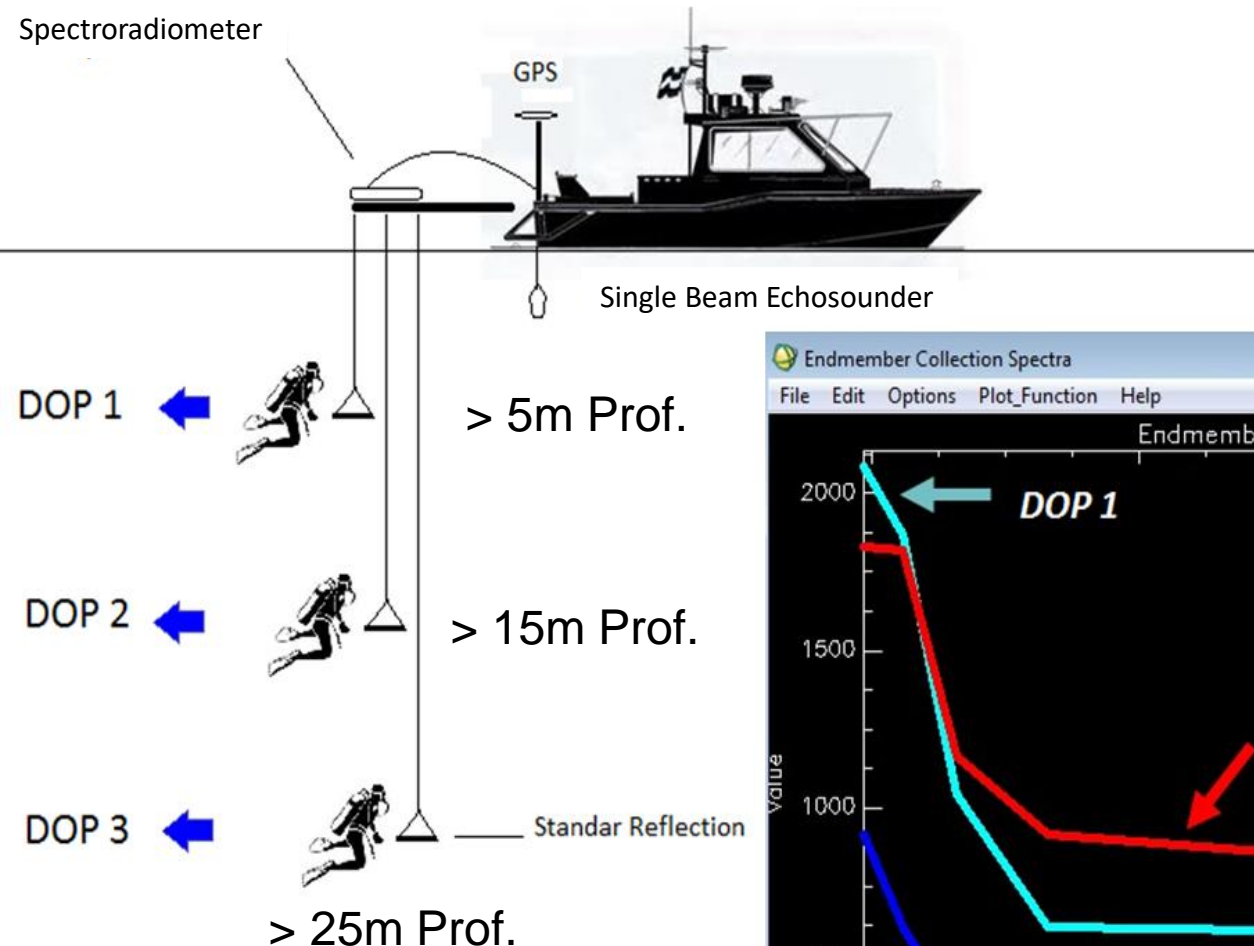
DOP Methodology

Depth of penetration

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



NO CLASIFICADO

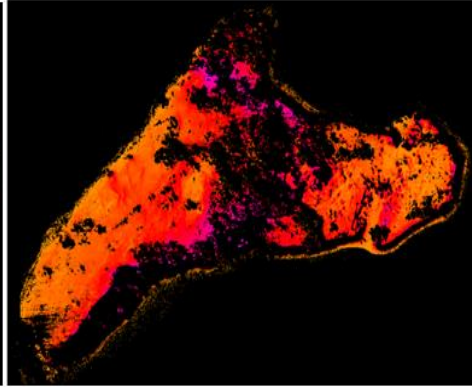
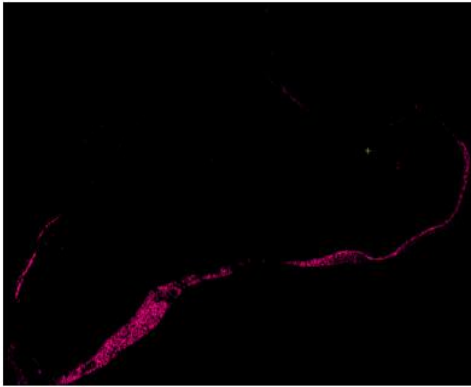


RESULTS

First phase

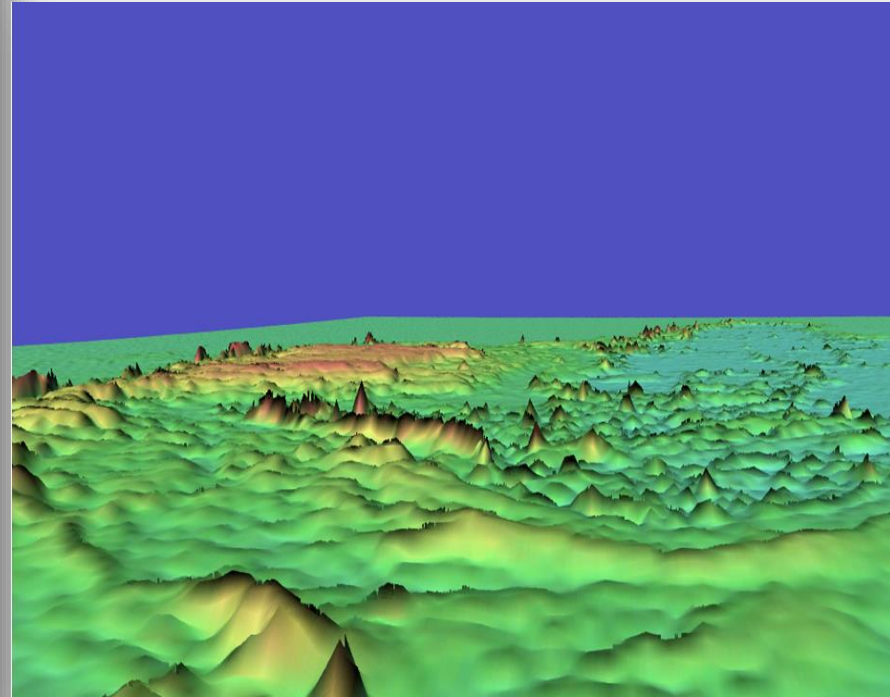
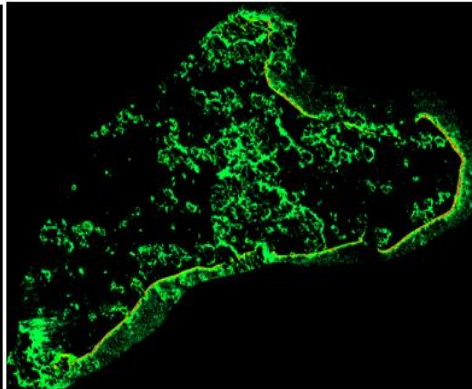
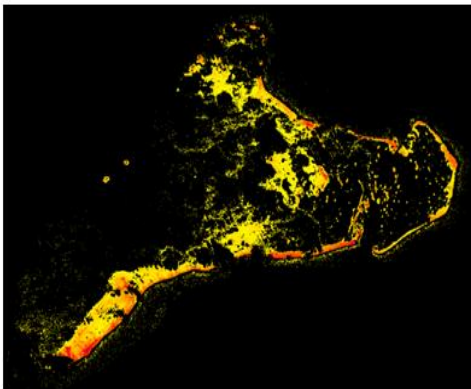
Entre 25 - 16 Metros de Profundidad.

Entre 16 - 12 Metros de Profundidad.



Entre 12 - 4 Metros de Profundidad.

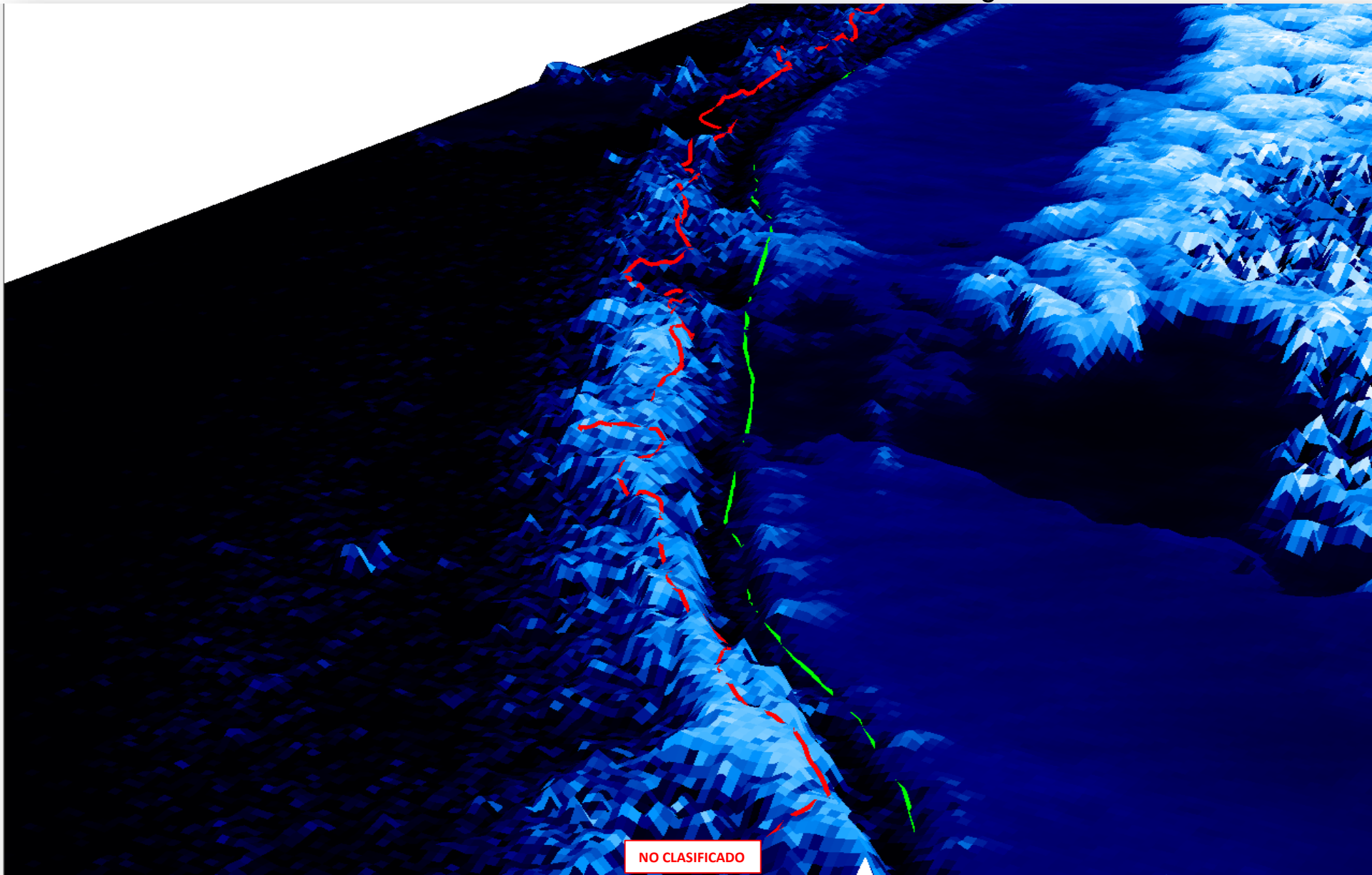
Entre 4 - 1 Metros de Profundidad.



RESULTS



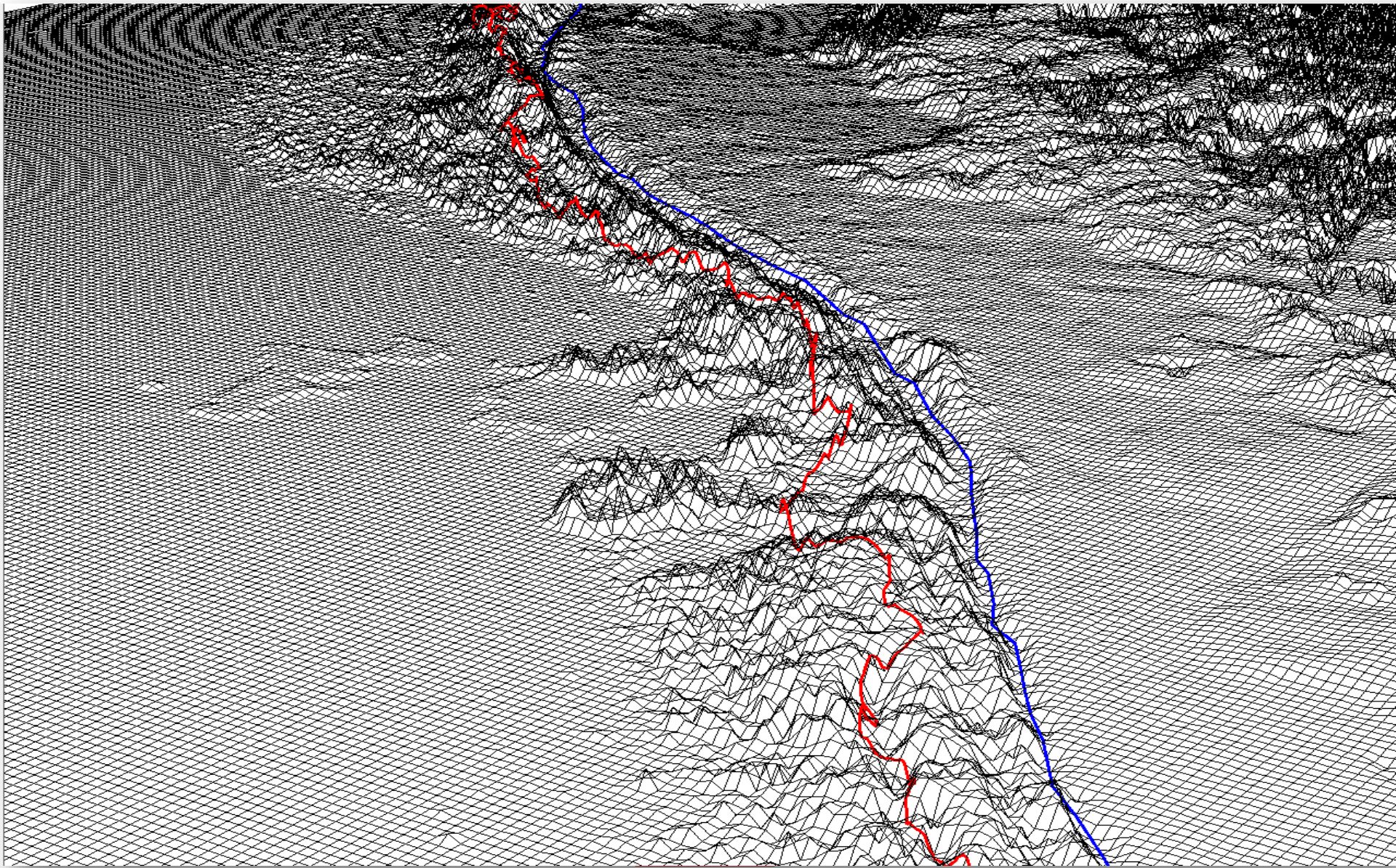
Detection of Braker Zone from WorldView 3 images.



RESULTS



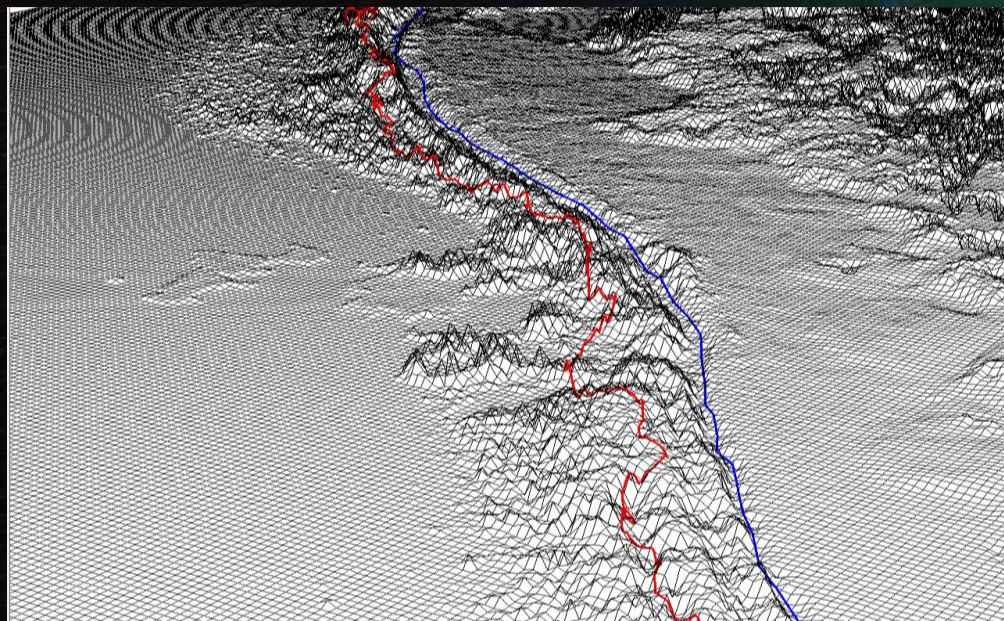
Detection of Braker Zone from WorldView 3 images.



RESULTS



Detection of Breaker Zone from WorldView 3 images.

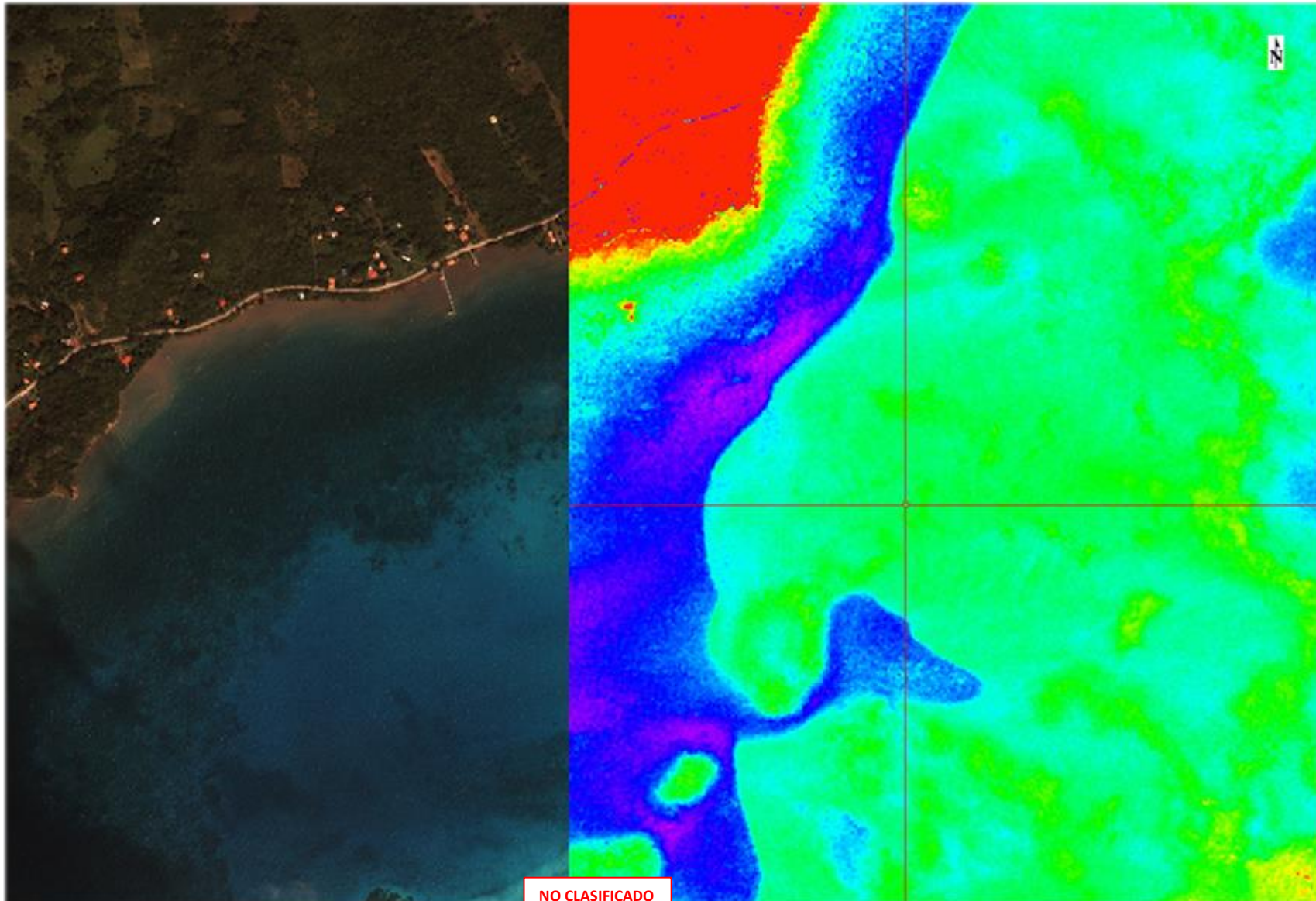


RESULTS

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



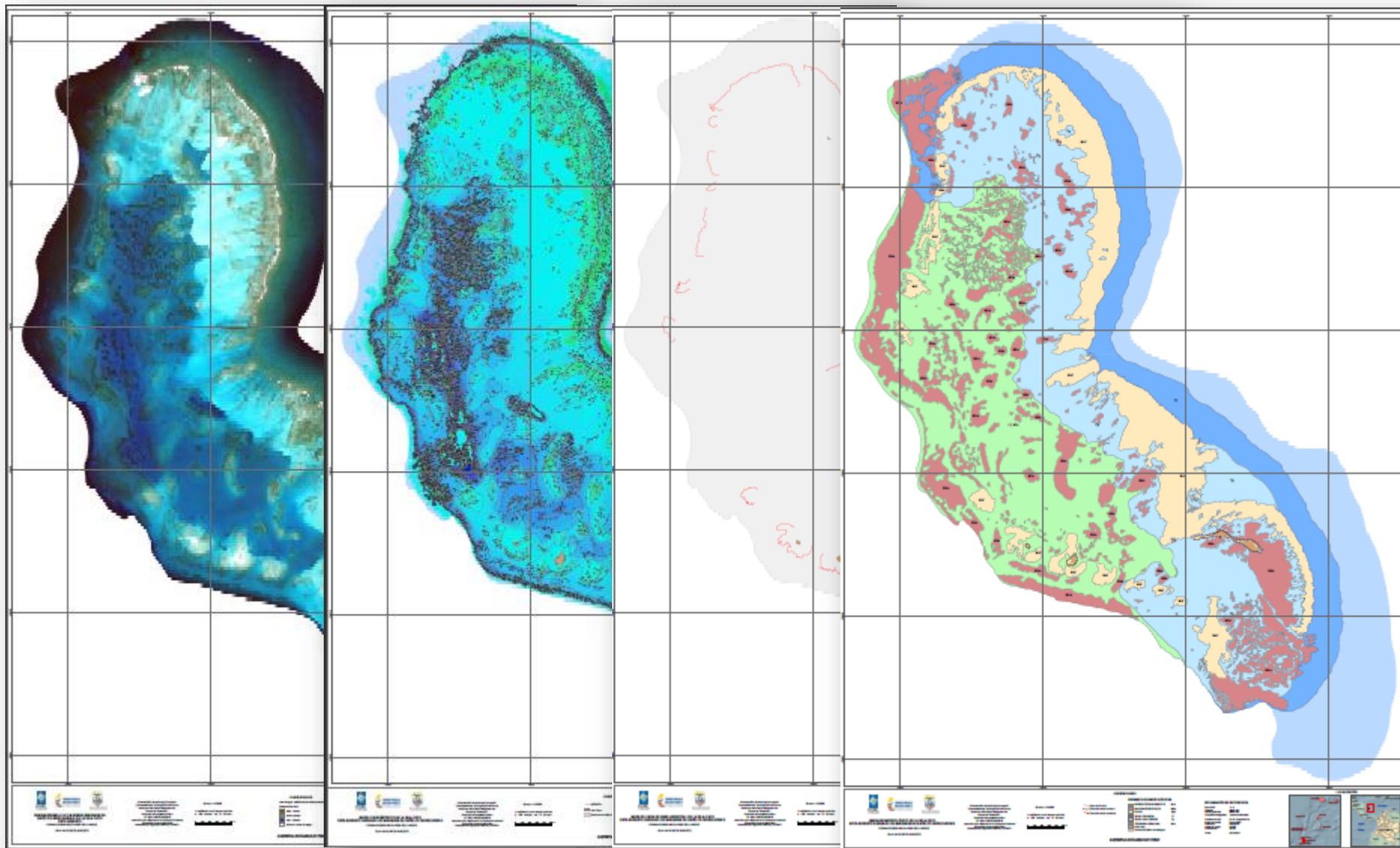
NO CLASIFICADO

RESULTS

NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana



NO CLASIFICADO



Dimar
Dirección General Marítima
Autoridad Marítima Colombiana

**BATHYMETRIC MODELS DERIVED FROM SATELLITE IMAGES OF HIGH RESOLUTION
IN “SAN ANDRÉS, PROVIDENCIA Y SANTA CATALINA” ARCHIPELAGO (2013-2016)**

Lieutenant Commander
Gustavo Adolfo Gutiérrez Leones
Head of Hydrography Area
Oceanographic and Hydrographic Research Center of Caribbean
National Hydrographic Service of Colombia
ggutierrez@dimar.mil.co

MANY THANKS FOR YOUR KIND ATTENTION
Valparaiso – Chile, September 12th 2016