




EARLY WARNING SYSTEM FOR TROPICAL CYCLONES IN THE REPUBLIC OF CUBA

**Second Experts' Symposium on
Multi-Hazard Early Warning Systems
with focus on the Role of National
Meteorological and Hydrological Services**

5-7 May 2009, Toulouse, France





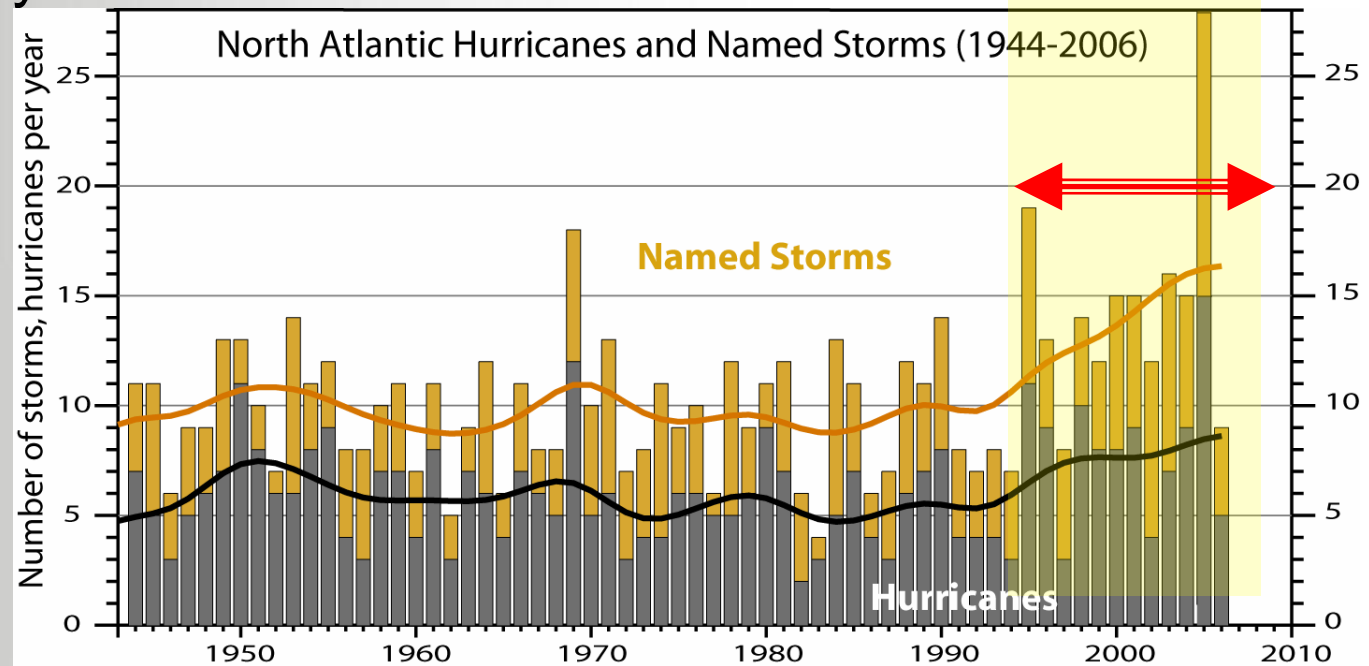
“Hazards should not be watched upon
when they are already over us, but
when they could be avoided”

“ 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)

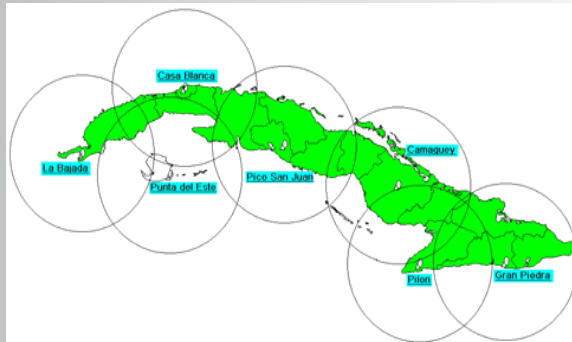
BACKGROUND OF THE ESTABLISHMENT OF EWS

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

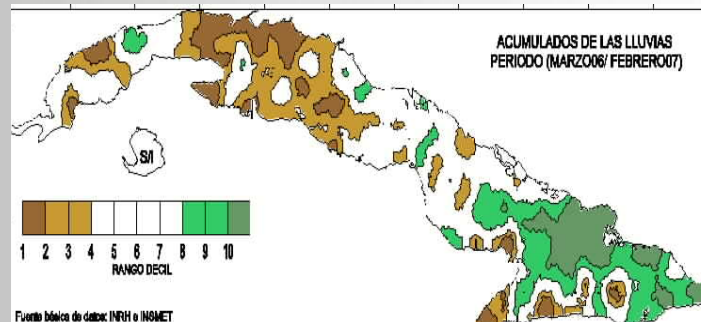
A set of institutions guarantee surveillance against all events threatening the country. They have branches in all provinces, and some have municipal representations



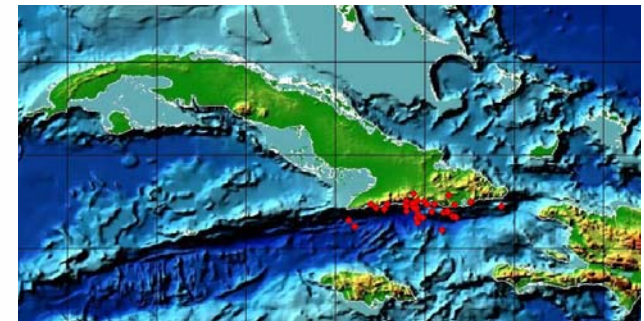
Hydrometeorological events

floods

forest fires



drought



earthquakes

This surveillance network makes up the base of Cuba's Early Warning System and is part of its Civil Defense System

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

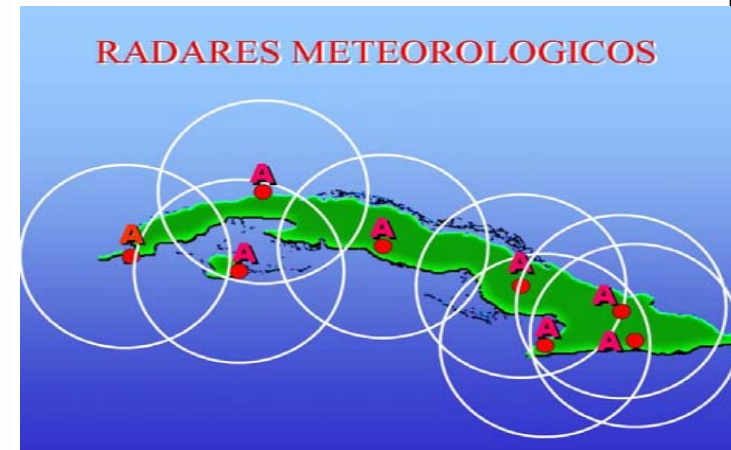
Main elements of the EWS for TC

- 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.

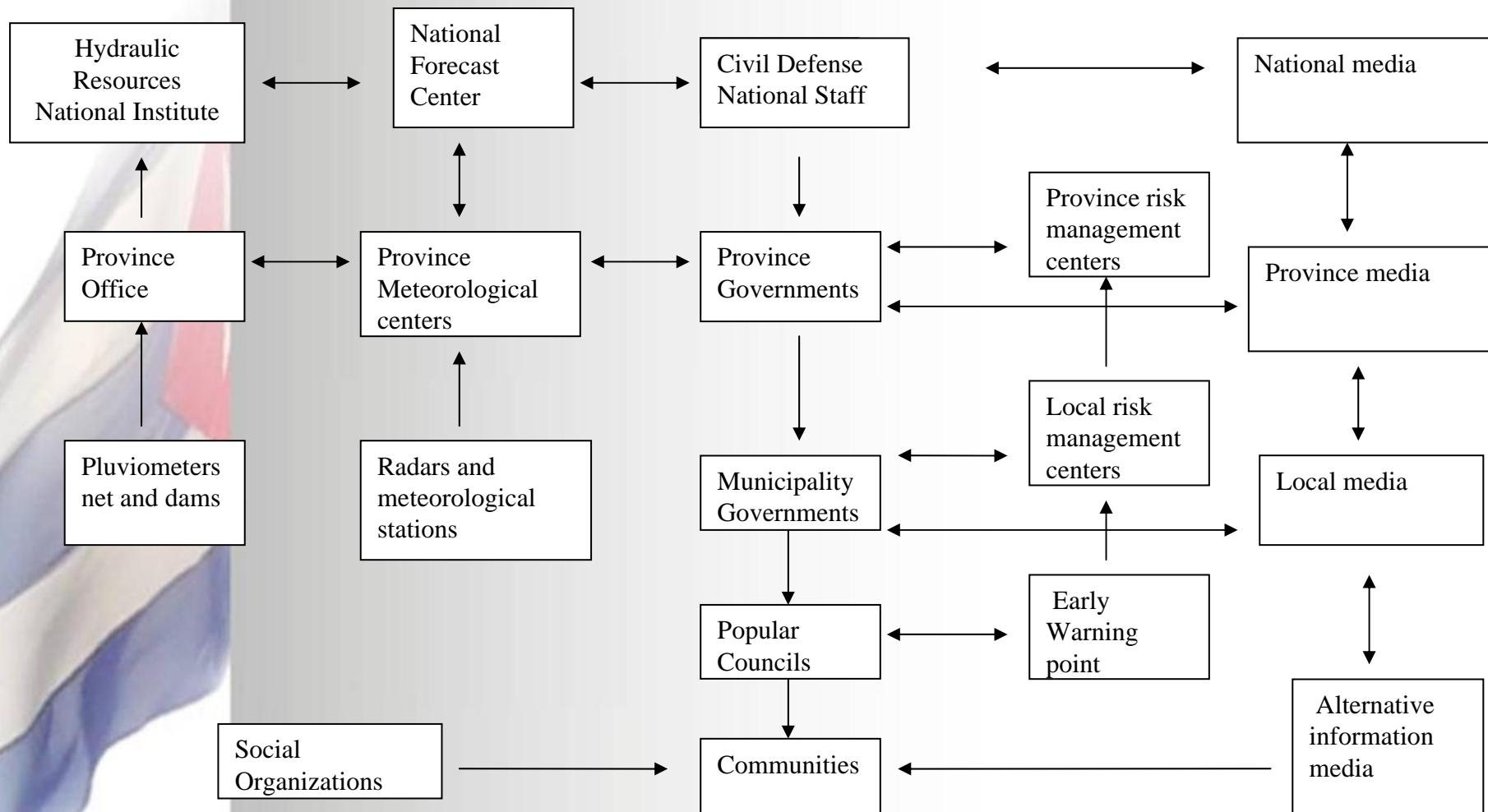


Elements including in EWS for tropical cyclones

- 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

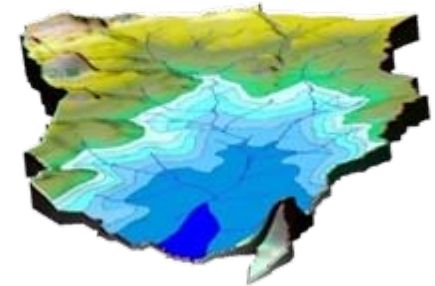


FUNCTIONAL STRUCTURE OF EARLY WARNING SYSTEM FOR TROPICAL CYCLONE IN CUBA

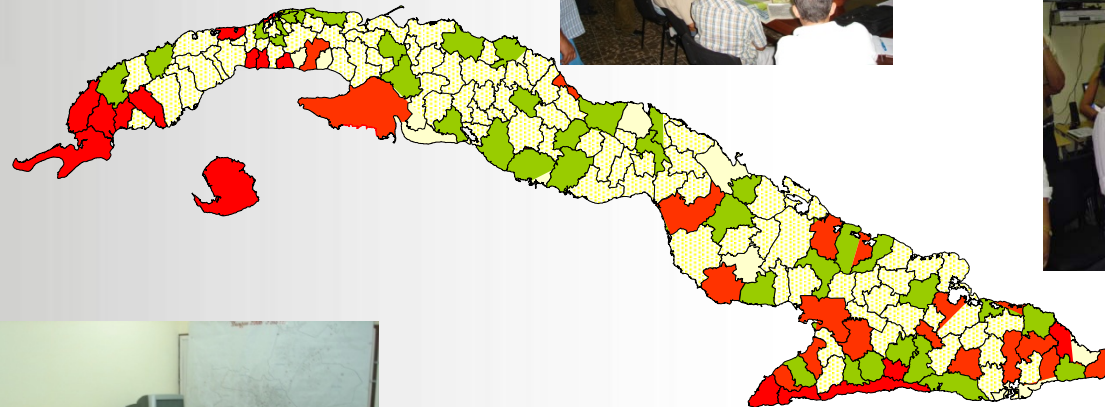


Utilization of risk information in emergency planning and warnings

- 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.

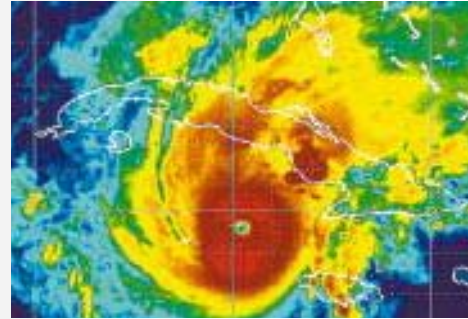


Hazard monitoring, forecasting, and mandates for warning development

National Forecast Center



river flooding



wildfires




National Institute of Hydraulic Resources



Forest Keeper Body

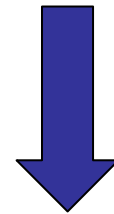
Hazard monitoring, forecasting, and mandates for warning development



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

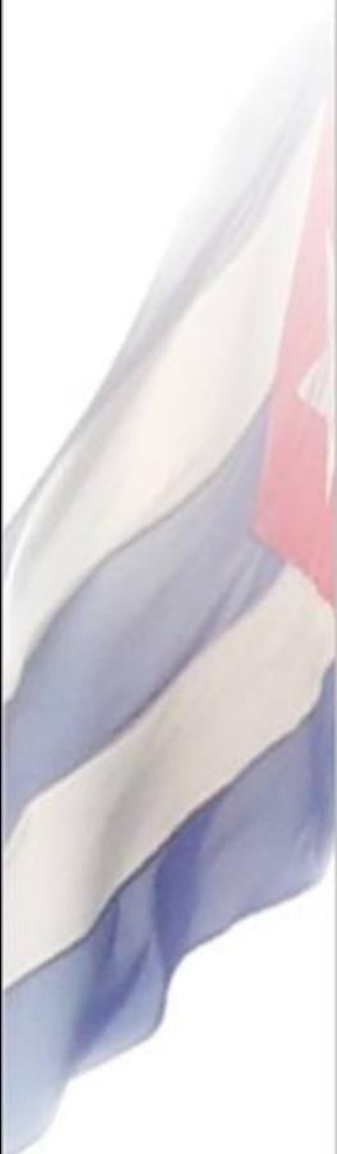


National Civil Defense is responsible for the development of the warning in terms of the mobilization of all national and local resources, including all logistics for protective measures and evacuations



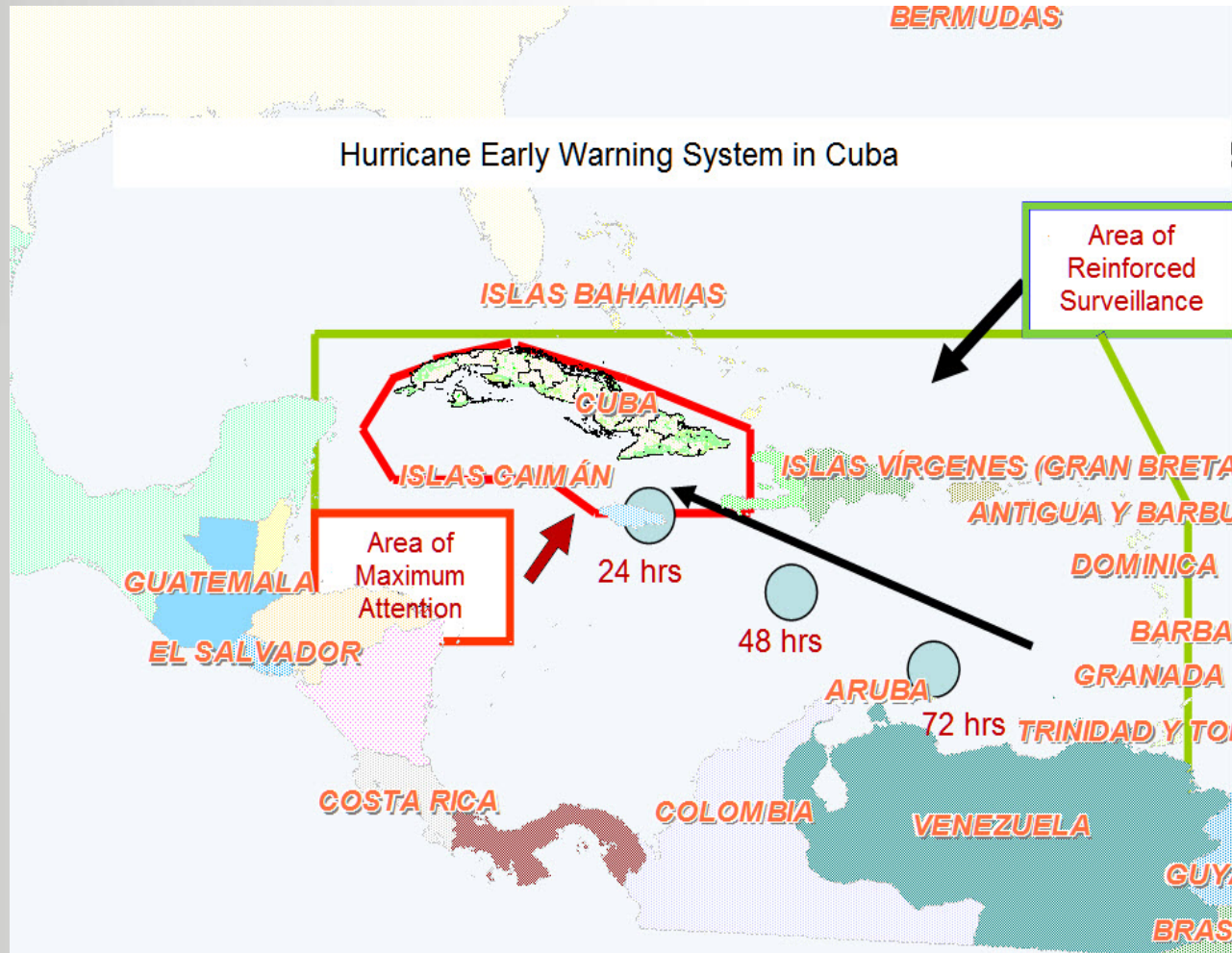
Warning message development cycle

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



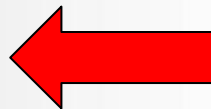
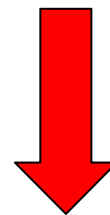
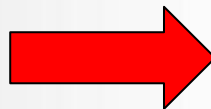
2

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



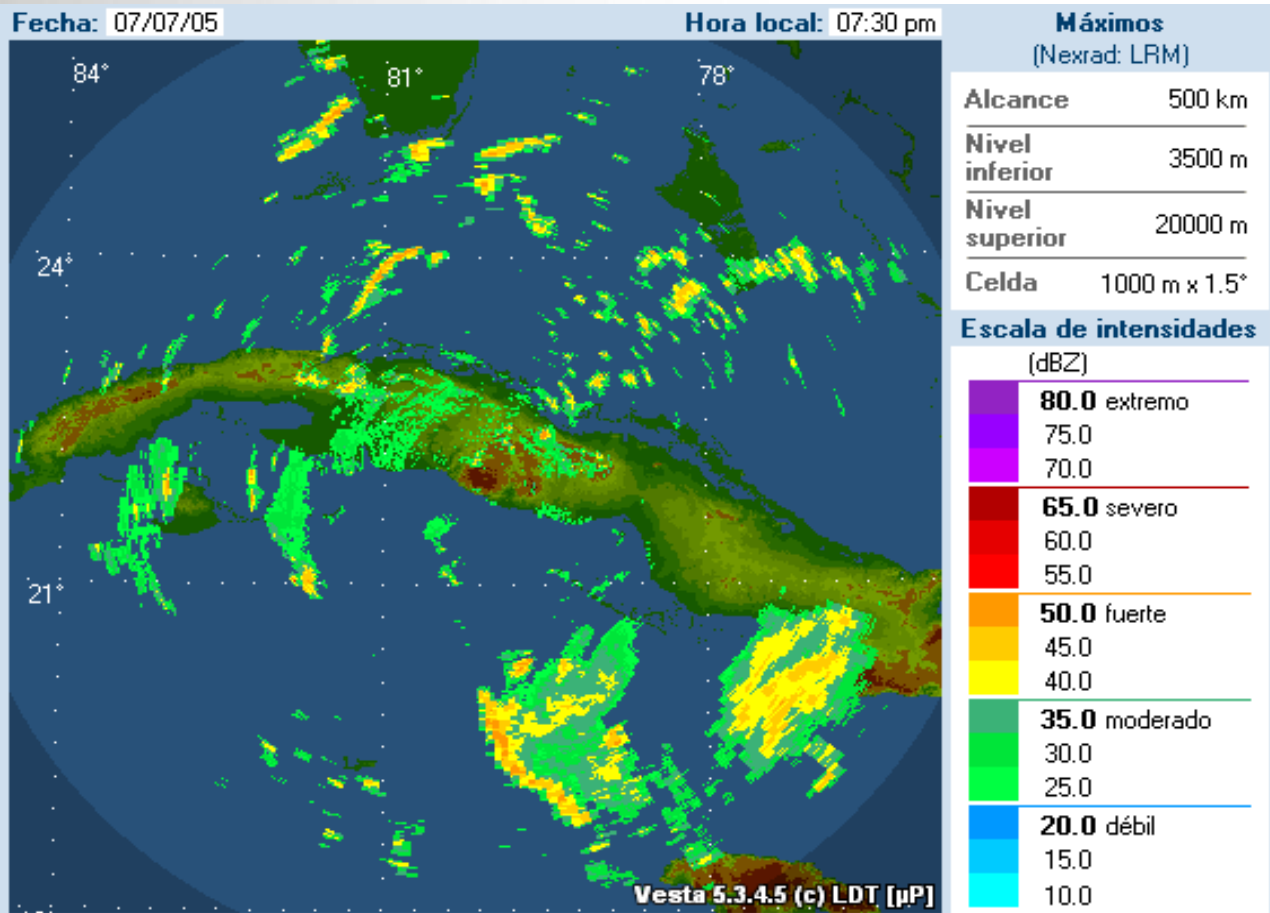
As the tropical cyclone continues to approach Cuba, the Meteorological Institute's Forecast Center increases the number of warnings describing in detail the future track and intensity of the hurricane, as well as the expected impact of winds, rains, storm surge and waves.

4



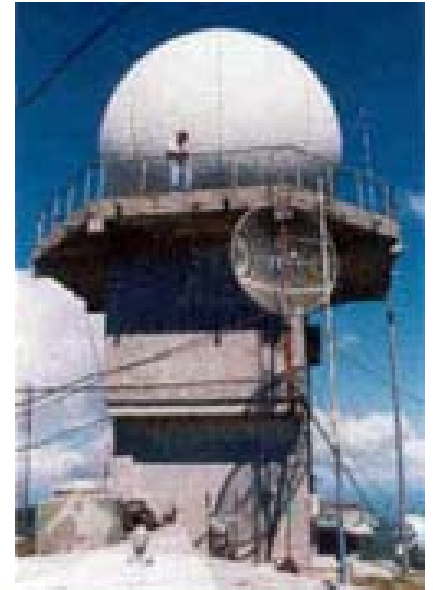
When it is estimated that the tropical cyclone could be affecting within the following 72 hours, the phases foreseen in the response stage are announced (Informative Phase (72 hours), Alert Phase (48 hours), and Alarm Phase (24hours)) by means of bulletins issued by the Civil Defense National Staff and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

5



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.)

6



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

- The 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 territory of the country, warnings are issued continually every 3 hours or less.



Warning dissemination mechanisms



Radio, and very especially television, is a very important tool for warnings.

The country counts with 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.



Several entities participate in the issuance and distribution process of the Early Warning messages

- The National Forecast Center of the Institute of Meteorology issues Early Warning and Warnings on the tropical cyclone for the National Staff of the Civil Defense, and meteorologists give the meteorological information through national radio and TV, both national and local.
- The National Staff of the Civil Defense issues informative notes with guidance and recommendations from an approach on the protection of lives and material goods, which are sent to all levels of government as well as to the radio and TV, both national and local.
- Television channels and radio stations, both national and local, transmit in a special program 24 hours round with reports, interviews to specialists and authorities and also reports related with the evolution of the hurricane, the protective measures being adopted in each place and guidance on measures to be completed. The International Press Center disseminates information for the foreign press agencies and coordinates interviews with forecasters and specialists

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



Main elements of response

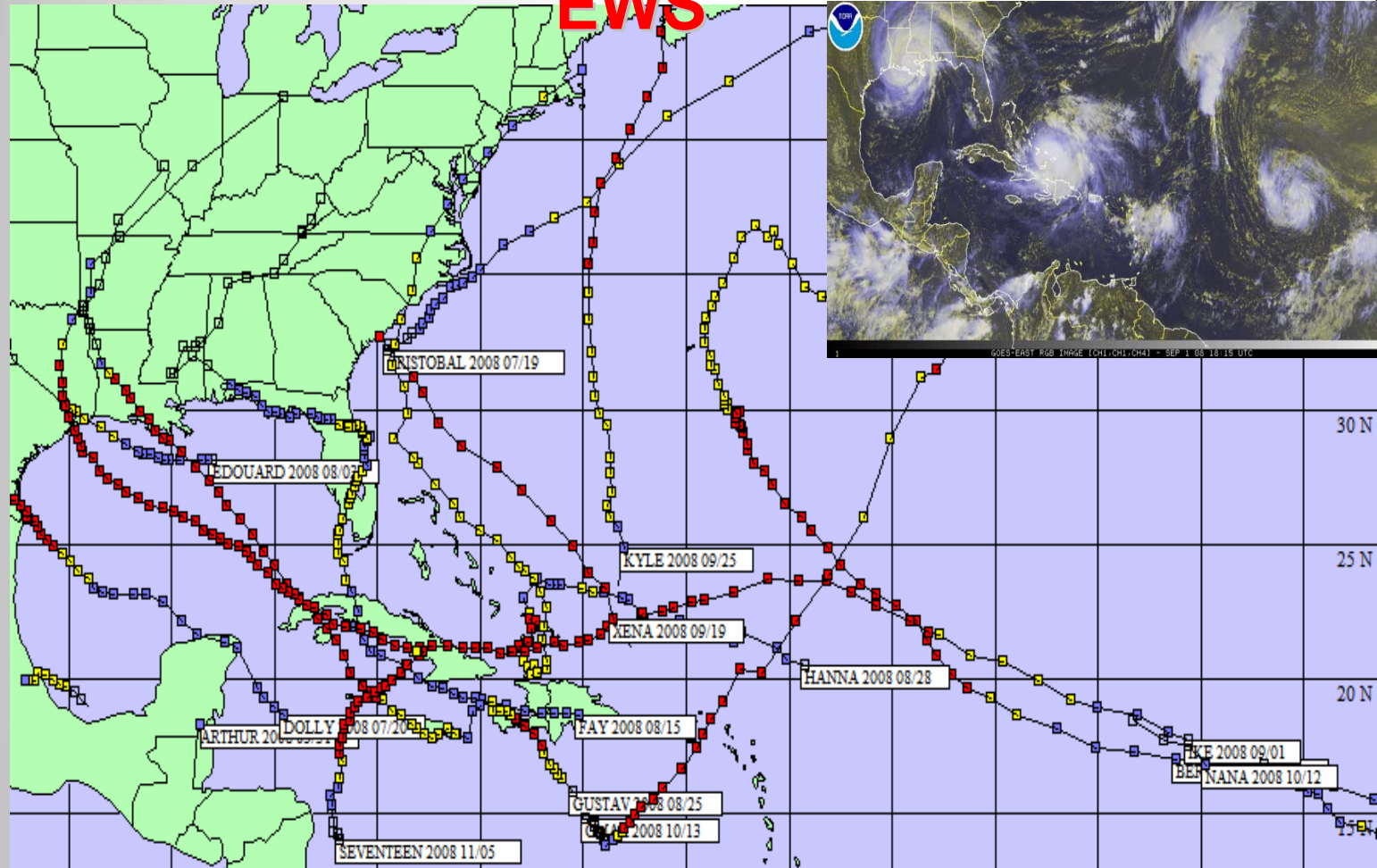
- An adequate appreciation of the event's main features and the level of risk for persons and the economical goods exposed
- A step by step implementation of all protective measures
- Timely protection of the population as well as their personal belongings.
- Permanent public information Información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

Improvement of overall operational framework of 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.

Examples of events where the EWS has led to improvements in preparedness and prevention

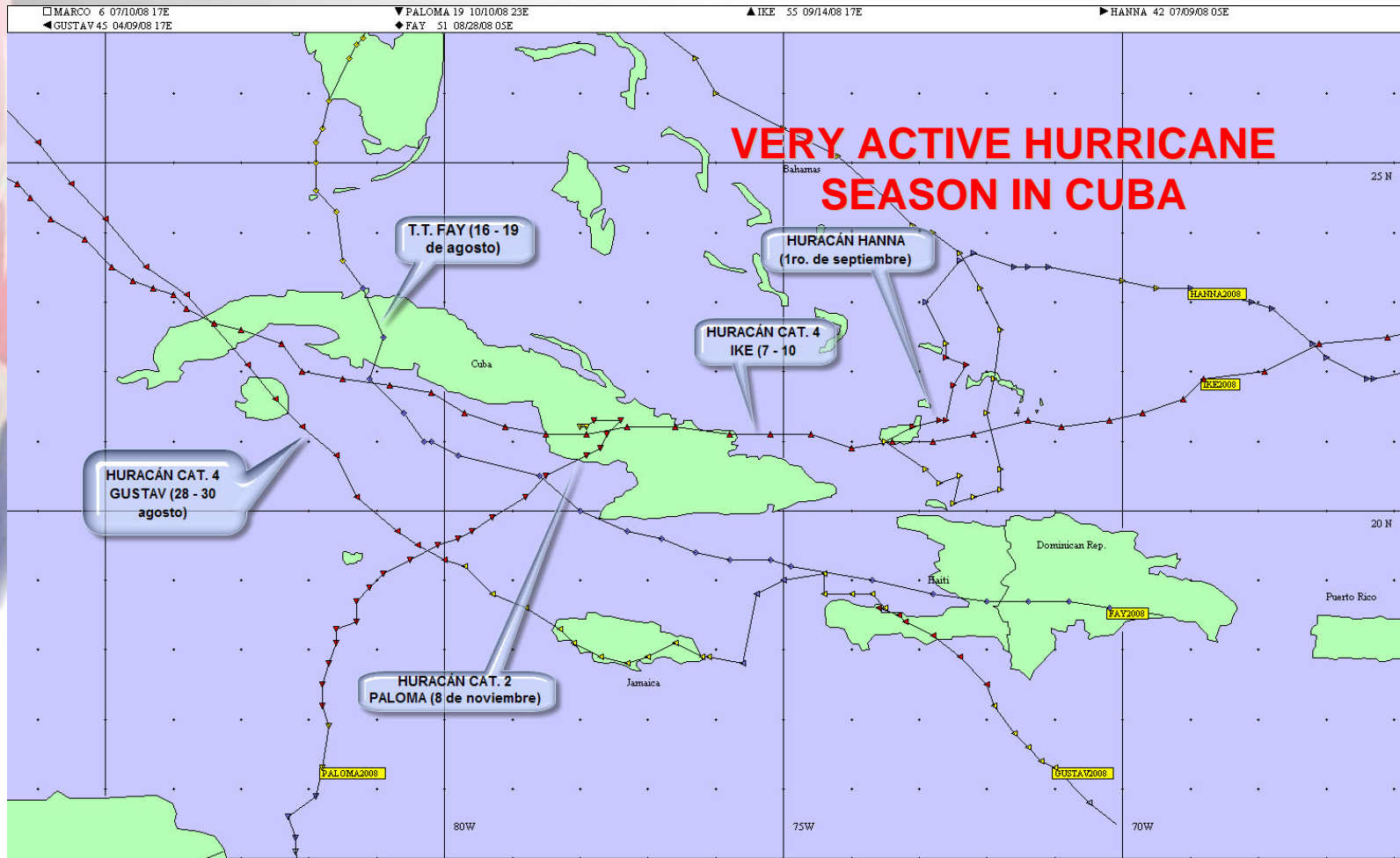
Role of the NMHS in the EWS



2008: ACTIVE HURRICANE SEASON

Examples of events where the EWS has led to improvements in preparedness and prevention

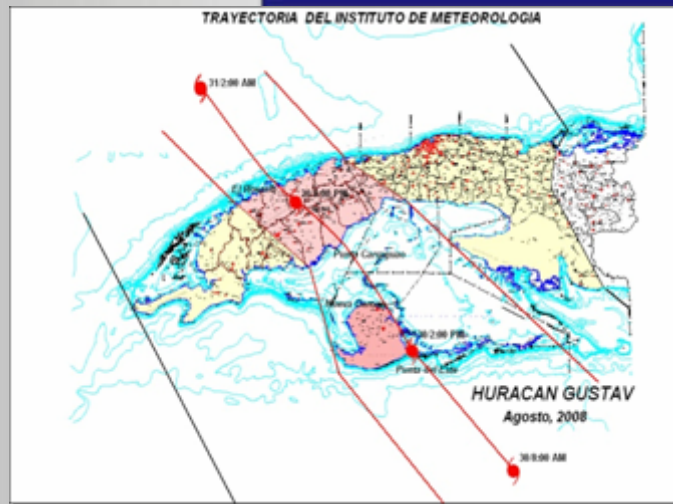
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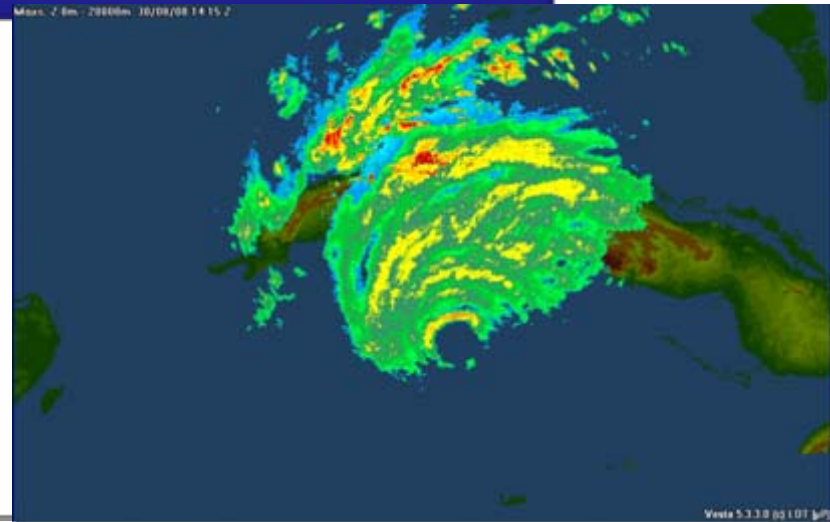
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Role of the NMHS in the EWS

Hurricane GUSTAV



Gustav Official Track



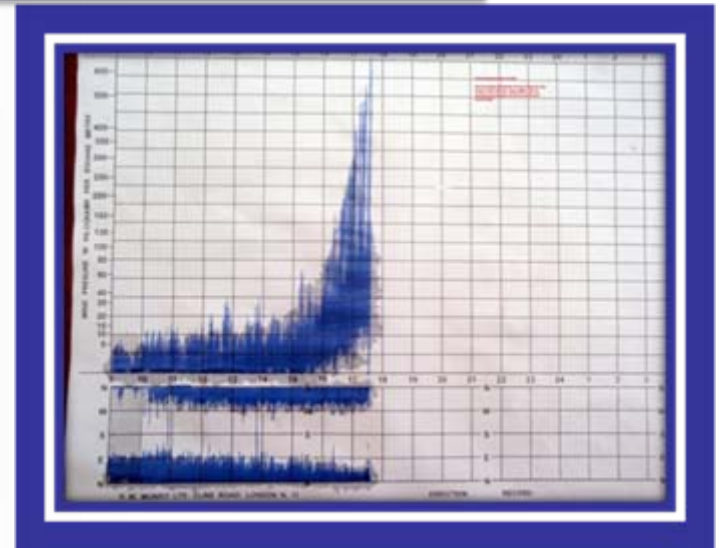
Havana Radar loop

Examples of events where the EWS has led to improvements in preparedness and prevention

Role of the NMHS in the EWS

Hurricane GUSTAV

A maximum wind gust of 340 km/h was recorded at Paso Real de San Diego Meteorological Station, a new World Record Wind Gust in Tropical Cyclones.





Examples of events where the EWS has led to improvements in preparedness and prevention

Role of the NMHS in the EWS

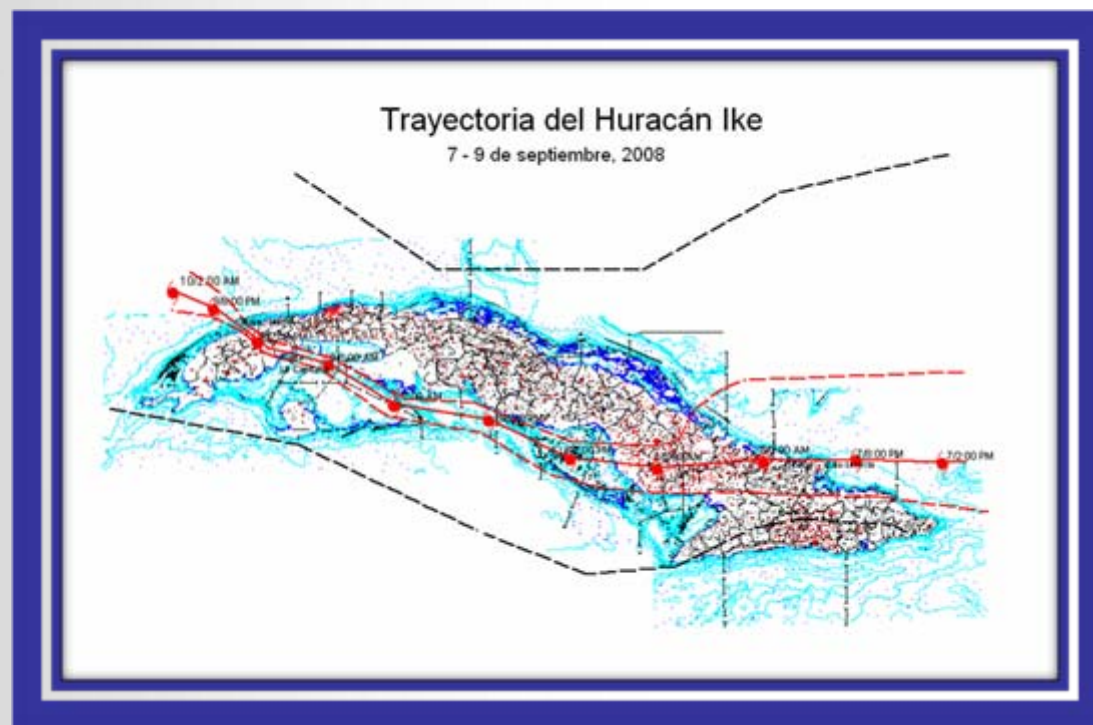
Meteorologist explained the main features of this deadly hurricane along with the track and intensity forecasts.

People were well prepared and the Civil Defense made a superb job. The amount of material losses was great, however, not a single life was lost.

Examples of events where the EWS has led to improvements in preparedness and prevention

Role of the NMHS in the EWS

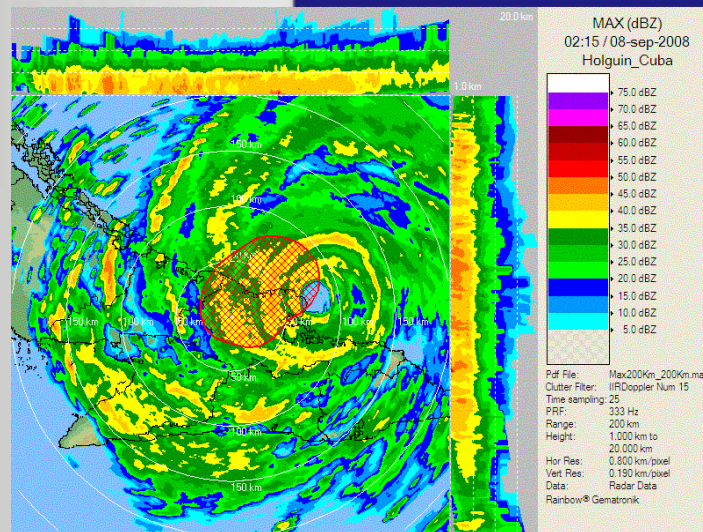
Just 10 days later came major hurricane “IKE” and affected the whole Country.



Examples of events where the EWS has led to improvements in preparedness and prevention

Role of the NMHS in the EWS

Huracán IKE



Doppler radar at Holguín showing the eye at landfall, 10:15 PM (02:15 UTC, Sept.8, 2008)

It was the first time ever that the Cuban Eastern provinces of Holguín and Las Tunas were hit by a major category 4 Hurricane

Wind speed at landfall is not known, for anemometers were destroyed



Examples of events where the EWS has led to improvements in preparedness and prevention Role of the NMHS in the EWS

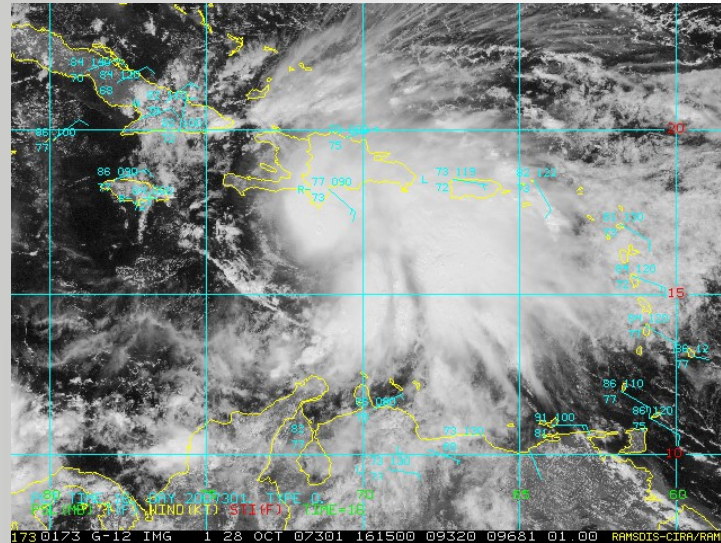
There were 7 deaths with “Ike”, the majority of them provoked by negligence of the victims, sometimes without anything to do directly with the hurricane.

The lesson is that it is needed to warn even more not to do things that people in the affected area or areas under some type of warning are not suppose to do.

A few weeks later, came Hurricane Paloma and there were a great insistence on the Media that people should not go out in a hurricane, nor do things that are hazardous and they are not suppose to do in a storm. No casualties were reported.

Examples of events where the EWS has led to improvements in preparedness and prevention

Role of the NMHS in the EWS



- Meteorologists stressed that rain was the important factor: forget the track and winds
- There was a timely Early Warning
- Great Material losses: \$499 millions USD

Rainfall totals in 24 hours were between 200 and 300 mm over Eastern Cuba. The soil was already saturated because of heavy rainfall during the previous month. Large areas were completely flooded and a massive evacuation took place well before that it happened.

There were big losses to agriculture and economy, but nobody was dead during the event.

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



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 an important factor.



Overall lessons learnt and future steps for improving the system

- Full discussion after any event lead to makes 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



Thank you!



