

Homogenization of daily peak wind gust series from Spain and Portugal

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Introduction

Homogenization strategies

Impact on extreme wind indexes

Conclusions



- ▶ Homogenization of daily series is difficult, due to their lower noise/signal ratio.
- ▶ Yet the study of the variability of extreme weather events requires homogeneous and quality controlled daily series.
- ▶ Here we apply different strategies to homogenize daily maximum gust speeds from Portugal and Spain, and analyze their impact on the evaluation of the trends of mean and maximum gusts, the number of days over the 90 percentile and maximum expected gusts for return periods of 50, 100 and 200 years.
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- ▶ The data set consisted of 80 series (7 Portuguese and 73 Spanish) of daily maximum peak wind gusts spanning 54 years (1961-2014).
- ▶ Corresponding daily series from MM5 simulations at 10 km resolution were available until 2007 (Murcia University).
- ▶ Homogenization was performed with Climatol 2.2 (multiplicative model) on:
 - ▶ Average monthly values, using MM5 series as references when available, and adjusting the daily series with interpolated monthly correction factors.
 - ▶ Direct homogenization of daily values, using MM5 series as references when available.
 - ▶ Direct homogenization of daily values, without MM5 references.
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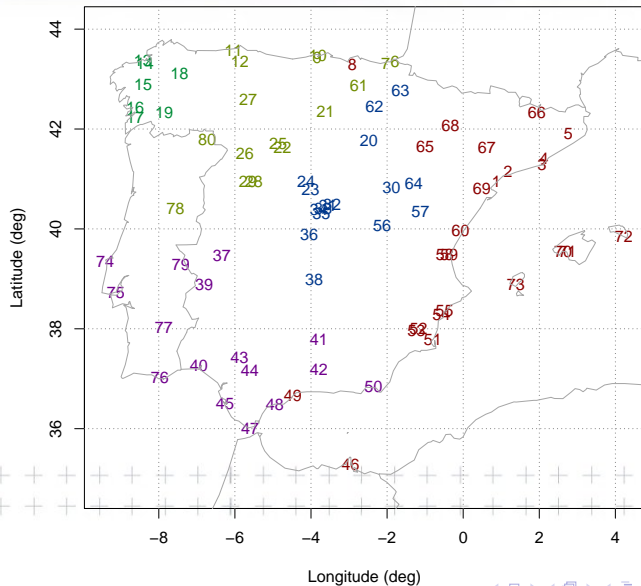
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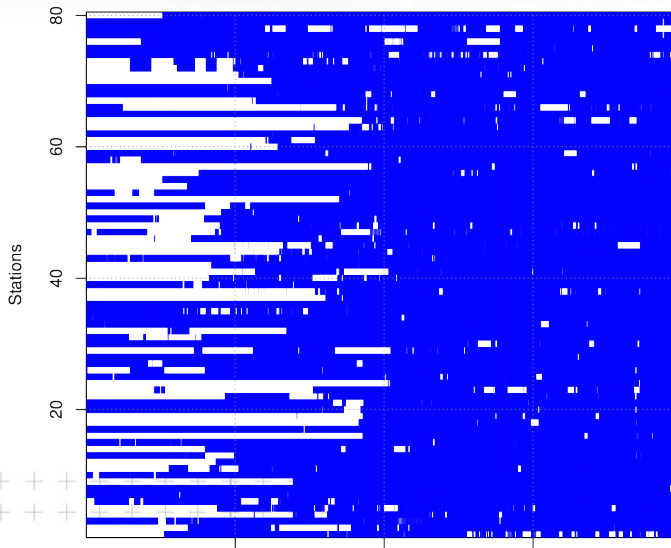
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Station locations

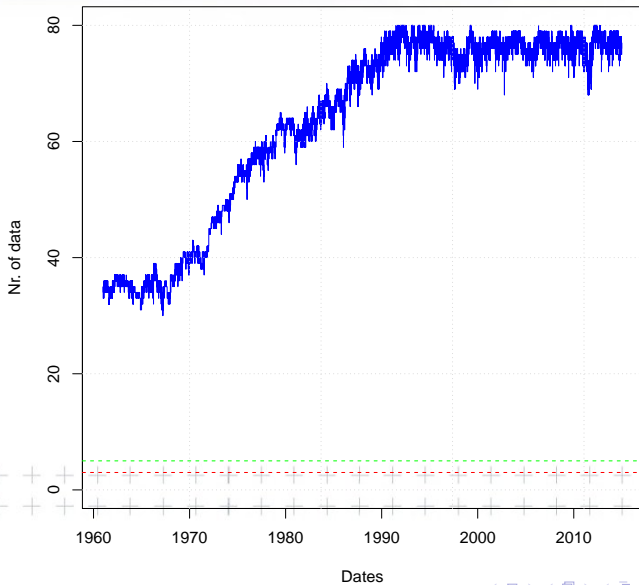
VX station locations (5 clusters)



VX data availability



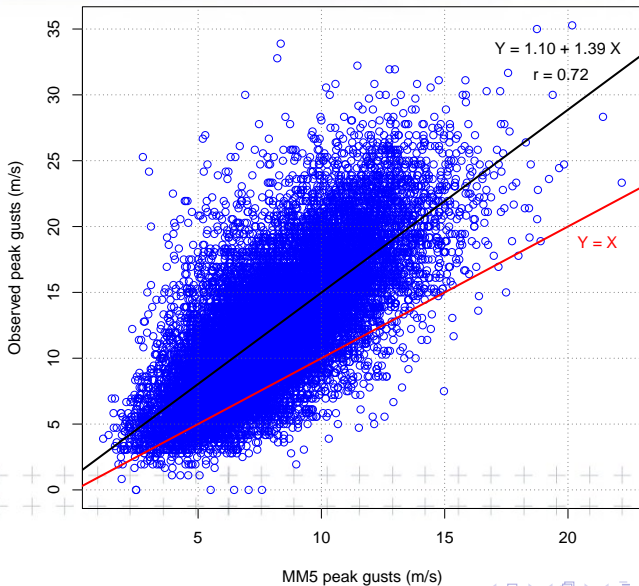
Nr. of VX-d data in all stations



Regression observations vs MM5



Zaragoza (1961–2007)



Correlations observations vs MM5

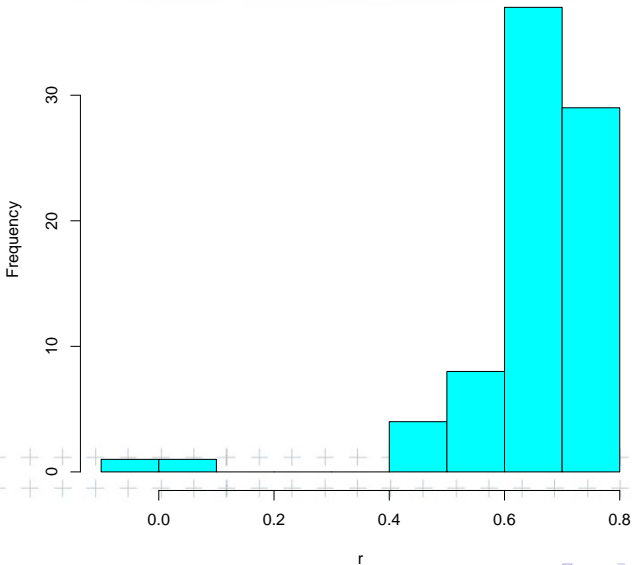


GOBIERNO DE ESPAÑA

MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

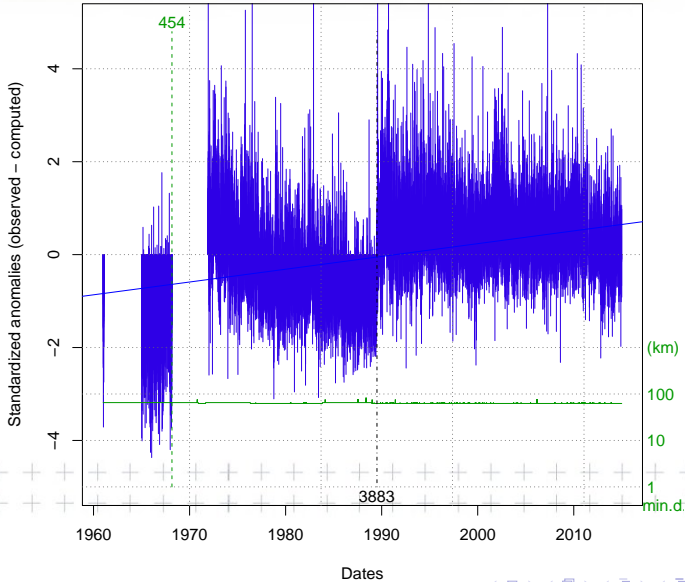
Aemet
Agencia Estatal de Meteorología

Correlations between observed and MM5 series

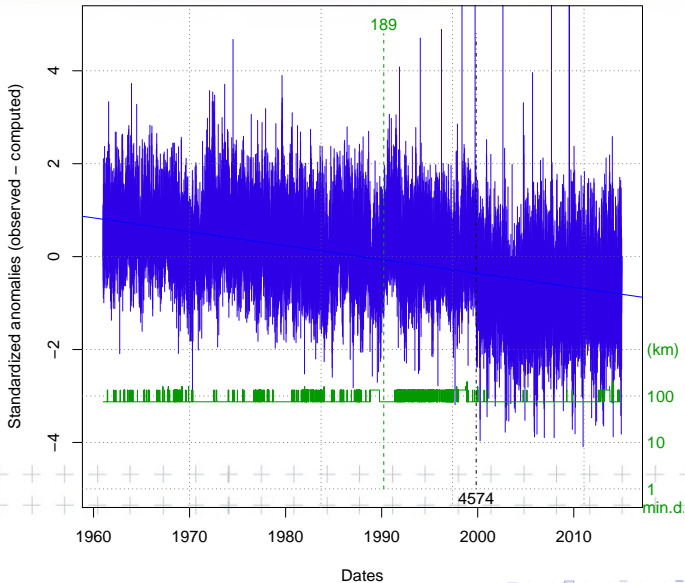


Inhomogeneities

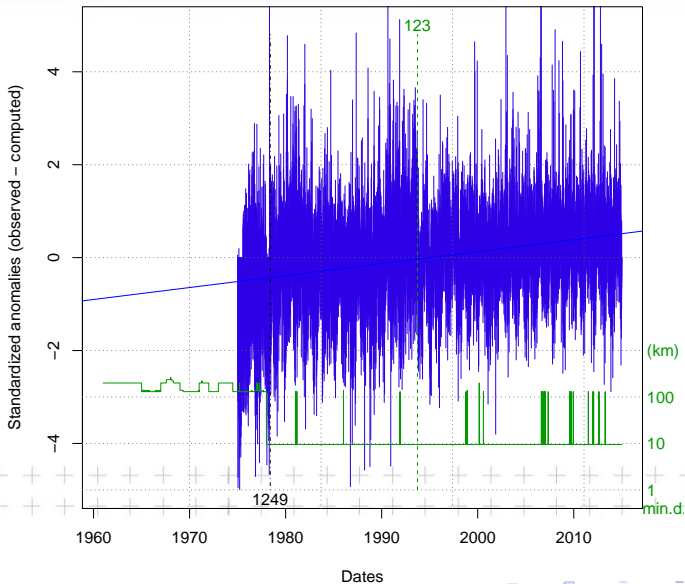
VX-d at 2614(26), ZAMORA



VX-d at P535(75), LISBOA GEOFÍSICO

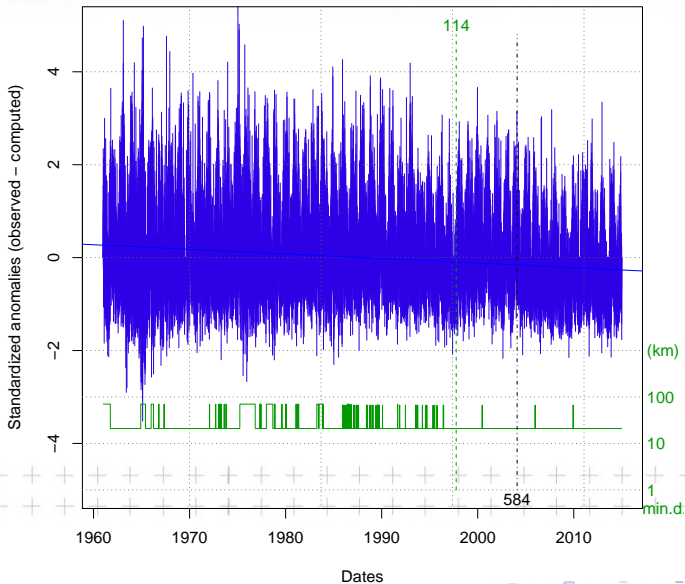


VX-d at B278(71), PALMA DE MALLORCA/SON SAN JUAN



Relative homogeneity

VX-d at 1024E(7), SAN SEBASTIÁN,IGUELDO



Windowed SNHT histogram

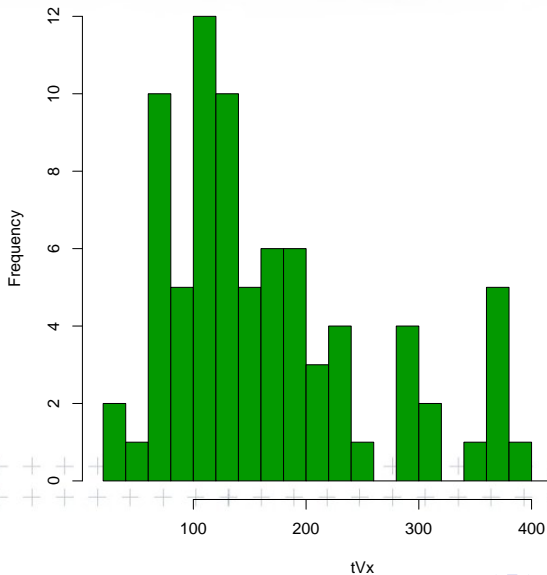


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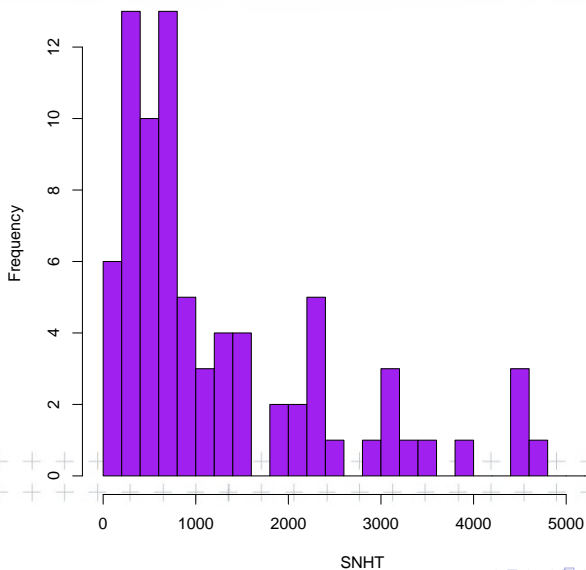


Histogram of maximum tv



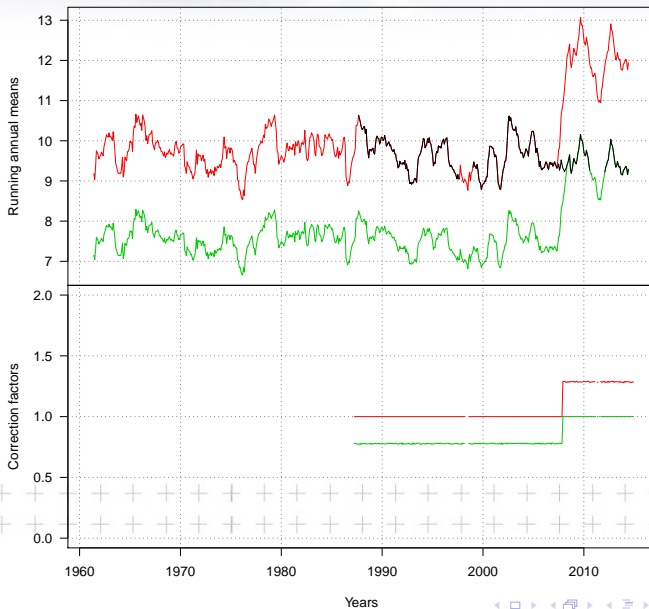
Complete SNHT histogram

Histogram of maximum SNHT



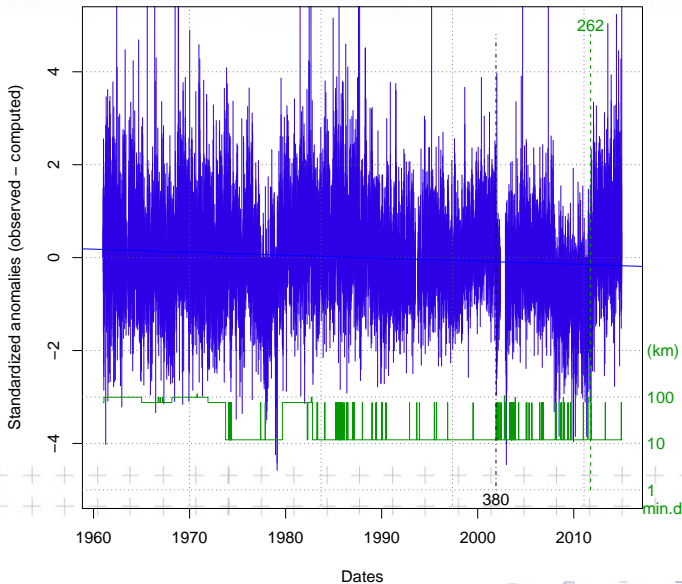
Abnormal series reconstruction

VX-m at 8368U(57), TERUEL



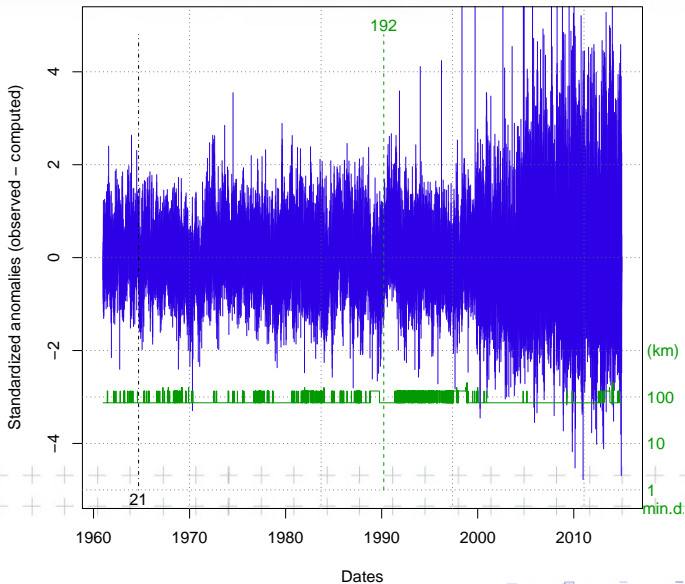
Residual inhomogeneities

VX2-d at 2539(25), VALLADOLID/VILLANUBLA



Change of variance

VX2-d at P535(75), LISBOA GEOFÍSICO



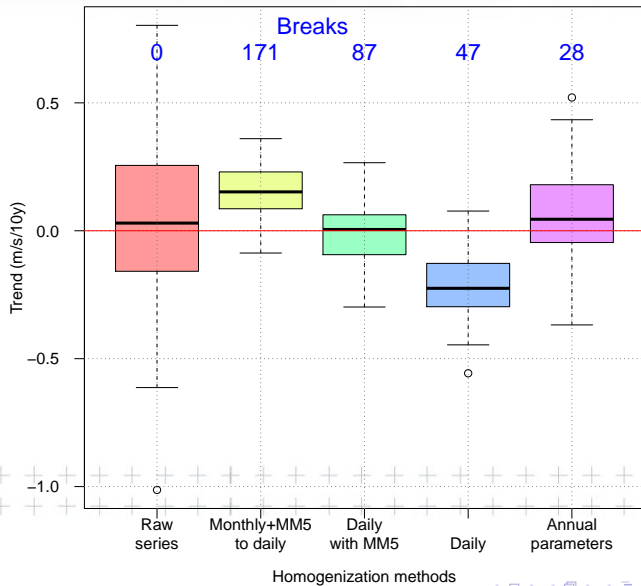
Other homogenizations

Due to these unsatisfactory results, further homogenizations were performed either directly on the daily data or on annual extreme wind indexes, which led to decreasing levels of break detection when compared to the monthly homogenization:

Series	Breaks		
Raw (filled)	-		
Monthly+MM5 to daily	171		
Daily+MM5	87		
Daily	47		
Annual indexes:	Averages	Maximums	Days > 90%
	28	6	25

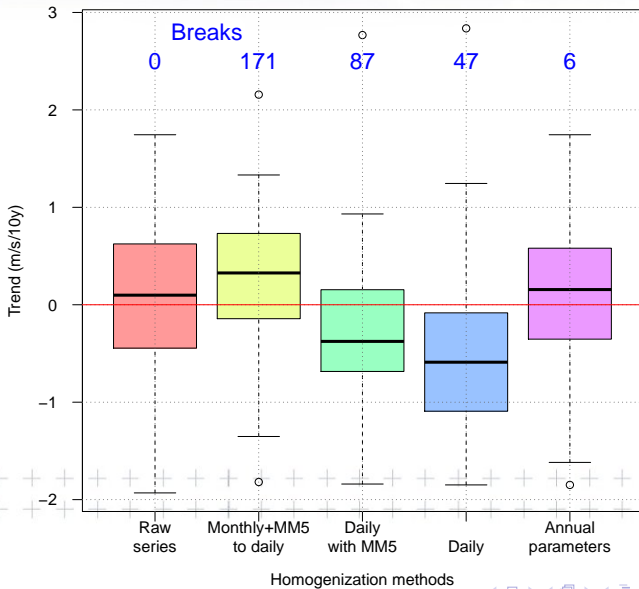
Trends of mean peak gusts

Trends of mean daily peak gusts



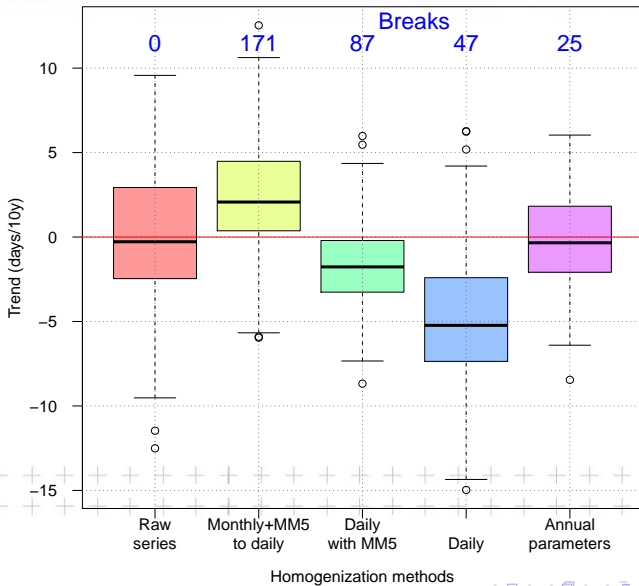
Trends of annual peak gusts

Trends of annual maximum peak gusts



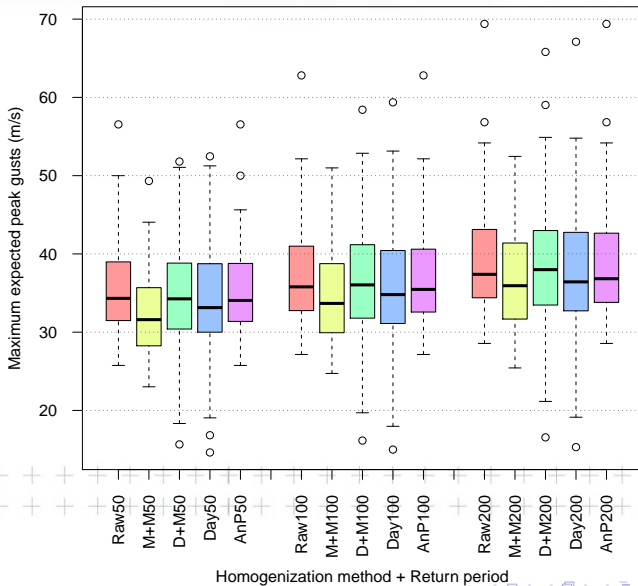
Trends of days > 90%

Trends of nr. of days with peak gust > 90 percentile



Max. expected peak gusts

Maximum expected peak gusts (m/s)
for return periods of 50, 100 and 200 years



- ▶ In many cases, there is no clear evidence suggesting that the homogenization of the daily series is needed (especially for computing trends of average values).
- ▶ But these results, derived from real data, cannot be conclusive, since we do not know the true solution.
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