CORDEX Central America and South America Training Workshop on Downscaling Techniques

weather@home Mexico: first attribution study in Mexico

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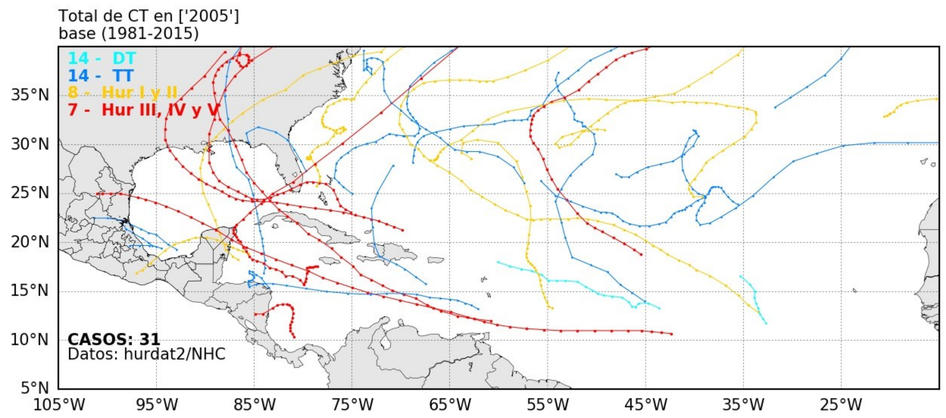
INTRODUCTION:

In this work we show preliminary results of the first Detection and Attribution study in Mexico for the 2005 Atlantic tropical cyclone season. Our study used the weatherathome methodology to generate an ensamble from thousands of simulations. A storm tracking algorithm was implemented to identify the occurrence and trajectory of tropical ciclones from model simulations. The main goal of the project is not to determine the attribution of anthropogenic activity for each individual cyclone, but for the totality of TC that occurred that season. It is important to note that 2005 has been the most active TC season recorded in the last 30 years



EXPERIMENTS:

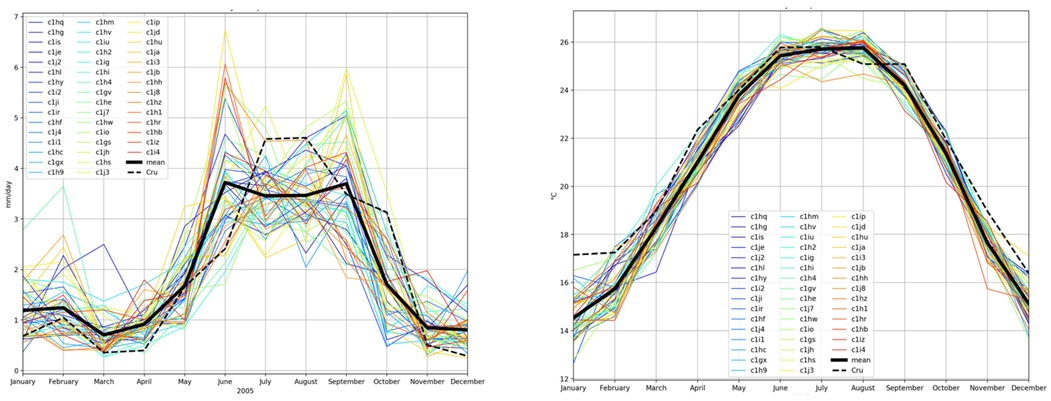
a) 1750 simulations for the 1986-2015 climatology (at 25 km of spatial resolution) with the HadRM3P to asses model's performance (HadRM3P has been used in different experiments over Mexico with very good results (i.e. Cerezo-Mota etal 2011; Cavazos et al 2018)) ⟶ CLIM

b) 1000 simulations of 2004-2005 under current climate ⟶ ANTHRO

c) 1000 simulations of 2004-2005 under counterfactual climate (as might have been without human influence on atmospheric composition)

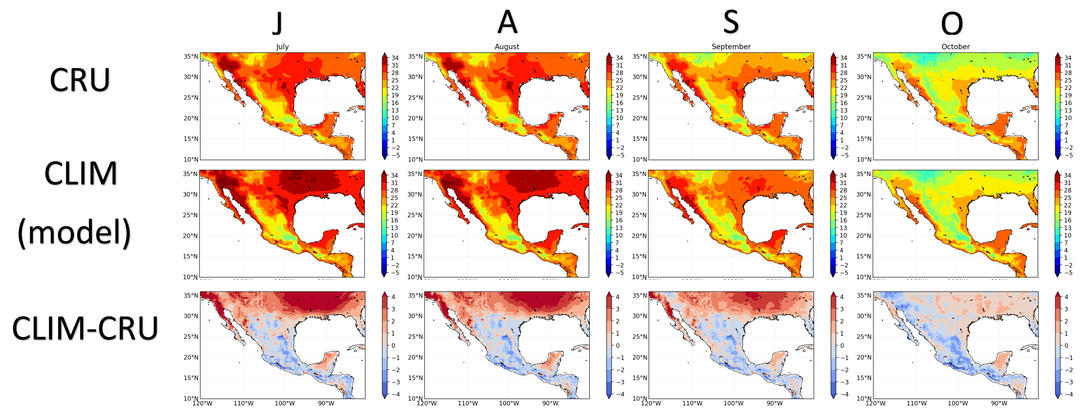
RESULTS:

The graphs below shows that each of the ensemble members can reproduce in an acceptable way the annual behavior of precipitation and temperature.

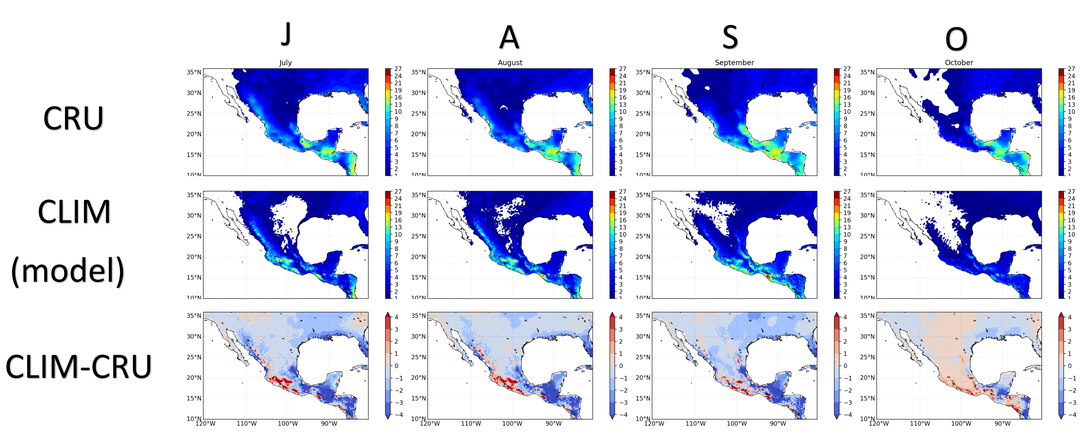


Annual Cycle (Climatology) for *precipitation (left)* and *temperature (right)* during 2005. Lines represent means over Mexico's land-area for individual ensamble members compared with CRU (dotted line) and ensamble mean (bold line).

Model simulations were compared versus the CRU climatology (monthly) in order to assess biases in precipitation and surface temperature. Identifyng the bias, help us to know the regions where model estimations are above or below observations for both temperature / precipitation. So that systematic errors produced by the model could be eventually corrected.



- Temperature biases: Systematic warm bias over Great Plains and Yucatan Peninsula ⟶ reported even when HadRM3P is forced with ERA.

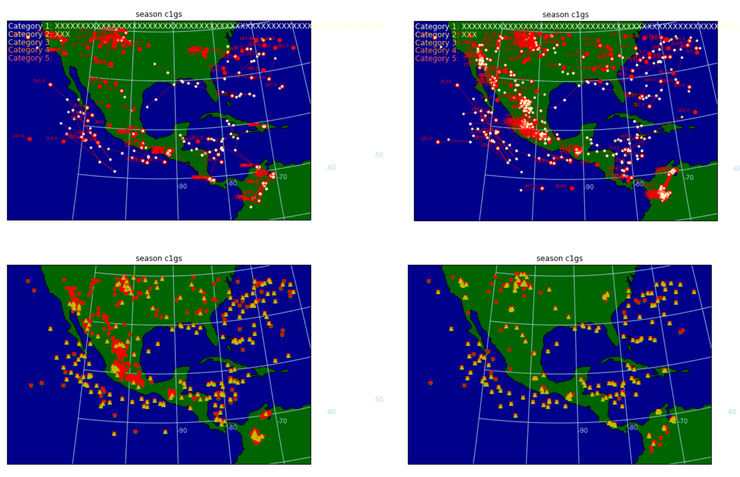


- Precipitation biases: Systematic dry bias over Great Plains and Yucatan Peninsula and wet over the Sierra Madre Occidental ⟶ reported even when HadRM3P is forced with ERA

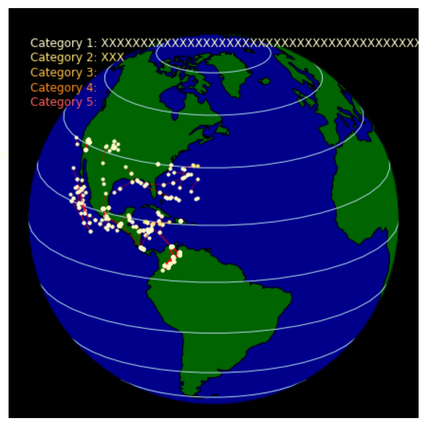
WORK IN PROGRESS:

Two methodologies are run separetely and then combined (Knutson 2007 and Murakami 2015), aiming to objectively evaluate the number of systems that were formed in the Atlantic.

Next step include a comparison between anthro and natural simulations.



HadRM3P simulations of storm tracks (above) and storm formation locations (below) based on Murakami's (left) and Knutson's (right) methodology for the year 2005. Ensamble member: c1gs.



The maps above show a combination (Pfleiderer, 2018) of both Murakami's and Knutson's methods for the year 2005. Ensamble member: c1gs. Climatology run.

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