Challenges in homogenizing long series. Two examples from the Balearic Islands.

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12^{th} Seminar for Homogenization and Quality Control in Climatological Databases *et alia* (Budapest, May 5-8, 2026)

Introduction

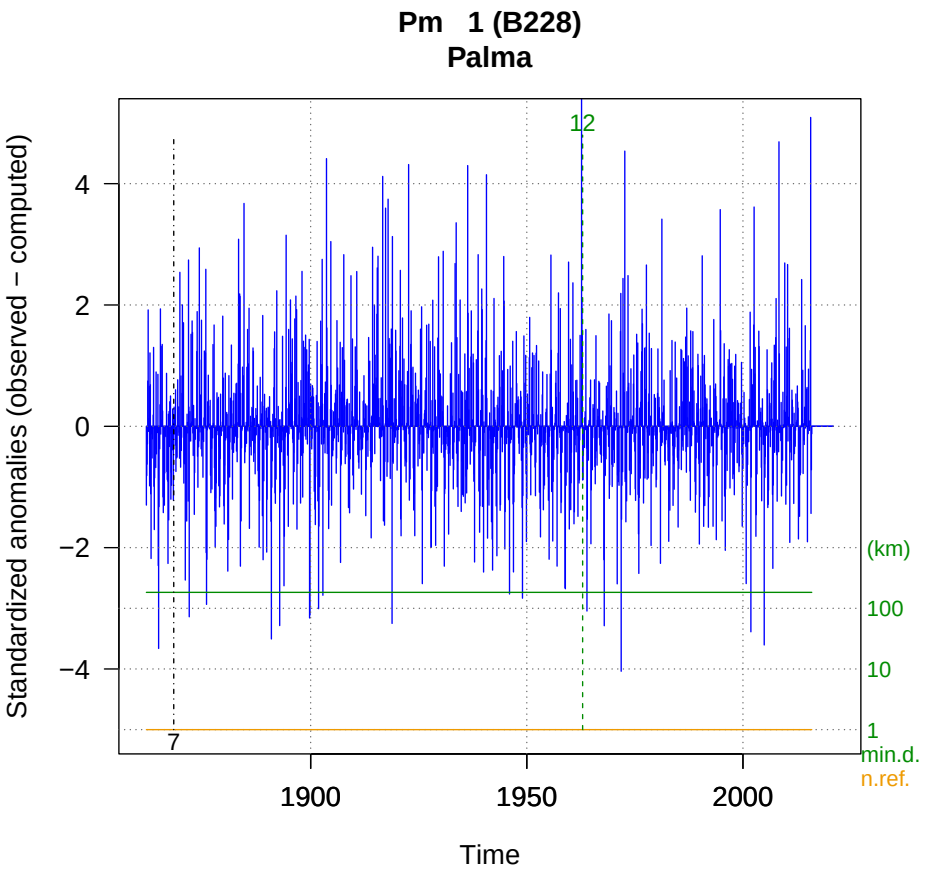
The relative homogenization of climatological series is based on comparing correlated series to distinguish anomalous biases in individual stations from the variability common to all stations, inherent in the climate signal. However, we often lack access to observed series with which to make these comparisons. This is the case with isolated stations, but the same applies to very old series, when the density of observatories was much lower than it is today.

This is exemplified here by the homogenization of two long series of monthly temperature and precipitation from two Balearic observatories (Palma and Mahon) by means of Climatol 4.4-2, RHtestV4 (absolute and relative) and a subjective implementation of the Craddock test, using 20CRv3 series as references. The metadata consists solely in relocation dates.

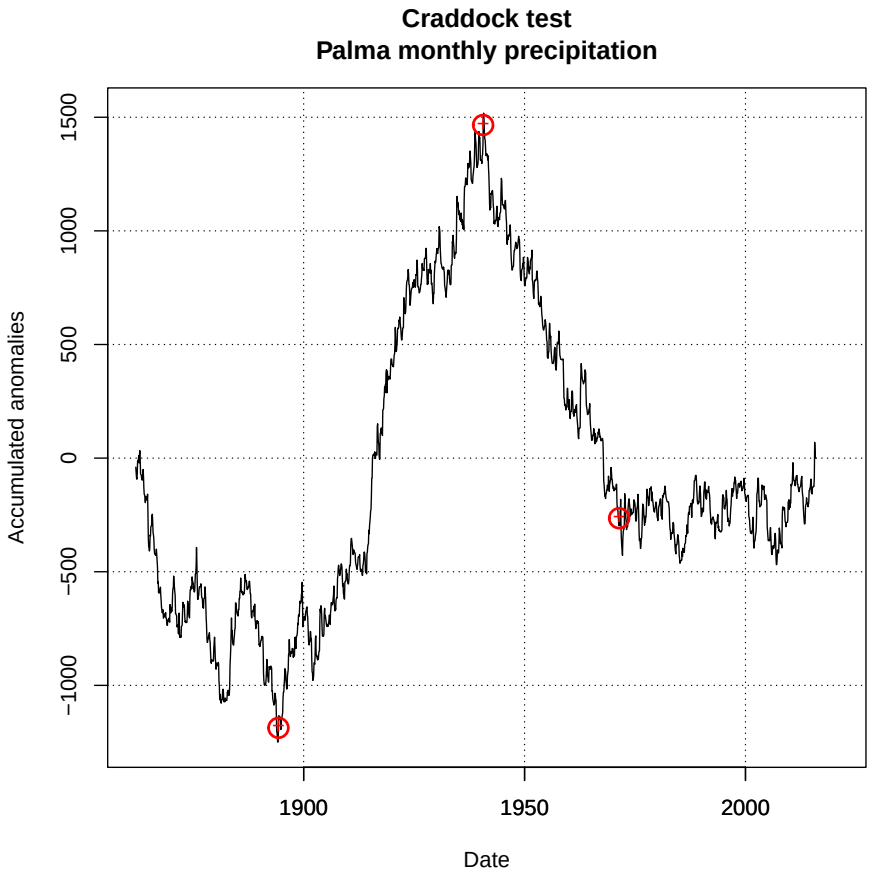
The studied series begin in 1862 (Palma) and 1865 (Mahon). Both observatories are still active, but the reference 20CRv3 reanalysis series end in 2015, which is the effective final date of these homogenization exercises.

Palma precipitation tests

Climatol: No breaks detected



Craddock: 3 subjective break-points



RHtestV4: 1 (absolute) and 3 (relative) break-points

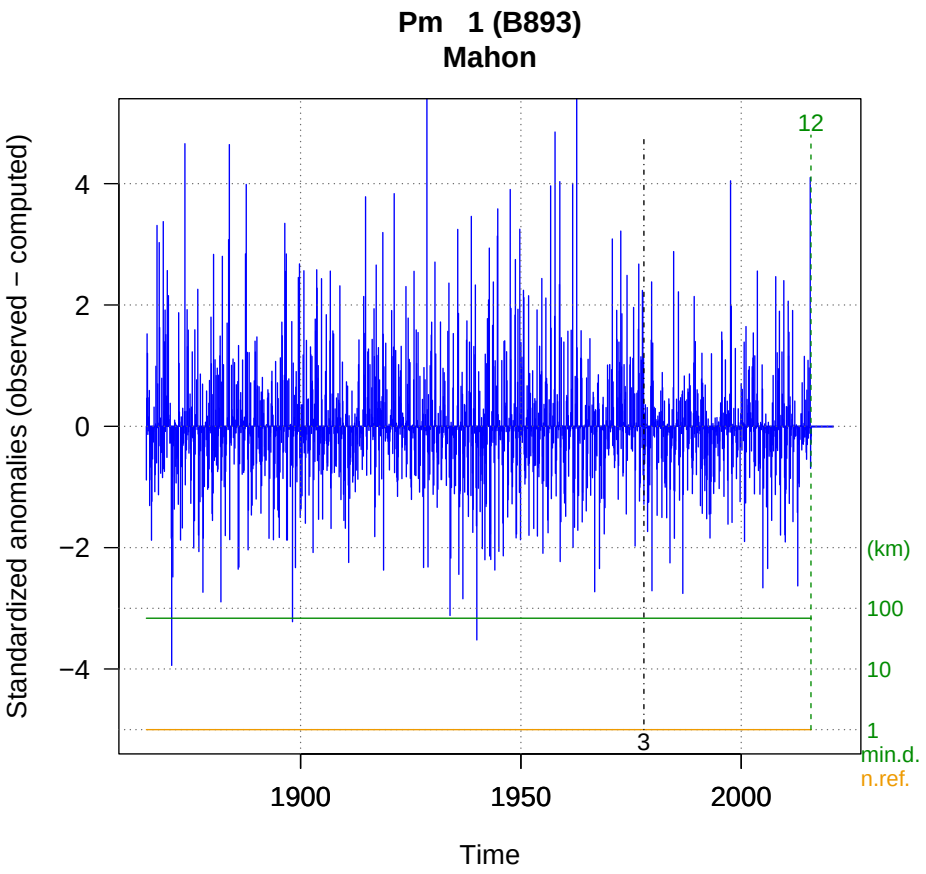
Palma precipitation break-points

Orange background: between 2 and 3 years away from the relocation

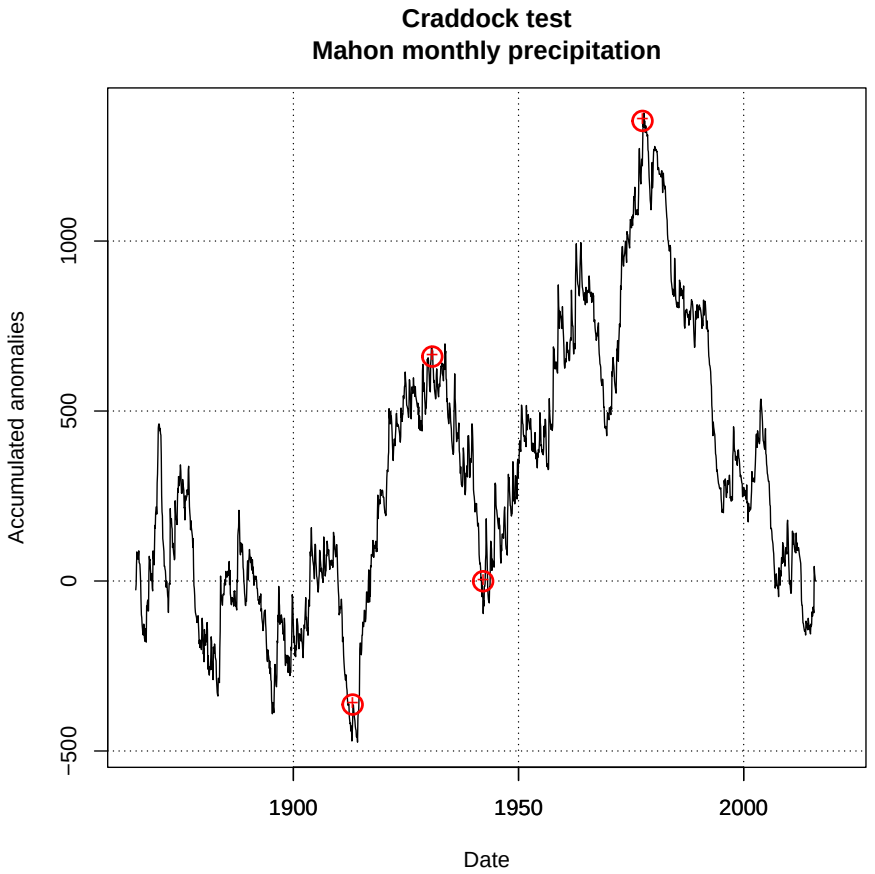
Palma monthly precipitation				
Relocations	**Climatol**	**RHtest-abs.**	**RHtest**	**Craddock**
			1868/9	
				1894/4
1917/1				
1938/5		1940/10	1940/10	1940/8
			1943/7	
				1971/6
1978/2				

Mahon precipitation tests

Climatol: No breaks detected



Craddock: 4 subjective break-points



RHtestV4: 0 (absolute) and 1 (relative) break-point

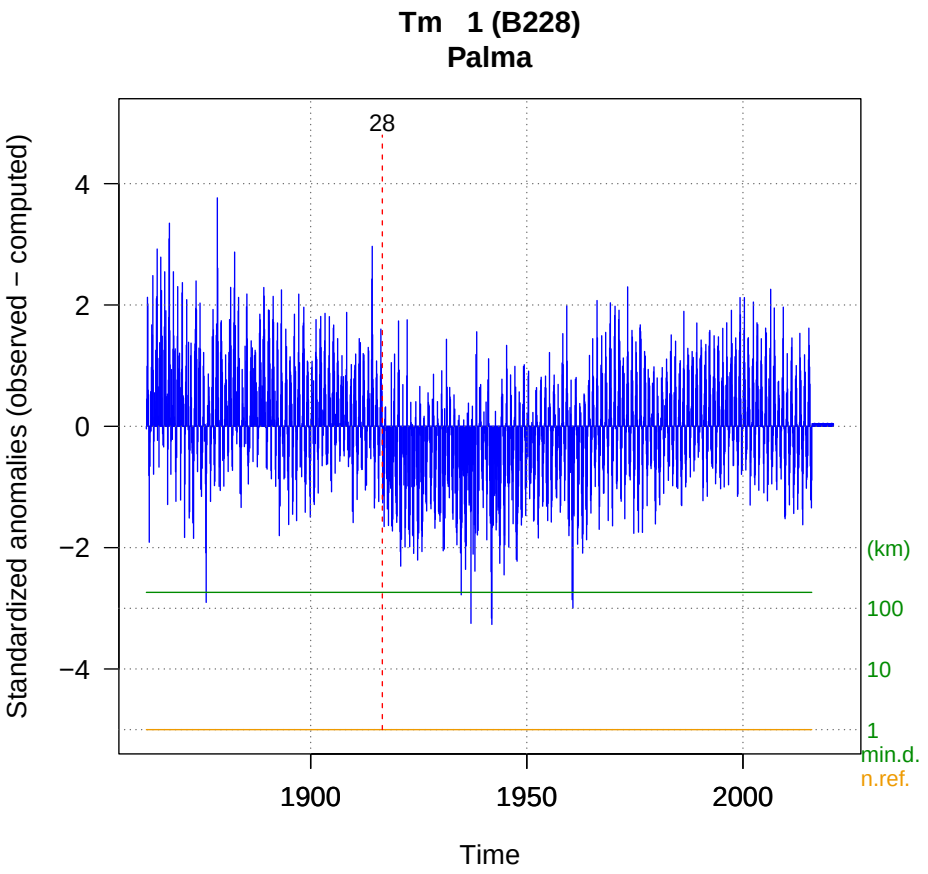
Mahon precipitation break-points

No relocation detected as a break-point

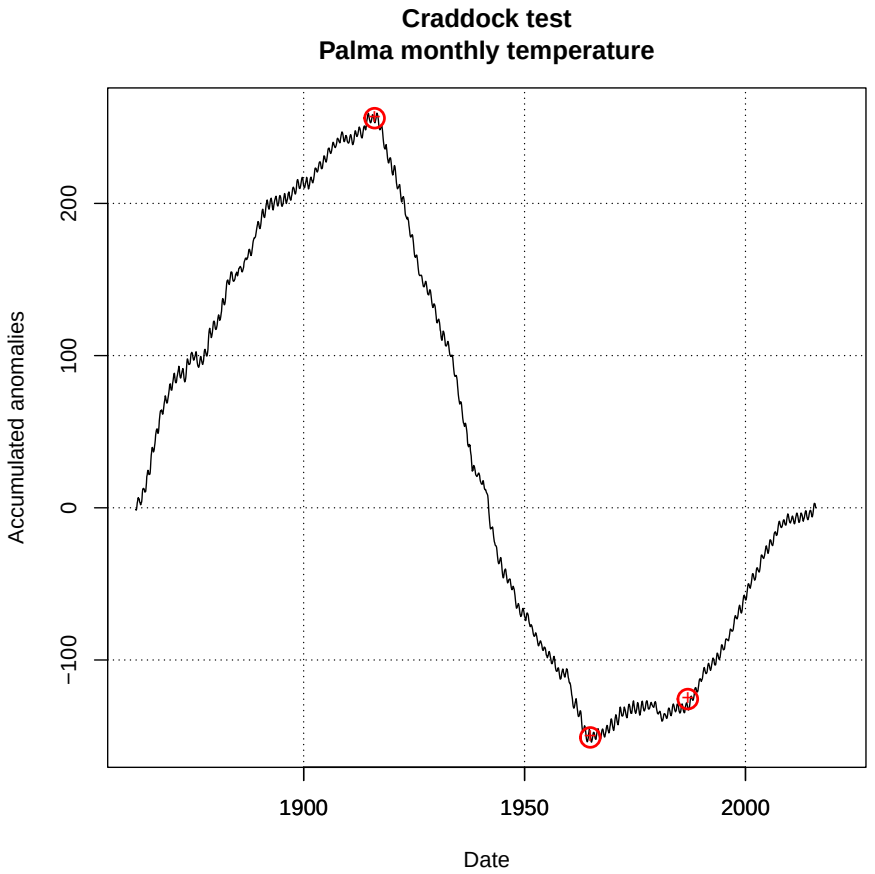
Mahon monthly precipitation				
Relocations	**Climatol**	**RHtest-abs.**	**RHtest**	**Craddock**
			1881/5	
1885/1				
				1913/3
1924/1				
				1930/11
1939/2				
				1942/3
1970/10				
				1977/7

Palma temperature tests

Climatol: 2 break-points detected



Craddock: 3 subjective break-points



RHtestV4: 6 (absolute) and 3 (relative) break-points

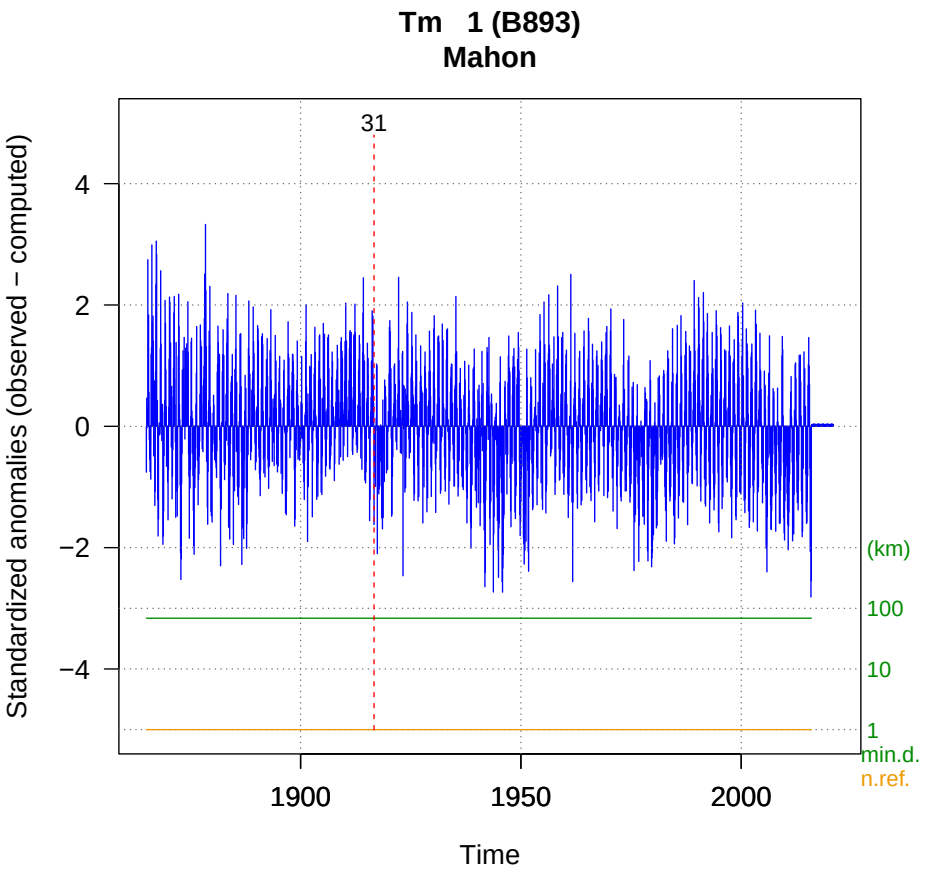
Palma temperature break-points

Green background: less than 1 year away from the relocation

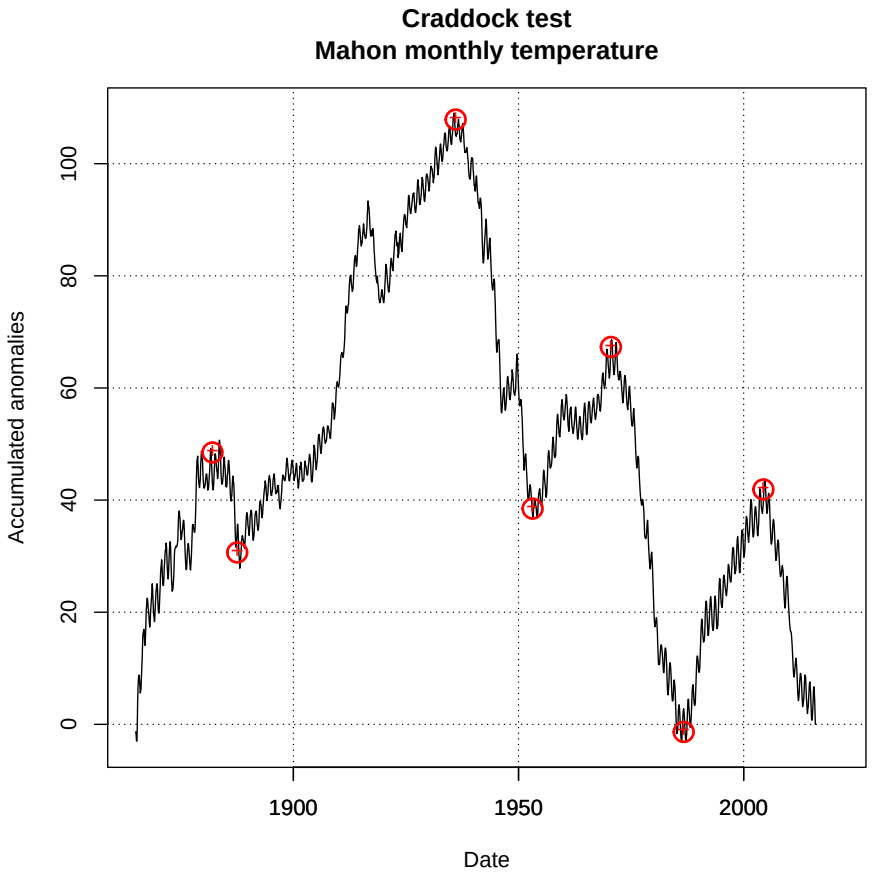
Palma monthly temperature				
Relocations	**Climatol**	**RHtest-abs.**	**RHtest**	**Craddock**
			1882/7	
1917/1	1916/8			1916/2
1938/5				
		1945/1		
	1964/2	1964/1		1964/11
			1969/1	
1978/2				
		1987/6		1986/12
		1990/10		
		1993/11	1993/11	
		2014/8		

Mahon temperature tests

Climatol: 1 break-point detected



Craddock: 7 subjective break-points



RHtestV4: 3 (absolute) and 10 (relative) break-points

Mahon temperature break-points

Green background: less than 1 year away from the relocation.
Yellow: between 1 and 2. Orange: between 2 and 3 years + 1 month.

Mahon monthly temperature				
Relocations	**Climatol**	**RHtest-abs.**	**RHtest**	**Craddock**
			1867/5	
		1881/8		1882/1
1885/1				1887/7
	1916/9			
1924/1				
1939/2			1937/4	1936/1
			1952/10	1953/2
1970/10		1970/11	1971/10	1970/7
			1975/8	
			1981/2	
		1987/6	1987/5	1986/9
2005/3			2004/12	2004/5
			2010/2	
			2010/9	

Concluding remarks

- The consevative detection threshold of Climatol resulted in very few break points in all four tests.
- RHtest detected few breaks in some tests and many in others.
- Craddock appears as a good tool, although lacking objective detection. (Anyway, setting a significance level also implies subjective decisions in other tests.)

-The general lack of agreement within the detected break-points, with very small accordance to relocations dates, ilustrate the difficulty of homogenizing isolated series and the need to revise the results provided by any methodology.

Many thanks for your attention!!!