

Assignment 1

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Assignment 1

```
rm(list=ls())
```

```
library(tidyverse)
```

```
-- Attaching packages ----- tidyverse 1.3.2 --
v ggplot2 3.4.0      v purrr   0.3.4
v tibble  3.1.8      v dplyr  1.0.9
v tidyr   1.2.0      v stringr 1.4.0
v readr   2.1.2      v forcats 0.5.1
-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()     masks stats::lag()
```

```
df_1 <- read_table2("https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt")
```

Warning: `read_table2()` was deprecated in readr 2.0.0.
i Please use `read_table()` instead.

Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]

```
-- Column specification -----
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.
```

Warning: 11 parsing failures.

row	col	expected	actual	file
532	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt'	fi
533	-- 29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt'	
534	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt'	
535	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt'	
536	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt'	

... ..
See problems(...) for more details.

```
df_2 <- read_table2("https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt")
```

Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean' => 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' => 'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' => 'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' => 'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' => 'Ocean_7' [26]

```
-- Column specification -----
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.
```

Warning: 11 parsing failures.

row	col	expected	actual	file
532	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt'	fi
533	-- 29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt'	
534	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt'	
535	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt'	
536	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt'	

... ..
See problems(...) for more details.

```
df_3 <- read_table2("https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.txt")
```

Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]

```
-- Column specification -----  
cols(  
  .default = col_character()  
)  
i Use `spec()` for the full column specifications.
```

Warning: 11 parsing failures.

row	col	expected	actual	file
532	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.tx'	
533	-- 29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.tx'	
534	-- 29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.tx'	
535	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.tx'	
536	-- 29 columns	7 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.tx'	

... ..
See problems(...) for more details.

```
df_4 <- read_table2("https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.txt")
```

Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]

```
-- Column specification -----
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.
```

Warning: 13 parsing failures.

row	col	expected	actual	file
504	--	29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.tx'
519	--	29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.tx'
532	--	29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.tx'
533	--	29 columns	28 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.tx'
534	--	29 columns	1 columns	'https://www.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.tx'

See problems(...) for more details.

```
#Select "Globe" column
```

```
df_1 <- df_1 %>%
select(c("Mo", "Globe", "Year"))
```

```
df_2 <- df_2 %>%
select(c("Mo", "Globe", "Year"))
```

```
df_3 <- df_3 %>%
select(c("Mo", "Globe", "Year"))
```

```
df_4 <- df_4 %>%
select(c("Mo", "Globe", "Year"))
```

```
#Add a new variabel with dates
```

```
df_1$Date <- as.Date(paste(df_1$Year, df_1$Mo, 1, sep="-"), format = "%Y-%m-%d")
df_2$Date <- as.Date(paste(df_2$Year, df_2$Mo, 1, sep="-"), format = "%Y-%m-%d")
df_3$Date <- as.Date(paste(df_3$Year, df_3$Mo, 1, sep="-"), format = "%Y-%m-%d")
df_4$Date <- as.Date(paste(df_4$Year, df_4$Mo, 1, sep="-"), format = "%Y-%m-%d")
```

```
df_1$Globe <- as.numeric(df_1$Globe)
```

Warning: NAs introduced by coercion

```
str(df_1)
```

```
tibble [542 x 4] (S3: tbl_df/tbl/data.frame)
 $ Mo   : chr [1:542] "12" "1" "2" "3" ...
 $ Globe: num [1:542] -0.48 -0.47 -0.43 -0.38 -0.41 -0.4 -0.4 -0.31 -0.4 -0.32 ...
 $ Year  : chr [1:542] "1978" "1979" "1979" "1979" ...
 $ Date  : Date[1:542], format: "1978-12-01" "1979-01-01" ...
```

```
df_2$Globe <- as.numeric(df_2$Globe)
```

Warning: NAs introduced by coercion

```
df_3$Globe <- as.numeric(df_3$Globe)
```

Warning: NAs introduced by coercion

```
df_4$Globe <- as.numeric(df_4$Globe)
```

Warning: NAs introduced by coercion

```
df_1 <- df_1 %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe))
df_2 <- df_2 %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe))
df_3 <- df_3 %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe))
df_4 <- df_4 %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe))
```

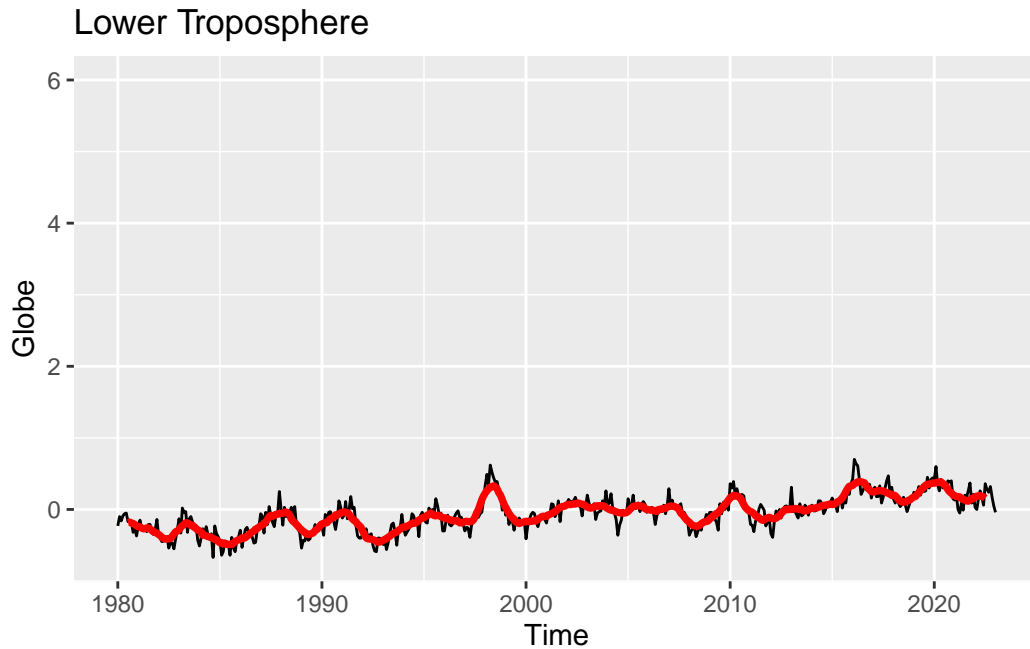
#plotting the dataset in a graph, with use of the zoo::rollmean function

```
df_1 %>% filter(Year >= 1980) %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe)) %>%
  ggplot(aes(x=Date, y=Globe)) + geom_line() +
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="red", size=1.3)+
  ggtitle("Lower Troposphere") +
  ylab("Globe") +
  xlab("Time")
```

Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
i Please use `linewidth` instead.

Warning: Removed 9 rows containing missing values (`geom_line()`).

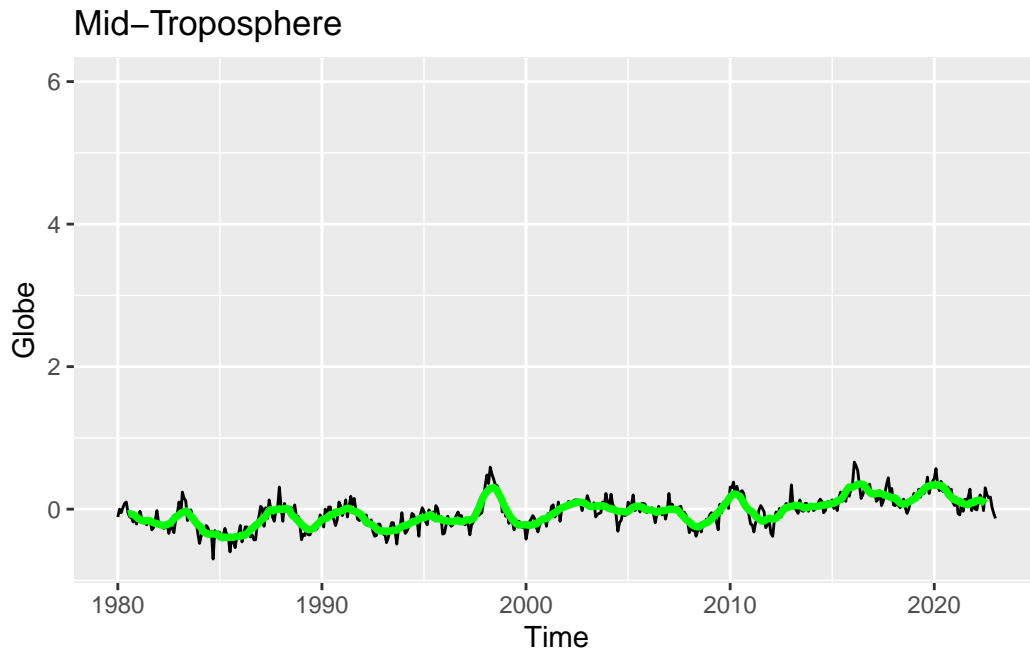
Warning: Removed 21 rows containing missing values (`geom_line()`).



```
df_2 %>% filter(Year >= 1980) %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe)) %>%  
  ggplot(aes(x=Date, y=Globe)) + geom_line() +  
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="green", size=1.3) +  
  ggtitle("Mid-Troposphere") +  
  ylab("Globe") +  
  xlab("Time")
```

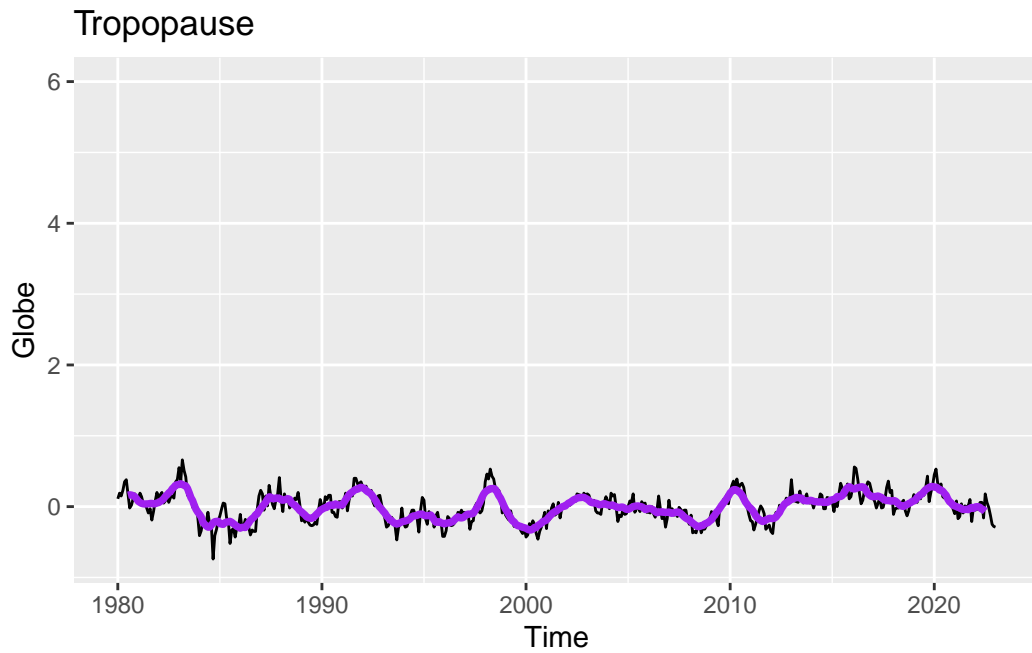
Warning: Removed 9 rows containing missing values (`geom_line()`).

Removed 21 rows containing missing values (`geom_line()`).



```
df_3 %>% filter(Year >= 1980) %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe)) %>%  
  ggplot(aes(x=Date, y=Globe)) + geom_line() +  
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="purple", size=1.3)+  
  ggtitle("Tropopause") +  
  ylab("Globe") +  
  xlab("Time")
```

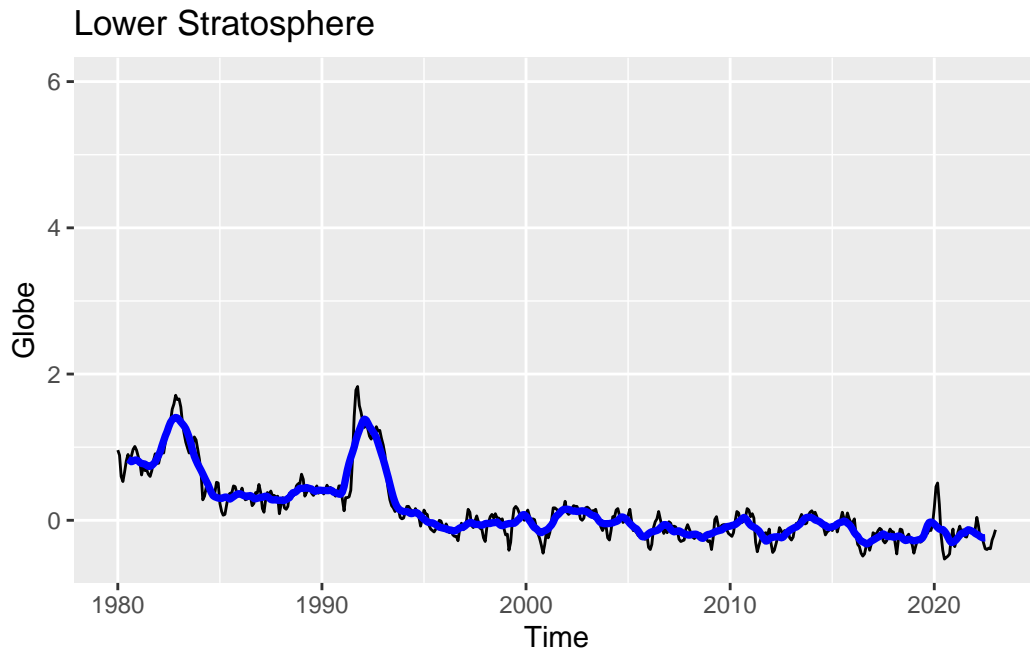
Warning: Removed 9 rows containing missing values (`geom_line()`).
Removed 21 rows containing missing values (`geom_line()`).



```
df_4 %>% filter(Year >= 1980) %>% group_by(Year) %>% mutate(Average.Temp=mean(Globe)) %>%
  ggplot(aes(x=Date, y=Globe)) + geom_line() +
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="blue", size=1.3)+
  ggtitle("Lower Stratosphere") +
  ylab("Globe") +
  xlab("Time")
```

Warning: Removed 9 rows containing missing values (`geom_line()`).

Removed 21 rows containing missing values (`geom_line()`).



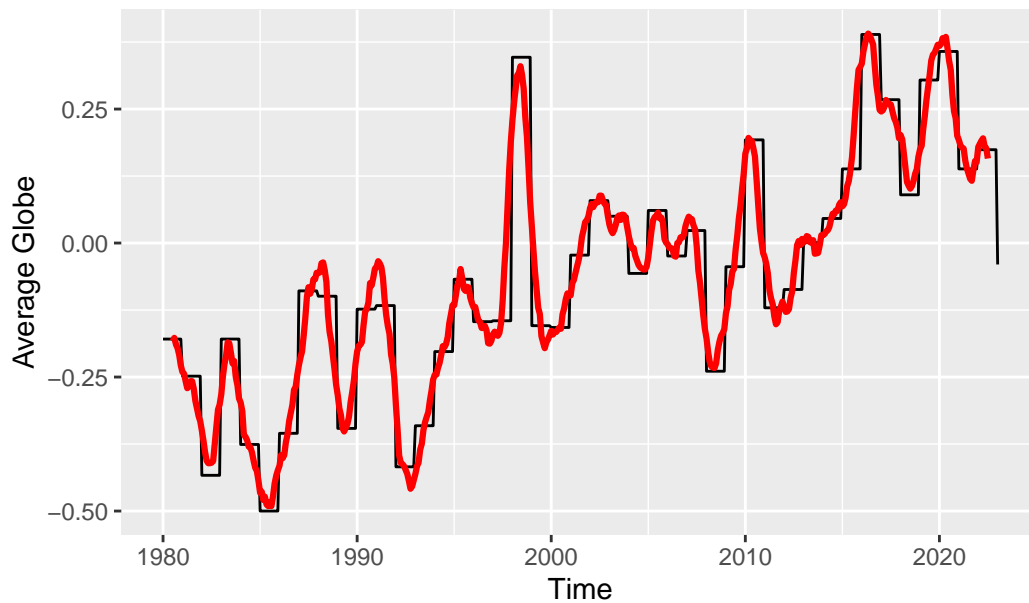
```
#Plotting in the average variabel of the temp

df_1 %>% filter(Year >= 1980) %>%
  ggplot(aes(x=Date, y=Average.Temp)) + geom_line() +
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="red", size=1.1)+
  ggtitle("Average of the 12-month Lower Troposphere") +
  ylab("Average Globe") +
  xlab("Time")
```

Warning: Removed 9 rows containing missing values (`geom_line()`).

Warning: Removed 21 rows containing missing values (`geom_line()`).

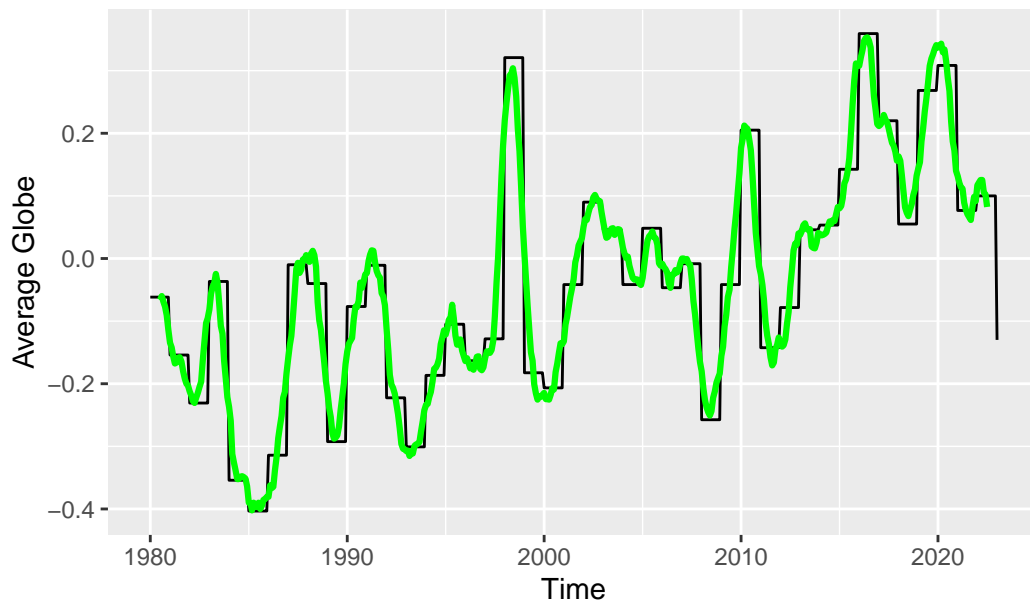
Average of the 12-month Lower Troposphere



```
df_2 %>% filter(Year >= 1980) %>%  
  ggplot(aes(x=Date, y=Average.Temp)) + geom_line() +  
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="green", size=1.1)+  
  ggtitle("Average of the 12-month Lower Stratosphere") +  
  ylab("Average Globe") +  
  xlab("Time")
```

Warning: Removed 9 rows containing missing values (`geom_line()`).
Removed 21 rows containing missing values (`geom_line()`).

Average of the 12-month Lower Stratosphere

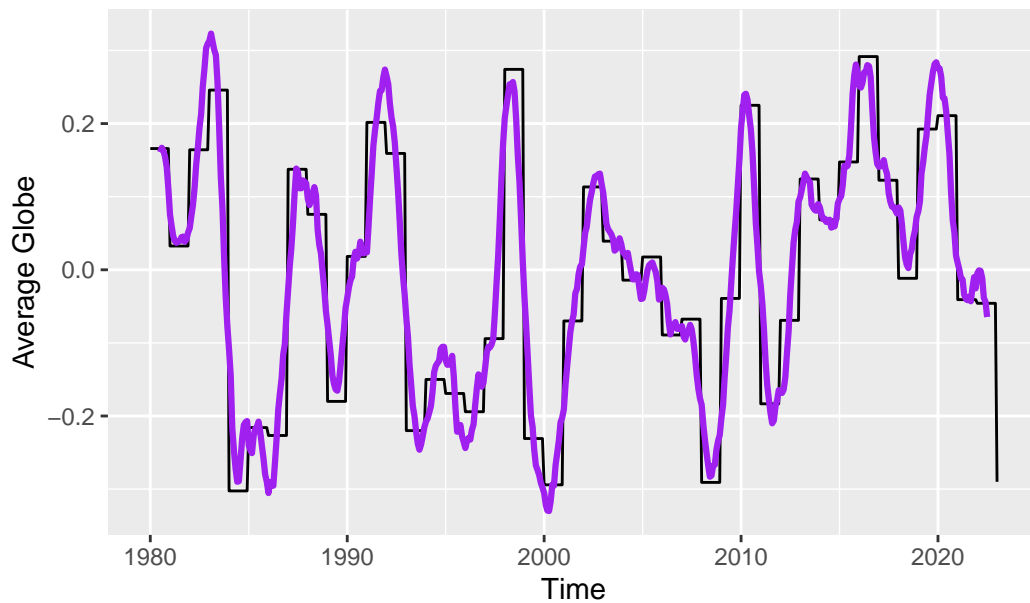


```
df_3 %>% filter(Year >= 1980) %>%
  ggplot(aes(x=Date, y=Average.Temp)) + geom_line() +
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="purple", size=1.1)+
  ggtitle("Average of the 12-month Tropopause") +
  ylab("Average Globe") +
  xlab("Time")
```

Warning: Removed 9 rows containing missing values (`geom_line()`).

Removed 21 rows containing missing values (`geom_line()`).

Average of the 12-month Tropopause



```
df_4 %>% filter(Year >= 1980) %>%
  ggplot(aes(x=Date, y=Average.Temp)) + geom_line() +
  geom_line(aes(y=zoo::rollmean(Globe, 13, fill=NA)), col="blue", size=1.1)+
  ggtitle("Average of the 12-month Lower Stratosphere") +
  ylab("Average Globe") +
  xlab("Time")
```

Warning: Removed 9 rows containing missing values (`geom_line()`).

Removed 21 rows containing missing values (`geom_line()`).

Average of the 12-month Lower Stratosphere

