INSTITUTO GEOGRÁFICO AGUSTÍN CODAZZI

“Supporting forest fire risk management in Colombia”

10 de Octubre de 2018
Instituto Geográfico Agustín Codazzi (IGAC), it’s the head of producing the basic cartography of the country, elaborating the national cadastre, carrying out the inventory and characterizing the country's soils, advancing geographical investigations as support for territorial development, training professionals in the information networks and coordinating the Colombian Data Infrastructure Space (ICDE).

Center for Research and Development in Geographic Information - CIAF
Research Center on Geospatial Technologies

- The CIAF- Important Actor of the SNCTeI. CIAF
- Research Center recognized by COLCIENCIAS.
- Recognized "Geomatics" Research Group

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### Academic Offer. F. Advanced:

- (8) graduate programs:
  2 Specializations
  5 Masters (MbA)
  1 PhD

<table>
<thead>
<tr>
<th>Knowledge Transfer</th>
<th>2018</th>
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<tbody>
<tr>
<td>university</td>
<td>36</td>
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<tr>
<td>Formed / Trained</td>
<td>1,253 (Advanced training) 7.036 (Short courses).</td>
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</table>

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### RESEARCH IN GEOSPATIAL TECHNOLOGIES

- 13 R & D Projects (Remote Sensing and GIS).
- Executive Secretary Colombian Space Commission (CCE)

### TRANSFER OF KNOWLEDGE

- Advanced training (IGAC-Universities Agreements)
- Informal education.

### ASSISTANCE AND TECHNICAL COOPERATION

- Territorial entities, Entities of National Order and International Cooperation.
Law 1523/2012
NATIONAL SYSTEM OF DISASTER RISK MANAGEMENT (SNGRD)

Direction of the National System

• National Council for Risk Management.
• National Unit for Disaster Risk Management.
• National Committee for the Knowledge of Risk.
• National Committee for Risk Reduction.
• National Committee for Disaster Management.

Departmental, district and municipal councils for risk management.

Instances for the Orientation and Coordination

• Torrential avenues - rains
• Mass removal
• Floods
• Forest Fire
IGAC: Development of Forest Fire Detection and Classification App

The Research and Development in Geographic Information Centre (IGAC) of IGAC, UN-SPIDER's Regional Support Office in Colombia, is working on the development of tools for disaster management and disaster relief.

One of its products is an application called SEMARK (Forest Fire Severity Markov Classification), which is the result of research conducted within the framework of a PhD thesis on the use of remote sensing techniques in forest fires.

SEMARK creates classifications of spectral indices derived from satellite imagery (NDVI, NDM, and SAVI) classifiers using Markov random fields (MRF). Based on the results, SEMARK can be used as an initial tool in the identification and quantification of areas affected by forest fires.


Read full story:
Publishing Date: 17/09/2014

IGAC through its Research Center "CIAF", promotes and develops the work of knowledge management in geospatial matters. Bring development and geographic technology to the support of government entities and the country.

**Remote Sensing Acquisition**

- 170 satellites
- 3.1 m
- 150 millón km²/Day
- CubeSat 3U (10 cm x 10 cm x 30 cm)
- 500 Mb/Escena - 6 TB/ día

New Method
Machine Learning application in the generation of severity maps
Highest average annual deforestation of primary forests, by area. Tropical countries

- Annually 25,000 - 22,000 ha 84.2% in natural forest.
- 2009 9,770 ha were burned, 2,130 ha Denso Native Forest.

STATISTICS OF INTEREST

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<td>ISTINNA</td>
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<tr>
<td>URIBE</td>
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<td>TIERRALTA</td>
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Unknoledge:
• Impact on ecosystems - (Biodiversity)
• Emissions - Global change
• Change in the landscape

Role of fire as landscape regulator:

FOREST FIRES IN LANDSCAPE DYNAMICS

Fuel

Meteorology

Weather

Behavior: Severity-intensity

Pre-fire

Succession

Post-fire
SYSTEM OF MANAGEMENT AND MONITORING IN FOREST FIRES

**Before the fire:**
Hazard estimation:
Fuel Maps

**During:**
Active fires
Detection: Hot Spots

**After:**
burned areas
mapping:
BA - Severity
• Field data:

I. Pre-fire index

I. Post-fire index

III. Differential index
Spectral library

La Información Geográfica de Colombia
National Natural Park: Sierra de la Macarena

STUDY AREA

- 5,868 of 117,500 ha - Affected (16 days)
- 39,500 ha - Natural Forest
- 85 Tn - Particulate Material
- (1500 Tn / year - Antioquia)
- (Estimates: Bottom-up)
- IPCC Model
GESTIÓN Y MONITOREO DE INCENDIOS FORESTALES
APPLICATION: SUPERVISED CLASSIFICATION FOR COVER MONITORING

IMAGE
Sentinel 2A-MSI Planet Scope

PRE AND POST PROCESSING

R, G, B, NIR, SWIR TOA - BOA

dNBR RdNBR RBR

Field data

Temporal series

Classifiers based on objects

Segmentation

CLASSIFICATION

Bayesian

Post Classification

ACCURACY

La Información Geográfica de Colombia
Clasification Model:

- Selección del Índice Espectral
- Modelos de Clasificación: GeoCBI Simulado, Modelos de Regresión, Clasificación Bayesiana
- Reclasificación, Entrenamiento 80%, Validación 20%
- Est. 1º Orden ($\mu_c, \sigma_u$), Densidad de prob /A Umb, Prob. a priori
- GeoCBI, Kappa
- Mapa de amenaza por severidad de incendios forestales

Adjustment of empirical models
Susceptibilidad de la vegetación

Precipitación

Pendiente

Temperatura

Frecuencia de incendios

Reclass

Severidad de incendios

Accesibilidad

Mapa de amenaza por severidad de incendios forestales

Modelo de combustible

NASA FIRMS MODIS (MODIS-C6) MOD14 (MCD14DL)

Hot Spots (Thermal Anomalies)
ESCENARIOS DE EVALUACIÓN TEMPORAL

ANTES  
(10/02/2018)

DESPUÉS  
(13/03/2018)

Rapideye 4-7-3
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<th>Clase</th>
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<td>No quemado</td>
<td>190,39</td>
<td>3,25</td>
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<tr>
<td>2</td>
<td>Bajo</td>
<td>554,65</td>
<td>9,48</td>
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<tr>
<td>3</td>
<td>Medio - bajo</td>
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<td>16,21</td>
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<td>4</td>
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<td>1600,79</td>
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<tr>
<td>Total</td>
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<td>5853,31</td>
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SEVERITY MAPPING BY CLOUD COMPUTING “GEE”

Alexander Ariza  
_Centro de Investigación CIAF – IGAC_

Hernando Hernández  
_Proyecto de Maestría en Gestión de la Información y Tecnologías Geoespaciales_  
_Universidad Sergio Arboleda_

Earth Engine Apps  
Search places

Severity Fire in Colombia Amazon 2018  
Loading legend...
SEVERITY MAPPING BY CLOUD COMPUTING “GEE”
Thanks