Decay Function of CO2

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Setting Up CO2 Decay Function

The decay of CO2 in the atmosphere is a function of time. The IPCC AR5 report provides the following equation for the decay of CO2 over time:

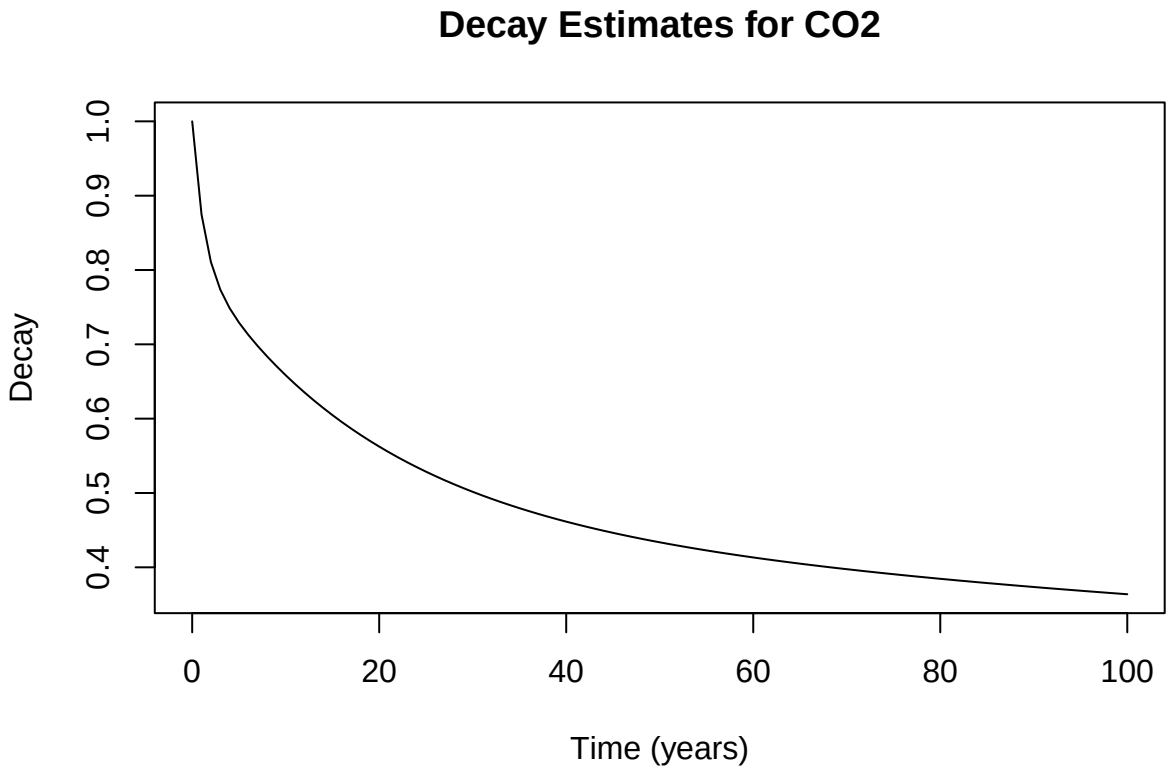
$$CO2(t) = a_0 + a_1 e^{-t/\tau_1} + a_2 e^{-t/\tau_2} + a_3 e^{-t/\tau_3} \quad (1)$$

where $a_0 = 0.217$, $a_1 = 0.259$, $a_2 = 0.338$, $a_3 = 0.186$, $\tau_1 = 172.9$, $\tau_2 = 18.51$, and $\tau_3 = 1.186$.

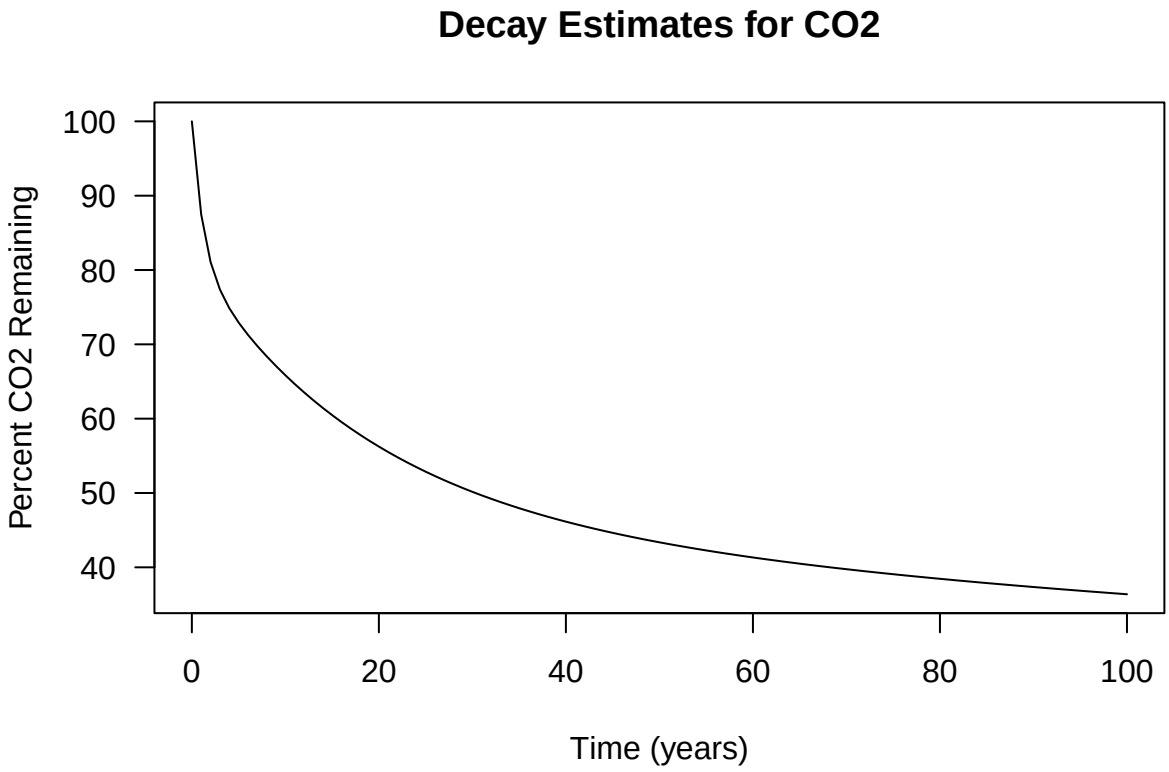
```
# Function to calculate the decay of CO2 over time
decay_function_co2 <- function(t) {
  # IPCC AR5 parameters for CO2
  a0 <- 0.217
  a1 <- 0.259
  a2 <- 0.338
  a3 <- 0.186
  tau1 <- 172.9
  tau2 <- 18.51
  tau3 <- 1.186

  decay <- a0 + a1 * exp(-t / tau1) + a2 * exp(-t / tau2) + a3 * exp(-t / tau3)
  return(decay)
}
```

```
timeframe = 0:100
```

```
plot(timeframe, decay_function_co2(timeframe),
     type = "l",
     xlab = "Time (years)",
     ylab = "Decay",
     main = "Decay Estimates for CO2")
```

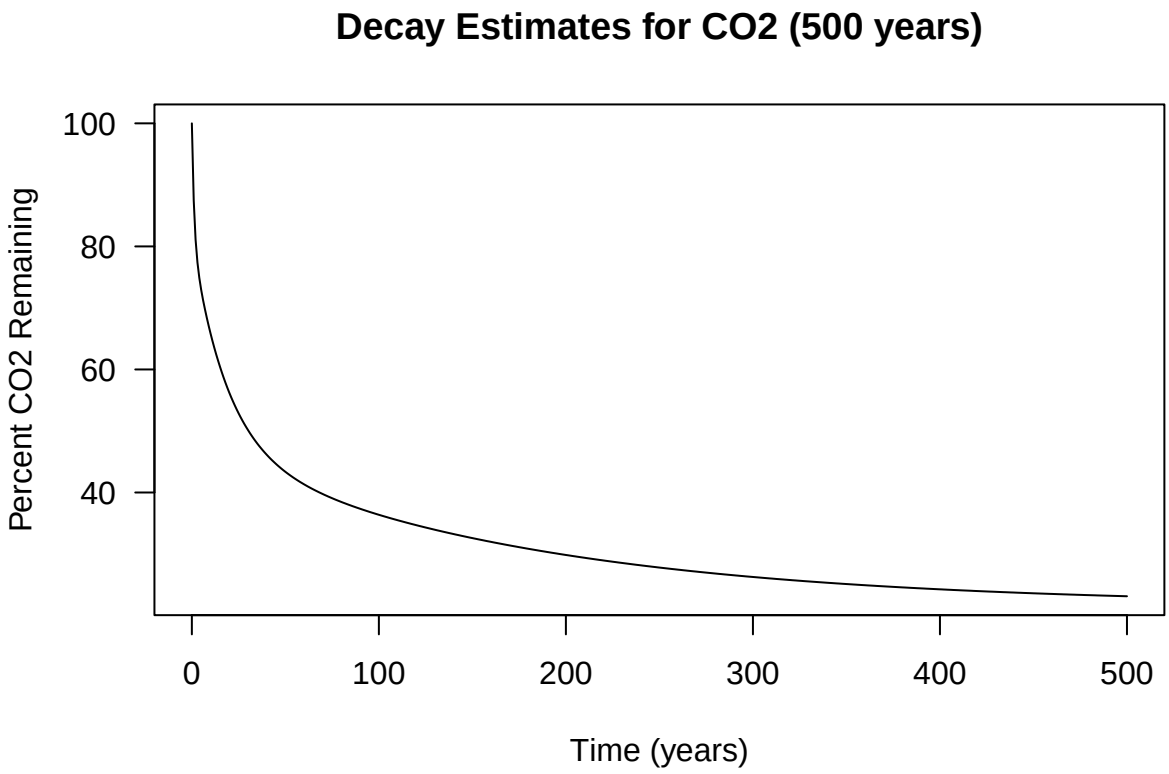



```
par(las=1)
plot(timeframe, decay_function_co2(timeframe)*100,
     type = "l",
     xlab = "Time (years)",
     ylab = "Percent CO2 Remaining",
     main = "Decay Estimates for CO2")
```

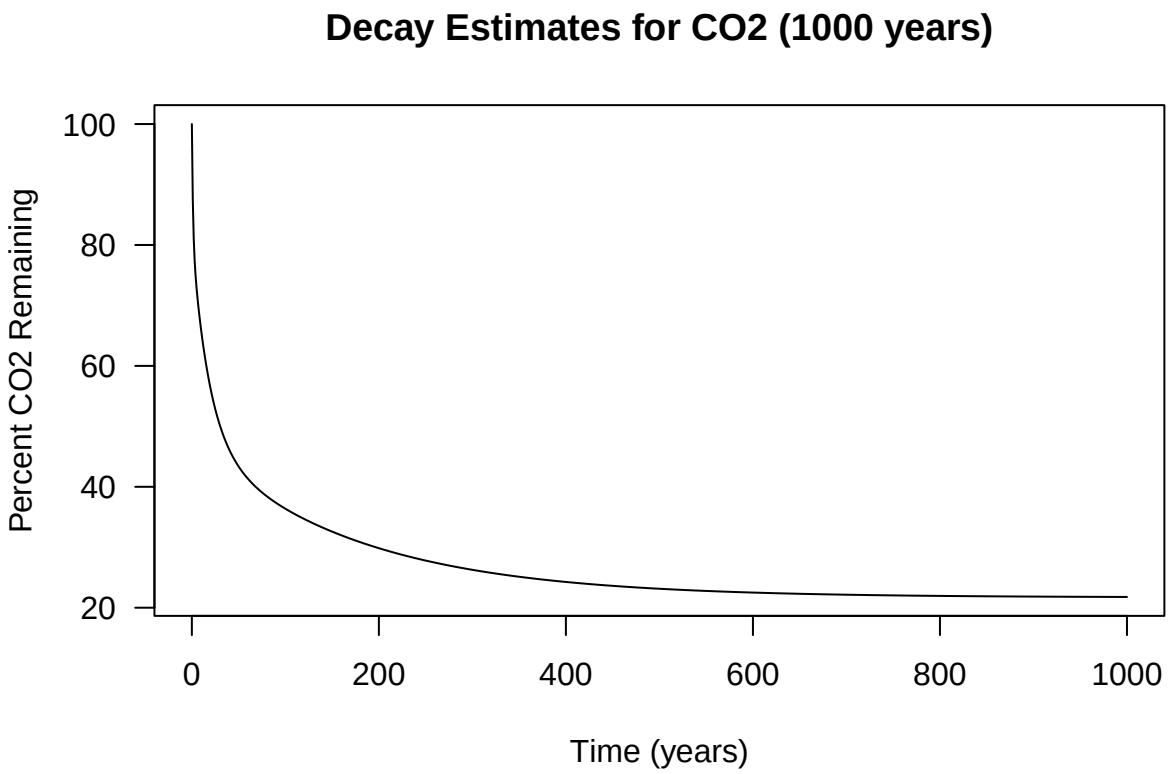


500 Years

```
timeframe = 0:500
```


Decay Estimates for CO2 (500 years)
Percent CO2 Remaining
100
80
60
40
0
100
200
300
400
500
Time (years)

1000 Years


Decay Estimates for CO2 (1000 years)
Percent CO2 Remaining
100
80
60
40
20
0
200
400
600
800
1000
Time (years)