MapMaker

UNL Regional Climate Modeling Facility UNIVERSITY OF NEBRASKA–LINCOLN

Hurricane Group

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Test 1 – Average temperature

Average temperature

RCCDP MapMaker									
Mesoamerica	•	102: Region	al (12km) 🔻 CCSM4_rcp	35 V Prese	nt-day	▼) (MY01	•		
Month(s): 🕑 Jan 🗉 Feb	Mar 🛛	Apr 🛛 I	May 🔲 Jun 🔲 Jul 🛛	🛛 Aug 🔲 Sep	Oct	Nov Dec	Annual	🗆 Wra	p winter
			[ctrl-click to clear radio b	uttons in menus be	low]				
Surface Parameter	FIII	Line		Flux Param	eter (at	SFC, unless noted) FIII	Line	
Precipitation (mm)				Solar Radiatio	n (w m⁻	⁻)	0	0	
Mean Sea-Level Pressure (hPa)	ŏ	ŏ		Downward Lor	ngwave	(W m ⁻ 2)	\bigcirc	\bigcirc	
Minimum Temperature (°C)	ŏ	ŏ		Outgoing Long	gwave at	t TOA (W m ⁻²)	\bigcirc	\bigcirc	
Maximum Temperature (°C)	õ	0		Ground Heat F	Flux (W i	m ⁻²)	\bigcirc	\bigcirc	
Mixing Ratio (g kg ⁻¹)	0	0		Sensible Heat	Flux (W	′ m ⁻²)	0	\bigcirc	
Relative Humidity (%)	0	0		Latent Heat FI	lux (W m	⁻²)	\bigcirc	\bigcirc	
Surface Pressure (hPa)	0	0		Upward Moist	ure Flux	(kg m ⁻² s ⁻¹)	\bigcirc	\bigcirc	
Skin temperature (°C)	0	0				(
Snow Water Equivalent [SWE] (kg m ⁻²)	0	0		Land	d-surfac	e Parameter	Fill	Line	
Mid-month SWF (kg m ⁻²)	0	0		Terrain Height	(m)		\bigcirc	\bigcirc	
LL-component (m s ⁻¹)	0			Albedo			\bigcirc	\bigcirc	
V component (m s ⁻¹)	õ	õ		Background A	lbedo		\bigcirc	\bigcirc	
V-component (m s *)		~		Surface Emiss	sivity		\bigcirc	\bigcirc	
wind Speed (m s ⁻¹)	_			Roughness Le	ength (m)	\bigcirc	\bigcirc	
Wind Vector (m s ⁻¹)	•	J		Vegetation Fra	action		0	0	
Administration Boundary		1.1		Leaf Area Inde	ex		0	\bigcirc	in days
Atmospheric Parameter	FIII	Line	Level (nPa)	Land Use Cate	egory	Catagony	0		index
remperature (°C)	0	0		Dominant Veg	Catego	Jalegory	0		index
Geopotential Height (m)	\bigcirc	\bigcirc		Dominant Soli	Calegoi	ly	0		Index
Mixing Ratio (g kg ⁻¹)	\bigcirc	\bigcirc			Soil Pa	rameter	Fill	Line	Laver
Relative humidity (%)	\circ	\circ		Soil Temperati	ure (°C)		0		Luyer
U-component (m s ⁻¹)	0	\bigcirc	T	Soil Moisture /	(m3 m-3)		0	0	
V-component (m s ⁻¹)	0	0	•	Mid month Or	(111 - 111 -) il Maiatu	ra (m3 m-3)		0	
Horizontal Wind Speed (m s ⁻¹)	0	0	T	ma-month So	ii woistu	re (mº mº)	0	0	
Vertical Velocity (m s ⁻¹)	0	0	T						
Wind Vector (m s^{-1})	-								

Plot Modifications



Comparative January/2006

• MapMaker

NASA

• ERICIII



https://www.esrl.noaa.gov/psd/data/gridded/data.ghcncams.html

Test 2 – Cumulative rainfall

Cumulative rainfall

Idecommenta • (d22. Regional (12km) • (CCSML_rcp65 • • Present-day • (MY02 • •) Month(s): Jan = Feb Mar = Apr May Jun = Jul Aug Sep ØCC Nov Dec Annual Wrap winter Ethicits to clear radio buttoni in monus below. Fill Line Fill Fill Line Precipitation (mm) • • • • • • • • • • • • • • • • • • •		RCC	DP MapMaker						
Month(s): Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual Wrap winter Liteidia to dear radio puttors in menua bolow) Fuit Line Temperature (°C) O O O O O Mean Sea-Level Pressure (hPa) O O Outgoing Longwave at TOA (W m²) O O Mixing Ratio (kg v1) O O Outgoing Longwave at TOA (W m²) O O Mixing Ratio (kg v1) O O Sensible Heat Flux (W m²) O O Strint eerser (hPa) O O Outgoing Longwave at TOA (W m²) O O Mid-month SVE((kg v1) O	Mesoamerica	▼) (d02: Regional (12km) ▼) (CC	SM4_rcp85 V Present-day V MY02 V						
Surface Parameter Fill Line Temperature (*C) Ourself (ts SFC, unless noted) Fill Line Solar Radiation (W m²) Ourself (ts SFC, unless noted) Fill Line Mean Sea-Level Pressure (PRa) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Maximg Ratio (g kg²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Sin temperature (°C) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Sin temperature (°C) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Mind-mont NSW (kg m²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Mind-mont NSW (kg m²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) V-component (m s²1) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Vind Speed (th s²1) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) V-component (m s²1) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) Ourself (ts Wm²) V-component (m s²1)<	Month(s): 🛛 Jan 🗇 Feb	□Mar □Apr □May □Jun	Jul 🛛 Aug 🔹 Sep 🕜 Oct 🔍 Nov 🔅 Dec 🔅 Annual 👘 Wrap winte	er					
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Precipitation (cm) Solar Redutation (cm) Solar Redutation (cm) Mean Sea-Level Pressure (hPa) O Minimum Temperature (*C) O Maximum Temperature (*C) O Strike Pressure (hPa) O Strike Pressure (hPa) O Strike Pressure (hPa) O Strike Pressure (hPa) O Strike repressure (hPa) O Wind Speed (m s*1) O V-component (m s*1) O Vind Speed (m s*1) O V-component (m s*1) O U-component (m s*1) O U-component (m s*1) O O Vertical Velocity (m s*1) O O Wintord Use C	Surrace Parameter Temperature (°C)		Flux Parameter (at SFC, unless noted) Fill Line						
Mean Sea_Level Pressure (hPa) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Maximum Temperature (*C) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Maximum Temperature (*C) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Sensible Heat Flux (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Ucomponent (m s ⁻¹) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Outwind Upgoing Longware (W m ²) Wind Speed (m s ⁻¹) Outwind Vector (m s ⁻¹) Output Ipgein Influx Output Ipgein Influx Output Ipgein Influx Vecomponent (m	Precipitation (mm)		Solar Radiation (W m ⁻²)						
Minimum Temperature (*C) Mixing Ratic (g kg ⁻¹) Relative Humidity (%) Surface Pressure (iPPa) Skin temperature (*C) Mid-month SWE (kg m ⁻²) U-component (m s ⁻¹) V-component (m s ⁻¹) Wind Vector (m s ⁻¹) Mixing Ratic (g kg ⁻¹) Relative humidity (%) U-component (m s ⁻¹) Wind Speed (m s ⁻¹) Wind Vector (m s ⁻¹) V-component (m s ⁻¹) V-component (m s ⁻¹) V-component (m s ⁻¹) Wind Speed (m s ⁻¹) Wind Speed (m s ⁻¹) Wind Speed (m s ⁻¹) V-component (m	Mean Sea-Level Pressure (hPa)	0 0	Downward Longwave (vv m 2)						
Maximum Temperature (°C) Mixing Ratio (g kg ⁻¹) Surface Pressure (hPa) Surface Pressure (hPa) Surface Pressure (hPa) Sow Water Equivalent (SWE) (kg m ⁻²) Mid-month SWE (kg m ⁻¹) U-component (m s ⁻¹) U-component (m s ⁻¹) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) U-component (m s ⁻¹) Temperature (°C) U-component (m s ⁻¹) U-component (Minimum Temperature (°C)	0 0	Outgoing Longwave at TOA (vv m ²)						
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Relative Humidity (%) Surface Pressure (hPa) Skin temperature (*C) Snow Water Equivalent [SWE] (kg m ²) U-component (m s ⁻¹) Wind Vector (m s ⁻¹) Temperature (*C) Atmospheric Parameter Fill Line Level (hPa) Temperature (*C) Geopotential Height (m) Mixing Ratio (g kg ⁻¹) U-component (m s ⁻¹) U-component	Mixing Ratio (g kg ⁻¹)	0 0	Sensible Heat Flux (W m ⁻²)						
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V-component (m s ⁻¹) Image: Second and Body Image: Second and Body Image: Second and Body Wind Speed (m s ⁻¹) Image: Second and Body Image: Second and Body<	U-component (m s ⁻¹)	0 0	Albedo O						
Wind Speed (m s ⁻¹) •	V-component (m s ⁻¹)	• •	Background Albedo						
Mind vector (m s ⁻¹) Image of the status of the statu	Wind Speed (m s ⁻¹)	0 0	Surface Emissivity						
Atmospheric Parameter Fill Line Level (hPa) Vegetation Category Index Coopotential Height (m) Image: Color Tables Soil Parameter Fill Line Layer Mixing Ratio (g kg ⁻¹) Image: Color Tables Soil Moisture (m ³ m ⁻³) Image: Color Tables Image: Color Tables V-component (m s ⁻¹) Image: Color Tables Upper right: 34 -85 Vind Vector (m s ⁻¹) Image: Color Tables Upper right: 34 -85 Fill 500 temp_diff_18lev Color Tables Upper right: 34 -85 Line Image: Color Tables Value Colors Mask: Waler: (*) Land: (*) Noi Wind Eelect or type a color name Named Colors Mask: Waler: (*) Land: (*) Noi Wind Eelect or type a color name PDF: (*)	Wind Vector (m s^{-1})	T	Vegetation Eraction						
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Geopotential Height (m) Image: Color (s)	Temperature (°C)		Dominant Vegetation Category	index					
Mixing Ratio (g kg ⁻¹) Relative humidity (%) U-component (m s ⁻¹) V-component (m s ⁻¹) Horizontal Wind Speed (m s ⁻¹) Vertical Velocity (m s ⁻¹) Wind Vector (m s ⁻¹) Wind Vector (m s ⁻¹) Wind Vector (m s ⁻¹) Wind Waximum Ref. Len. Magnitude Ref. Len. Magnitude Ref. Len. Magnitude Magnitude Minimum Maximum Color Soil Parameter Soil Parameter Submit Reset Help	Geopotential Height (m)		Dominant Soil Category O	index					
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V-component (m s ⁻¹) Horizontal Wind Speed (m s ⁻¹) Vertical Velocity (m s ⁻¹) Wind Vector (m s ⁻¹) Vertical Velocity (m s ⁻¹) Velocity	U-component (m s ⁻¹)		Soil Moisture (m ³ m ⁻³)	•					
Horizontal Wind Speed (m s ⁻¹) Vertical Velocity (m s ⁻¹) Wind Vector (m s ⁻¹) Plot Modifications Plot Modifications Color(s) Fill 50 0 600 temp_diff_18lev Line	v-component (m s ')		Mid-month Soil Moisture (m ³ m ⁻³)						
Vertical Velocity (m s ⁻¹) Wind Vector (m s ⁻¹) Plot Modifications Plot Modifications Color(s) Fill 50 0 600 temp_diff_18lev Color Tables Line Select or type a color name Named Colors Ref. Len. Magnitude Thinning Color Wind Select or type a color name PDF:	Horizontal Wind Speed (m s ⁻¹)	• • •							
Vind Vector (m s ⁻¹) Plot Modifications Plot Modifications Interval Minimum Maximum Color(s) Corners Latitude Longitude Fill 50 0 600 temp_diff_18lev Color Tables Upper right: 34 -85 M Line Select or type a color name Named Colors Mask: Water: @ Land: @ Nor Wind Select or type a color name PDF: @ PS: @	Vertical Velocity (m s ⁻¹)								
Plot Modifications Interval Minimum Maximum Color(s) Conrers Latitude Longitude Fill 50 0 600 temp_diff_18lev Color Tables Upper right: 34 -85 M Line	Wind Vector (m s ⁻¹)								
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Wind select or type a color name PDF:	Ref. Len. Magnitude	Thinning Color	Output type: PNG: • SVG: 0	NC					
Submit Reset Help	Wind	select or type a color nar	ne 🔻 PDF: O PS: O						
		Submit	Reset Help						

Comparative October/2007

• MapMaker

NASA

• ERICIII



Test 3 – Wind Speed

Tropical Cyclones Septiember/2010

C

• Hermine (TT)

• Karl (H cat.III)

• Matthew (DT)



uadro resumen	de ciclones	tropicales	2010 en el 0	céano Atlántico
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6

Ciclones tropicales directamente sobre México

Huracán "Alex" (27-30 junio) Depresión tropical No. 2 (8 julio) TT. "Hermine" (6 sept) Huracán "Karl" (15-17 sept) Depresión tropical "Matthew" (25 sept) Depresión tropical "Richard" (25 oct)

Karl (H cat.III) September/2010







Karl (H cat.III) September/2010



Quintana Roo - Nicolas Bravo - September/2010





Average wind speed 2010

					RCC	CDP Ma	рМа	aker						
		Mesoamer	ica 🔻	d02: Reg	gional (12km) 🔻 🖸	CSM4_rcp85		Present-day		MY05	,			
r	Month(s):	Jan Fe	eb 🗆 Mar	🗆 Apr	🗆 May 🔲 Jun	Jul 🗆	Aug	🗹 Sep 🔲 Oct	Nov	Dec	🗆 Annual	■ W	rap winter	
s	urface Par	ameter	Fill	Line	[ctrl-click to cl	ear radio butt	tons in n Flux	nenus below] Parameter (at	SEC. u	nless not	ted) Fill	Line		
Temperature	(°C)		0	0			Solar F	Radiation (W m	·2)		0	0		
Precipitation	(mm)		0	\bigcirc			Downy	vard Longwave	(W m-2)	0	0		
Mean Sea-Le	evel Pressu	ire (hPa)	\bigcirc	\bigcirc			Outaoi	ng Longwave a	t TOA (/ W m ⁻²)	0	0		
Minimum Ten	nperature (°C)	0	0			Ground	d Heat Flux (W	m ⁻²)	,	0	0		
Maximum Ter	mperature ((-C)	0	0			Sensib	le Heat Flux (V	/ m ⁻²)		0	0		
Delative Hum	(g kg ·)		0				Latent	Heat Flux (W n	1 ⁻²)		0	0		
Surface Pres	sure (hPa)		0	0			Unwar	d Moisture Flux	(ka m ⁻²	2 5-1)	0	0		
Skin tempera	ture (°C)		õ	0			opman		(ng 11)	5 /		_		
Snow Water I	Equivalent	[SWE] (kg m ⁻	2)	0				Land-surfac	e Para	meter	Fill	Line		
Mid-month S	WE (kg m ⁻²	2)	0	0			Terrain	Height (m)			0	\bigcirc		
U-component	t (m s ⁻¹)	·	\bigcirc	\bigcirc			Albedo)			\bigcirc	\bigcirc		
V-component	t (m s ⁻¹)		0	\circ			Backg	round Albedo			0	0		
Wind Speed ((m s ⁻¹)		۲				Surrac	e Emissivity				0		
Wind Vector ((m s ⁻¹)			•			Vegeta	tion Fraction	9		ŏ	ŏ		
	(Leaf A	rea Index			õ	õ		
Atm	ospheric F	Parameter	Fill	Line	Level (hPa	a)	Land U	Jse Category			0		inde	<u>ex</u>
Temperature	(°C)		\bigcirc	\bigcirc	T		Domin	ant Vegetation	Categor	ry	\bigcirc		inde	<u>ex</u>
Geopotential	Height (m)		\bigcirc	\bigcirc	T		Domin	ant Soil Catego	ry		\bigcirc		inde	<u>ex</u>
Mixing Ratio	(g kg ⁻¹)		\bigcirc	\bigcirc	T			Soil Da	ramete	-	Eill	Line	1.5%	or
Relative hum	idity (%)		\bigcirc	\bigcirc	T		Soil Te	mperature (°C)	ramete	1		Line	Lay	ei •
U-component	t (m s ⁻¹)		\bigcirc	\bigcirc			Soil M	nieture (m ³ m ⁻³	<u>, </u>		õ	ŏ		<u> </u>
V-component	t (m s ⁻¹)		\bigcirc	\bigcirc	T		Mid m	onth Soil Moiet) 1ro (m3	m-3)		ŏ		
Horizontal Wi	ind Speed	(m s ⁻¹)	\bigcirc	\bigcirc	T		Mu-m	onun Son Moisu	ne (m-	III -)	0	0		•
Vertical Veloc	city (m s ⁻¹)		\bigcirc	\bigcirc										
Wind Vector ((m s ⁻¹)			•	▼									
Plot Modifications														
	Interval	Minimun	n Maximu	ım	Color	r(s)				Corners	Lati	tude	Longitude	•
Fill				pre	cip2_17lev		-	Color Tables		Upper	right: 34		-85	Ma
Line				sele	ect or type a color na	ame	•	Named Color	<u>s</u>	Lower	Left: 14		-122	None
	Ref. Len.	Magnitud	e Thinnir	ng	Cold	or			Out	tout type	PNG		SVG: 0	None
Wind]	sele	ect or type a color na	ame	-		Ju	ipar type.	PDF	0	PS: 0	
											PDF.		10.0	
					Subm	nit Rese	et	Help						

Average wind speed 2060

Idecommenta et d2. Regional (12km) CCSM4_rcp85 • Mid-century • Mid-cen						R		МарМ	aker						
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Comparative September/2010 – September/2060 (d02)

• MapMaker 2010

MapMaker 2060



Cuadro resumen de ciclones tropicales 2010 en el Océano Atlántico						
Ciclones tropicales directamente sobre México	6 Huracán "Alex" (27-30 junio) Depresión tropical No. 2 (8 julio) TT. "Hermine" (6 sept) Huracán "Karl" (15-17 sept) Depresión tropical "Matthew" (25 sept) Depresión tropical "Richard" (25 oct)					

Comparative September/2010 – September/2060 (d03)

• MapMaker 2010

• MapMaker 2060



Cuadro resumen de ciclones tropicales 2010 en el Océano Atlántico							
Ciclones tropicales directamente sobre México	6 Huracán "Alex" (27-30 junio) Depresión tropical No. 2 (8 julio) TT. "Hermine" (6 sept) Huracán "Karl" (15-17 sept) Depresión tropical "Matthew" (25 sept) Depresión tropical "Richard" (25 oct)						

Methods for Detection of TCs

Methods for Detection of TCs (Bengstsson, Oouchi, Gualdi and Zhao)

For tropical cyclones, Gray has proposed a criterion which reproduces the geographical repartition of their seasonal frequency occurrence in the current climate. Gray (1979) related this seasonal tropical cyclone frequency to a combination of six seasonal genesis parameters divided in two groups, three dynamical variables (Lower-tropospheric relative vorticity, Coriolis parameter and vertical wind-shear) and three thermodynamical variables (ocean thermal energy, humidity and moist instability of lower atmosphere)computed from seasonally (3-months) averaged large scale field.

Bengstsson (1995) and Walsh(1997) propose thresholds for following para meters:

4) Ratio at 300 hPa and 850 hPa, 5)Wind speed and 6)Duration of the event

PARAMETER	BENGTSSON (1996)	OOUCHI (2006)	GUALDI (2008)	ZHAO (2009)
Vorticity	Relative vorticity at 850 hPa > 3.5 x 10 ⁻⁵ s ⁻¹	The magnitude of the maximum relative vorticity at 850 hPa exceeds 3.5 x 10 ⁻⁵ s ⁻¹	In A, relative vorticity at 850 hPa is >3 x 10^{-5} s ⁻¹	At each time, 850-hPa relative vorticity maximum exceeding 1.6 x 10^{-4} s ⁻¹ are located within areas of 6° x 6° latitude and longitude.
Minimum surface pressure	A maximum velocity of 15 m s ⁻¹ and a minimum surface pressure within a 7x7 grid point area around the point which fulfils condition 1.	Across the 45S–45N latitudinal belt, the grid point corresponding to a TC-center candidate was defined as the one where the minimum surface pressure is at least 2 hPa lower than the mean surface pressure over the surrounding 7° x 7° grid box.	There is a relative minimum surface pressure and wind velocity > 14 m s ⁻¹ in an area of 2.25° around A	The local minimum of sea level pressure, which must be within a distance of 2° latitude or longitude from the vorticity maximum, is defined as the center of the storm. And the local maximum surface (lowest model level) wind speed is recorded.

¹⁾ Relative Vorticity, 2) Minimum surface pressure, 3) Temperature anomalies,

Identification algorithms of TCs Bengstsson, Oouchi, Gualdi and Zhao

PARAMETER	BENGTSSON (1996)	OOUCHI (2006)	GUALDI (2008)	ZHAO (2009)
Temperature anomalies	The sum of the temperature anomalies for the levels 700, 500 and 300 hPa > 3°C	The temperature structure aloft has a marked warm core such that the sum of the temperature deviations at 300, 500 and 700 hPa exceeds 2°K.	The sum of temperature anomalies at 700, 500, and 300hPa is >2°K, where the anomalies are defined as the deviation from a spatial mean computed over an area of 13 grid points in the east–west and 2 grid points in the north–south direction	The local maximum temperature averaged between 300 and 500 hPa is defined as the center of the warm core. The distance of the warm-core center from the storm center must not exceed 2°. The warm-core temperature must be at least 1°C warmer than the surrounding local mean.
Ratio at 300 hPa and 850 hPa	The temperature anomaly at 300 hPa > temperature anomaly at 850 hPa	The maximum wind speed at 850 hPa is larger than that at 300 hPa	The temperature anomaly at 300 hPa is greater than the temperature anomaly at 850 hPa	
Wind speed	The mean wind speed at 850 hPa > mean wind speed at 300 hPa.	The maximum wind speed at 850 hPa is larger than 15 m s-1	The wind velocity at 850 hPa is > wind velocity at 300 hPa	
Duration of the event	Minimum duration of the event ≥ 1.5 days	The duration is not shorter than 36 hours	The above conditions persist for a period longer than 1.5 days	

 Several authors (OOUCHI, 2006 and ZHAO, 2009) have performed simulations of tropical cyclones with good results.



Observed Tracks (1981-2005) Model Tracks (1981-2005) Contraction of the second secon

• Gualdi, 2008, has analyzed the changes in the activity of tropical cyclones due to global warming.



- A higher resolution of the mesh is required to efficiently detect the increase in tropical cyclones.
- Having the possibility of visualizing the maximum speeds, and not only the means, would be of great help.

TC Changes

Comparison between 36 Km and 12 Km of Resolution



Precipitation



Changes in Surface Temperature



RCP 8.5 Change in average surface temperature (1986–2005 to 2081–2100)



Changes in Temperature and Wind Speed in May



Changes in Temperature and Wind Speed in June



Changes in Temperature and Wind Speed in July



Changes in Temperature and Wind Speed in August



Changes in Temperature and Wind Speed in Sept



Changes in Temperature and Wind Speed in Oct



Changes in Temperature and Wind Speed in Nov





Improvements for MapMaker

Improvements

- It is necessary to have the option of choosing any of the IPCC scenarios. (2.6,4.5, 6.0 y 8.5).
- Implement the option to scale the results to intermediate times.

$$\bar{T}_{INT} = \bar{T}_{PD} + (\bar{T}_{FT} - \bar{T}_{PD}) \left(\frac{t_{INT} - t_{PD}}{t_{FT} - t_{PD}} \right)$$

where \overline{T} and t are temperature and time, respectively, and the subscripts *PD*, *FT*, and *INT* refer to the present-day, future, and intermediate climatologies, respectively.

- Include analysis results for the years 2000 to 2005 and 2011 to 2015 for Mesoamerica and define an additional domain for the pacific.
- Add genesis parameters in MapMaker as relative and absolute vorticity,
- Create a window to make different calculations with different parameters as for exemple the sum of temperaturas anomalies at different levels of hPa for a date and point of interest

Thanks