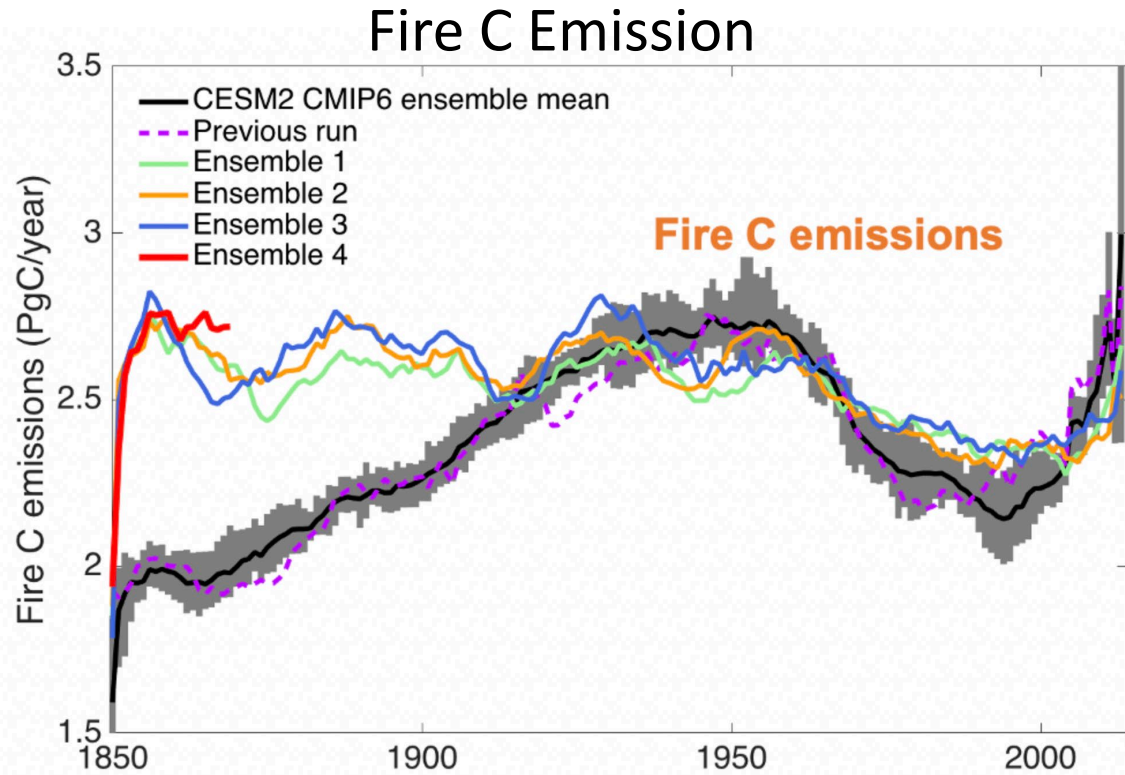


# Interactive fire emissions in CESM2

Simone Tilmes, David Lawrence, Marika Holland, John Fasullo, with support from Cecile Hannay, Julio Bachmeister, Dave Bailey



Thanks to Wenfu Tang

## Motivation

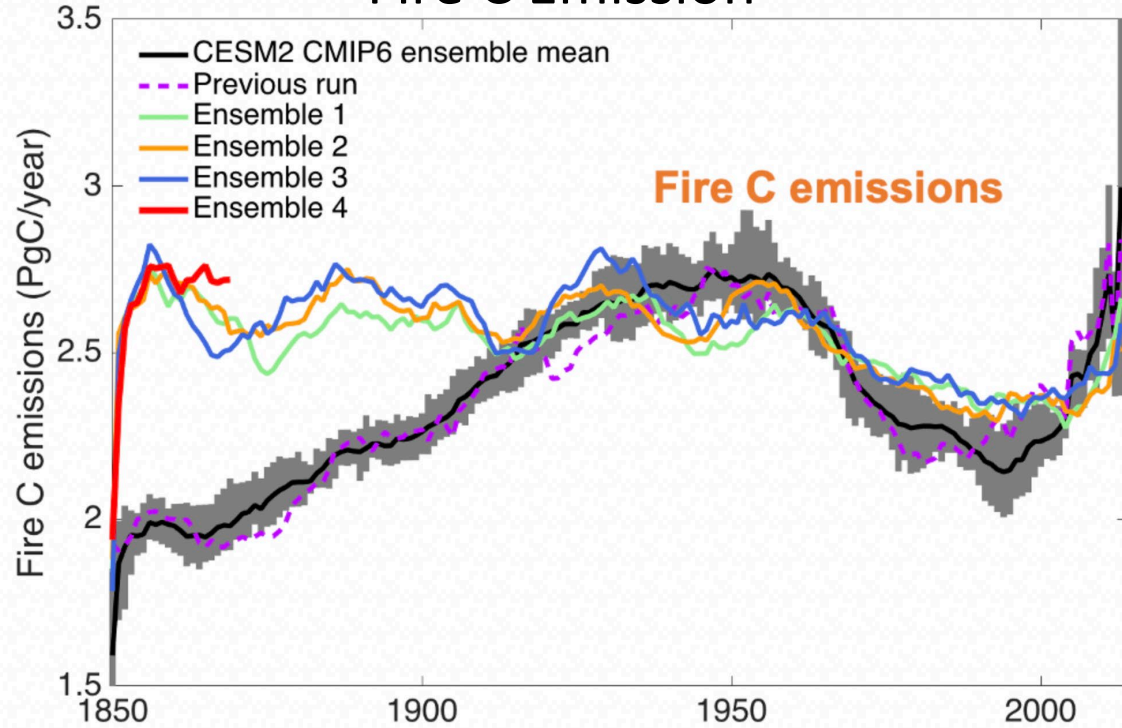
- Prescribed fire emissions in CMIP6 are too low for PI conditions (Hamilton et al., 2018)
- Trend in fire emissions is likely unrealistic in CMIP6
- Interactive fire emissions in tune with meteorology in the model

## Basic CESM2.2.0 default setup:

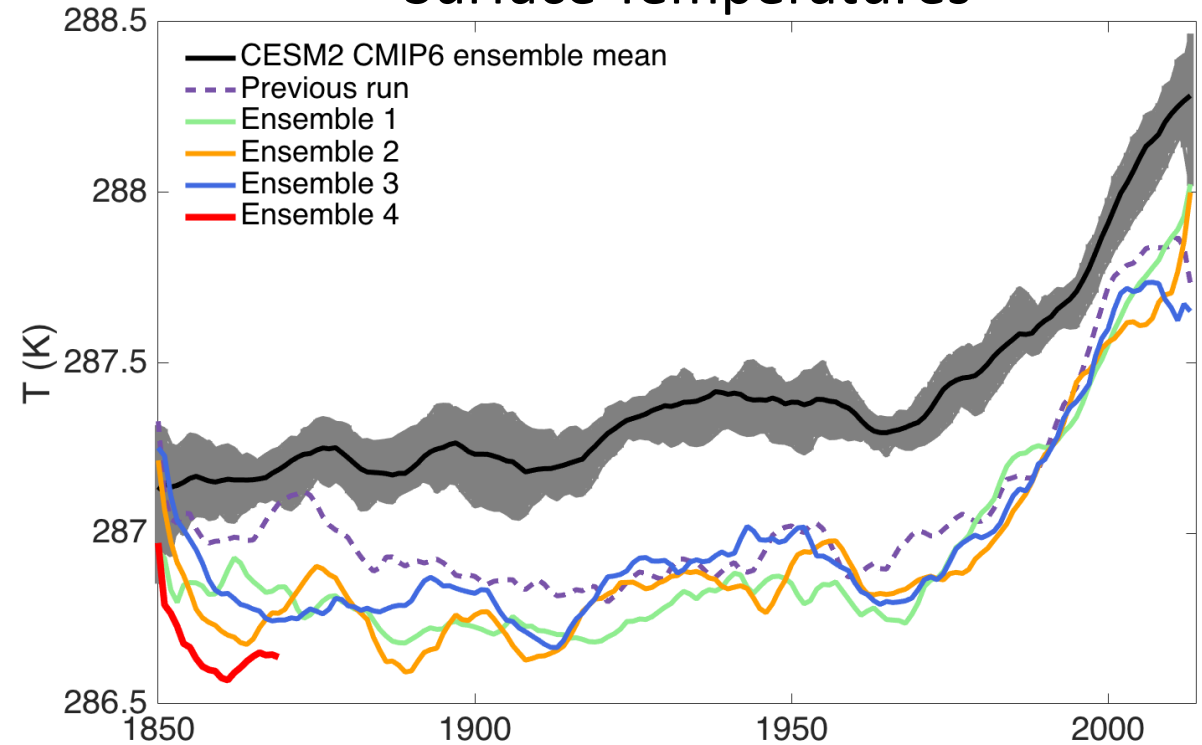
- PI control simulation runs without land-use
- In 1850, sudden increase in fire C emissions due to unburned carbon accumulation
- Sudden increase in fire C emission
- Drop in temperatures with more fire emissions with the start of the historical simulation

# Interactive fire emissions in CESM2

## Fire C Emission



## Surface Temperatures

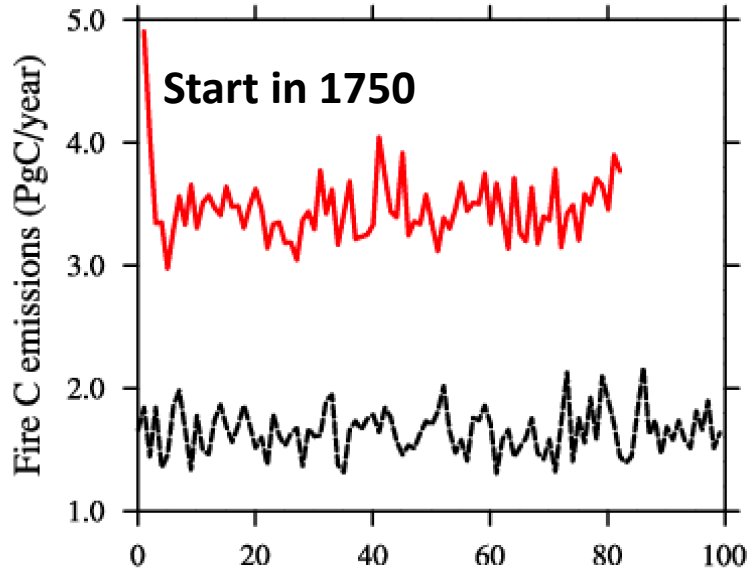


Thanks to Wenfu Tang

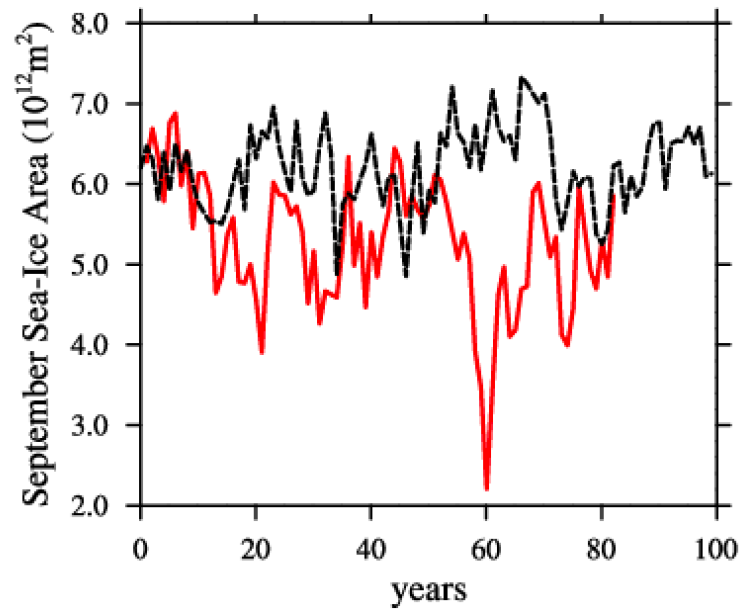
- Drop in temperatures with more fire emissions with the start of the historical simulation in previous setup

# Interactive fire emissions in CESM2: New PI Control Simulation

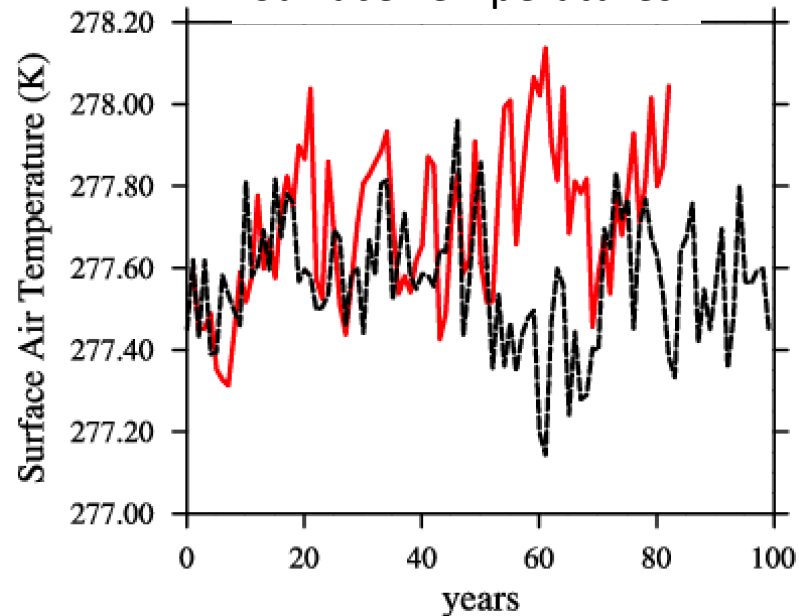
Fire C Emission



September Sea-Ice Area



Surface Temperatures



**CMIP6**

**CMIP6 + Interactive Fire**

## CESM2.2 setup

- Start in 1750
  - Updated wet scavenging
  - OASISS ocean emissions (more SO<sub>4</sub>)
- > **model out of balance**

## CESM2.2 tuning

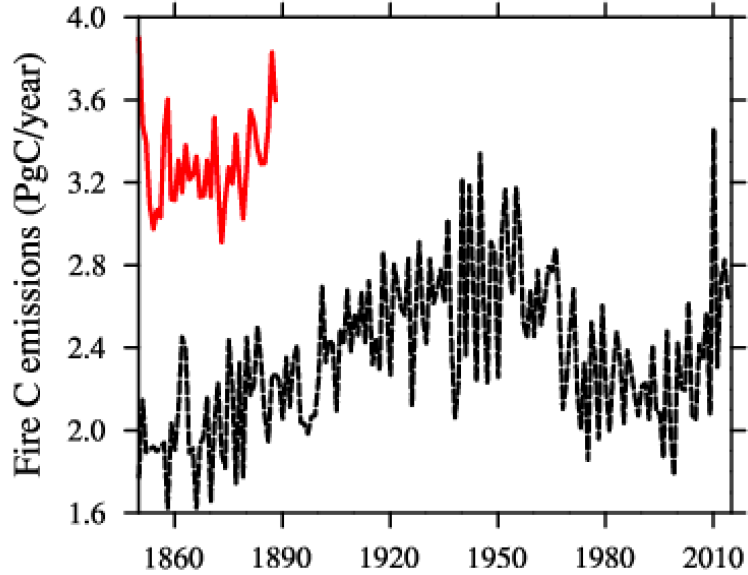
- `clubb_gamma_coef` = 0.30
- `dust_emis_fact` = 0.65

## Sea-ice tuning

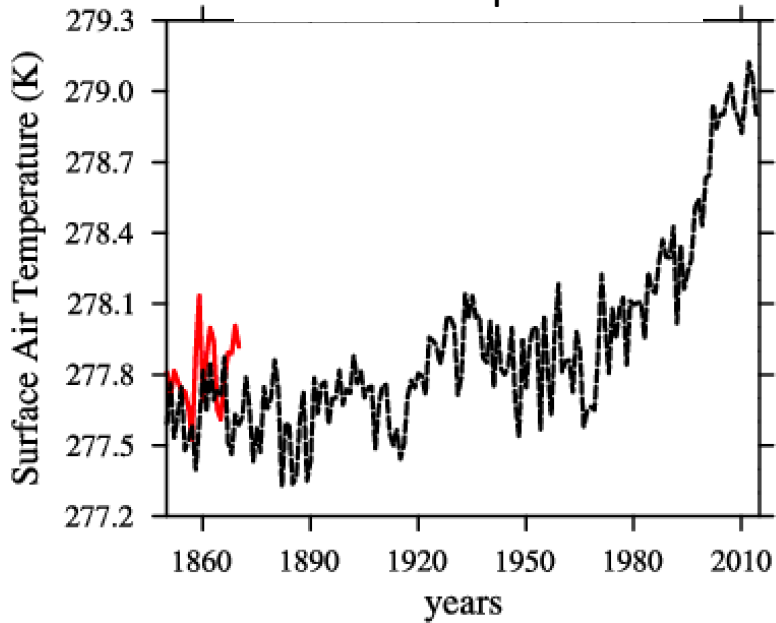
- `r_snw` = 1.6
- `dt_mlt` = 0.2
- `rsnw_mlt` = 1000.

# Interactive fire emissions in CESM2: New Historical Simulation

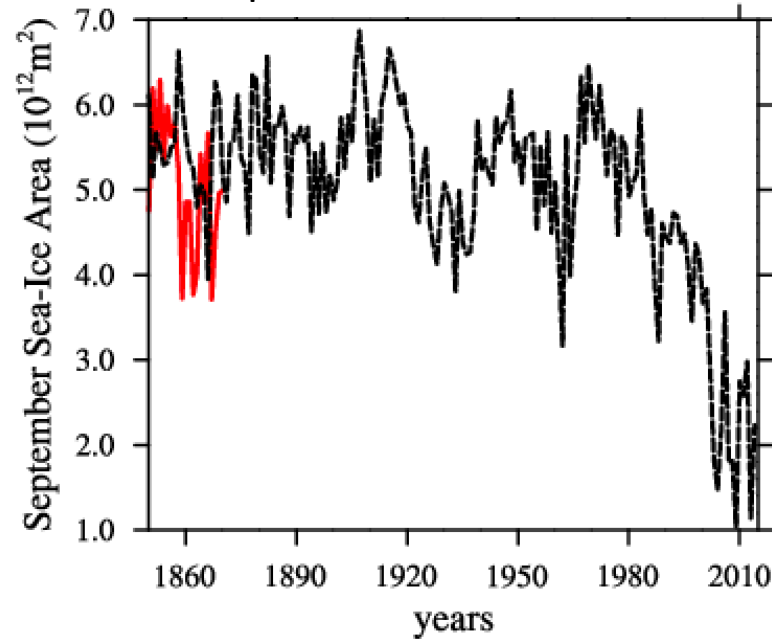
Fire C Emission



Surface Temperatures



September Sea-Ice Area



**CMIP6**

**CMIP6 + Interactive Fire**

So far it looks good 😊

## CESM2.2 setup

- Start in 1750
  - Updated wet scavenging
  - OASISS ocean emissions (more SO<sub>4</sub>)
- > **model out of balance**

## CESM2.2 tuning

- `clubb_gamma_coef` = 0.30
- `dust_emis_fact` = 0.65

## Sea-ice tuning

- `r_snw` = 1.6
- `dt_mlt` = 0.2
- `rsnw_mlt` = 1000.