Foundations of Data Science

Capstone Project - Analysis of Climate Change

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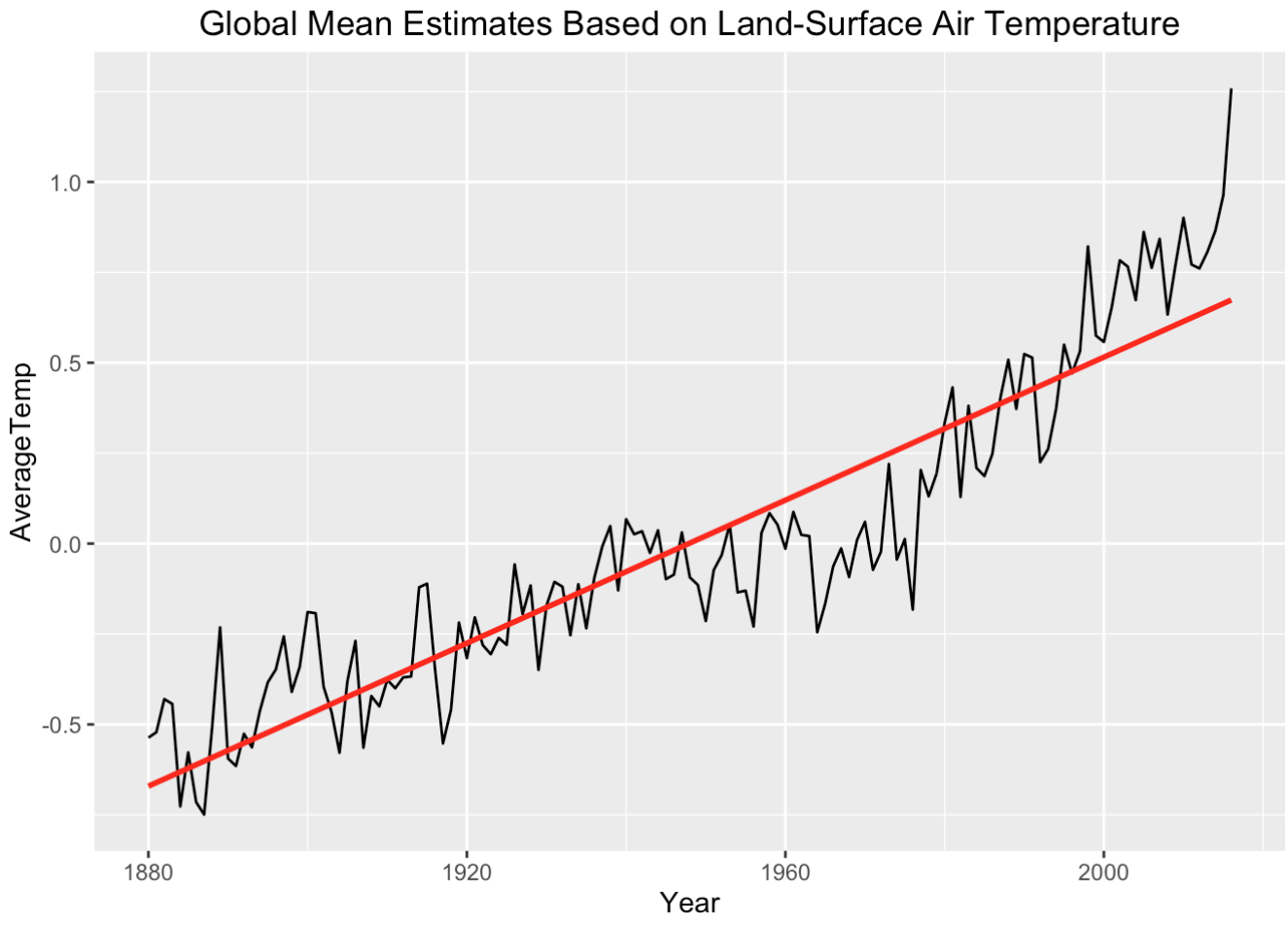
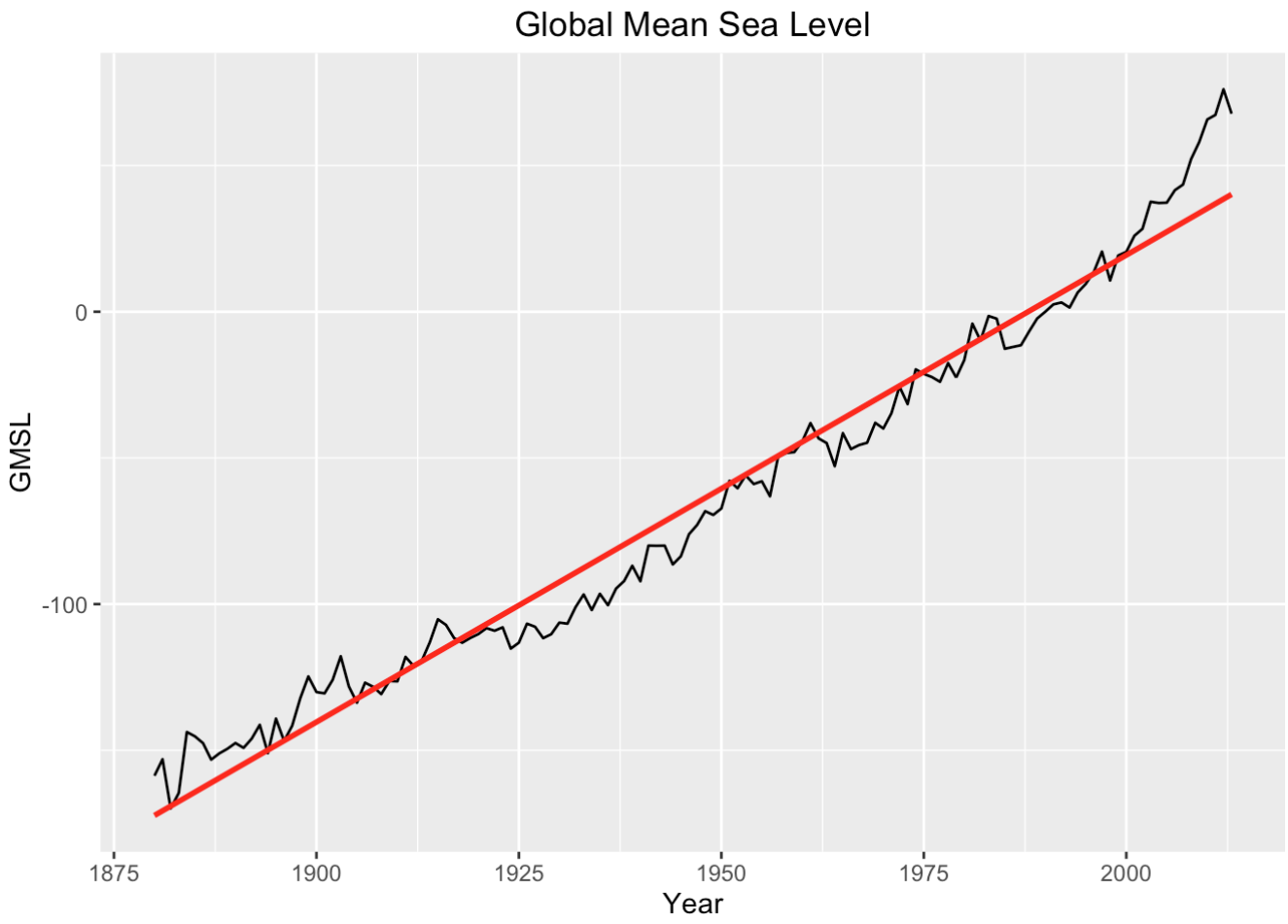
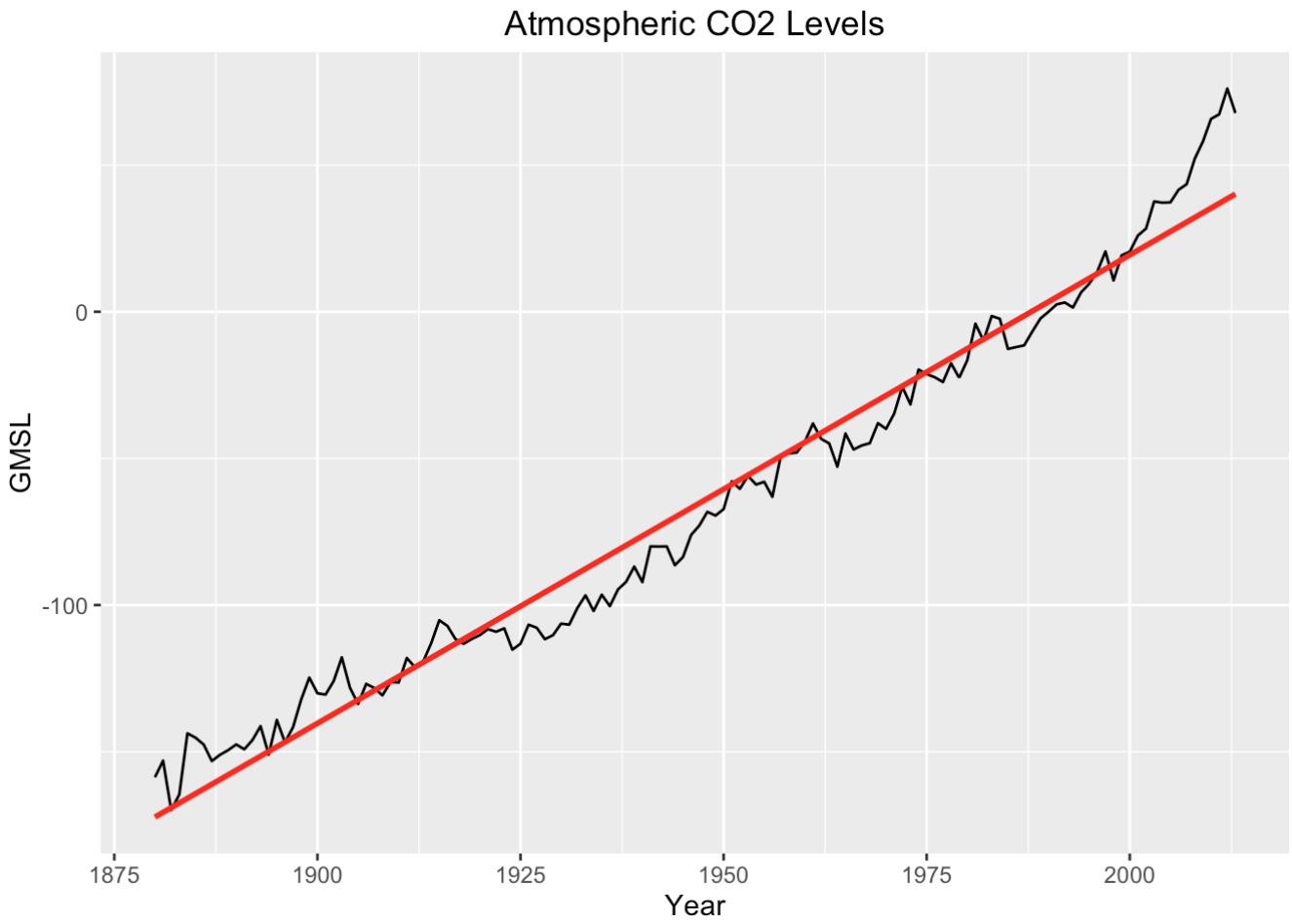
```
# Global Mean Estimates Based on Land-Surface Air Temperature Anomalies Only (Meteoro
logical Station Data, dTs)
# http://data.giss.nasa.gov/gistemp/
land_surface_water_temp_filename <- "GLB.Ts.csv"
land_surface_water_temp <- load_data(land_surface_water_temp_filename)
land_surface_water_temp <- land_surface_water_temp_cleanup(land_surface_water_temp)
#View(land_surface_water_temp)
ggplot(land_surface_water_temp, aes(x = Year, y = AverageTemp)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Global Mean Estimates Based on Land-Surface Air Temperature")
```



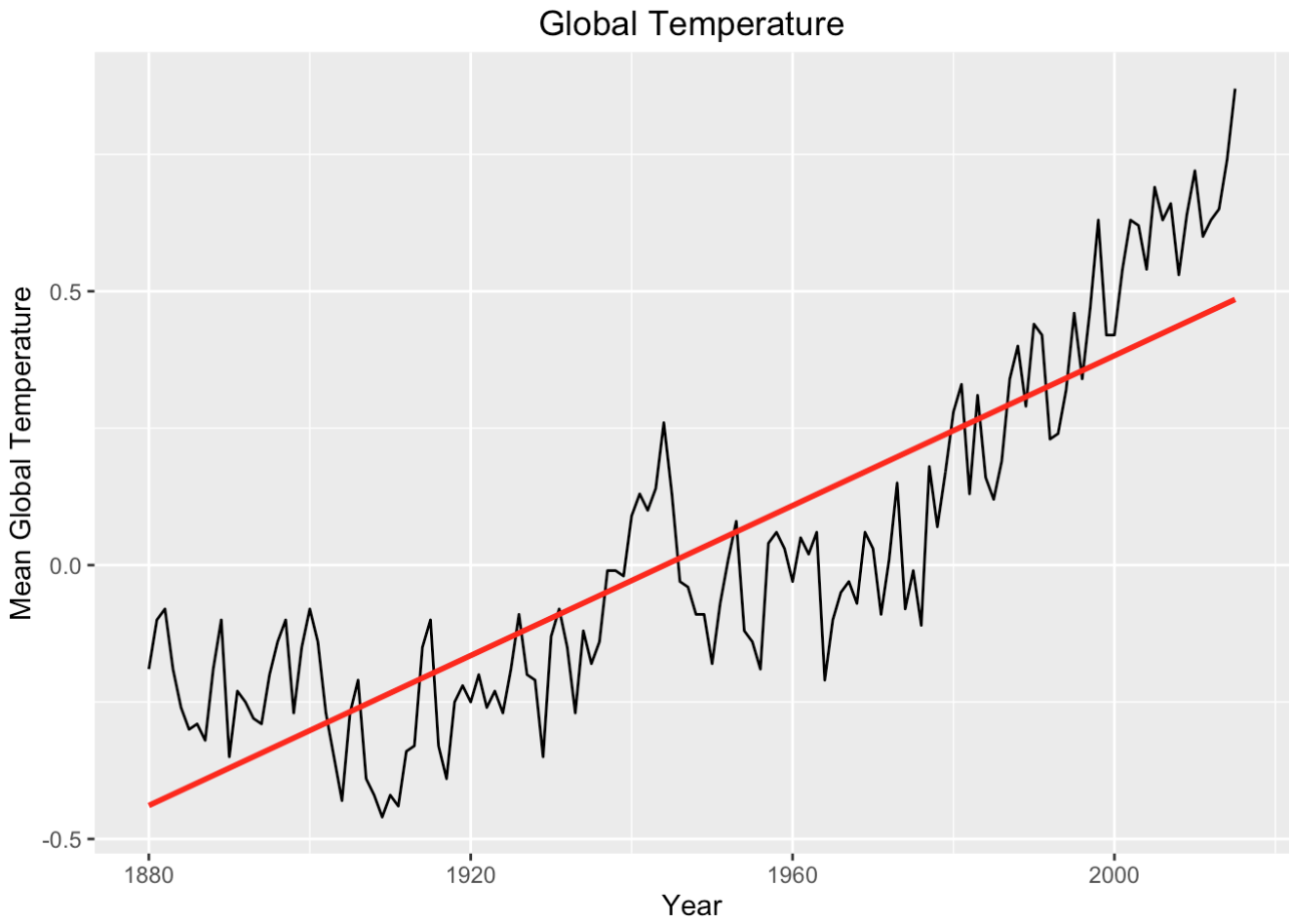
```
# Global Mean Estimates Based on Land-Surface Air Temperature Anomalies Only (Meteoro
logical Station Data, dTs)
# http://www.cmar.csiro.au/sealevel/sl_data_cmar.html
global_mean_sea_level_filename <- "CSIRO_Recons_gmsl_mo_2015.csv"
global_mean_sea_level <- load_data(global_mean_sea_level_filename)
global_mean_sea_level <- global_mean_sea_level_cleanup(global_mean_sea_level)
#View(global_mean_sea_level)
ggplot(global_mean_sea_level, aes(x = Year, y = GMSL)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Global Mean Sea Level")
```




```
# Historical CO2 Data  |  Years 0 to 2014
# https://www.co2.earth/historical-co2-datasets
atmospheric_co2_levels_filename <- "mole_fraction_of_carbon_dioxide_in_air_input4MIPs
_GHGConcentrations_CMIP_UoM-CMIP-1-1-0_gr3-GMNHSH_0000-2014.csv"
atmospheric_co2_levels <- load_data(atmospheric_co2_levels_filename)
atmospheric_co2_levels <- atmospheric_co2_levels_cleanup(atmospheric_co2_levels)
#View(atmospheric_co2_levels)
ggplot(global_mean_sea_level, aes(x = Year, y = GMSL)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Atmospheric CO2 Levels")
```

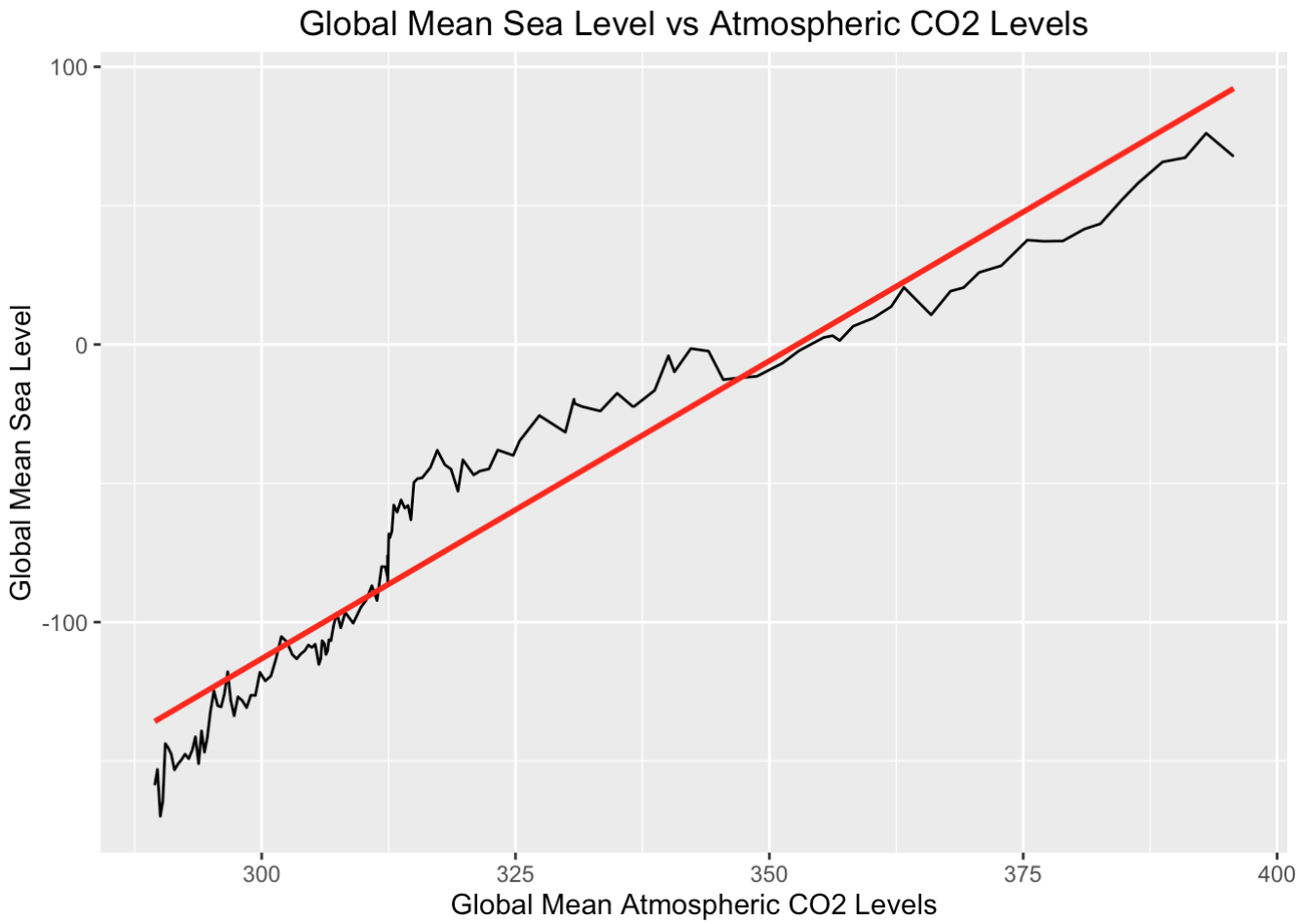



```
global_temperature_filename <- "647_Global_Temperature_Data_File.csv"
global_temperature <- load_data(global_temperature_filename, skipLines = 2)
global_temperature <- global_temperature_cleanup(global_temperature)
ggplot(global_temperature, aes(x = Year, y = TempMean)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Global Temperature", y = "Mean Global Temperature")
```

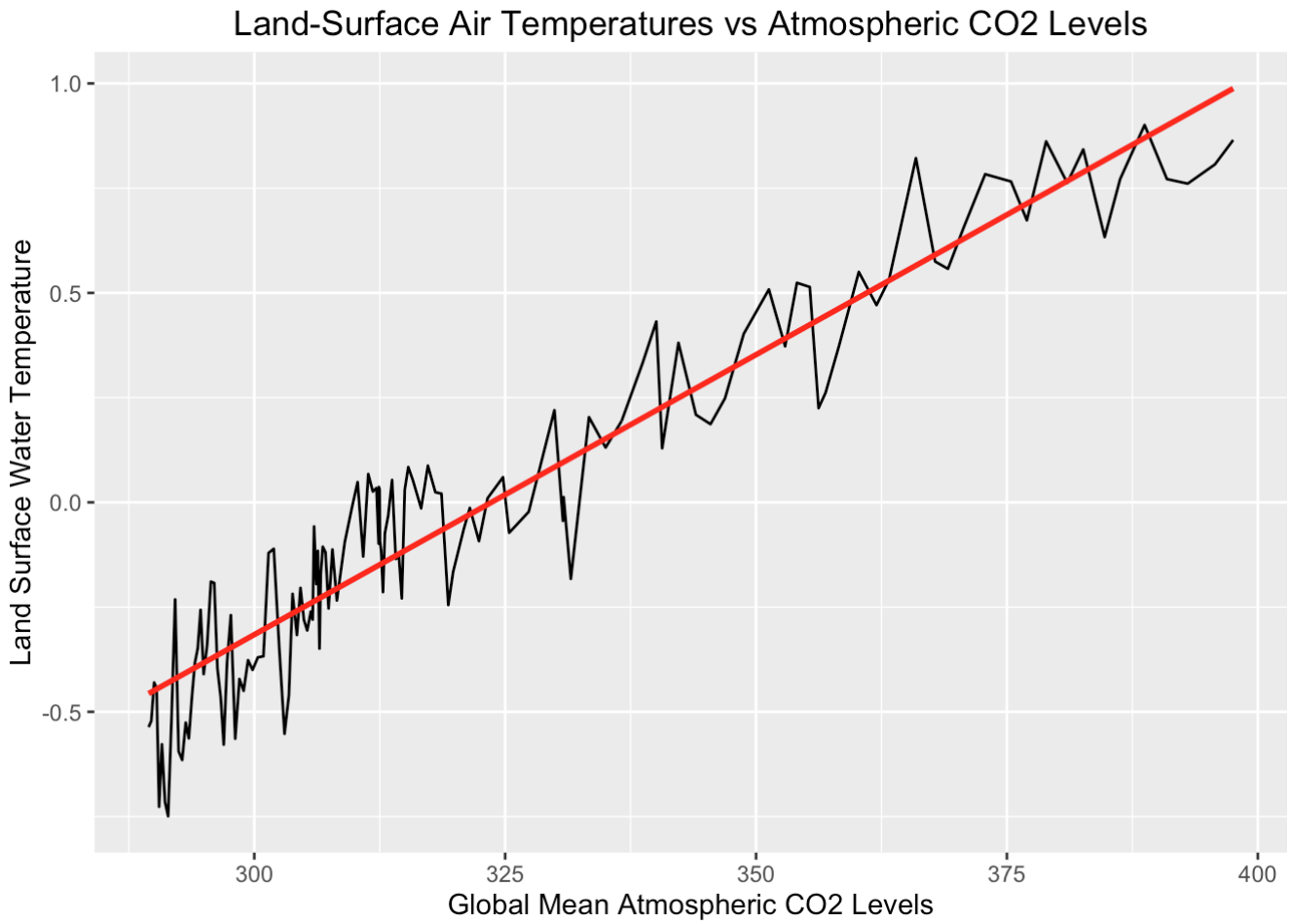



```
#View(global_temperature)
```

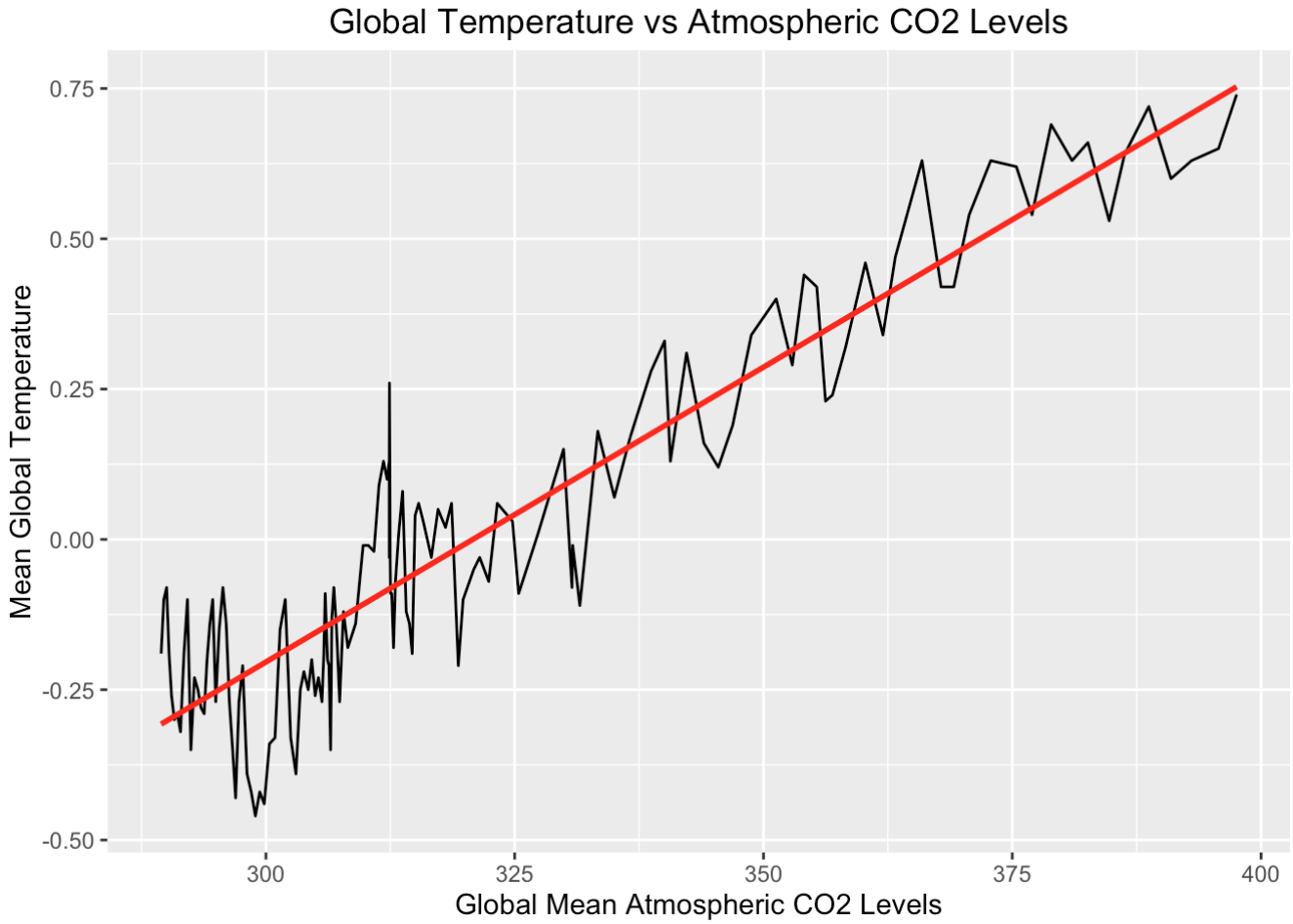
```
# Join GMSL and CO2 data
gmsl_co2 <- inner_join(global_mean_sea_level, atmospheric_co2_levels, by = "Year")
ggplot(gmsl_co2, aes(x = GlobalMeanCO2, y = GMSL)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Global Mean Sea Level vs Atmospheric CO2 Levels", x = "Global Mean At
mospheric CO2 Levels", y = "Global Mean Sea Level")
```




```
# Join LSWT and CO2 data
lswt_co2 <- inner_join(land_surface_water_temp, atmospheric_co2_levels, by = "Year")
ggplot(lswt_co2, aes(x = GlobalMeanCO2, y = AverageTemp)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Land-Surface Air Temperatures vs Atmospheric CO2 Levels", x = "Global
 Mean Atmospheric CO2 Levels", y = "Land Surface Water Temperature")
```




```
# Join GT and CO2 data
gt_co2 <- inner_join(global_temperature, atmospheric_co2_levels, by = "Year")
ggplot(gt_co2, aes(x = GlobalMeanCO2, y = TempMean)) +
  geom_line() +
  stat_smooth(method = "lm", col = "red", se = FALSE) +
  labs(title = "Global Temperature vs Atmospheric CO2 Levels", x = "Global Mean Atmos
pheric CO2 Levels", y = "Mean Global Temperature")
```


Global Temperature vs Atmospheric CO2 Levels
Mean Global Temperature
0.75
0.50
0.25
0.00
-0.25
-0.50
300
325
350
375
400
Global Mean Atmospheric CO2 Levels