# DAP, HOM and SPLIDHOM - North East scenarios

Rachel Warren

April 1, 2016

This document should be considered in conjunction with chapters five and six of the thesis 'Benchmarking the Performance of Daily Temperature Homogenisation Algorithms'. These chapters explain the validation framework used in the assessment of algorithms and a comparison of performance across algorithms alongside a reminder of the differences between scenarios.

This document provides a more detailed insight into the performance of the DAP, HOM and SPLIDHOM algorithms when applied to the North East scenario 1. These three algorithms are considered together as their performance is similar. These algorithms did not homogenise all stations, though all stations were assessed by them and the results given are the best these versions of the algorithms were capable of. In spite of this their performance is expected to be lower than other algorithms because of fewer stations being altered. It should be noted that the versions of these algorithms run by the homogenisor were not the most up to date available and therefore further investigation with newer versions would be a beneficial area of future work.

## 1 North East summary

DAP, HOM and SPLIDHOM left the greatest proportion of station biases unchanged by homogenisation, though they did also all reduce the bias of just over half the stations in the region for scenario one, which was the only scenario they tackled. Owing to such a large number of stations being unchanged their reduction of the sum of absolute biases in the region lagged behind that of other algorithms as did their reduction of the regional RMSE. For individual station RMSEs they once more reduced over half, but also showed one of the greatest tendencies to make individual station RMSEs worse. Ranking the algorithms between themselves sees HOM being the best in terms of number of station biases improved and not made worse, but DAP is best going on regional bias reduction. For RMSE the rankings are the same.

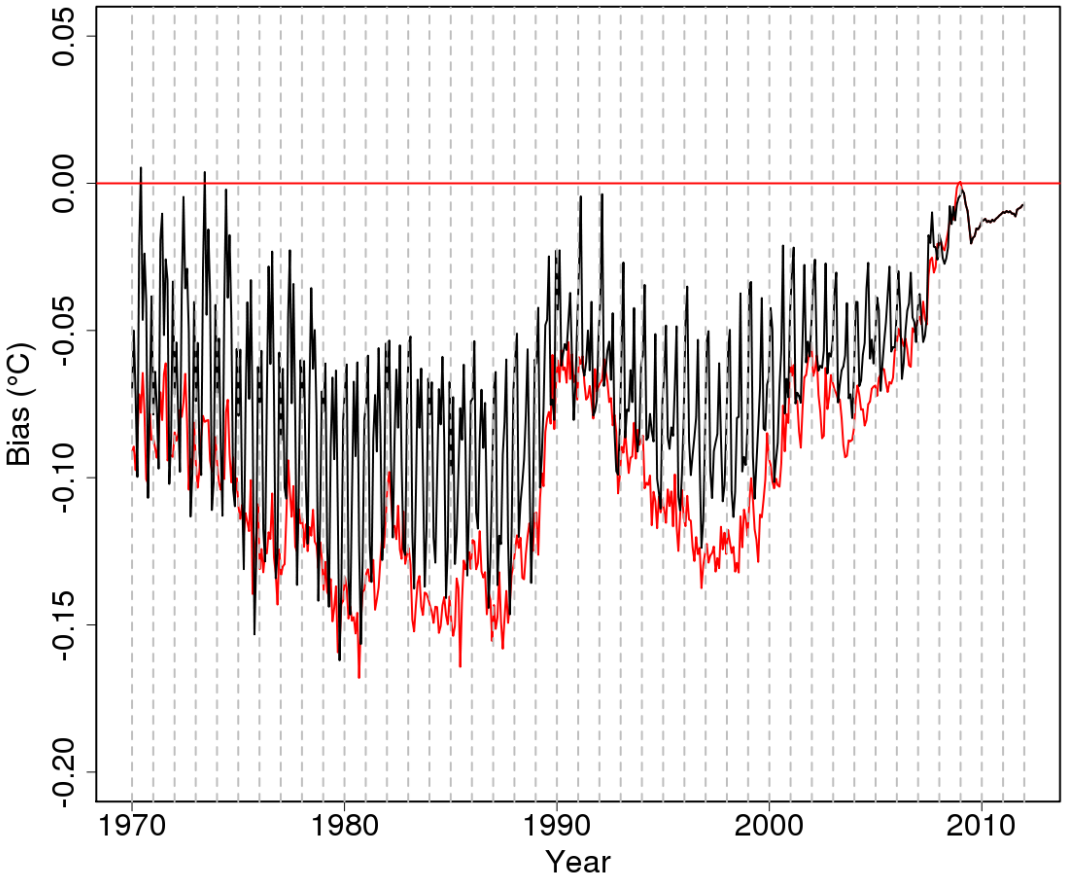



Figure 1: A plot to illustrate the progression of bias over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released bias and black lines indicate the returned bias after homogenisation by DAP.

For the North East scenario one a very large proportion of the clean station trends were significant. DAP, HOM and SPLIDHOM all returned one fewer significant trends than there were in the released data (23 fewer than there were in the clean data), but their frequency of significant trends with values that approximately matched those found in the clean data was better than the proportions had been on release with HOM doing best of the three. SPLIDHOM had the best regional trend recovery and also improved the most individual station trends, but it made most worse as well out of these three algorithms. All three lagged behind other algorithms in terms of the number of individual station trends improved, whilst also having amongst the greatest tendencies to make individual station trends worse. For station variabilities these three algorithms were improving fewest and making the second most worse, this is surprising given that these are the only algorithms that specifically assess higher order moments. For warm extremes these algorithms showed the lowest tendency to make extremes worse, but they showed

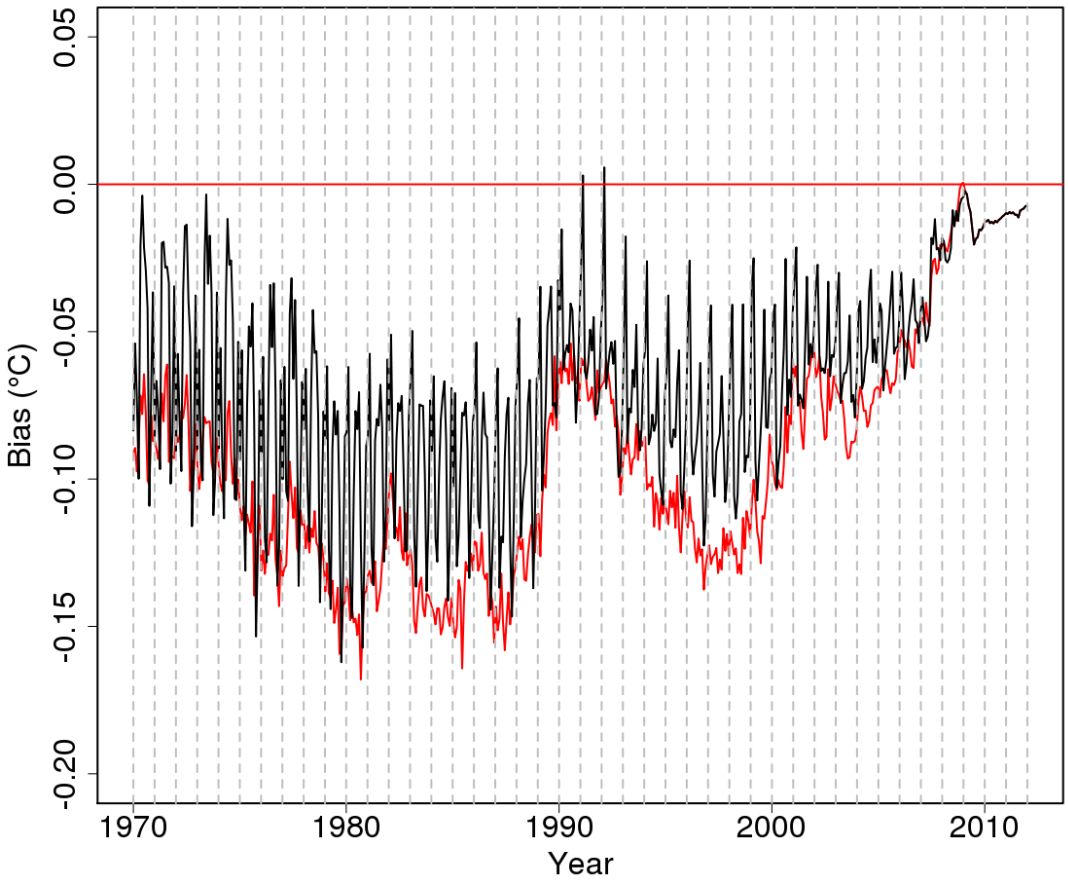



Figure 2: A plot to illustrate the progression of bias over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released bias and black lines indicate the returned bias after homogenisation by HOM.

the highest tendency to make extremes worse for cold extremes.

The hit rate for the detection algorithm behind these three algorithms was very low with a comparatively very high false alarm rate. This is likely caused by the assigning of change points to predominantly the first day of the year.

It is not possible to comment on the impact of different scenarios for these algorithms as only scenario one was homogenised by these algorithms in this region.

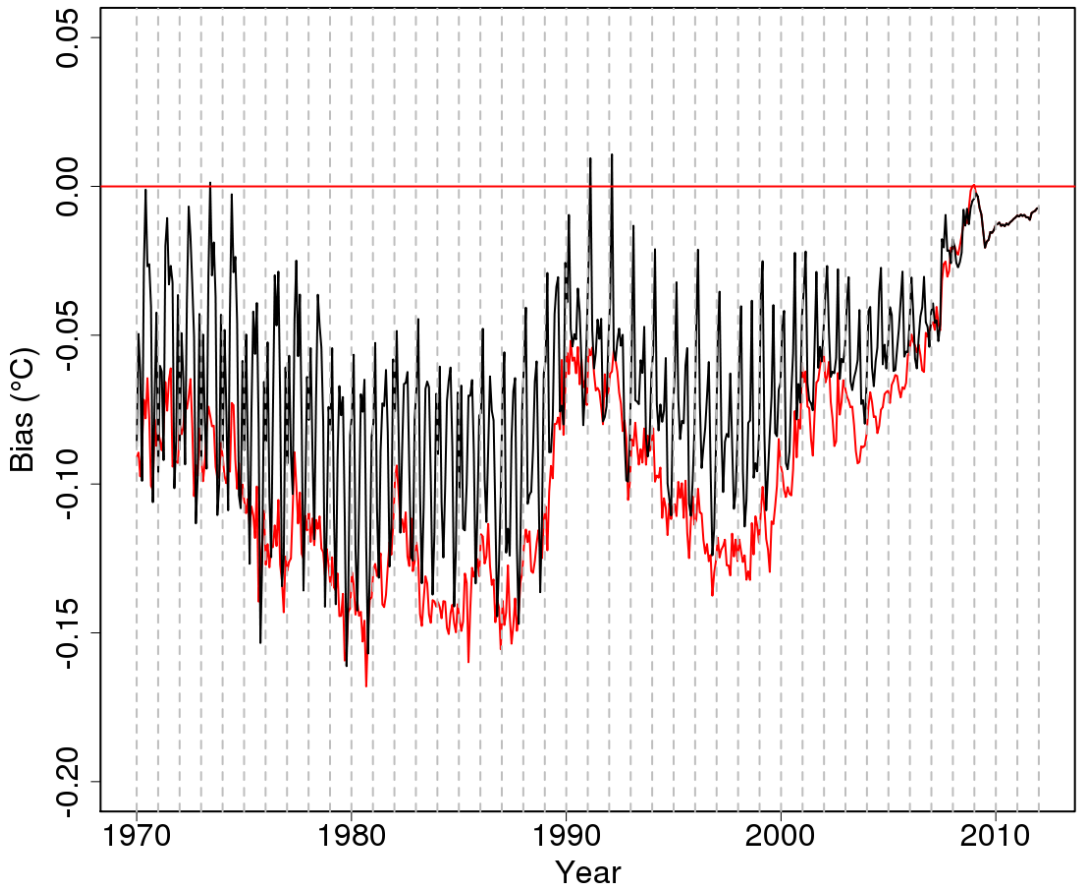



Figure 3: A plot to illustrate the progression of bias over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released bias and black lines indicate the returned bias after homogenisation by SPLIDHOM.

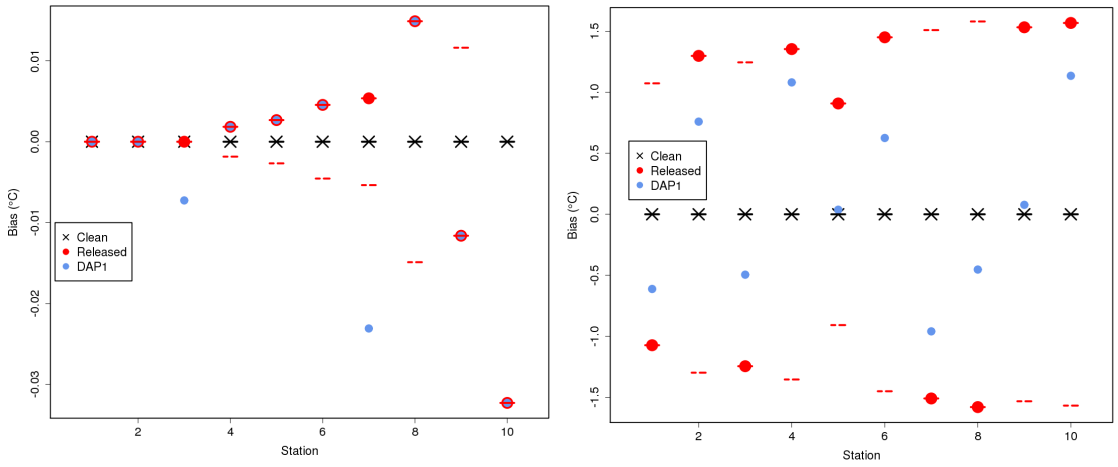
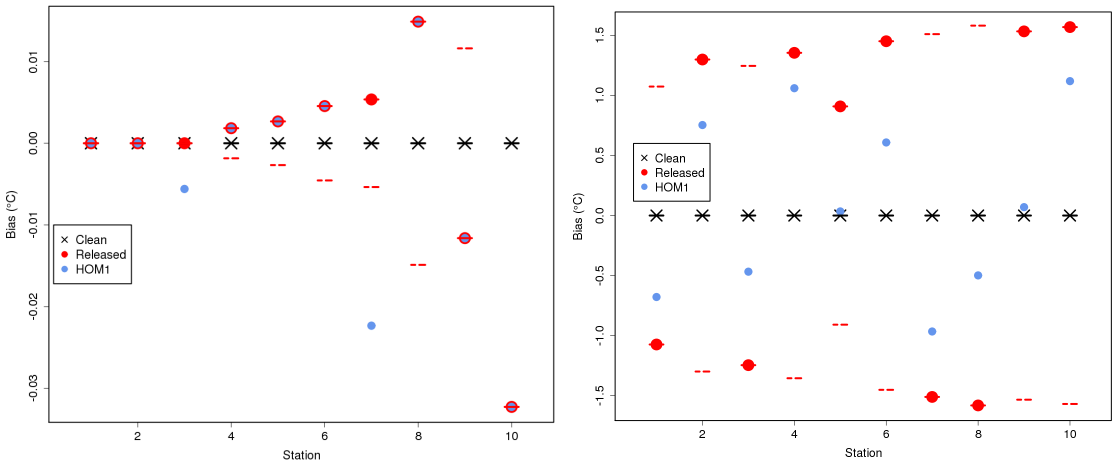
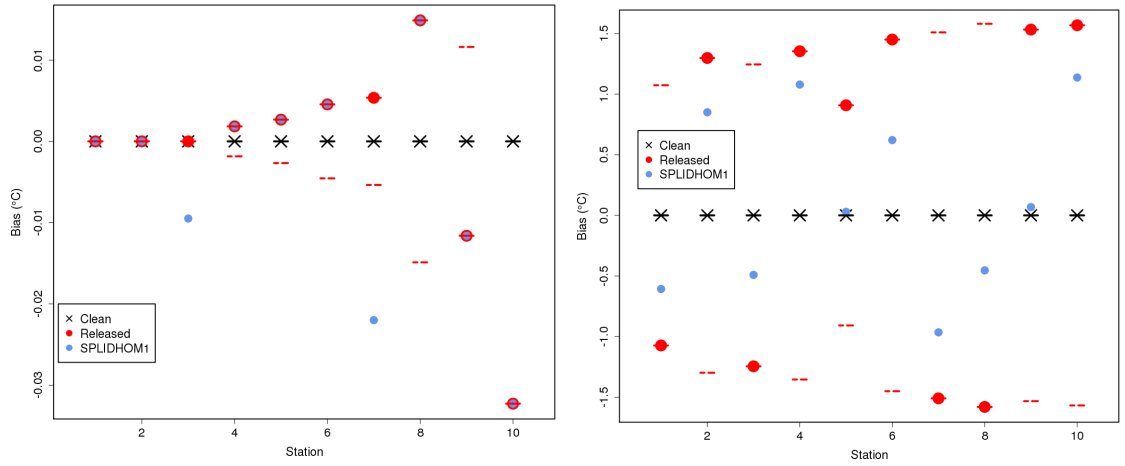



Figure 4: Percentage recovery plots showing the performance of DAP on the best (a,c,e) and worst (b,d,f) stations in the North East scenario 1.




(a) (b)

Figure 5: Percentage recovery plots showing the performance of HOM on the best (a,c,e) and worst (b,d,f) stations in the North East scenario 1.




(a) (b)

Figure 6: Percentage recovery plots showing the performance of SPLIDHOM on the best (a,c,e) and worst (b,d,f) stations in the North East scenario 1.

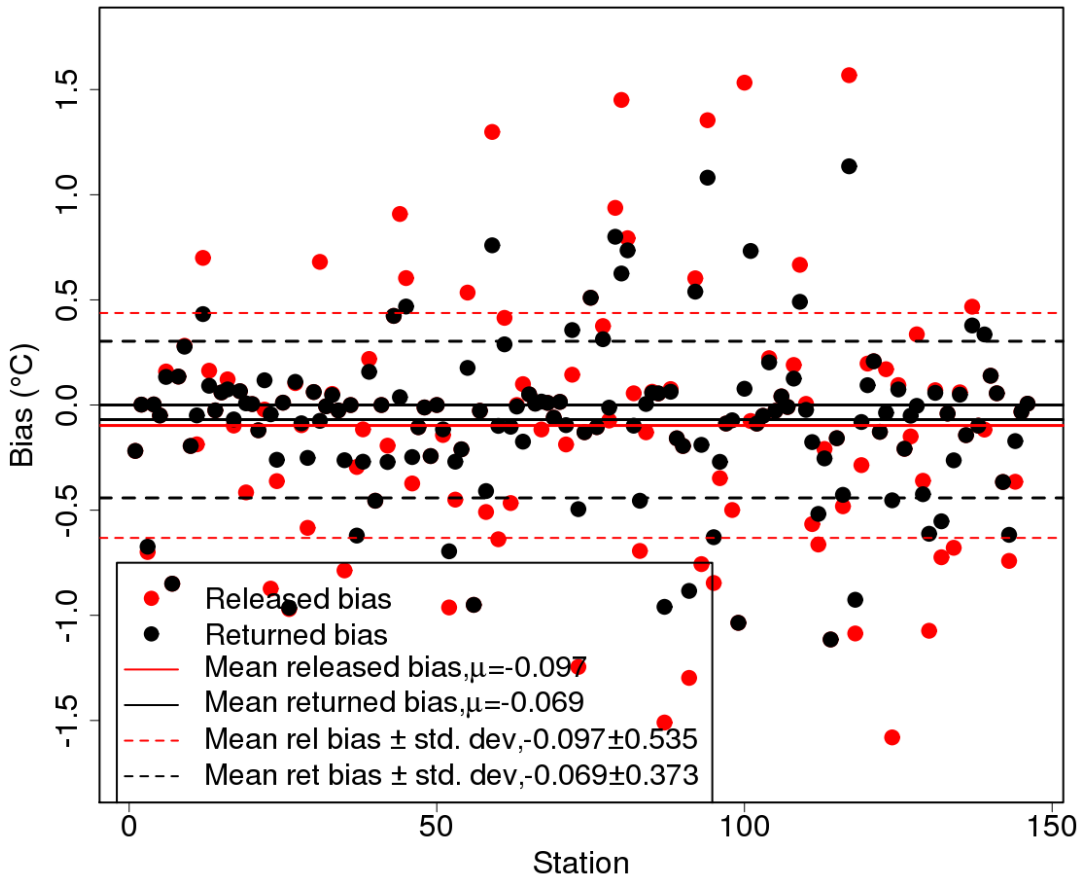



Figure 7: A plot to illustrate the bias before (red) and after (black) homogenisation by DAP for each station in the North East scenario 1.

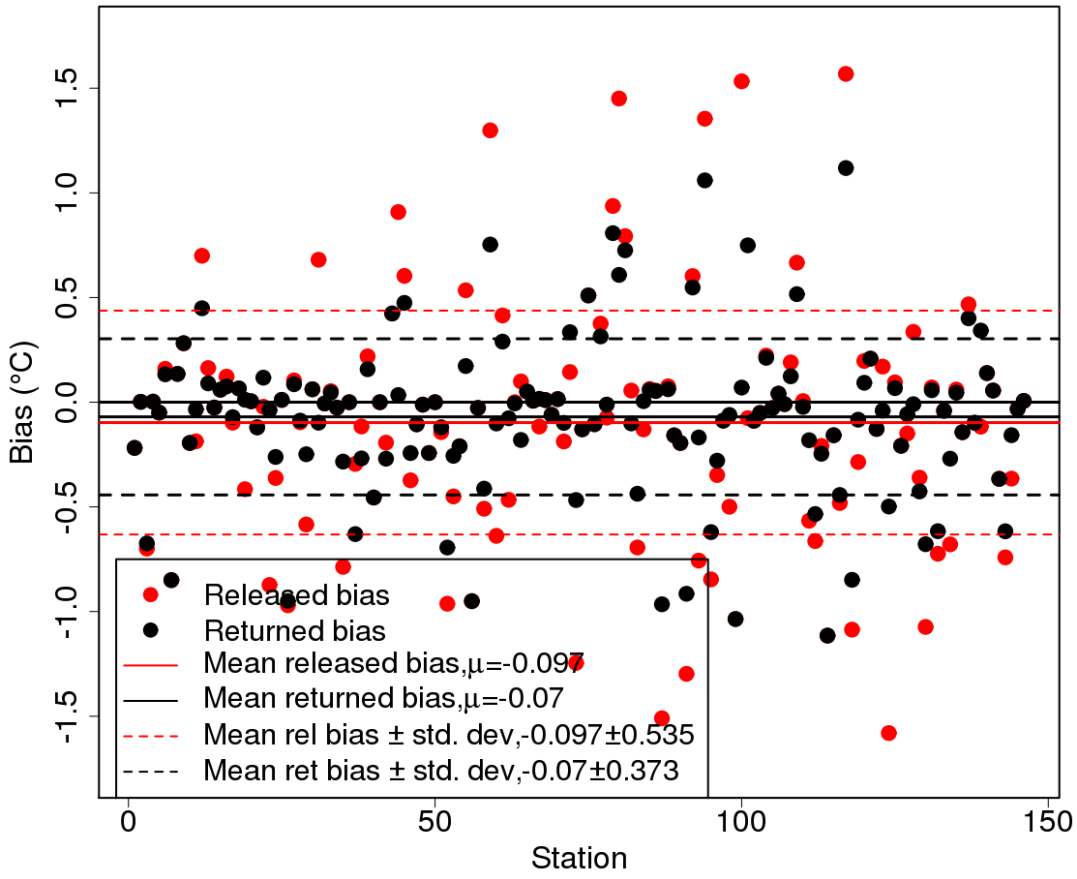



Figure 8: A plot to illustrate the bias before (red) and after (black) homogenisation by HOM for each station in the North East scenario 1.

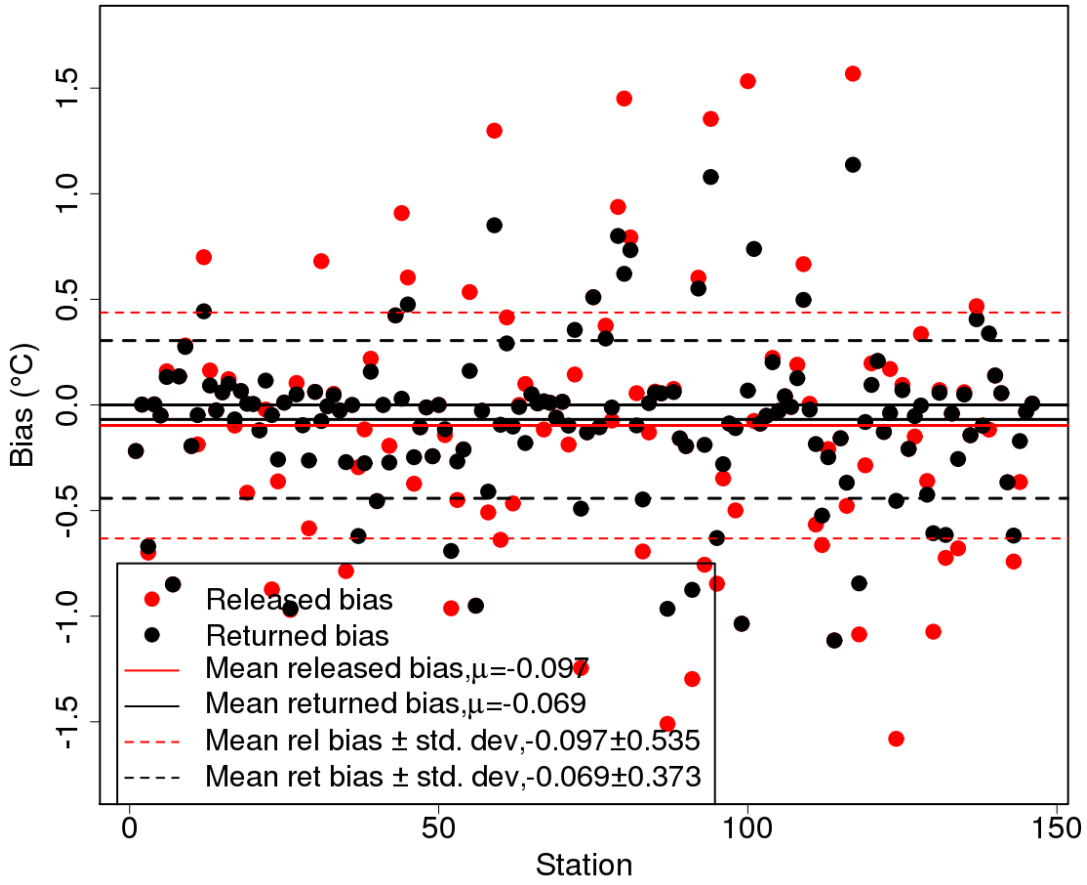



Figure 9: A plot to illustrate the bias before (red) and after (black) homogenisation by SPLIDHOM for each station in the North East scenario 1.

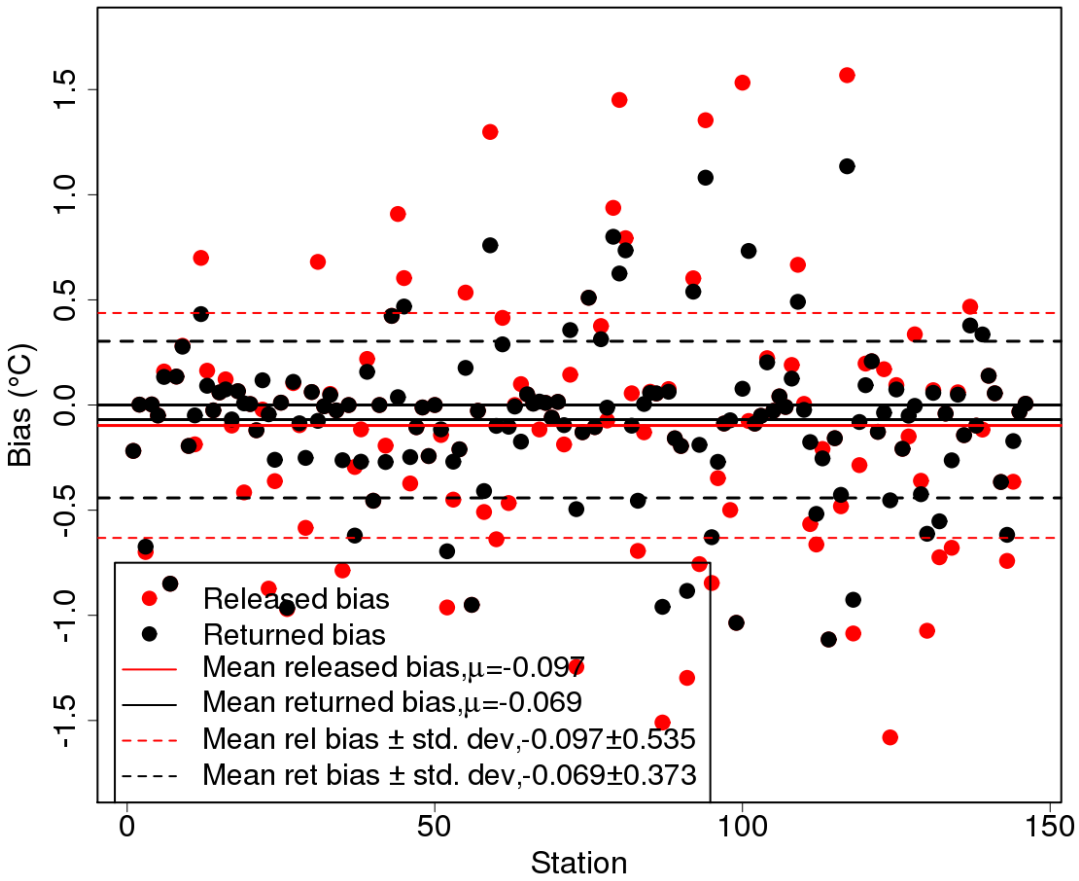



Figure 10: A plot to illustrate the progression of RMSE over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released RMSE and black lines indicate the returned RMSE after homogenisation by DAP.

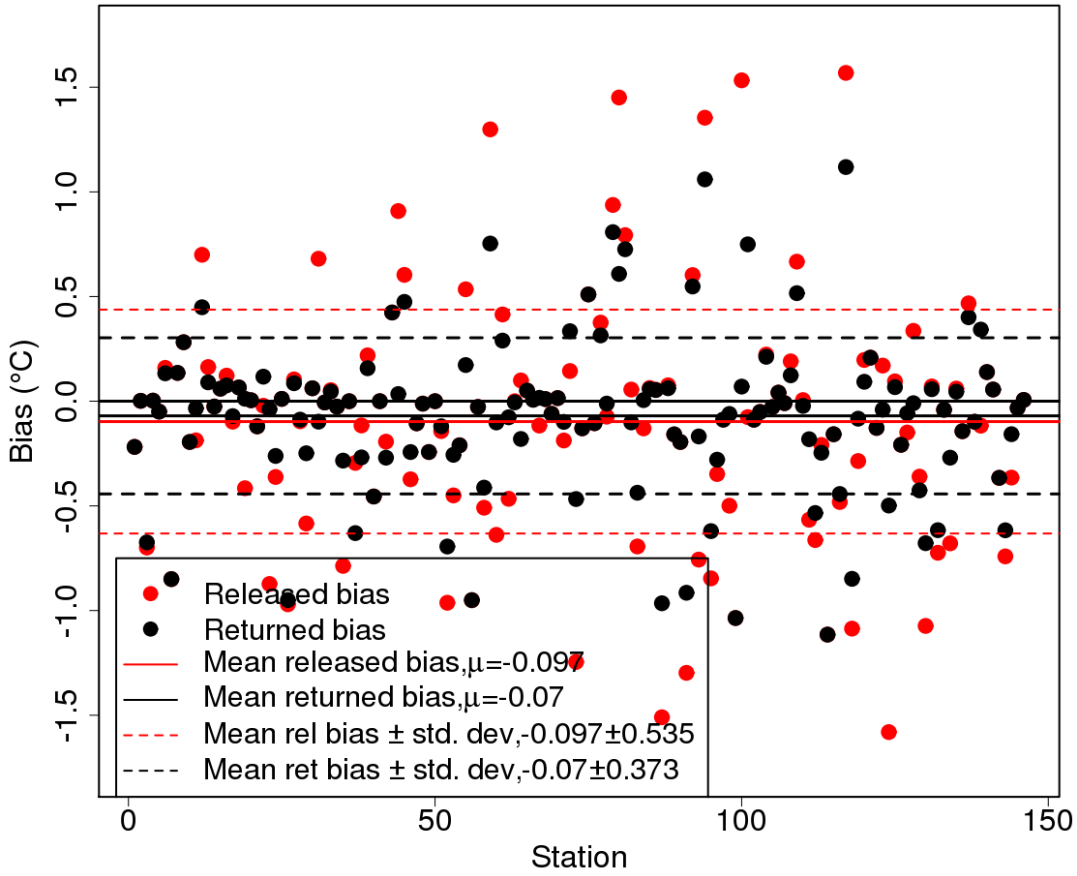



Figure 11: A plot to illustrate the progression of RMSE over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released RMSE and black lines indicate the returned RMSE after homogenisation by HOM.

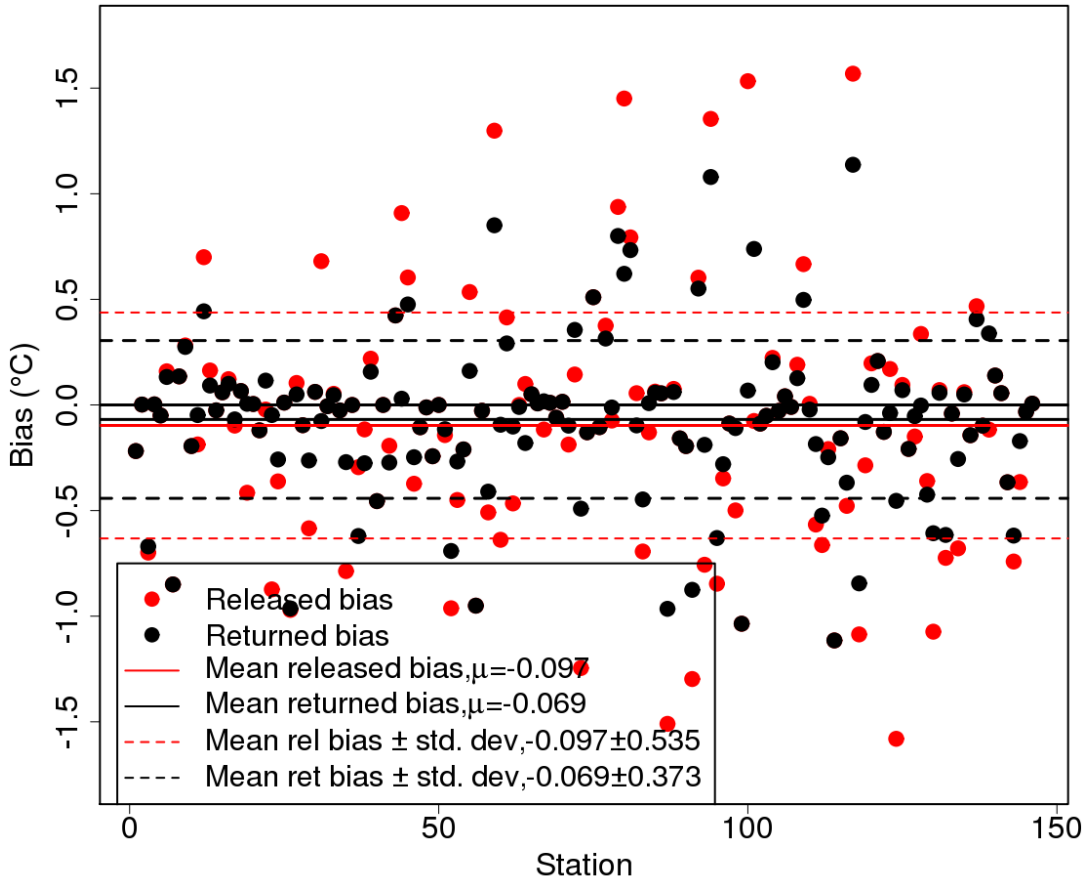



Figure 12: A plot to illustrate the progression of RMSE over time for the North East scenario 1. Data have been aggregated to the monthly level to summarise the progression. Red lines indicate the released RMSE and black lines indicate the returned RMSE after homogenisation by SPLIDHOM.

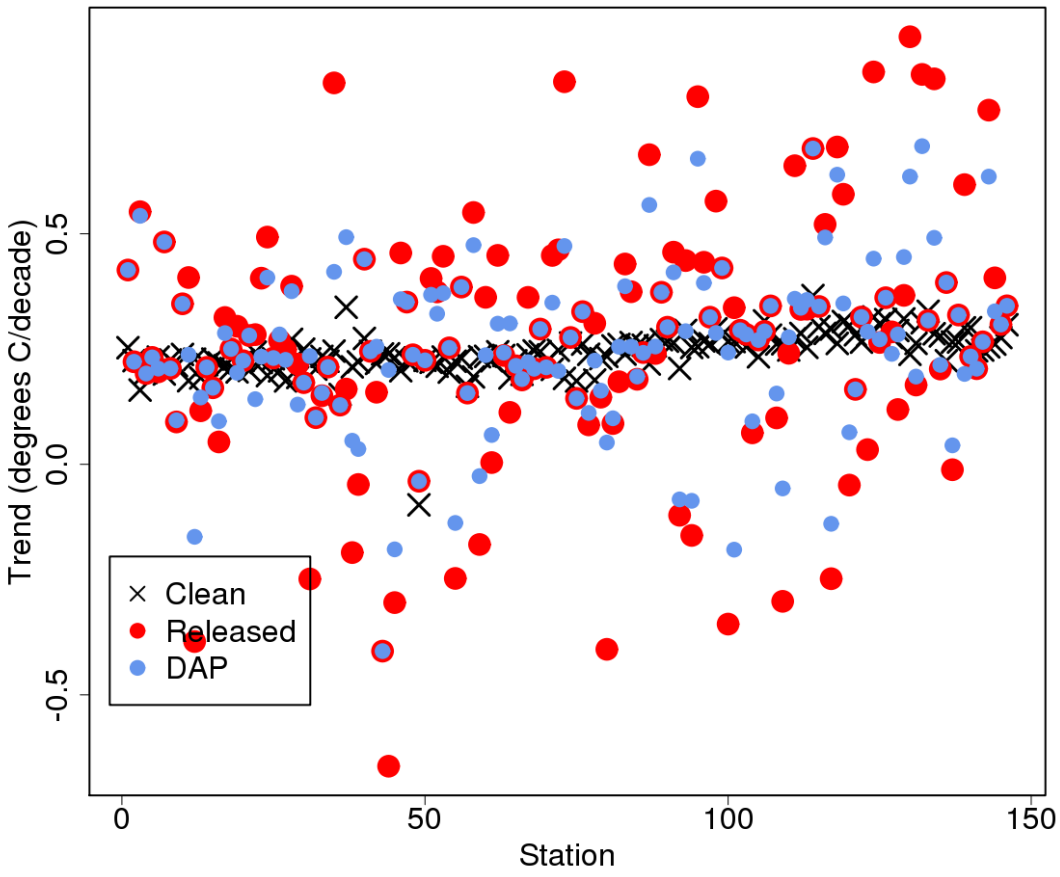



Figure 13: A plot to illustrate the least squares trends before (red) and after (blue) homogenisation by DAP for each station in the North East scenario 1.

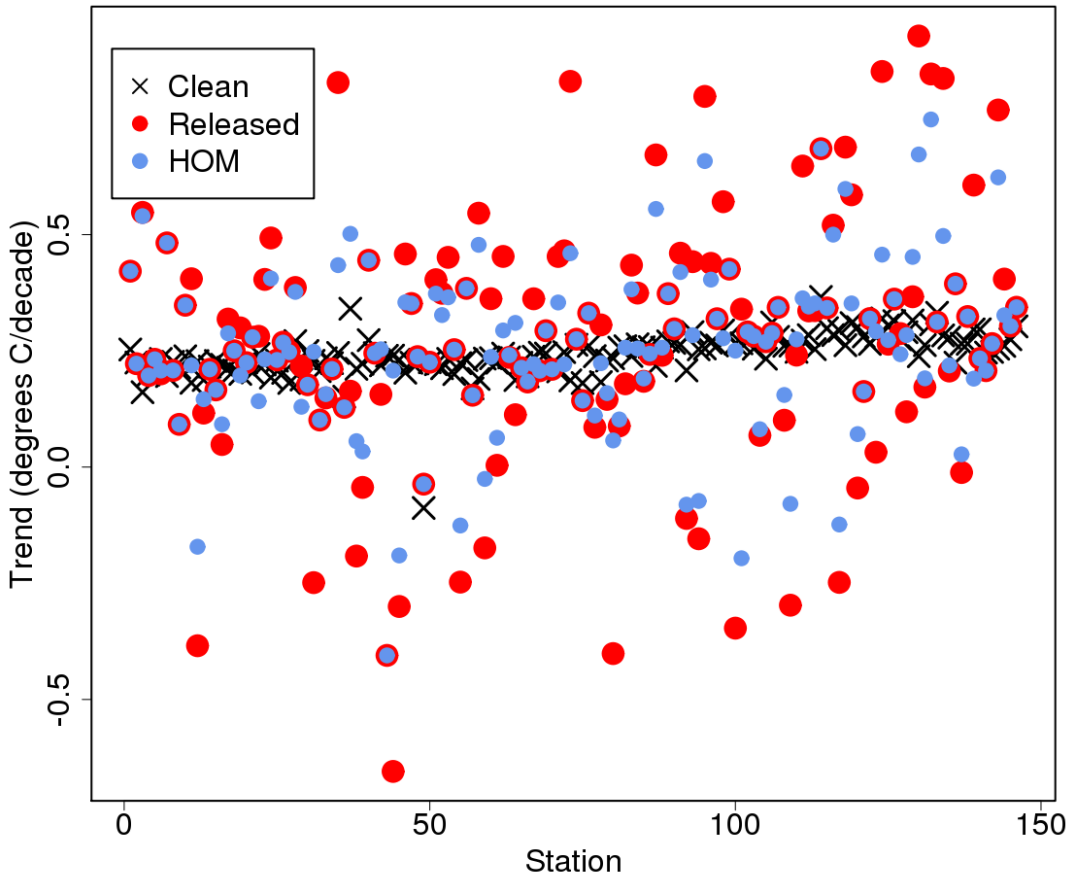



Figure 14: A plot to illustrate the least squares trends before (red) and after (blue) homogenisation by HOM for each station in the North East scenario 1.

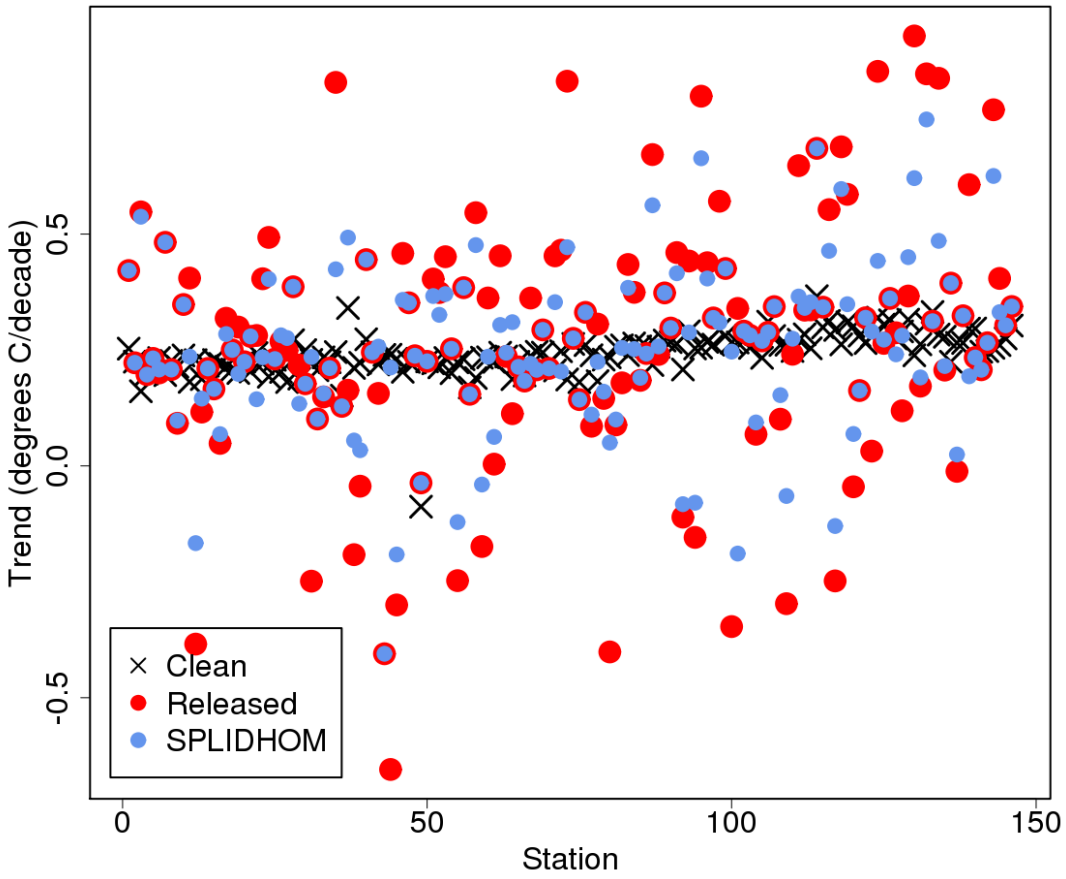



Figure 15: A plot to illustrate the least squares trends before (red) and after (blue) homogenisation by SPLIDHOM for each station in the North East scenario 1.

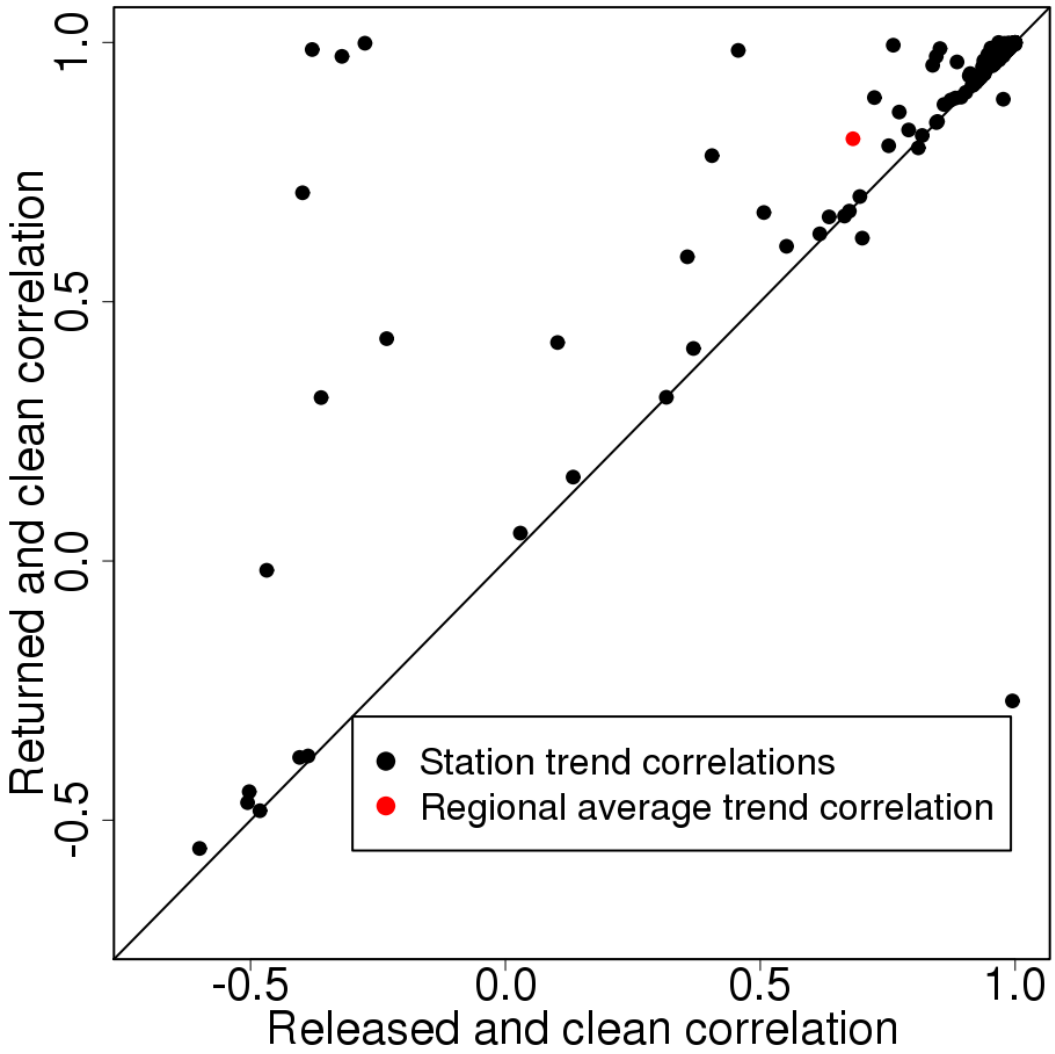



Figure 16: A plot to illustrate how the correlations of inter-decadal loess smooths change after homogenisation by DAP for each station in the North East scenario 1.

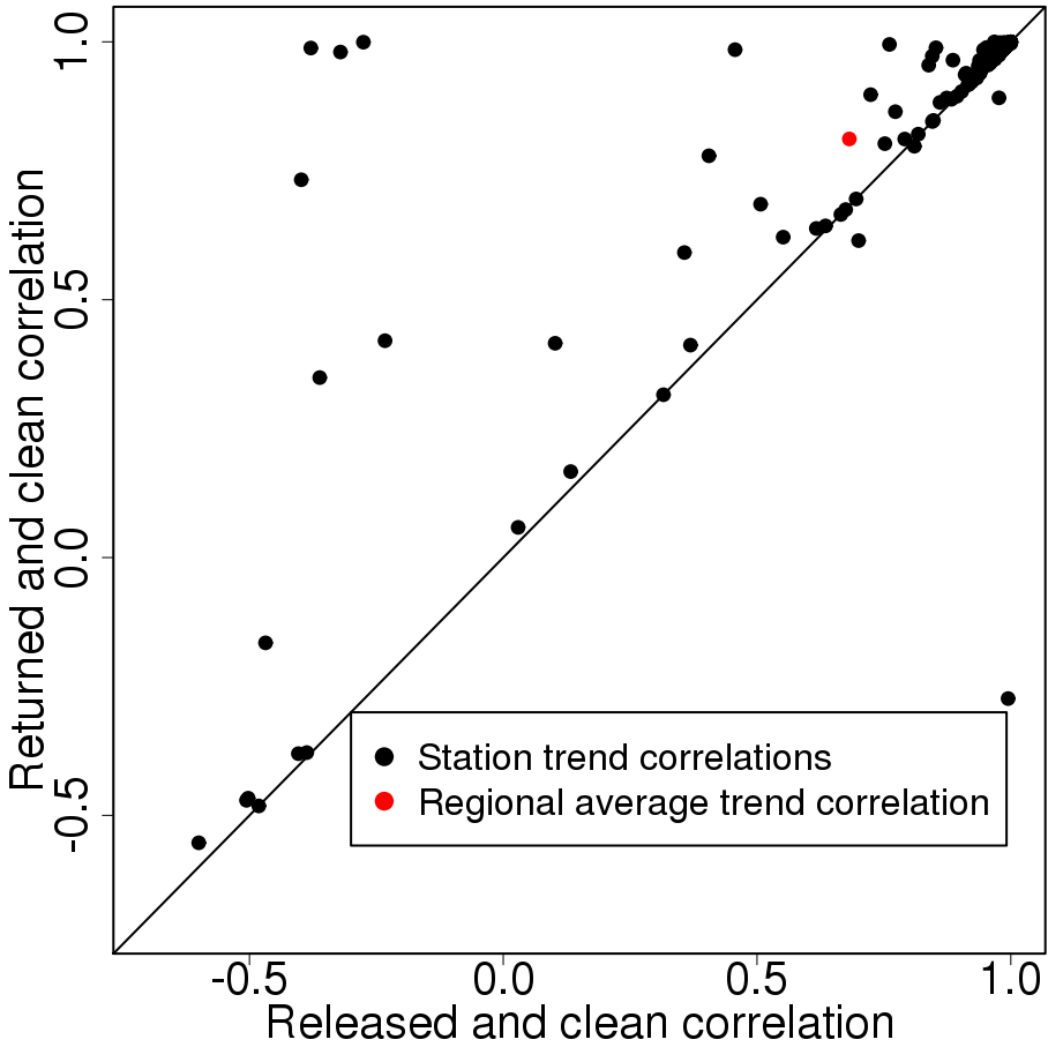



Figure 17: A plot to illustrate how the correlations of inter-decadal loess smooths change after homogenisation by HOM for each station in the North East scenario 1.

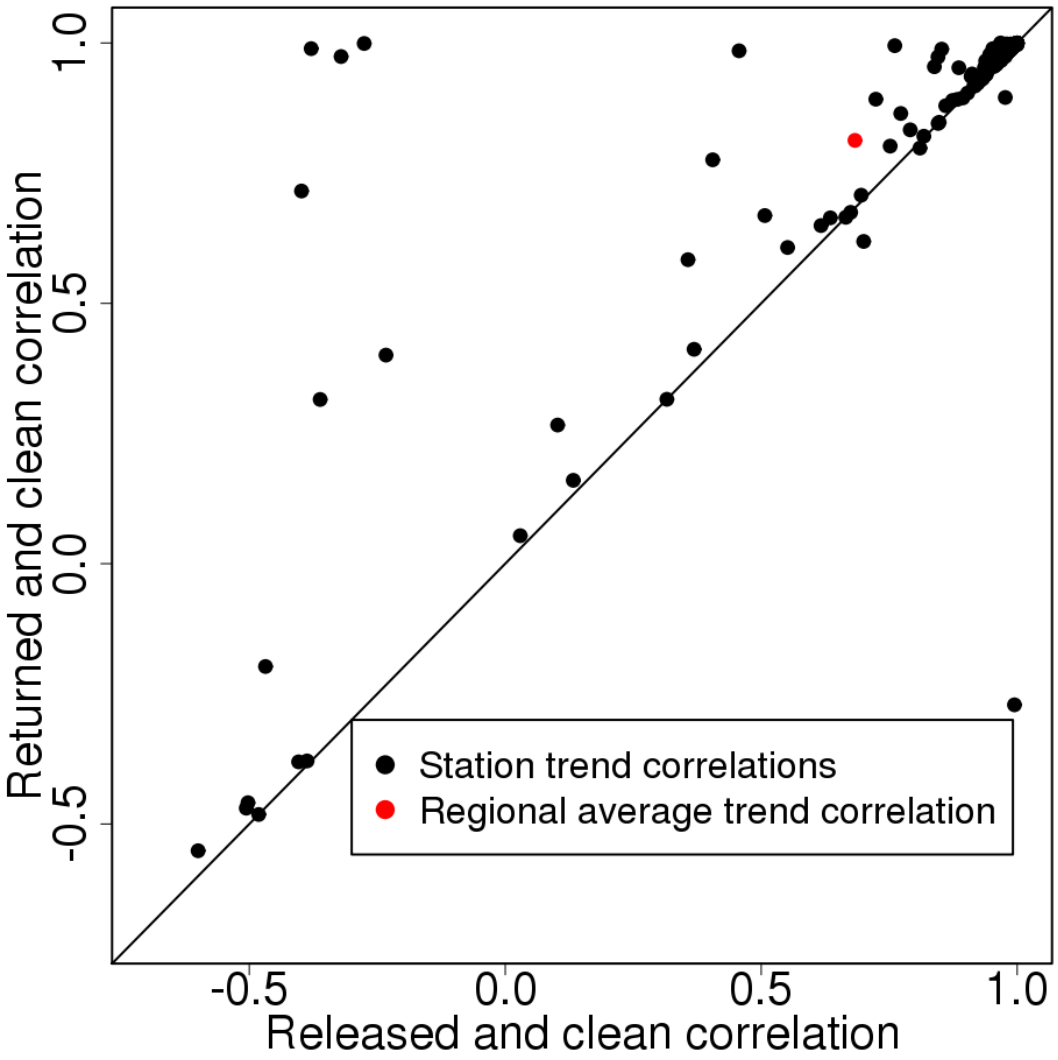



Figure 18: A plot to illustrate how the correlations of inter-decadal loess smooths change after homogenisation by SPLIDHOM for each station in the North East scenario 1.

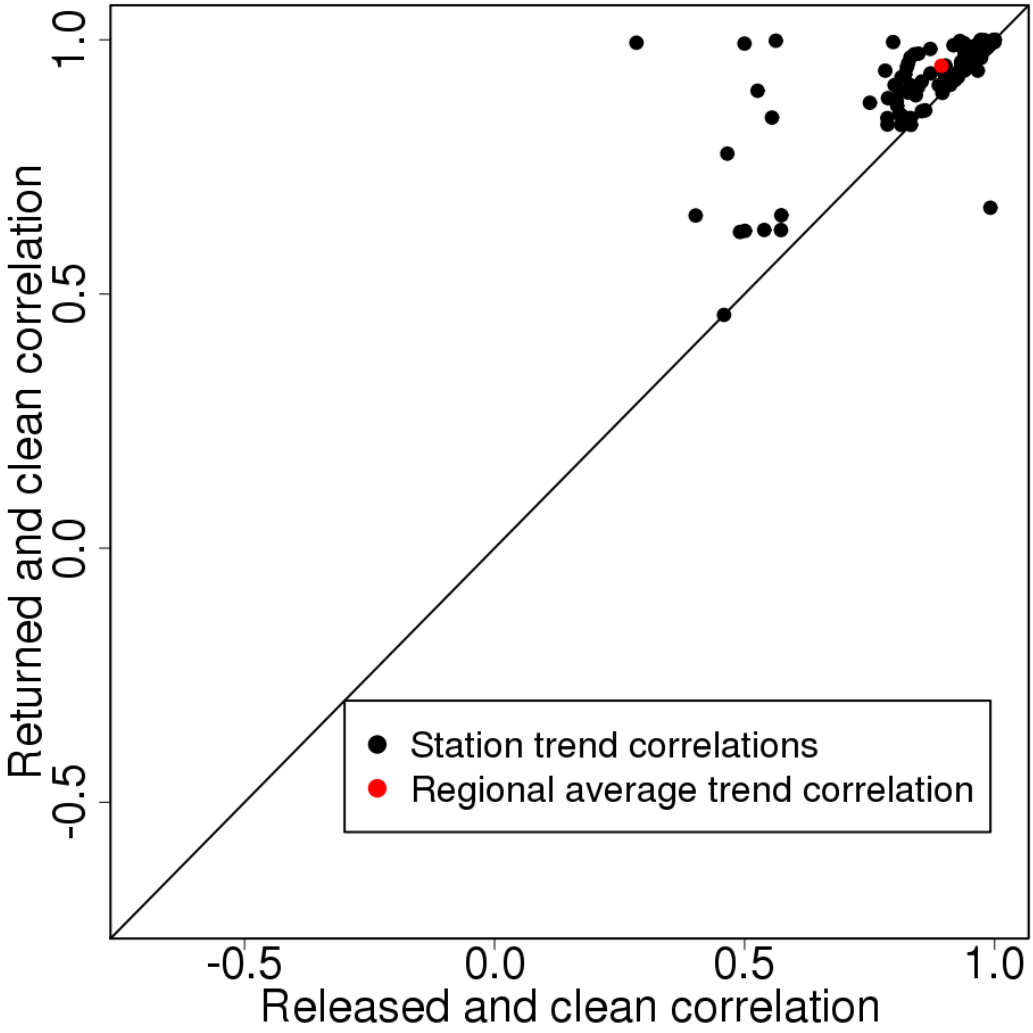



Figure 19: A plot to illustrate how the correlations of inter-annual loess smooths change after homogenisation by DAP for each station in the North East scenario 1.

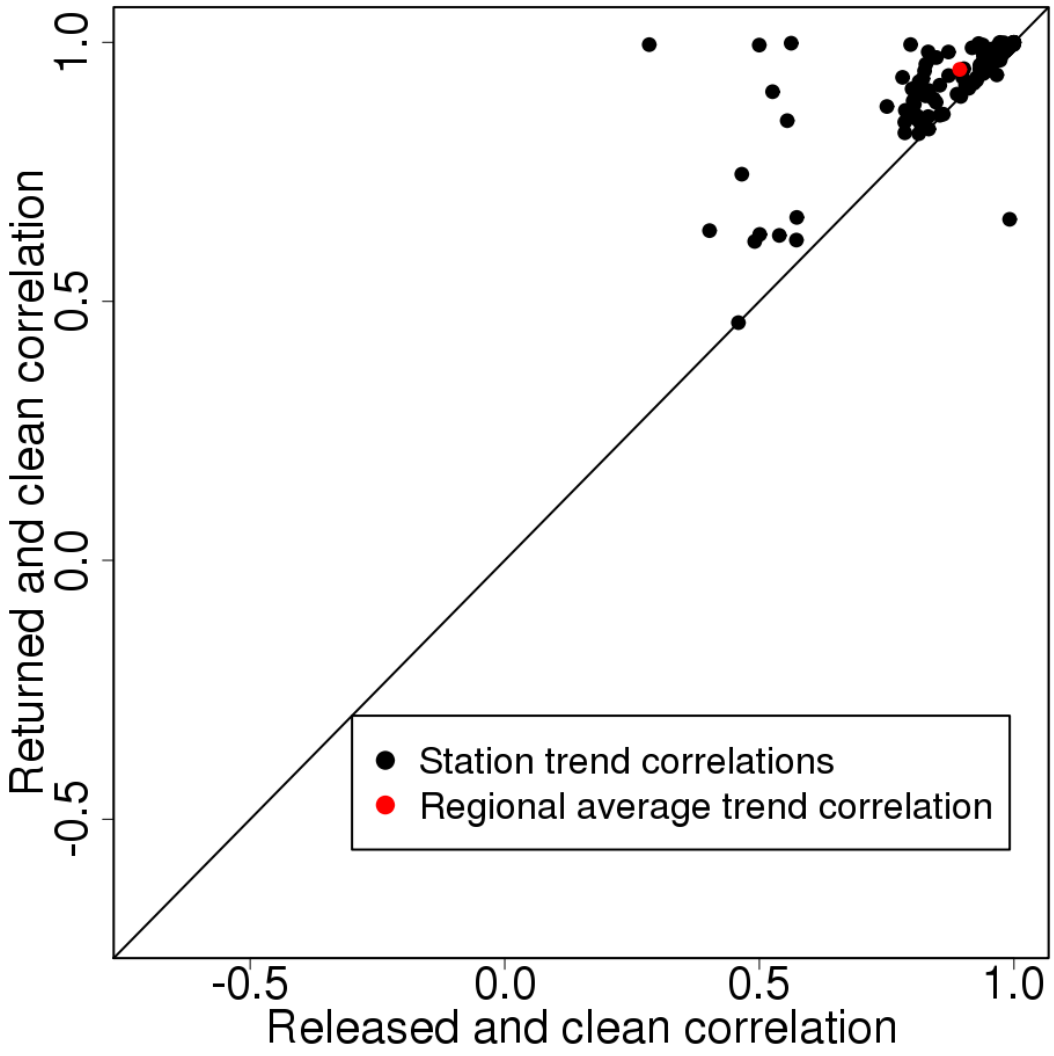



Figure 20: A plot to illustrate how the correlations of inter-annual loess smooths change after homogenisation by HOM for each station in the North East scenario 1.

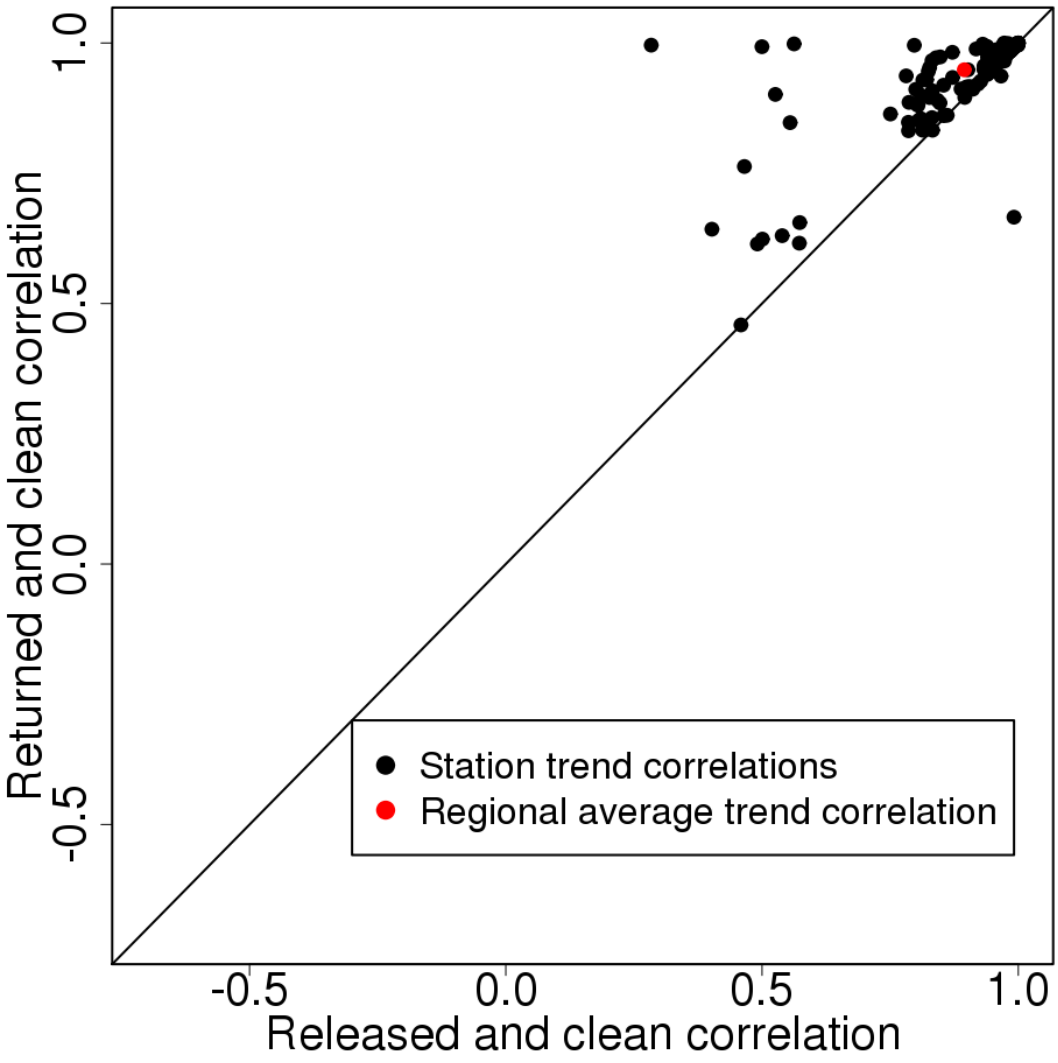



Figure 21: A plot to illustrate how the correlations of inter-annual loess smooths change after homogenisation by SPLIDHOM for each station in the North East scenario 1.

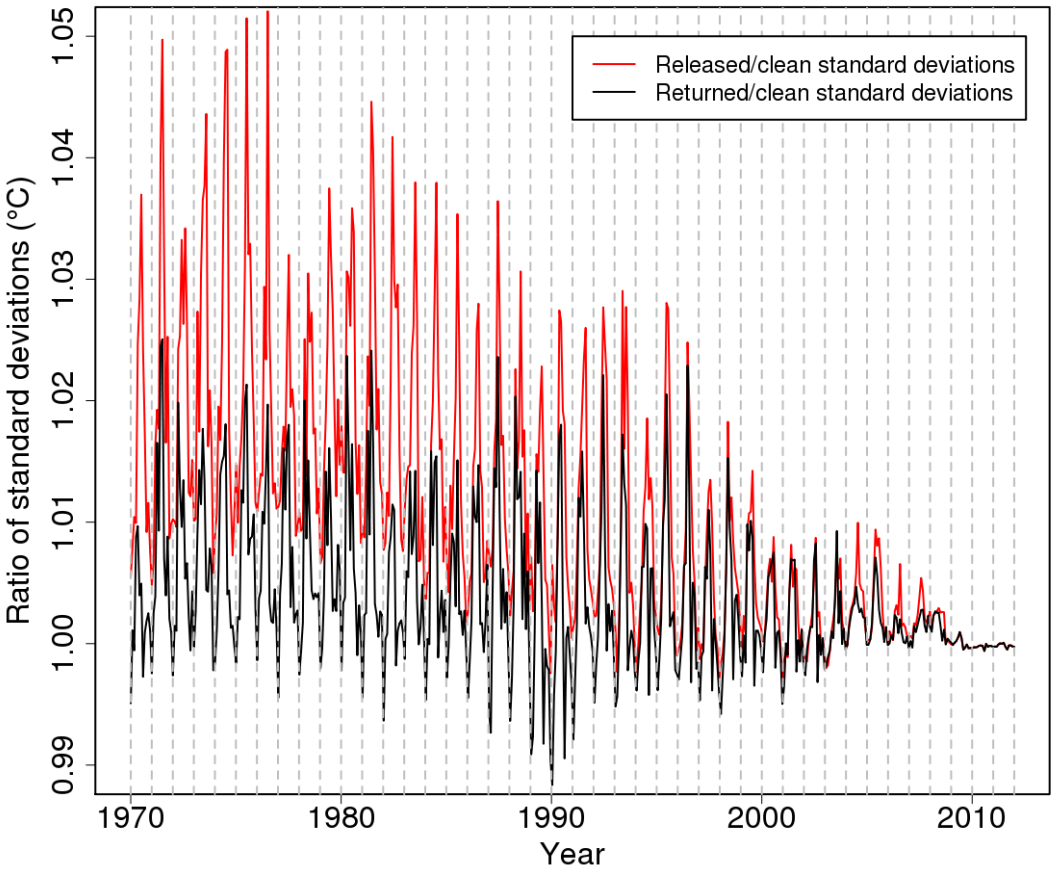



Figure 22: A plot to illustrate how the ratios of released to clean (red) and returned to clean (black) standard deviations change over the period of the record after the application of DAP, for the North East (a) scenario 1.

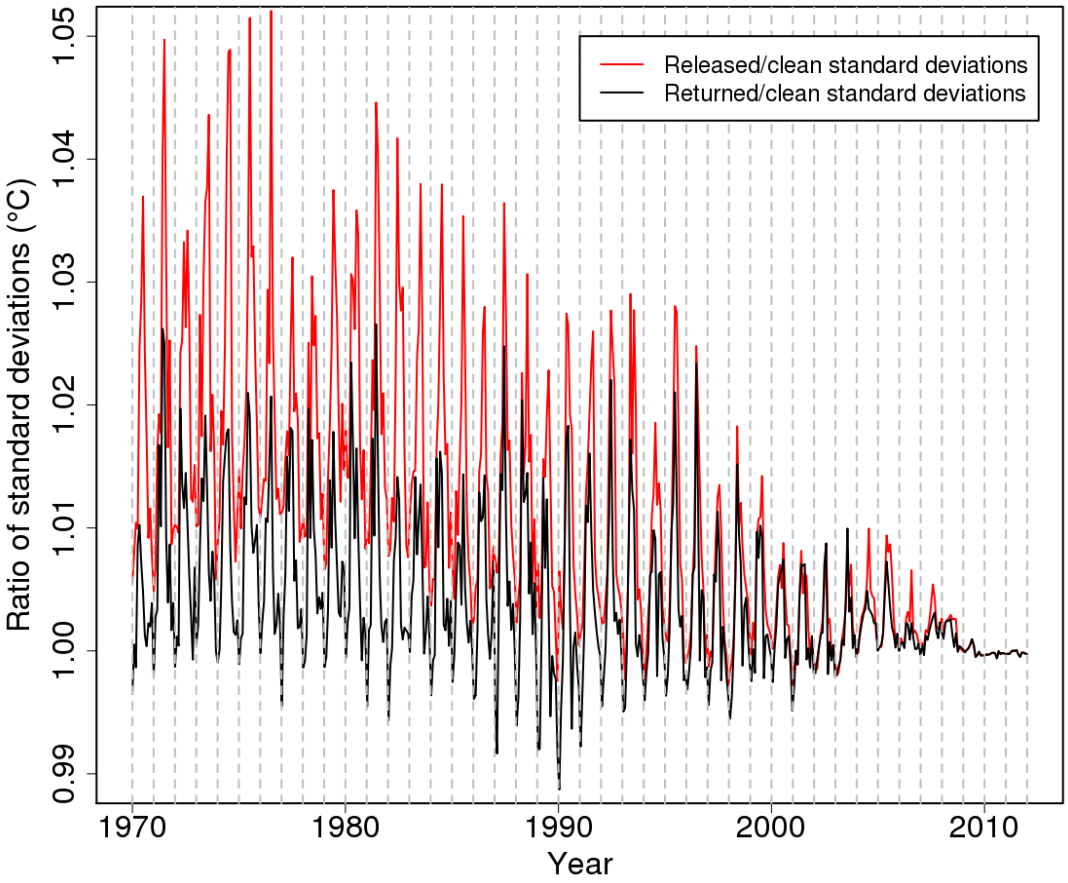



Figure 23: A plot to illustrate how the ratios of released to clean (red) and returned to clean (black) standard deviations change over the period of the record after the application of HOM, for the North East (a) scenario 1.

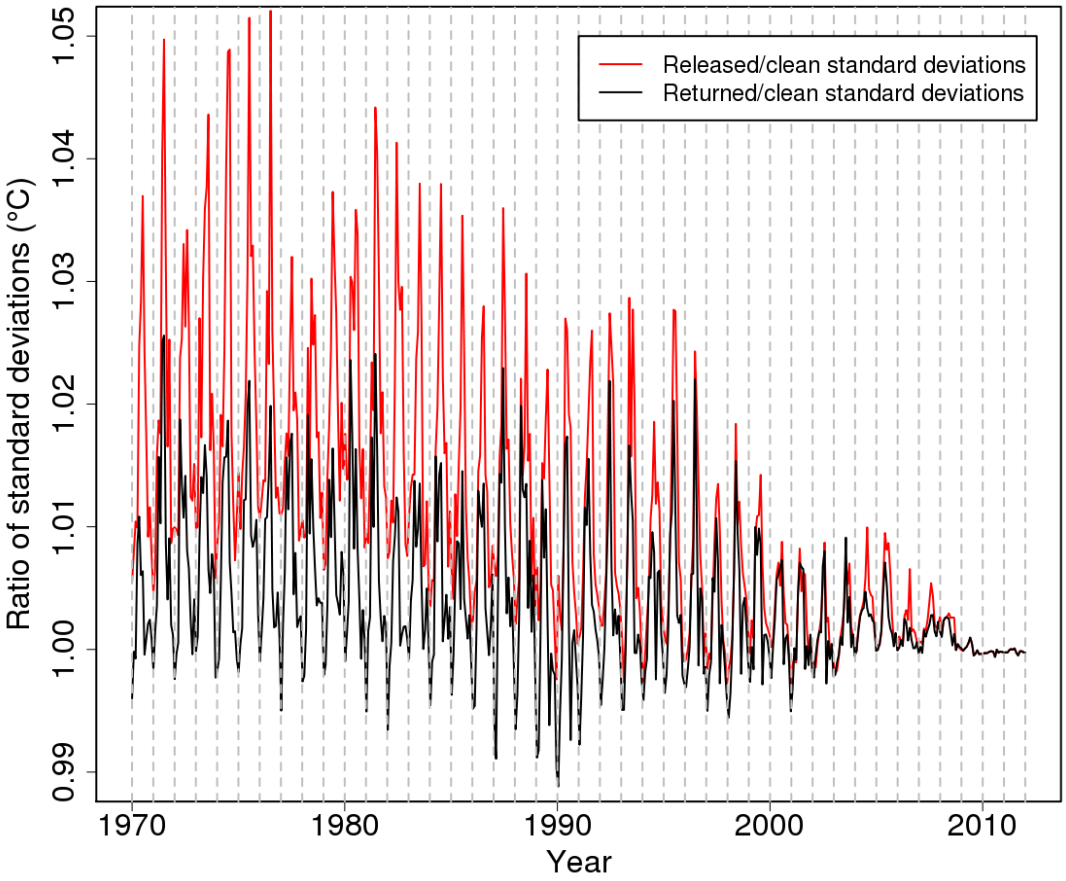



Figure 24: A plot to illustrate how the ratios of released to clean (red) and returned to clean (black) standard deviations change over the period of the record after the application of SPLIDHOM, for the North East (a) scenario 1.

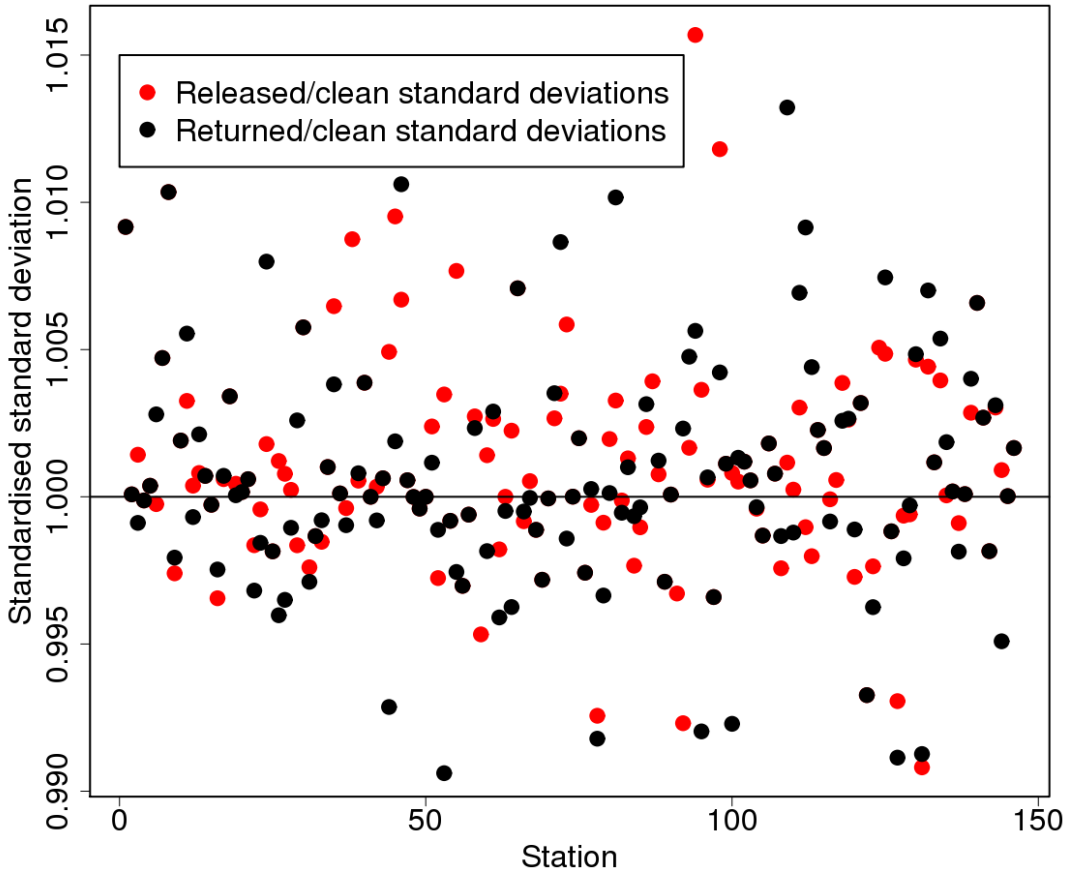



Figure 25: A plot to illustrate the ratios of released to clean (red) and returned to clean (black) standard deviations for each station in the North East for scenario 1 after the application of DAP.

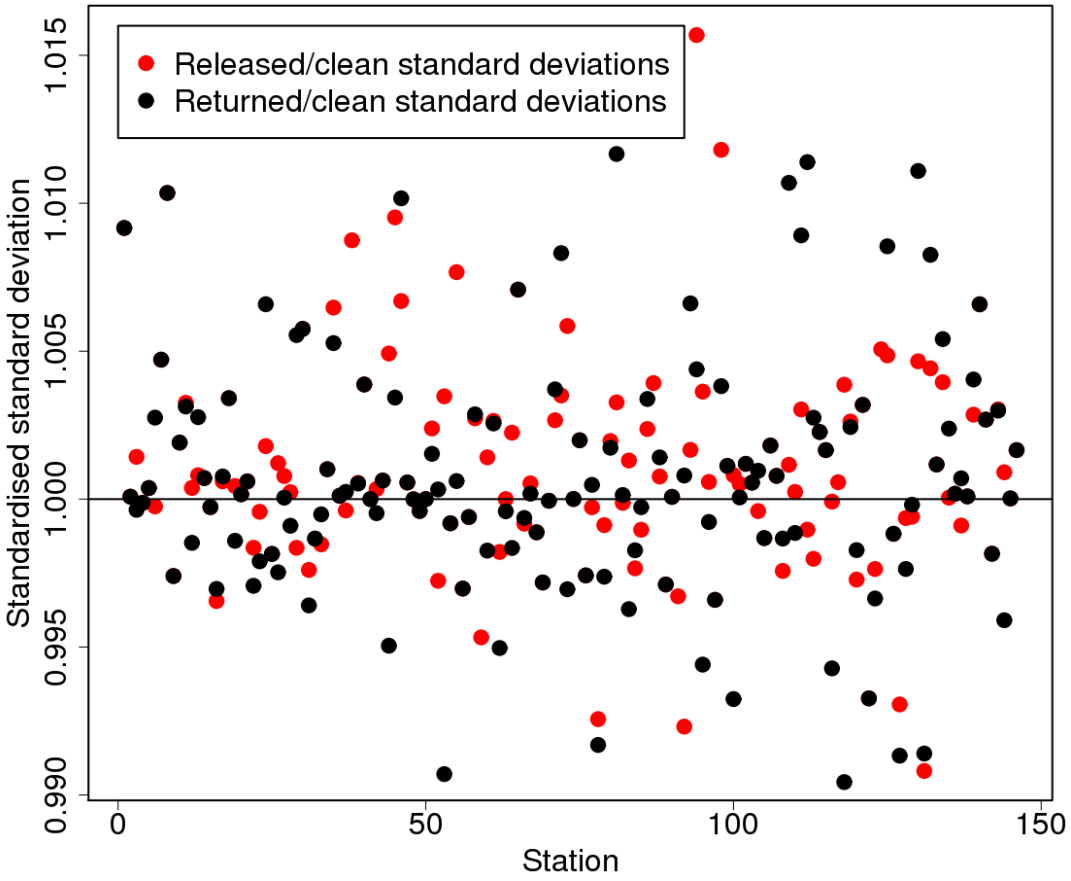



Figure 26: A plot to illustrate the ratios of released to clean (red) and returned to clean (black) standard deviations for each station in the North East for scenario 1 after the application of HOM.

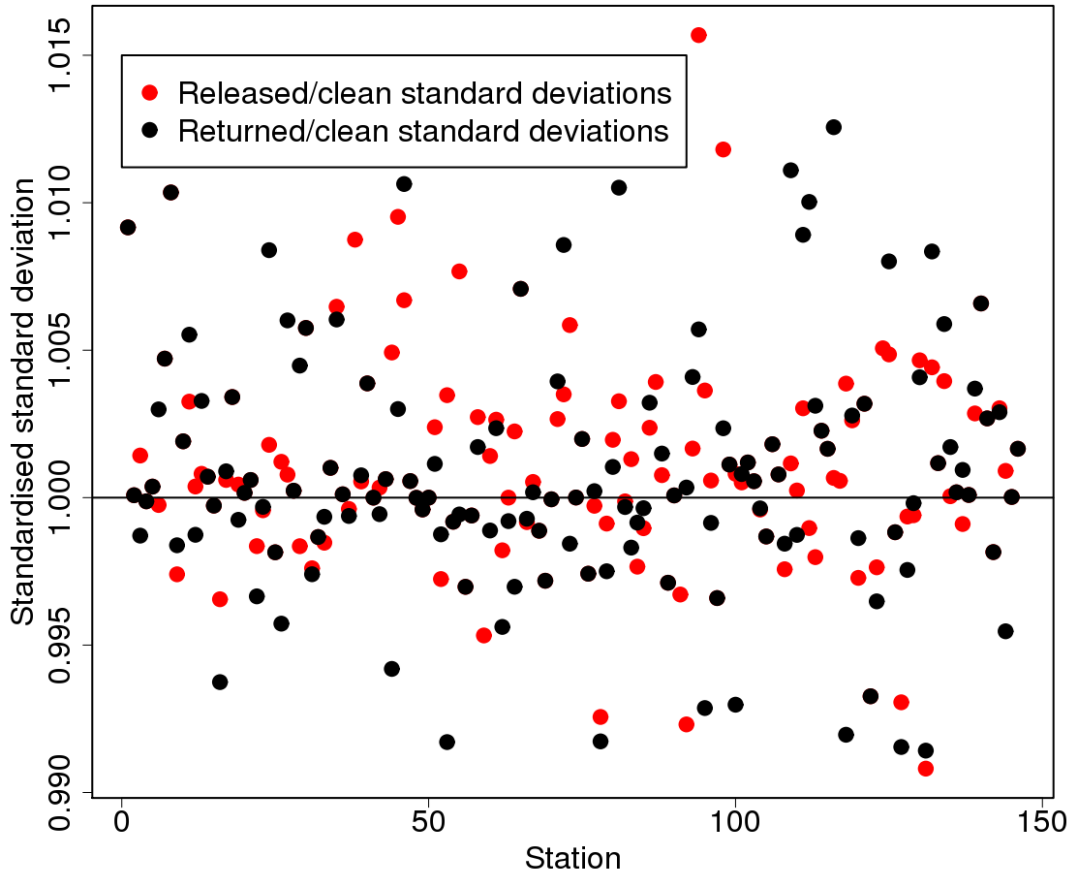



Figure 27: A plot to illustrate the ratios of released to clean (red) and returned to clean (black) standard deviations for each station in the North East for scenario 1 after the application of SPLIDHOM.

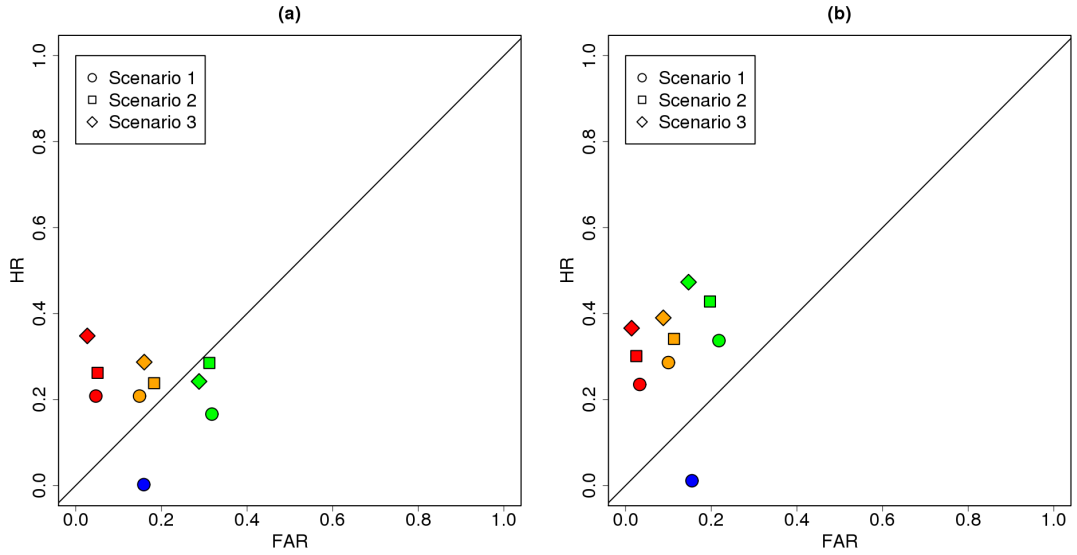



Figure 28: ROC plots showing false alarm rate against hit rate for (a) a window extending thirty days either side of the break point and (b) a window extending ninety days either side of the break point. DAP, HOM and SPLIDHOM all used the same detection algorithm and were only applied to scenario one of this region, they are represented by the blue shape.