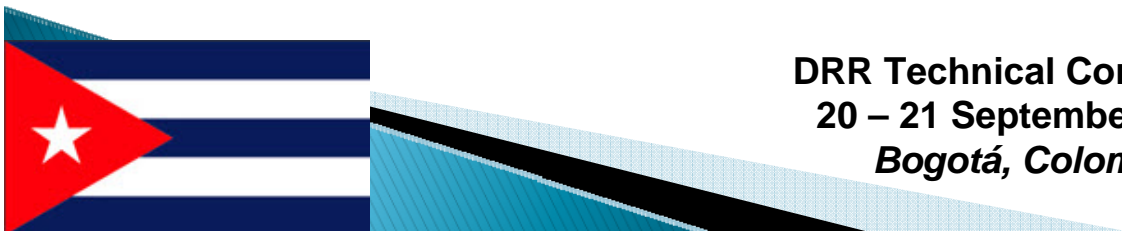




# EARLY WARNING SYSTEM FOR TROPICAL CYCLONES IN THE REPUBLIC OF CUBA

**Dr. José Rubiera**  
**Director National Forecast Center**  
**Institute of Meteorology, Cuba**

DRR Technical Conference  
20 – 21 September, 2010  
*Bogotá, Colombia*

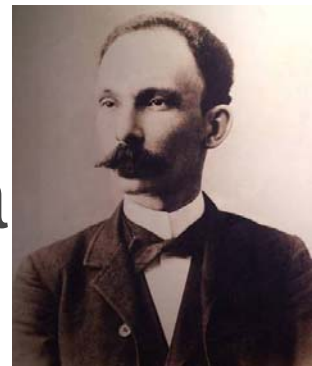


“Los peligros no han de verse cuando se les tiene encima, sino cuando se les puede evitar”

---

“ Poner la Ciencia en lengua de todos, he aquí un bien que pocos hacen”.

José Martí  
Héroe Nacional de Cuba  
(1853 – 1895)



“Hazards should not be watched upon when they are already over us, but when they could be avoided”

---


“ To place Science in everybody’s language, that is a goodness than only a few people do”.

José Martí  
National Hero of Cuba  
(1853 – 1895)

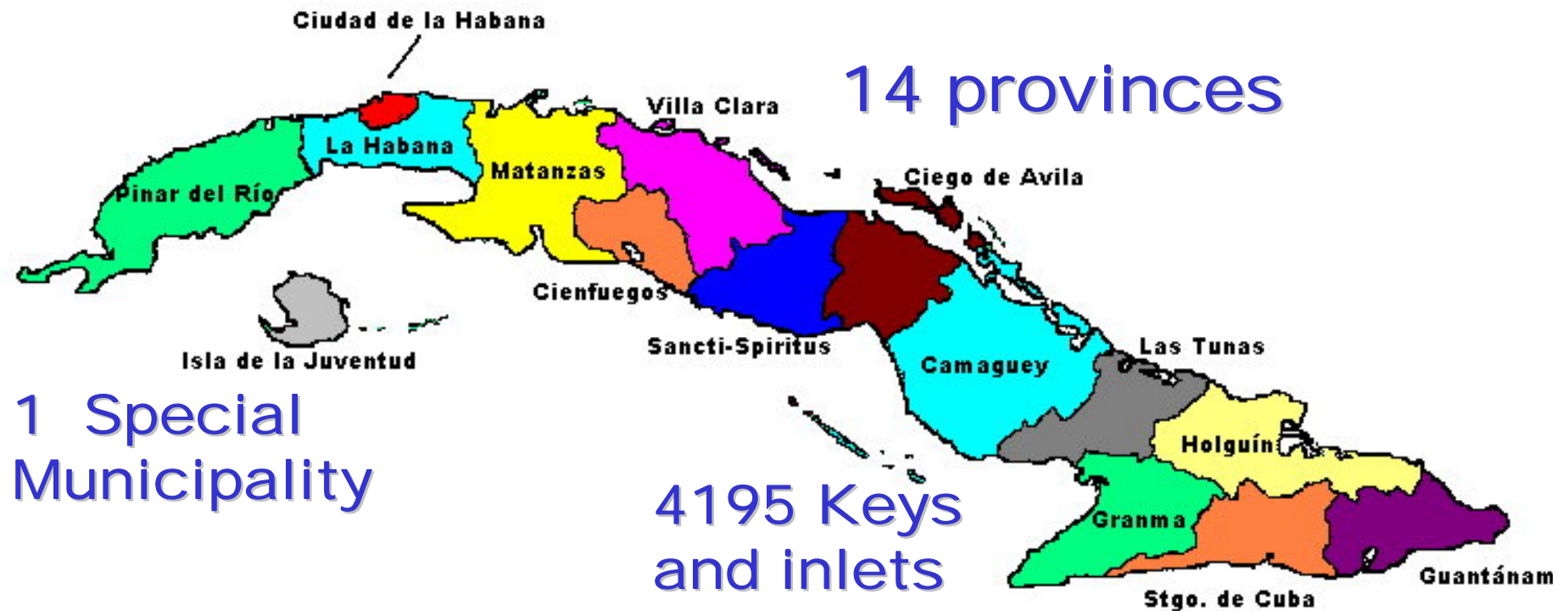


# Part I

## OVERVIEW OF EARLY WARNING SYSTEM AND THE ROLE OF THE CUBAN NATIONAL METEOROLOGICAL SERVICE

- Overview on Cuba and the establishment of EWS
  - Governance and Institutional Arrangements
  - Planning
  - Institutional Coordination
  - Role of the NMHS
- 

# Overview on Cuba



**Area : 110 922 km<sup>2</sup>  
km**

**Coastline: 5 746**

**Population: 11 millon**





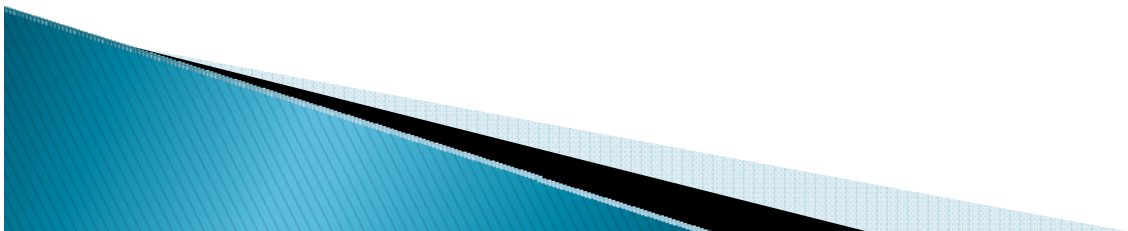
**CUBA, THE CARIBBEAN SEA**

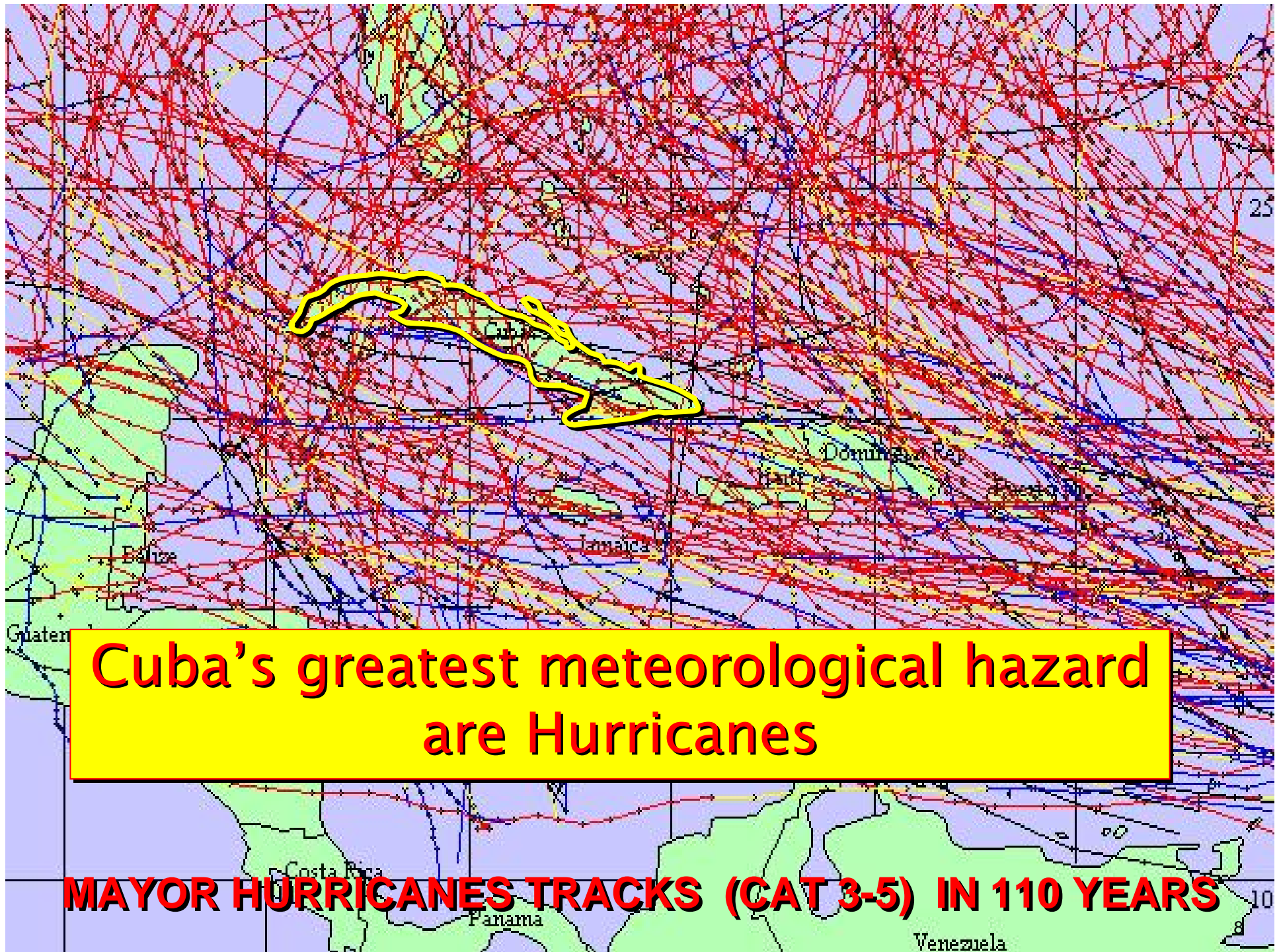
**AND CENTRAL AMERICA:**

**HAVE THE SAME SCENARIO OF HAZARDS**

# Hidrometeorological Hazards

- **TROPICAL CYCLONES**
- **TORRENTIAL RAINS**
- **COASTAL FLOODINGS**
- **LOWLAND FLOODINGS**





**Cuba's greatest meteorological hazard are Hurricanes**

**MAYOR HURRICANES TRACKS (CAT 3-5) IN 110 YEARS**



A satellite image of a hurricane system over the Caribbean Sea. The hurricane is visible as a large, swirling cloud mass with a distinct eye. The surrounding clouds are shown in shades of green and brown, indicating different cloud heights and densities. The text is overlaid on the image in white and yellow. 

# *Hurricanes are multi-hazard Systems*

- **Strong Winds**
- **Storm Surge**
- **Torrential Rains**
- **Tornadoes**

***Factor that lead to the  
establishment of EWS in  
Cuba***





SANTA CRUZ  
DEL SUR  
NOVEMBER  
1932

Mayor  
Catastrophe in  
Cuban History

Storm Surge in a Major  
Hurricane.

**Casualties: 3033**

The whole city disappeared  
under the 6.5 meters high  
Storm Surge

# HURRICANE FLORA OCTOBER 1963

**Casualties: 1200**

Great Material Losses,

US \$300 000 000  
(1963 value)



Total amount of rain:  
1 800 mm in 72 hours  
over mountainous terrain  
where the largest Cuban  
river cross lowlands

# ORIGIN OF THE EARLY WARNING SYSTEM IN CUBA

- ▶ Triumph of Cuban Revolution in 1959.
- ▶ The Great Disaster in Hurricane “Flora” (1963).
- ▶ The specific need for organization and preparedness to face the threat of disasters.

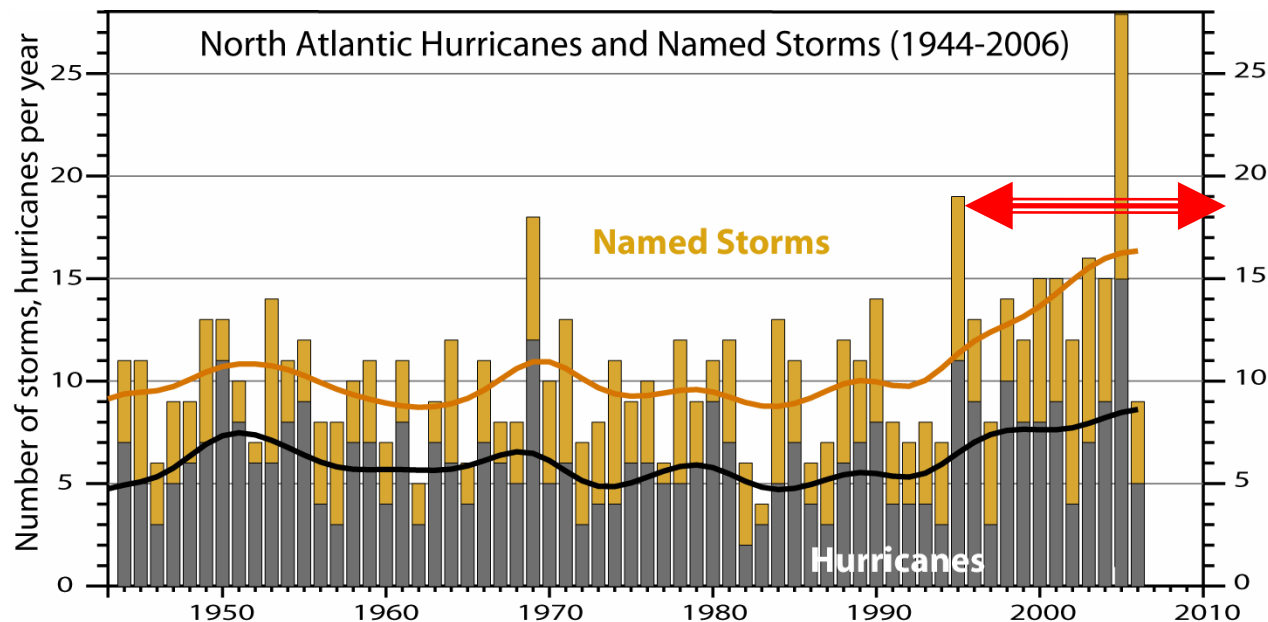
## LEAD TO:

- ✓ THE MODERNIZATION OF THE CIVIL DEFENSE (CREATED IN 1962)
- ✓ THE METEOROLOGICAL SERVICE (FOUNDED IN 1856, BUT ALMOST WITH NO CHANGE UNTIL 1963),
- ✓ THE BUILDING OF A SYSTEM OF DAMS TO PREVENT LARGE FLOODINGS.



## OTHER BACKGROUND ISSUES FOR THE ESTABLISHMENT OF EWS

An active Tropical Cyclone period began in 1995  
Cuban National Meteorological Service foresaw the need to have an early alert on tropical cyclones



The first Early Warning Message was issued on October 14, 1996, several days before hurricane "Lili" crossed over the central provinces of Cuba

# PRINCIPLES OF THE EARLY WARNING SYSTEM IN CUBA

- ✓ NATIONAL AND INSTITUTIONAL REACH
- ✓ DIRECTION OF THE SYSTEM AT HIGHEST LEVEL
- ✓ OVERALL PROTECTION
- ✓ DIFFERENTIAL WAY OF PLANNING AND ORGANIZING PROTECTION.
- ✓ EFFECTIVE COOPERATION WITH THE METEOROLOGICAL SERVICE, THE MEDIA, THE ARMED FORCES AND THE MINISTRY OF THE INTERIOR, AS WELL AS OTHER SPECIALIZED FORCES, FOR THEIR SUPPORT IN CASE OF NATURAL DISASTER SITUATIONS.

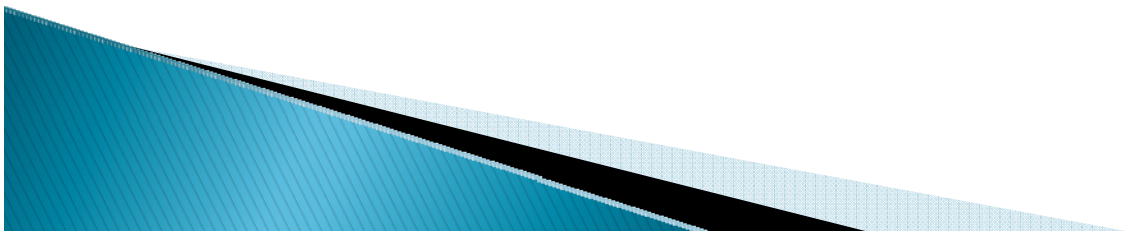
# A wide legal basis regulating the functioning of EWS

- ▶ Law No. 75 of National Defense
- ▶ Decree-law No. 170 on the Civil Defense system
- ▶ Guideline No. 1 of the Vice President of the National Defense Council
- ▶ Law No. 81 / 97 on the Environment
- ▶ Resolution 106 /99 of the Ministry of Science, Technology and Environment
- ▶ Ordinance Law No. 279 of 2007 "On General Principles, Organization, Preparation and Provisions of the Hydrometeorological System of Cuba for Exceptional Situations

# **NATIONAL AND INSTITUTIONAL REACH**

**The system of Civil Defense in Cuba exists in the whole Country and is organized at all levels, taking into account the political and administrative divisions and the corresponding structure of the State.**

**It is supported by the use of all human and materials resources that belong to the State, economic and societal organizations.**



**DIRECTION AT THE HIGHEST LEVEL**

**THE PRESIDENT OF THE STATE COUNCIL  
IS THE HEAD OF THE CIVIL DEFENSE**



**THE MINISTER OF THE ARMED FORCES HAS:**



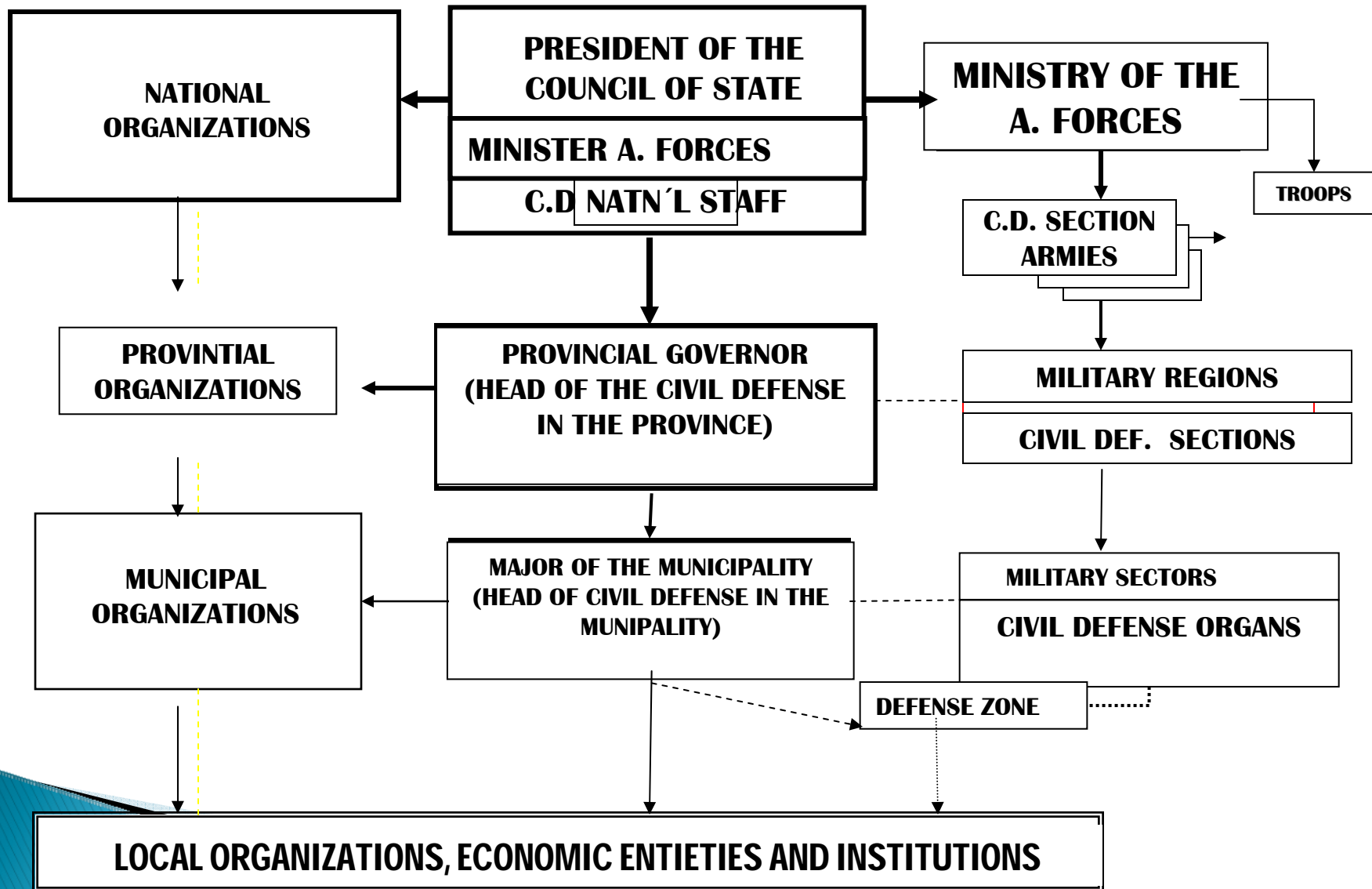
**THE CIVIL DEFENSE NATIONAL STAFF**



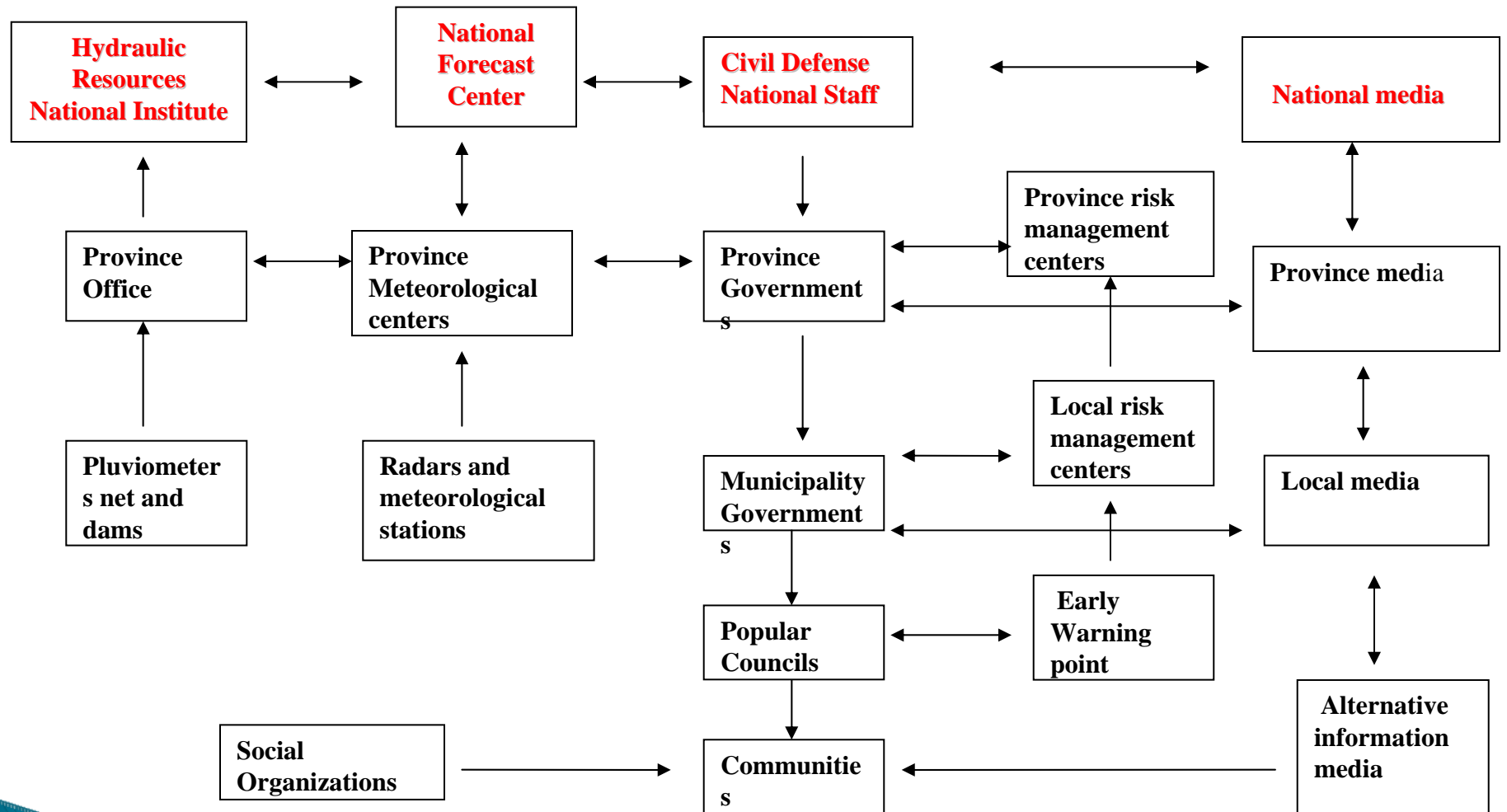
**THE GOVERNORS AND MAYORS IN PROVINCES AND MUNICIPALITIES ARE THE HEADS OF THE CIVIL DEFENSE IN THEIR TERRITORIES**

**THE DIRECTORS OF STATE ORGANIZATIONS, AND THE ONES OF ECONOMICAL ENTITIES AND SOCIAL INSTITUTIONS ARE AT THE SAME TIME THE HEADS OF THE CIVIL DEFENSE AND ARE RESPONSIBLE FOR THE CIVIL DEFENSE SYSTEM IN THEIR AREAS OF INTEREST.**

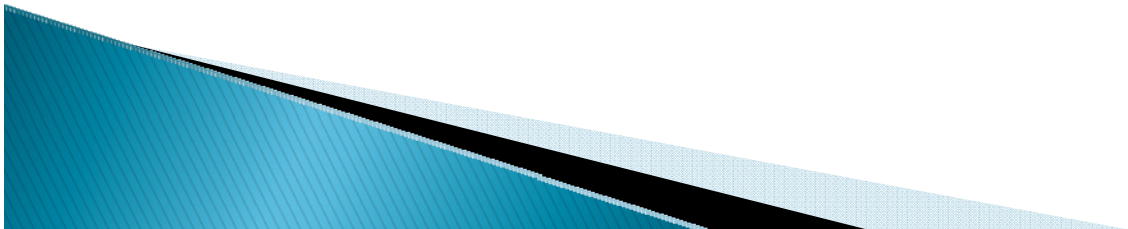
# ORGANIZATION OF THE CUBAN CIVIL DEFENSE SYSTEM



# FUNCTIONAL STRUCTURE OF EARLY WARNING SYSTEM FOR TROPICAL CYCLONE IN CUBA

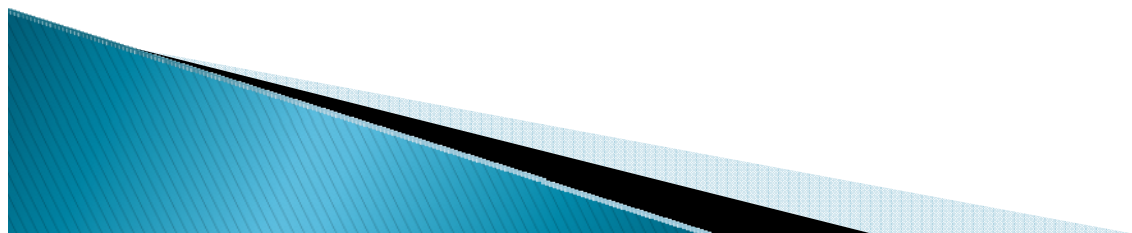


**THE PROTECTION IS PLANNED,  
ORGANIZED AND EXECUTED  
TAKING INTO ACCOUNT THE  
RESPONSABILITIES AND FIELD OF  
ACTION OF EVERY OFFICIAL AT ALL  
LEVELS, AS WELL AS THE HAZARDS  
TO WHICH EVERY COMMUNITY IS  
EXPOSED TO.**



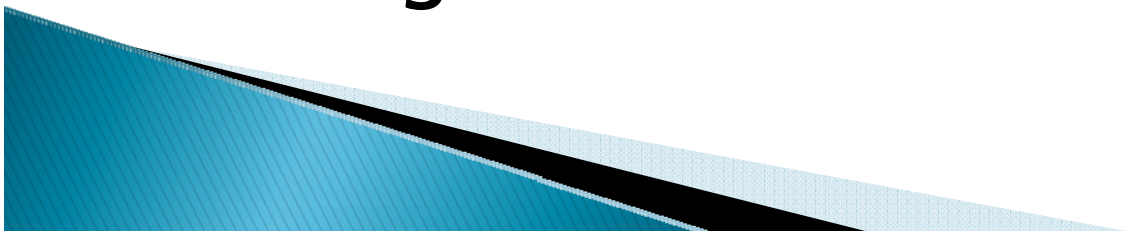
**AN IMPORTANT ELEMENT IS THE ACTIVE PARTICIPATION OF ALL INSTITUTIONS THAT HAVE FORCES AND SPECIALIZED TECHNICAL ELEMENTS WHICH HAVE BEEN TRAINED AND ORGANIZED FOR A QUICK RESPONSE, SUCH AS:**

**ARMED FORCES, MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT, MINISTRY OF HEALTH, INSTITUTE OF WATER RESOURCES, MINISTRY OF INFORMATICS AND COMMUNICATIONS, ETC.**



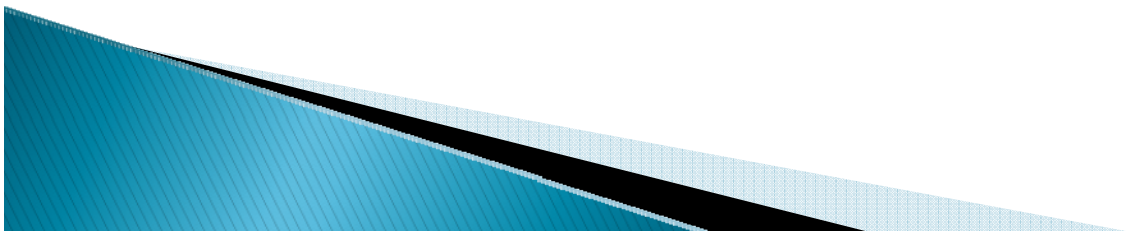


**The development of this Legislative framework for Civil Defense and the mandatory inclusion of measures for Disaster Reduction and Mitigation in the process of planning the development of the Country and new projects and investments, acts as a strong policy that has already yielded good benefits to Cuban Society**



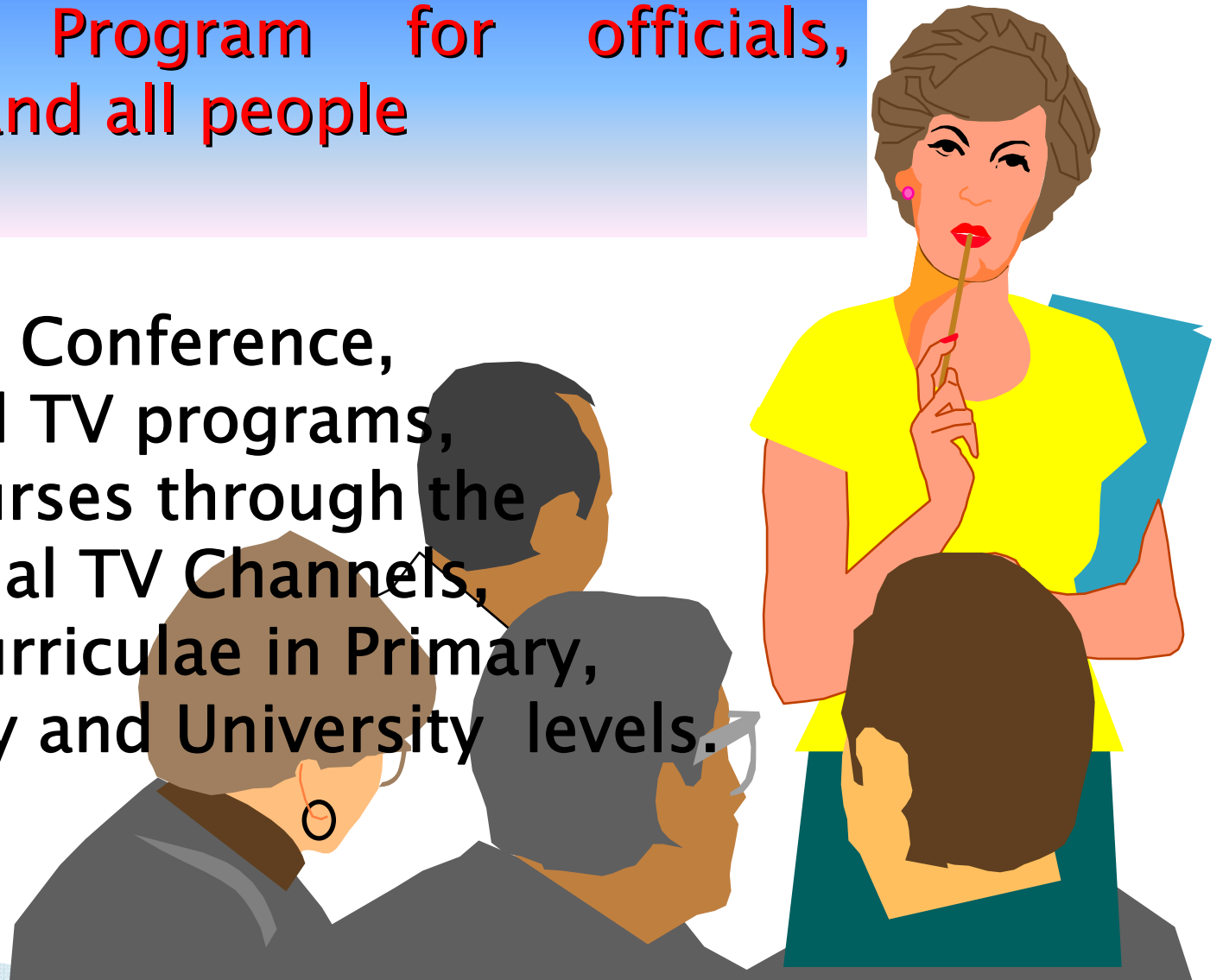
# GENERAL STEPS IN THE EARLY WARNING PROCESS

- PREVENTION
- PREPAREDNESS
- RESPONSE: PHASES, ACTIONS AND MEASURES
- RECUPERATION, REHABILITATION AND RECONSTRUCTION



**Training Program for officials,  
workers and all people  
includes:**

**Talks and Conference,  
Radio and TV programs,  
Short Courses through the  
Educational TV Channels,  
School Curriculae in Primary,  
Secondary and University levels.**



# Main elements of the EWS for TC

- ▶ The central surveillance entities in charge of monitoring the hazards and their territorial branches.
- ▶ Authorities at the different levels, entrusted implementing the relevant protection measures, advised by officials and experts of the Civil Defense.
- ▶ The media and mass and social organizations at the local level, which help disseminate information.
- ▶ The people, who are well organized and prepared.



## Elements including in EWS for tropical cyclones

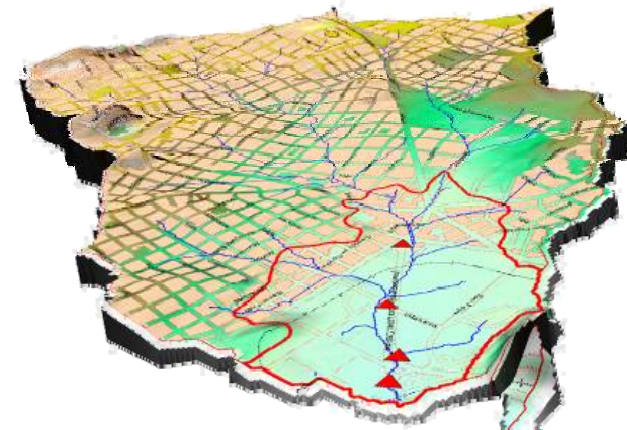
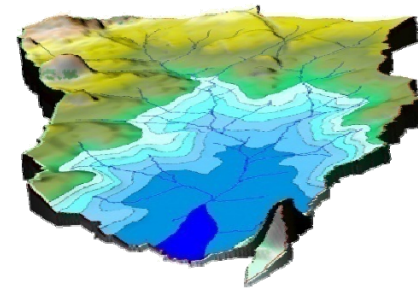
- ▶ An effective meteorological and hydrologic surveillance and communication systems between these services and Civil Defense institutions, both at the national and local levels.
- ▶ An effective network for transmitting information
- ▶ The use of all the mass media for spreading warning messages.
- ▶ Plans designed for different situations



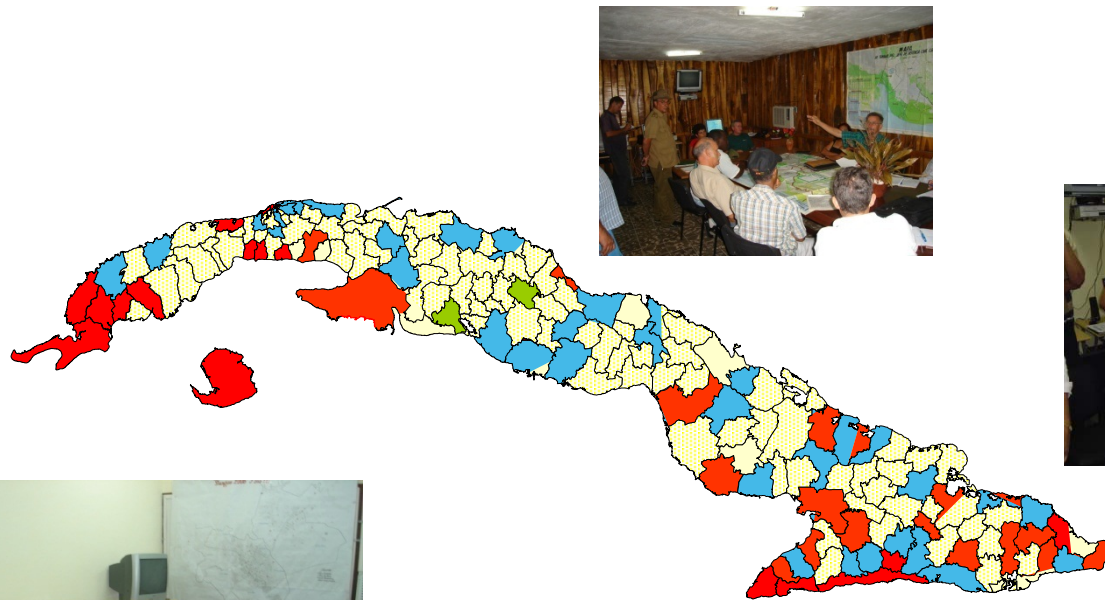


# Utilization of risk information in emergency planning and warnings

- ▶ The Environment Agency of the Ministry of Science, Technology and the Environment was assigned the responsibility, to organize, lead and conduct disaster risk studies.
- ▶ There is a group of specialists that elaborated a methodology to assess the risk from national to local level



- ▶ Databases of risk for are properly stored at the risk management centers of each municipality
- ▶ Plans are updated every year based on risk estimation
- ▶ The results of the upgrade are informed to the provincial and national levels.

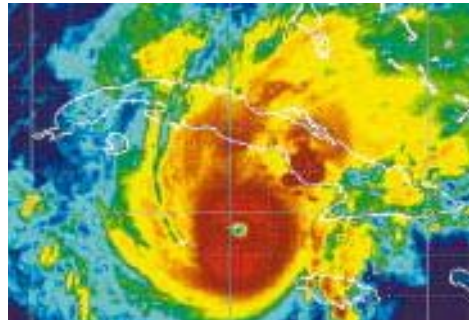


# Hazard monitoring, forecasting, and mandates for warning development

National Forecast Center



Coastal Floodings



Tropical Cyclones



Torrential and Heavy Rains

**Forest Keeper Body**



wildfires

**National Institute of Hydraulic Resources**



Dam Management, Overflown Rivers



## Role of the NMHS in the EWS

- ▶ To constantly monitor weather
- ▶ To issue timely Early Warnings to the Government, the Civil Defense, and the people on any hazardous weather system that could affect any part of the Country.
- ▶ To transmit Early Warnings and warnings through the Media, mainly TV and radio, updating the information.
- ▶ To participate in awareness and educational activities

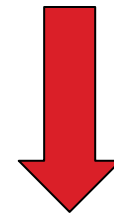


# Hazard monitoring, forecasting, and mandates for warning development

The National Meteorological Service has the sole mandate for issuing meteorological warnings on thunderstorm, tropical cyclone, flash flood, strong winds, landslide, tornado, coastal flooding and storm surge



National Staff of the Civil Defense issues a warning note



threatened areas

# A true partnership as part of a sole National System in which all efforts are put into action for the protection of life and material resources as well



Cuban Meteorological Service has the organizational responsibility for monitoring, forecasting and developing the hazard warning and communicating it to the public from the scientific and operational point of view



National Civil Defense is responsible for the development of the warning in terms of the mobilization of all national and local resources, including all logistics for protective measures and evacuations



# HIGHLIGHTS OF PART I

- Historical Disasters in Hurricanes and the Cuban Socio-Economical conditions lead to the establishment of EWS
- A strong legal basis was created
- Direction at the highest level
- Important Role of the Meteorological Service: Cuban NWS is the only voice for issuing forecasts, Early Warnings and Warnings in weather hazards.
- Strong Partnership and Coordination among the Meteorological Service, the Civil Defense and the Media
- All the process goes from National to Local and Local to National: It follows all steps of the EW Process

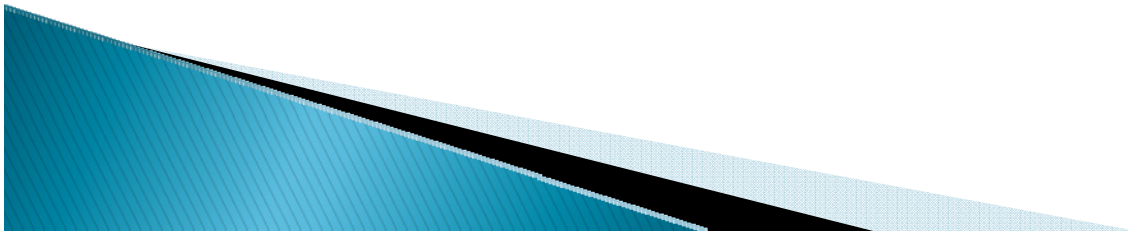
➤ **POLITICAL WILL IS A MUST !!!**



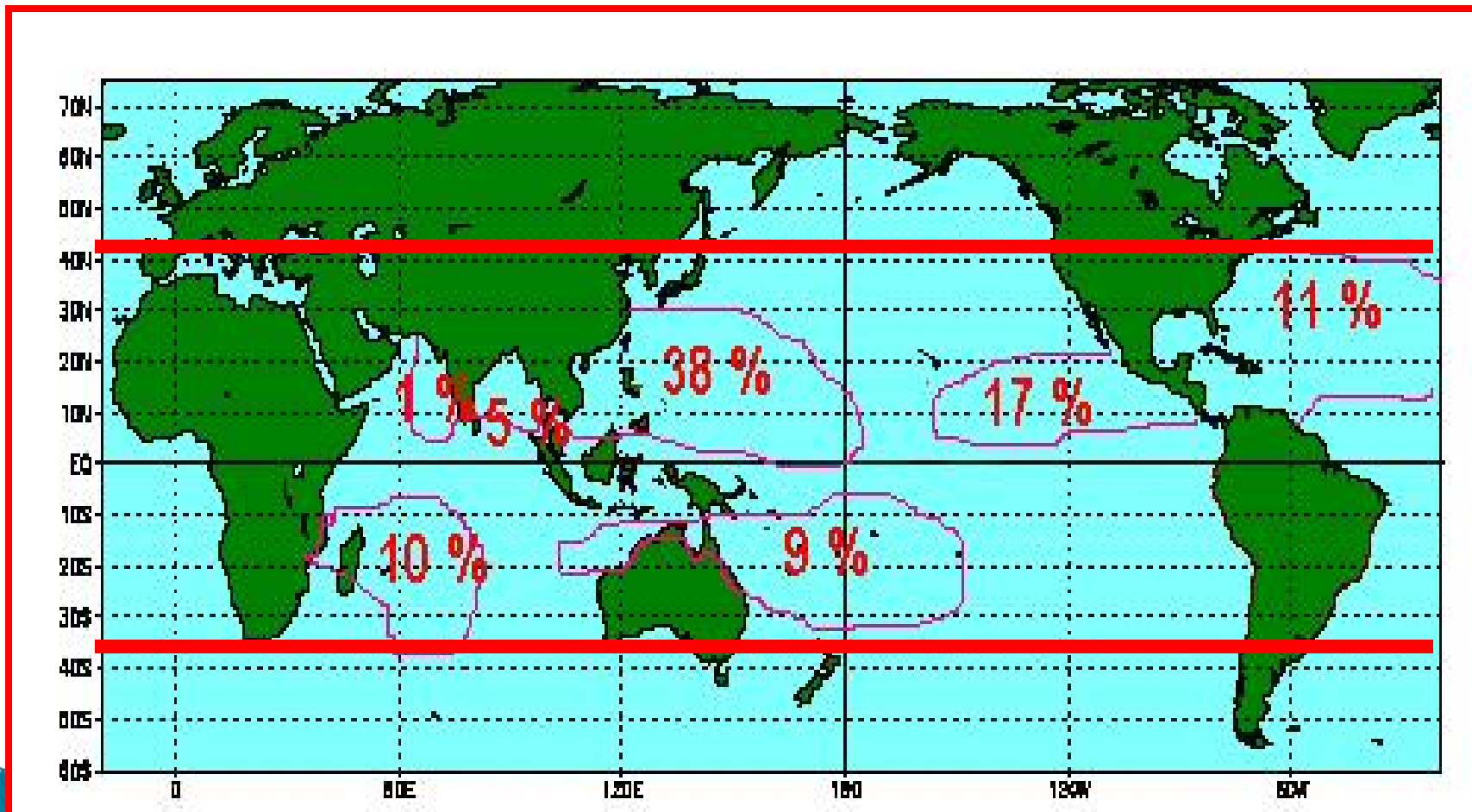
# Part II

## OVERVIEW

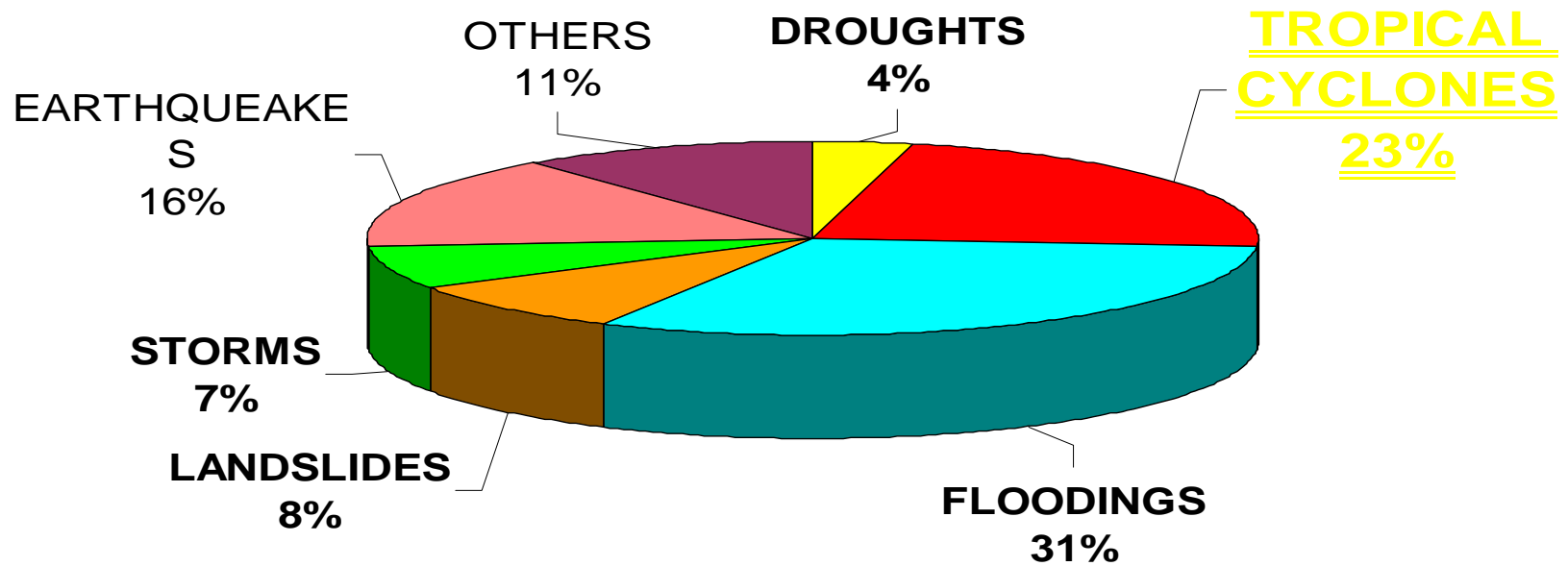
- Technical Developments of Tropical Cyclones Warnings
- Meteorological and operational perspectives



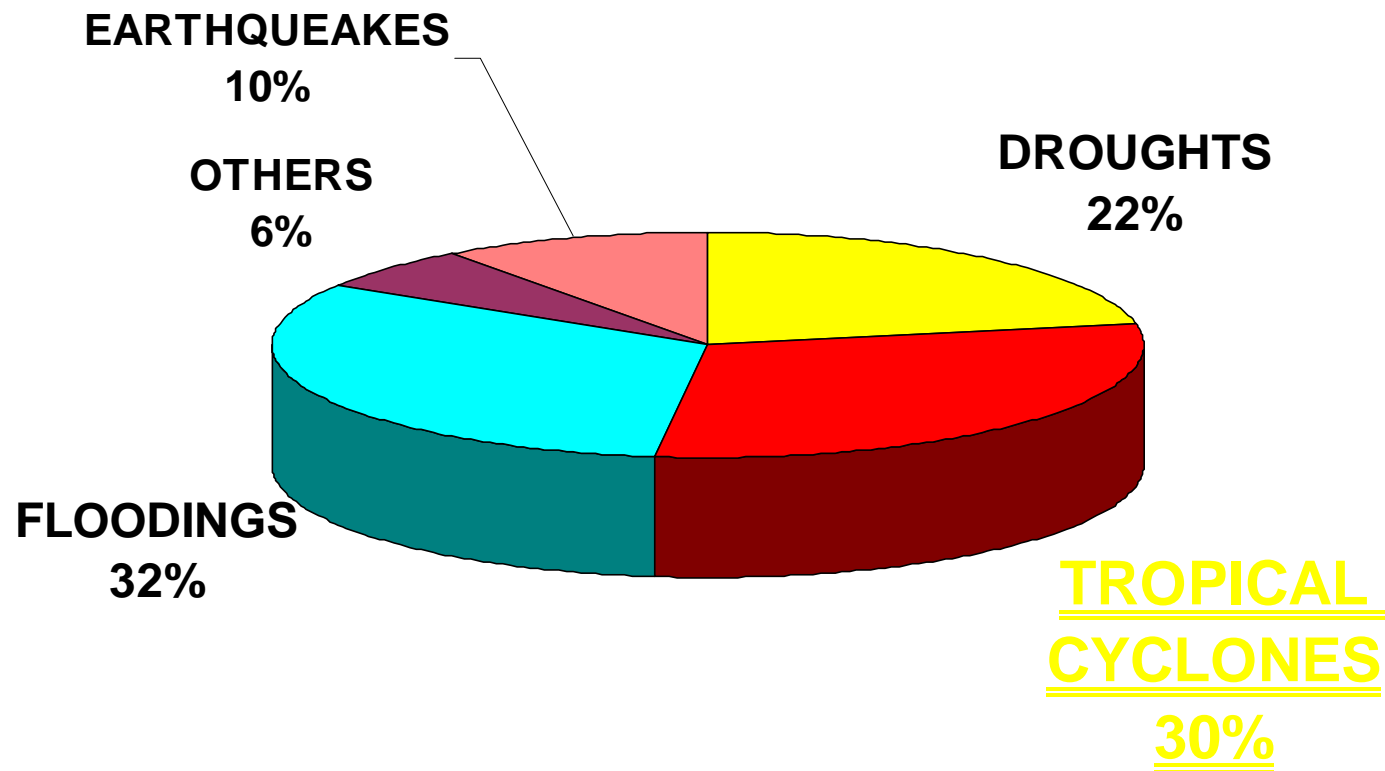
# WORLD DISTRIBUTION OF TROPICAL CYCLONES



# DEATHS IN NATURAL DISASTERS



# MATERIAL LOSSES IN NATURAL DISASTERS



# WORLD TROPICAL CYCLONE SYSTEM

## WMO WORLD WEATHER WATCH

Global Observations --- Global Telecommunications

## WORLD METEOROLOGICAL SPECIALIZED CENTERS

Global Numerical Models

## WMO REGIONAL & TC SPECIALIZED CENTERS

Regional Models and TC Models

## NATIONAL METEOROLOGICAL CENTERS

National Weather Watch, Forecasts & Warnings for the Country

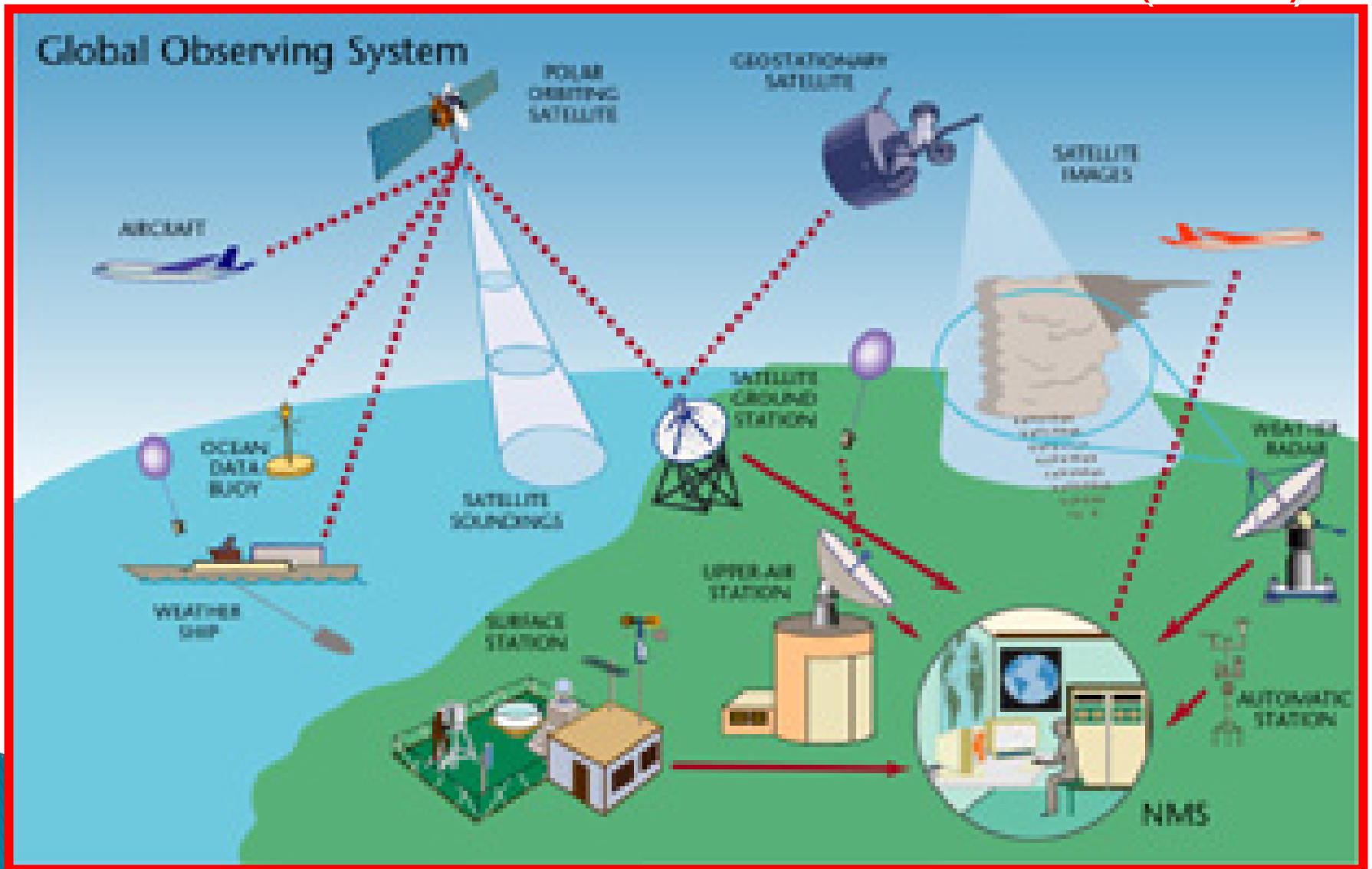
PUBLIC

GOVERNMENT

CIVIL DEFENSE

MEDIA

# WMO GLOBAL OBSERVING SYSTEM (GOS)



# Cuba:

## METEOROLOGICAL SERVICE

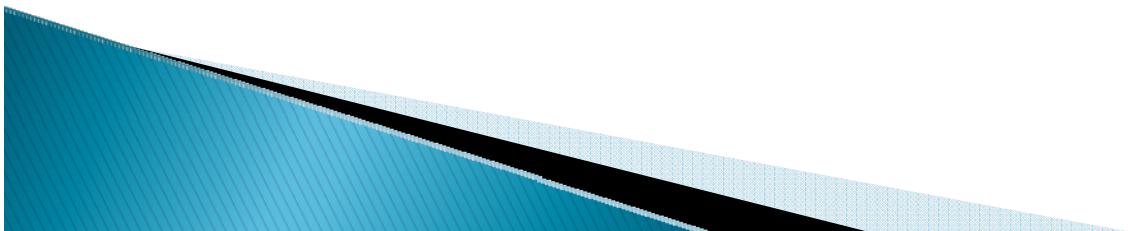
1 National Forecasting Center

15 Provincial Forecasting Departments

68 Meteorological Stations

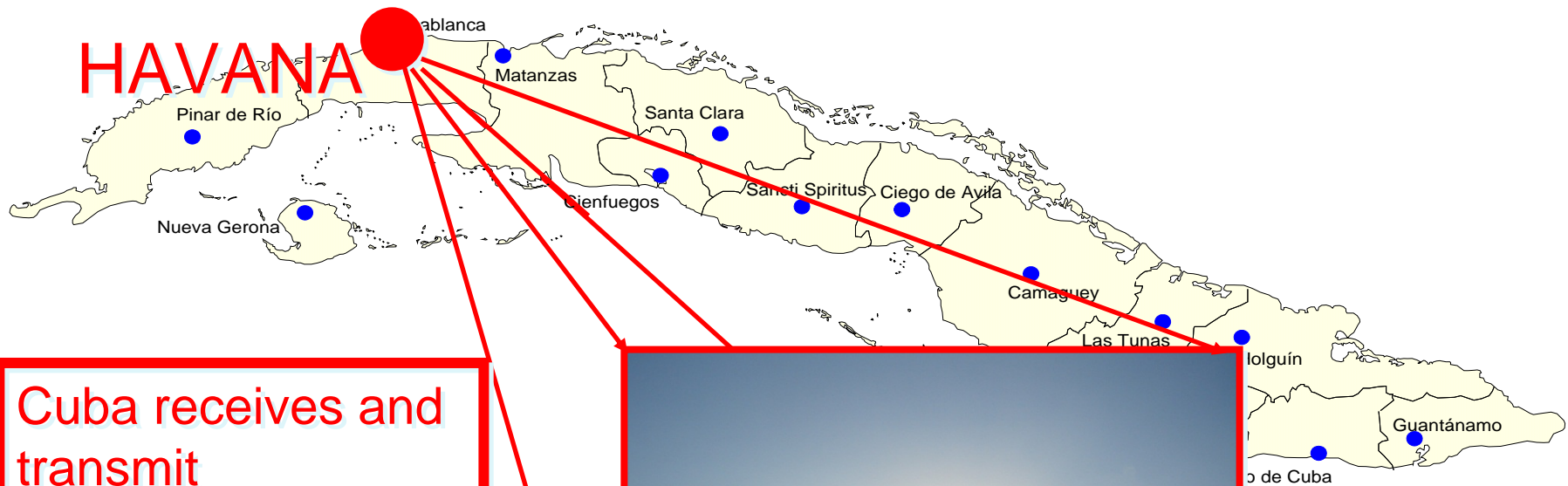
8 Meteorological Radars

2 Meteorological Satellite Ground Stations





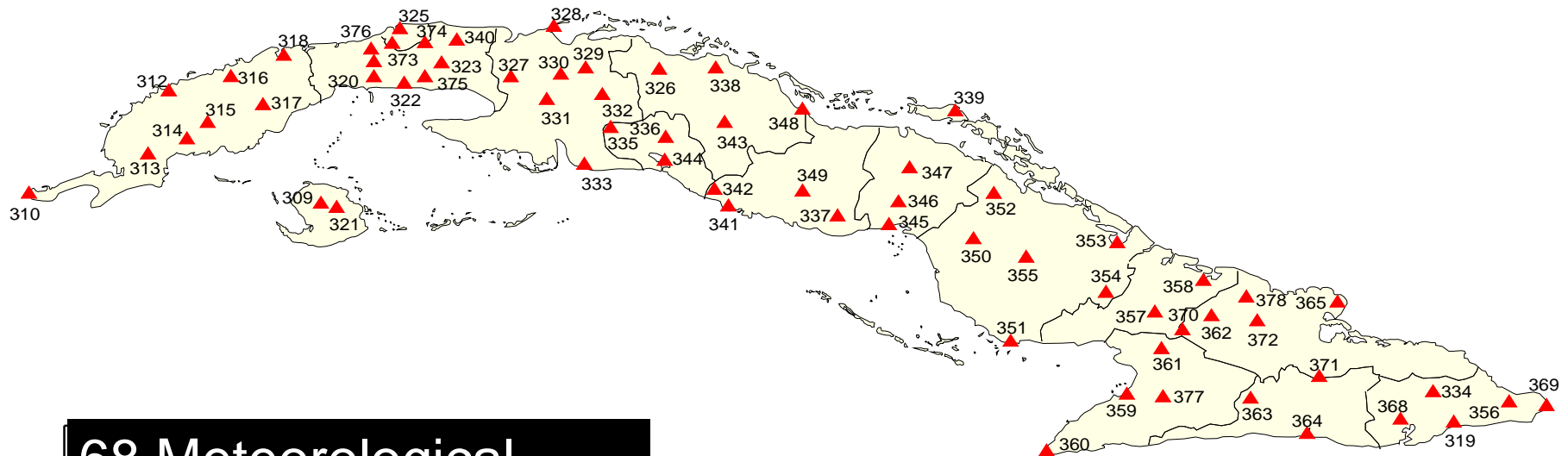
# WMO GTS link at the Cuban National Meteorological Center in Havana



Cuba receives and transmit Meteorological Information to the GTS in several WMO formats

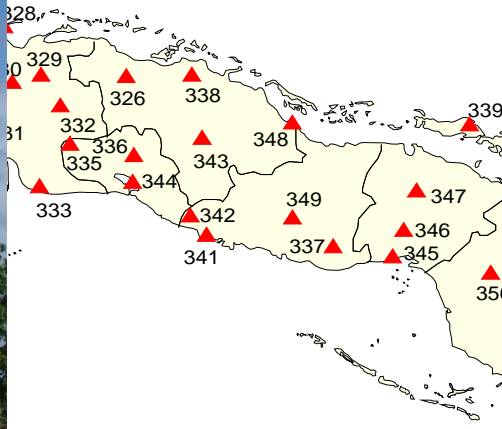


# NATIONAL METEOROLOGICAL OBSERVING SYSTEM IN CUBA



68 Meteorological  
Stations  
1 Upper Air Sounding  
Station  
2 Satellite Earth  
Station

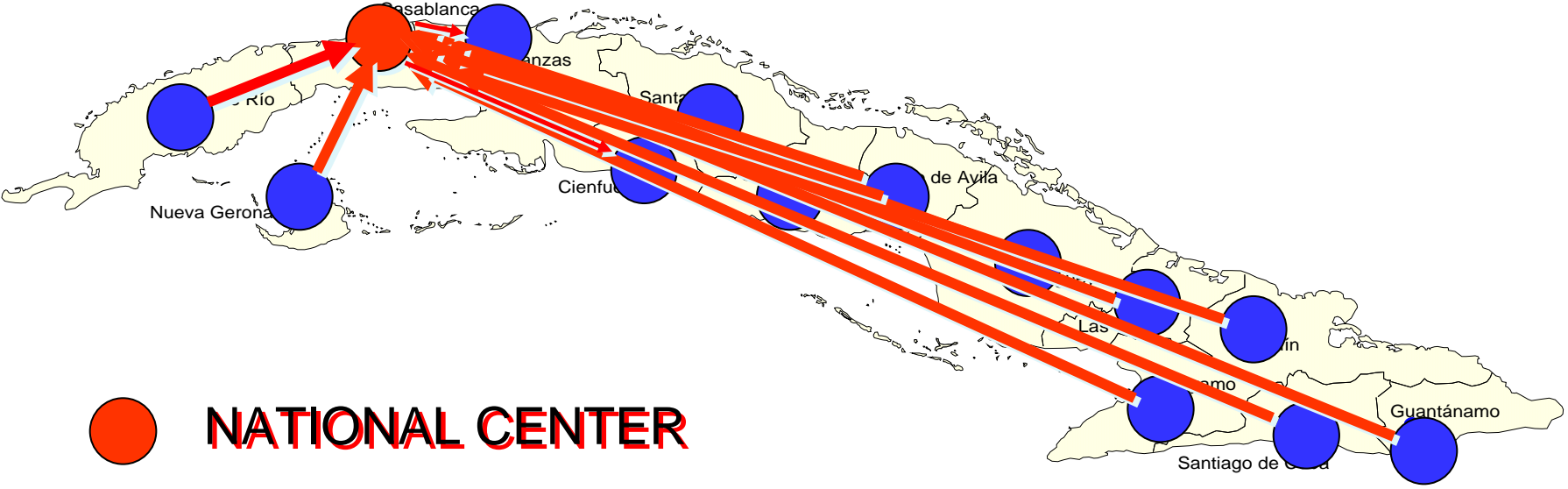
# NATIONAL METEOROLOGICAL OBSERVING SYSTEM IN CUBA






68 Meteorological  
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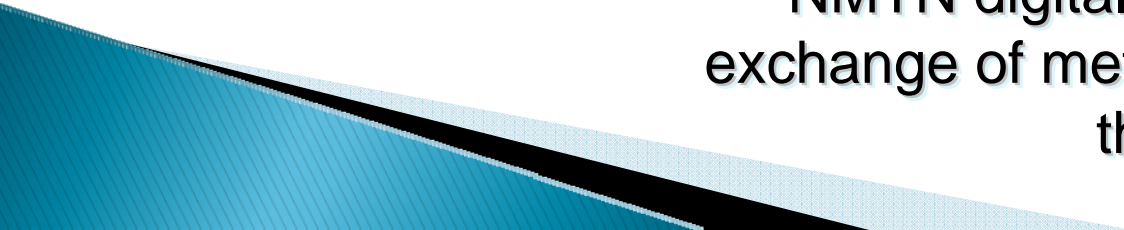


# NATIONAL METEOROLOGICAL TELECOMMUNICATION NETWORK IN CUBA



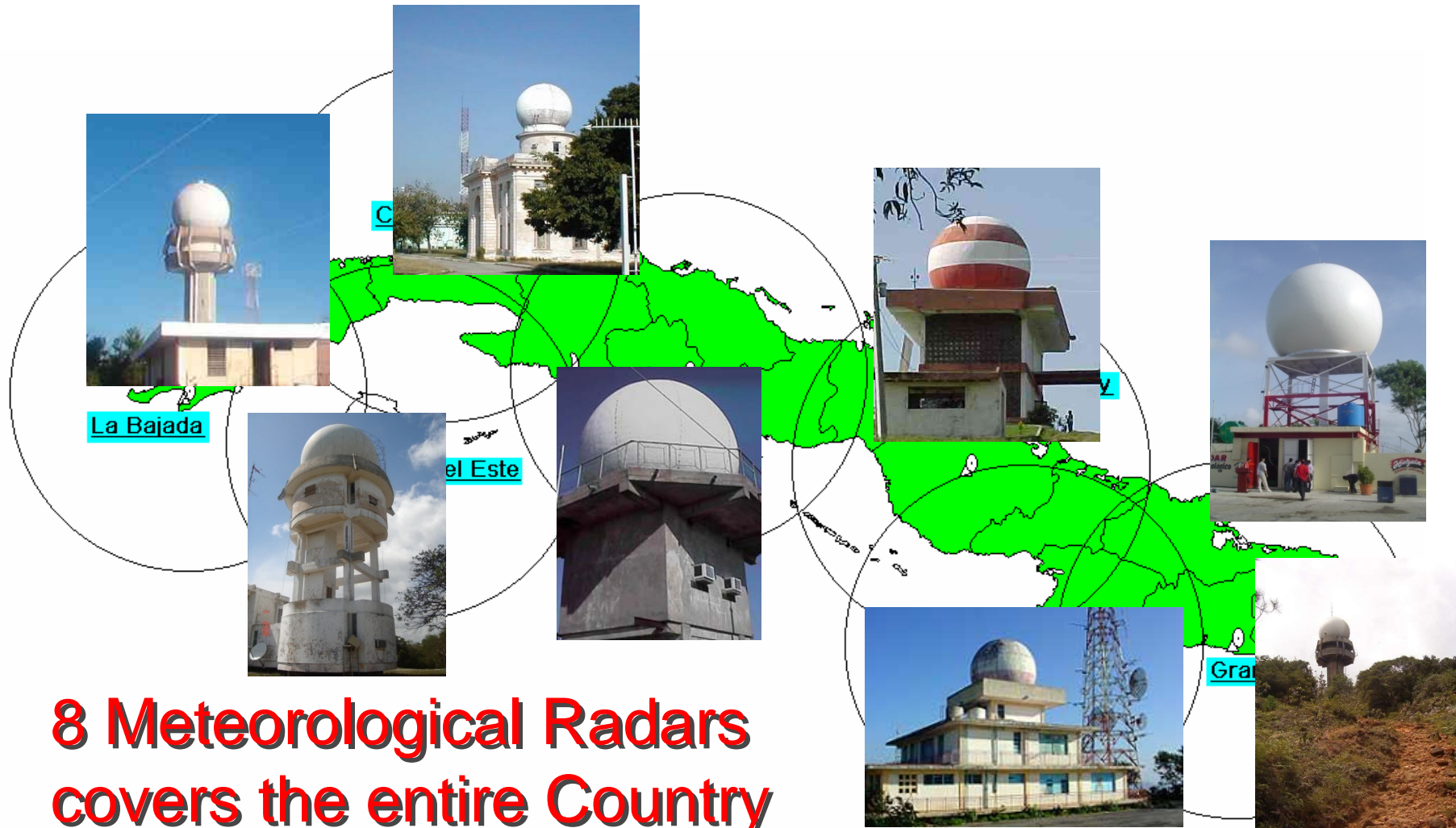
-  **NATIONAL CENTER**
-  **PROVINCIAL CENTER**
-  **TCP / IP LINK**

NMTN digitally provides all relevant exchange of meteorological information in the Country





# WEATHER RADAR NETWORK COVERAGE IN CUBA

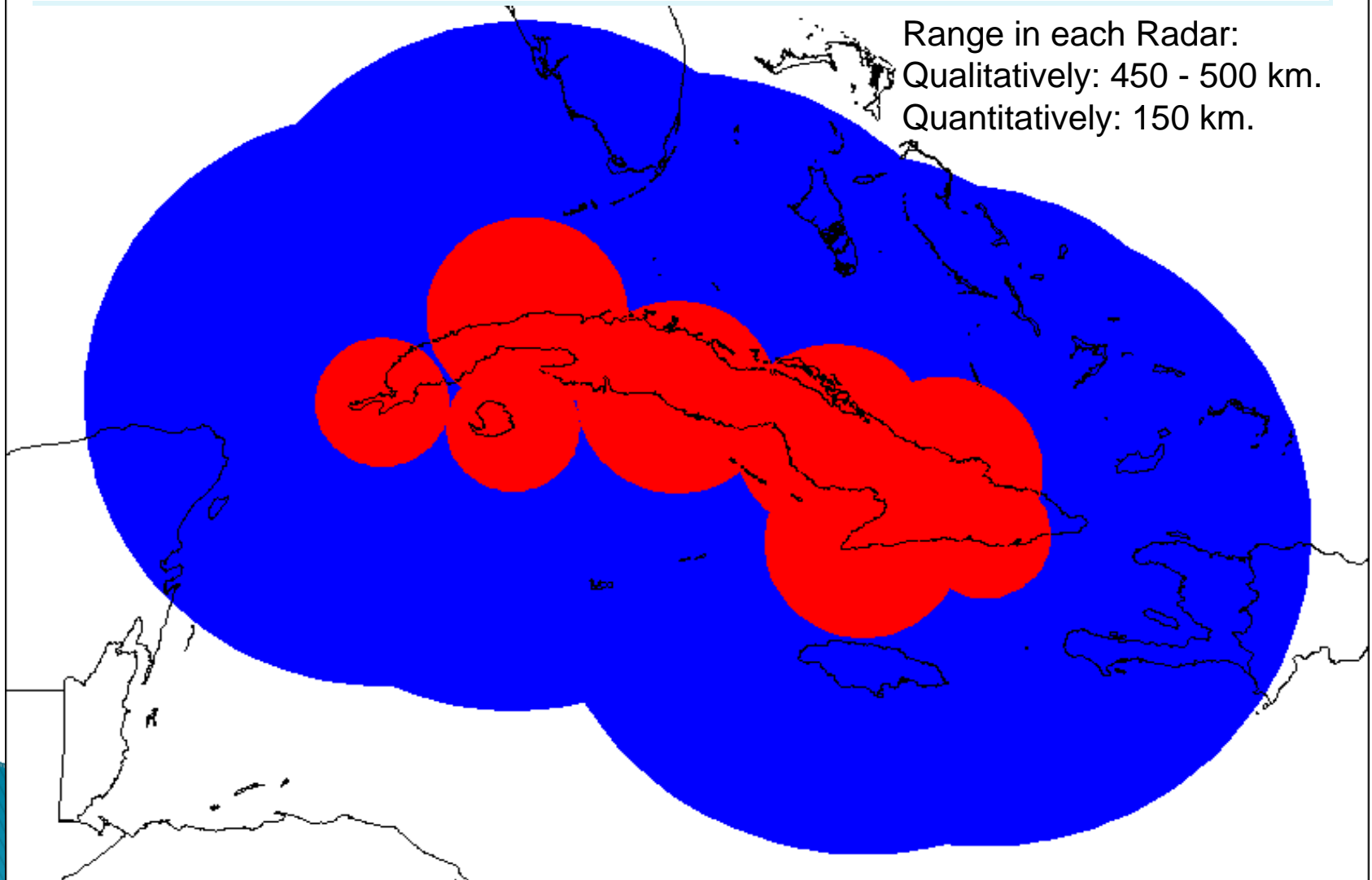


**8 Meteorological Radars  
covers the entire Country**



# RADAR NETWORK COVERAGE IN CUBA

Range in each Radar:  
Qualitatively: 450 - 500 km.  
Quantitatively: 150 km.



DATA INPUT

ANALYSIS AND  
NUMERICAL  
MODELS

DIFFUSION OF  
WARNINGS

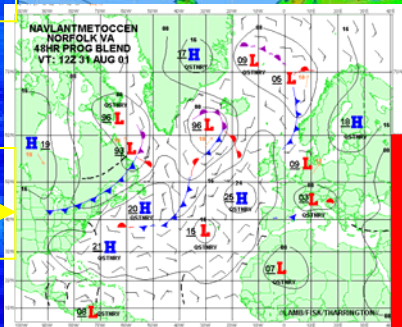
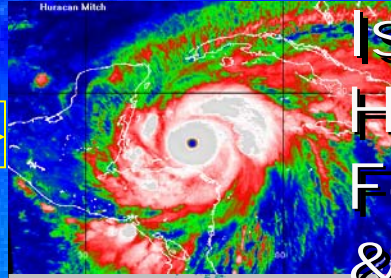
RESPONSE  
ACTIONS

SATELLITES

RADARS

WEATHER  
STATIONS  
UA SOUNDINGS  
SHIPS  
BUOYS  
AIRCRAFTS

NUMERICAL  
MODELS

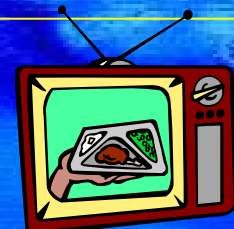


# Issues Official Hurricane Forecasts & Warnings



FORECASTERS

**NATIONAL  
FORECASTING  
CENTER**



TV



RADIO



PHONE - FAX



INTERNET



GOVERNMENT, CIVIL DEFENSE,  
RESIDENTS

# The Hurricane Forecast Process

- **Surface observations (land, ships, buoys).**
- **Upper air observations (rawinsondes, aircrafts).**
- **Satellites (geostationary, polar).**

- **Global Models**
- **Regional Models**
- **TC track and intensity Models**

- **Model Comparison, Probabilities, Consensus.**

- **Issuance and Diffusion of Warnings**

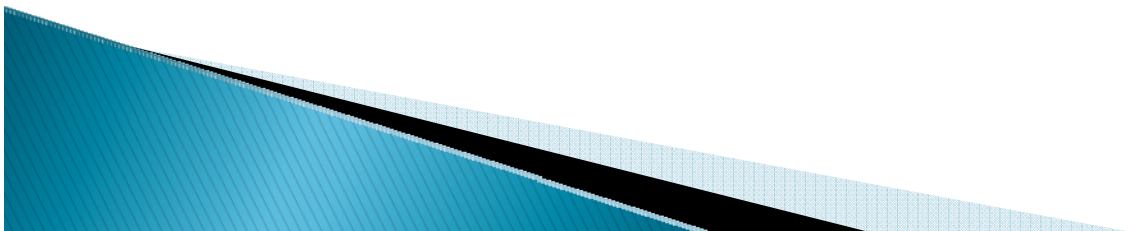
# OPTIONS TO REDUCE FORECAST UNCERTAINTY?

More accurate and numerous observations with greater coverage.

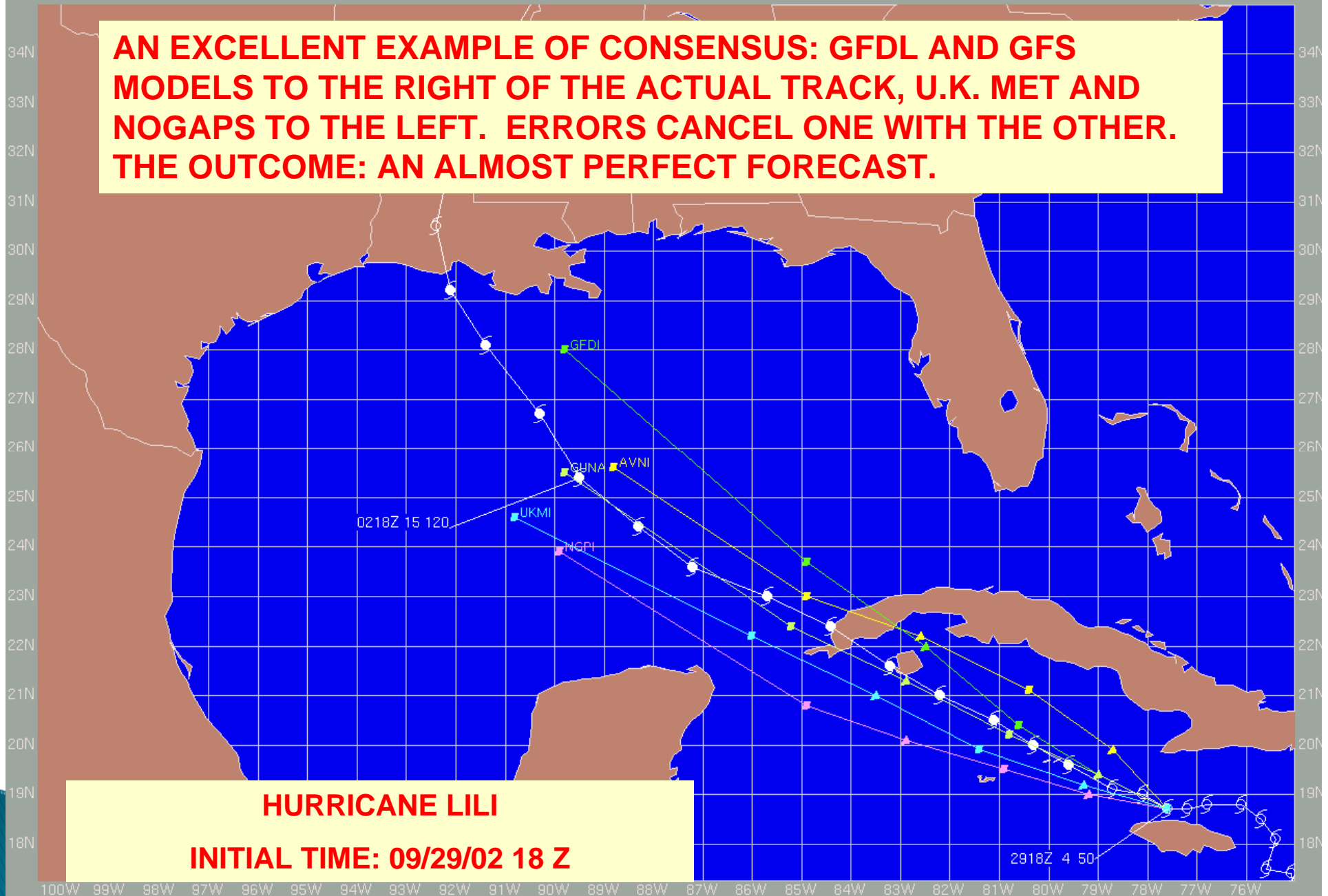
Improved analysis (data assimilation) methods.

Faster computers and more complex models.

*Probabilistic forecasting with ENSAMBLES and a  
CONSENSUS FORECAST*



**AN EXCELLENT EXAMPLE OF CONSENSUS: GFDL AND GFS MODELS TO THE RIGHT OF THE ACTUAL TRACK, U.K. MET AND NOGAPS TO THE LEFT. ERRORS CANCEL ONE WITH THE OTHER. THE OUTCOME: AN ALMOST PERFECT FORECAST.**



Source: TCP/NHC





# THE CHALLENGE OF AN EARLY WARNING IN HURRICANES

## MEAN 5-DAY TRACK FORECAST ERRORS FOR THE ATLANTIC BASIN

24 HR....147 km  
48 HR....257 km  
72 HR....388 km  
96 HR....505 km  
120 HR...688 km



# **“WARNING” AND “EARLY WARNING” HAS DIFFERENT MEANINGS WHEN DEALING WITH TROPICAL CYCLONES**

## **WARNING**

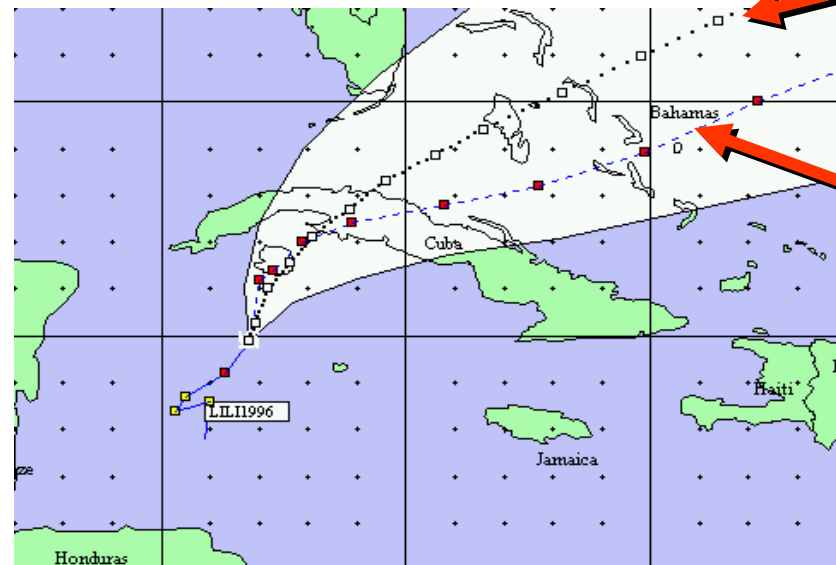
- Usually means that immediate actions have to be taken to protect lives and properties, generally in a 24 hr time frame.

## **EARLY**

- Means that **there is some likelihood that hurricane conditions might be expected in 3, 4 or 5 days and, because of it, the level of information and awareness should be increased, without taking, for the moment, any further action.** This information is given with time enough, so that everyone could be well informed.
- Heavily depends on a previous education and preparation of the users of this information (i.e. Government, Civil Defense, the Media people, residents, etc.).
- Increases awareness on the likelihood of the hurricane threat and prepares everybody to take actions in the near future, if it becomes

# ERROR CONE GRAPHICS

**Forecast track + mean error = "Risk area"**



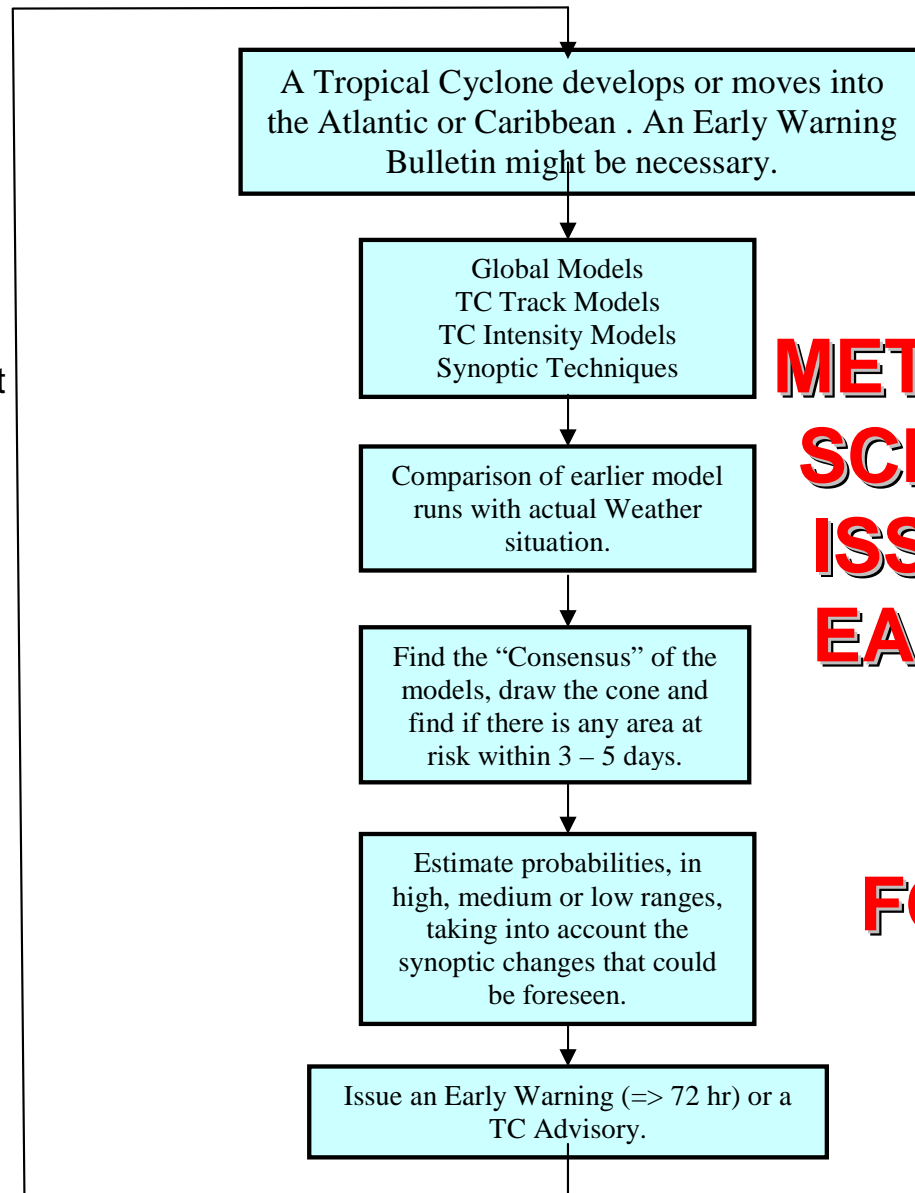
Forecasted mean track in the middle of the cone

Actual best track

(60 to 70 % of actual tracks will be inside the cone area)

**Main Application in Early Warning:**  
To make users aware of the uncertainty of the forecast track and to discourage users from focusing only on a single forecast track, but at the same time ASSESSING THAT THEY ARE IN AN AREA AT RISK.

Repeat at next  
Forecast  
Cycle.



# METHODOLOGICAL SCHEME FOR THE ISSUANCE OF AN EARLY WARNING AT CUBAN NATIONAL FORECASTING CENTER.

# EXAMPLE OF AN EARLY WARNING BULLETIN

- ▶ Havana, Thursday, November 1, 2001 2:30 pm  
National Forecasting Center, Institute of Meteorology.

- ▶ EARLY WARNING BULLETIN

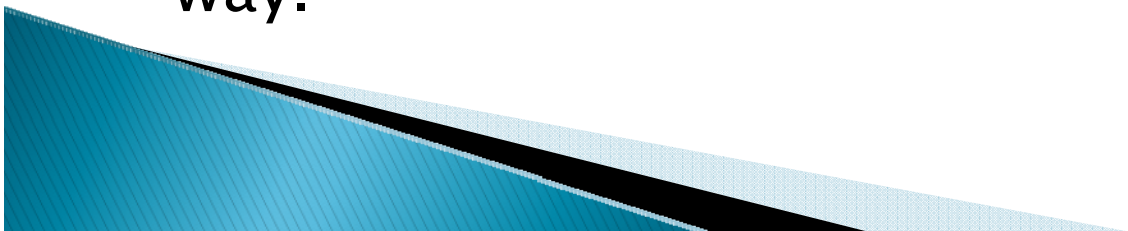
Synopsis: Tropical Depression No. 15 was upgraded to Tropical Storm “Michelle” last night and is now over water in the NW Caribbean Sea. The Tropical Storm is located 490 km South of Cabo Corrientes, Pinar del Río province. Maximum Sustained Winds are 110 km/h, near Hurricane strength. It is expected to become a Hurricane this afternoon. It is moving Northnorthwest at 11 km/h.

- ▶ Outlook: Conditions favor further development of this tropical system. Within 72 hours, “Michelle” could already be a Major Hurricane over an area very near Cuba. A Northnortheast or Northeast movement is likely to occur by then, which would make “Michelle” cross directly over Cuba. The most threatened areas are the Western and Central provinces. The greatest likelihood is for a hit from Sunday to Monday. This will depend on the storm movement, for there could be periods of stalling or slow movement before “Michelle” speeds up in a near Northeast direction. All interests should very carefully follow further information on “Michelle” issued by the National Forecasting Center.



## HIGHLIGHTS OF PART II

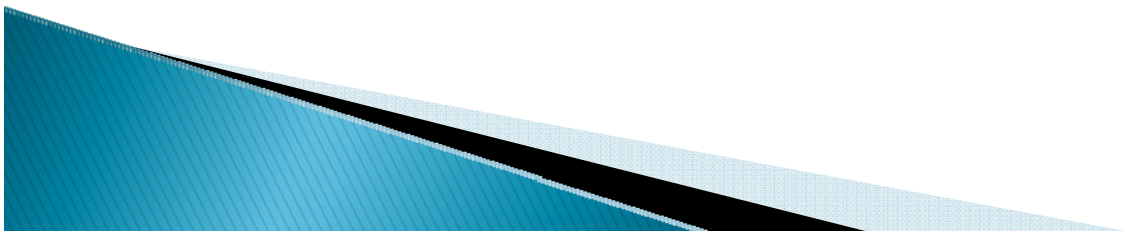
- The Cuban Meteorological Service is well prepared, both in high skilled personnel and equipments, to face the threat of meteorological hazards such as hurricanes.
- Early Warnings and Warnings have been incorporated within the whole forecast process and a methodology is followed.
- Forecast Uncertainties are addressed and explained to the public in a clear understandable way.



# Part III

## OVERVIEW

- Dissemination of Warnings
- Cooperation with the Media
- Disaster risk management Agency and Local Authorities
- Actions from National to Local levels and role of the Met Service
- Training of Authorities and population



**National Forecast Center**

**STRONG**

**PARTNERSHIP**

**The  
Media**

**TO FACE THE HURRICANE  
HAZARD, THERE IS A STRONG  
PARTNERSHIP AMONG THE  
NFC, THE CIVIL DEFENSE AND  
THE MEDIA**

**Civil  
Defense**

# Cuba:

## RADIO & TELEVISION

### Radio:

5 Natl. Networks  
15 Prov. Networks  
63 Municipal Radio  
Stations

Coverage: 99.3 %  
of Cuban territory

### Television:

4 Natl. Networks  
15 Prov. TV Stations

Coverage: 96 %  
of Cuban territory

## NATIONAL FORECASTING CENTER (NMS)

- Cuban NMS uses an user-oriented philosophy, as emphasized by WMO PWS Program.
- Cuban NMS has a reputation of accuracy, reliability and timeliness.
- Early Warnings and Warnings are issued with a clear, concise wording, with a wide use of graphics and the introduction of probabilities to address incertitude.

### CIVIL DEFENSE

The Civil Defense receive a clear message so that they can take protective measures such as evacuation, well ahead of the impact.

### MEDIA

The Media is an effective link between the NMS, the Civil Defense and the community, having a strong influence in how a warning is received



## “EARLY WARNINGS”

- Are issued by the NMS whenever there is some likelihood that hurricane conditions might be expected in the next 3, 4 or 5 days.
- **Increases awareness on the hurricane threat and prepares everybody to take actions in the near future, if it becomes necessary.**
- **Heavily depends on a previous education and preparation of the users of this information (i.e. Government, Civil Defense, the Media people, residents, etc.).**

Regular Warnings are issued every 6 hours or less from 72 hours before any forecasted strike

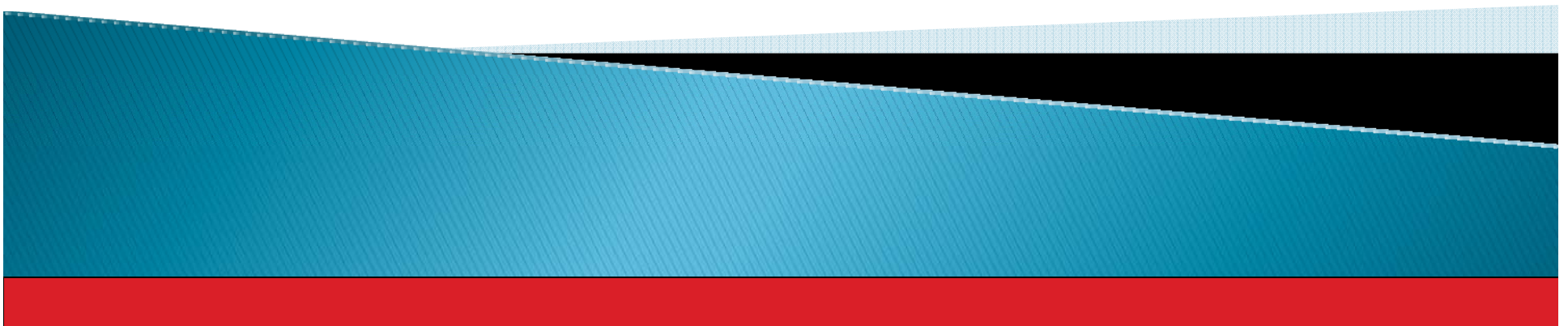


# PUBLIC INFORMATION

- Is more frequent as the Tropical Cyclone becomes closer.
- National Radio & TV broadcast "live" from the National Forecasting Center and the Civil Defense Headquarters from 48 - 24 hours before the storm strikes.
- Local Radio & TV stations do the same for their localities from the Provincial Forecasting Departments and Local Civil.
- **The Perception of Danger is gradually being created!!**

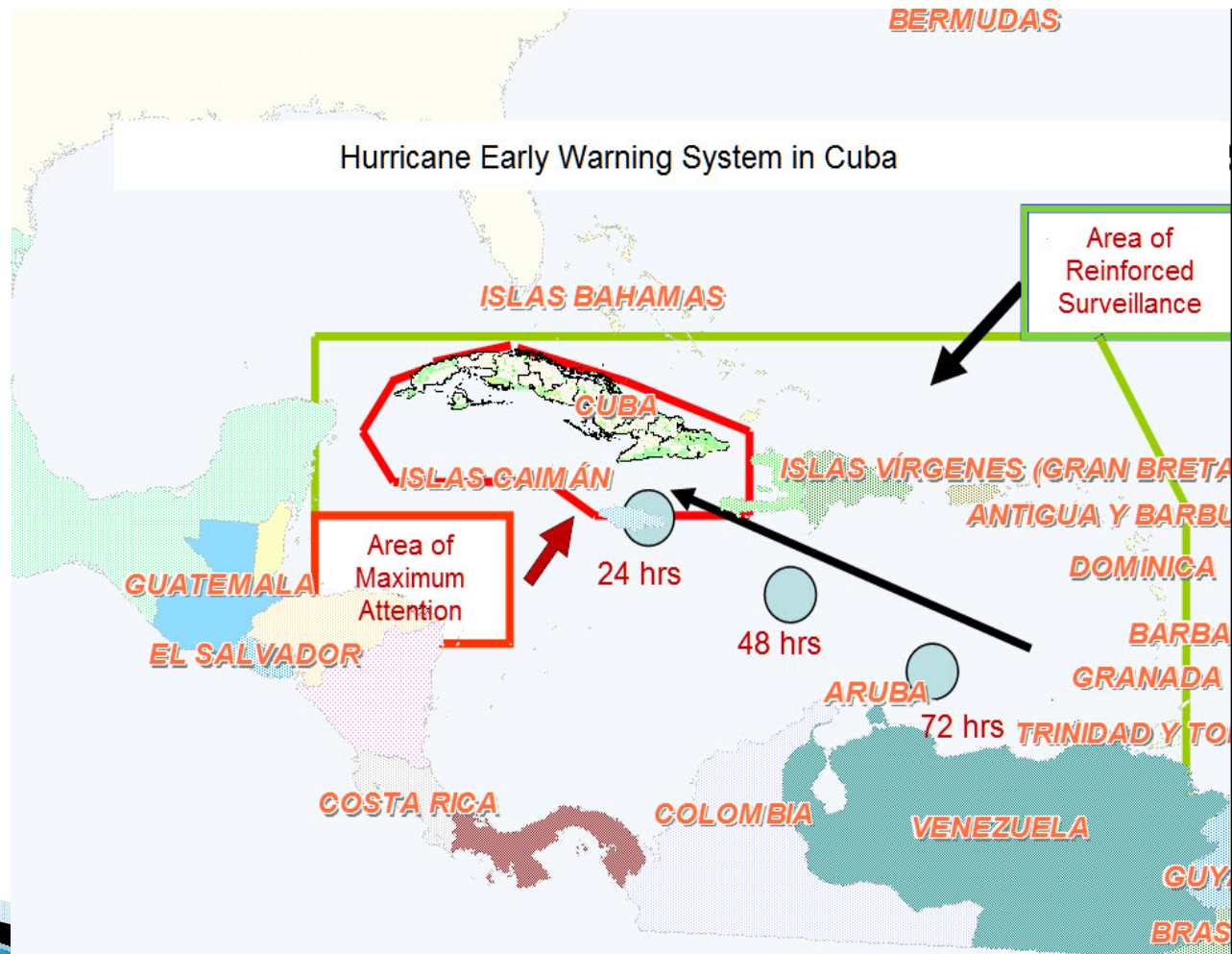
# Warning message development cycle

The Early Warning System for tropical hurricanes is organized and works along the following sequence:



The National Forecast Center of the Institute of Meteorology permanently monitors the formation and development of tropical cyclones from their formation in the West African coast and during their traveling across the Atlantic towards the Caribbean

1





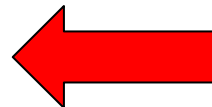
2

The National Staff of the Civil Defense evaluates the warning and issues a notice for the governments of the threatened provinces and for the state organizations whose resources might be affected



**The governments of the threatened provinces, take measures based on the risk level of each community, and the assessment of the local meteorological and hydrological services**

3



**As the tropical cyclone continues to approach Cuba, the Meteorological Institute's Forecast Center increases the number of warnings describing in detail the future track and intensity of the hurricane, as well as the expected impact of winds, rains, storm surge and**

**waves**

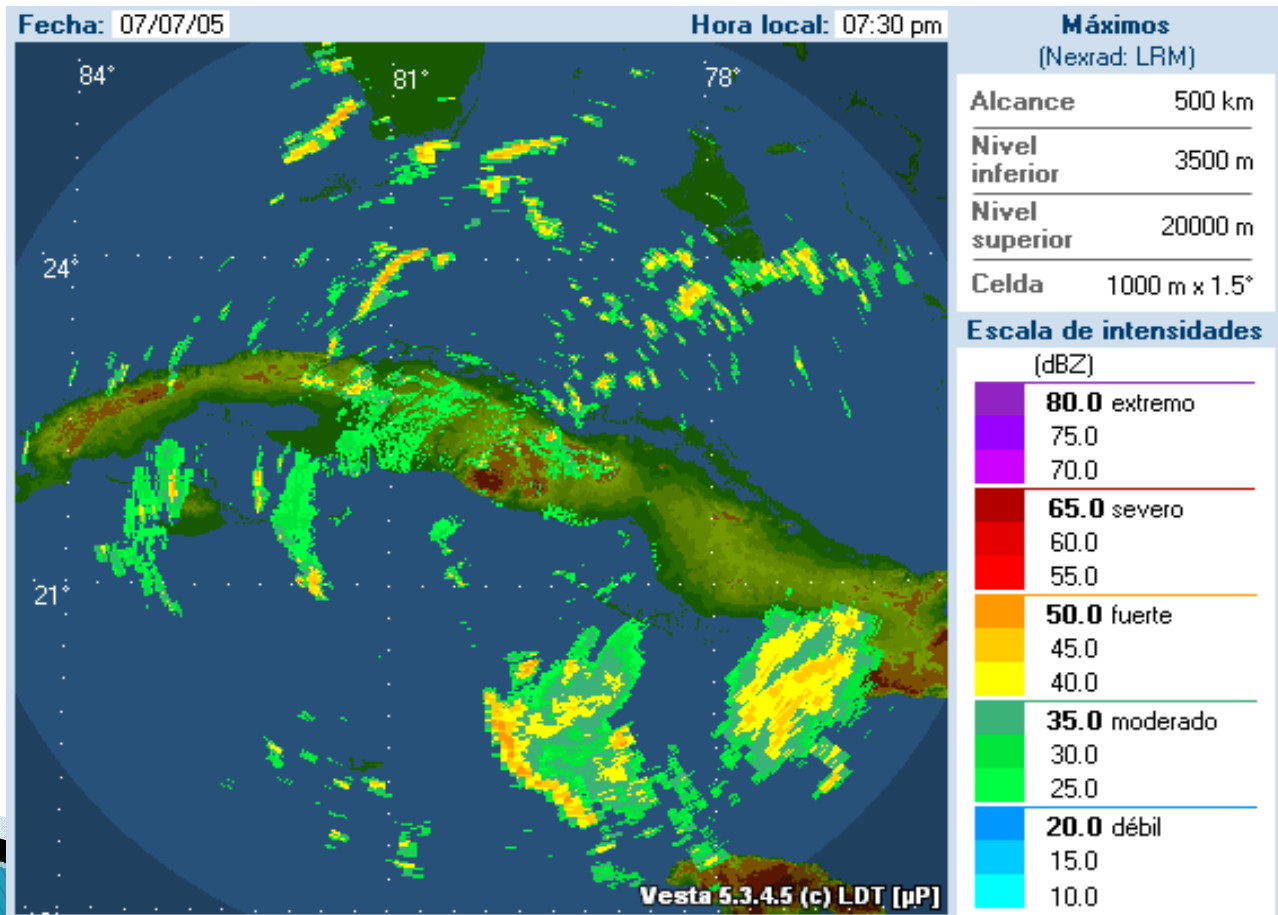
4





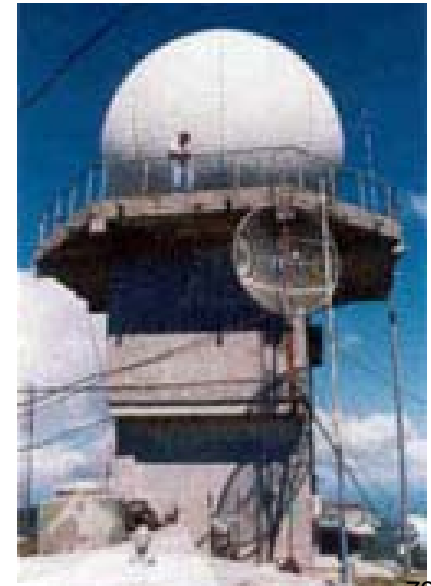
When it is estimated that the tropical cyclone could be affecting within the following 72 hours, the phases foreseen in the response stage are announced (Informative Phase (72 hours), Alert Phase (48 hours), and Alarm Phase (24hours)) by means of bulletins issued by the Civil Defense National Staff and broadcast over national and local radio and television.

5



6

The provincial meteorological centers evaluate the probable local impact of the precipitations and send the information to the hydrological service in the territory, which in turn estimates the potential for floods based on the situation of the water resources (level of water in the reservoirs, the canalization and drainage conditions, the soil saturation, and the hydrological condition of rivers.)



7

An assessment of the likely impact of winds and waves is conducted along similar lines, taking into consideration the structural vulnerabilities of housing, economic facilities and coastal settlements, which receive protection in accordance with their level of exposure and risk.





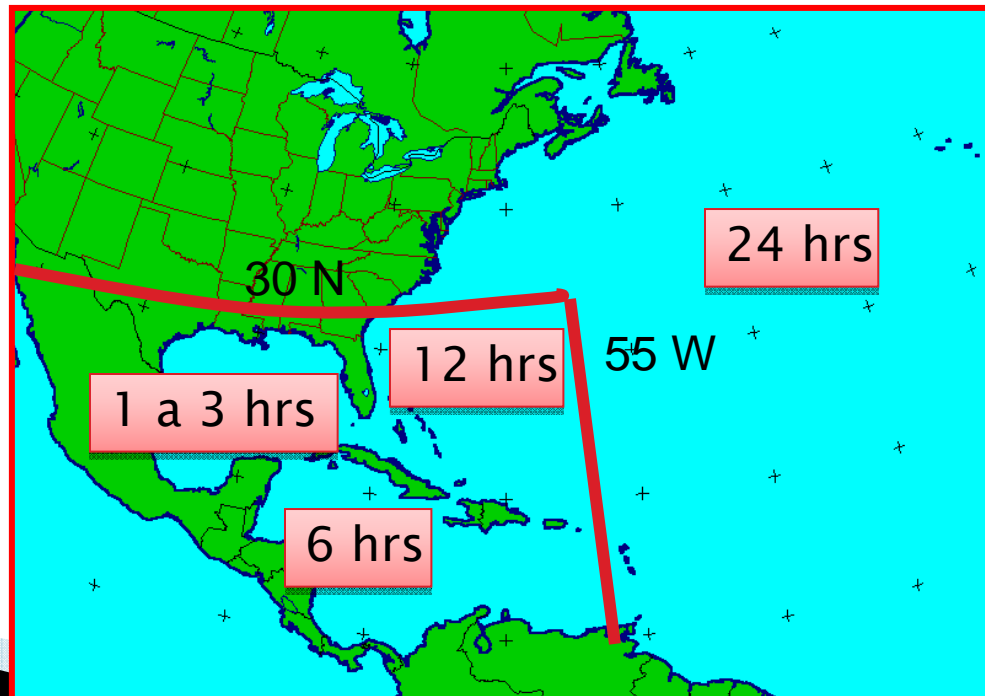
After the tropical cyclone stops being a hazard for the country, the recovery stage is declared, and the restoration of the damaged infrastructure and services begins, for which there are territorial and national plans.

8



# Warning dissemination mechanisms

- Early Warning messages begin to be issued by the National Forecast Center with 120 hours in advance of a possible impact, repeating them every 24 hours.
- When the Hurricane penetrates inside the area of surveillance of the Caribbean Sea, warnings are issued every 12 hours, and when the Hurricane ends up being a potential threat to Cuban territory in 72 hours or less, warnings begin to be issued every 6 hours.
- When the hurricane is very near the Cuban territory, warnings are issued continually every 3 hours or less.





# Warning dissemination mechanisms



**Radio, and very especially television, are very important tools for transmitting warnings.**

**Cuba has more than a television set for home and the TV signal arrives to 98% of the national territory, and almost to all of the population. This results in building a great awareness and interest among everybody, with frequent live direct broadcasts by meteorologists from the National Forecast Center.**

Plain language is used,  
and also many details are  
given

A call is made for  
everyone's past  
experiences with  
hurricanes

People is warned about some details that could drive to confusion, i.e. the hurricane is **NOT** a point.



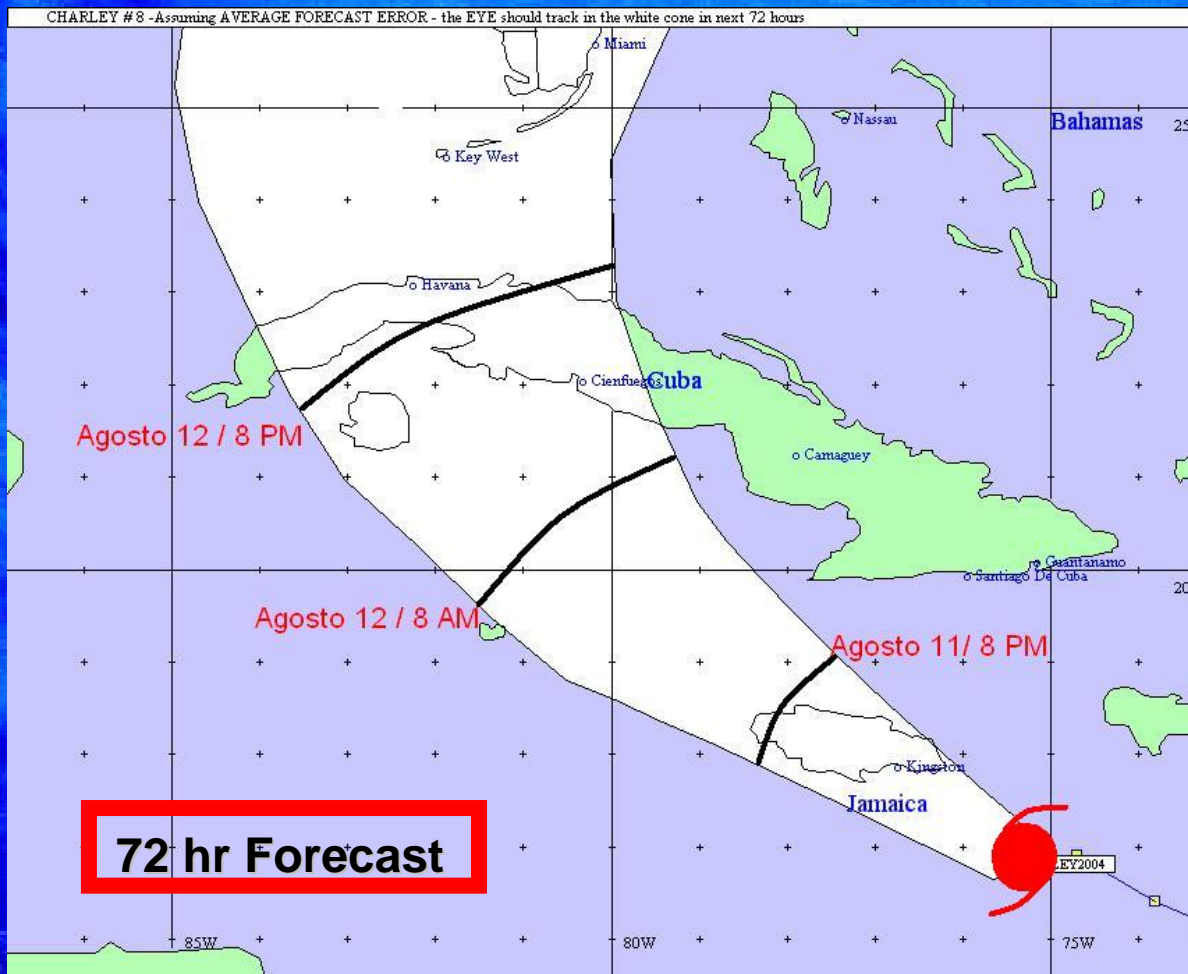
And also that the main dangers are **WINDS**, **FLOODINGS** and **STORM SURGE**



The Use of Radar and Satellite Imagery in TV is very helpful to show the movement and the area covered by the Hurricane.



# The Use of Probabilistic Cones to Address Uncertainties

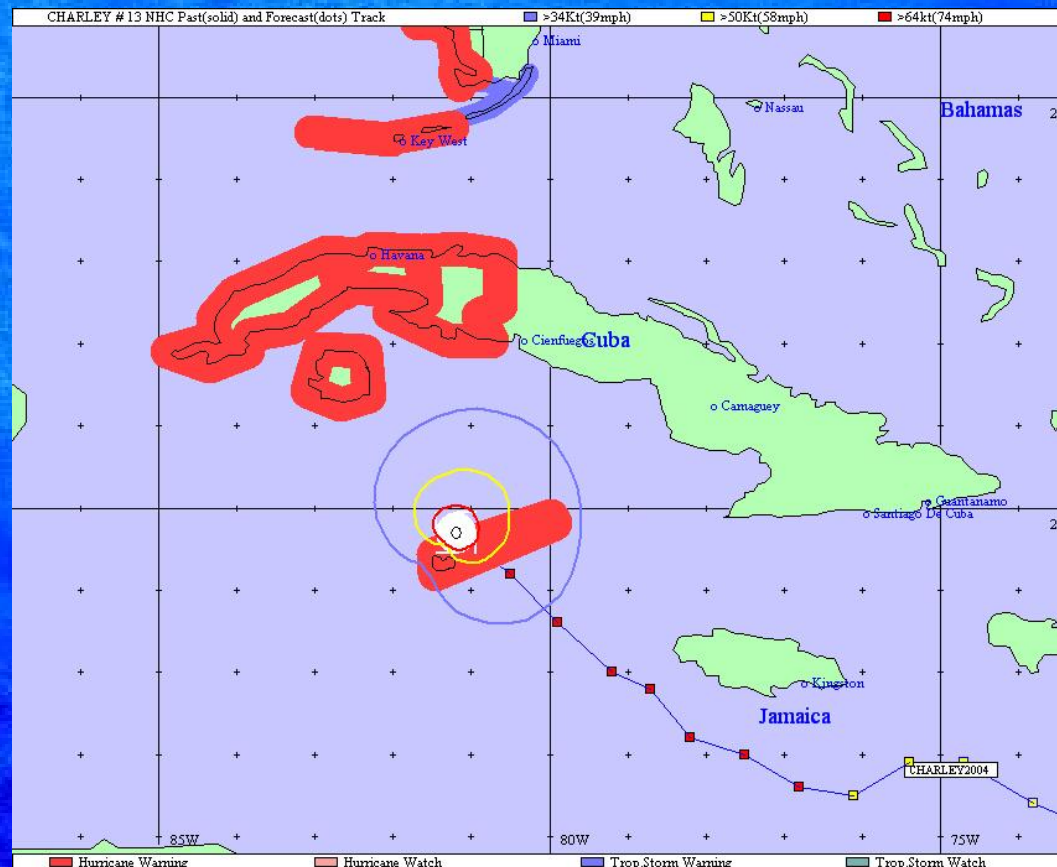


**Tropical Storm  
CHARLEY**

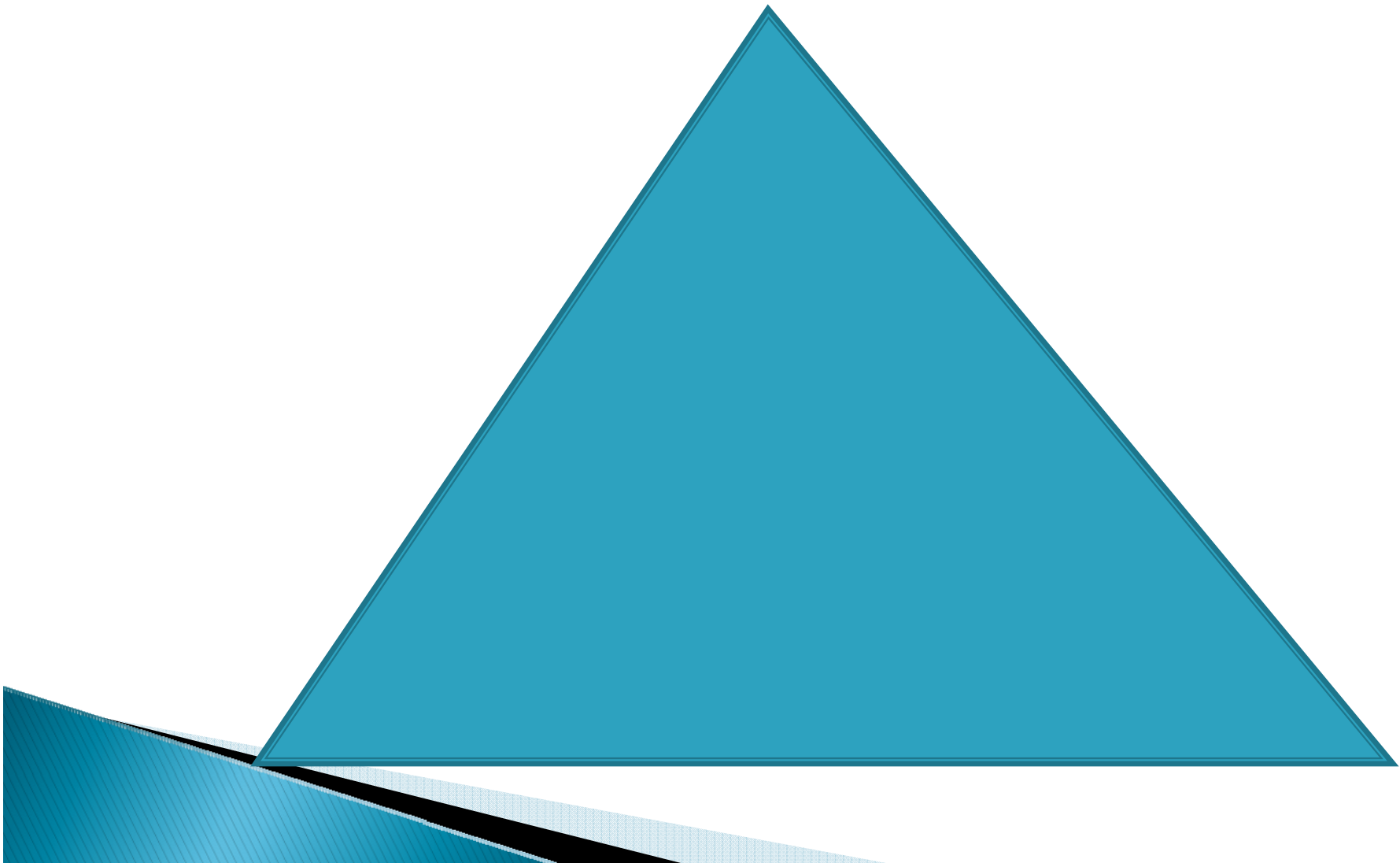
**Initial Pos.  
Aug 11 / 12 noon  
16.5 N 76.1 W 175  
km SE Kingstn,  
JAM 860 km SE  
Isle of Youth  
Max.Sust.Winds:  
110 km/h**



# The Areas under Warnings are clearly shown



# Three Main Actors in the process of issuance and distribution of the Early Warnings messages



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**CENTRO NACIONAL DE PRONÓSTICOS  
INSMET**



**TELEVISIÓN  
Y RADIO**

**EMN  
DEFENSA CIVIL**

# Three Main Actors in the process of issuance and distribution of the Early Warnings messages

**CENTRO NACIONAL DE PRONÓSTICOS  
INSMET**

**UNA FUERTE  
INTERACCIÓN  
Y COORDINACIÓN**

**TELEVISIÓN  
Y RADIO**

**EMN  
DEFENSA CIVIL**

# MAIN ELEMENTS OF RESPONSE

- ▶ An adequate appreciation of the event's main features and the level of risk for persons and the economical goods exposed
- ▶ A step by step implementation of all protective measures
- ▶ Timely protection of the population as well as their personal belongings.
- ▶ Permanent public information Información on the evolution of the hazards and the measures to take in each situation.
- ▶ A centralized System of Direction



Disasters Reduction Plans in Cuba are drafted at all levels, from the very basic People's Council to the provincial governments and from local to national economic entities and organizations, based on an assessment of the risk at each level



## IMPROVEMENT OF OVERALL OPERATIONAL WORK IN EWS

- ▶ The feedback mechanisms that the NMS has been utilizing is the direct dialog with users, being these special users like the government and Civil Defense, or other users as Ministries, the Media, etc. Sometimes, written suggestions are also received. All suggestions are taken into consideration and they help to improve the forecast and warning service.
- ▶ Congratulations messages from many people and organizations, including Government, are received after each hurricane impact, for forecasts and warnings are generally successful.

# TROPICAL STORMS AND HURRICANES THAT HAVE AFFECTED CUBA SINCE 1995

NAME	YEAR	CATEGORY	DEATHS
Lili	1996	H2	0
Georges	1998	H1	6
Irene	1999	TT	2
Michelle	2001	H4	5
Isidore	2002	H1	0
Lili	2002	H2	1
Charley	2004	H3	4
Ivan	2004	H5	0
Dennis	2005	H4	16
Alberto	2006	TT	0
Ernesto	2006	TT	0
Noel	2007	TT	0

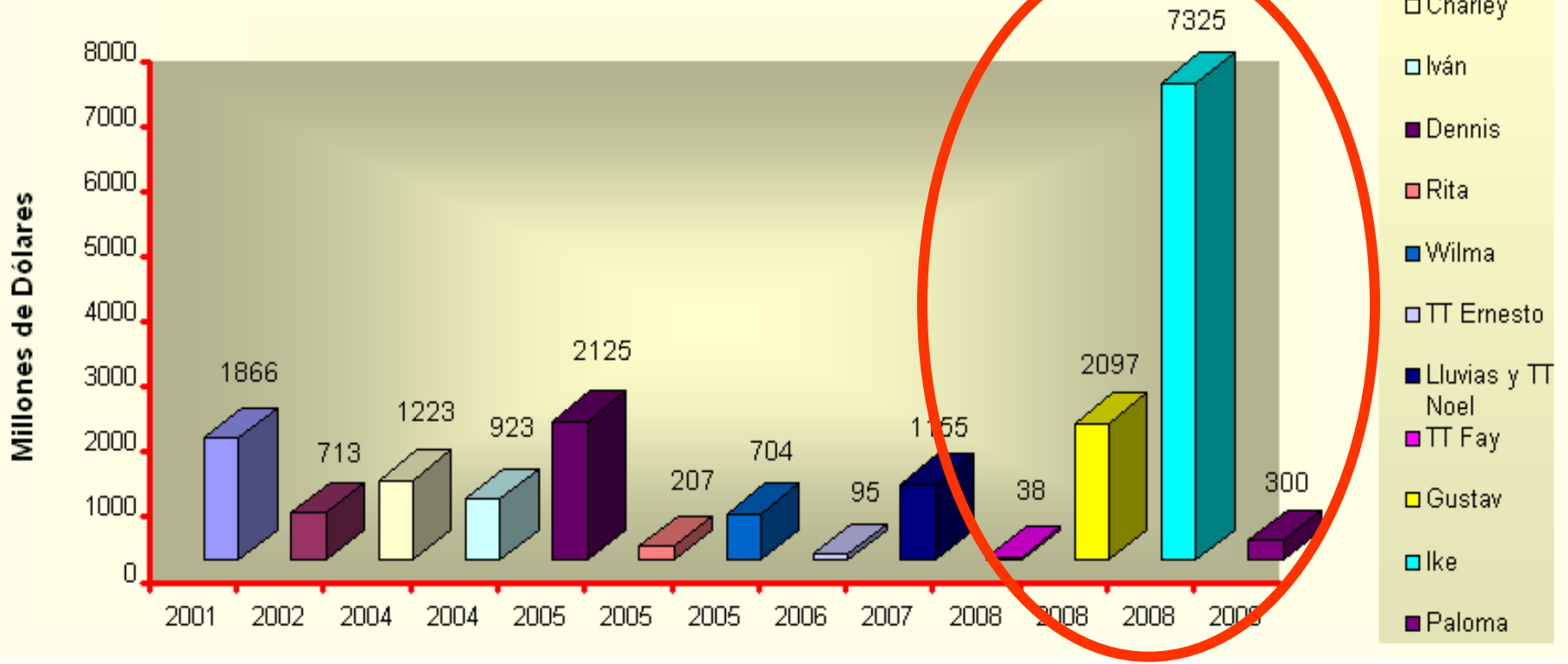
## HURRICANE SEASON 2008 WAS ONE OF THE MOST ACTIVE EVER IN CUBAN HISTORY

NAME	YEAR	CATEGORY	DEATHS
Fay	2008	TT	0
Hanna (Indir.)	2008	TT	0
Gustav	2008	H4	0
Ike	2008	H3	7
Paloma	2008	H2	0

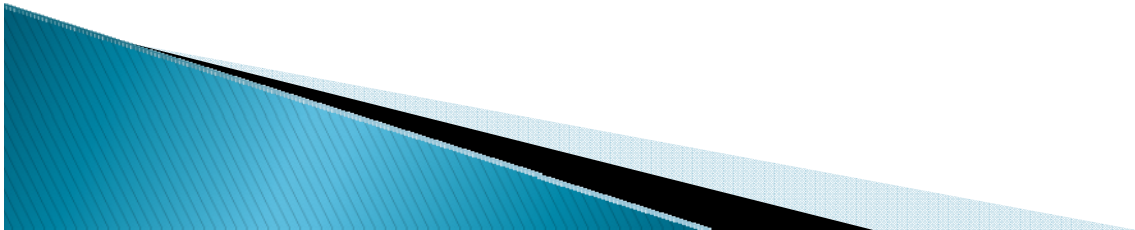
**BUT ONLY 7 PEOPLE LOST THEIR LIVES, MAINLY BECAUSE OF THE VICTIMS THEMSELVES, FOR SOME OF THEM DID NOT FOLLOW ACCORDINGLY THE ORIENTATIONS GIVEN BY THE CIVIL DEFENSE**

# Huracanes

2008



ECONOMIC DAMAGES ARE GREAT





## OVERALL LESSONS LEARNT AND FUTURE STEPS FOR IMPROVING THE SYSTEM

- ▶ The NMS needs human resources and a good infrastructure as well,
- ▶ Full coordination among the NMS, Civil Defense and the Media is needed,
- ▶ People's education is very important factor.

## OVERALL LESSONS LEARNT AND FUTURE STEPS FOR IMPROVING THE SYSTEM

- ▶ Full discussion after any event leads to making things better next time,
- ▶ Increase even more people's education, mainly in aspects such as individual responsibility and discipline,
- ▶ Continue improving infrastructure of the NMS as far as economic factor permits

## HIGHLIGHTS OF PART III

- The Media are partners in the whole Warning and Early Warnings Processes.
- Radio and TV has an excellent coverage in the Nation.
- Forecasters are in charge of presenting the forecast to the public through national and local radio and TV networks, but also to the Civil Defense Staff and the Government to all levels, using the same easy, jargon-free, practical language.
- The loss of lives in Cuba is minimal, although material damage is still high.
- Lessons from past events are learned and used in the improvement of the Early Warning System.

# Thank you !

# ¡ Gracias !



# Merci !

**QUESTIONS? ¿PREGUNTAS?**

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