

# South Africa Flash Flood Guidance (SAFFG) Feasibility Assessment – June 2007

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## Regional Flash Flood Guidance Systems An Operational Case Study: CAFFG

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Hydrologic Research Center

<http://www.hrc-lab.org>



# Regional Flash Flood Guidance Systems

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- System Design Constraints and Distinctions
  - Data Availability
  - Supporting Infrastructure
  - Policy and Protocol
  - Collaboratively Established Specifications
- System Description Abstractions
  - Data Products and User Interface
  - System Components, Processing Flow and Administration
  - Computational and Scientific Implementation



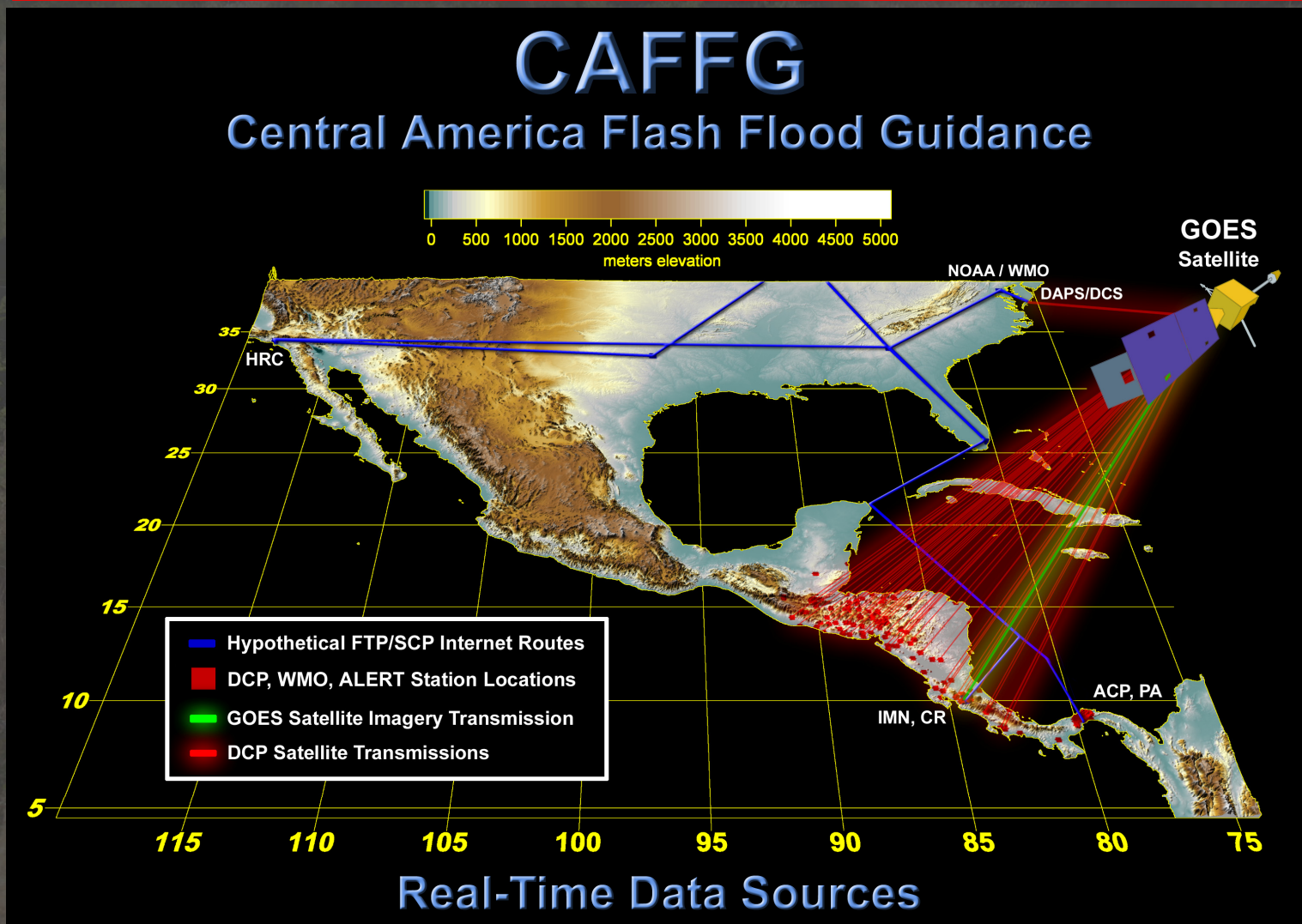
# Regional Flash Flood Guidance Systems

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## CAFFG System Overview

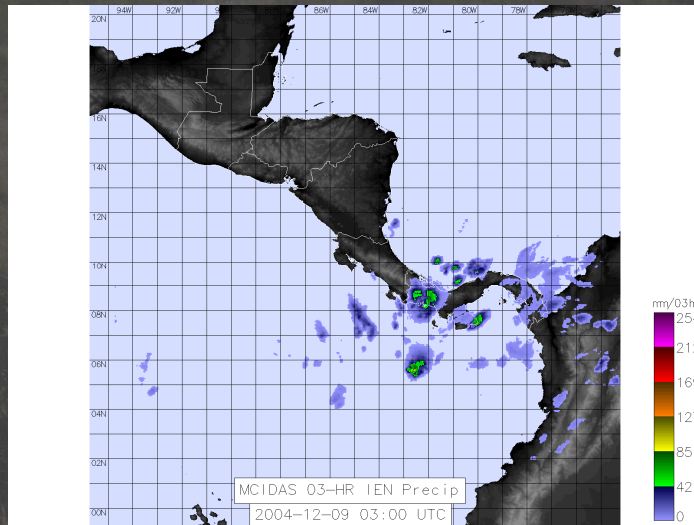


# CAFFG Real-Time Data Sources

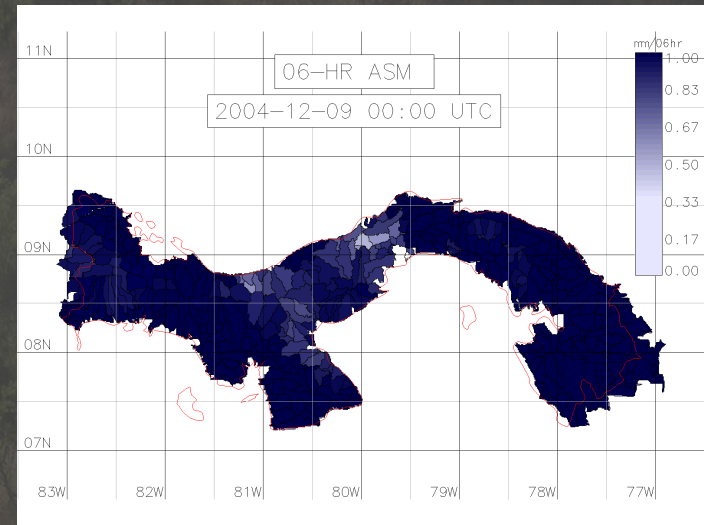


# Regional Processing, National FFG Products

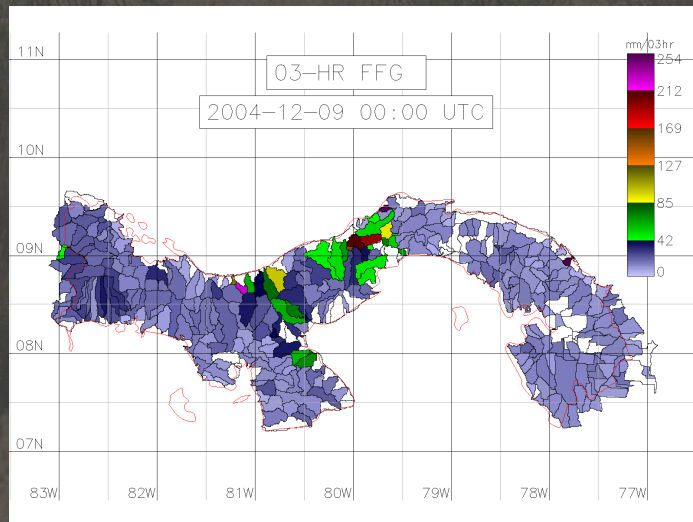
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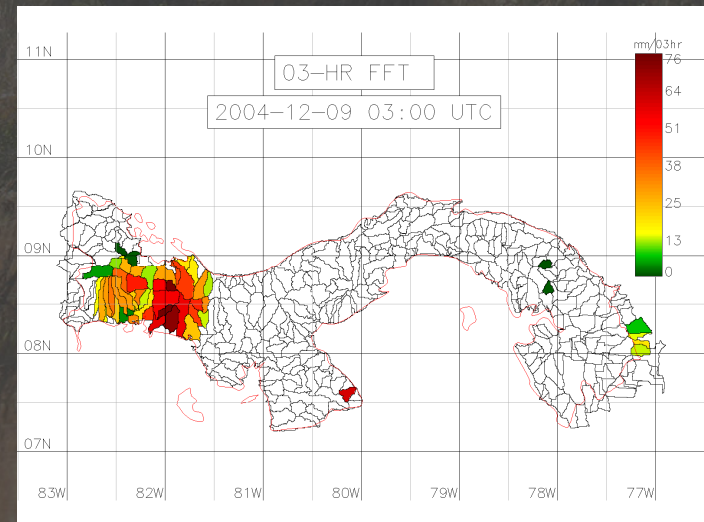
2



3



4



# CAFFG System Unique Characteristics

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- World's first regional flash flood guidance system
  - Operational dissemination of both regional and small-scale products for all countries throughout Central America
- Fully-automated real-time operation
  - Data acquisition, ingest and quality control, model processing, output publication and data management
- Centralized acquisition, standardization and archive of disparate real-time data products throughout the entire region



# CAFFG System Hardware

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- The CAFFG system is composed of two servers installed at the Instituto Meteorologico Nacional (IMN) in San Jose, Costa Rica
  - **CAFFG Processing Server (CPS)**
    - Red Hat Enterprise Linux WS v4.5
    - Collects and standardizes numerous real-time data products, evokes various models to produce FFG and publishes output to the CDS
  - **CAFFG Dissemination Server (CDS)**
    - Red Hat Enterprise Linux WS v4.5
    - Provides login-restricted, secure WWW and SCP access to various national data products for all CAFFG-participating National Meteorological and Hydrological Services (NMHS)



# How Do Users Interact with the System?

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- Participating Agency remote access to the CDS
  - ID/Password – Login-based access privileges
  - HTTPS - Secure (encrypted) and restricted web access
  - SCP - Secure (encrypted) and restricted data transfers
  - National Agency access to respective data only
- Administrative remote access to the CDS and CPS
  - SSH - Secure (encrypted) and restricted shell access
- Public access to sample regional products at HRC web site – <http://www.hrc-lab.org/CAFFG/CAMI>





# CAFFFG Dissemination Server (CDS)

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## CDS Design Overview and Graphical User Interface (GUI)



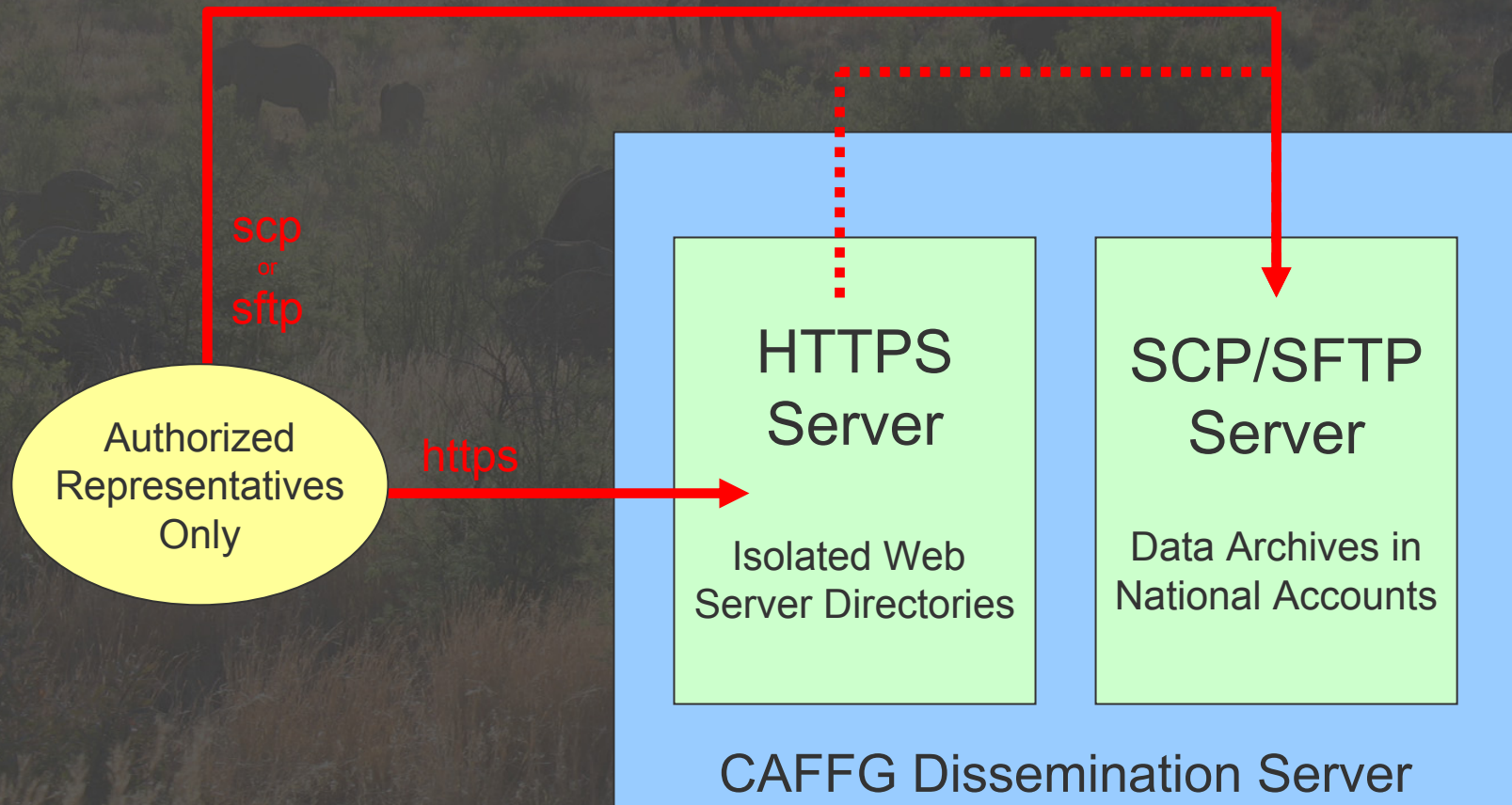
# CAFFG Dissemination Server

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- The CDS is designed for dissemination purposes only
- The CDS graphical user interface (GUI) is designed to facilitate user review of available data products and to streamline an efficient process of remote data acquisition. (ArcView-formatted data composites)
- Data comparisons, quality control, revisions and response take place at each NMHS following remote acquisition of composite ArcView data tables



# CAFFG Dissemination Server (CDS)



# CAFFG Dissemination Server Web Access GUI – Welcome Screen



# CAFFG Dissemination Server Web Access GUI – National Data Interface

Reports - Mozilla Firefox


File Edit View Go Bookmarks Tools Help

Address: <https://cdis.imn.ac.cr/NATIONAL/>

## National Representative Access Only

Please select your dissemination region:


- [Belize](#)
- [Costa Rica](#)
- [El Salvador](#)
- [Guatemala](#)
- [Honduras](#)
- [Nicaragua](#)
- [Panama](#)



**Central America Mitigation Initiative (CAMI)**  
Regional Operational Flash Flood Guidance

Public Information: [English](#) [Spanish](#)  
 Restricted Access: [HOME](#) [HRC](#) [NOAA](#) [USAID](#) [NATIONAL](#) |  
 Send comments to: [cami\\_admin@hrc-lab.org](mailto:cami_admin@hrc-lab.org)

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last updated: 06/13/2004



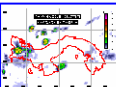
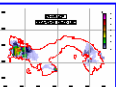
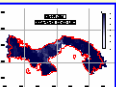
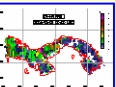
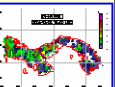
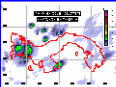
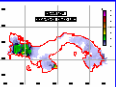
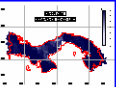
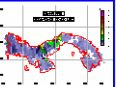
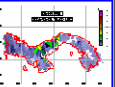
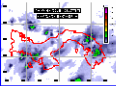
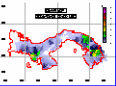
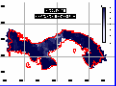
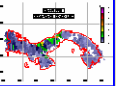
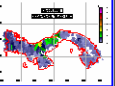
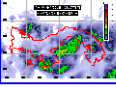
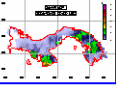
Done cdis.imn.ac.cr

Panama Admin - Microsoft Internet Explorer

File Edit View Favorites Tools Help defax

Address: <https://cdis.imn.ac.cr/PANAMA/>

## Most Recent Observations and Data Products

Time-Scale	MAI	MAP	ASM	FFG	Prev FFG
<b>01-hr</b> MAI and MAP updated hourly	 <a href="#">1600x1200, 640x480</a> 24-hrs MNG	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text
<b>03-hr</b> MAI and MAP updated at: 00Z, 03Z, 06Z, 09Z, 12Z, 15Z, 18Z, 21Z	 <a href="#">1600x1200, 640x480</a>	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text
<b>06-hr</b> updated at: 00Z, 06Z, 12Z, 18Z	 <a href="#">1600x1200, 640x480</a>	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text	 <a href="#">1600x1200, 640x480</a> text
<b>24-hr</b> updated at: 00Z	 <a href="#">1600x1200, 640x480</a>	 <a href="#">1600x1200, 640x480</a> text			
<b>Archive</b> (requires WinSCP)	<a href="#">MNG, PNG</a>	<a href="#">MNG, PNG, Text</a>	<a href="#">MNG, PNG, Text</a>	<a href="#">MNG, PNG, Text</a>	

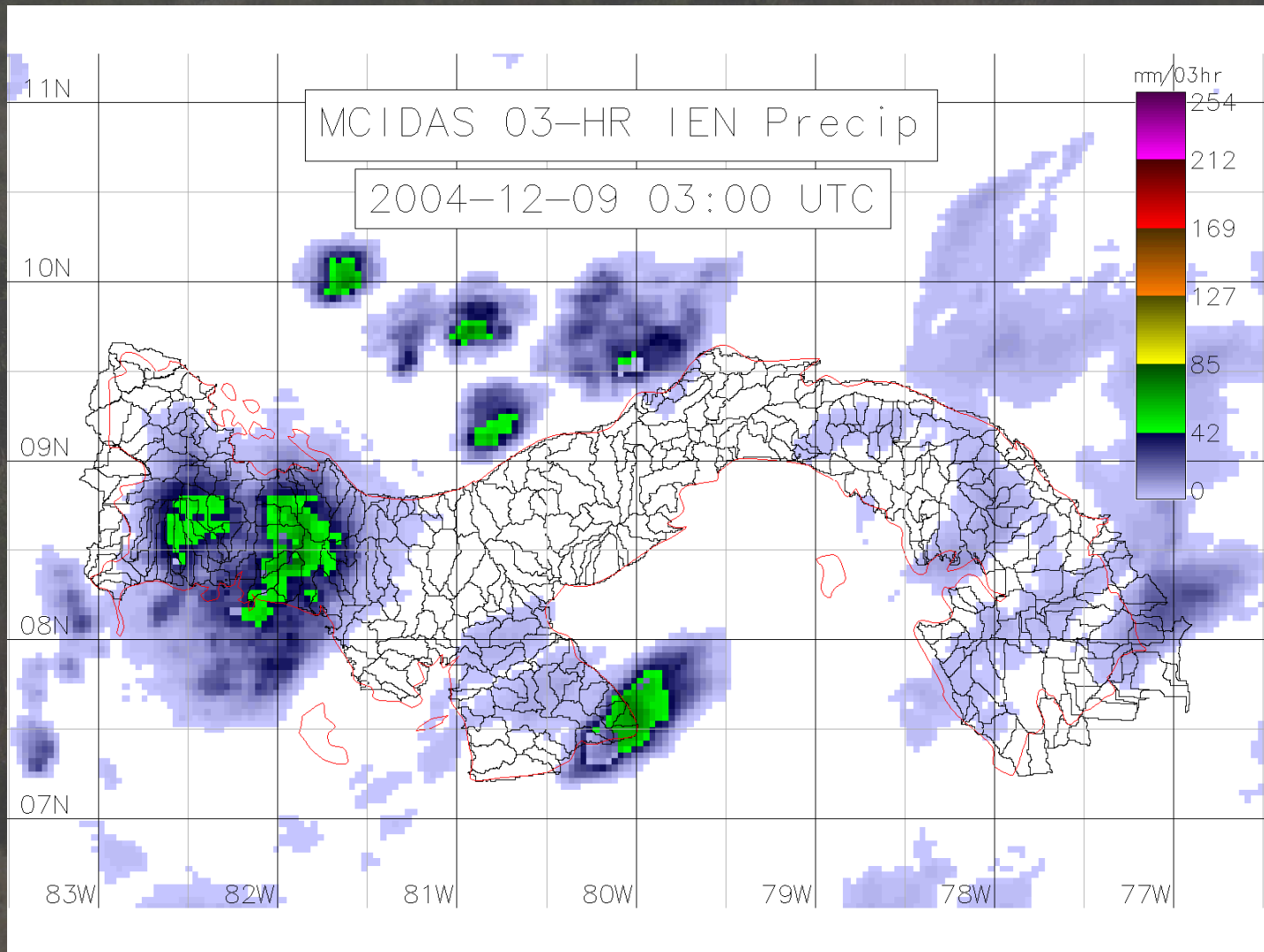
ArcView Import Tables: [Current](#), [Archive](#)

Done Internet

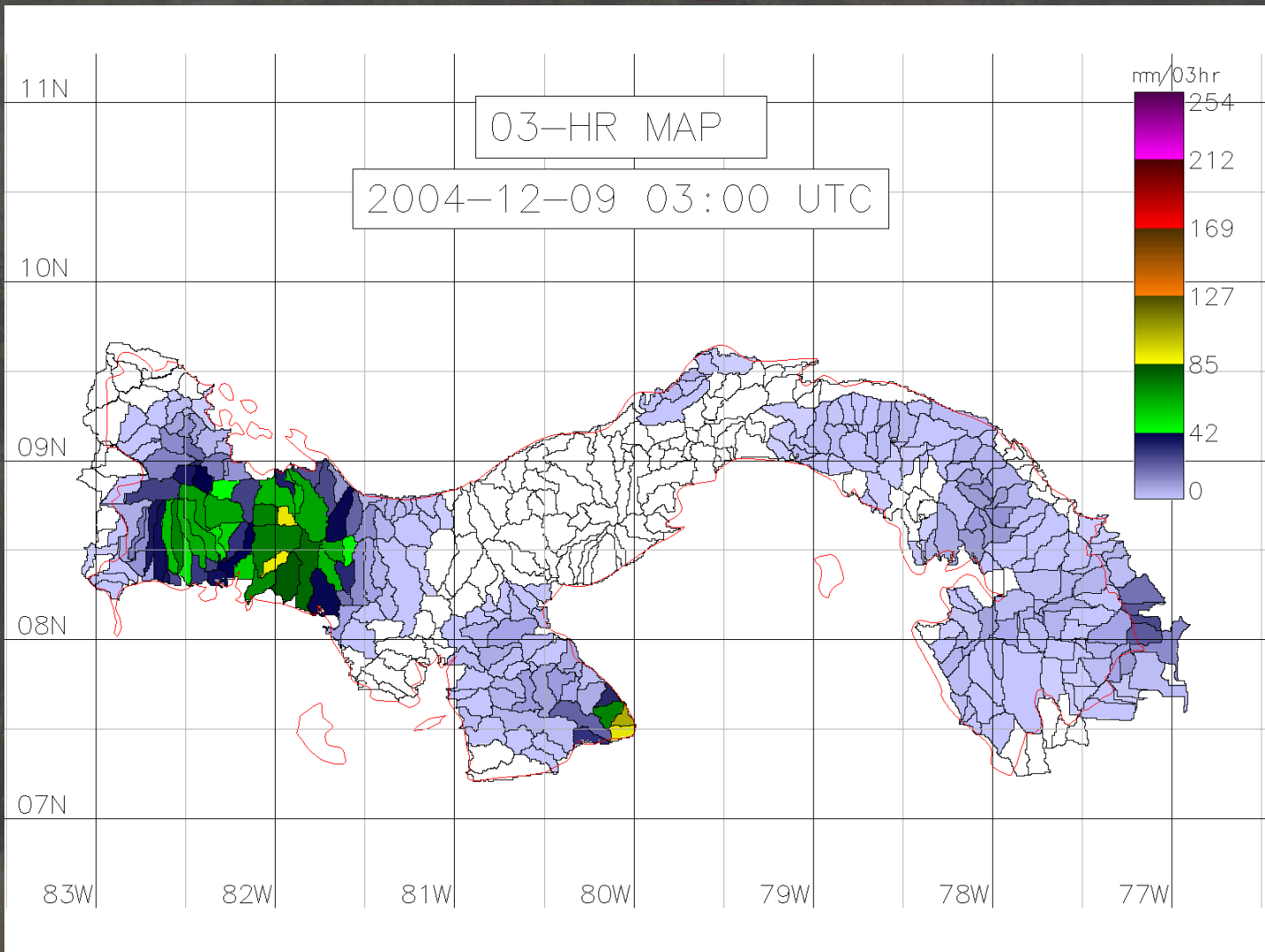


# CAFFG Dissemination Server

## Web Access GUI – Sample 3-hr GOES-12 HE Image

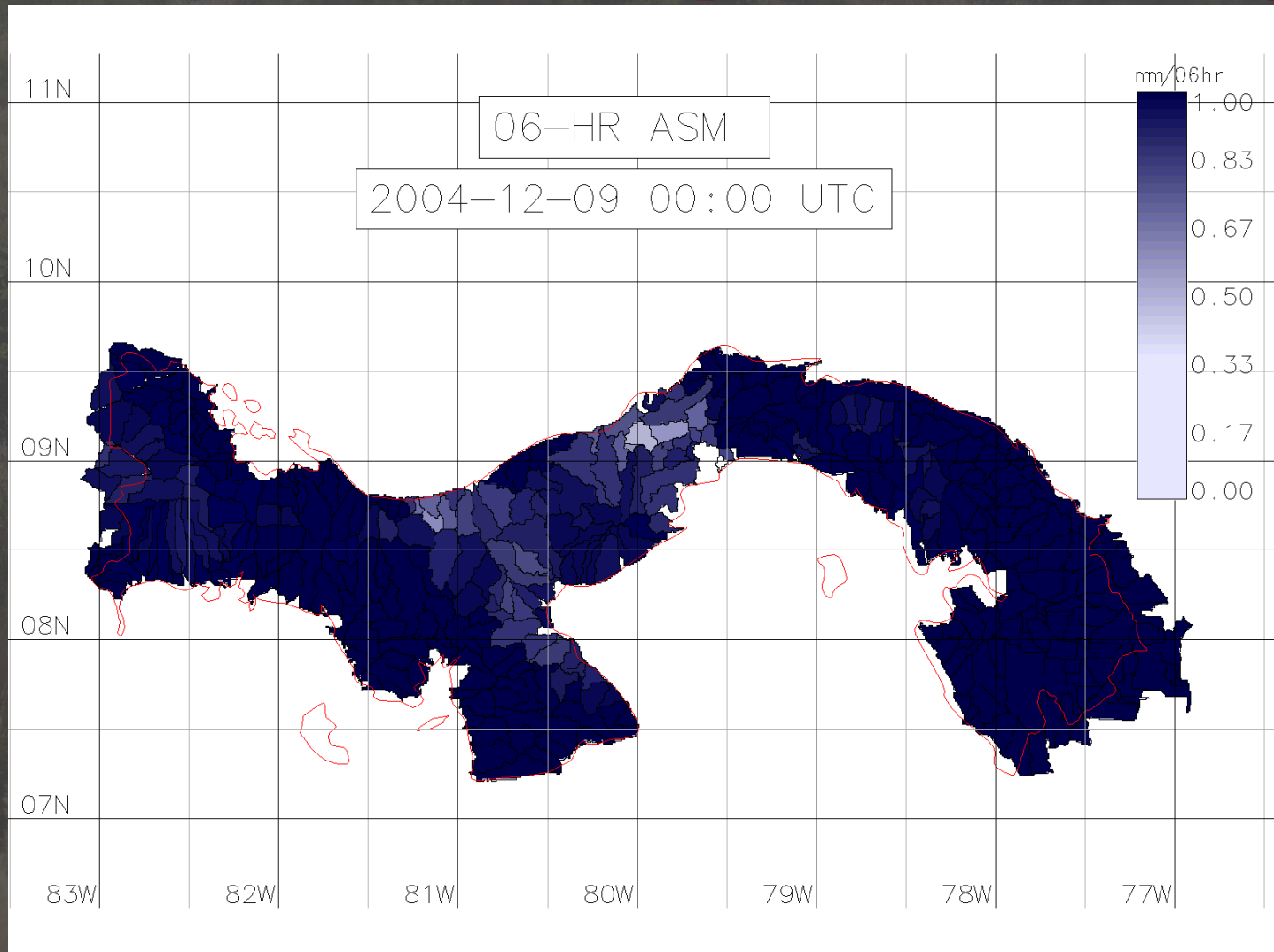


# CAFFG Dissemination Server Web Access GUI – Sample 3-hr MAP Image



# CAFFG Dissemination Server

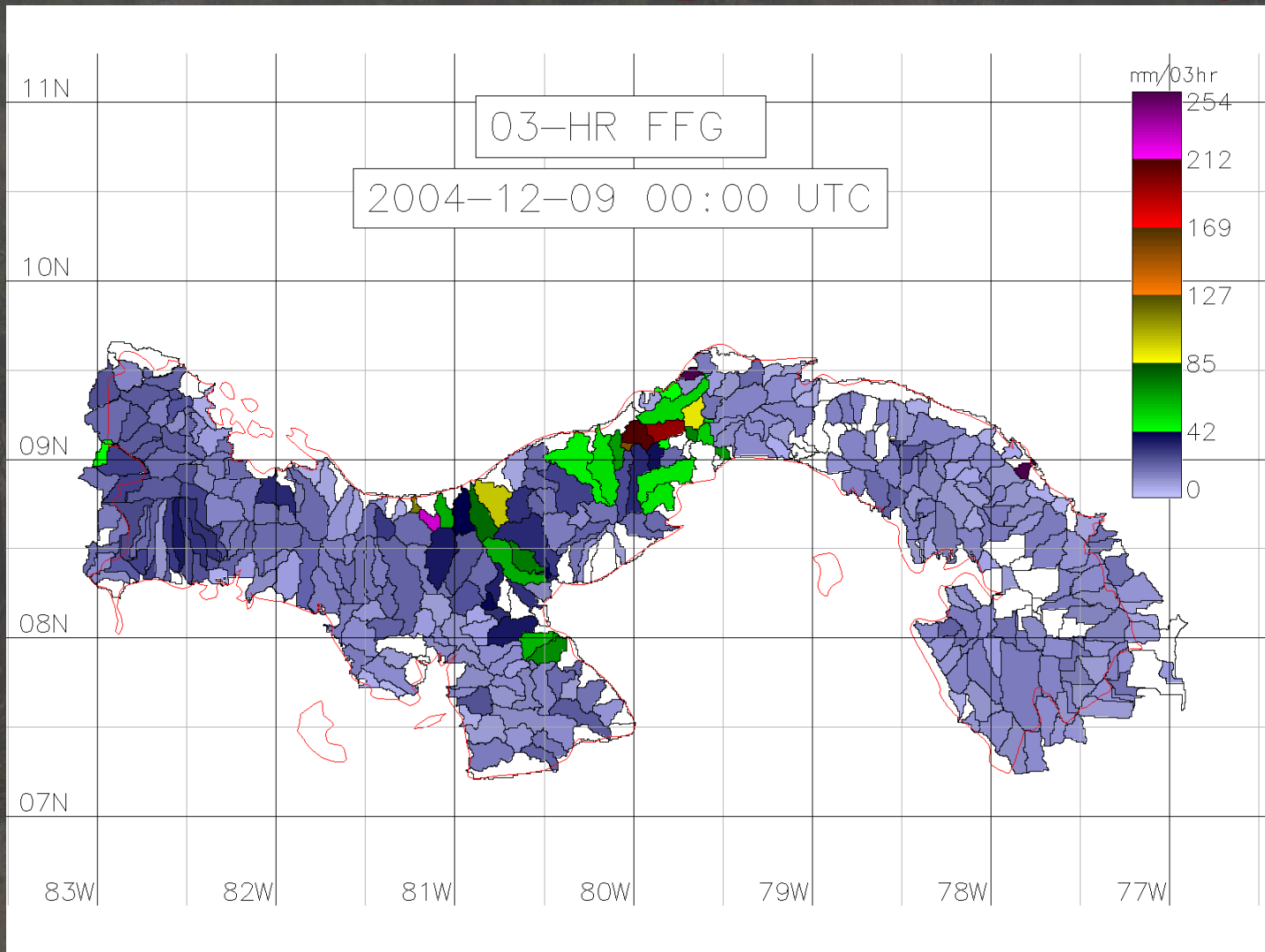
## Web Access GUI – Sample 6-hr ASM Image





# CAFFG Dissemination Server

## Web Access GUI – Sample 3-hr FFG Image



# CAFFG Dissemination Server

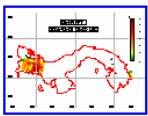
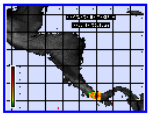
## Web Access GUI – Regional Data Products

Panama Admin - Microsoft Internet Explorer

Address: <https://cde.imn.ac.cr/PANAMA/>

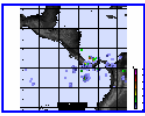
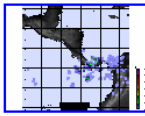
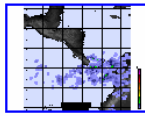
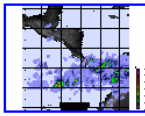
### Most Recent CAFFG Flash Flood Threat (FFT) Index

*(updated/valid at 03Z, 09Z, 15Z and 21Z)*

National 03-hr FFT Index	Regional 03-hr FFT - 15Km Grid
 1600x1200, 640x480 text	 1600x1200, 640x480

### MCIDAS AREA Image (MAI) Regional Observations

*(same updating schedule as national MAI products)*

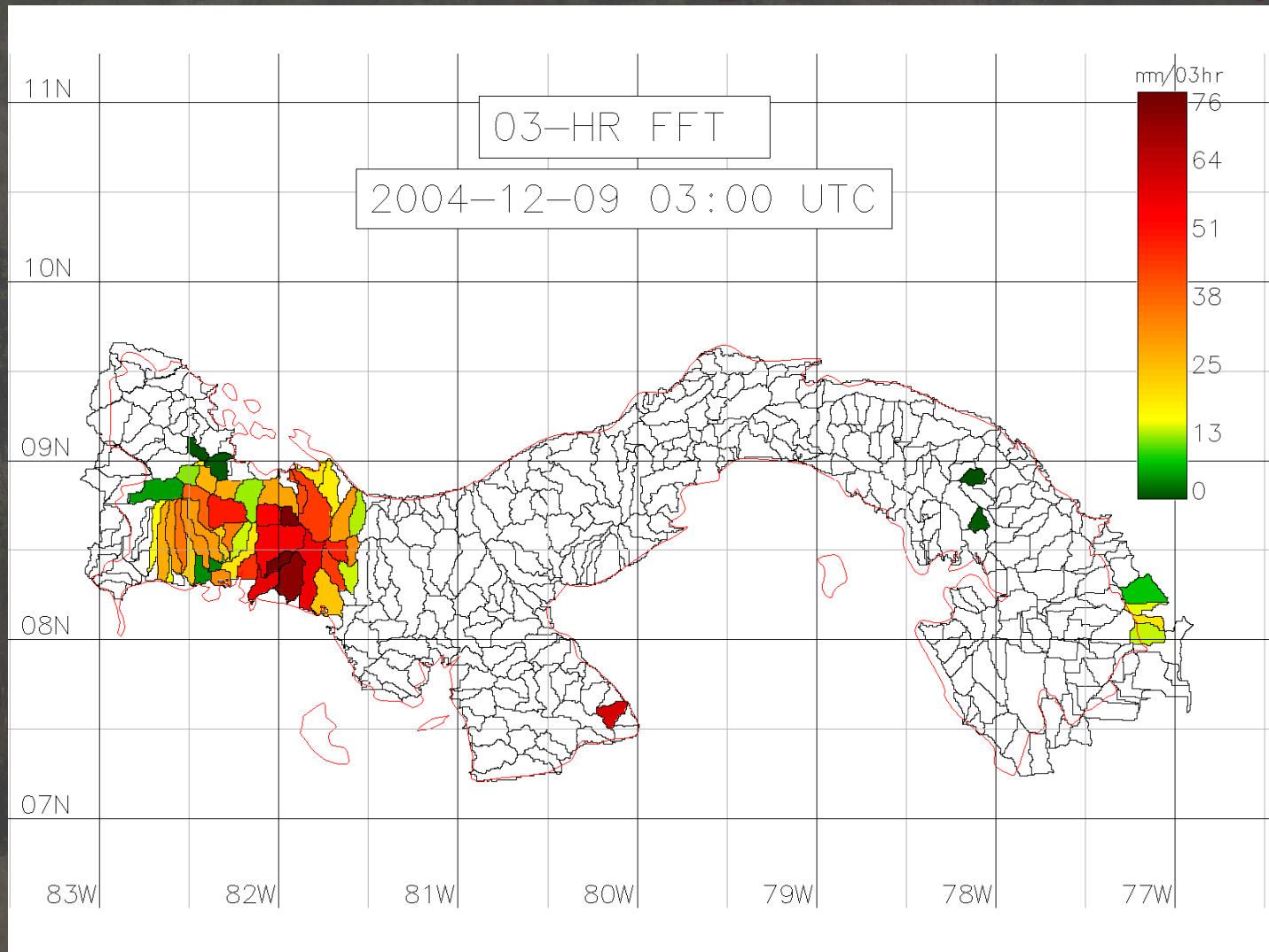
MCIDAS 01-hr	MCIDAS 03-hr	MCIDAS 06-hr	MCIDAS 24-hr
 1600x1200, 640x480 24-hrs MNG	 1600x1200, 640x480	 1600x1200, 640x480	 1600x1200, 640x480

Pre-Processed Database MCIDAS Inventory: [24hr Catalog](#)



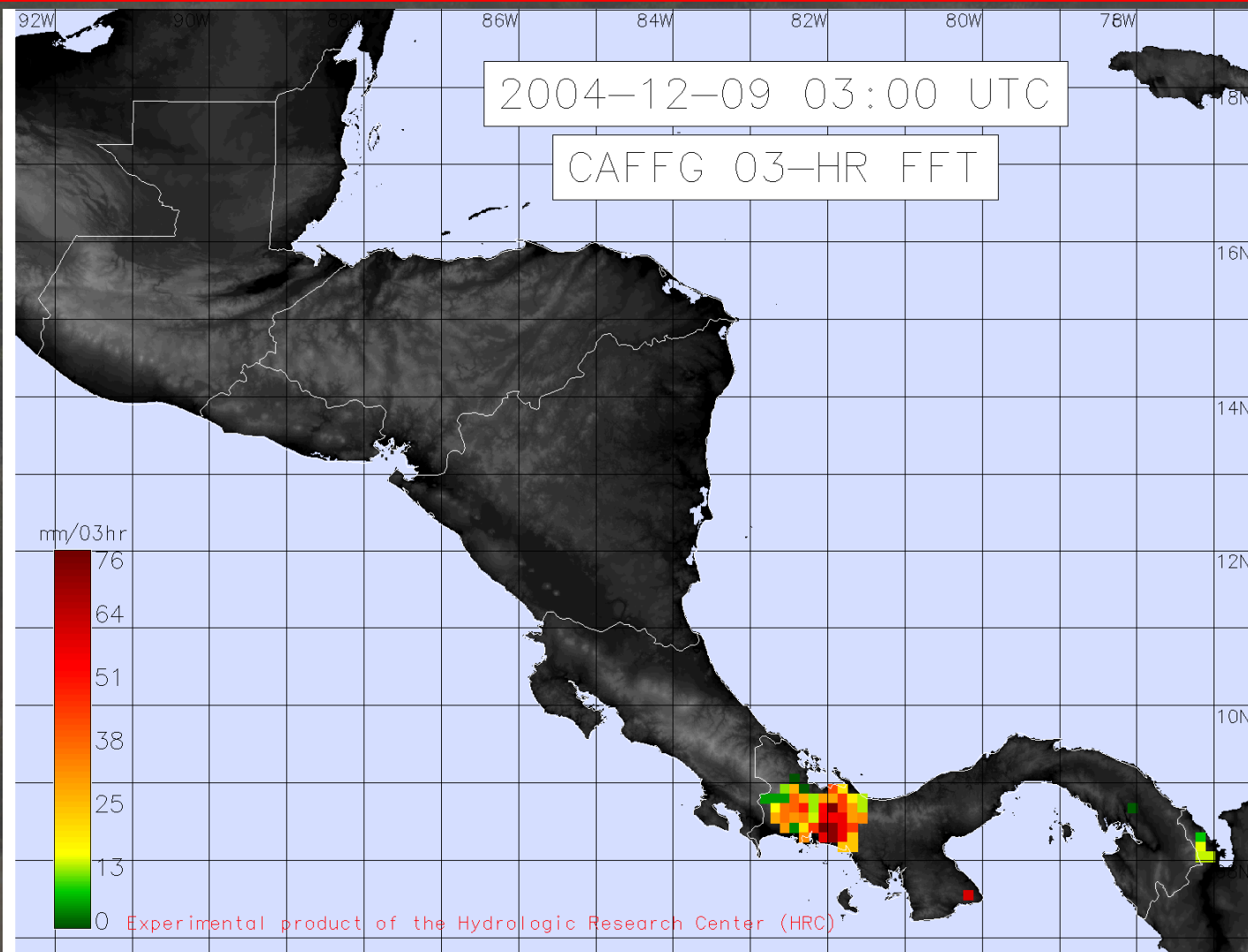
# CAFFG Dissemination Server

## Web Access GUI – Sample 3-hr FFT Image



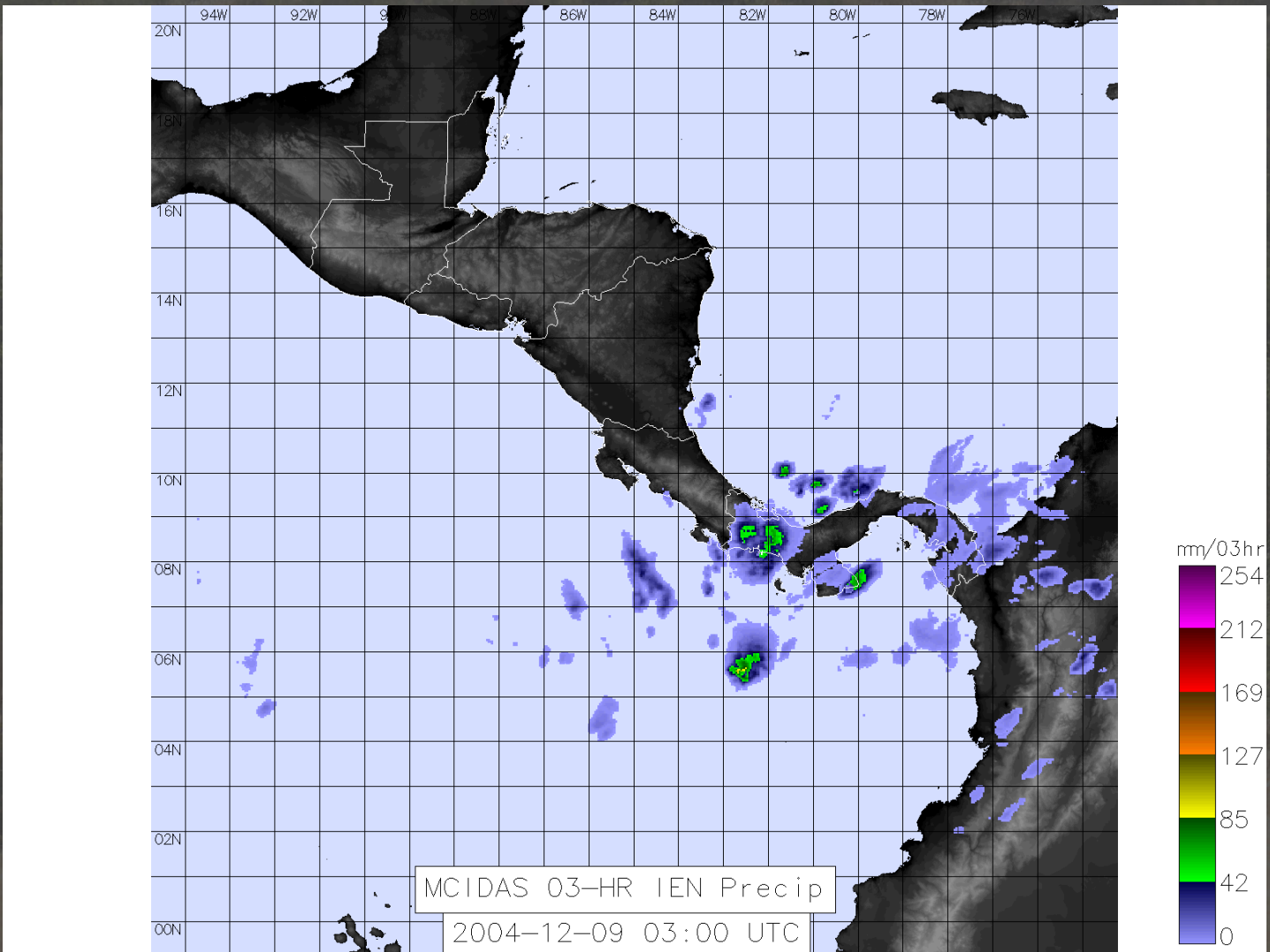
# CAFFG Dissemination Server

## Web Access GUI – Sample 3-hr Regional FFT Image



# CAFFG Dissemination Server

## Web Access GUI – Sample 3-hr Regional GOES-12 HE Image



# CAFFG Dissemination Server

## Web Access GUI – Static ArcView Resources



Microsoft Internet Explorer window showing the CAFFG Static ArcView Resources page.

Address: <https://cds.imn.ac.cr/PANAMA/>

### CAFFG Static ArcView Resources


Shape Files	MAP Legends	ASM Legend	FFG Legends	Images
<a href="#">Basin Delineation .dbf</a>	<a href="#">MAP 01hr .avl</a>	<a href="#">ASM 06hr .avl</a>	<a href="#">FFG 01hr .avl</a>	<a href="#">Basin IDs (668KB)</a>
<a href="#">Basin Delineation .shp</a>	<a href="#">MAP 03hr .avl</a>		<a href="#">FFG 03hr .avl</a>	<a href="#">Streams</a>
<a href="#">Basin Delineation .shx</a>	<a href="#">MAP 06hr .avl</a>		<a href="#">FFG 06hr .avl</a>	<a href="#">Elevation</a>
	<a href="#">MAP 24hr .avl</a>			

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**Regional Operational Flash Flood Guidance**


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**Restricted Access:** | [HOME](#) | [HRC](#) | [NOAA](#) | [USAID](#) | [NATIONAL](#) |  
 Send comments to: [cam\\_i\\_admin@hrc-lab.org](mailto:cam_i_admin@hrc-lab.org)

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# CAFFG Dissemination Server

## Web Access GUI – System Monitoring Resources

**Pre-Processed Database (PREDB) Inventory:**

MCIDAS AREA Image data:	<a href="#">24hr catalog</a>	<a href="#">10day catalog</a>
DCP Stage and Precip data:	<a href="#">24hr catalog</a>	<a href="#">10day catalog</a>
WMO Surface Met data:	<a href="#">24hr catalog</a>	<a href="#">10day catalog</a>
ALERT Precip and Surface data:	<a href="#">24hr catalog</a>	<a href="#">10day catalog</a>

**Linux System Information:**

<a href="#">Reported Uptime</a>
<a href="#">Active Logins</a>
<a href="#">Active Processes</a>
<a href="#">Disk Space Usage</a>
<a href="#">Active CAFFG Crontab</a>
<a href="#">Active CAFFG Environment Variables</a>

**CAFFG CPS Backup Logs:**

<a href="#">CAFFG Database Dump Files Cleanup Log</a>
<a href="#">CAFFG Postgres Database Dump Log</a>
<a href="#">CAFFG Data Tape Backup Log</a>



# CAFFG Processing Server (CPS)

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## CPS Operational Design and Data Processing Overview





# CAFFG Processing Server (CPS)

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## ➤ Pre-Processing

- Collect real-time data products from various sources
- Archive real-time download files and data values

## ➤ Processing

- Standardize real-time data and prepare numerous input data products
- Execute Models
  - Satellite Rainfall Bias Adjustment
  - Surface Meteorological Interpolation (Gauge and Temperature)
  - Basin Mean Areal Precipitation and Mean Areal Temperature
  - Soil Moisture and Flash Flood Guidance
- Archive model output and state parameters

## ➤ Post-Processing

- Create graphical products of processed data and model output
- Prepare data products and reports for web publication
- Upload images, data and reports for web dissemination and archive

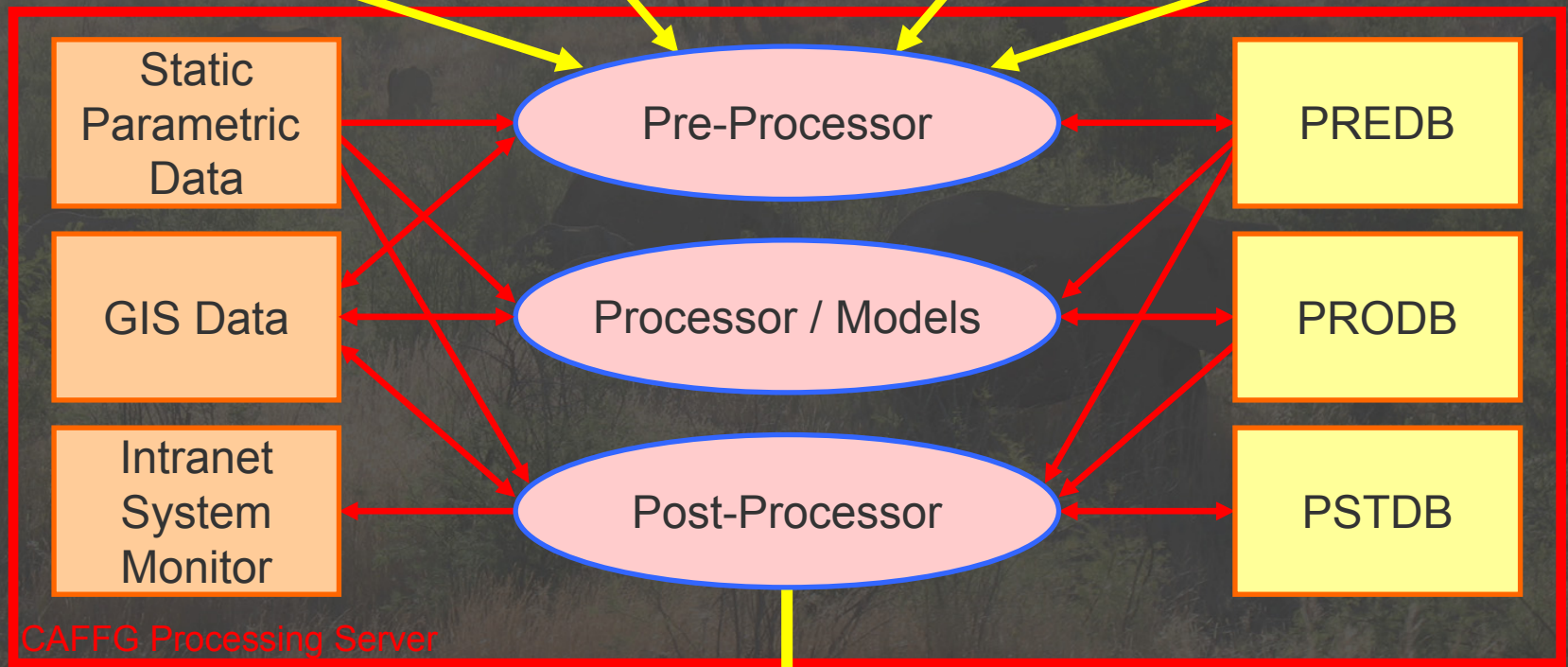


**SCP**  
**GOES-12**  
(IMN)

**TCP**  
**DCP**  
(DAPS/DCS)

**SCP**  
**ALERT**  
(ACP/HRC)

**FTP**  
**WMO**  
(NOAA)



CAFFG Processing Server

**CAFFG Dissemination Server**  
HTTPS / SCP

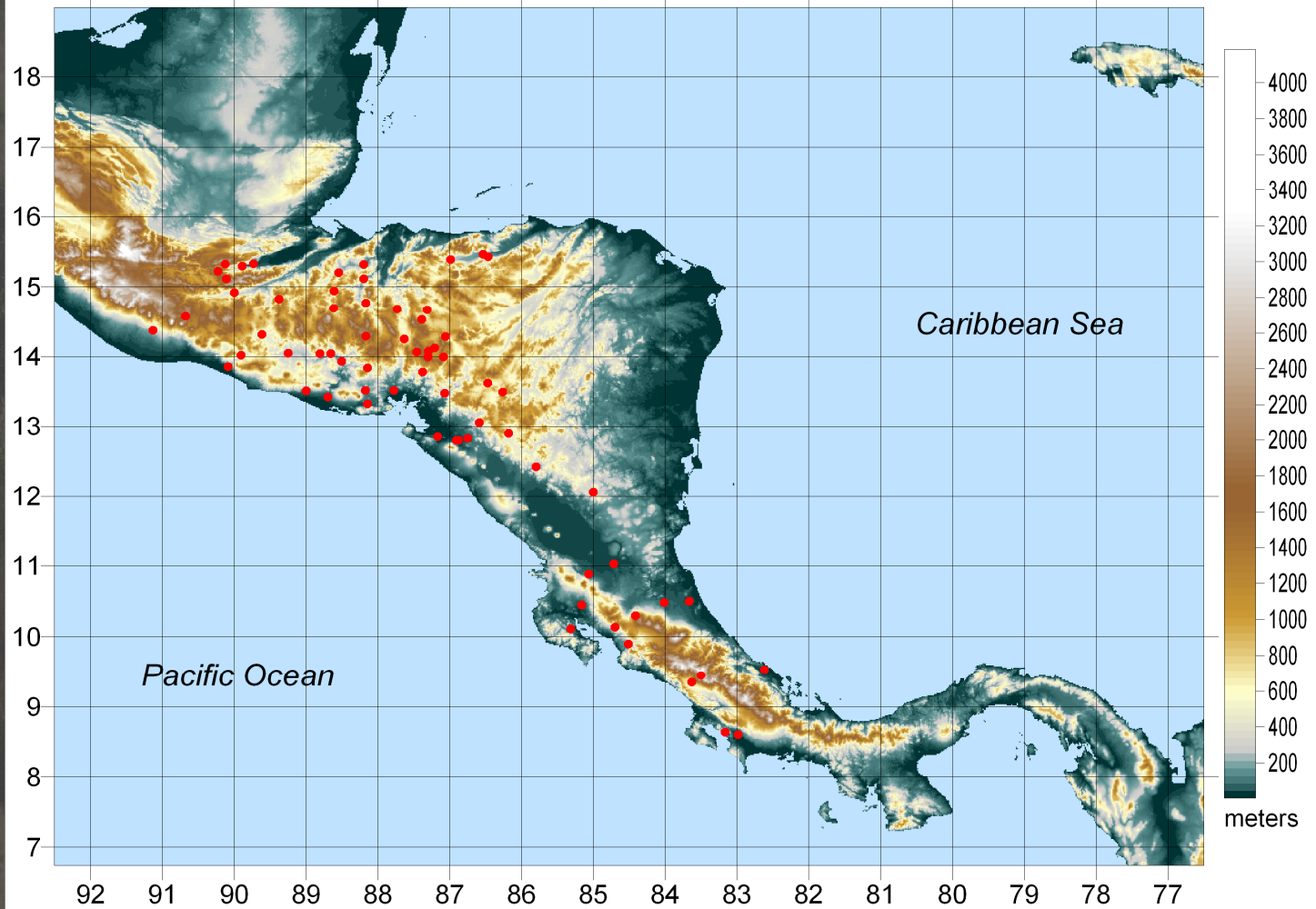
National Agencies  
HRC

USAID  
NOAA



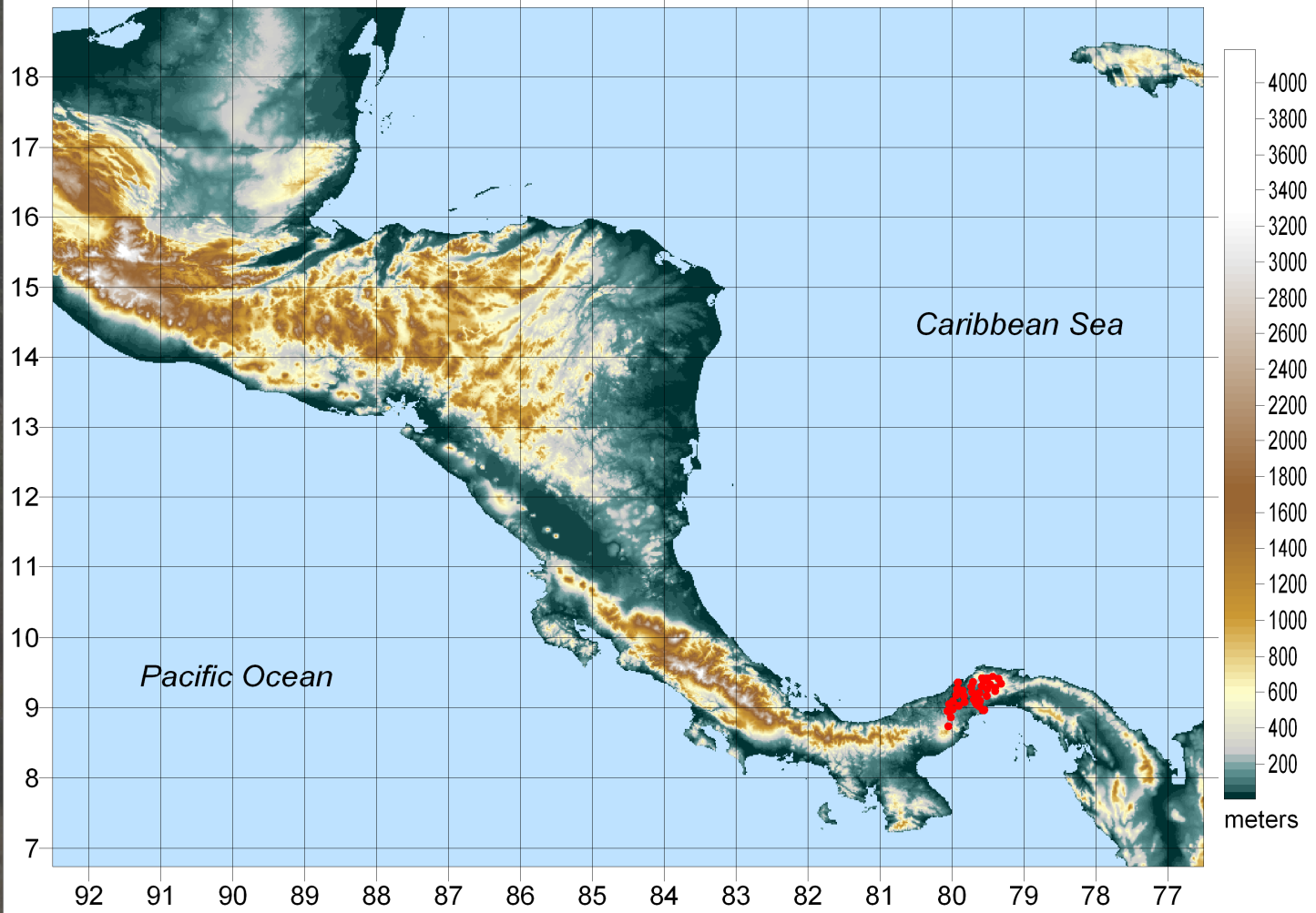
# DCP Stations (Precip, some Temp)

CAFFG Real-Time DCP Stations (via TCP through DAPS/DCS)



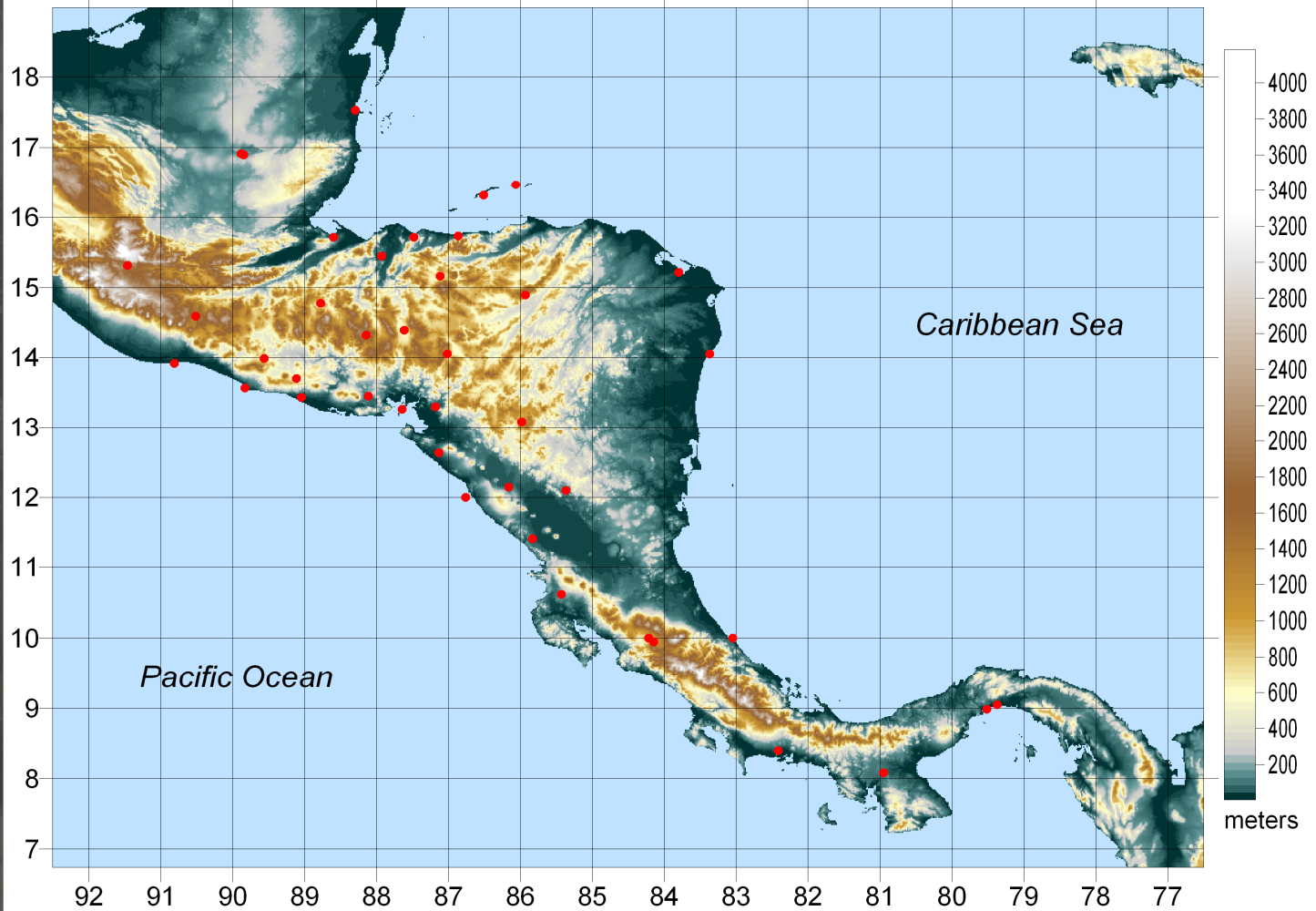
# ALERT Stations (Precip, some Temp)

CAFFG Real-Time ALERT Stations (via SCP through ACP/HRC)



# WMO METAR Stations (Temp)

CAFFG Real-Time WMO METAR Stations (via FTP through NOAA)



# Concluding Remarks

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## ➤ System Status

- Operational since June 2004
- Hands-on Operator training completed and continuing
- Recent hardware upgrade and system administrator training completed

## ➤ CAFFG Product Validation

- Validation is ongoing, with encouraging results

## ➤ Transferability for global application

- Plans for implementation with weather radar data in:  
Romania, Southeast Asia, South Korea and South Africa
- Plans for global implementation with satellite precipitation data

## ➤ Additional information at <http://www.hrc-lab.org>



# South Africa Flash Flood Guidance (SAFFG) Feasibility Assessment – June 2007

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**Konstantine Georgakakos, Director**  
**Theresa Carpenter, Hydrologic Engineer**  
**Jason Sperflage, Software Engineer**

*Thank you!*

