

Mappeoppgave 1

Oppgave 1

Først importerer vi dataen fra nettsiden og danner et datasett og gjør det om til numeriske verdier.

```
Temp <- fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt")

## Warning in fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/
## uahncdc_lt_6.0.txt"): Stopped early on line 520. Expected 29 fields but found
## 0. Consider fill=TRUE and comment.char=. First discarded non-empty line: <<Trend
## 0.14 0.18 0.12 0.16 0.19 0.14 0.11 0.16 0.10 0.12 0.16 0.11 0.18 0.21 0.17 0.10
## 0.15 0.09 0.25 0.23 0.27 0.01 0.09 -0.02 0.18 0.18 0.18>>

Temp <- Temp[-c(518)]
Temp <- as.data.frame(apply(Temp, 2, as.numeric))
```

Så endrer vi datasettet slik at det kun er de verdiene vi er interessert i som er igjen.

```
Values <- c("Year", "Mo", "Globe")
Temp <- Temp[Values]
```

Så finner vi det glidende gjennomsnittet av endringene.

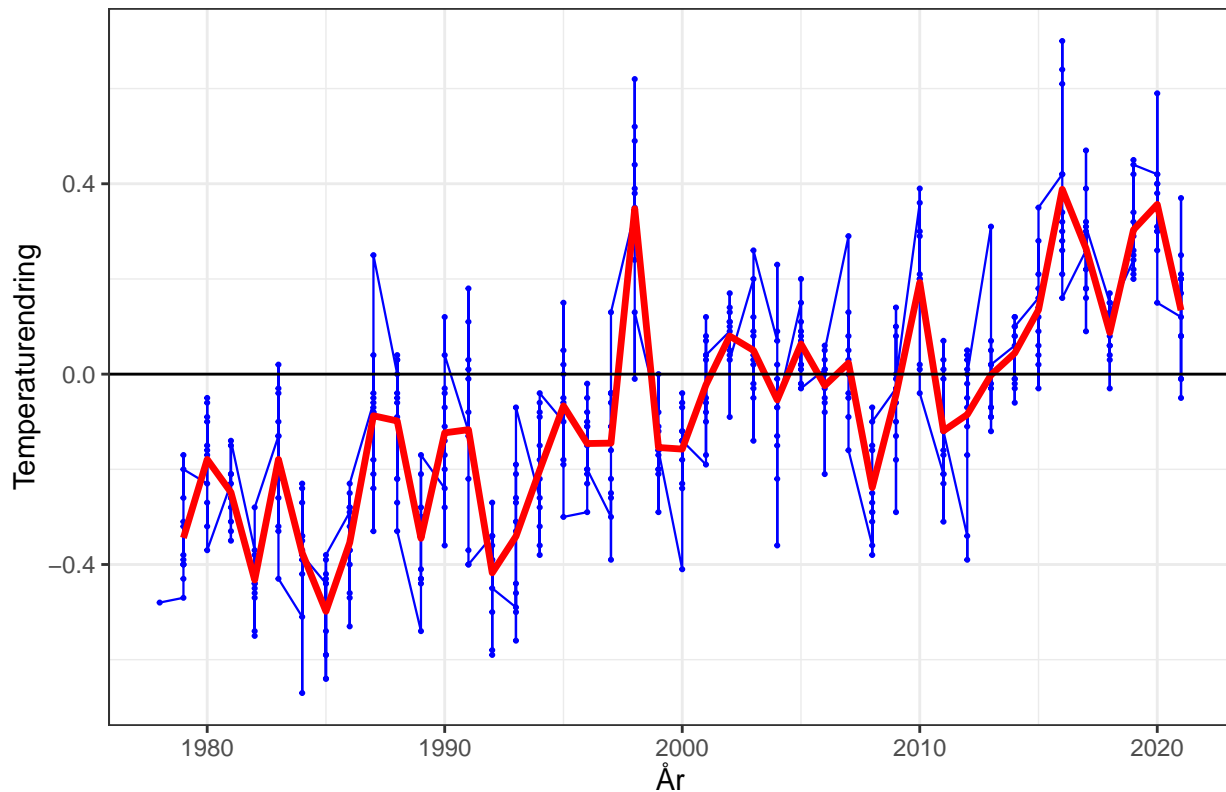
```
Temp1 <- Temp %>%
  arrange(Year) %>%
  group_by(Year) %>%
  mutate(Mean_Globe = rollmean(Globe, k = 12, fill = NA)) %>%
  ungroup()

Temp2 <- Temp1 %>% drop_na()
Temp2 <- Temp2 %>%
  rename(Filler = Globe,
         Globe = Mean_Globe)
```

Vi plotter det inn og får denne figuren hvor den røde streken markerer det glidende gjennomsnittet.

```
ggplot(NULL, aes(Year, Globe)) +
  geom_point(data = Temp1, color="blue", size= 0.4) +
  geom_line(data = Temp1, color ="blue", size = 0.4) +
  geom_line(data = Temp2, color ="red1", size = 1.2) +
  labs(title = "Temperaturendring i Nedre troposfære i forhold til normalperioden 1991-2020",
       x = "År",
       y = "Temperaturendring") +
  geom_hline(yintercept = 0, size = 0.5) +
  theme_bw()
```

Temperaturendring i Nedre troposfære i forhold til normalperioden 1991–20



Oppgave 2

Først laster vi inn dataene fra nettsiden og lager et datasett med numeriske verdier.

```
LowTrop <- fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt")
```

```
## Warning in fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/
## uahncdc_lt_6.0.txt"): Stopped early on line 520. Expected 29 fields but found
## 0. Consider fill=TRUE and comment.char=. First discarded non-empty line: <<Trend
## 0.14 0.18 0.12 0.16 0.19 0.14 0.11 0.16 0.10 0.12 0.16 0.11 0.18 0.21 0.17 0.10
## 0.15 0.09 0.25 0.23 0.27 0.01 0.09 -0.02 0.18 0.18 0.18>>
```

```
LowTrop <- LowTrop[-c(518)]
```

```
LowTrop <- as.data.frame(apply(LowTrop, 2, as.numeric))
```

```
MidTrop <- fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.txt")
```

```
## Warning in fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/
## uahncdc_mt_6.0.txt"): Stopped early on line 520. Expected 29 fields but found
## 0. Consider fill=TRUE and comment.char=. First discarded non-empty line: <<Trend
## 0.10 0.13 0.08 0.12 0.14 0.10 0.07 0.10 0.07 0.09 0.12 0.09 0.13 0.15 0.12 0.06
## 0.09 0.06 0.17 0.16 0.19 -0.02 0.01 -0.03 0.14 0.14 0.13>>
```

```
MidTrop <- MidTrop[-c(518)]
```

```
MidTrop <- as.data.frame(apply(MidTrop, 2, as.numeric))
```

```
Trop <- fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.txt")
```

```
## Warning in fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/
```

```
## uahncdc_tp_6.0.txt"): Stopped early on line 520. Expected 29 fields but found
## 0. Consider fill=TRUE and comment.char=. First discarded non-empty line: <<Trend
## 0.02 0.02 0.02 0.03 0.04 0.03 0.01 -0.00 0.01 0.03 0.04 0.03 0.03 0.04 0.03
## -0.01 -0.03 -0.00 0.02 0.02 0.03 -0.08 -0.13 -0.05 0.05 0.05 0.04>>

Trop <- Trop[-c(518)]
Trop <- as.data.frame(apply(Trop, 2, as.numeric))

LowStrat <- fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.txt")

## Warning in fread("http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/
## uahncdc_ls_6.0.txt"): Stopped early on line 505. Expected 29 fields but found
## 28. Consider fill=TRUE and comment.char=. First discarded non-empty line: <<2020
## 11 -0.23 -0.96 0.05 0.05 -0.40 0.34 -0.52 -2.24 -0.16 1.29 1.26 1.31 -0.53 -0.78
## -0.30 -1.55 -5.03 -0.94 -1.85 -2.08 -1.58 -8.78-13.45 -6.57 -0.32 -1.04 0.53>>

LowStrat <- LowStrat[-c(518)]

## Warning in `[.data.table`(LowStrat, -c(518))`: Item 1 of i is -518 but there are
## only 503 rows. Ignoring this and 0 more like it out of 1.

LowStrat <- as.data.frame(apply(LowStrat, 2, as.numeric))
```

Vi endrer datasettene slik at de kun inneholder de verdiene vi er ute etter og finner gjennomsnittet av lagene.

```
Values1 <- c("Year", "Mo", "NoPol")
LowTrop <- LowTrop[Values1]
MidTrop <- MidTrop[Values1]
Trop <- Trop[Values1]
LowStrat <- LowStrat[Values1]

Mean <- rbindlist(list(LowTrop, MidTrop, Trop, LowStrat))[,lapply(.SD, mean), list(Year, Mo)]
```

Deretter lager vi et plot for hvert av lagene

```
p1 <- ggplot(LowTrop, aes(Year, NoPol)) +
  geom_point(color = "cyan1", size = 0.3) +
  geom_line(color = "cyan1", size = 0.3) +
  coord_fixed(ratio = 2.2) +
  labs(title = "Nedre Troposfære",
       x = "År",
       y = "Temperaturendring") +
  theme_bw()

p2 <- ggplot(MidTrop, aes(Year, NoPol)) +
  geom_point(color = "darkorange1", size = 0.3) +
  geom_line(color = "darkorange1", size = 0.3) +
  coord_fixed(ratio = 2) +
  labs(title = "Midtre troposfære",
       x = "År",
       y = "Temperaturendring") +
  theme_bw()

p3 <- ggplot(Trop, aes(Year, NoPol)) +
  geom_point(color = "blue", size = 0.3) +
  geom_line(color = "blue", size = 0.3) +
  coord_fixed(ratio = 1) +
```

```

labs(title = "Troposfæren",
      x = "År",
      y = "Temperaturendring") +
theme_bw()

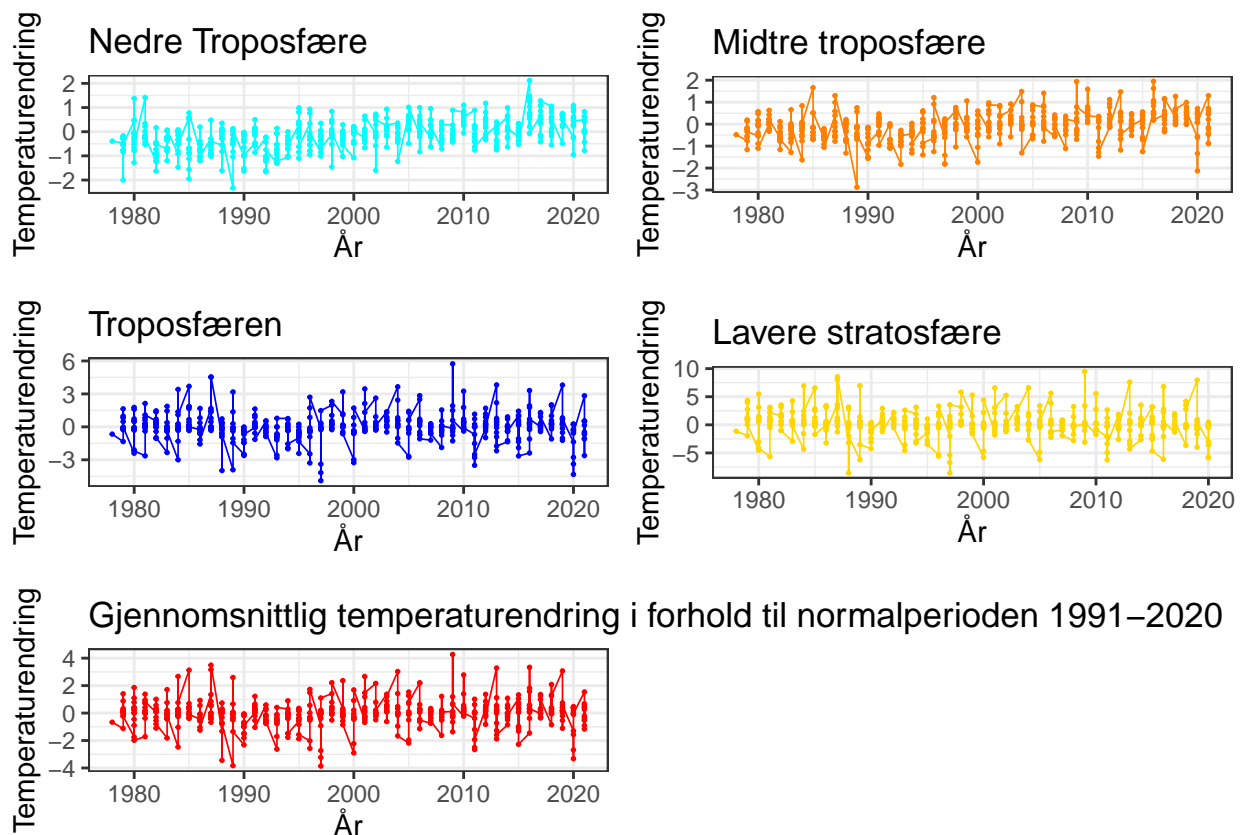
p4 <- ggplot(LowStrat, aes(Year,NoPol)) +
  geom_point(color = "gold", size = 0.3) +
  geom_line(color = "gold", size = 0.3) +
  coord_fixed(ratio = 0.5) +
  labs(title = "Lavere stratosfære",
        x = "År",
        y = "Temperaturendring") +
  theme_bw()

p5 <- ggplot(Mean, aes(Year,NoPol)) +
  geom_point(color = "red1", size = 0.3) +
  geom_line(color = "red1", size = 0.3) +
  coord_fixed(ratio = 1.25) +
  labs(title = "Gjennomsnittlig temperaturendring i forhold til normalperioden 1991-2020",
        x = "År",
        y = "Temperaturendring") +
  theme_bw()

```

Før vi så plotter det inn med cowplot og får dette:

```
plot_grid(p1,p2,p3,p4,p5,ncol = 2)
```



For å prøve å gjøre det litt lettere å se har vi kombinert alle lagene ved å bruke `geom_smooth()`. Her ser vi

gjennomsnittet markert med rød strek.

```
ggplot(NULL, aes(Year, NoPol)) +  
  geom_smooth(data = LowTrop, color = "cyan1", size = 0.8, alpha = 0) +  
  geom_smooth(data = MidTrop, color = "darkorange1", size = 0.8, alpha = 0) +  
  geom_smooth(data = Trop, color = "blue", size = 0.8, alpha = 0) +  
  geom_smooth(data = LowStrat, color = "gold", size = 0.8, alpha = 0) +  
  geom_smooth(data = Mean, color = "red1", size = 1.5, alpha = 0) +  
  coord_fixed(ratio = 8.5) +  
  geom_hline(yintercept = 0, size = 0.5) +  
  labs(title = "Gjennomsnittlig temperaturendring i forhold til normalperioden 1991–2020",  
        x = "År",  
        y = "Temperaturendring") +  
  theme_bw()
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'  
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'  
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'  
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'  
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```

