Homogenization of ECA&D temperature series

- Step 1: constructing long homogeneous series -

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ECA&D

ECA&D dataset

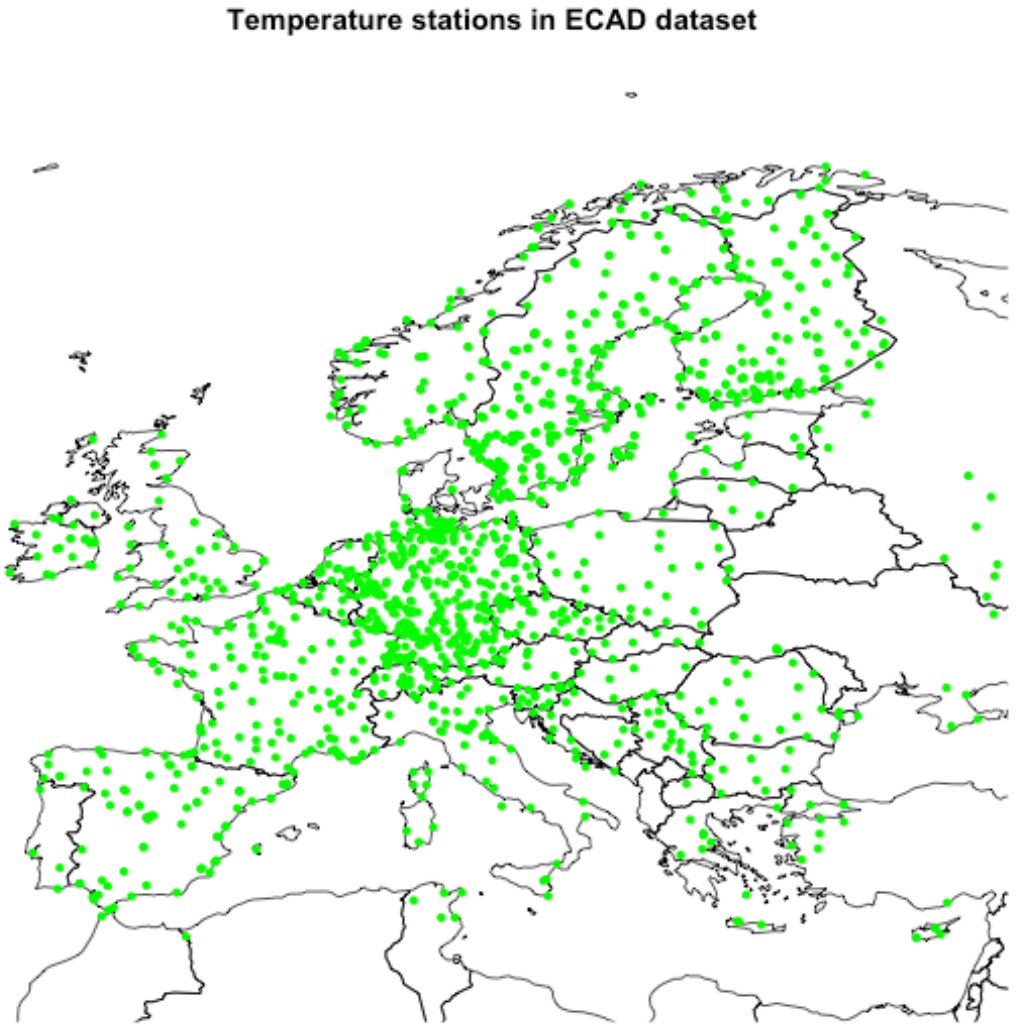
Collection of ground based observations all over Europe

http://www.ecad.eu/

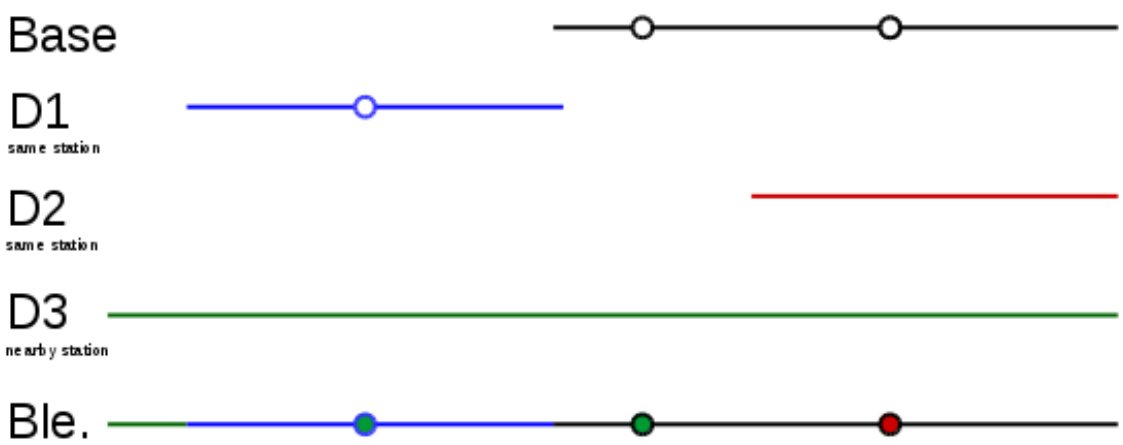
E-OBS gridded data set (newly released version 13.1!)

Blending procedure allows to have longer series (but inhomogeneities are introduced)

Long homogeneous temperature series will improve quality of E-OBS

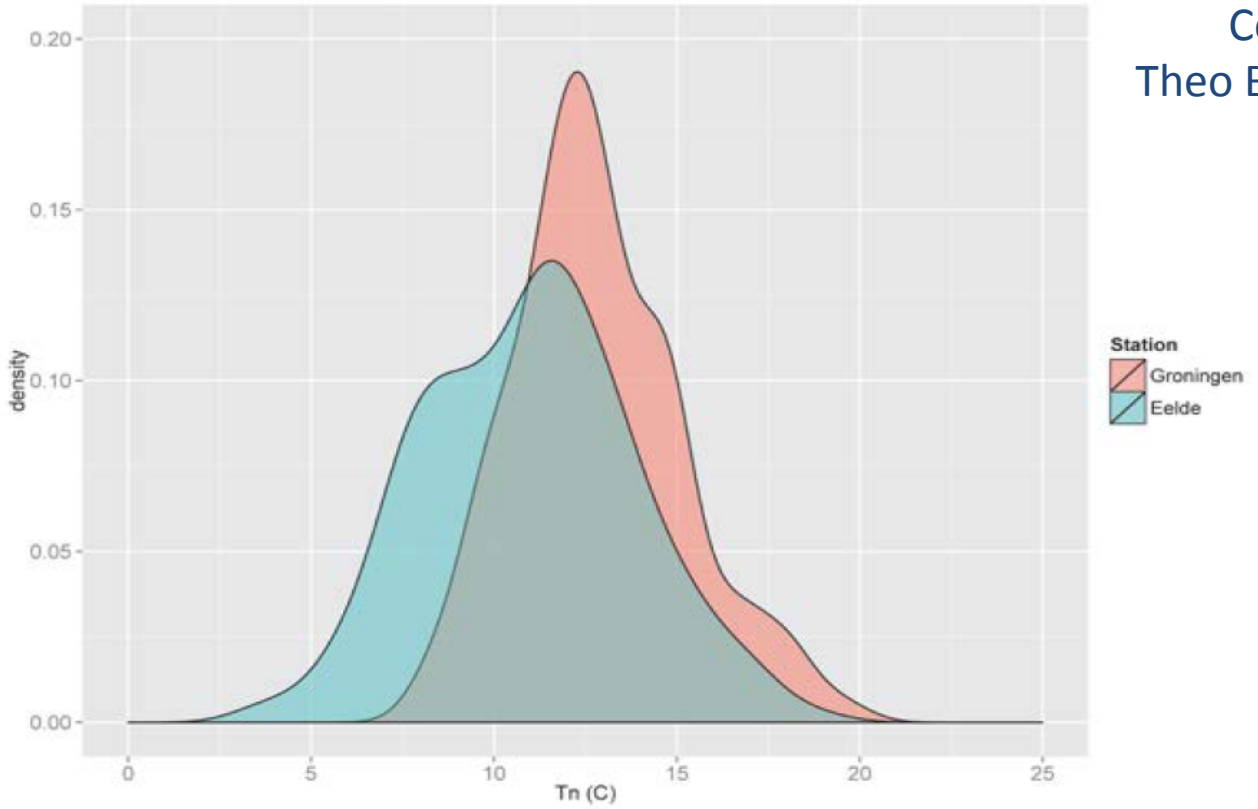


The blending procedure



During the last century several stations have been moved (i.e. from city to airport).
The blending procedure aims at obtaining long series, integrating the gaps in the base series with data coming from surrounding stations or new instruments of original station.

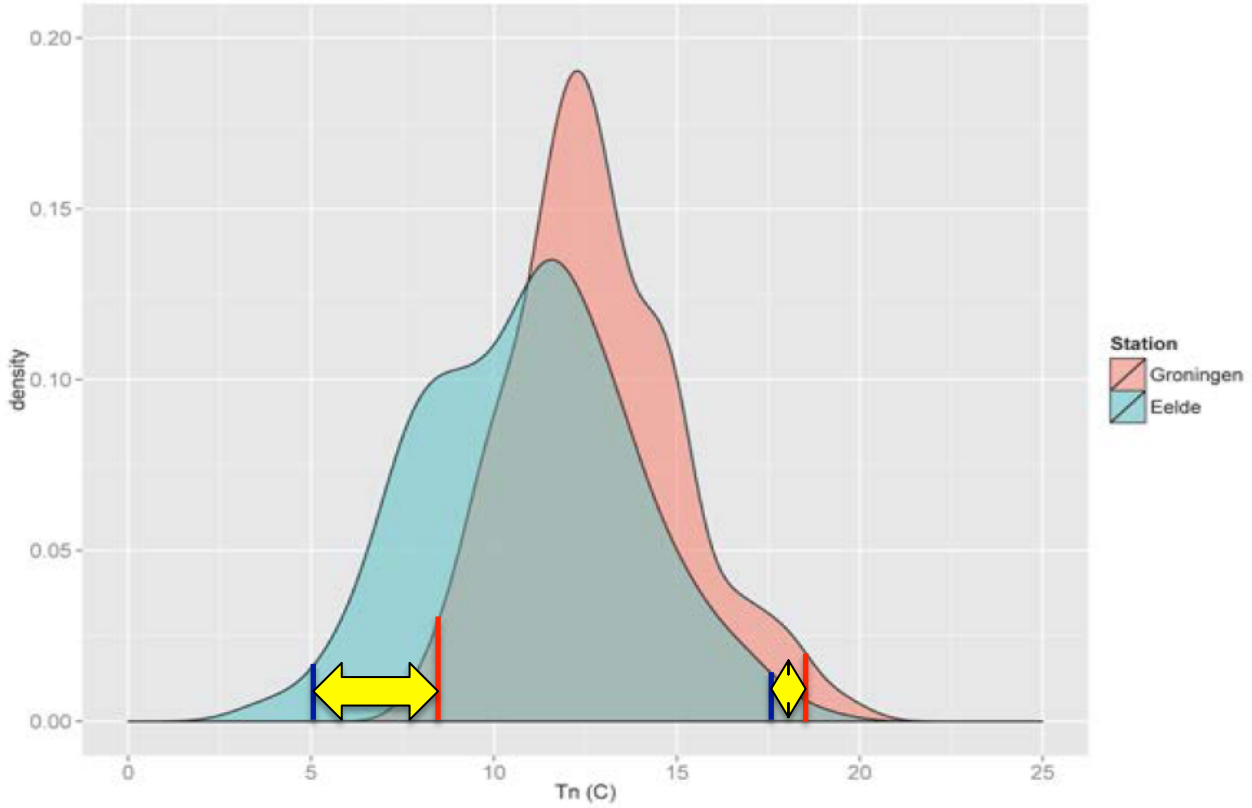
But…



Courtesy of
Theo Brandsma,
KNMI

... donating series have different statistic features and need to be corrected to be homogeneous with the base series.

Quantile matching (Trewin et al.,2012)



Adjustments depend on the quantiles of the distribution, aiming at shifting and “squeezing” the donating temperature distr.

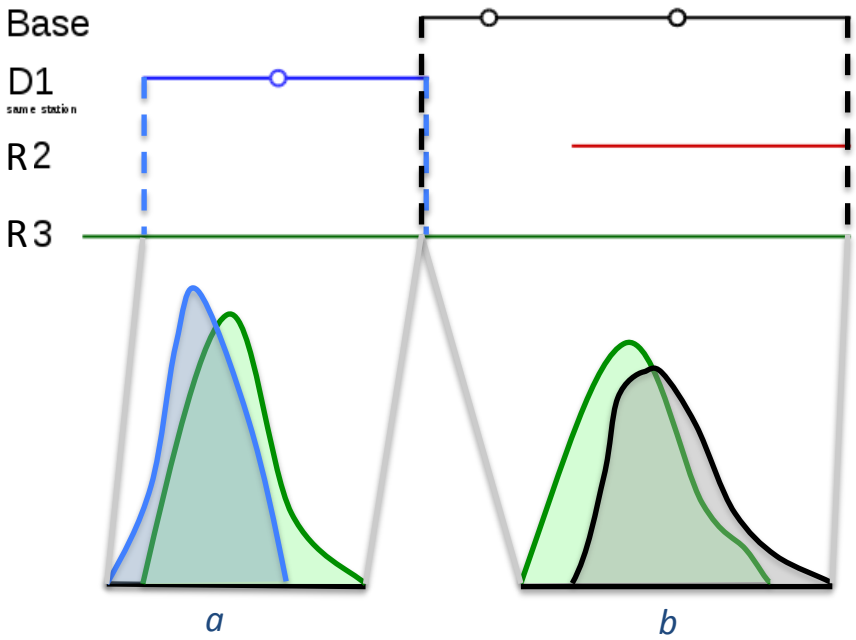
Transfer Function calculation

OVERLAP between basis (B) and donating (D) series: Transfer Function based on quantile matching.

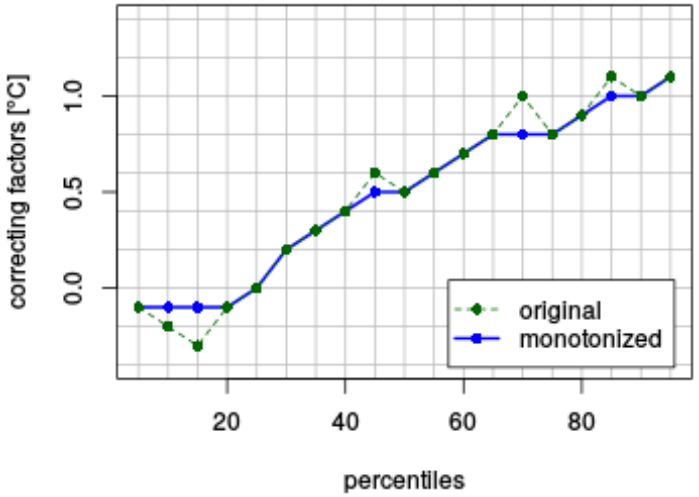
$(B\text{-}D)$

NO OVERLAP: use of reference series (R), difference of two Transfer Functions.

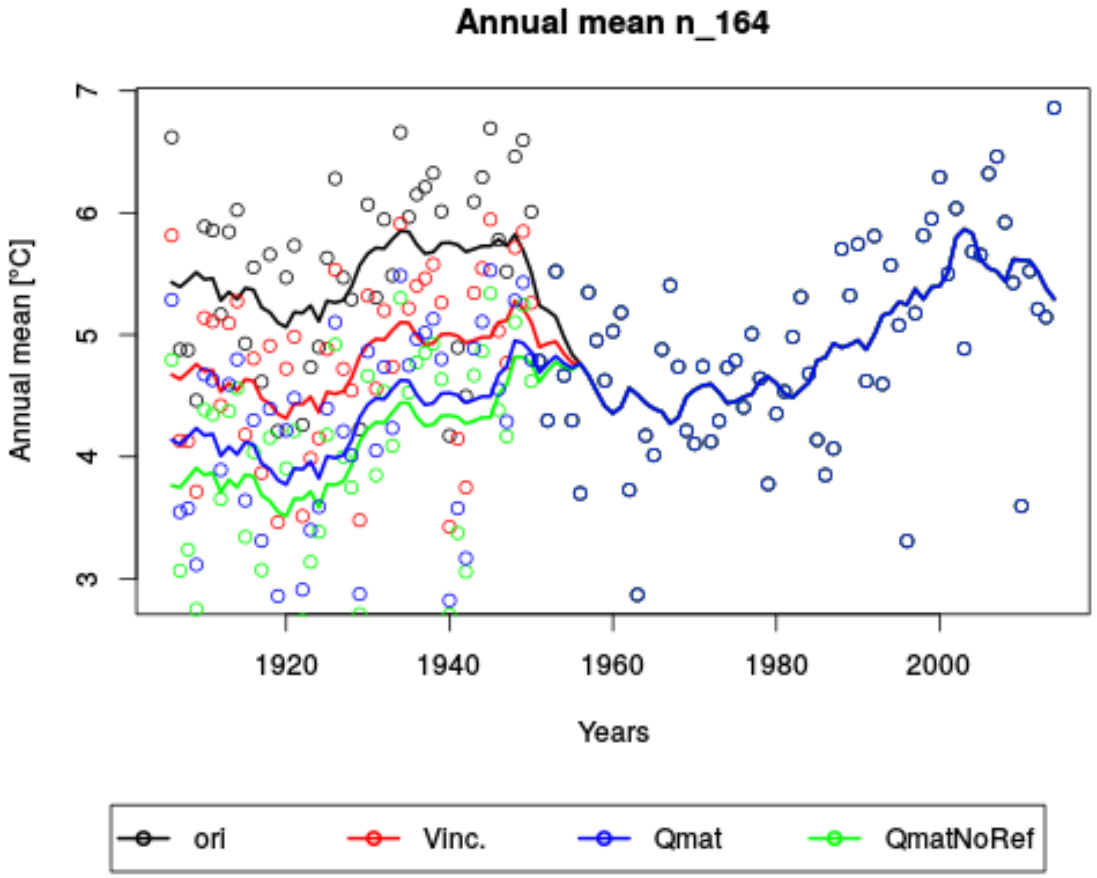
$(B\text{-}R_a)\text{-}(D\text{-}R_b)$



Obtained adjustments are smoothed and monotonized



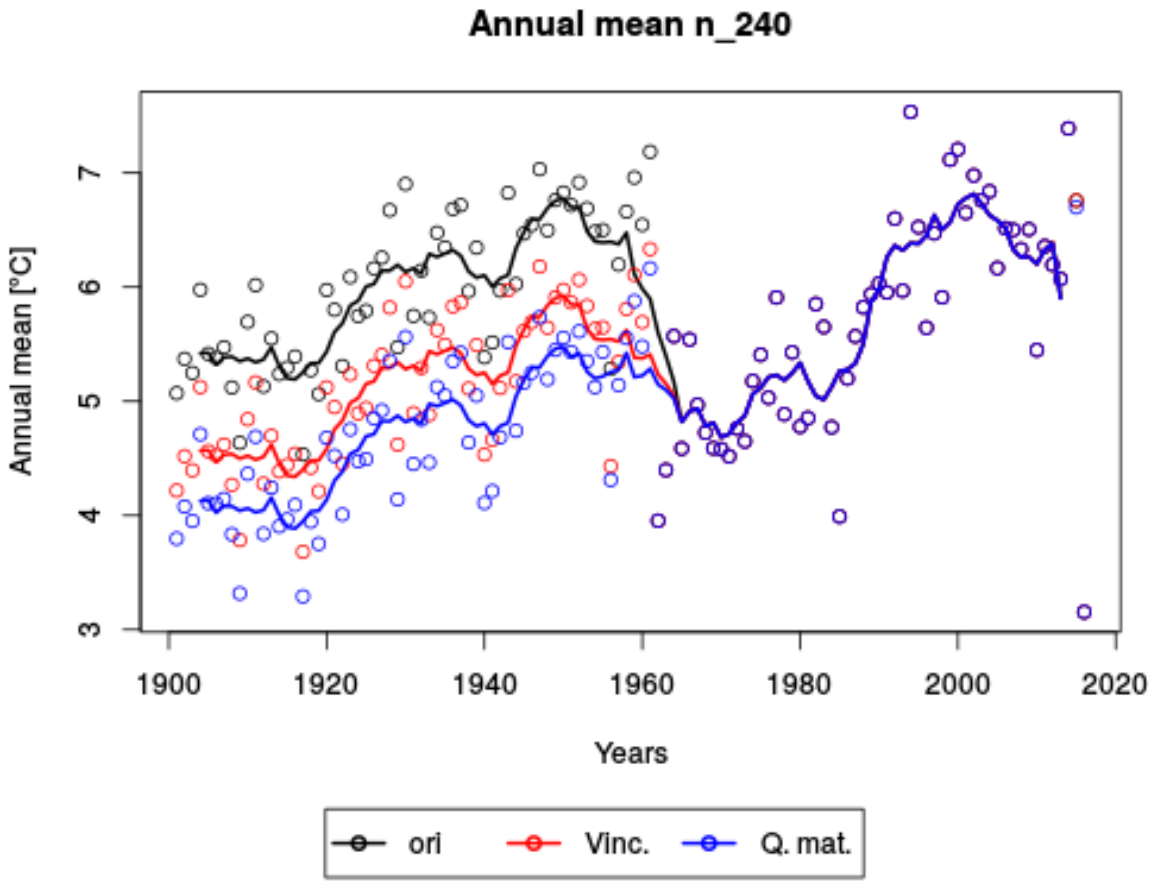
Groningen – Eelde (NL)



Vincent et al. (2001) method (red):
yearly cycle of adjustments by comparing monthly means before and after the given break.
Low capability to correct extremes and to deal with single data-gap-filling.

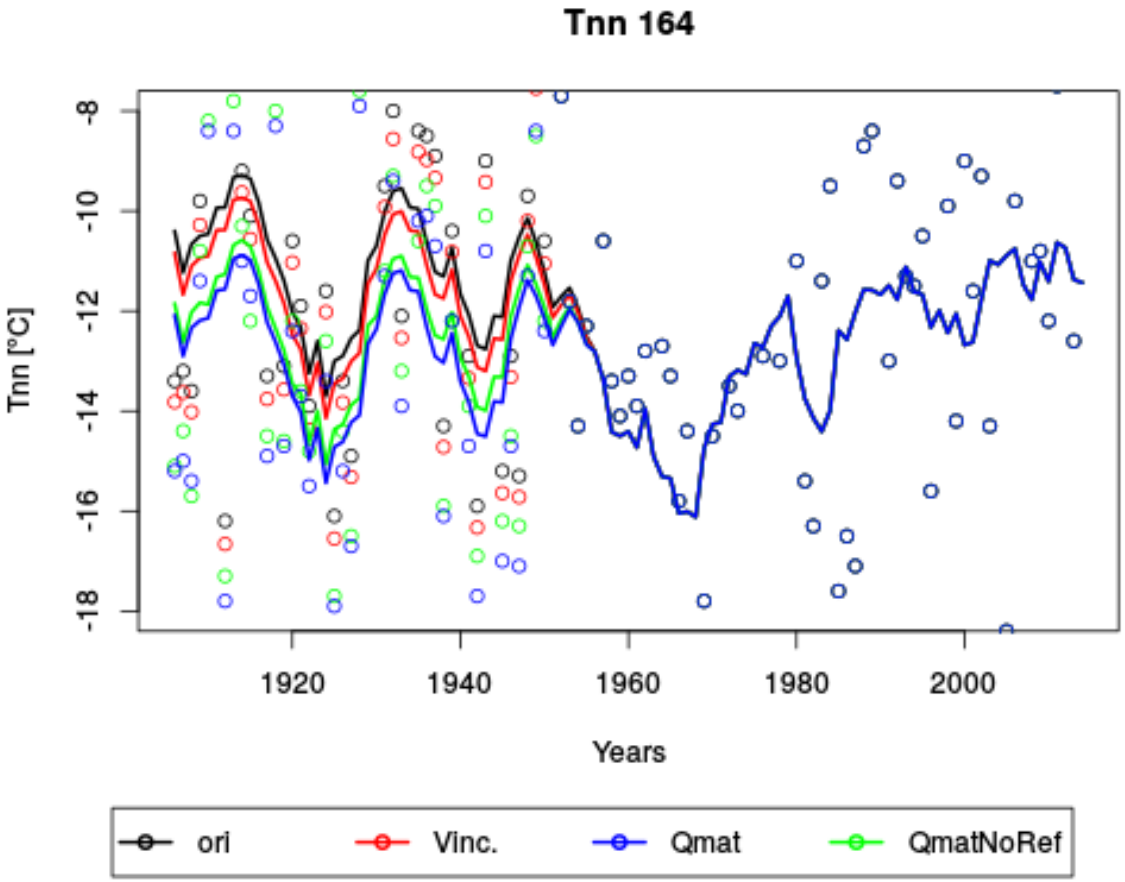
trend original bl series:
-0.03 °C/dec
trend Qmat hom.:
+0.14 °C/dec

Geneva – Geneva Airport (CH)

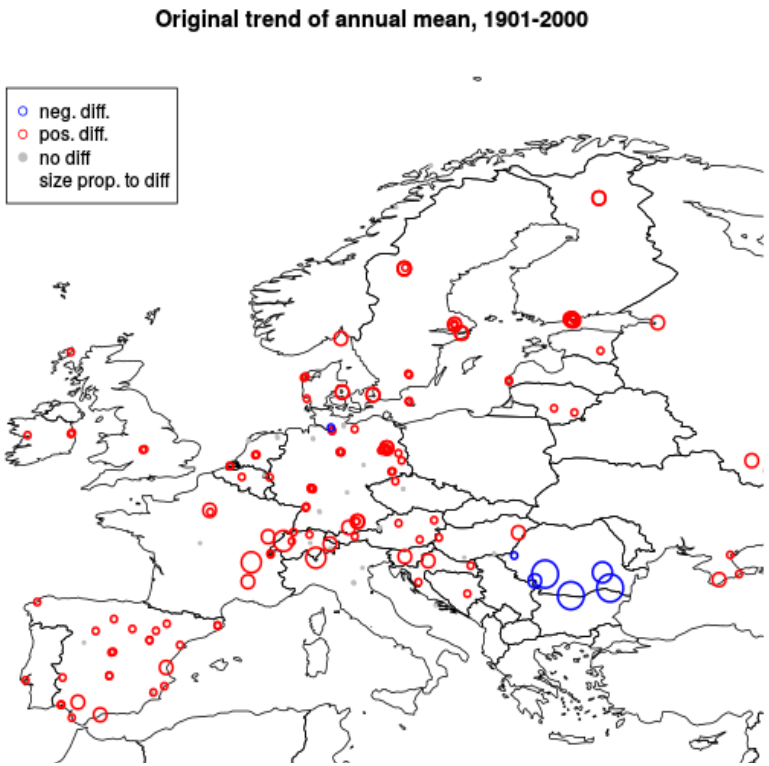


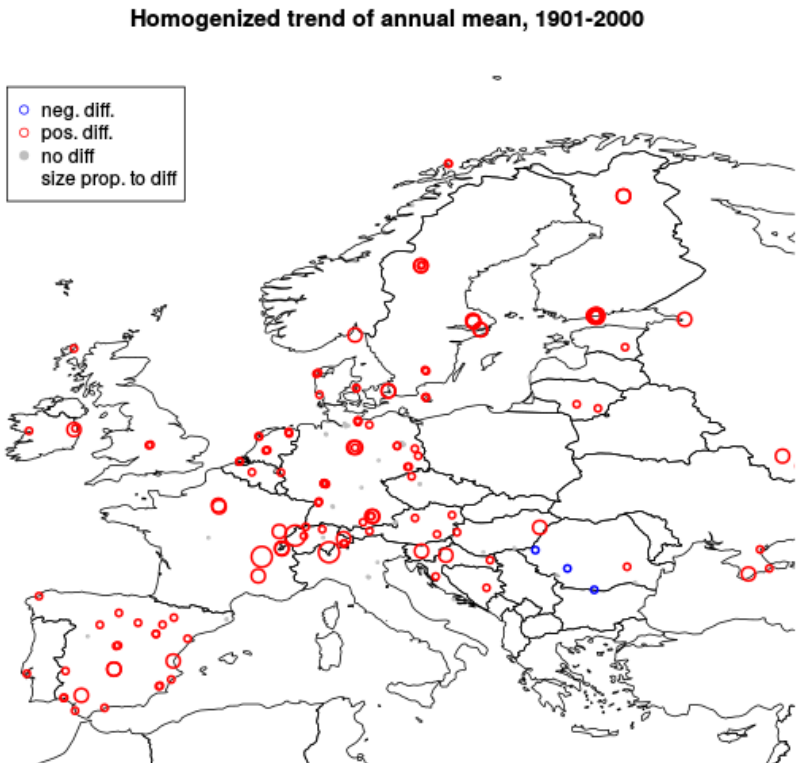
trend original bl series:
+0.07 °C/dec
trend Qmat hom.:
+0.22 °C/dec

Back to Groningen: extreme values



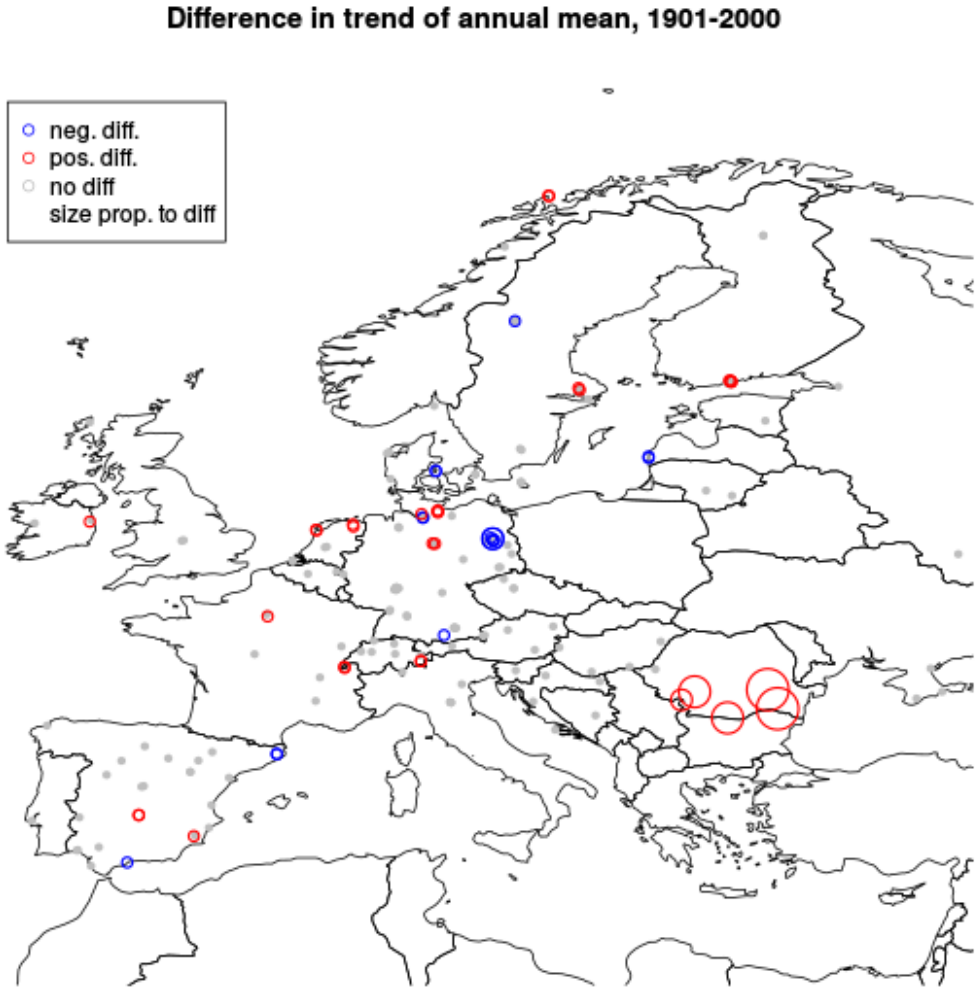
Adjusting ECA&D dataset: 1901-2000





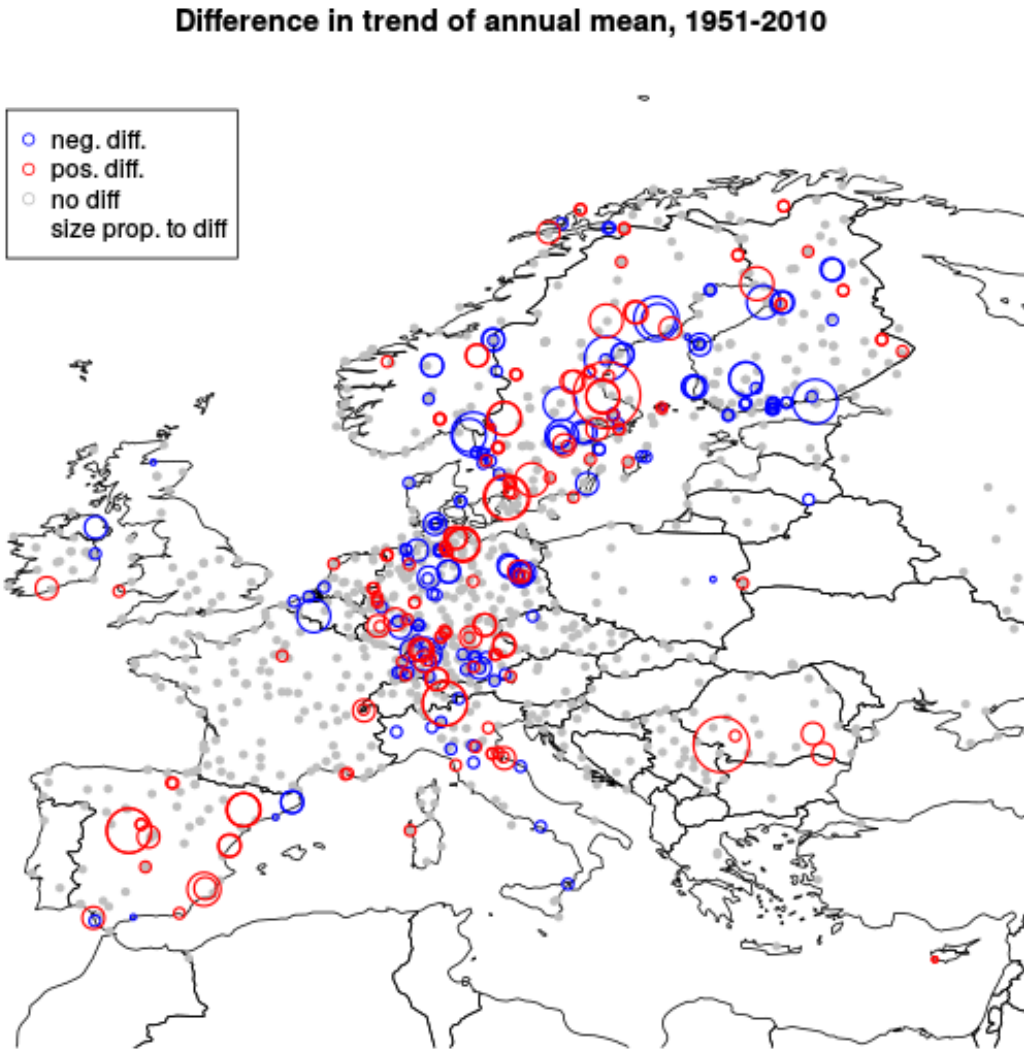
Less spatially diverse trends and remotion of almost all negative trends.

1901-2000 : difference in trends

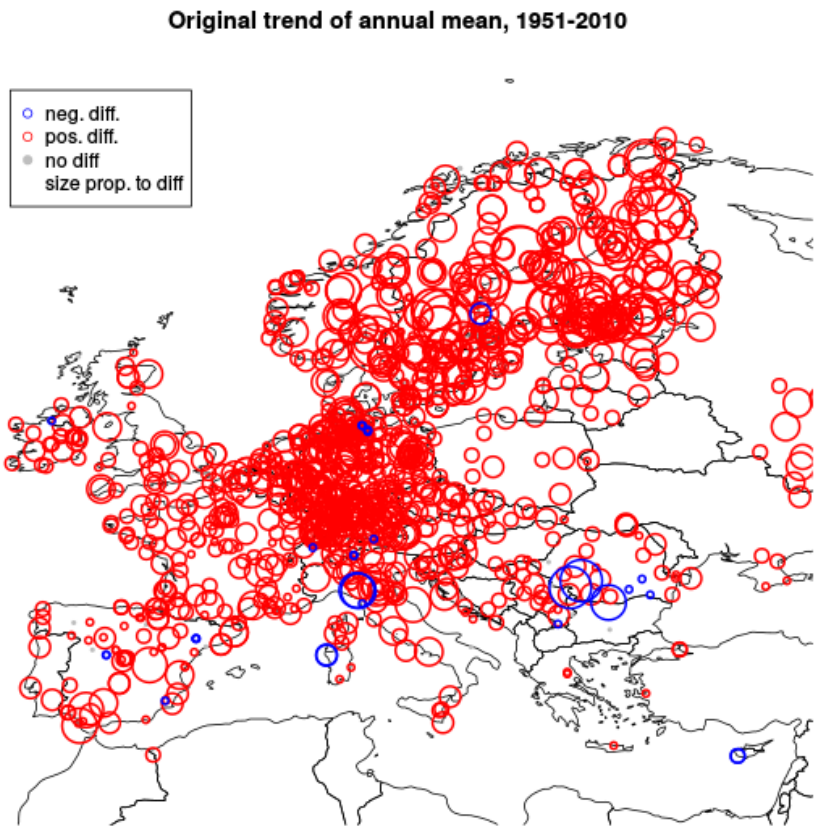


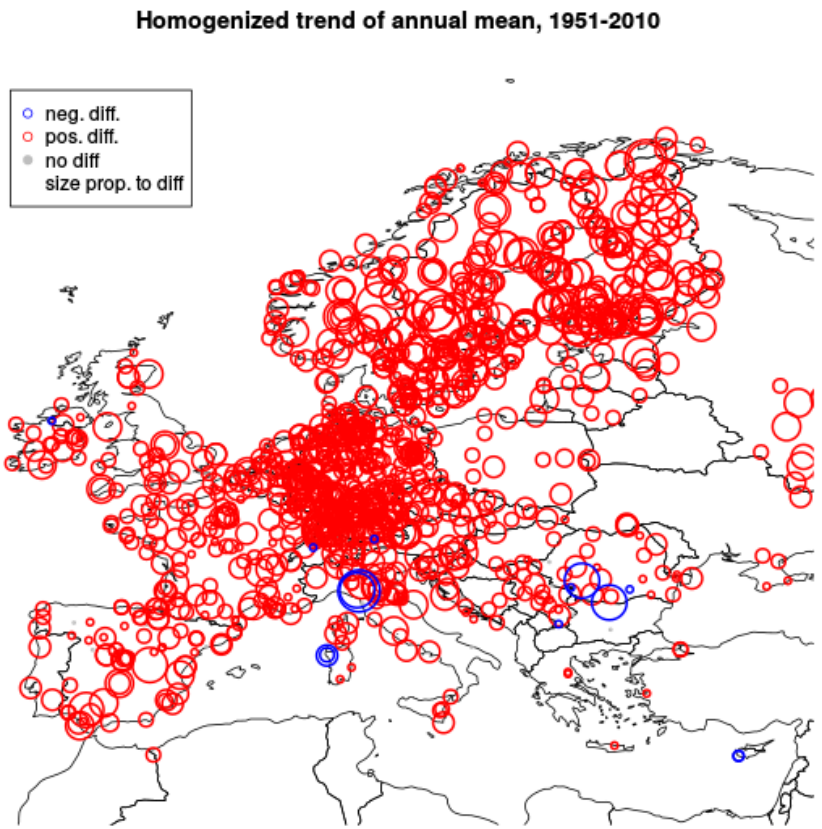
Different sign and magnitude of the differences depends on the amplitude in the adjustments and on the time interval they have been applied to.

1951-2010 : difference in trends



Adjusting ECA&D dataset: 1951-2010





General improvement! But…

Summary and further work

New blending procedure, including homogenization based on the Trewin et al. (2012) method, has been developed

Blended series whose original donating series were already nearly homogeneous show clear improvement in the final product

Improvement in the spatial homogeneity of the trends in the annual means is evident

Extreme values are well corrected, but, being less robust indices, a more strict quality check is needed

Trewin method, coupled with a break detection procedure, will be applied on the ECA&D series, before proceeding with the blending

New homogenized ECA&D blended series
will be used to improve the quality of E-OBS