

# Covid-19 Wastewater Flagging Method Optimization Using a Minimum Flagging Difference of 10%

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using HFD to get a good understanding of the relationships between the Covid-19 measurements and the other covariates. we did this by breaking the signal down into two components. (1) the trend of the data. This is created using a loess smoothing. (2) the detrended data. We do this on the log of the data because the noise appears to be log normal meaning a more clear trend. The main goal of this document is to show the main takeaways of those plots in an easier way to see. The main takeaways are, 1) the covariates don't relate to the covid signal any more than the population does. 2) The detrended data seems to be largely independent

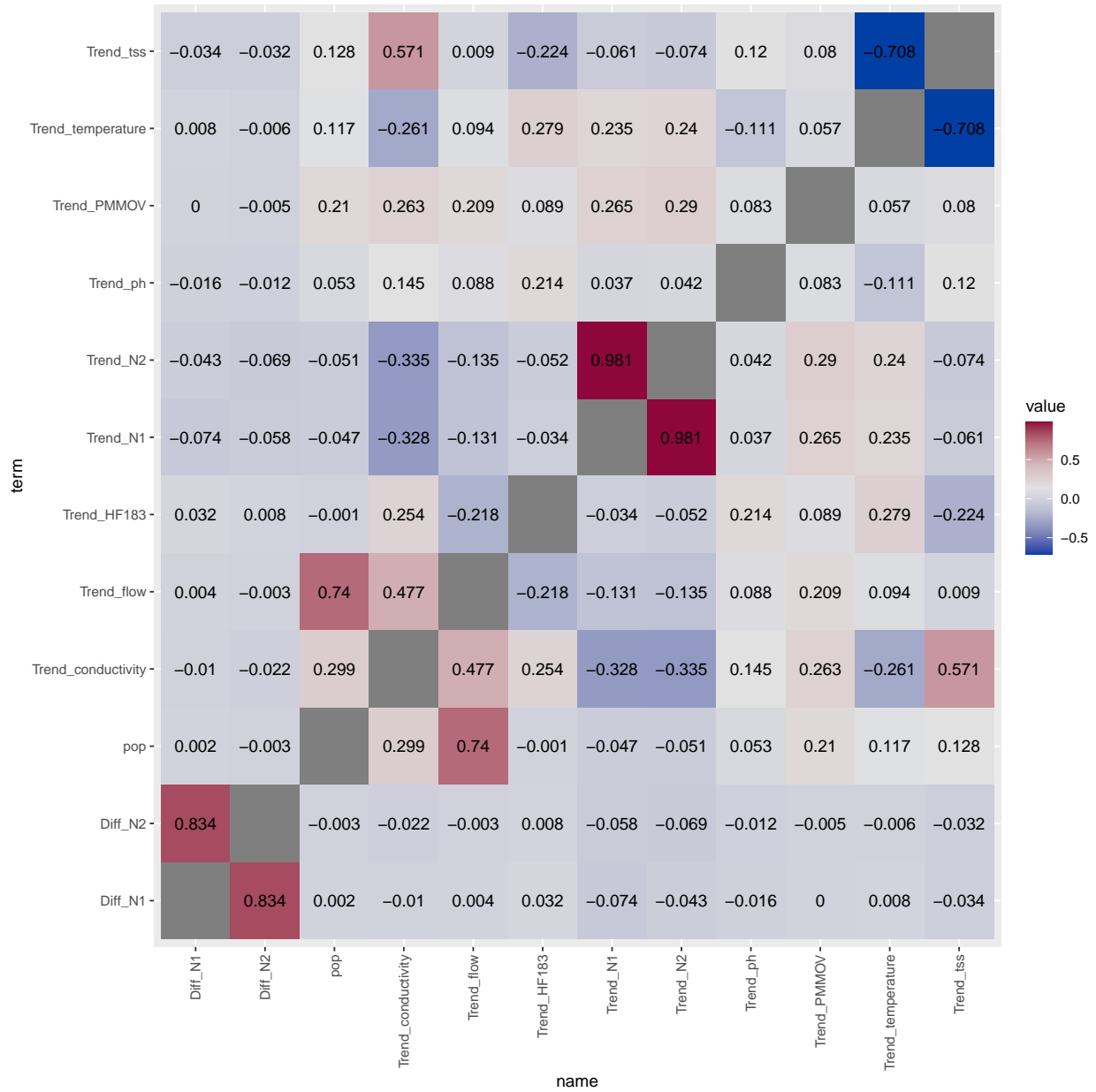
```
## # A tibble: 82 x 2
##   county      n
##   <chr>    <int>
## 1 Algoma      1
## 2 Appleton    1
## 3 Ashland     1
## 4 Baraboo     1
## 5 Beloit      1
## 6 Berlin      1
## 7 Black River Falls 1
## 8 Brookfield  1
## 9 Burlington  1
## 10 Cedarburg  1
## # i 72 more rows
```

```
## # A tibble: 5 x 2
##   regions      n
##   <chr>    <int>
## 1 Southern    21
## 2 Northeastern 20
## 3 Southeastern 15
## 4 Northern    14
## 5 Western     12
```

The heatmap below shows the correlation between the Covid-19 signals and the covariate components. The baseline these covariates are meant to control for is population so it acts as the baseline. We see the data it has a .25 correlation which is mildly meaningful. This is around the correlation the other covariants have. None of the detrended data correlates meaningful supporting the view that they are mostly caused by noise.

```
## # A tibble: 16 x 3
##   term      name      value
```

##	<chr>	<chr>	<dbl>
## 1	Trend_N1	Trend_N2	0.981
## 2	Trend_N2	Trend_N1	0.981
## 3	Diff_N1	Diff_N2	0.834
## 4	Diff_N2	Diff_N1	0.834
## 5	pop	Trend_flow	0.740
## 6	Trend_flow	pop	0.740
## 7	Trend_tss	Trend_temperature	-0.708
## 8	Trend_temperature	Trend_tss	-0.708
## 9	Trend_tss	Trend_conductivity	0.571
## 10	Trend_conductivity	Trend_tss	0.571
## 11	Trend_flow	Trend_conductivity	0.477
## 12	Trend_conductivity	Trend_flow	0.477
## 13	Trend_N2	Trend_conductivity	-0.335
## 14	Trend_conductivity	Trend_N2	-0.335
## 15	Trend_N1	Trend_conductivity	-0.328
## 16	Trend_conductivity	Trend_N1	-0.328



For a baseline we showed the relationship between N1 and N2 that show an extremely strong correlation clearly due to them measuring the same thing.

```
##           log      base
## trend corr  0.9814402 0.9911101
## detrend corr 0.8336602 0.9244558
```