



# CATHALAC

Centro del Agua del Trópico Húmedo para América Latina y el Caribe



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## Aprovechamiento de las Imágenes Satelitales Sentinel en Análisis de Desastres Naturales

Caso: Panamá  
Huracanes ETA e IOTA

Diciembre, 2021



# Quienes somos

**Organismo Internacional**  
(Programa PHI-UNESCO)

1992-2008

**Nuevo Convenio Constitutivo**

2010



Hub Regional para  
Las Agencias de UN

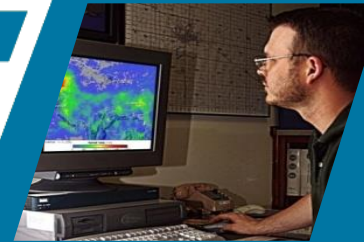


**Ciudad del Saber**  
P A N A M A  
City of Knowledge



## Nuestro objetivo

La **investigación aplicada** para el **Desarrollo sostenible** que fortalezca la capacidad regional y que facilite las capacidades profesionales para la transferencia e innovación tecnológica en los países del Trópico Húmedo de América Latina y el Caribe.



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para América Latina y el Caribe



### GESTIÓN INTEGRADA DE CUENCAS



### CAMBIO CLIMATICO

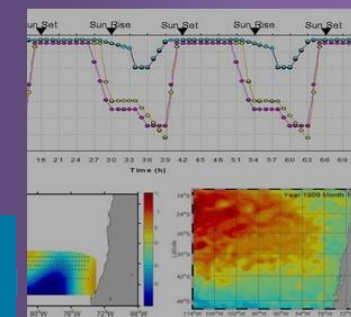


## Áreas temáticas de trabajo

### GESTIÓN DE RIESGOS



### MODELACIÓN Y ANÁLISIS AMBIENTALES



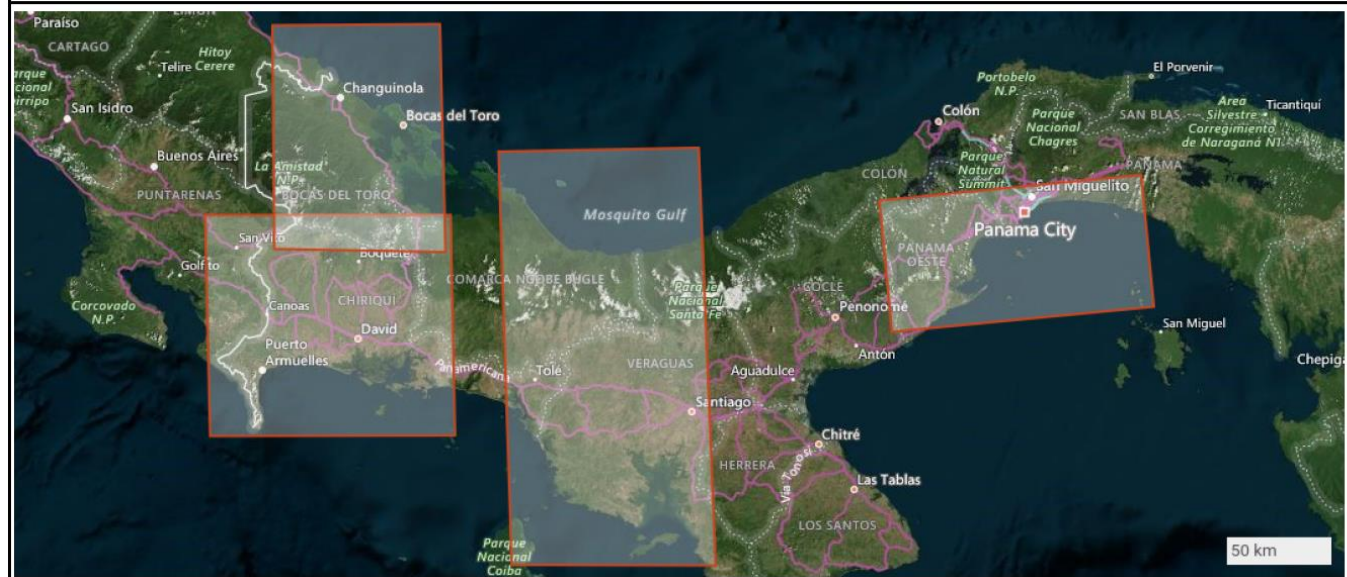
Áreas temáticas  
de trabajo

GESTIÓN  
DE RIESGOS

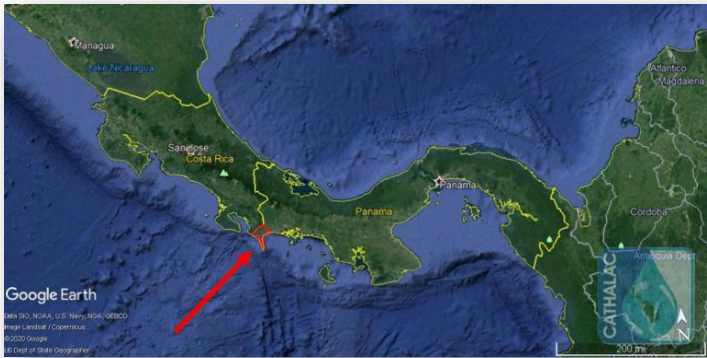


# ACTIVACIÓN DE LA CARTA INTERNACIONAL DE DESASTRE

| DOSSIER                                                                                                                                                                                   |                                                                                           |                                                                           |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------|
| Date                                                                                                                                                                                      | 2020-11-09                                                                                |                                                                           | Call ID: 787     |
| ECO on-duty                                                                                                                                                                               |                                                                                           |                                                                           |                  |
| Contact                                                                                                                                                                                   | ECO_CONAE ECO_CONAE                                                                       |                                                                           |                  |
| Agency                                                                                                                                                                                    | CONAE                                                                                     |                                                                           |                  |
| Phone                                                                                                                                                                                     | +54 3547 426766                                                                           | Mobile phone                                                              | +54 9351 5489340 |
| Fax                                                                                                                                                                                       | +54 3547431032                                                                            |                                                                           |                  |
| E-mail                                                                                                                                                                                    | charter@conae.gov.ar                                                                      |                                                                           |                  |
| Authorized User / Co-operating Body                                                                                                                                                       |                                                                                           |                                                                           |                  |
| Name of the organization                                                                                                                                                                  | EROS                                                                                      |                                                                           |                  |
| Contact                                                                                                                                                                                   | Michael Budde                                                                             |                                                                           |                  |
| Phone                                                                                                                                                                                     | +1 605 594 2619                                                                           | Mobile phone                                                              | +1 605 254 5699  |
| Fax                                                                                                                                                                                       |                                                                                           |                                                                           |                  |
| E-mail                                                                                                                                                                                    | mbudde@usgs.gov                                                                           |                                                                           |                  |
| End-User                                                                                                                                                                                  |                                                                                           |                                                                           |                  |
| Name of the organization                                                                                                                                                                  | Ministry of Government/Panama and Water Center for the Humid Tropics of Latin America and |                                                                           |                  |
| Contact                                                                                                                                                                                   | Freddy Picado                                                                             |                                                                           |                  |
| Phone                                                                                                                                                                                     | +507 317 3200                                                                             | Mobile phone                                                              | +507 69321147    |
| Fax                                                                                                                                                                                       |                                                                                           |                                                                           |                  |
| E-mail                                                                                                                                                                                    | freddy.picado@cathalac.int                                                                |                                                                           |                  |
| Type of disaster                                                                                                                                                                          |                                                                                           |                                                                           |                  |
| <input type="checkbox"/> Earthquake                                                                                                                                                       | <input type="checkbox"/> Flash Flood                                                      | <input checked="" type="checkbox"/> Flood (large area)                    |                  |
| <input checked="" type="checkbox"/> Landslide                                                                                                                                             | <input type="checkbox"/> Oil spill                                                        | <input type="checkbox"/> Sea ice                                          |                  |
| <input type="checkbox"/> Snow hazard                                                                                                                                                      | <input type="checkbox"/> Storm & Hurricane (Rural area)                                   | <input type="checkbox"/> Storm & Hurricane (Urban areas & Infrastructure) |                  |
| <input type="checkbox"/> Tsunami                                                                                                                                                          | <input type="checkbox"/> Volcanic eruptions                                               | <input type="checkbox"/> Wildfire                                         |                  |
| Other (e.g. wind storm, tornado, industrial accident) specify:                                                                                                                            |                                                                                           |                                                                           |                  |
| Area Details                                                                                                                                                                              |                                                                                           |                                                                           |                  |
| Region/country name:                                                                                                                                                                      | Geographical location                                                                     |                                                                           | Extent (km2):    |
| / Panama                                                                                                                                                                                  | From:                                                                                     | To:                                                                       |                  |
|                                                                                                                                                                                           | David                                                                                     | Panama City                                                               |                  |
| Area of Interest ID                                                                                                                                                                       | Priority                                                                                  | Comment                                                                   | Coordinates      |
| Call-787 Aol ID: 1                                                                                                                                                                        | 1                                                                                         | The SW AOI is of highest priority.                                        | Polygon          |
| Call-787 Aol ID: 2                                                                                                                                                                        | 2                                                                                         |                                                                           | Polygon          |
| Call-787 Aol ID: 3                                                                                                                                                                        | 2                                                                                         |                                                                           | Polygon          |
| Call-787 Aol ID: 4                                                                                                                                                                        | 2                                                                                         |                                                                           | Polygon          |
| Primary KML link: <a href="https://disasterscharter.org/documents/10180/64961/primary-787.kml/5441aa3f-">https://disasterscharter.org/documents/10180/64961/primary-787.kml/5441aa3f-</a> |                                                                                           |                                                                           |                  |

| Approximate date/time of occurrence or predicted occurrence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Date: 2020-11-03 Local time: 06:51:00 Time zone: UTC-06:00 UTC time: 2020-11-03 12:51:00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| Additional information on the disaster                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <p>As a result of heavy rains associated with Hurricane Eta, Panama has experienced extensive flooding and landslides since 3 November, 2020. Several deaths have been reported and more than 300 houses destroyed with more people missing. See links to additional information below.</p> <p> <a href="https://www.sinaproc.gob.pa/nota-de-prensa/">https://www.sinaproc.gob.pa/nota-de-prensa/</a><br/> <a href="http://www.servir.net/servir-en-accion/analisis-de-desastres.html">http://www.servir.net/servir-en-accion/analisis-de-desastres.html</a><br/> <a href="https://www.france24.com/es/minuto-a-minuto/20201106-centroam%C3%A9rica-eva%C3%BAa-la-destrucci%C3%B3n-provoca-da-por-el-cicl%C3%B3n-eta">https://www.france24.com/es/minuto-a-minuto/20201106-centroam%C3%A9rica-eva%C3%BAa-la-destrucci%C3%B3n-provoca-da-por-el-cicl%C3%B3n-eta</a><br/> <a href="https://cnnespanol.cnn.com/2020/11/06/al-menos-5-muertos-y-11-desaparecidos-en-panama-tras-el-paso-de-eta/">https://cnnespanol.cnn.com/2020/11/06/al-menos-5-muertos-y-11-desaparecidos-en-panama-tras-el-paso-de-eta/</a><br/> <a href="https://www.laestrella.com.pa/nacional/201107/panama-reporta-17-personas-fallecidas-causa-tormenta-eta">https://www.laestrella.com.pa/nacional/201107/panama-reporta-17-personas-fallecidas-causa-tormenta-eta</a><br/> <a href="https://www.tvn-2.com/nacionales/huracan-eta-Panama-inundaciones-chiriqui-fallecidos-damnificados_0_5709928975.html">https://www.tvn-2.com/nacionales/huracan-eta-Panama-inundaciones-chiriqui-fallecidos-damnificados_0_5709928975.html</a> </p> |  |
| Additional instructions (list of End users and Specific Users needs in terms of damage detection if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |

# ANÁLISIS PREVIO A LA ACTIVACIÓN DE LA CARTA INTERNACIONAL DE DESASTRE (HURCANES ETA E IOTO)



*Satélite: Imagen Sentinel\_2*

*Fecha de Adquisición: 4 de noviembre de 2020*

*Satélite: Imagen Sentinel\_2*

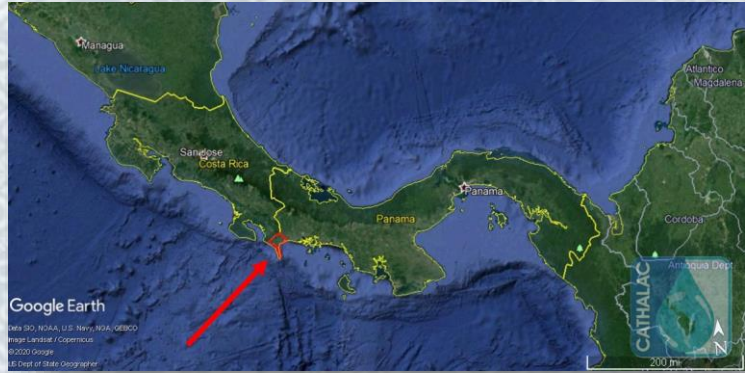
*Fecha de Adquisición: 4 de noviembre de 2020*

**Análisis:**

*Área mayormente afectada por inundación en terrenos de predominio agrícola principalmente en las comunidades de Majagual, Corotú y Baco*



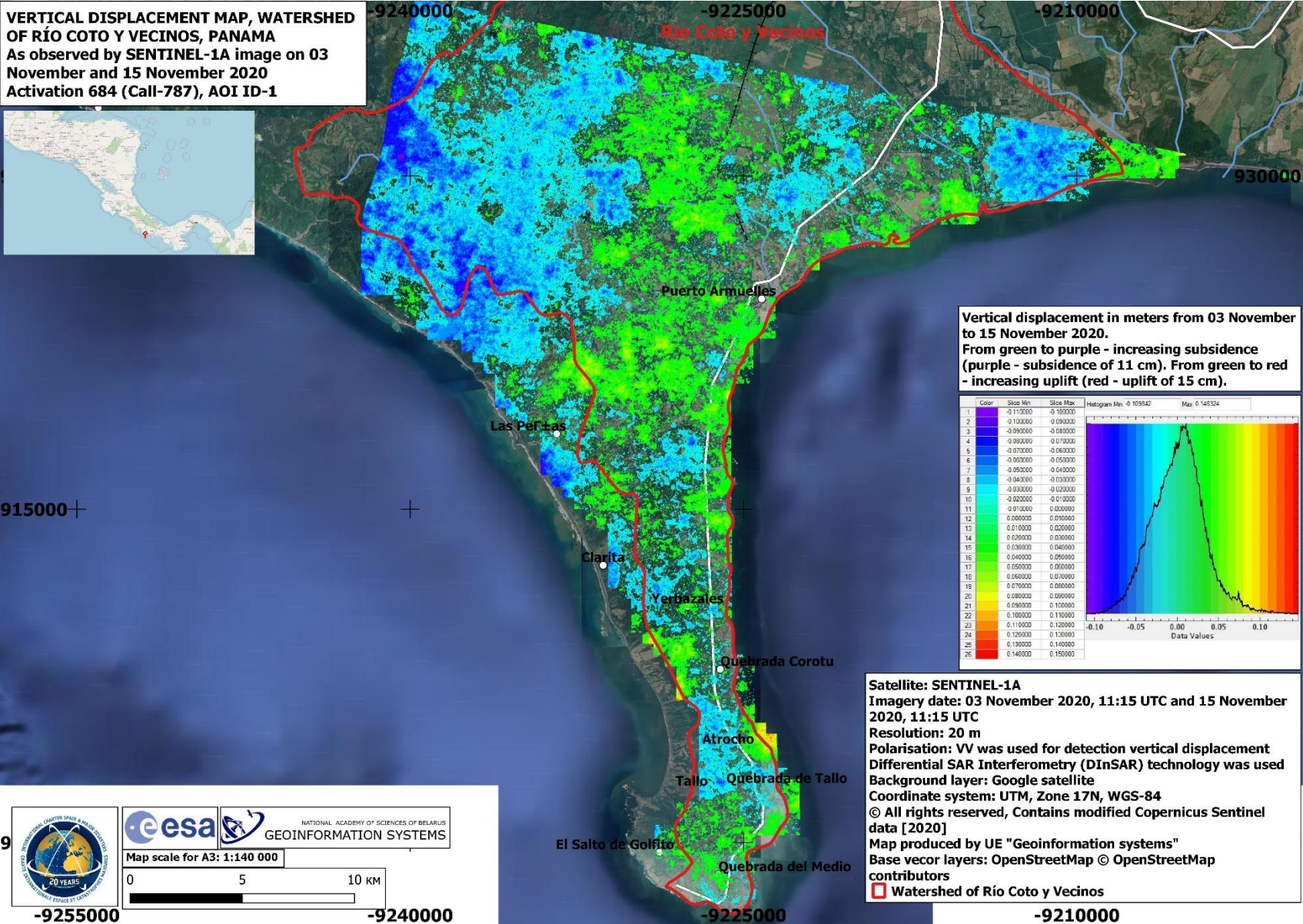
# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE



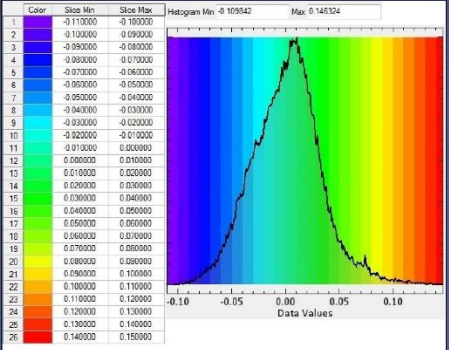
## ANÁLISIS DE DESPLAZAMIENTO EN

## CUENCA DE RÍO COTO Y VECINOS, PANAMÁ

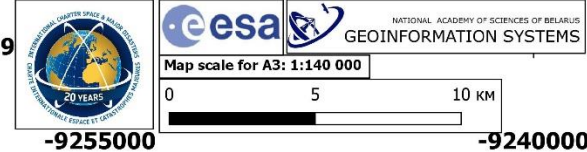
**VERTICAL DISPLACEMENT MAP, WATERSHED OF RÍO COTO Y VECINOS, PANAMA**  
As observed by SENTINEL-1A image on 03 November and 15 November 2020  
Activation 684 (Call-787), AOI ID-1



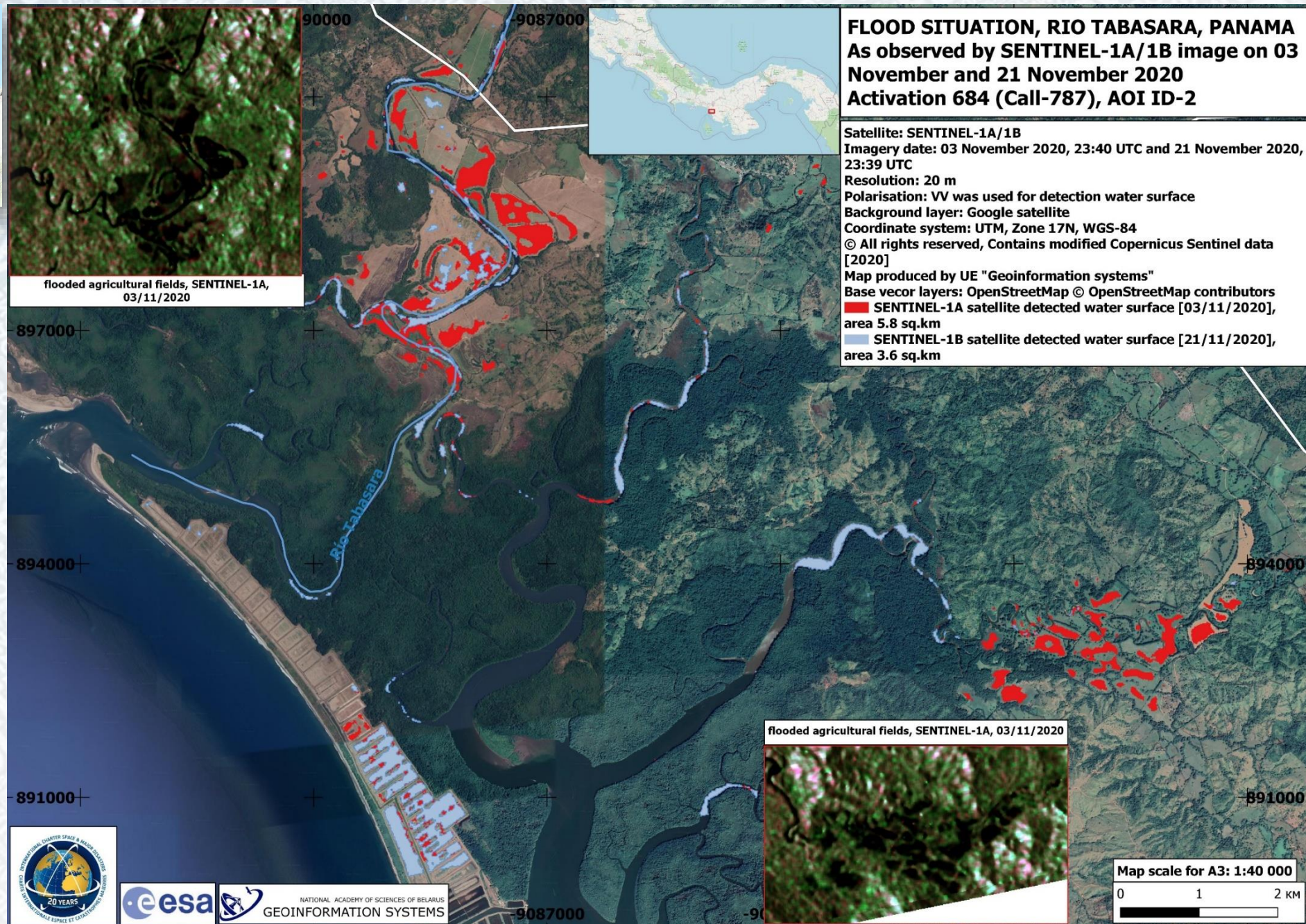
Vertical displacement in meters from 03 November to 15 November 2020.  
From green to purple - increasing subsidence (purple - subsidence of 11 cm). From green to red - increasing uplift (red - uplift of 15 cm).



Satellite: SENTINEL-1A  
Imagery date: 03 November 2020, 11:15 UTC and 15 November 2020, 11:15 UTC  
Resolution: 20 m  
Polarisation: VV was used for detection vertical displacement  
Differential SAR Interferometry (DInSAR) technology was used  
Background layer: Google satellite  
Coordinate system: UTM, Zone 17N, WGS-84  
© All rights reserved, Contains modified Copernicus Sentinel data [2020]  
Map produced by UE "Geoinformation systems"  
Base vector layers: OpenStreetMap © OpenStreetMap contributors  
Watershed of Río Coto y Vecinos



# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE

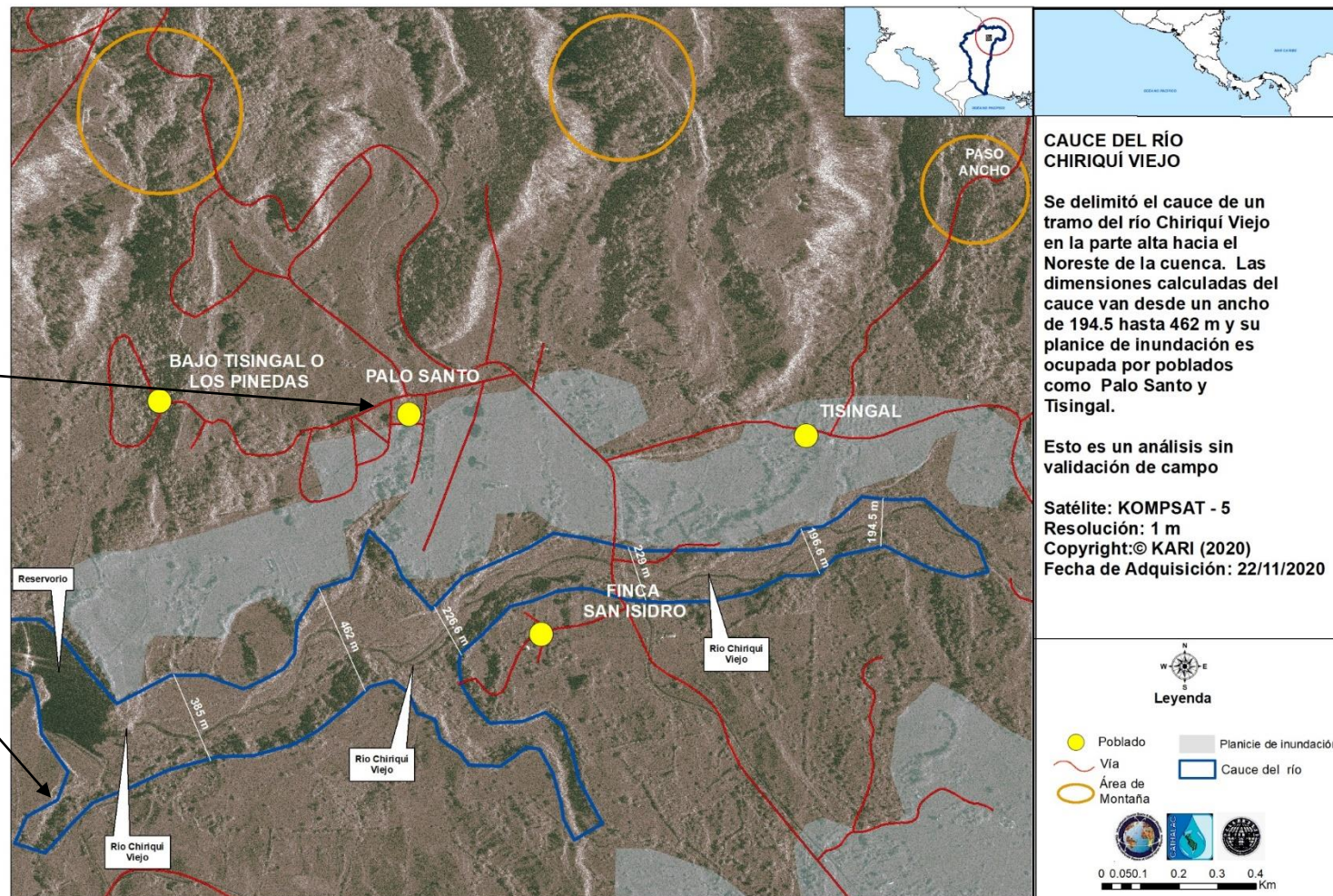
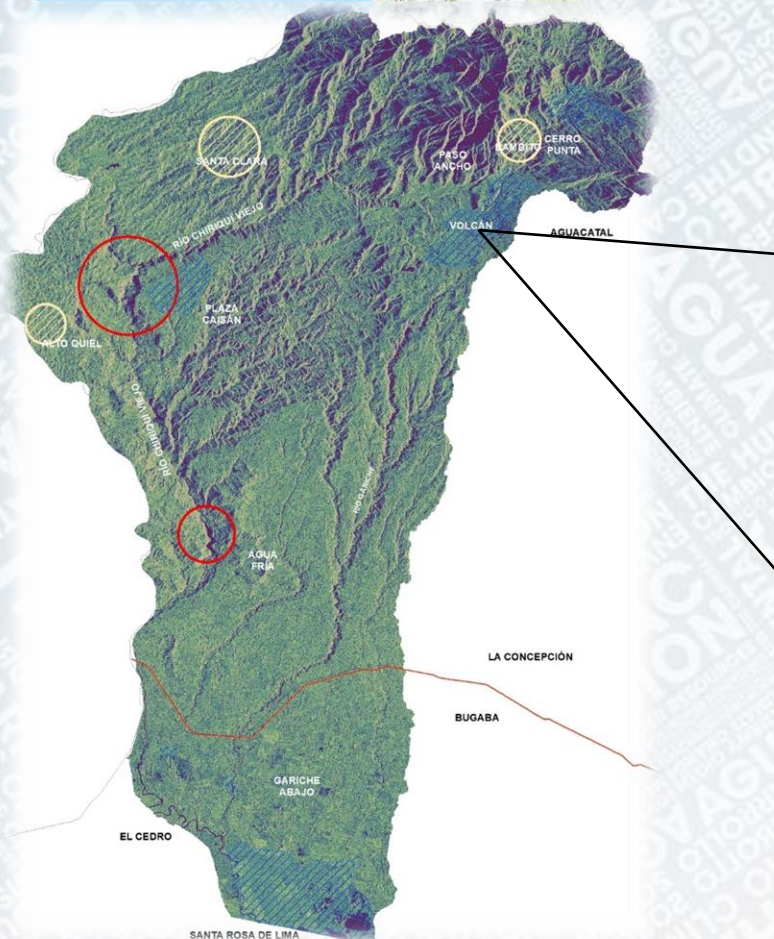


DELIMITACIÓN DE  
ÁREAS INUNDADAS,

CUENCA DEL RÍO TABASARÁ,  
PANAMÁ



# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE



## CAUCE DEL RÍO CHIRIQUÍ VIEJO

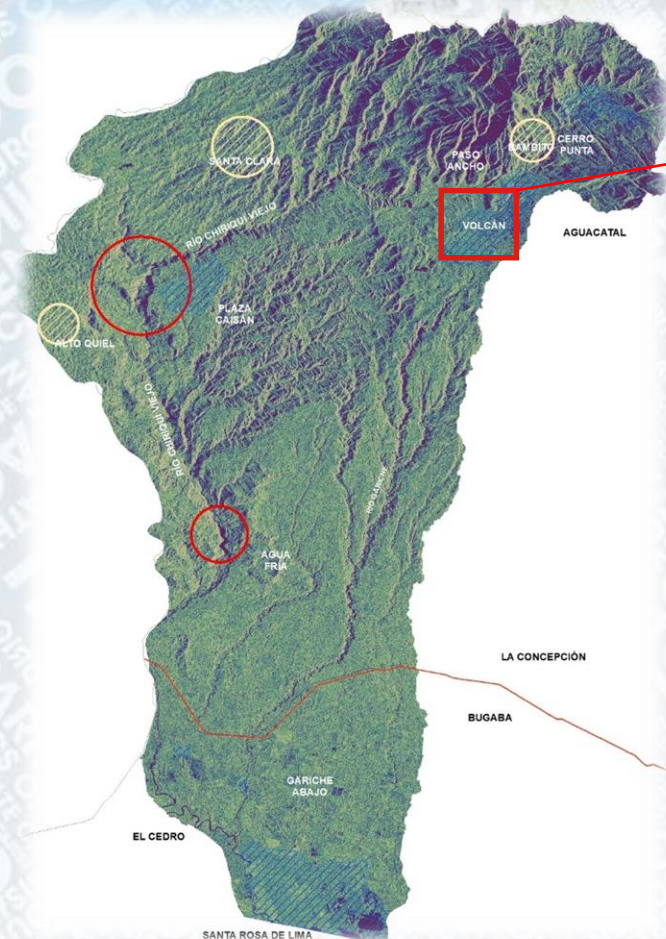
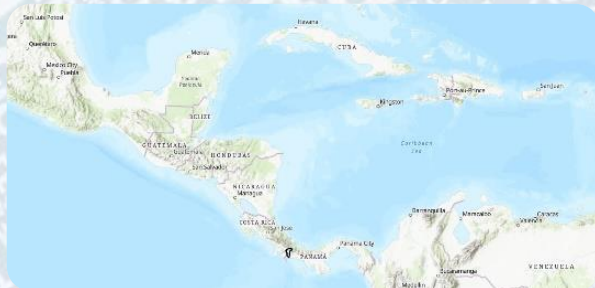
Se delimitó el cauce de un tramo del río Chiriquí Viejo en la parte alta hacia el Noreste de la cuenca. Las dimensiones calculadas del cauce van desde un ancho de 194.5 hasta 462 m y su planicie de inundación es ocupada por poblados como Palo Santo y Tisingal.

Esto es un análisis sin validación de campo

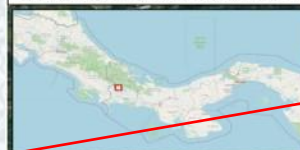
Satélite: KOMPSAT - 5  
Resolución: 1 m  
Copyright:© KARI (2020)  
Fecha de Adquisición: 22/11/2020



# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE



**VERTICAL DISPLACEMENT MAP, VOLCAN TOWN, CHIRIQUI PROVINCE, PANAMA**  
As observed by SENTINEL-1A image on 27 October and 08 November 2020  
Activation 684 (Call-787), AOI ID-1



Vertical displacement in meters from 27 October to 08 November 2020.  
From green to purple - increasing subsidence (purple - subsidence of 15 cm). From green to red - increasing uplift (red - uplift of 11 cm).

ram Min -0.143272 Max 0.102677

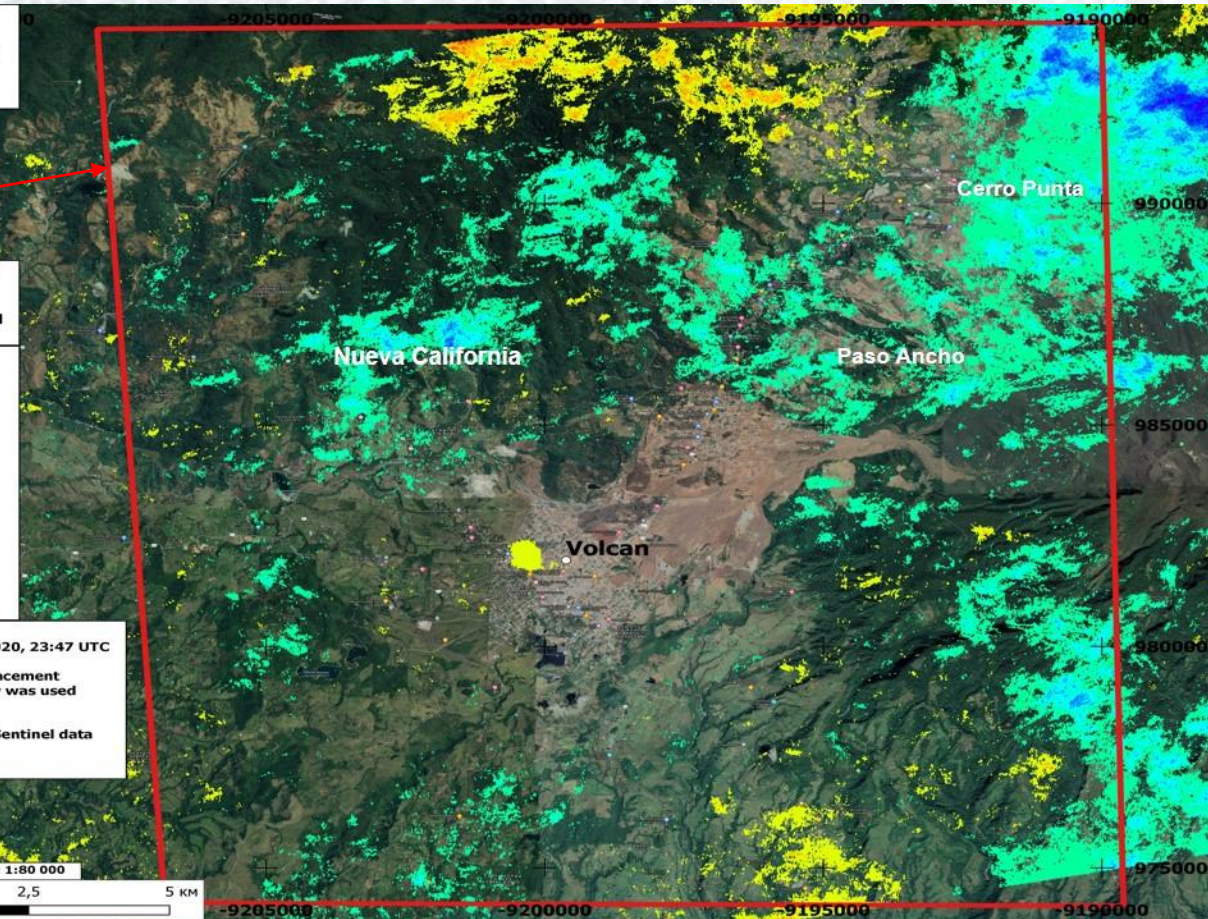
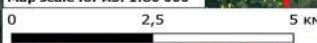
|    | Color        | Slice Min | Slice Max |
|----|--------------|-----------|-----------|
| 1  | Purple       | -0.150000 | -0.130000 |
| 2  | Dark Blue    | -0.130000 | -0.110000 |
| 3  | Blue         | -0.110000 | -0.090000 |
| 4  | Light Blue   | -0.090000 | -0.070000 |
| 5  | Cyan         | -0.070000 | -0.050000 |
| 6  | Green        | -0.050000 | -0.030000 |
| 7  | Yellow-Green | 0.030000  | 0.050000  |
| 8  | Yellow       | 0.050000  | 0.070000  |
| 9  | Orange       | 0.070000  | 0.090000  |
| 10 | Red          | 0.090000  | 0.110000  |

Satellite: SENTINEL-1A  
Imagery date: 27 October 2020, and 08 November 2020, 23:47 UTC  
Resolution: 20 m  
Polarisation: VV was used for detection vertical displacement  
Differential SAR Interferometry (DInSAR) technology was used  
Background layer: Google satellite Hybrid  
Coordinate system: UTM, Zone 17N, WGS-84  
© All rights reserved, Contains modified Copernicus Sentinel data [2020]  
Map produced by UE "Geoinformation systems"

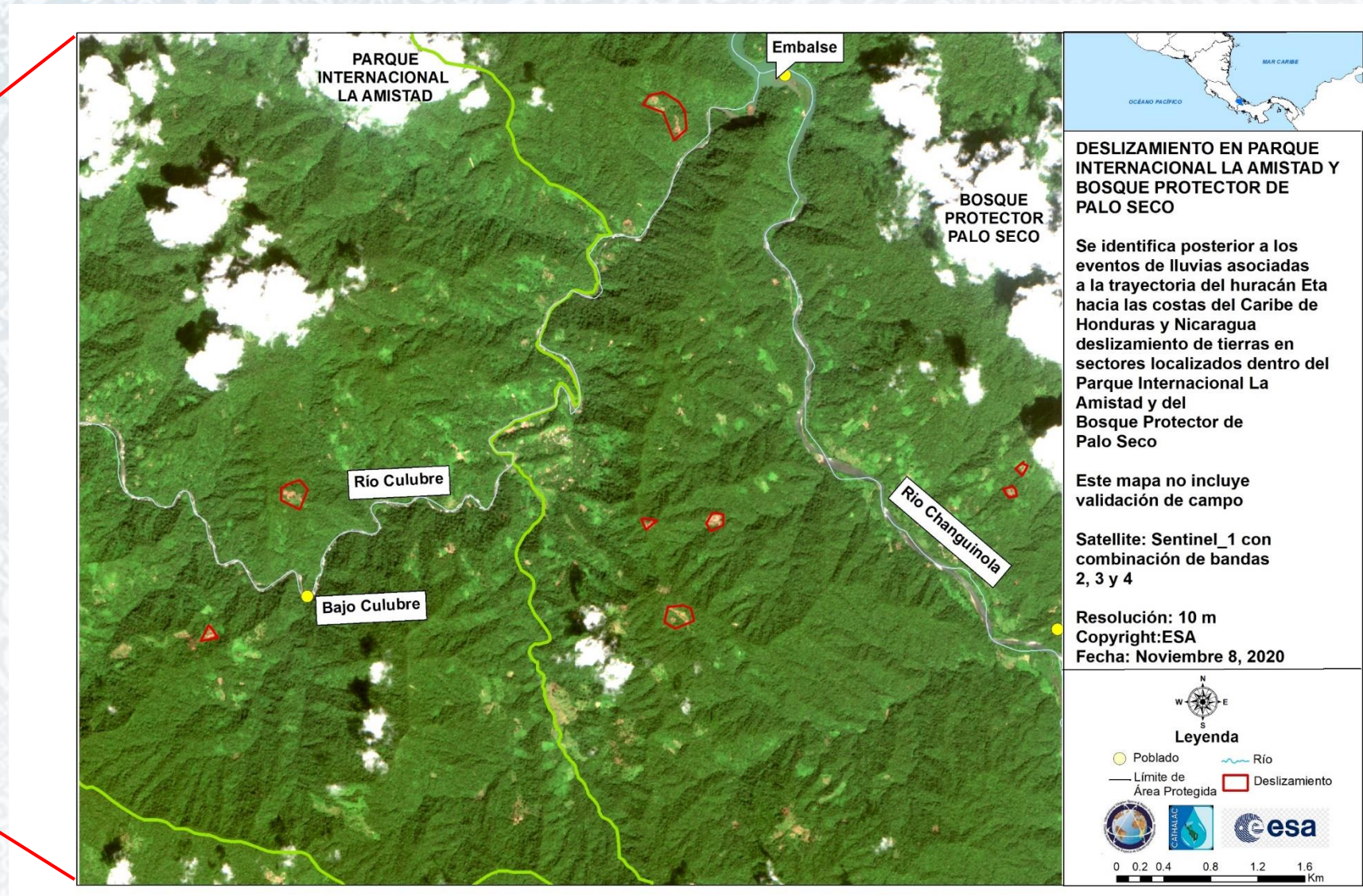
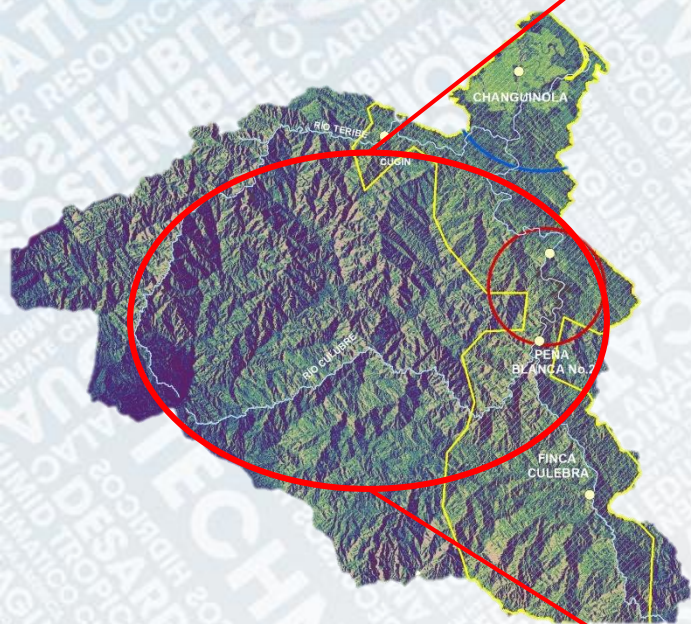


NATIONAL ACADEMY OF SCIENCES OF BELARUS  
GEOINFORMATION SYSTEMS

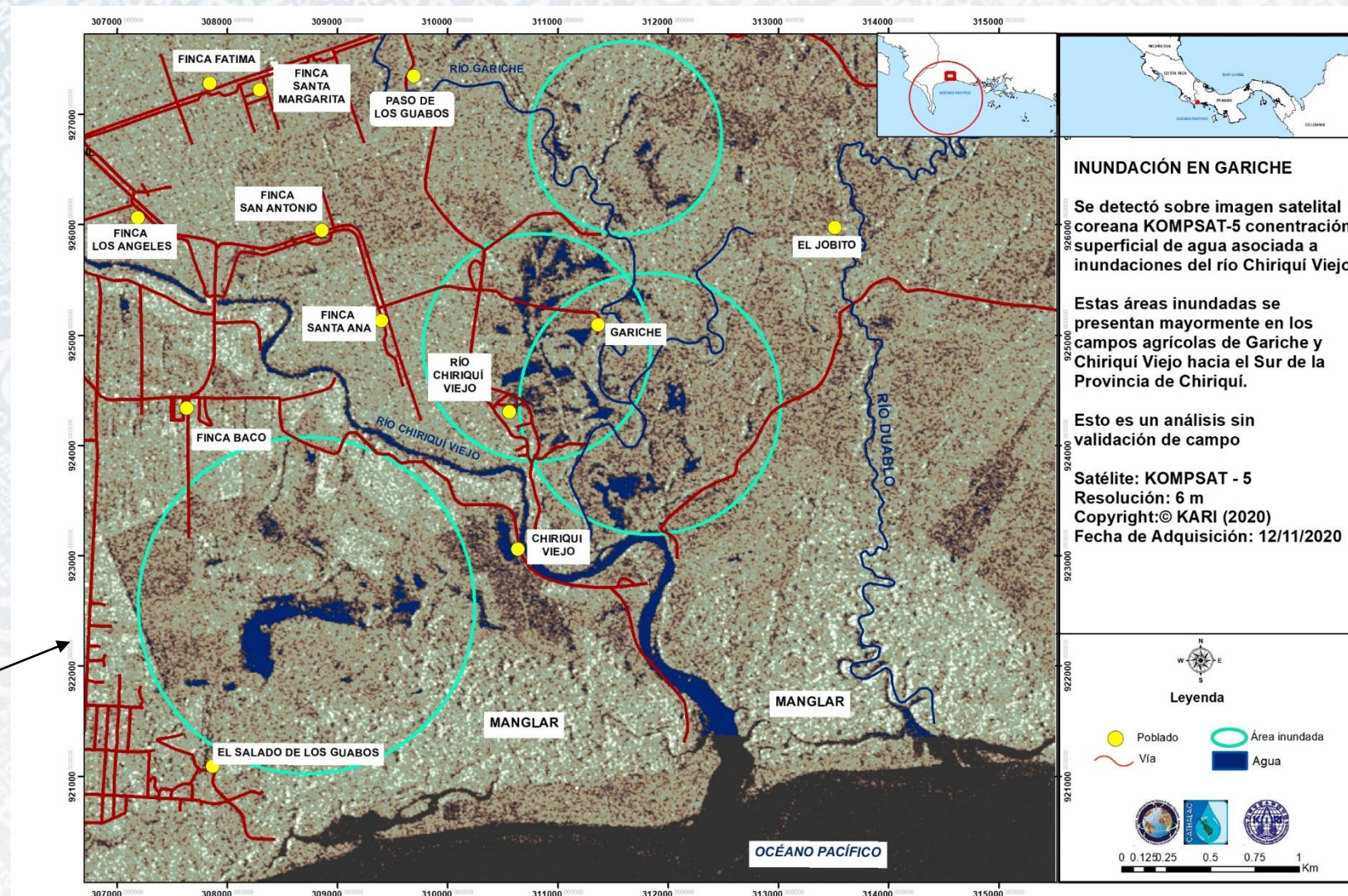
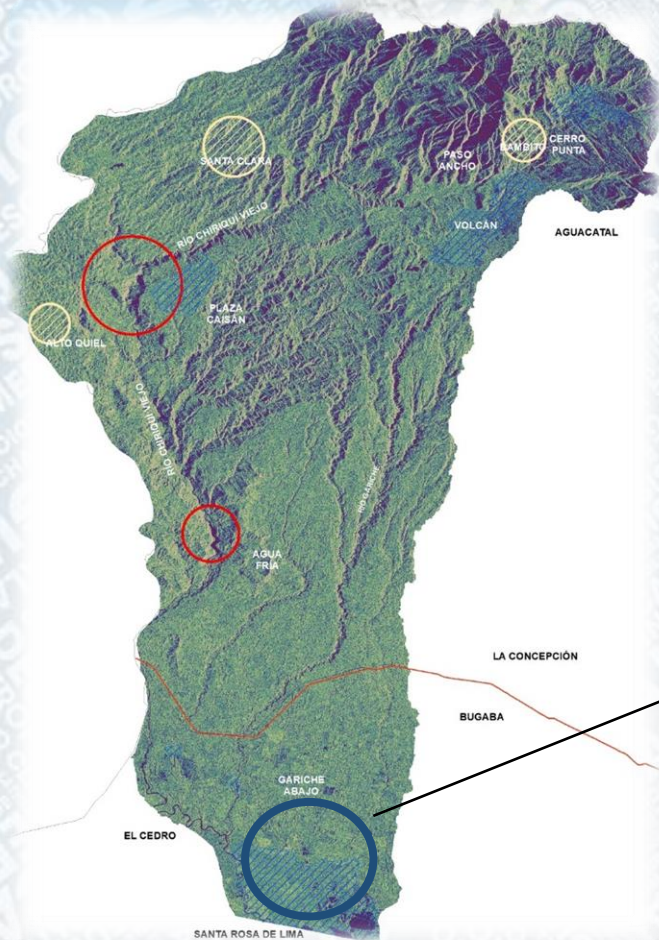
Map scale for A3: 1:80 000



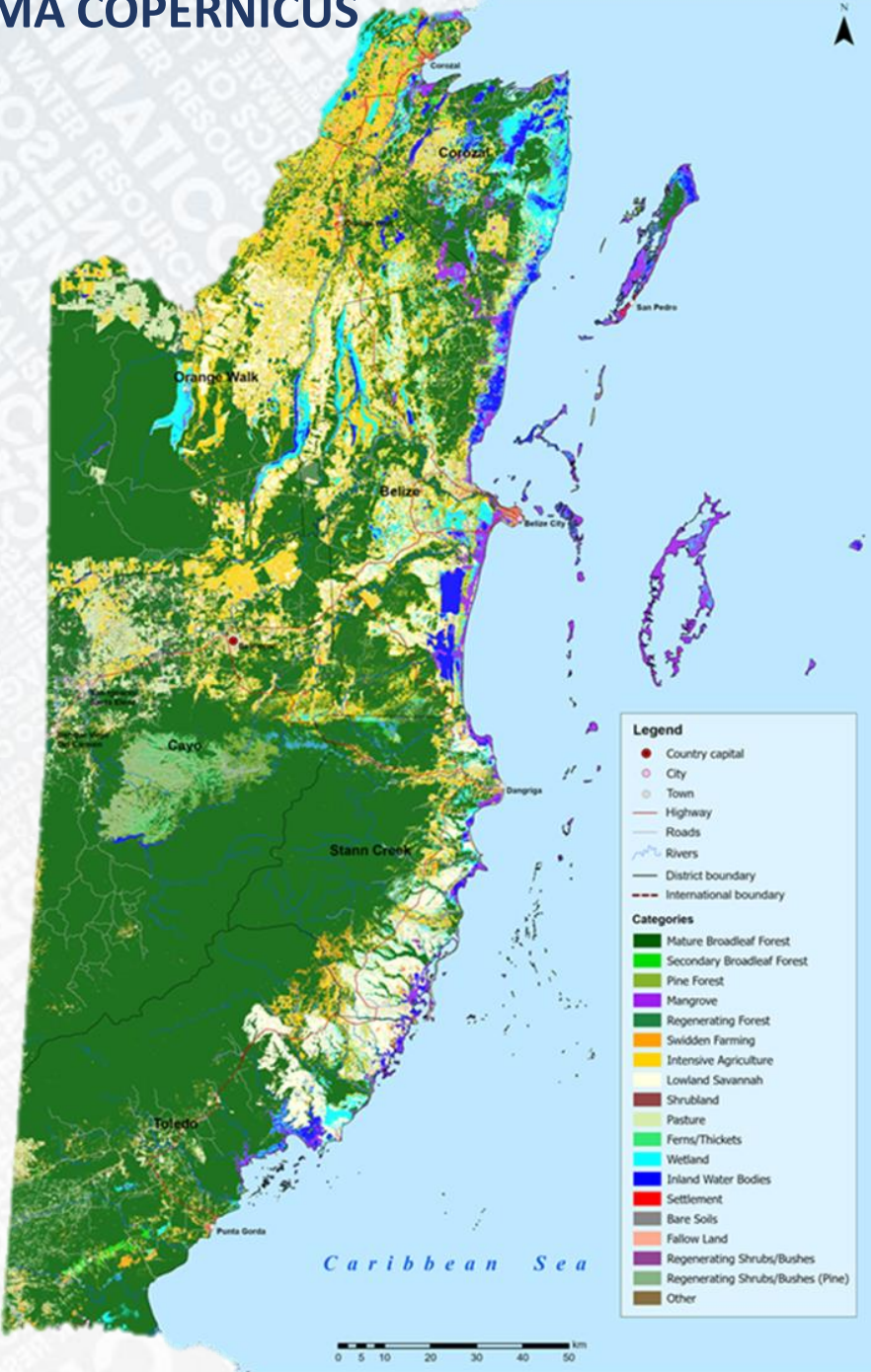
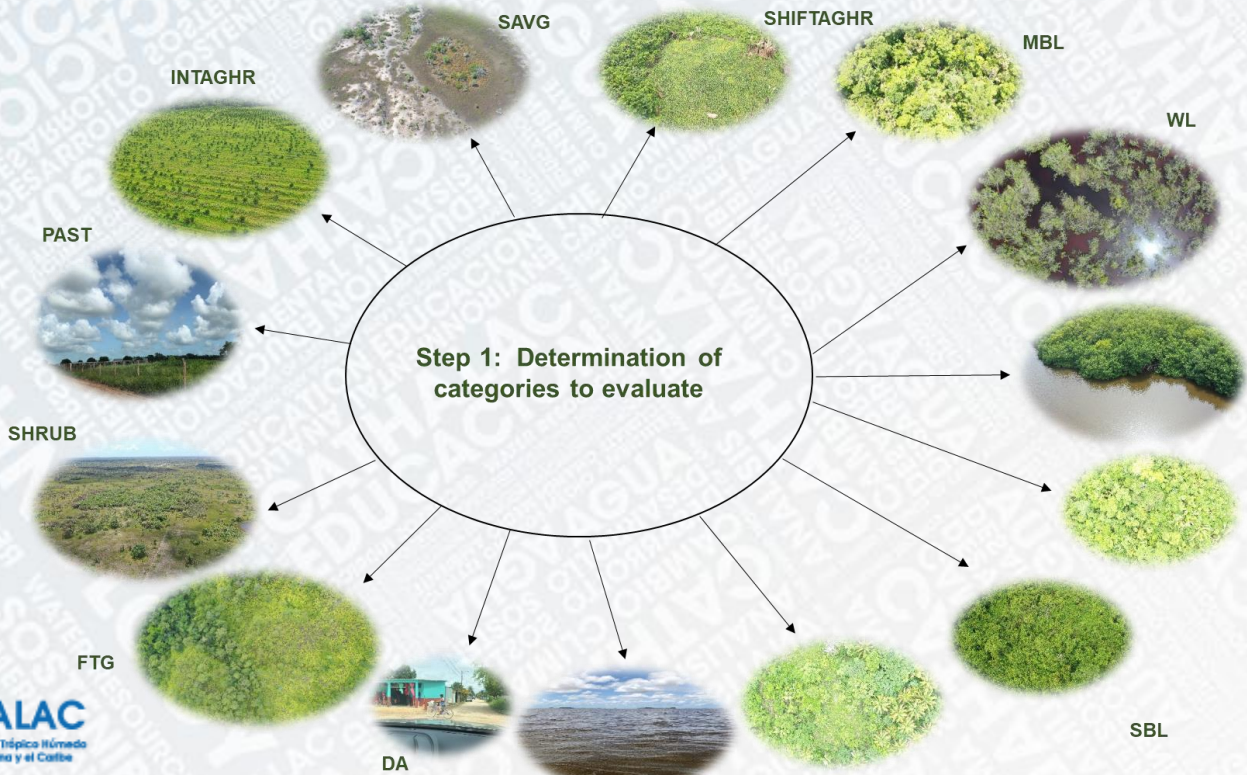
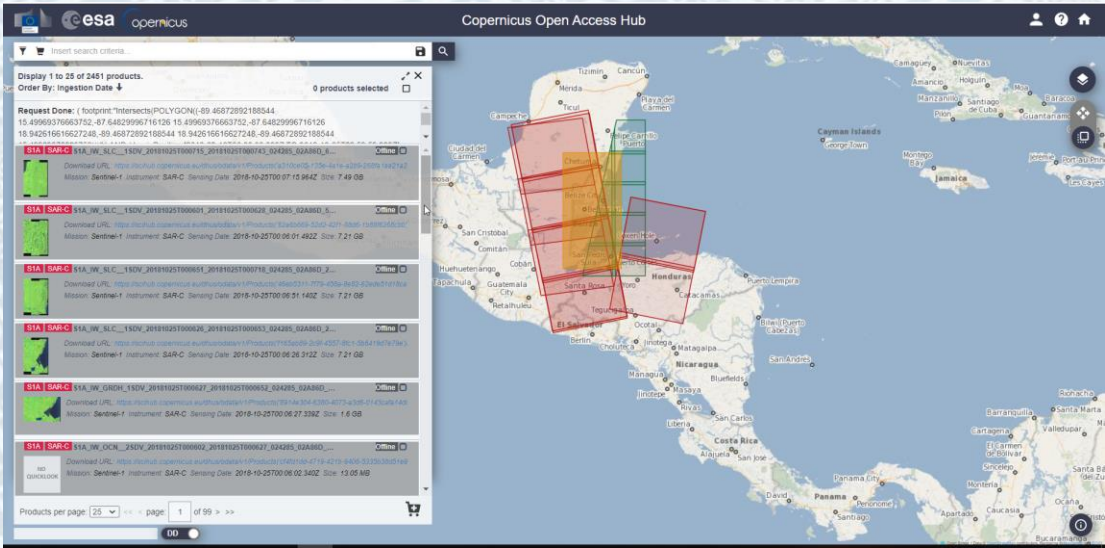
# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE



# ANÁLISIS EN EL MARCO DE LA CARTA INTERNACIONAL DE DESASTRE



# OTRAS EXPERIENCIAS, DESCARGANDO SENTINEL – 2 DESDE LA PLATAFORMA COPERNICUS



# Centro del Agua del Trópico Húmedo para América Latina y el Caribe



## CATHALAC

Centro del Agua del Trópico Húmedo para América Latina y el Caribe



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MSc. Octavio Smith  
Investigador Principal

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## *Gracias*

[www.cathalac.int](http://www.cathalac.int)



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para América Latina y el Caribe

