

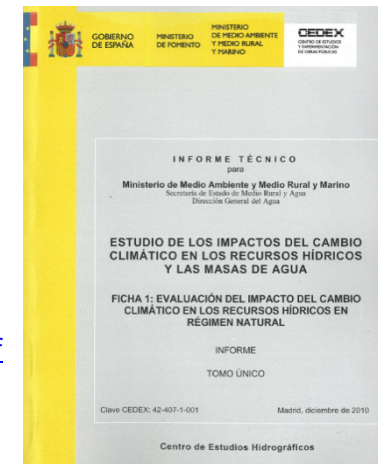
## TALLER SOBRE INUNDACIONES Y CAMBIO CLIMÁTICO DGA, 21/06/2017

# Impacto del Cambio Climático sobre las Precipitaciones Máximas en España (2010)

Centro de Estudios Hidrográficos  
CEDEX

[http://www.mapama.gob.es/es/agua/temas/planificacion-hidrologica/ImpactoCCRecursosHidricos\\_tcm7-310162.pdf](http://www.mapama.gob.es/es/agua/temas/planificacion-hidrologica/ImpactoCCRecursosHidricos_tcm7-310162.pdf)

Barranco et al (2017).- Int. JRBM, 2017, 15 (2), 161-173



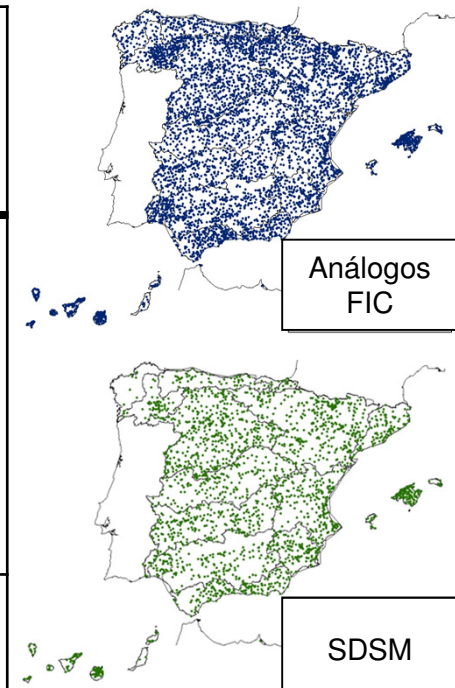
# Información de partida

AEMET (2008, TAR)

8 escenarios climáticos regionalizados

Centro de Estudios Hidrográficos

Sigla	SRES	MCG	Regionaliz.	1961-1990	2011-2040	2041-2070	2071-2100	Series diarias de PRE		
CFA	A2	CGCM2	Análogos FIC	√	√	√	√	5579		
CFB	B2									
EFA	A2	ECHAM4								
EFB	B2									
hFA	A2	HadAM3		√			√			
hFB	B2									
HSA	A2	HadCM3		SDSM	√	√	√		√	2320
HSB	B2									





## Metodología

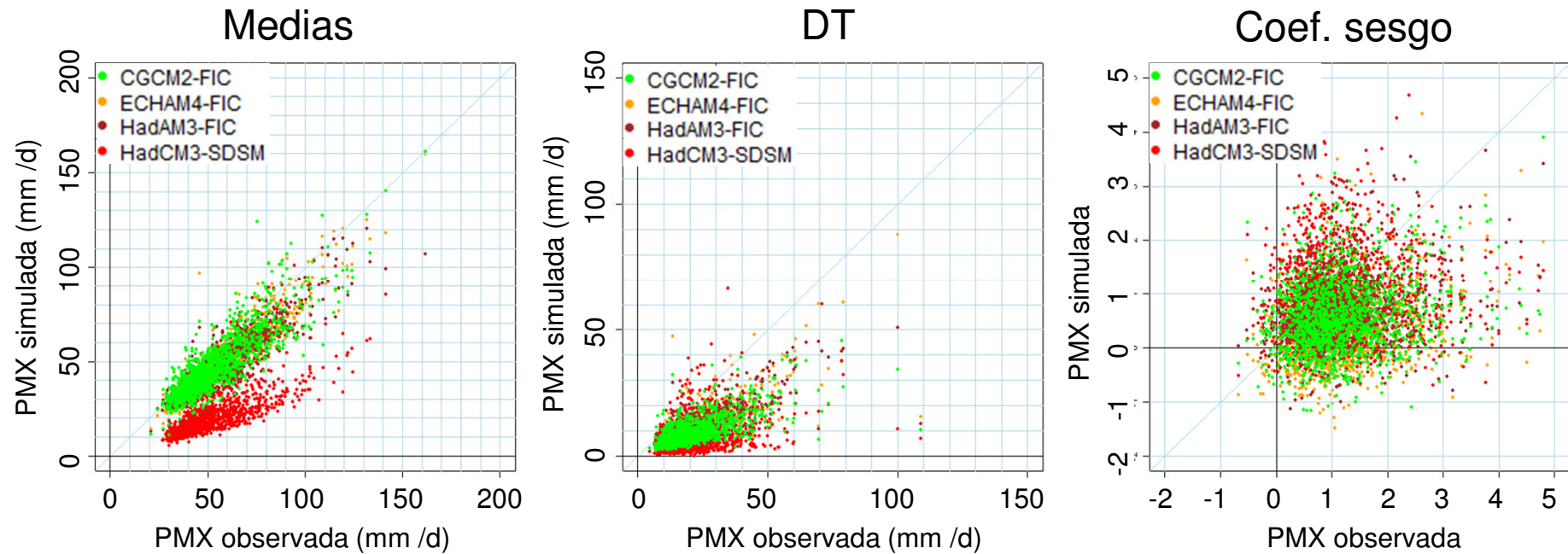
- 2 tipos de series con valores en estaciones:
  - Máximas Precipitaciones Diarias de cada Año (PMX)
  - R95T (fracción de la PRE anual debida a eventos diarios que superan el percentil 95 del PC)
- Contraste PMX
- Análisis Estadístico
  - Tendencias 2011-2100
  - Cambios 2011-2040, 2041-2070, 2071-2100 vs 1961-1990
    - Media / Mediana
    - Variabilidad
    - Estacionalidad
    - Cuantiles (SQRT et max)
  - Estaciones y Regiones (Ferrer y Ardiles)



# Contraste de PMX

Cada punto es una estación: la media en los 30 años del PC

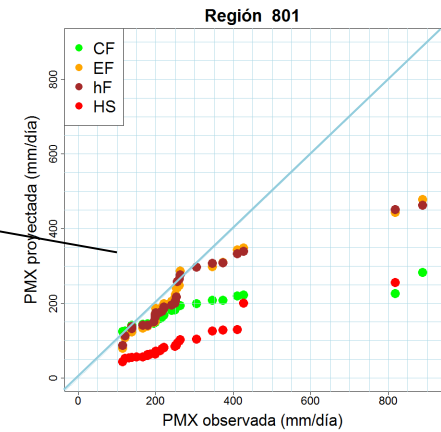
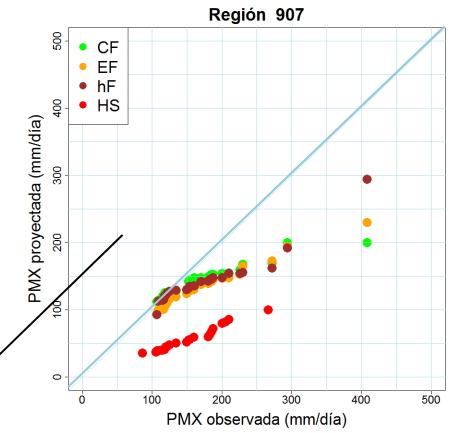
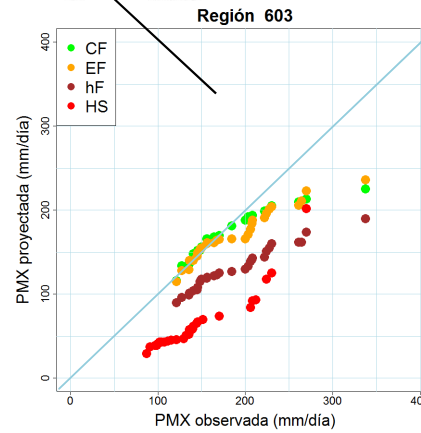
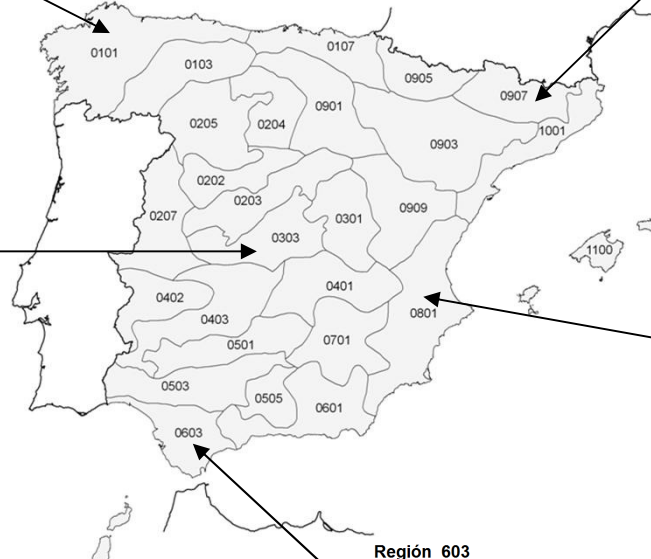
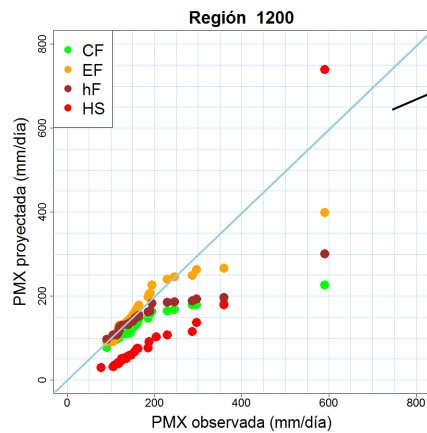
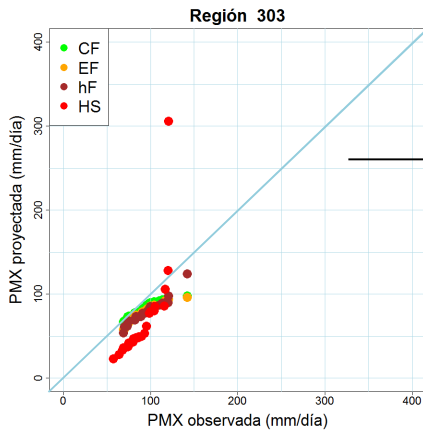
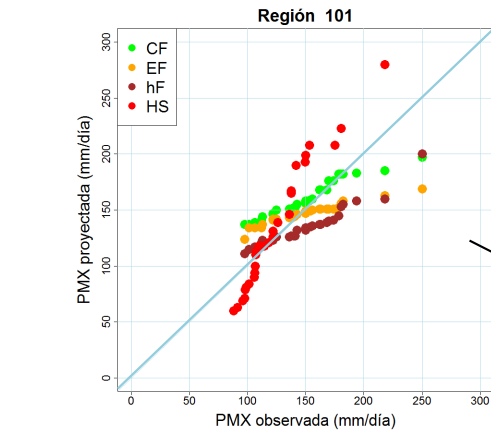
España



Desajuste con datos observados (infravaloran los estadísticos)

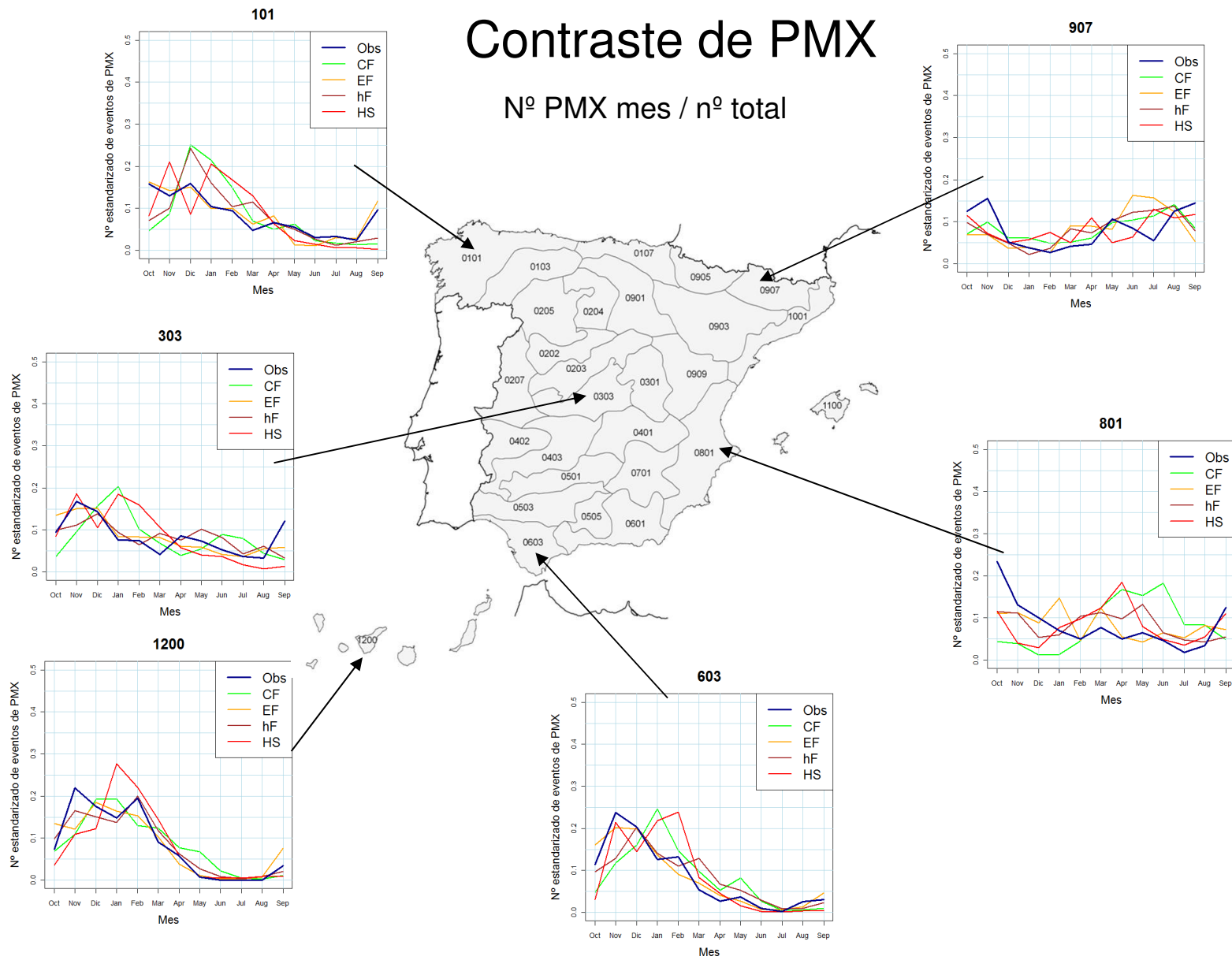
# Contraste de PMX

Distribución frecuencias Q-Q  
Serie anual de Máximos de PMX



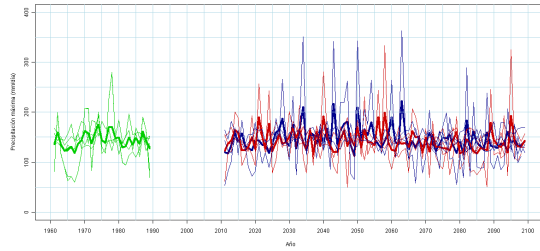
# Contraste de PMX

Nº PMX mes / nº total



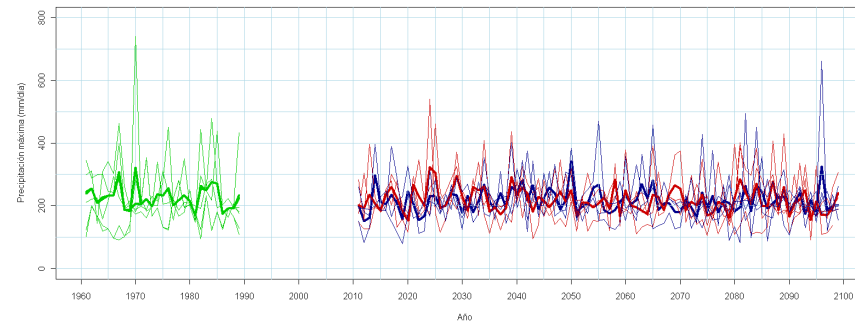
Desajuste con datos observados y diferencias entre proyecciones

NO

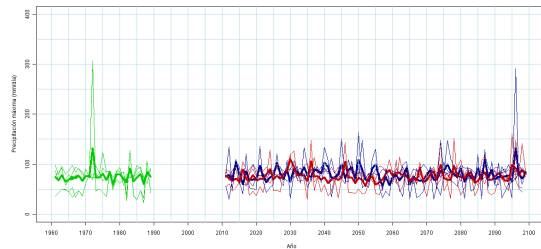


# Evolución de PMX

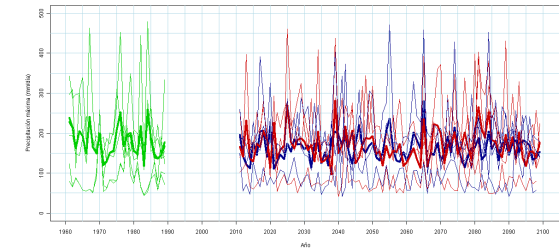
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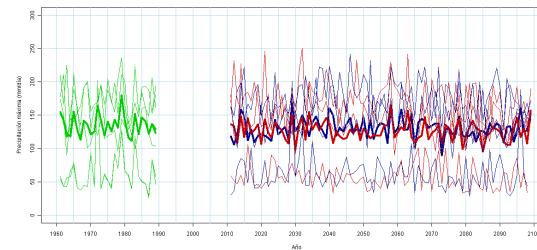
Centro



Levante



SO

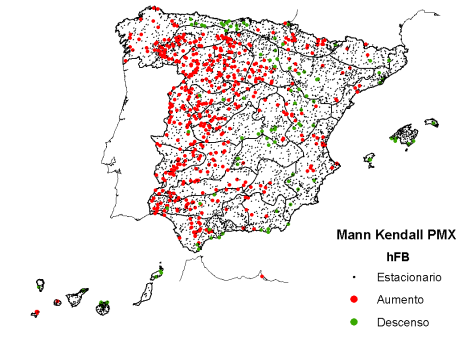
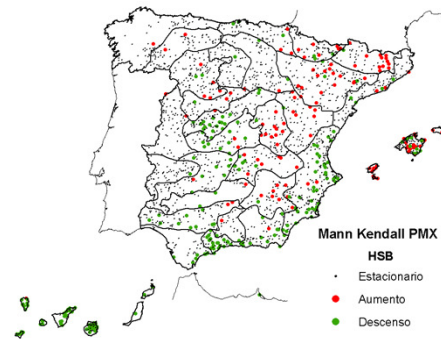
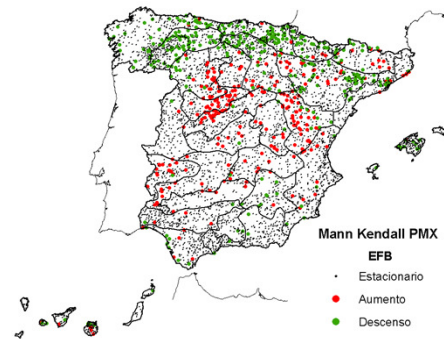
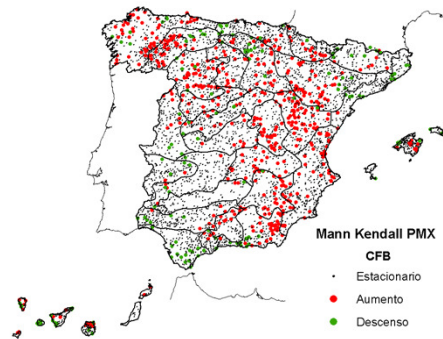
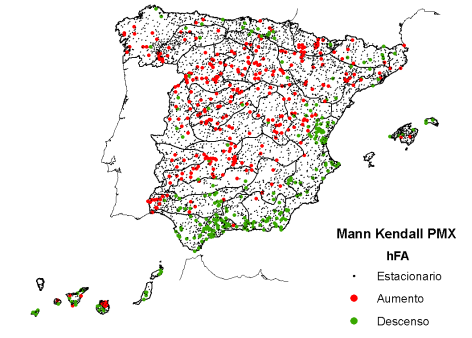
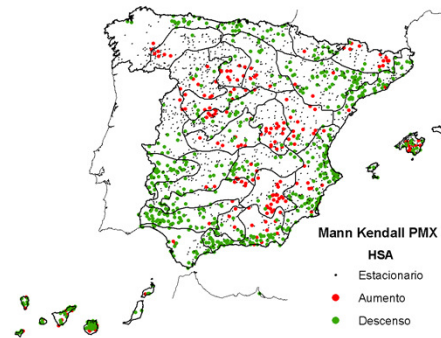
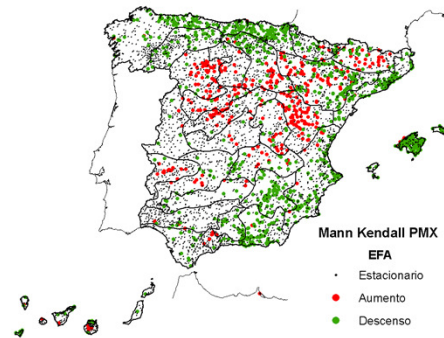
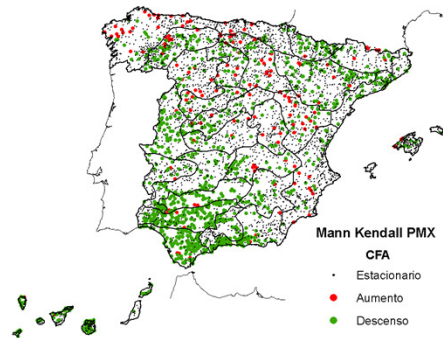




# Tendencias PMX 2011-2100 / 2071-2100

## Test Mann Kendall

### Estaciones

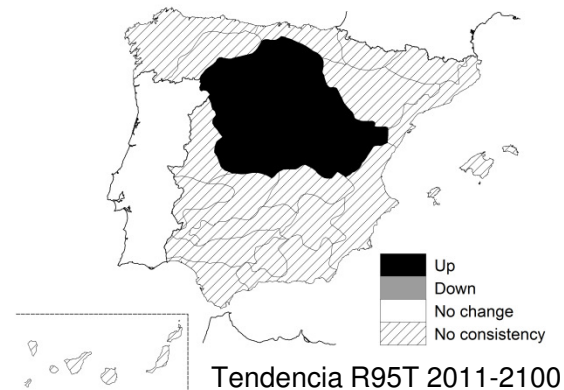
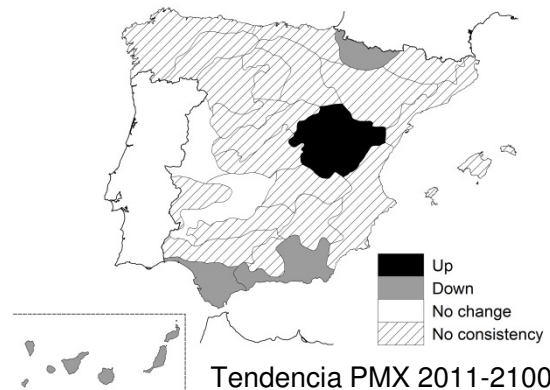
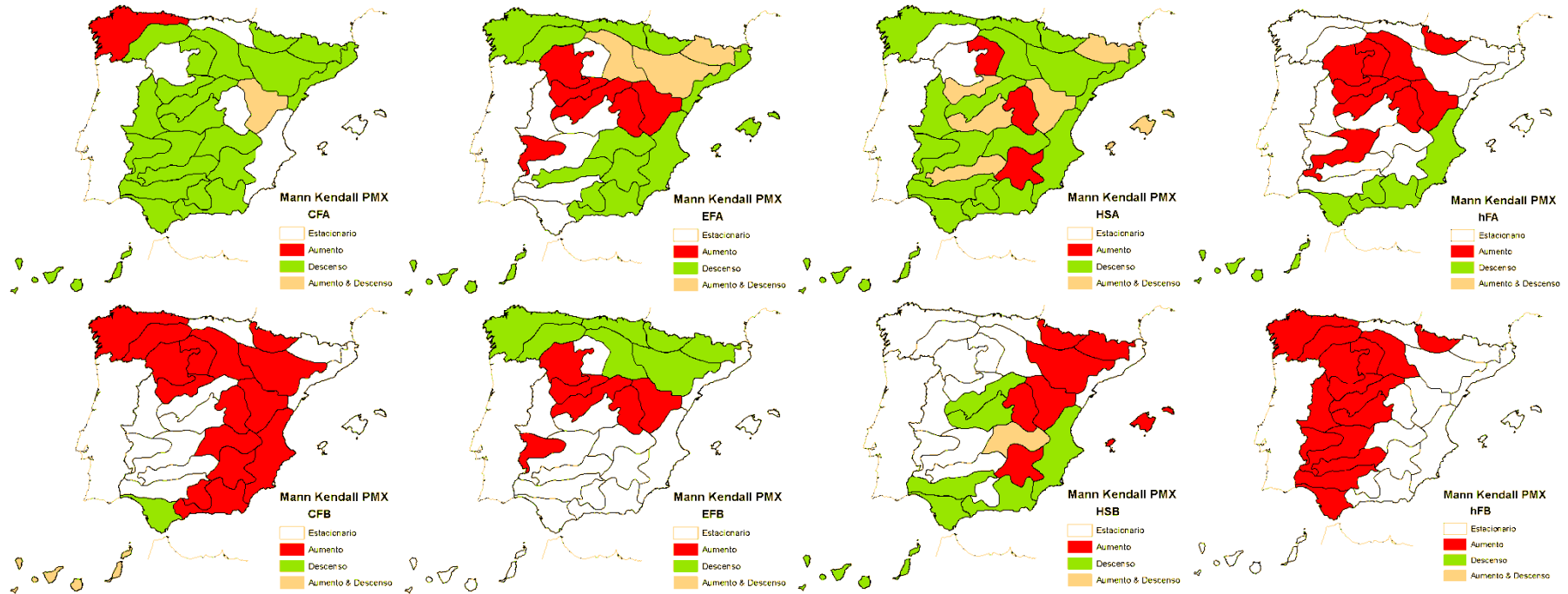




# Tendencias PMX 2011-2100 / 2071-2100

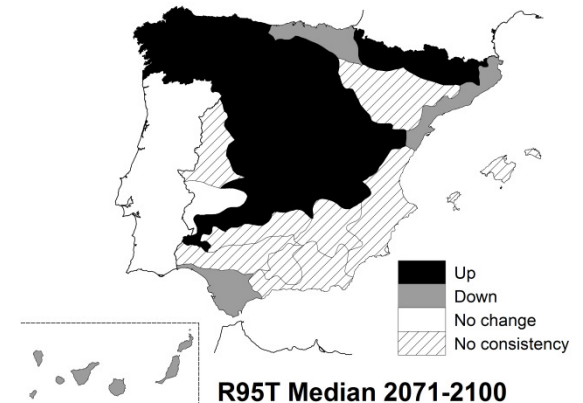
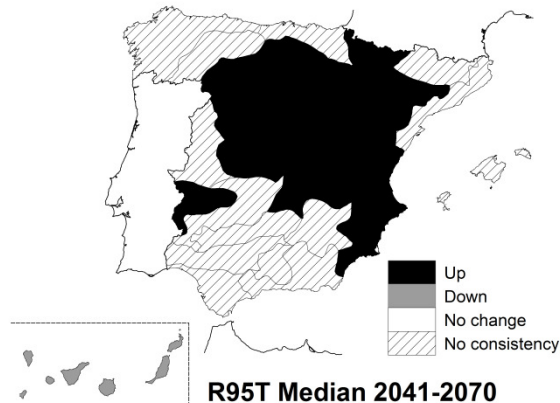
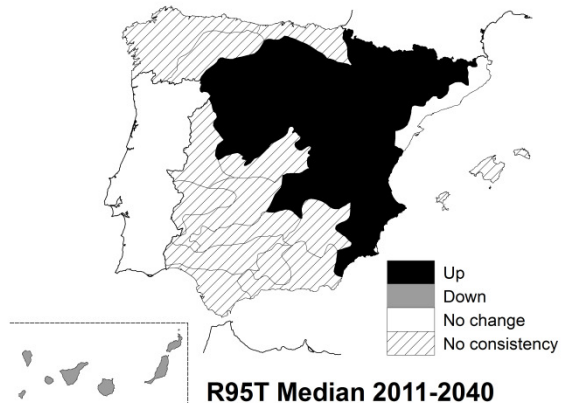
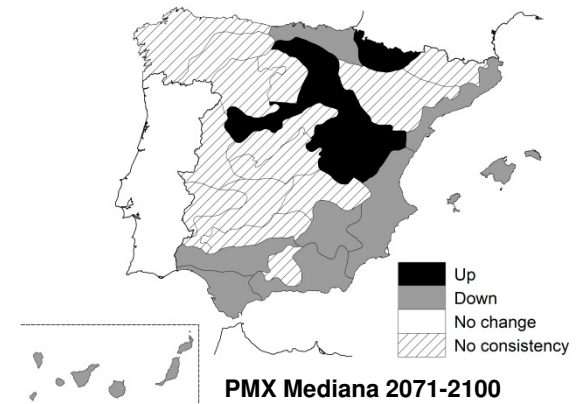
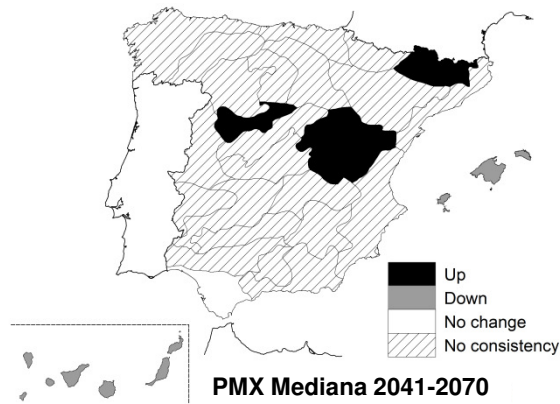
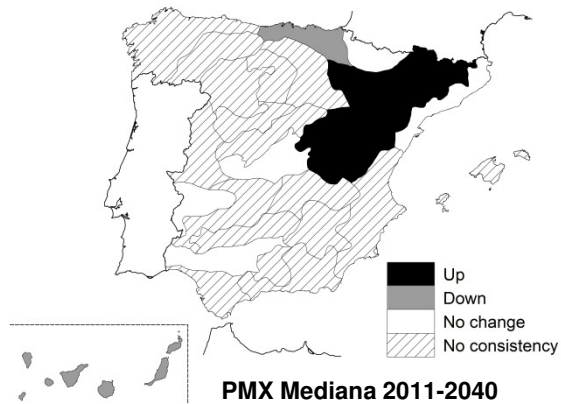
## Significación regional test Mann Kendall: test binomial

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# Cambios Mediana PMX y R95T

## Significación regional test Wilcoxon: test binomial

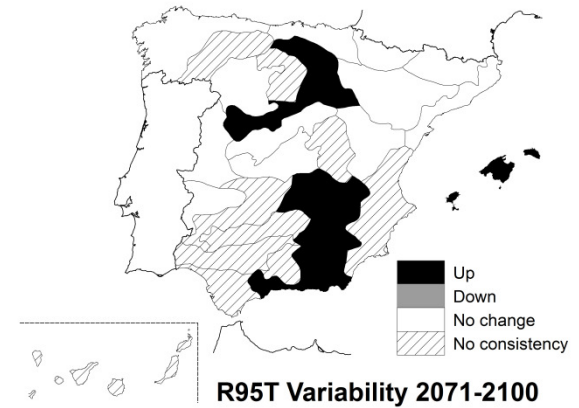
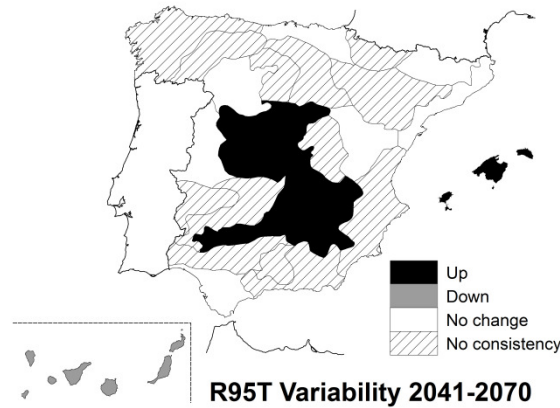
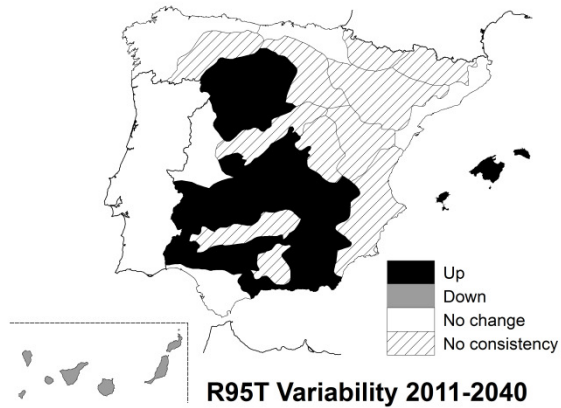
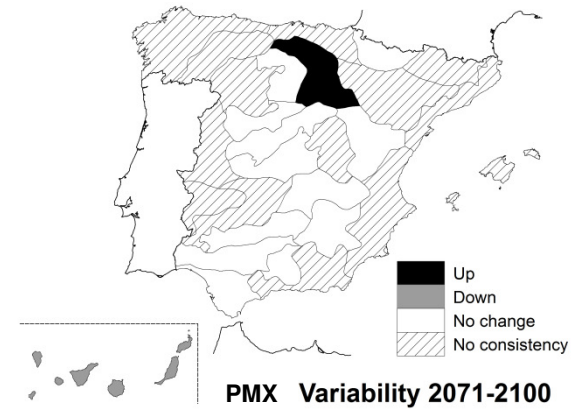
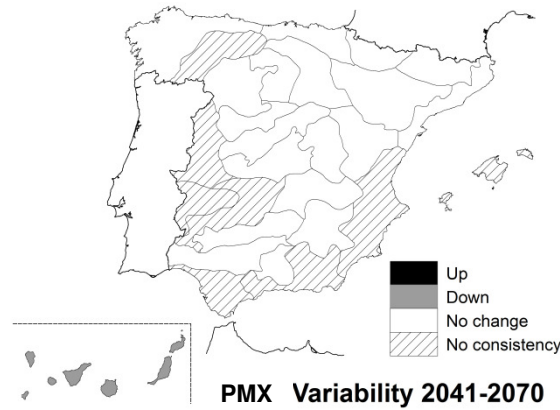
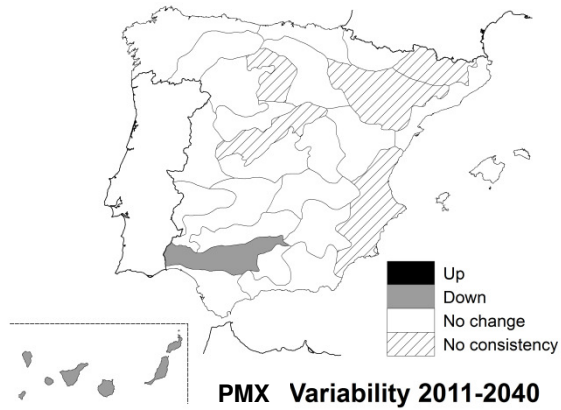


Aumento en R95T por descenso de la precipitación total

$$R95T = PMX / PRE$$

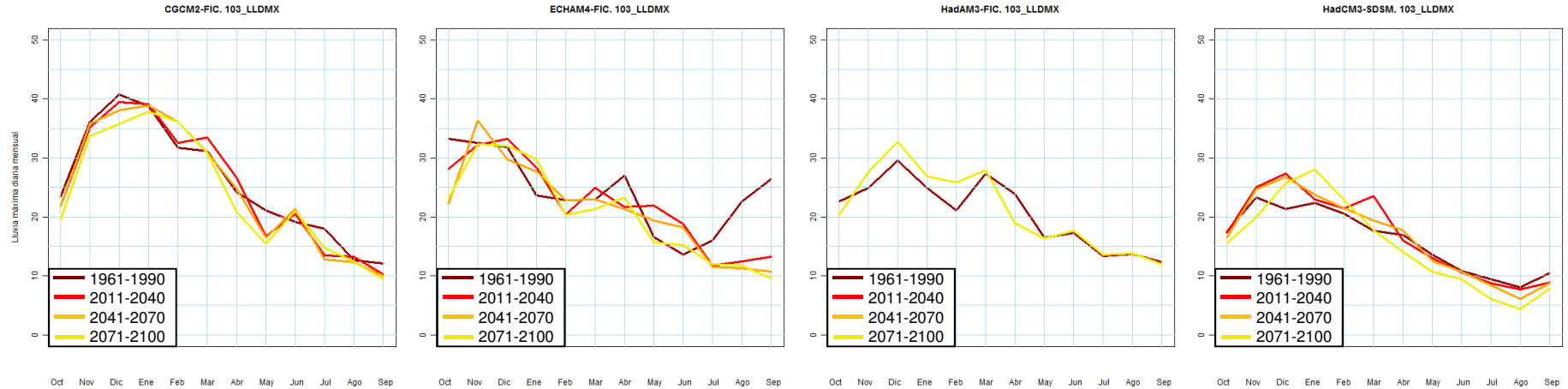
# Cambios Variabilidad PMX y R95T

## Significación regional test Fligner Killeen: test binomial

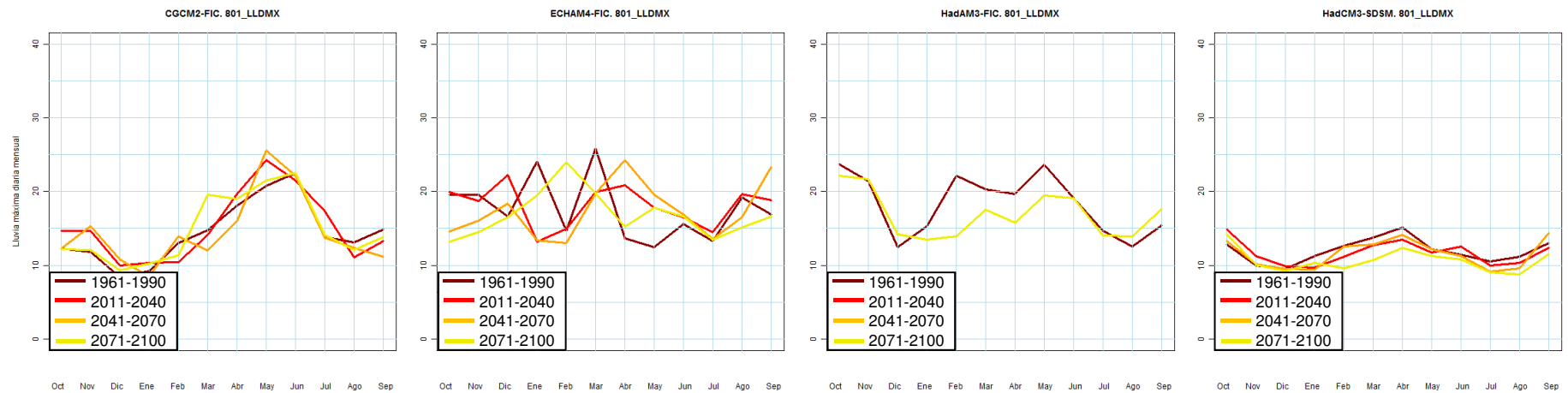


# Ciclo anual

## Región 103 (Galicia SE) A2



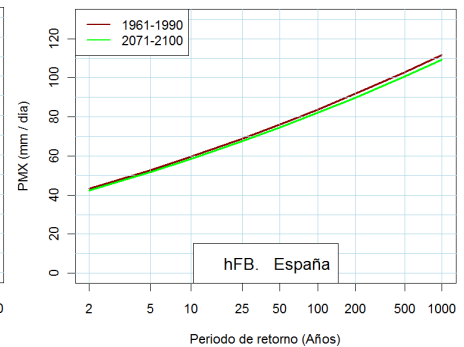
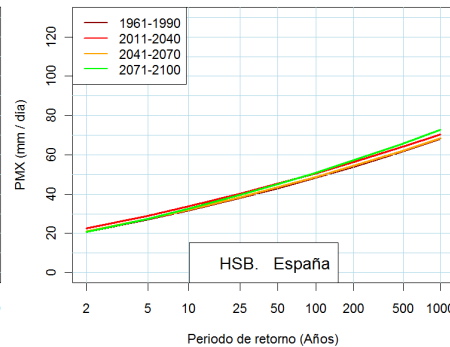
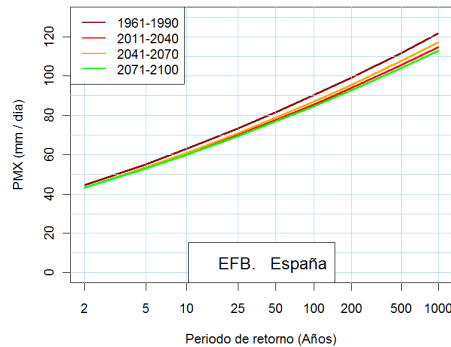
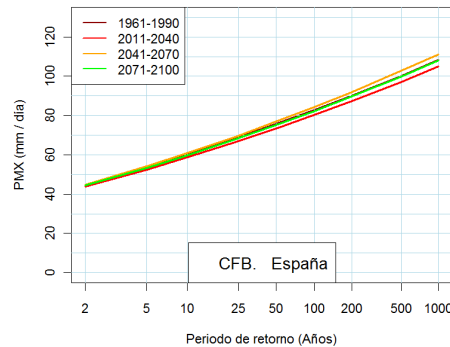
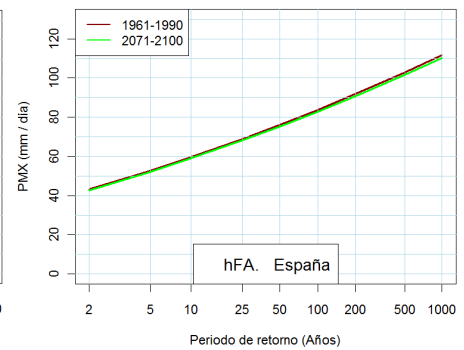
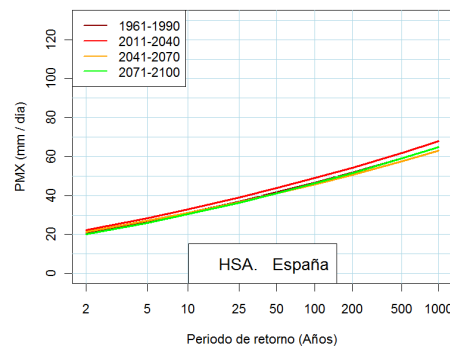
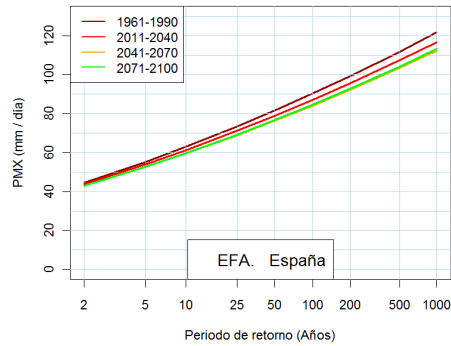
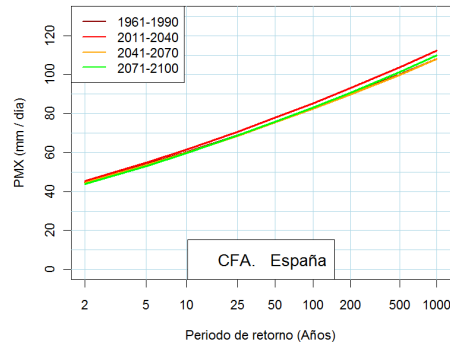
## Región 801 (Levante) A2



No hay cambios durante el siglo XXI

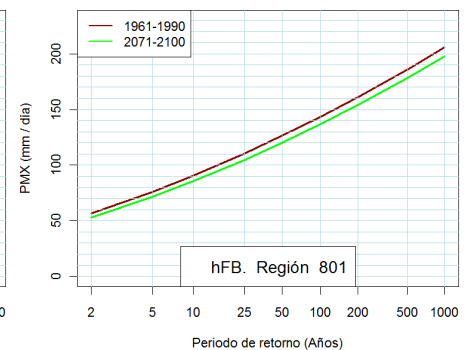
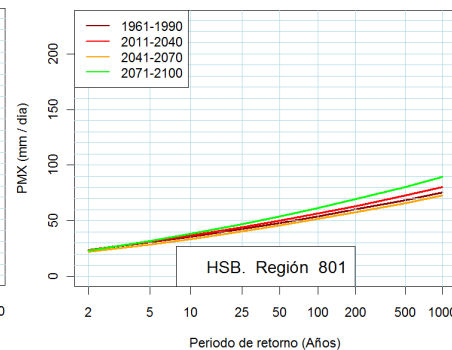
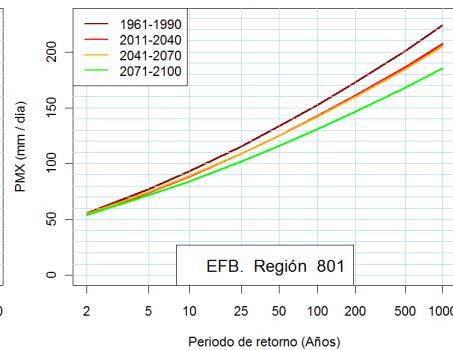
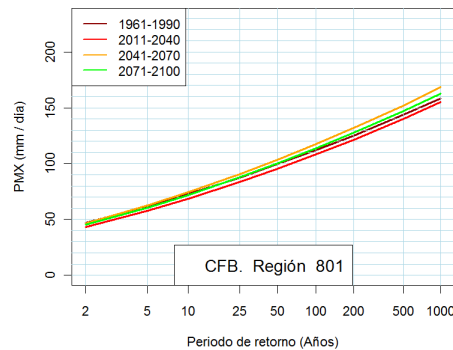
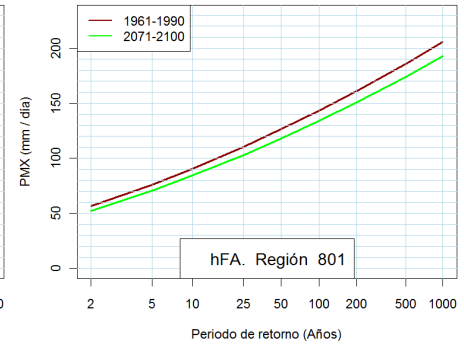
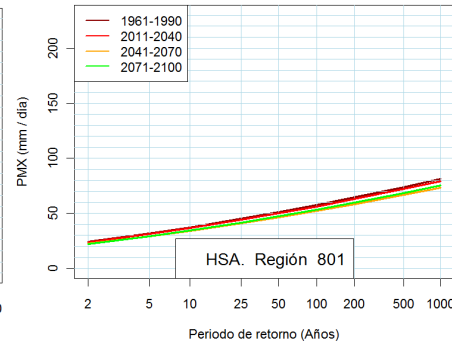
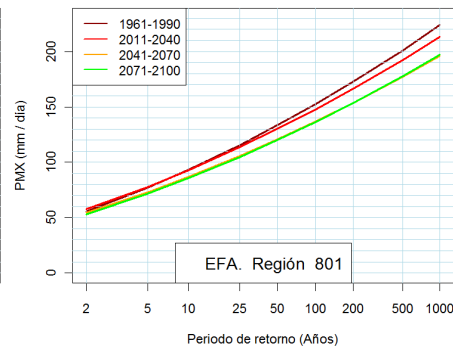
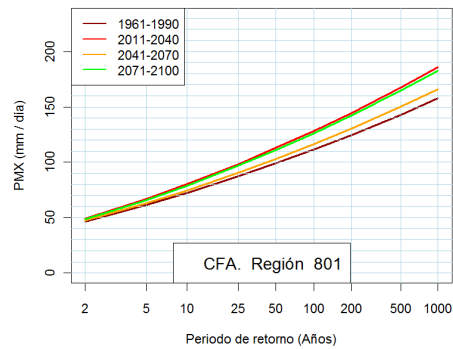
# Cambios en las distribuciones de frecuencia PMX SQRT et max

## España



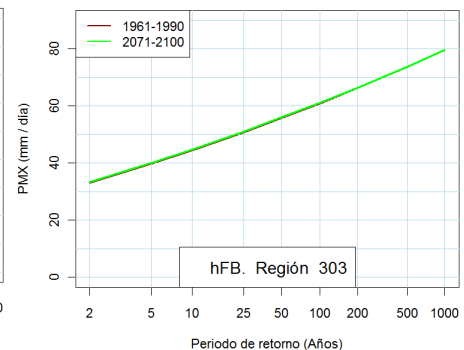
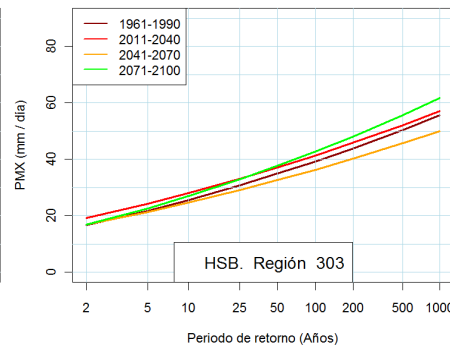
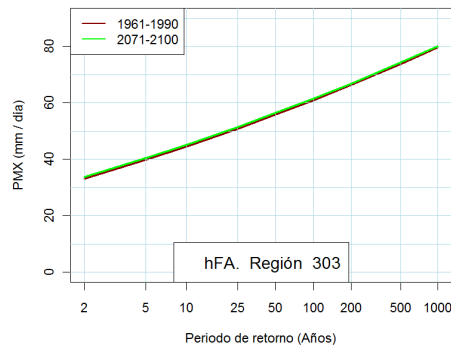
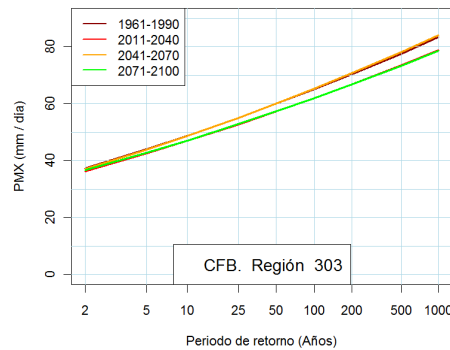
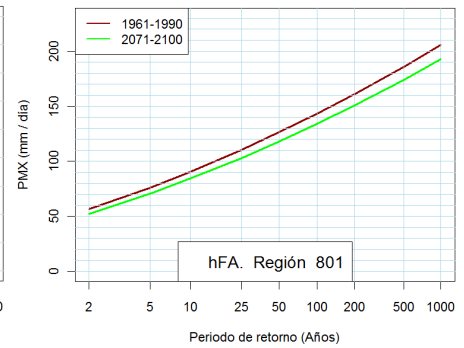
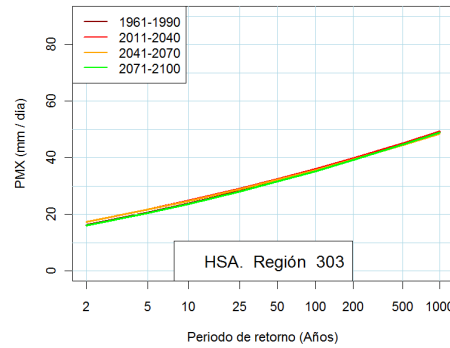
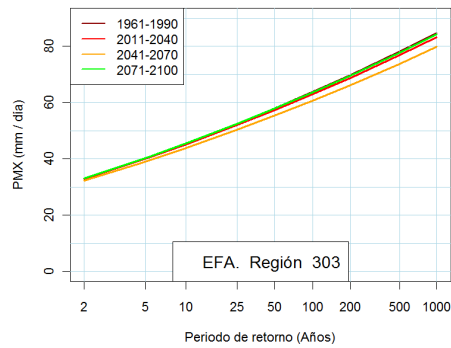
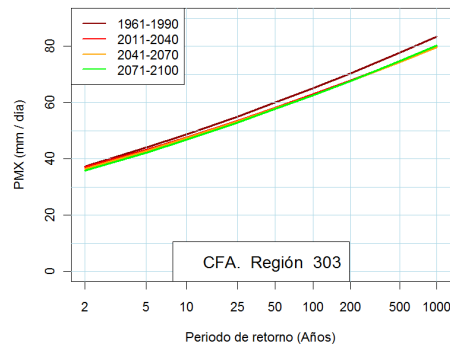
# Cambios en las distribuciones de frecuencia PMX SQRT et max

## Levante



# Cambios en las distribuciones de frecuencia PMX SQRT et max

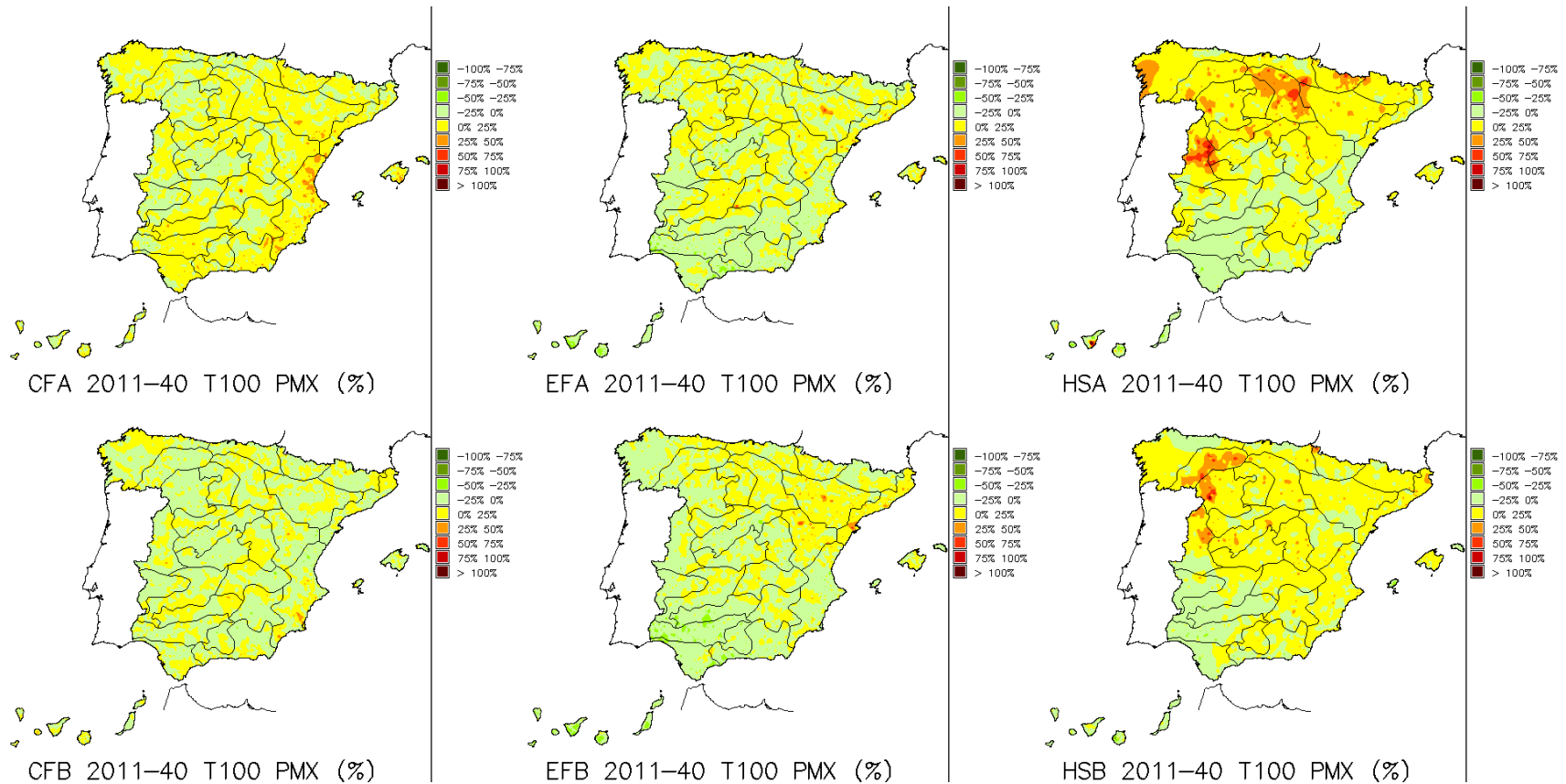
## Centro





# Cambios en las distribuciones de frecuencia PMX SQRT et max

## Cambio de cuantiles PMX para T=100 años en 2011-2040





## Conclusiones

1. Incertidumbre de los resultados: escasa señal de cambio climático en las 8 proyecciones climáticas
  - Desajuste con datos observados
  - Resultados dispares
    - No se estiman aumentos generalizados de PMX
  - Poca continuidad espacial y temporal de los cambios
2. Hay más regiones con aumento de R95T que con aumento de PMX, centro Península (descenso de la precipitación total)
3. Resultados acordes con:
  1. AEMET AR4: Petisco de Lara et al (2012) y AR5.
  2. IPCC, dificultad de simular PMX
4. Nuevas proyecciones ¿mejor señal?

