Extreme Events in the Colombian Pacific and Caribbean Catchment Basins

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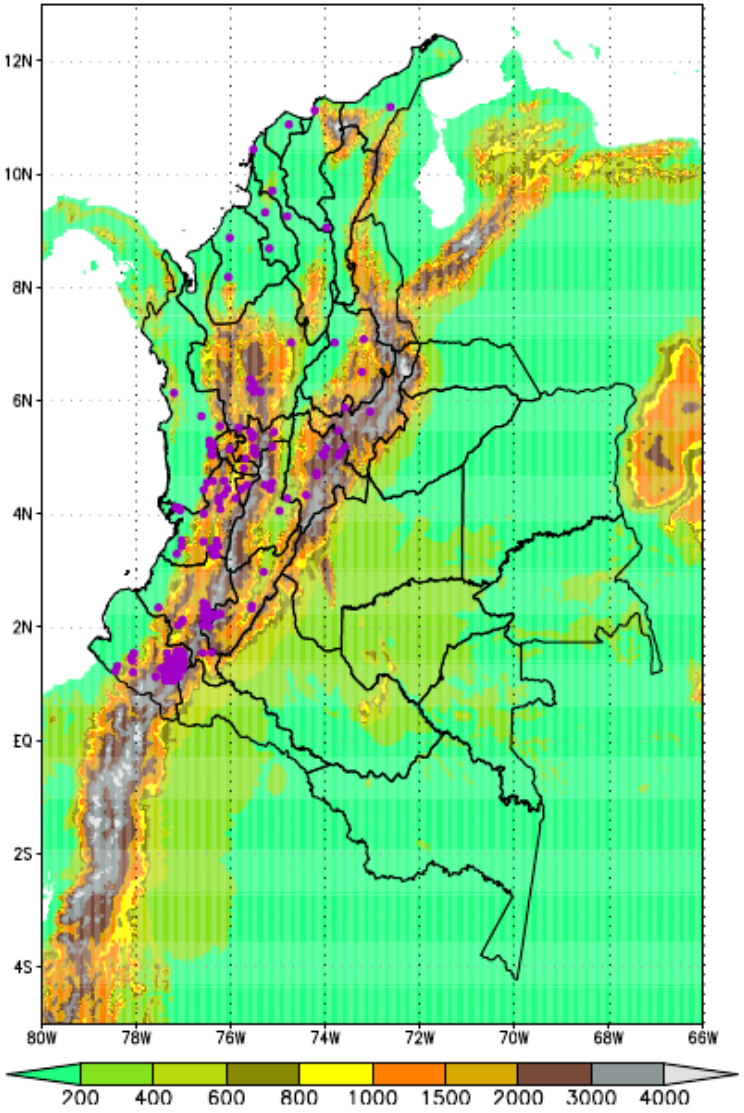
Outline

Colombia: geographic features

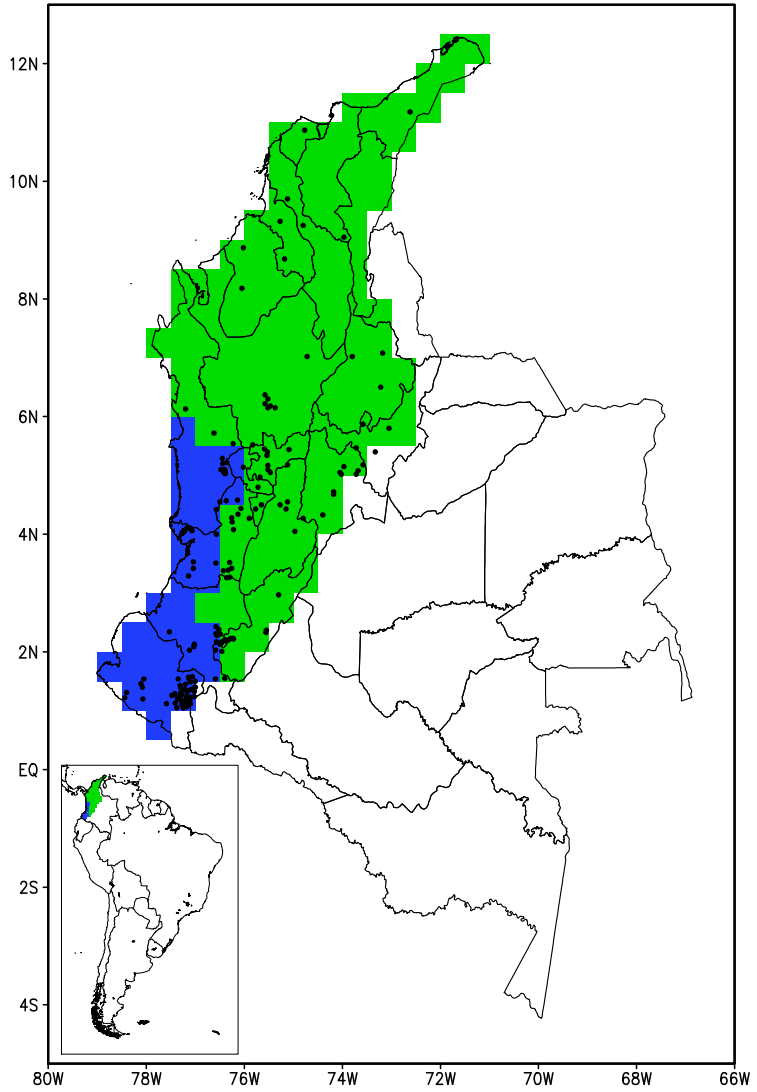


Colombia: climatic features

- ITCZ - Incoming solar energy quasiconstant seasonally.
- Atmospheric processes are mostly convectives.
- Influenced by several global climatic phenomena: TEWs, NAO, AMO, QBO, MJO, ENSO.
- Great spatial and temporal variability of climate - high vulnerability to extreme climate events (Sura P, 2011).

Outline

Study area



- CCCB: Andean region (mountain) + Caribbean region (dry marine)
- CCPB: Choco rainforest (extremely wet)

Data

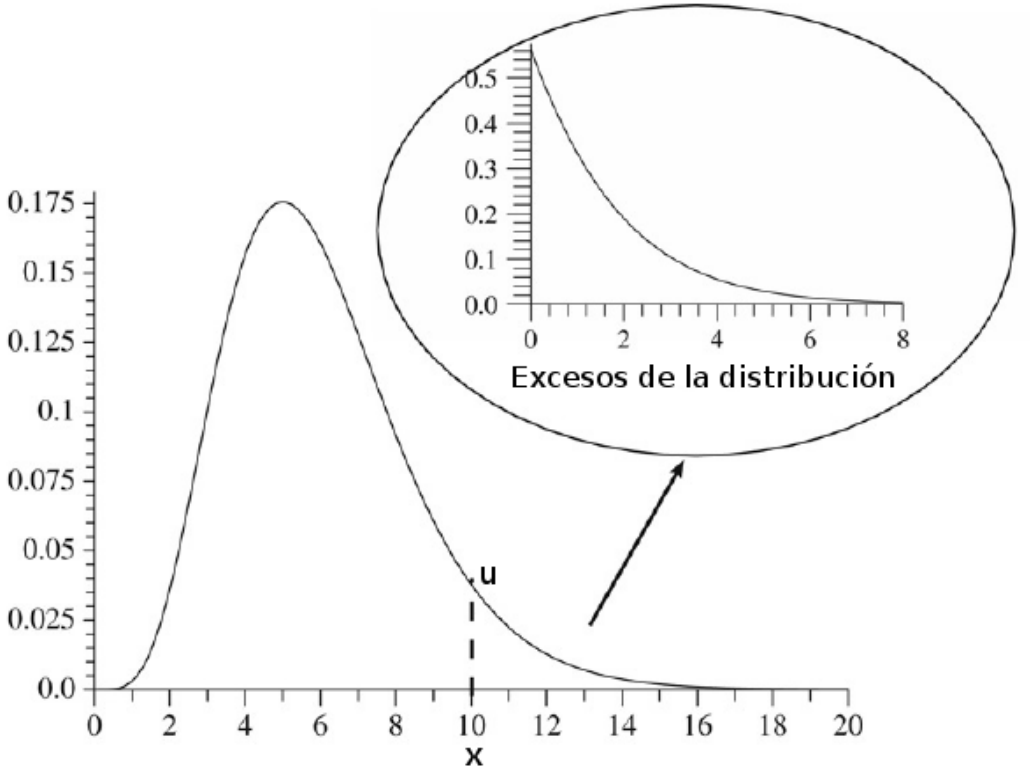
	Description	T	PP	Period	Grid size
CPC	reconstructed		X	1948-2000	2 .5°
DELAWARE	reconstructed	X	X	1950-1999	0.5°
NCEPNCAR	reanalysis	X	X	1948-2009	2 .5°
ERA-40	reanalysis	X	X	1958-2000	2 .5°
REMO	regional model	X	X	1958-2000	0.5°
OBS	IDEAM - HIDROSIG	X	X	available	-

Second order remap (Jones, 1999) $\mapsto$ 0.5°

Outline

Extreme value model

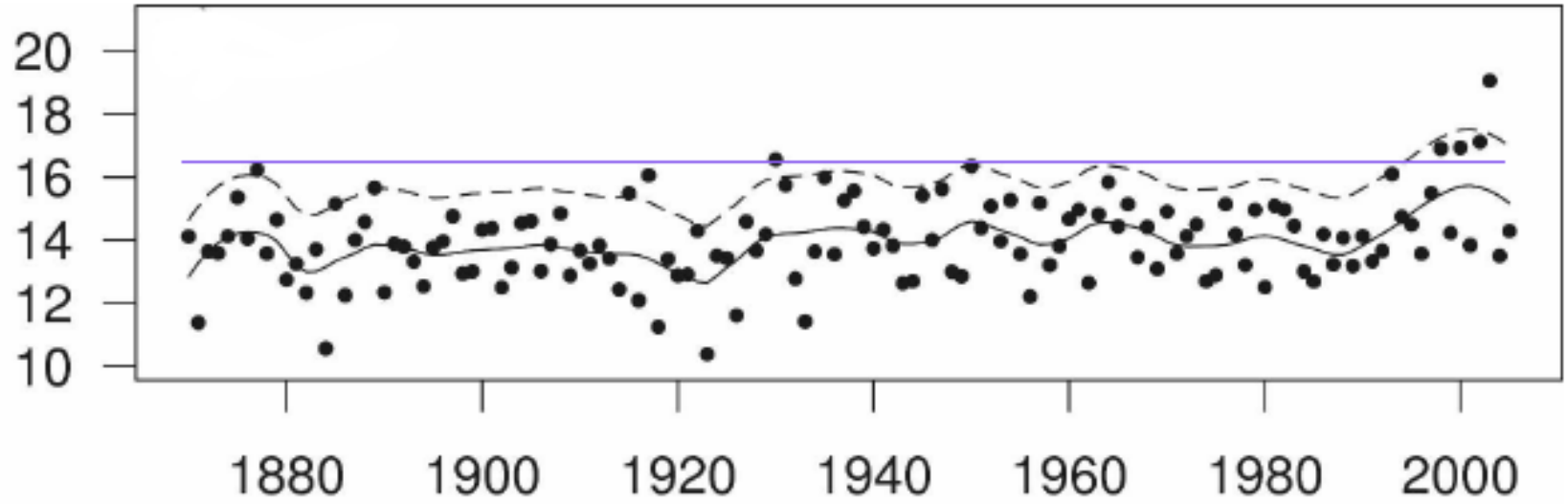
The extreme behavior is characterized by great values of the sample (tail)



If the distribution tail belongs to extreme value domain, it follows a Generalized Pareto Distribution Function (GPD) - Balkema and de Haan (1974); Pickands (1975).

Non stationary processes - variable threshold

$$u_{ym} = L_{ym} + \epsilon$$

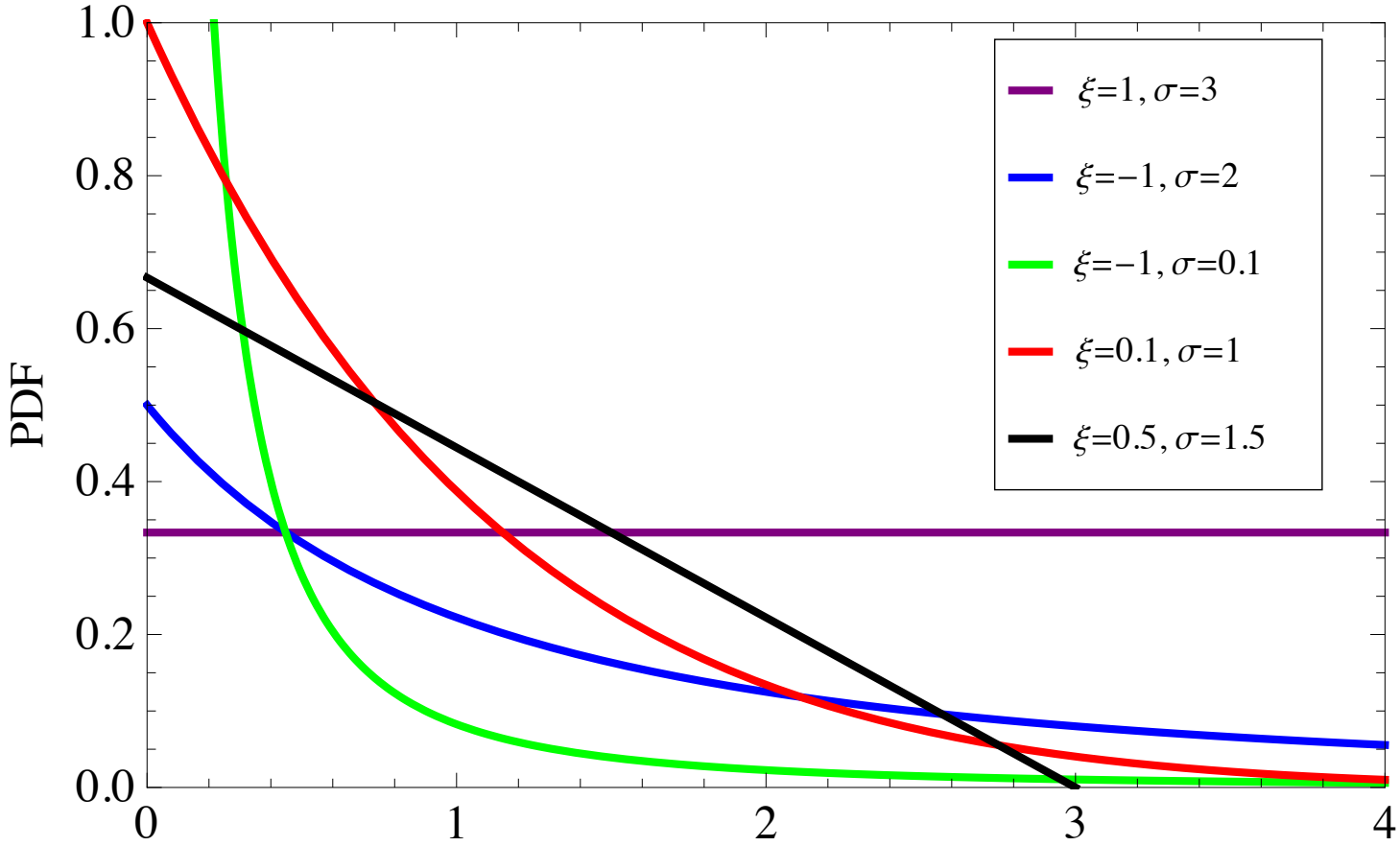


L_{ym} is calculated through local polynomial fit

ϵ sets the size of extremes sample

Generalized Pareto Distribution Function

$$F_{\sigma,\xi}(z) = 1 - \left(1 - \frac{\xi z}{\sigma}\right)^{1/\xi}$$



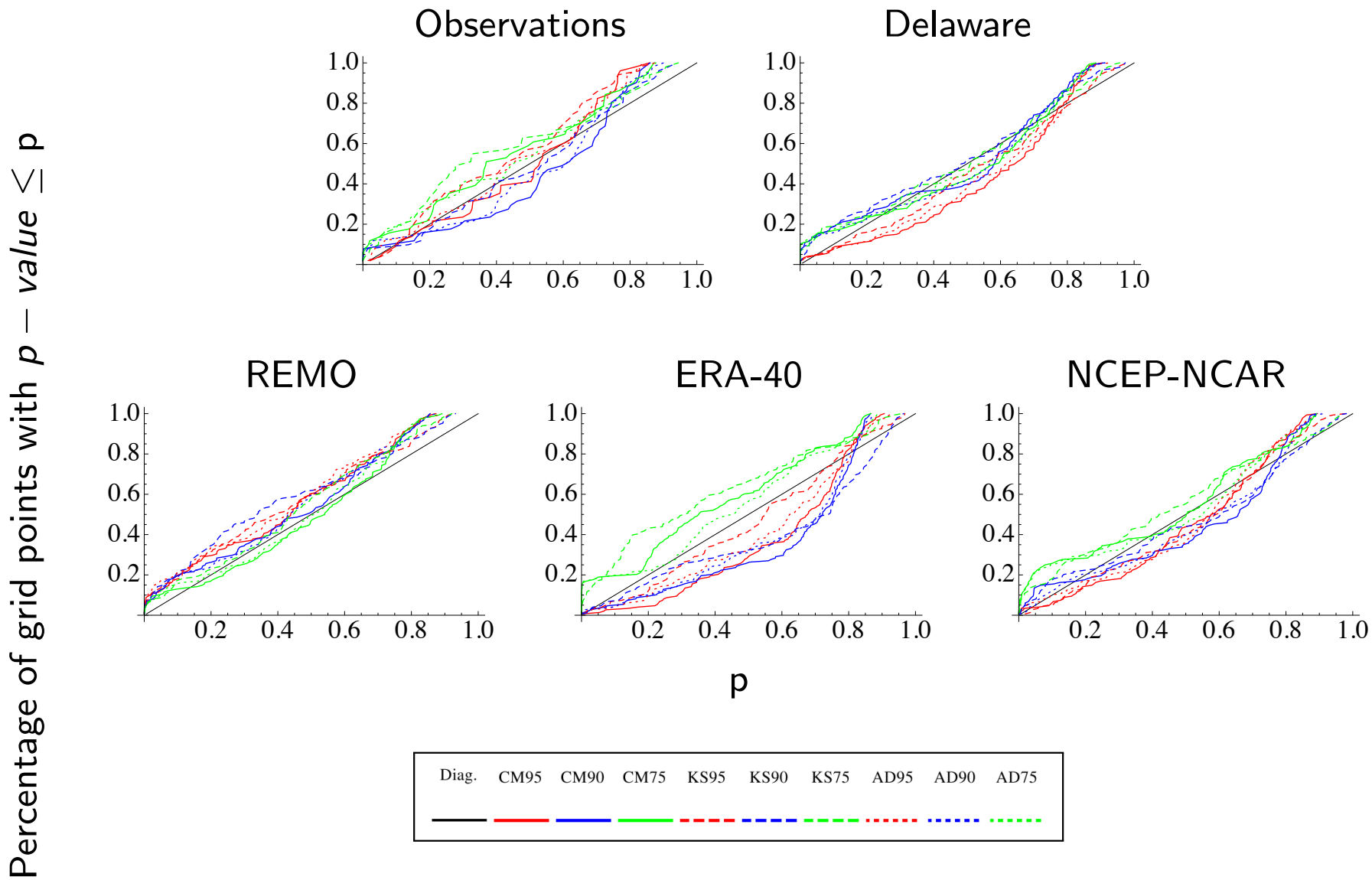
Extreme value model

1. Selection of excesses Z over non-stationary threshold $u_{ym} = L_{ym} + \epsilon$
2. The sample Z is fitted to GPD (Zhang y Stephens, 2009)
3. Regional goodness and threshold choice, KS, AD, CM. *parametric boostrap*
4. Maps of parameter distributions and return periods

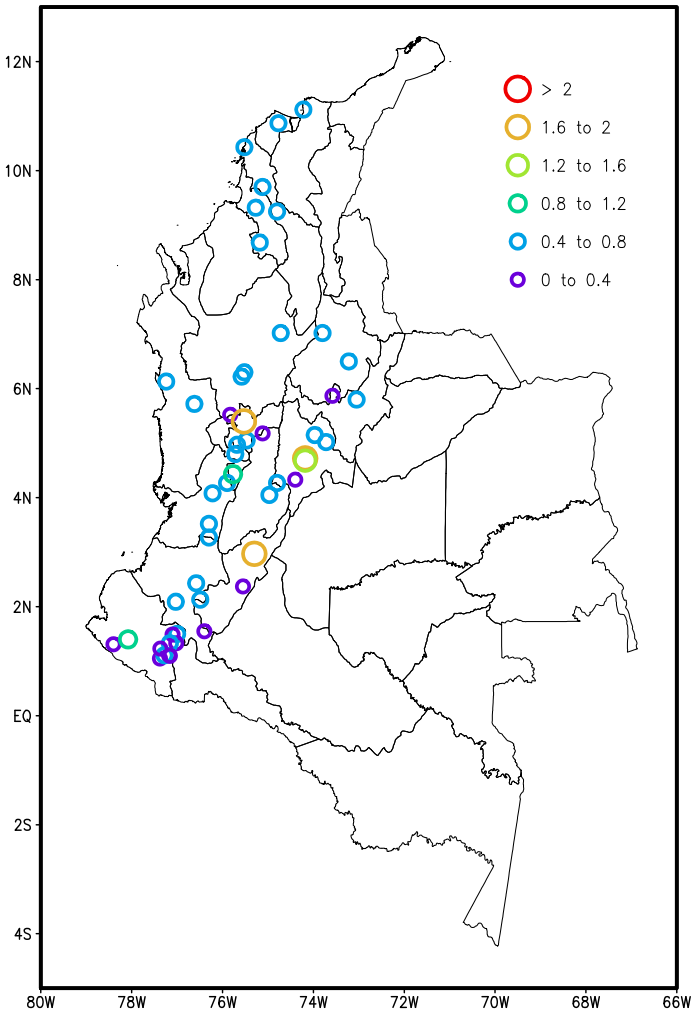
Outline

Results: Temperature

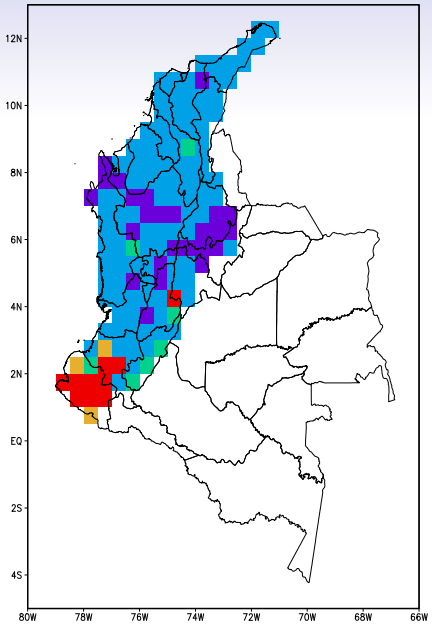
Goodness of fit and threshold choice



Temperature: scale parameter σ (°C)



Observations



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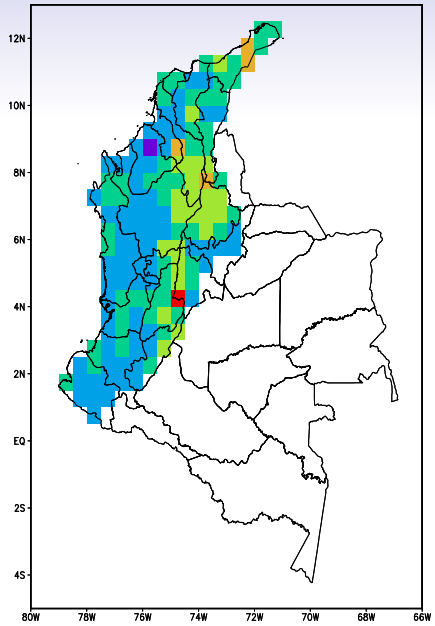

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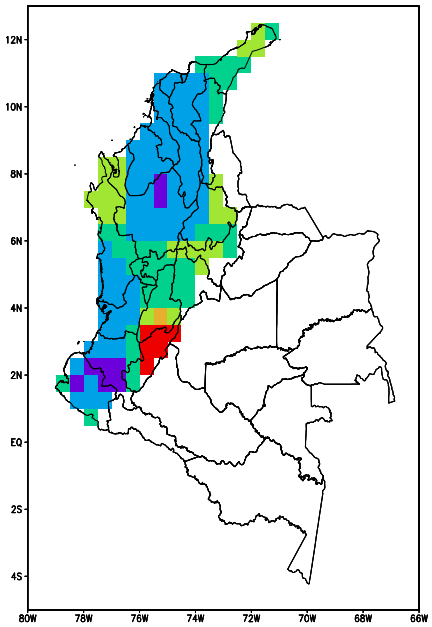

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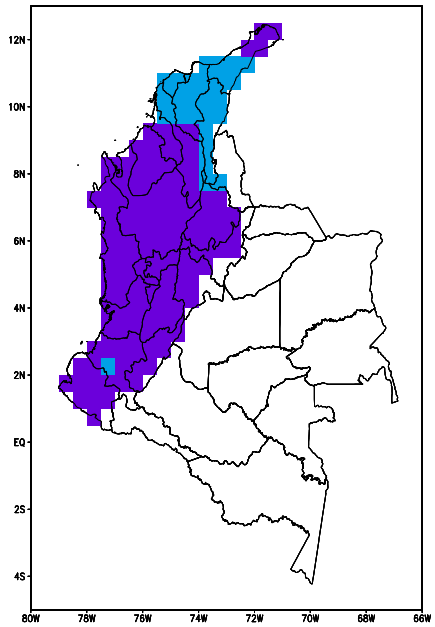
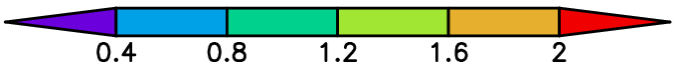
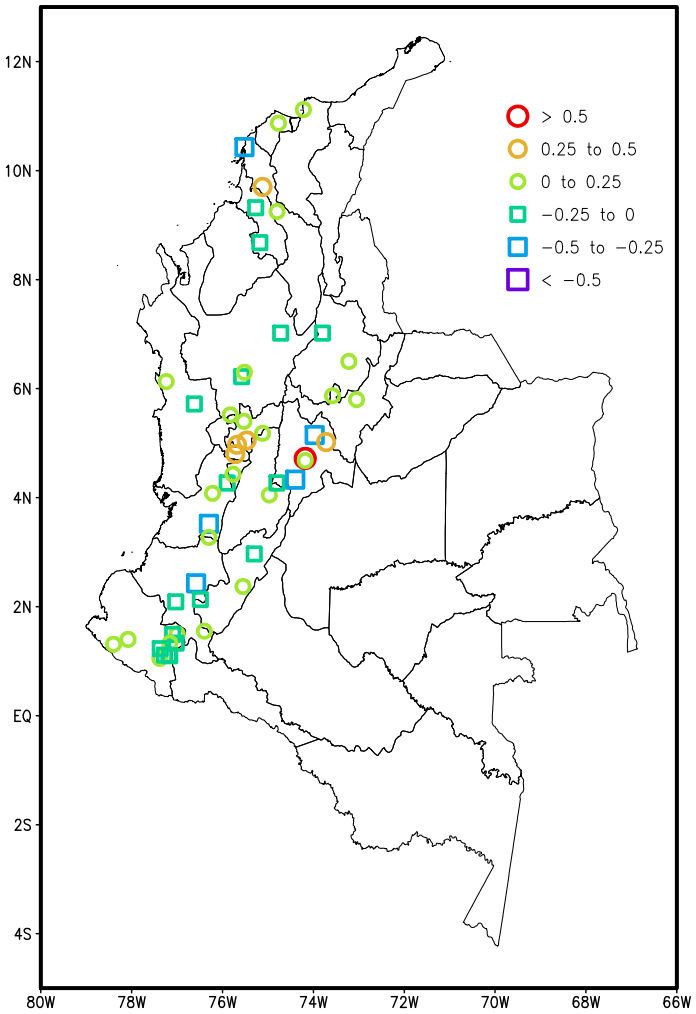


NCEP



Temperature: shape parameter (ξ)



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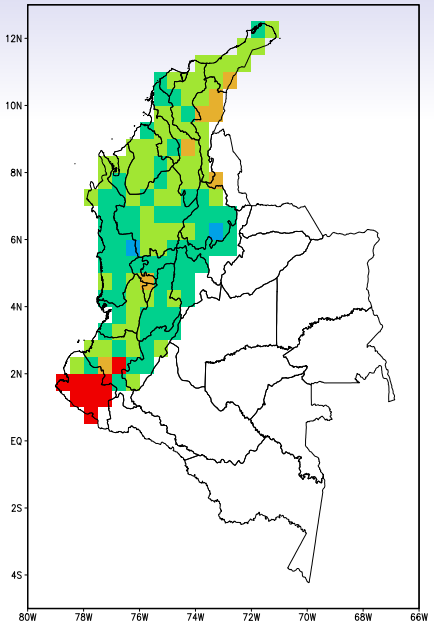

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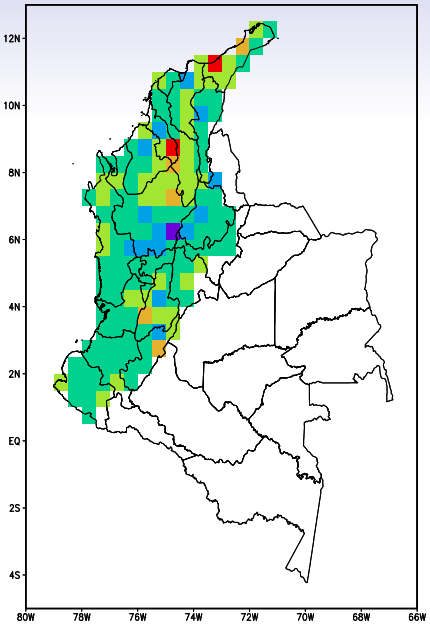

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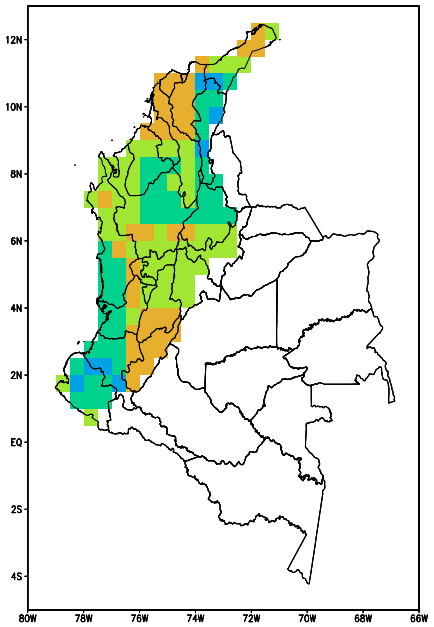

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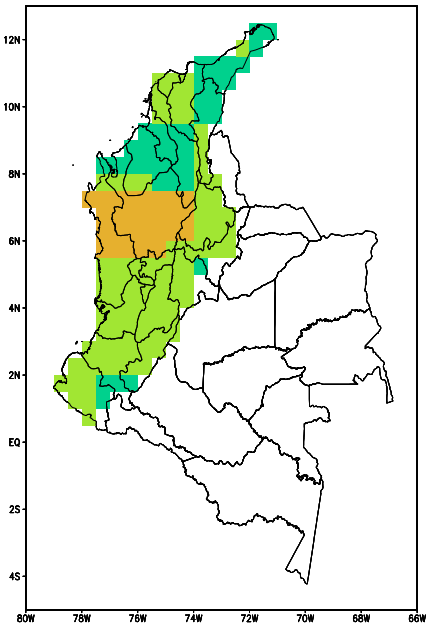

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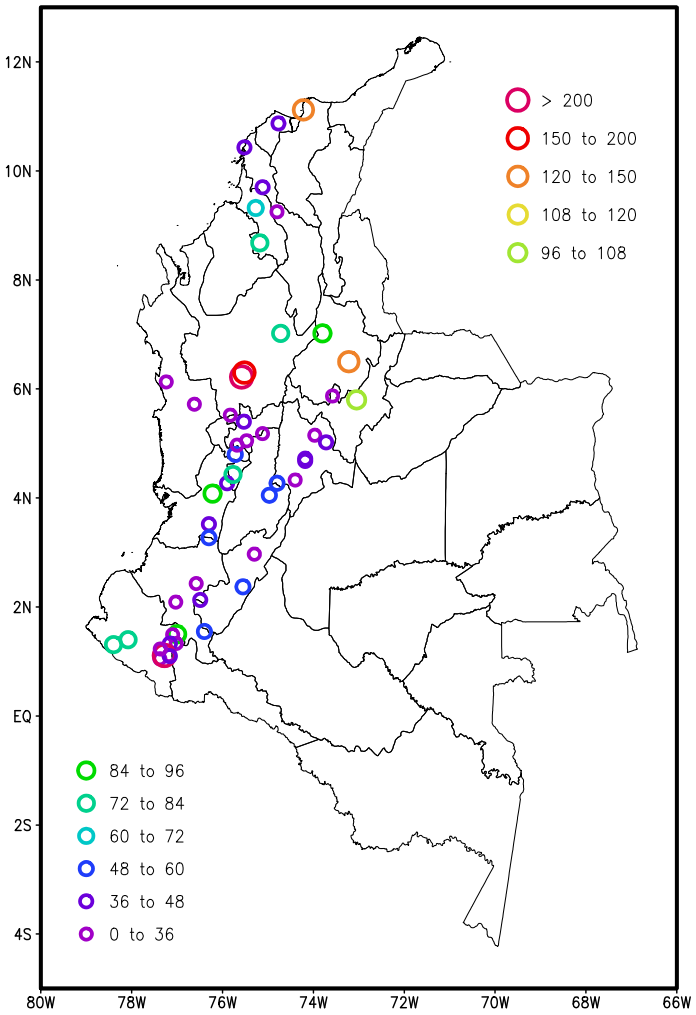
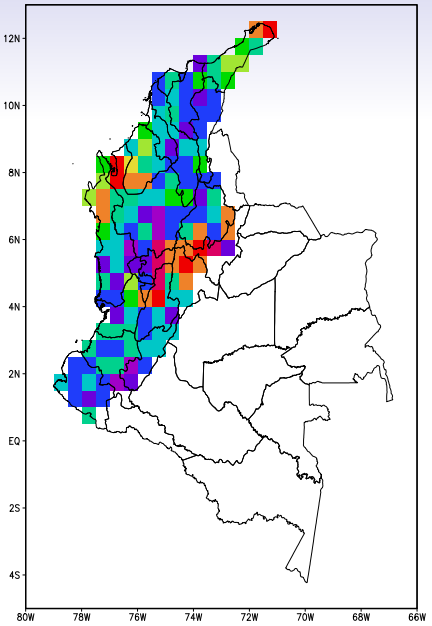
Temperature: Return period (months) - maximum event



Observations



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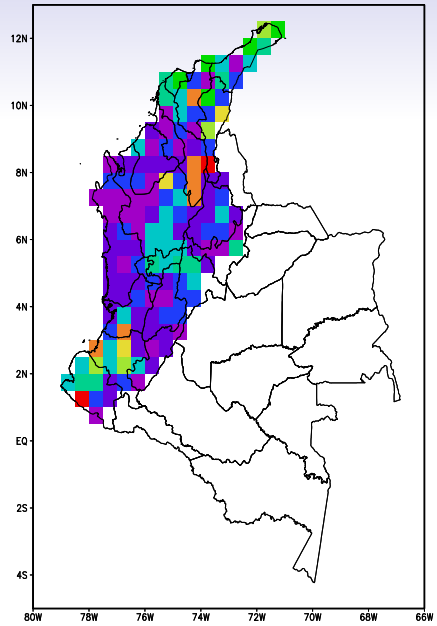

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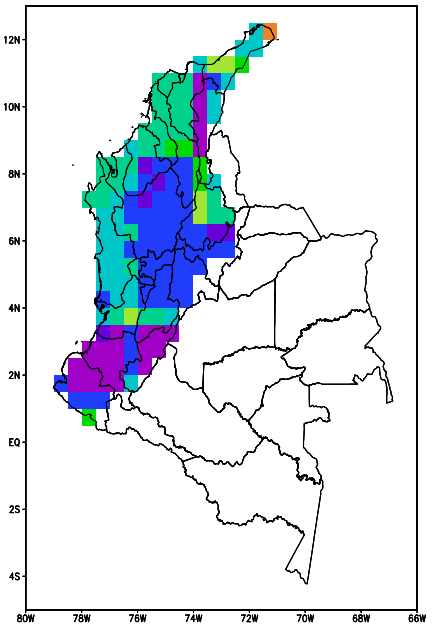

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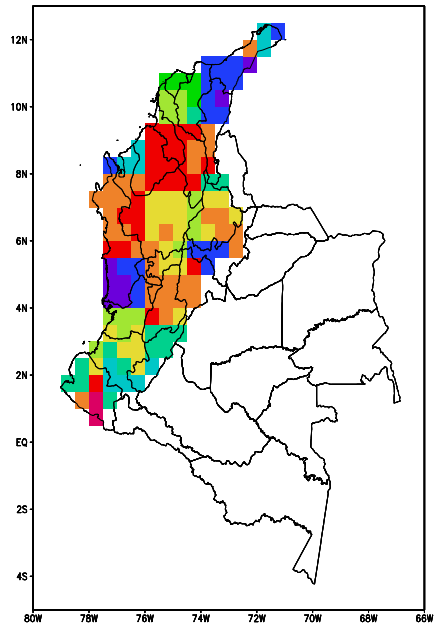

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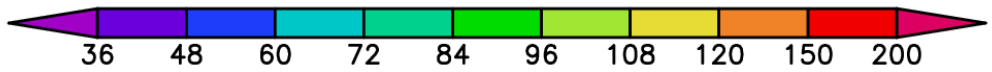
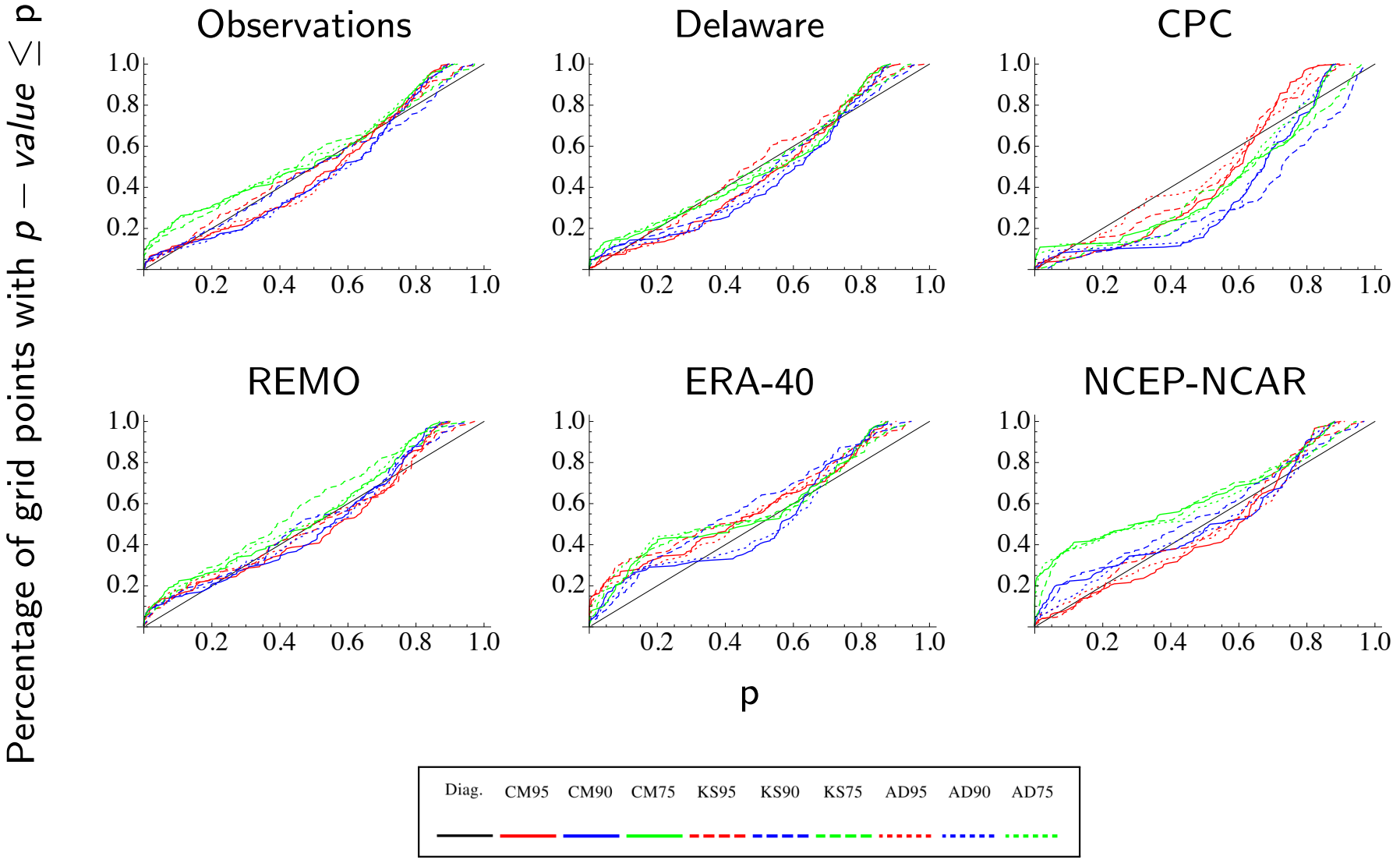
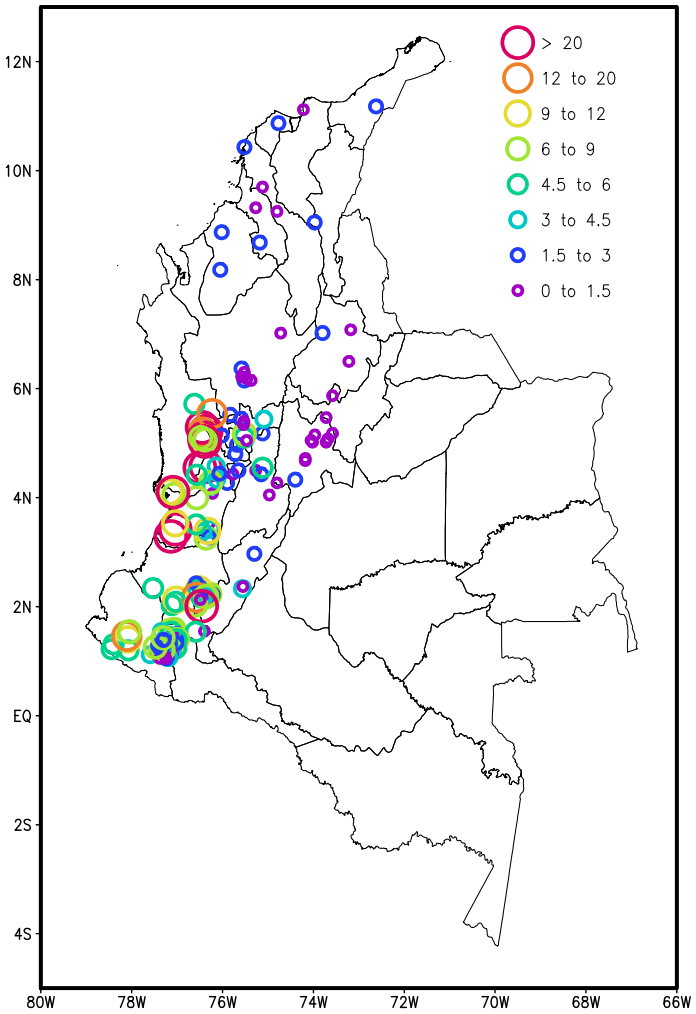


Results: Precipitation

Goodness of fit and threshold choice



Precipitation: scale parameter σ (mm/day)



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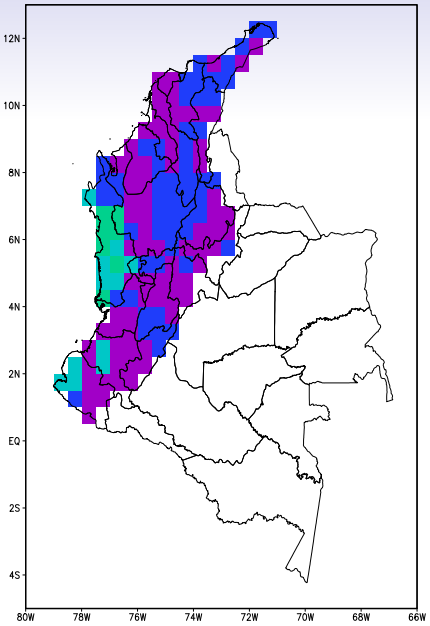

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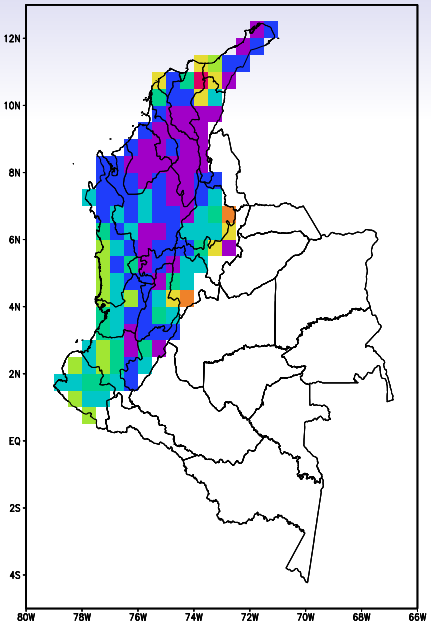

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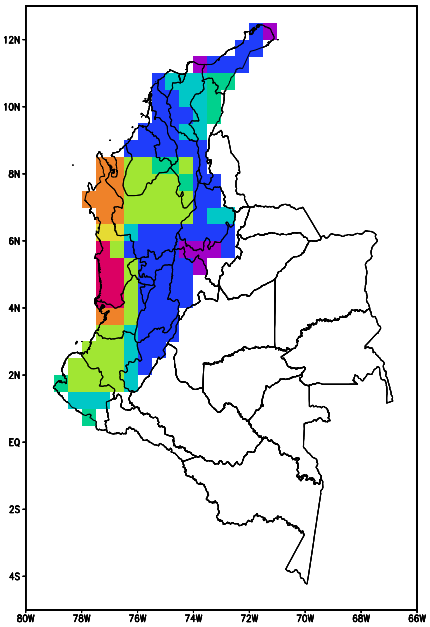

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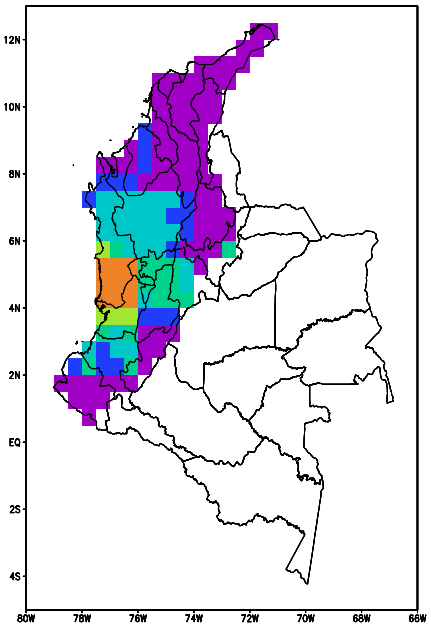
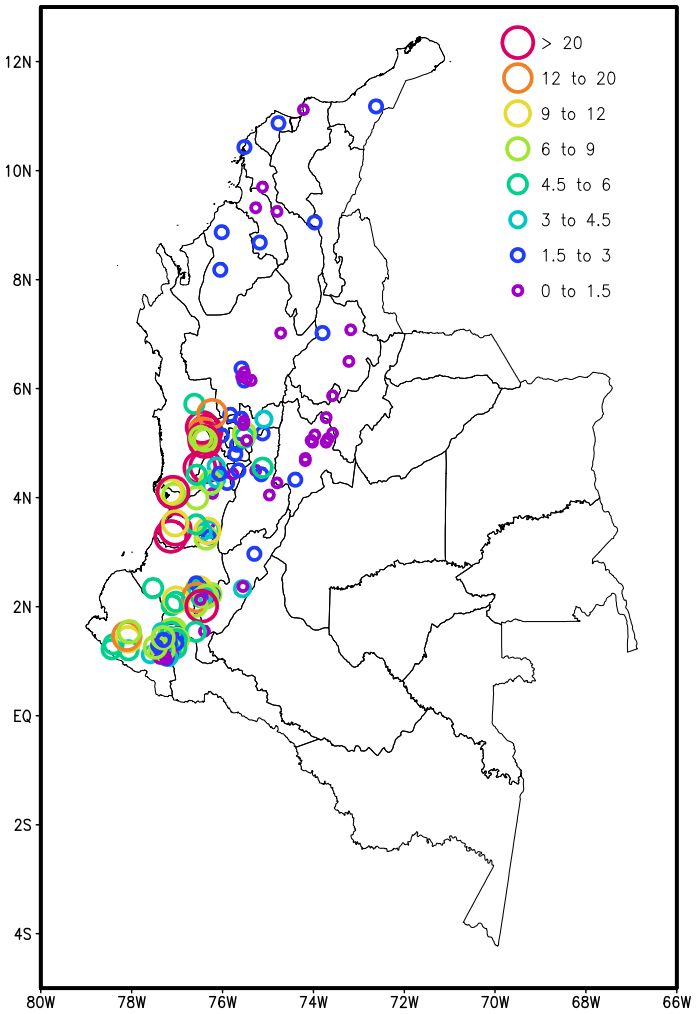
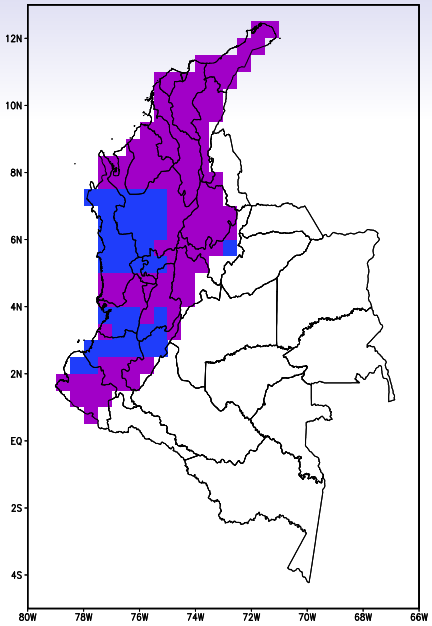


NCEP

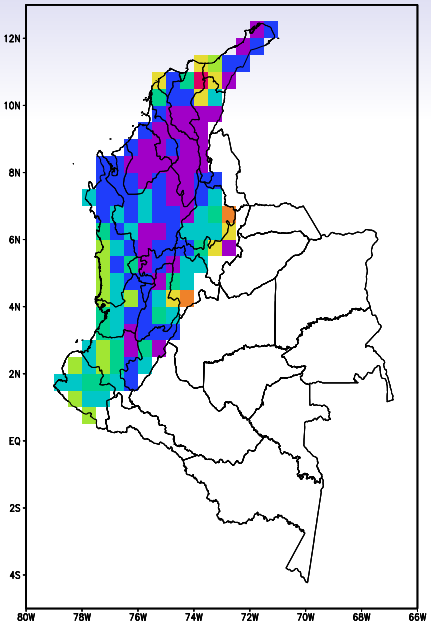
Precipitation: scale parameter σ (mm/day)



Observations



CPC



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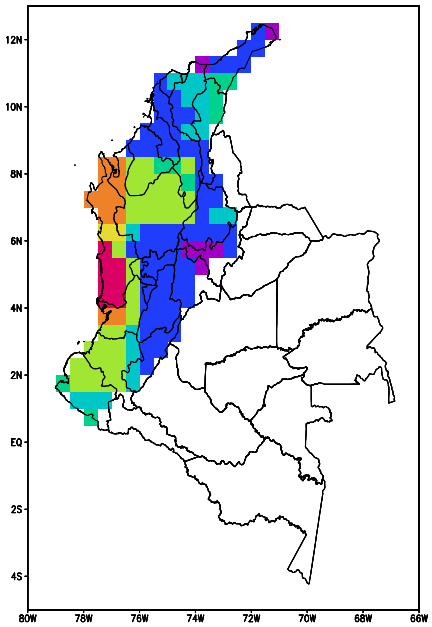

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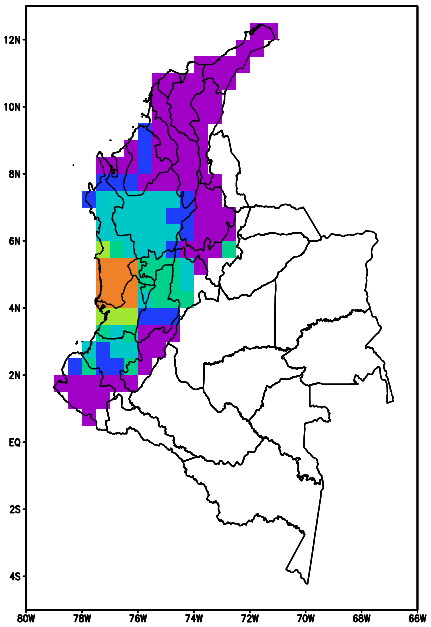
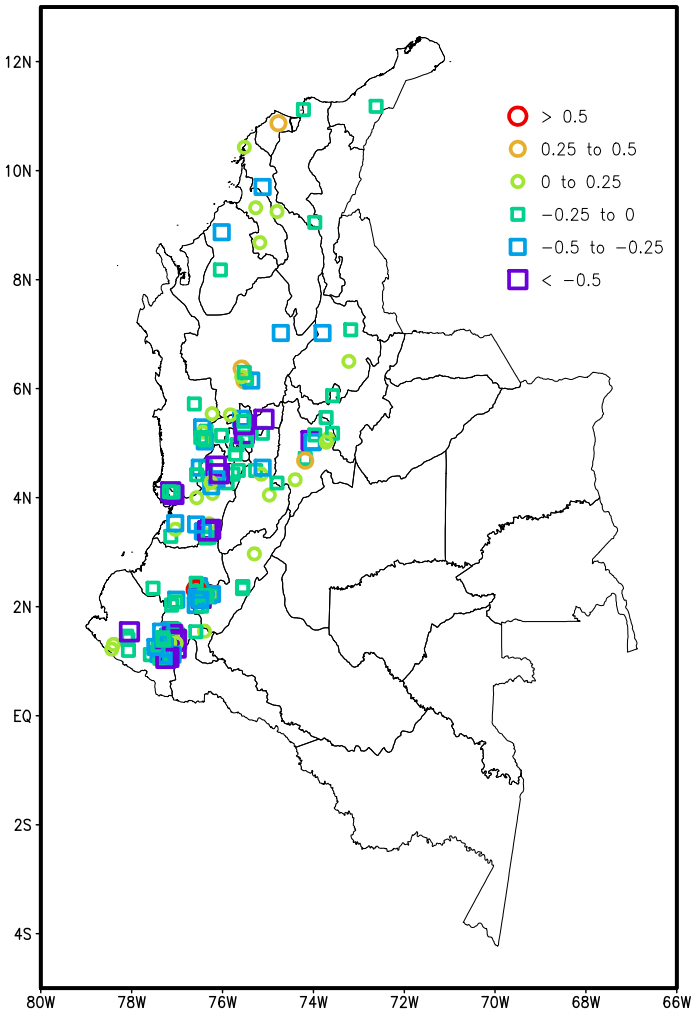


NCEP

Precipitation: shape parameter (ξ)



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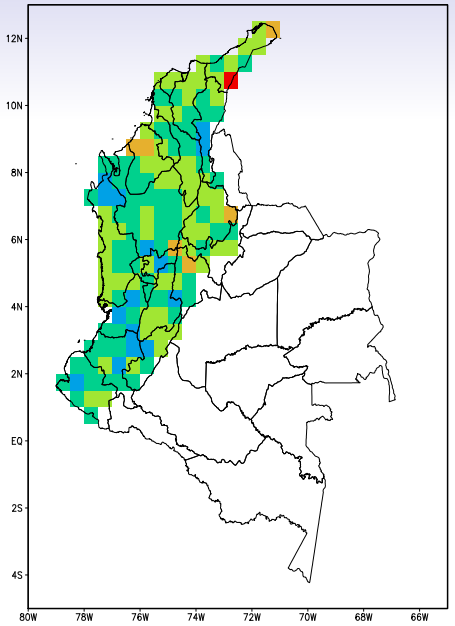

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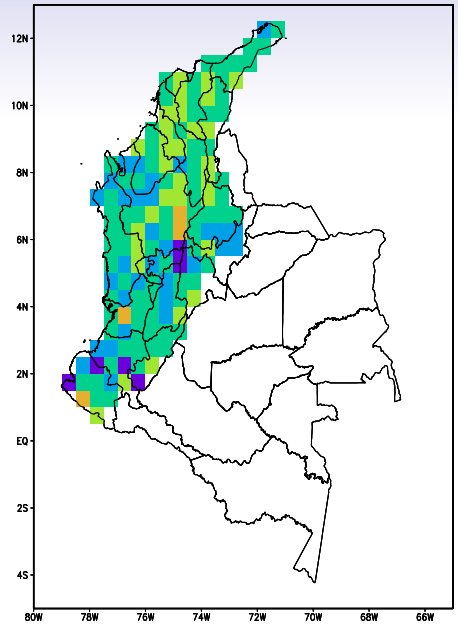

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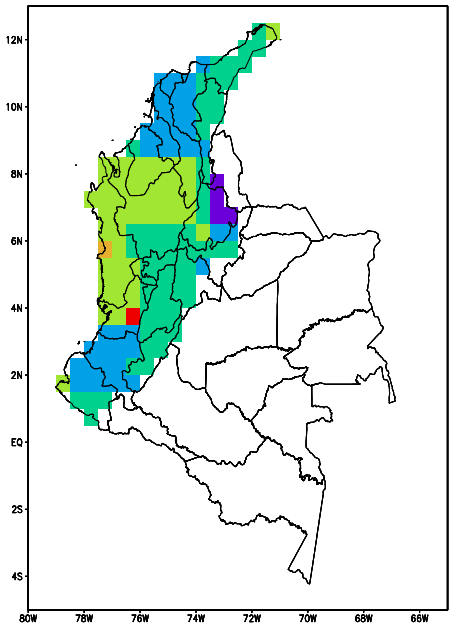

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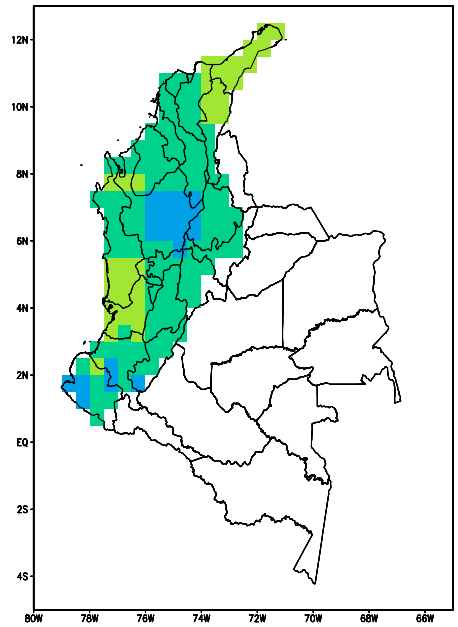
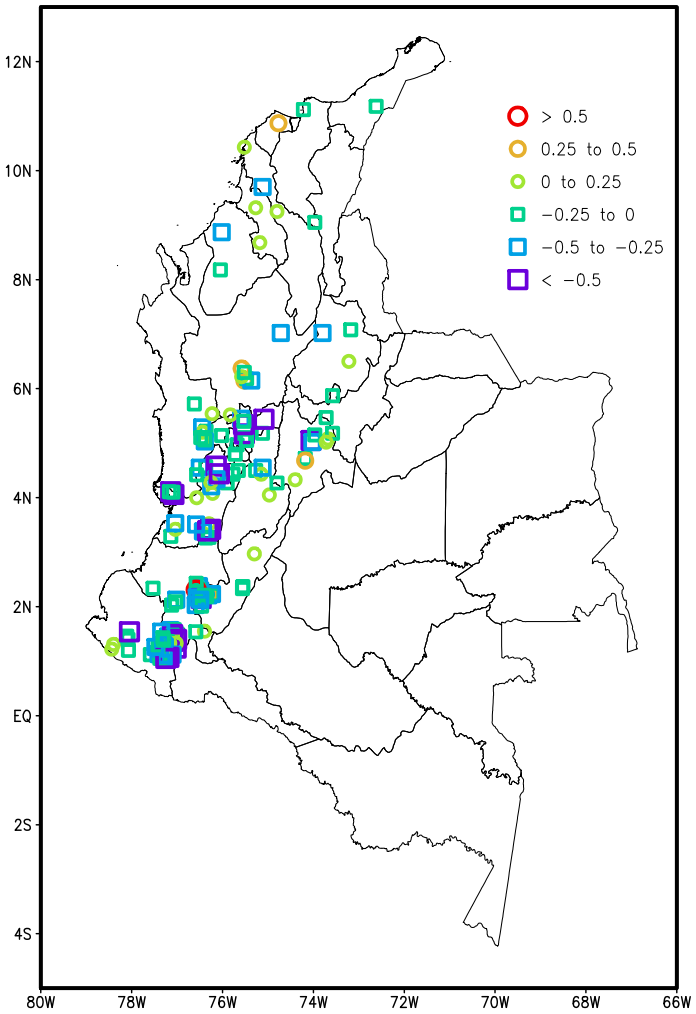


NCEP

Precipitation: shape parameter (ξ)



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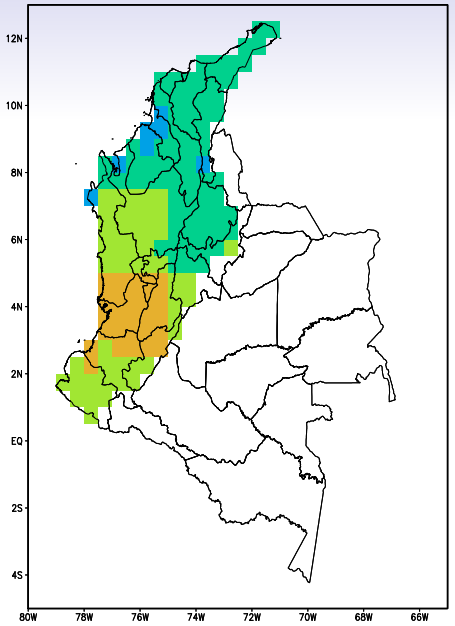

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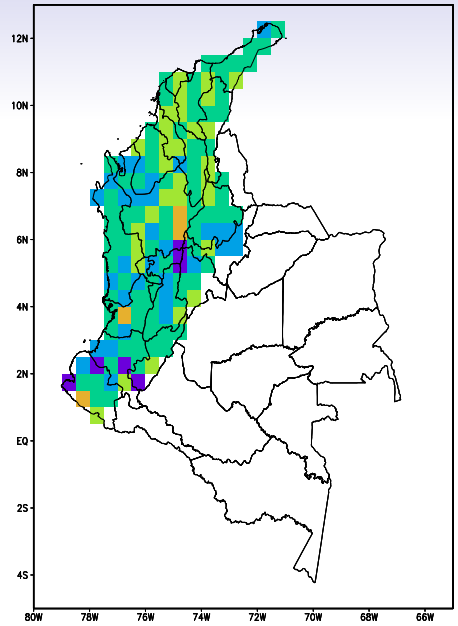
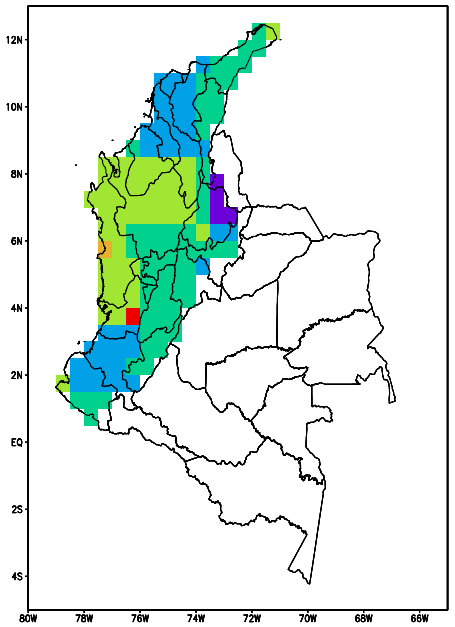


REMO



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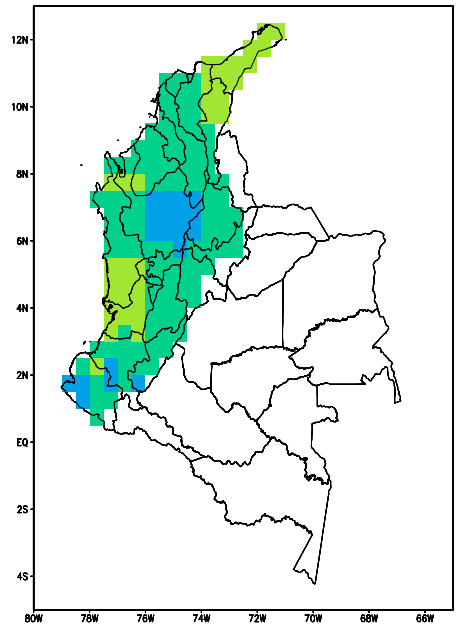
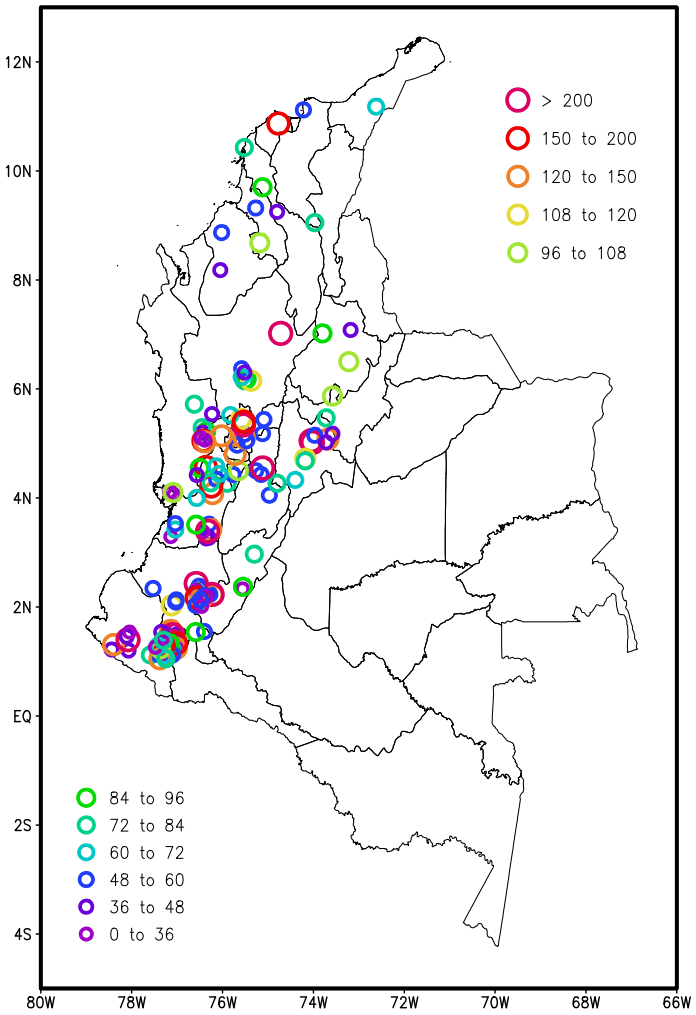
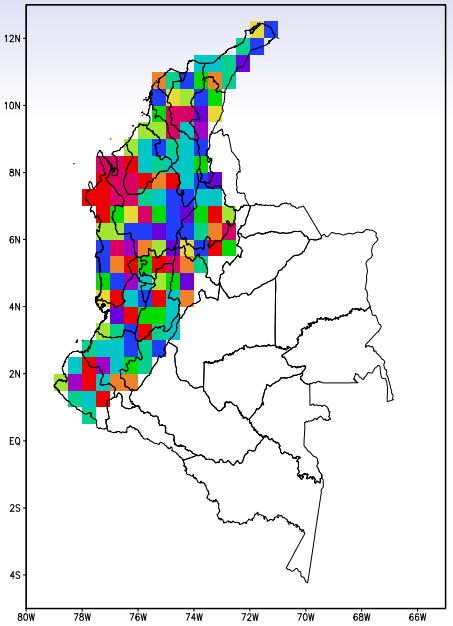


NCEP

Precipitation: return period (months) - maximum event



Observations



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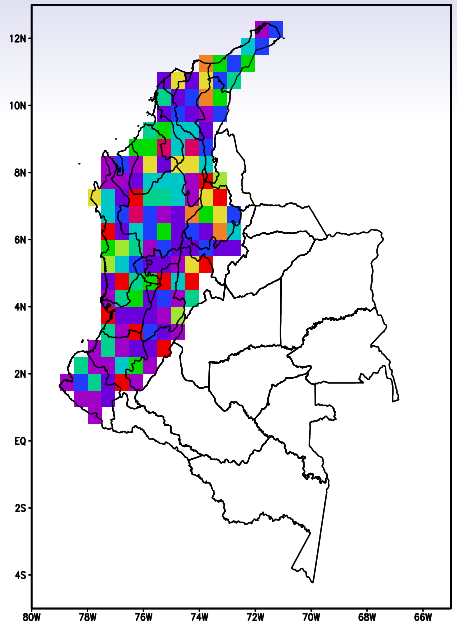

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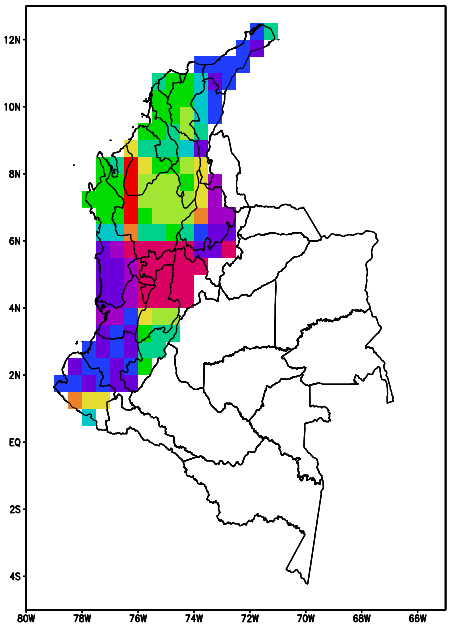
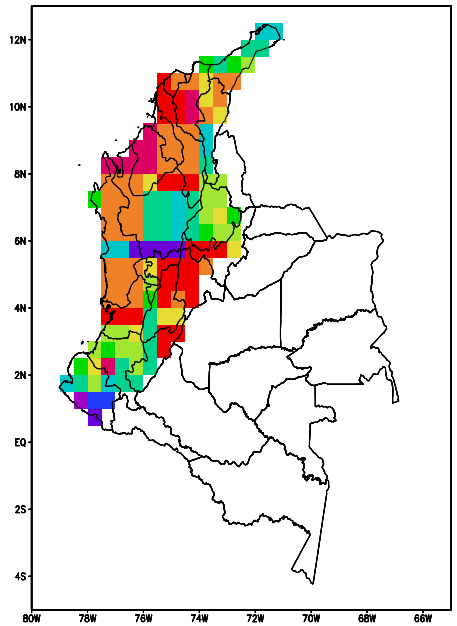


ERA-40



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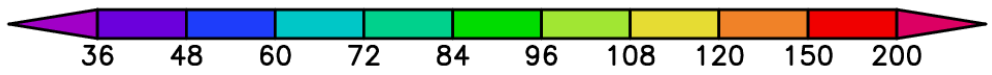
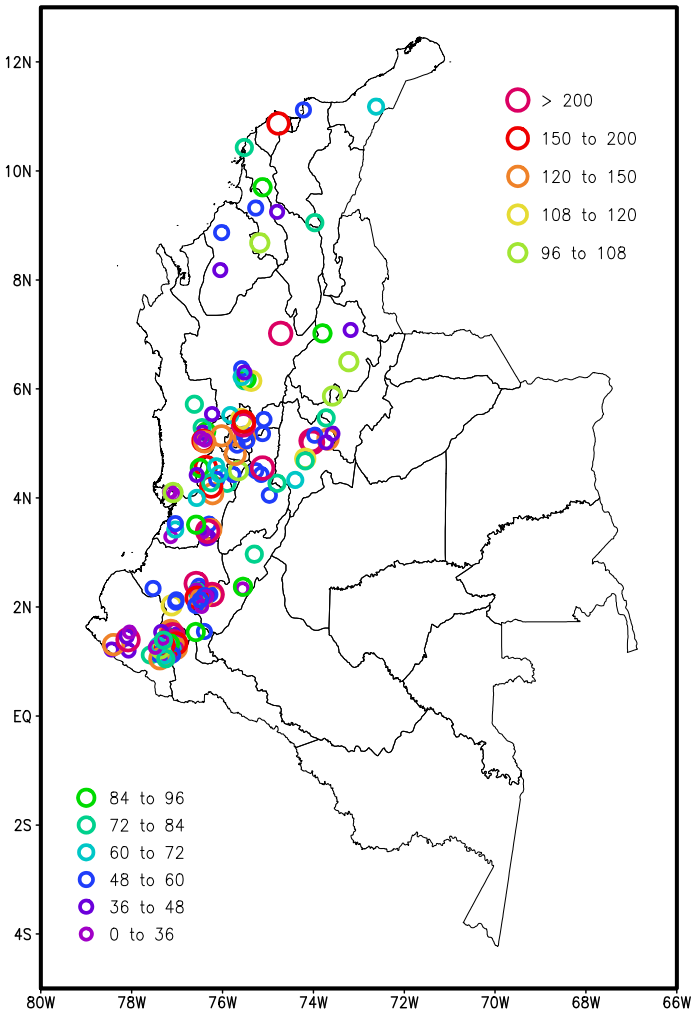
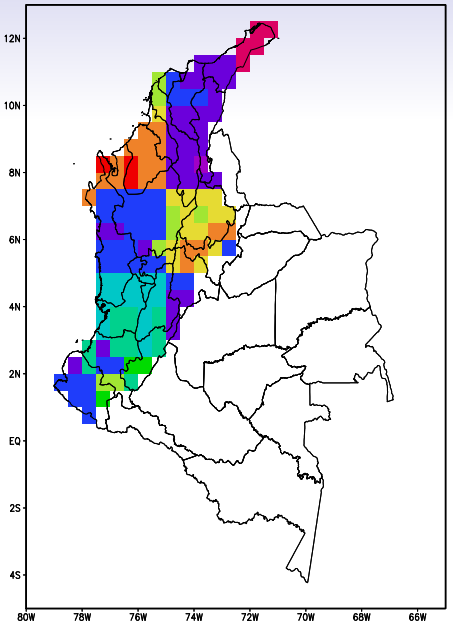


Precipitation: return period (months) - maximum event



Observations



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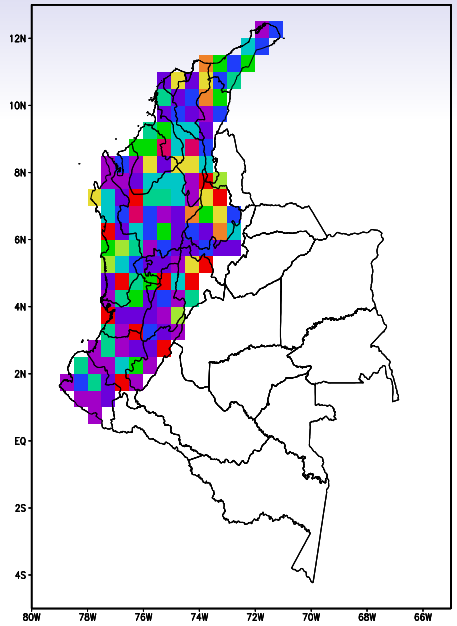
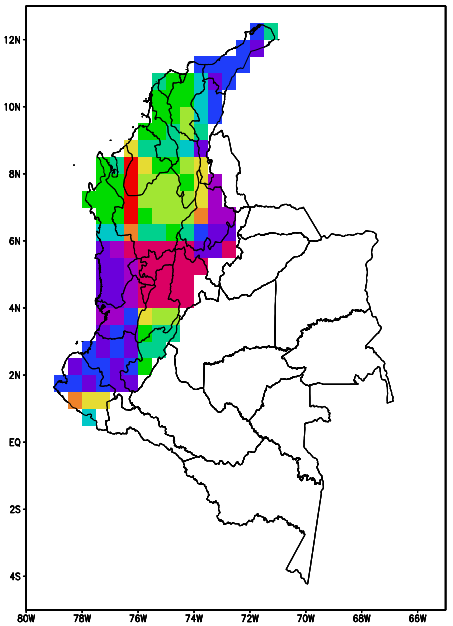
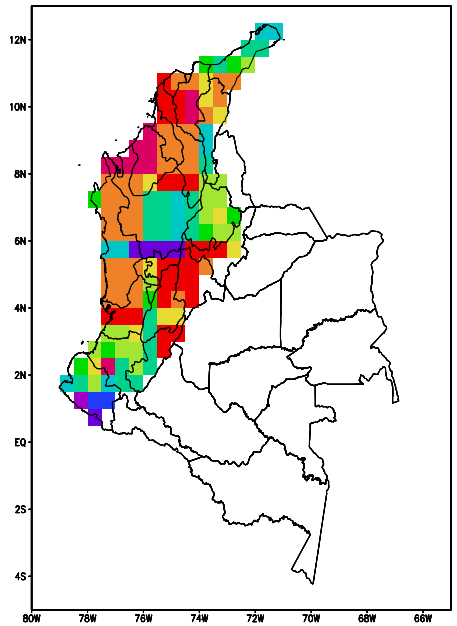


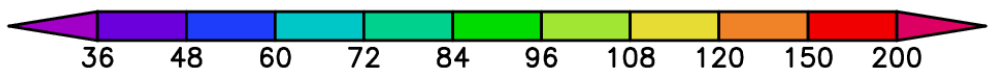
REMO



ERA-40



NCEP



Outline

Summary

Temperature:

- Low regional variability.
- Bounded distributions are predominant in the study area.
- Return periods less than 8 years.

Precipitation:

- Subregional differences between CCCB and CPCB
- Unbounded distributions are predominant in CPCB
- Return periods over 15 years with more often frecuency around 6 years

Hoyos I, A Baquero, D Jacob and B Rodriguez. Extreme Events in the Colombian Pacific and Caribbean Catchment Basins. (submitted)