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The role of tropical cyclone size in precipitation over Mexico

NH9.3 Resilience to natural hazards: assessments, frameworks and tools

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Introduction

TCs are a constant extreme hazard in Mexico.

Improving emergency management for TC-associated risk is urgent (EWS-TCs)

Define the size of tropical cyclones that affect Mexico during the period 2000-2020 by using infrared satellite imagery.

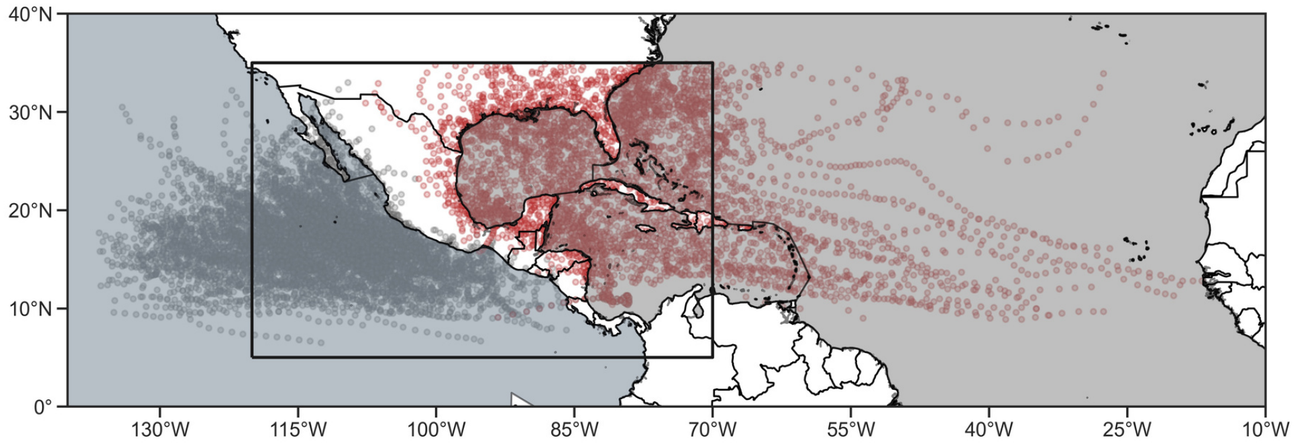

Figure 1. The study area (black square). The TC positions are shown in red for the NA basin and in gray, for the EP basin, every 6h as recorded in HURDAT during the period 2000-2020.

A look at our methodology

We designed an algorithm that measures radial distances from the TC center to the farthest point where the brightness temperatures of clouds belong to TC circulation and are below -40°C.

ROCLOUD

1. Inputs
2. Segmentation
3. ROI's selection
4. Distances for each quadrant
5. Radius for quadrants

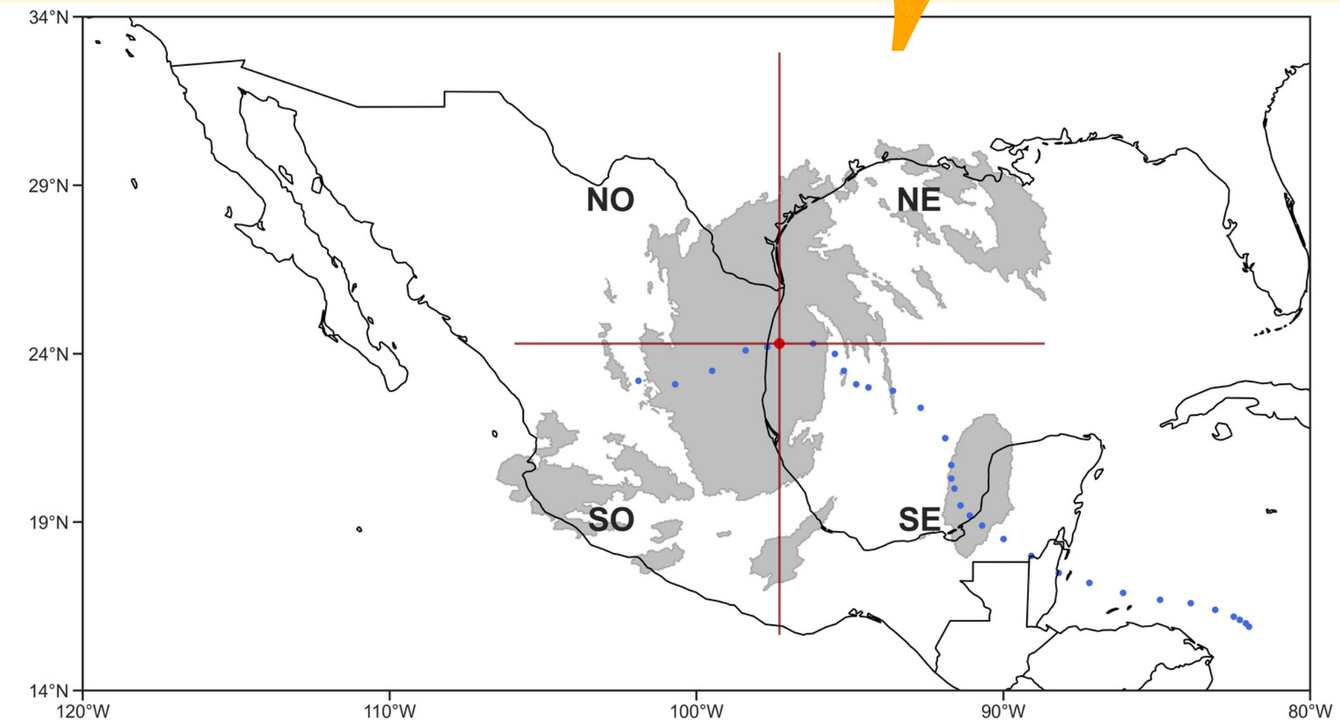

Figure 2. Extension of the cloud bands according to their brightness temperatures (gray contours) in Hurricane Alex (2010). The red lines represent the quadrants that are considered for TC radii.

May 27th, 2022

Summary

191 and 337 TCs from the NA and EP basins respectively were analyzed during the period 2000-2020.

1

The results show that TCs tend to be larger in the NA basin than in the EP basin. Furthermore, TC size is not related to TC intensity in both basins.

2

The calculated radii appropriately describe the areas of precipitation associated with TC bands. Their positive correlation is greater than 0.3 at a 99% confidence level.

3

Precipitation is influenced by various large-scale parameters, such as specific humidity at mid-levels, vertical wind shear, and divergence values in the upper atmosphere.

Early Warning System for TCs

in Mexico

Prevention actions to decrease disasters in Mexico are guided by the Early Warning System for TCs, which does not consider the TC-rainfall.

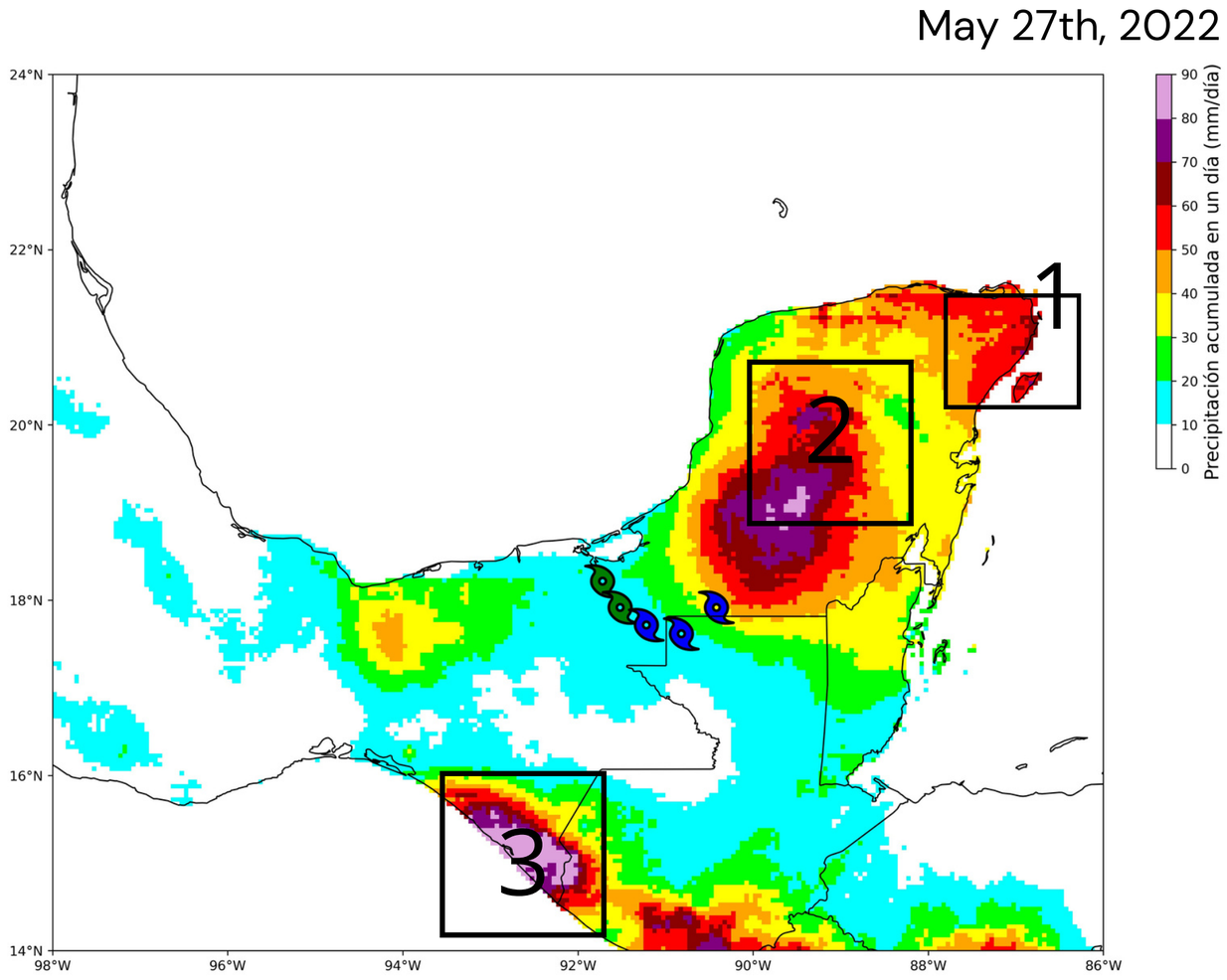

Figure 3. Precipitation reported by CHIRPS data in June 4th, 2020 over southeastern Mexico. The positions of Cristobal from 00:00 UTC June, 4 to 00:00 UTC June 5, are shown in green (TT) and blue (TD) according to its intensity.

May 27th, 2022

Early Warning System for TCs

in Mexico

The modification of the EWS-TC improves the warnings. The incorporation of TC size shows better results for emergency management.

The incorporation of rainfall bands provides more efficient warnings.

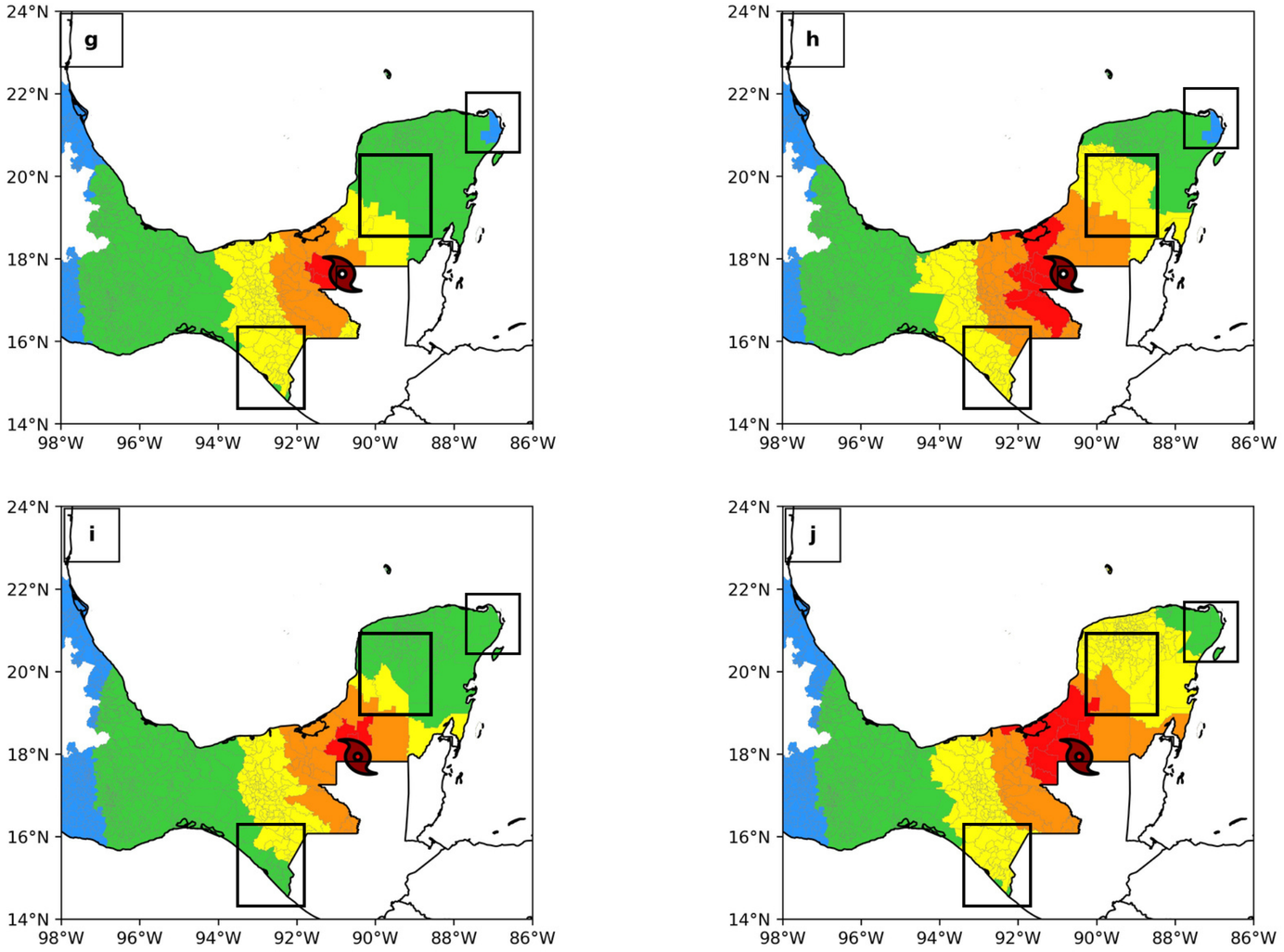

Figure 4. Warnings from the EWS-TCs during 18:00 UTC, June 4th, (g) and 00:00 UTC June, 5th (i). Modified warnings by our TC size definition during the same hours as (g) and (i), respectively (h, j).

May 27th, 2022

Thank you

Have a great day ahead!

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