

# Assignment 5

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.2.1 --
## v ggplot2 2.2.1      v purrr  0.2.4
## v tibble  1.4.2      v dplyr  0.7.4
## v tidyr   0.7.2      v stringr 1.2.0
## v readr   1.1.1      v forcats 0.2.0

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()

library(readxl)
library(imputeTS)
library(lubridate)

##
## Attaching package: 'lubridate'

## The following object is masked from 'package:base':
##
##     date

library(padr)
library(stringr)
library(forecast)
library(ggseas)

## Loading required package: seasonal
## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following object is masked from 'package:imputeTS':
##
##     na.locf

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

## Part 1

```
tdata.tidy <- NULL

comb.data <- function(n){
  header <- scan(n, nlines = 1, what = character())
  data <- read.table(n, skip = 2, header = FALSE)
  names(data) <- header
  as.tibble(data)
```

```

data.tidy <- data %>%
  filter(hh == 12) %>%
  select(YY = contains("YY"), MM, DD, Air_temp = ATMP, Sea_temp = WTMP) %>%
  mutate(YY = ifelse(str_length(YY)==2, str_c(19, YY, sep = "", collapse = NULL), YY)) %>%
  mutate(Date = paste(as.character(YY), as.character(MM), as.character(DD), sep = "-"))
  mutate(Air_temp = replace(Air_temp, Air_temp == 999.0, NA)) %>%
  mutate(Sea_temp = replace(Sea_temp, Sea_temp == 999.0, NA)) %>%
  mutate(Date = as.Date(Date)) %>%
  select(Date, Air_temp, Sea_temp)

if (is_empty(tdata.tidy))
{
  tdata.tidy <- data.tidy
} else
{
  tdata.tidy <- rbind(tdata.tidy, data.tidy)
}

}

for (i in list.files(pattern = ".txt")){
  tdata.tidy <- comb.data(i)
}

tdata.tidy <- tdata.tidy %>%
  pad() %>%
  filter(!str_detect(Date, "02-29"))

## pad applied on the interval: day
t.series.A <- ts(tdata.tidy[,2], frequency = 365, start = decimal_date(as.Date("1986-01-01")))
t.series.A <- na.seadec(t.series.A, algorithm = "interpolation")
t.series.S <- ts(tdata.tidy[,3], frequency = 365, start = decimal_date(as.Date("1986-01-01")))
t.series.S <- na.seadec(t.series.S, algorithm = "interpolation")

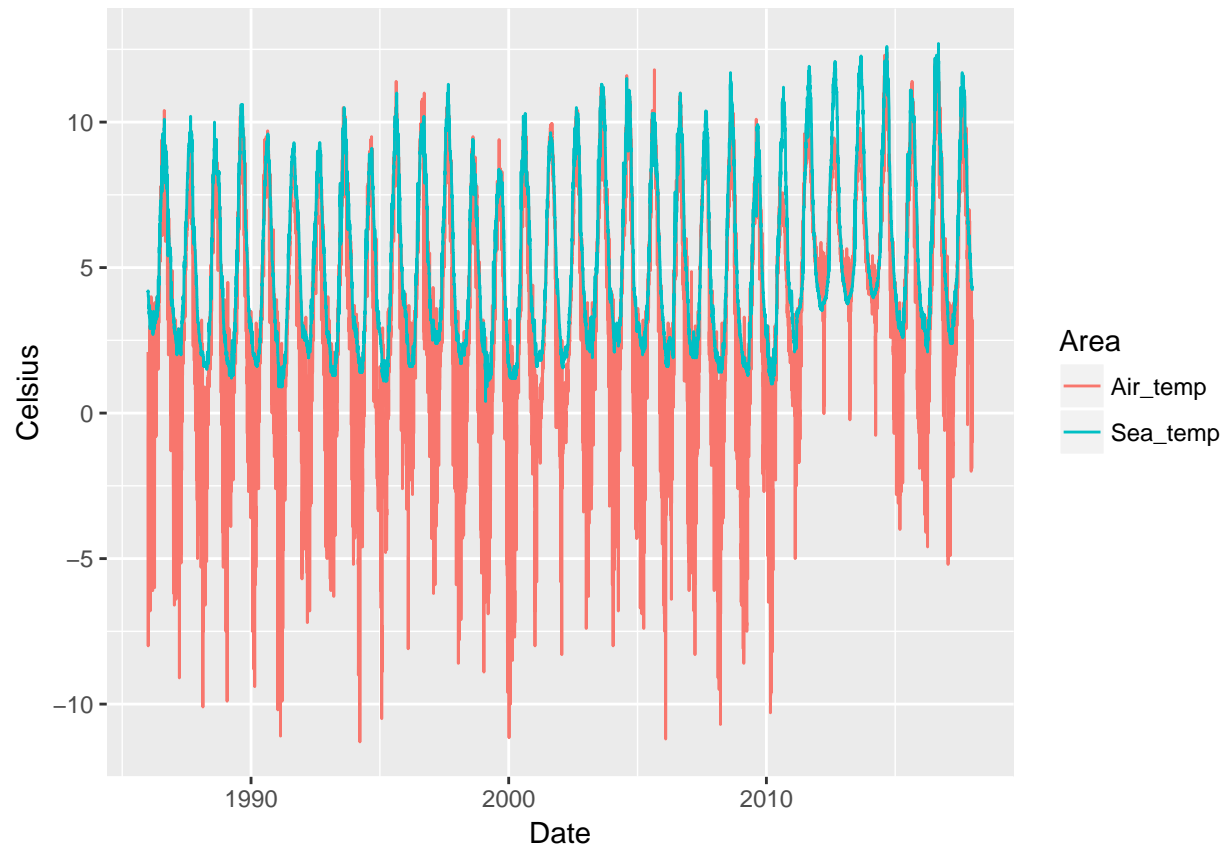
tdata.tidy <- tdata.tidy %>%
  mutate(Air_temp = t.series.A) %>%
  mutate(Sea_temp = t.series.S)

tdata.tidy2 <- tdata.tidy %>% gather(key = "Area", value = "Celsius", -Date) %>%
  mutate(Date = as.Date(Date))

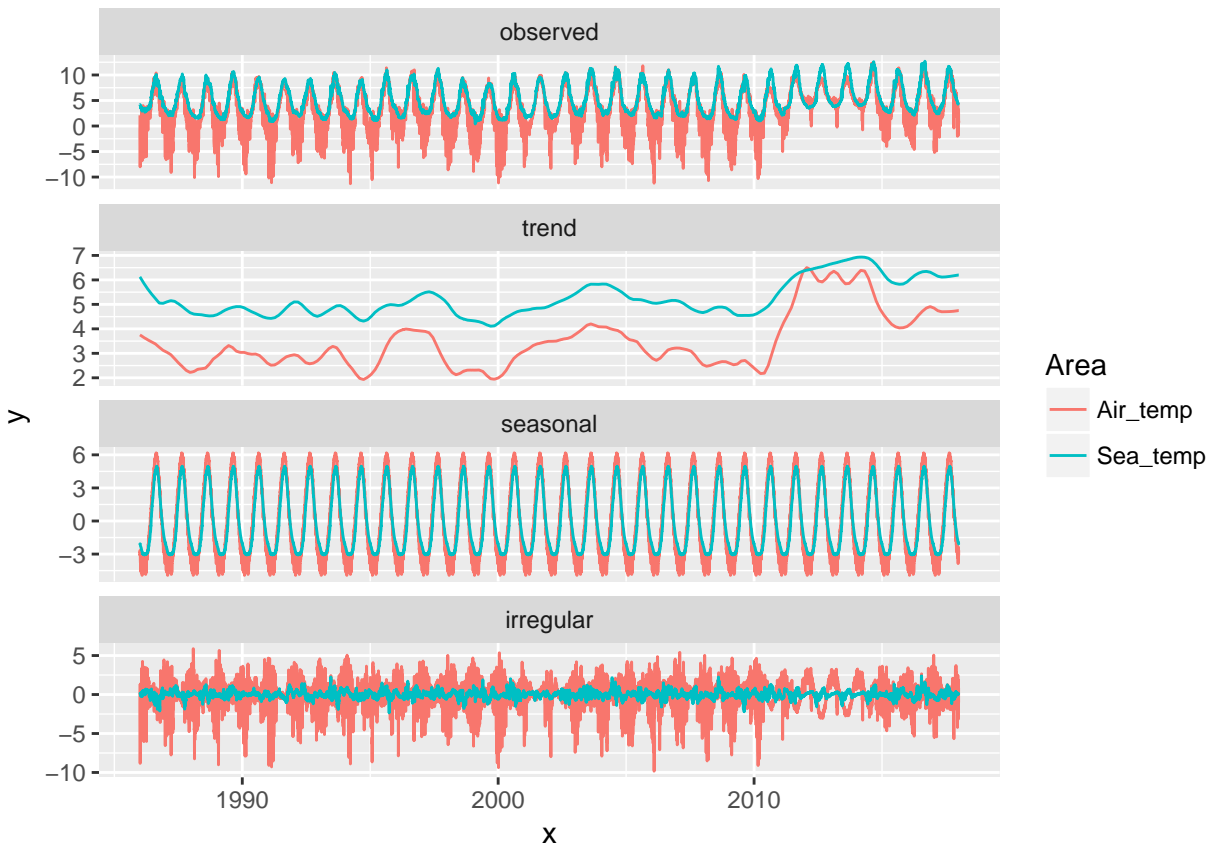
ggplot(data = tdata.tidy2, aes(Date, Celsius, color = Area), na.rm = T) + geom_line()

## Don't know how to automatically pick scale for object of type ts. Defaulting to continuous.

```



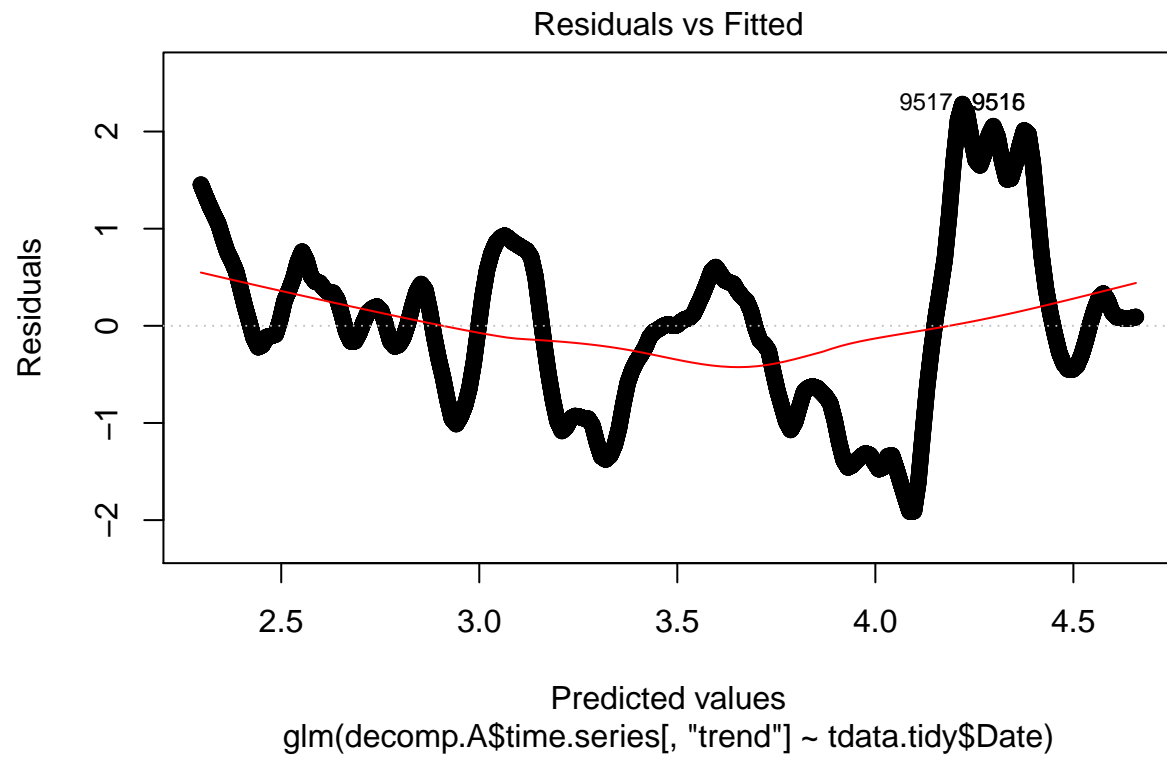
```
ggsdc(data = tdata.tidy2, aes(Date, Celsius, color = Area),  
      method = "stl", s.window = "period", frequency = 365) +  
  geom_line()
```

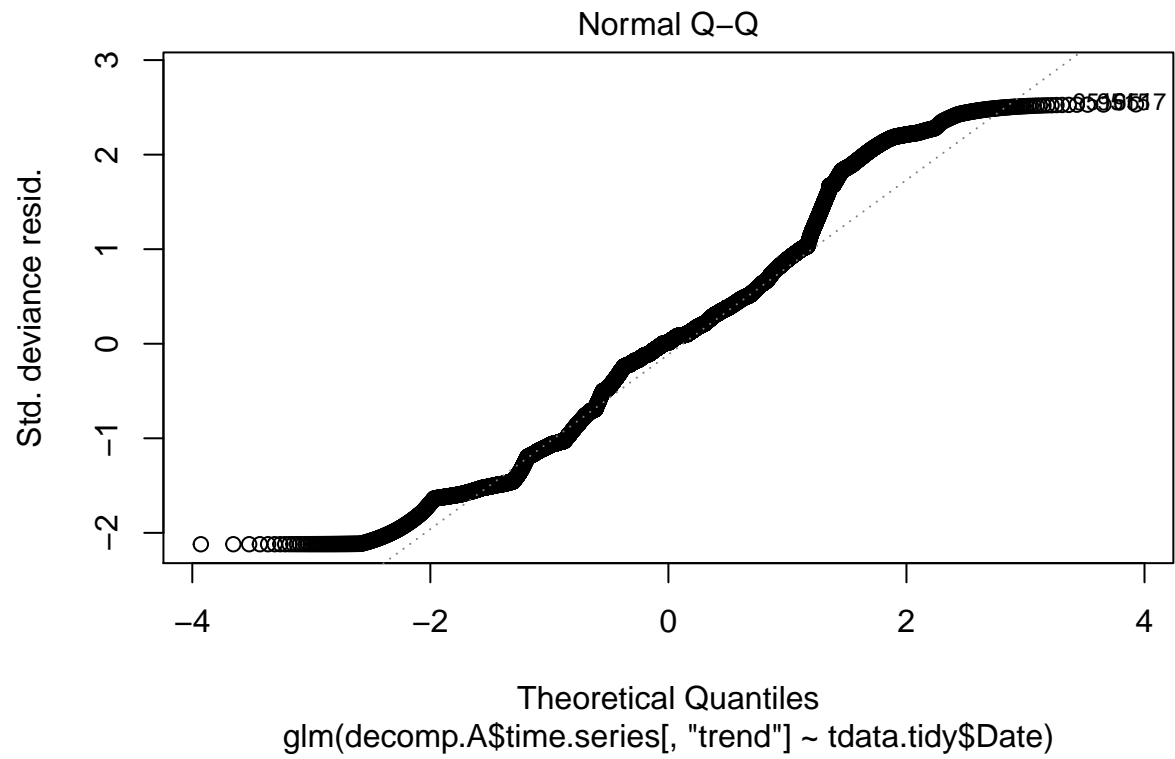


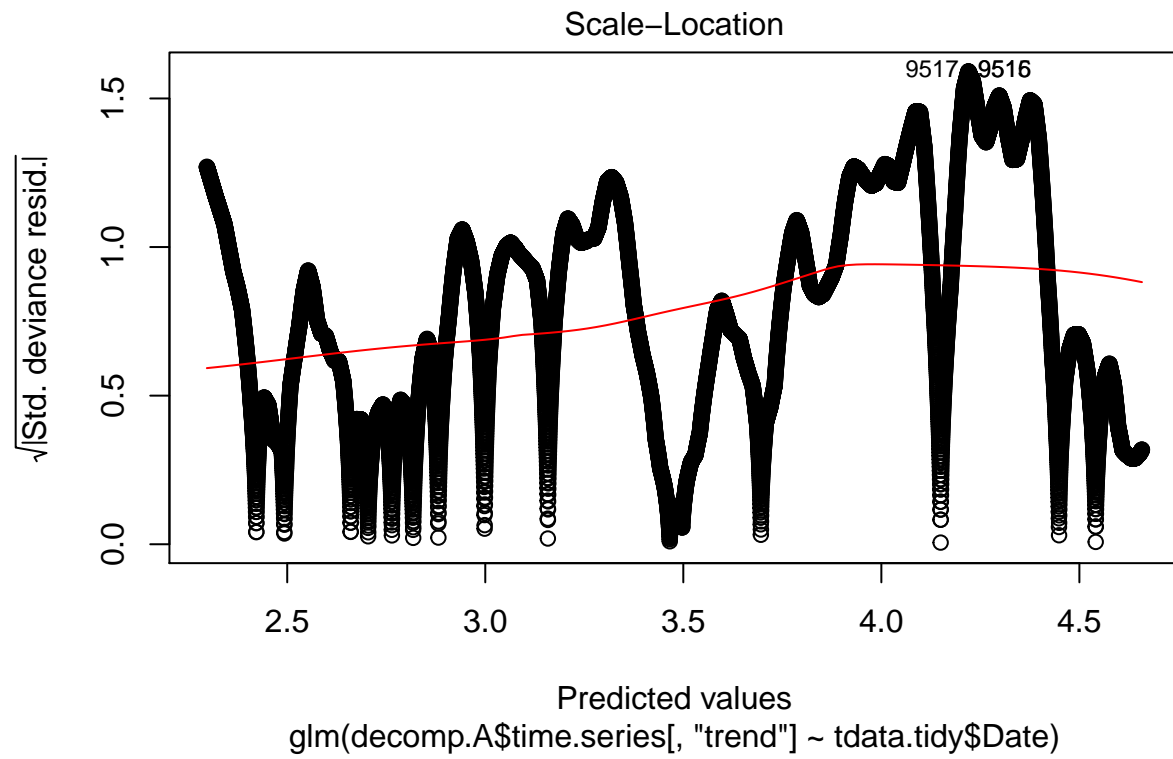
```
# A.NA.data <- as.numeric(forecast(t.series.A,1098)$mean)
#
# tdata.tidy <- tdata.tidy %>%
#   mutate(Air_temp = ifelse(Date %in% "2011-07-01":"2014-07-02",A.NA.data,tdata.tidy ))

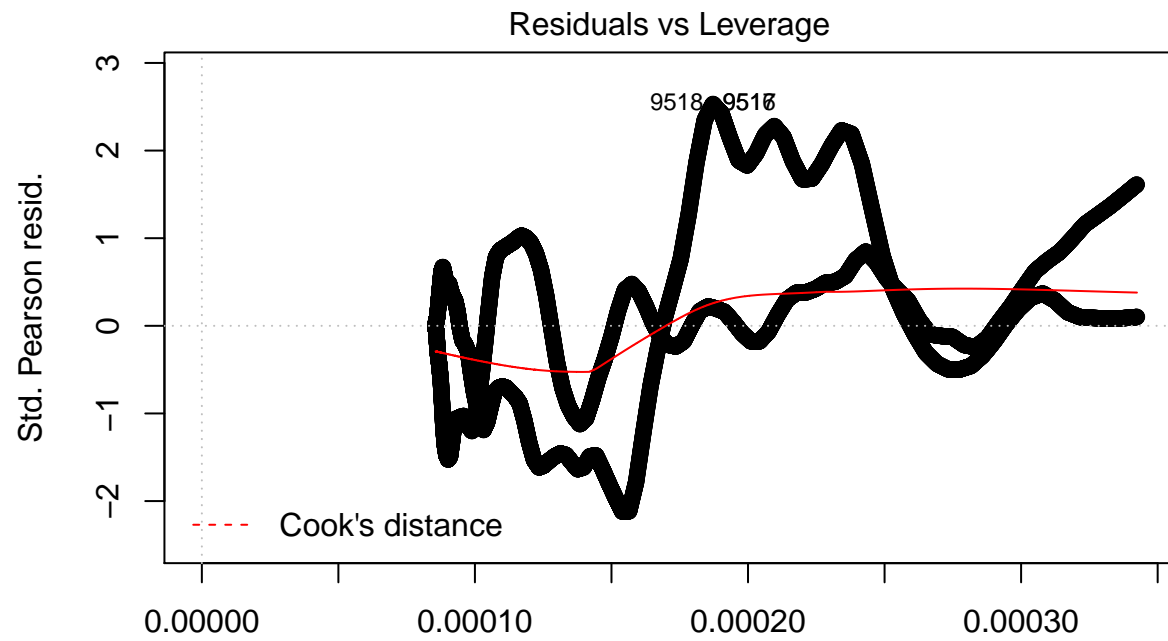
decomp.A <- stl(t.series.A, s.window = "periodic")
decomp.S <- stl(t.series.S, s.window = "periodic")

plot(glm(decomp.A$time.series[, "trend"] ~ tdata.tidy$Date))
```







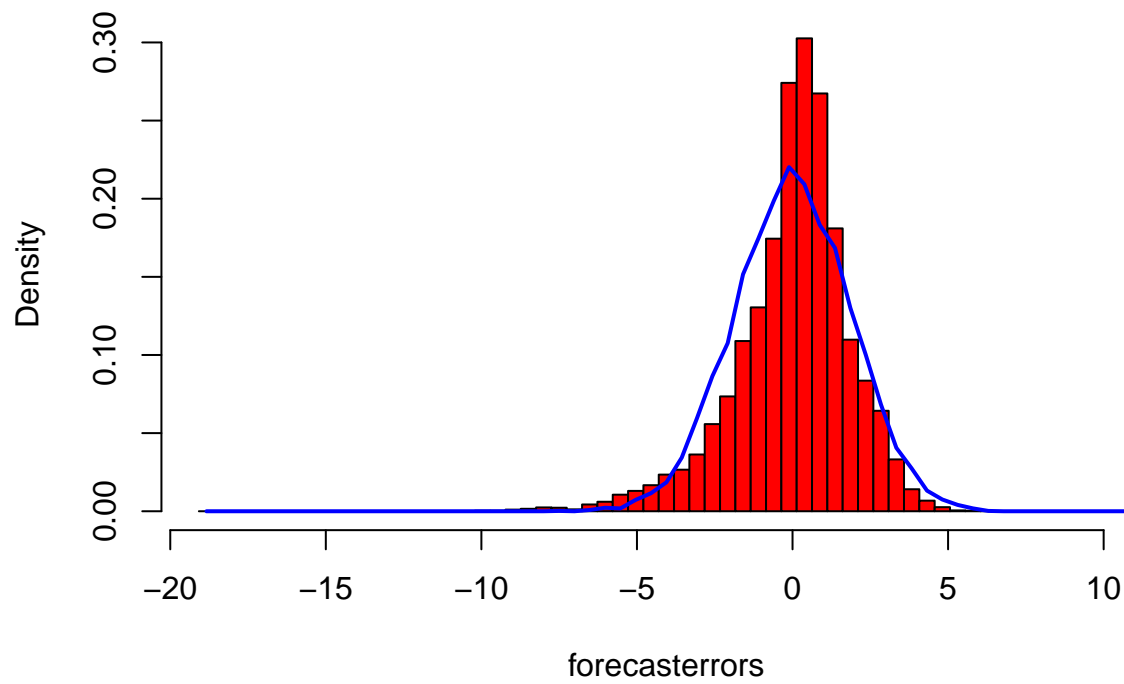


```
glm(decomp.A$time.series[, "trend"] ~ tdata.tidy$Date)
```

```
plotForecastErrors(decomp.A$time.series[, "remainder"])
```

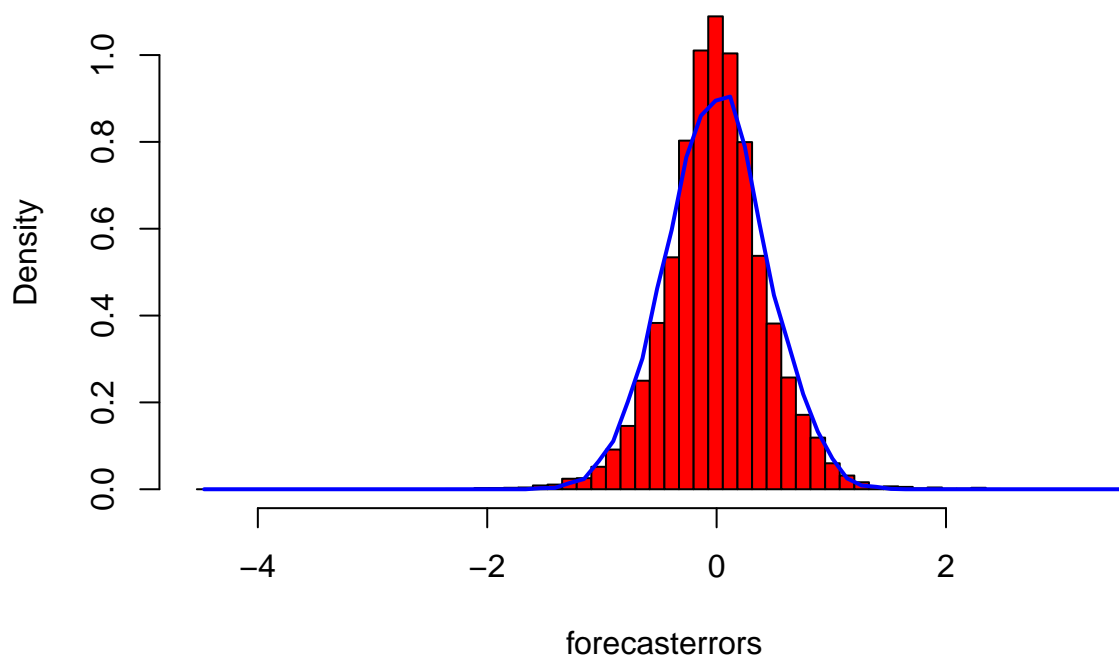


## Histogram of forecasterrors



```
plotForecastErrors(decomp.S$time.series[, "remainder"])
```

## Histogram of forecasterrors



```
# plot(decompose(t.series.A))
```

```
# t.series2 <- ts(tdata.tidy[,3], start = c(1995,1), end = c(2017,12), frequency = 365)
# t.series2 <- na.seadec(t.series2, algorithm = "mean")
# plot(t.series2)
# fit2 <- stl(t.series2, s.window = "period")
# plot(fit2)
```

```
header <- scan("1995.txt", nlines = 1, what = character())
data <- read.table("1995.txt", skip = 2, header = FALSE)
names(data) <- header
as.tibble(data)
```

```
## # A tibble: 8,217 x 16
```

	YY	MM	DD	hh	WD	WSPD	GST	WVHT	DPD	APD	MWD	BAR
	<int>	<int>	<int>	<int>	<int>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<int>	<dbl>
## 1	95	1	1	6	208	9.70	12.7	4.20	10.0	7.60	999	986
## 2	95	1	1	12	197	14.3	19.0	3.90	10.0	6.90	999	988
## 3	95	1	1	18	198	13.8	18.5	4.70	10.0	7.20	999	990
## 4	95	1	2	0	199	8.30	10.7	4.60	12.5	8.30	999	994
## 5	95	1	2	6	111	2.80	3.70	3.40	10.0	7.90	999	995
## 6	95	1	2	12	83	10.0	12.6	2.70	10.0	6.70	999	994
## 7	95	1	2	18	86	12.3	16.3	2.80	6.70	5.80	999	992
## 8	95	1	3	0	75	13.3	18.5	4.70	10.0	7.30	999	992
## 9	95	1	3	6	46	12.7	17.9	5.70	12.5	8.40	999	989

```
## 10    95      1      3      12      51 10.1 13.3   5.30 14.3   8.60  999  984
## # ... with 8,207 more rows, and 4 more variables: ATMP <dbl>, WTMP <dbl>,
## #   DEWP <dbl>, VIS <dbl>
```

```
data.tidy <- data %>%
  filter(hh == 12) %>%
  select(YY = contains("YY"), MM, DD, Air_temp = ATMP, Sea_temp = WTMP) %>%
  mutate(YY = ifelse(str_length(YY)==2,str_c(19,YY,sep = "", collapse = NULL),YY)) %>%
  mutate(Date = paste(as.character(YY),as.character(MM),as.character(DD), sep = "-"))
  mutate(Air_temp = replace(Air_temp, Air_temp == 999.0,NA)) %>%
  mutate(Sea_temp = replace(Sea_temp, Sea_temp == 999.0,NA)) %>%
  mutate(Date = as.Date(Date)) %>%
  select(Date,Air_temp,Sea_temp)
```

```
data.tidy
```

```
##           Date Air_temp Sea_temp
## 1  1995-01-01    -1.2      2.7
## 2  1995-01-02     1.2      2.7
## 3  1995-01-03     1.6      2.7
## 4  1995-01-04     1.3      2.7
## 5  1995-01-05     1.2      2.7
## 6  1995-01-06     0.1      2.7
## 7  1995-01-07    -0.4      2.7
## 8  1995-01-08    -0.2      2.5
## 9  1995-01-09    -0.3      2.5
## 10 1995-01-10    -2.7      2.4
## 11 1995-01-11    -4.4      2.5
## 12 1995-01-12    -3.8      2.4
## 13 1995-01-13    -1.9      2.5
## 14 1995-01-14    -6.1      2.4
## 15 1995-01-15    -2.9      2.4
## 16 1995-01-16    -1.3      2.4
## 17 1995-01-17    -5.1      2.3
## 18 1995-01-18    -6.7      2.3
## 19 1995-01-19    -4.8      2.2
## 20 1995-01-20    -4.3      2.2
## 21 1995-01-21    -2.7      2.2
## 22 1995-01-22    -1.3      2.1
## 23 1995-01-23    -1.2      2.1
## 24 1995-01-24    -2.7      2.1
## 25 1995-01-25    -5.3      2.1
## 26 1995-01-26    -2.7      2.1
## 27 1995-01-27   -10.5      2.1
## 28 1995-01-28   -10.5      2.0
## 29 1995-01-29    -7.3      1.8
## 30 1995-01-30    -8.9      1.6
## 31 1995-01-31    -8.6      1.7
## 32 1995-02-01    -8.5      1.7
## 33 1995-02-02    -7.7      1.4
## 34 1995-02-03    -8.2      1.5
## 35 1995-02-04    -6.0      1.3
```

## 36	1995-02-05	-0.9	1.5
## 37	1995-02-06	-0.6	1.5
## 38	1995-02-07	-0.1	1.6
## 39	1995-02-08	2.3	1.5
## 40	1995-02-09	NA	1.5
## 41	1995-02-10	NA	1.5
## 42	1995-02-11	NA	1.5
## 43	1995-02-12	NA	1.4
## 44	1995-02-13	NA	1.4
## 45	1995-02-14	NA	1.4
## 46	1995-02-15	NA	1.3
## 47	1995-02-16	NA	1.2
## 48	1995-02-17	NA	1.6
## 49	1995-02-18	NA	1.6
## 50	1995-02-19	NA	1.6
## 51	1995-02-20	NA	1.3
## 52	1995-02-21	NA	1.3
## 53	1995-02-22	NA	1.1
## 54	1995-02-23	NA	1.4
## 55	1995-02-24	NA	1.8
## 56	1995-02-25	NA	1.8
## 57	1995-02-26	NA	1.7
## 58	1995-02-27	NA	1.8
## 59	1995-02-28	NA	1.8
## 60	1995-03-01	NA	1.8
## 61	1995-03-02	NA	1.8
## 62	1995-03-03	NA	1.7
## 63	1995-03-04	NA	1.7
## 64	1995-03-05	NA	1.7
## 65	1995-03-06	NA	1.7
## 66	1995-03-07	NA	1.7
## 67	1995-03-08	NA	1.6
## 68	1995-03-09	NA	1.8
## 69	1995-03-10	NA	1.7
## 70	1995-03-11	NA	1.8
## 71	1995-03-12	NA	1.3
## 72	1995-03-13	NA	1.2
## 73	1995-03-14	NA	1.3
## 74	1995-03-15	NA	1.2
## 75	1995-03-16	NA	1.3
## 76	1995-03-17	NA	1.3
## 77	1995-03-18	NA	1.3
## 78	1995-03-19	NA	1.2
## 79	1995-03-20	NA	1.1
## 80	1995-03-21	NA	1.3
## 81	1995-03-22	NA	1.2
## 82	1995-03-24	NA	1.2
## 83	1995-03-25	NA	1.1
## 84	1995-03-26	NA	1.1
## 85	1995-03-27	NA	1.1
## 86	1995-03-28	NA	1.1
## 87	1995-03-29	NA	1.1
## 88	1995-03-30	NA	1.2
## 89	1995-03-31	NA	1.3

## 90	1995-04-01	-3.4	1.2
## 91	1995-04-02	-1.8	1.3
## 92	1995-04-03	-1.4	1.3
## 93	1995-04-04	1.1	1.3
## 94	1995-04-05	0.6	1.4
## 95	1995-04-06	0.5	1.7
## 96	1995-04-07	-4.5	1.3
## 97	1995-04-08	-4.7	1.3
## 98	1995-04-09	-3.3	1.2
## 99	1995-04-10	-3.5	1.1
## 100	1995-04-11	-2.3	1.3
## 101	1995-04-12	0.3	1.3
## 102	1995-04-13	1.2	1.5
## 103	1995-04-14	1.6	1.5
## 104	1995-04-15	0.2	1.4
## 105	1995-04-16	-1.7	1.3
## 106	1995-04-17	0.9	1.4
## 107	1995-04-18	-2.0	1.3
## 108	1995-04-19	-2.1	1.8
## 109	1995-04-20	-1.2	1.9
## 110	1995-04-21	0.9	1.4
## 111	1995-04-22	1.6	1.7
## 112	1995-04-23	1.6	1.6
## 113	1995-04-24	1.0	1.7
## 114	1995-04-25	1.2	1.7
## 115	1995-04-26	1.4	1.6
## 116	1995-04-27	1.9	1.7
## 117	1995-04-28	3.5	1.6
## 118	1995-04-29	0.7	2.2
## 119	1995-04-30	0.5	2.1
## 120	1995-05-01	0.2	1.9
## 121	1995-05-02	0.7	2.0
## 122	1995-05-03	0.5	2.4
## 123	1995-05-04	-0.2	2.5
## 124	1995-05-05	0.7	2.5
## 125	1995-05-06	0.8	2.2
## 126	1995-05-07	-0.1	2.6
## 127	1995-05-08	1.5	2.9
## 128	1995-05-09	2.3	3.0
## 129	1995-05-10	3.6	2.8
## 130	1995-05-11	1.9	2.8
## 131	1995-05-12	1.4	2.9
## 132	1995-05-13	3.1	2.9
## 133	1995-05-14	2.7	3.1
## 134	1995-05-15	2.3	3.3
## 135	1995-05-16	2.4	3.3
## 136	1995-05-17	3.0	3.0
## 137	1995-05-18	3.4	3.5
## 138	1995-05-19	3.0	3.3
## 139	1995-05-20	2.2	3.3
## 140	1995-05-21	3.5	3.4
## 141	1995-05-22	2.5	3.4
## 142	1995-05-23	2.5	3.5
## 143	1995-05-24	2.5	3.7

## 144	1995-05-25	2.4	3.8
## 145	1995-05-26	2.6	4.0
## 146	1995-05-27	2.3	4.1
## 147	1995-05-28	4.1	3.9
## 148	1995-05-29	3.9	4.0
## 149	1995-05-30	4.0	4.0
## 150	1995-05-31	2.2	3.7
## 151	1995-06-01	2.1	3.9
## 152	1995-06-02	3.2	4.1
## 153	1995-06-03	2.0	4.8
## 154	1995-06-04	2.1	4.9
## 155	1995-06-05	2.7	5.0
## 156	1995-06-06	2.6	5.3
## 157	1995-06-07	3.0	5.2
## 158	1995-06-08	2.7	5.2
## 159	1995-06-09	4.8	5.5
## 160	1995-06-10	4.8	5.3
## 161	1995-06-11	4.9	5.8
## 162	1995-06-12	4.6	5.9
## 163	1995-06-13	3.2	5.7
## 164	1995-06-14	4.3	6.1
## 165	1995-06-15	4.4	6.0
## 166	1995-06-16	3.3	5.9
## 167	1995-06-17	5.4	6.6
## 168	1995-06-18	6.6	7.2
## 169	1995-06-19	5.2	6.3
## 170	1995-06-20	4.1	6.0
## 171	1995-06-21	4.1	6.3
## 172	1995-06-22	4.8	7.0
## 173	1995-06-23	4.6	7.0
## 174	1995-06-24	5.6	6.6
## 175	1995-06-25	6.3	6.7
## 176	1995-06-26	6.6	6.6
## 177	1995-06-27	6.3	6.5
## 178	1995-06-28	6.3	6.5
## 179	1995-06-29	5.9	6.7
## 180	1995-06-30	6.7	6.9
## 181	1995-07-03	7.0	7.3
## 182	1995-07-04	6.8	7.5
## 183	1995-07-05	7.2	7.2
## 184	1995-07-06	7.1	7.0
## 185	1995-07-07	6.8	7.1
## 186	1995-07-08	7.1	7.5
## 187	1995-07-09	7.3	7.5
## 188	1995-07-10	8.2	7.7
## 189	1995-07-11	7.5	8.0
## 190	1995-07-12	6.9	8.1
## 191	1995-07-13	7.5	7.9
## 192	1995-07-14	7.8	8.1
## 193	1995-07-15	7.9	7.9
## 194	1995-07-16	7.5	8.1
## 195	1995-07-17	5.9	8.5
## 196	1995-07-18	7.0	8.4
## 197	1995-07-19	7.0	8.5

## 198	1995-07-20	8.0	8.5
## 199	1995-07-21	8.0	8.7
## 200	1995-07-22	8.8	8.9
## 201	1995-07-23	8.4	9.0
## 202	1995-07-24	8.8	8.8
## 203	1995-07-25	8.3	8.8
## 204	1995-07-26	8.7	8.7
## 205	1995-07-27	8.9	9.3
## 206	1995-07-28	8.1	9.5
## 207	1995-07-29	8.4	9.5
## 208	1995-07-30	8.6	9.4
## 209	1995-07-31	8.1	9.7
## 210	1995-08-01	8.4	9.6
## 211	1995-08-02	9.5	9.7
## 212	1995-08-03	9.6	9.8
## 213	1995-08-04	10.2	10.2
## 214	1995-08-05	8.3	9.8
## 215	1995-08-06	9.0	9.8
## 216	1995-08-07	9.2	9.9
## 217	1995-08-08	8.5	10.0
## 218	1995-08-09	8.7	10.0
## 219	1995-08-10	8.9	10.1
## 220	1995-08-11	8.9	9.8
## 221	1995-08-12	9.8	9.4
## 222	1995-08-13	7.9	9.7
## 223	1995-08-14	7.8	9.8
## 224	1995-08-15	10.5	10.1
## 225	1995-08-16	10.2	10.1
## 226	1995-08-17	10.1	9.8
## 227	1995-08-18	9.6	9.9
## 228	1995-08-19	10.0	9.9
## 229	1995-08-20	11.4	10.5
## 230	1995-08-21	10.7	10.5
## 231	1995-08-22	8.9	10.3
## 232	1995-08-23	10.9	10.4
## 233	1995-08-24	10.4	10.4
## 234	1995-08-25	10.5	10.4
## 235	1995-08-26	10.0	10.6
## 236	1995-08-27	10.5	10.7
## 237	1995-08-28	10.6	11.0
## 238	1995-08-29	10.0	10.5
## 239	1995-08-30	10.3	9.6
## 240	1995-08-31	9.2	9.4
## 241	1995-09-01	9.3	9.5
## 242	1995-09-02	9.8	9.9
## 243	1995-09-03	8.9	10.1
## 244	1995-09-04	8.9	10.1
## 245	1995-09-05	9.6	9.9
## 246	1995-09-06	9.2	9.8
## 247	1995-09-07	9.3	9.7
## 248	1995-09-08	8.4	9.4
## 249	1995-09-09	9.2	9.6
## 250	1995-09-10	8.8	9.4
## 251	1995-09-11	8.6	9.3

## 252	1995-09-12	8.3	8.9
## 253	1995-09-13	8.8	9.1
## 254	1995-09-14	9.4	8.9
## 255	1995-09-15	9.1	9.2
## 256	1995-09-16	9.0	9.2
## 257	1995-09-17	9.3	9.4
## 258	1995-09-18	8.4	9.4
## 259	1995-09-19	8.8	9.5
## 260	1995-09-20	8.7	9.6
## 261	1995-09-21	8.0	9.5
## 262	1995-09-22	8.8	9.4
## 263	1995-09-23	8.0	9.3
## 264	1995-09-24	8.6	9.1
## 265	1995-09-25	7.8	8.8
## 266	1995-09-26	8.8	8.7
## 267	1995-09-27	6.7	7.0
## 268	1995-09-28	6.8	6.2
## 269	1995-09-29	7.5	7.3
## 270	1995-09-30	7.4	7.9
## 271	1995-10-01	6.8	8.0
## 272	1995-10-02	6.2	8.1
## 273	1995-10-03	6.2	8.1
## 274	1995-10-04	6.3	8.2
## 275	1995-10-05	6.4	8.2
## 276	1995-10-06	4.5	8.0
## 277	1995-10-07	5.0	7.7
## 278	1995-10-08	5.6	7.6
## 279	1995-10-09	4.5	7.6
## 280	1995-10-10	4.3	7.5
## 281	1995-10-11	6.1	7.3
## 282	1995-10-12	4.9	7.4
## 283	1995-10-13	2.9	7.1
## 284	1995-10-14	2.9	7.1
## 285	1995-10-15	4.2	6.6
## 286	1995-10-16	4.4	6.5
## 287	1995-10-17	4.4	6.5
## 288	1995-10-18	4.5	6.4
## 289	1995-10-19	5.6	6.4
## 290	1995-10-20	5.9	6.3
## 291	1995-10-21	5.5	6.3
## 292	1995-10-22	5.1	6.4
## 293	1995-10-23	5.3	6.1
## 294	1995-10-24	3.9	6.0
## 295	1995-10-25	4.1	5.9
## 296	1995-10-26	3.5	5.7
## 297	1995-10-27	5.7	5.8
## 298	1995-10-28	5.0	5.8
## 299	1995-10-29	4.9	5.8
## 300	1995-10-30	2.0	5.3
## 301	1995-10-31	-0.6	5.1
## 302	1995-11-01	3.1	5.1
## 303	1995-11-02	1.5	5.1
## 304	1995-11-03	4.6	4.9
## 305	1995-11-04	5.4	4.9



## 306 1995-11-05	2.8	4.9
## 307 1995-11-06	4.5	5.0
## 308 1995-11-07	5.1	5.0
## 309 1995-11-08	3.1	4.9
## 310 1995-11-09	1.3	4.9
## 311 1995-11-10	3.5	5.0
## 312 1995-11-11	2.8	5.0
## 313 1995-11-12	3.7	4.9
## 314 1995-11-13	3.8	5.0
## 315 1995-11-14	1.6	4.7
## 316 1995-11-15	-0.5	4.5
## 317 1995-11-16	-0.7	4.4
## 318 1995-11-17	-2.6	4.4
## 319 1995-11-18	-0.3	4.4
## 320 1995-11-19	2.8	4.3
## 321 1995-11-20	3.6	4.0
## 322 1995-11-21	2.1	4.1
## 323 1995-11-22	1.1	4.1
## 324 1995-11-23	1.2	4.0
## 325 1995-11-24	3.5	4.0
## 326 1995-11-25	2.9	3.9
## 327 1995-11-26	2.9	4.1
## 328 1995-11-27	4.2	3.9
## 329 1995-11-28	4.1	3.8
## 330 1995-11-29	1.5	3.8
## 331 1995-11-30	3.5	3.7
## 332 1995-12-01	2.3	3.8
## 333 1995-12-02	2.5	4.1
## 334 1995-12-03	3.8	4.1
## 335 1995-12-04	2.3	4.1
## 336 1995-12-05	3.0	4.1
## 337 1995-12-06	4.1	4.1
## 338 1995-12-07	3.9	4.2
## 339 1995-12-08	3.4	4.1
## 340 1995-12-09	3.9	3.9
## 341 1995-12-10	1.8	4.1
## 342 1995-12-11	-0.8	4.0
## 343 1995-12-12	-0.2	3.8
## 344 1995-12-13	-0.7	3.8
## 345 1995-12-14	1.9	3.8
## 346 1995-12-15	2.0	3.8
## 347 1995-12-16	3.6	3.8
## 348 1995-12-17	2.8	3.8
## 349 1995-12-18	1.8	3.7
## 350 1995-12-19	1.2	3.7
## 351 1995-12-20	3.2	3.6
## 352 1995-12-21	1.2	3.6
## 353 1995-12-22	1.3	3.7
## 354 1995-12-23	-0.6	3.6
## 355 1995-12-24	-1.0	3.6
## 356 1995-12-25	-0.4	3.4
## 357 1995-12-26	0.2	3.3
## 358 1995-12-27	1.8	3.3
## 359 1995-12-28	2.9	3.4

```
## 360 1995-12-29      4.1      3.5
## 361 1995-12-30      2.5      3.5
## 362 1995-12-31      2.3      3.4
```

```
str_length(data.tidy$YY)
```

```
## integer(0)
```

```
#filter out restricted use chemicals - make a table
#

 #(paraquat index number)
```