

Klimawandel

Die durch den Treibhauseffekt hervorgerufene Erderwärmung gilt als größte Herausforderung für die Menschheit. Allen ist klar, dass schnell etwas getan werden muss.



Die Prognose der Klimaexperten ist drastisch: Wenn der Treibhausgasausstoß nicht deutlich gesenkt wird, könnte die Durchschnittstemperatur auf der Erde bis zum Jahr 2100 um weitere fünf Grad steigen - mit verheerenden Folgen für das Überleben in vielen Regionen.



Mauritius und eine gute
Nachbarschaft schützen
gegen die Fluten der Donau



Westafrika: Fulani-Konflikt
spitzt sich zu



Klimagespräche: Ein Gehör
für die schwächsten Länder



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zu retten

05.06.2018

05.06.2018

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30.04.2018

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New climate 'feedback loop' discovered in
freshwater lakes

... over the next 50 years because of a novel "feedback loop", say scientists. Climate change causes more greenhouse gases to be produced by freshwater lakes. They say the warming climate will affect different aquatic species in different ways.

News | Science & Environment



Rising levels of 'frustration' at UN climate
stalemate

... threatening to limit progress in UN climate negotiations. Discussions between negotiators... on the Paris climate deal have stalled. But developing countries say they are "frustrated" with the lack of progress. "This is unacceptable," they said. 2018 marks a critical stage in global climate negotiations...

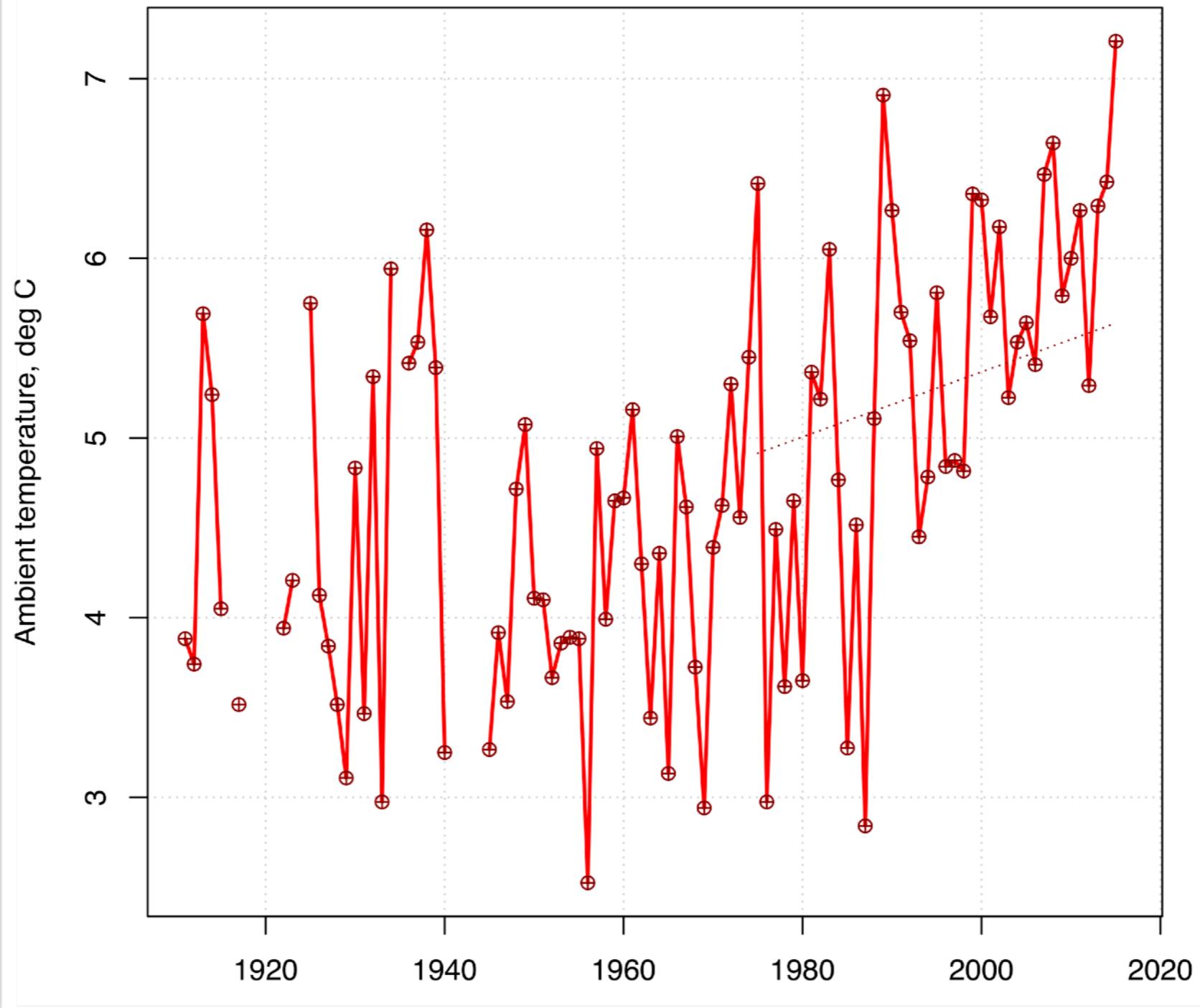
News | Science & Environment



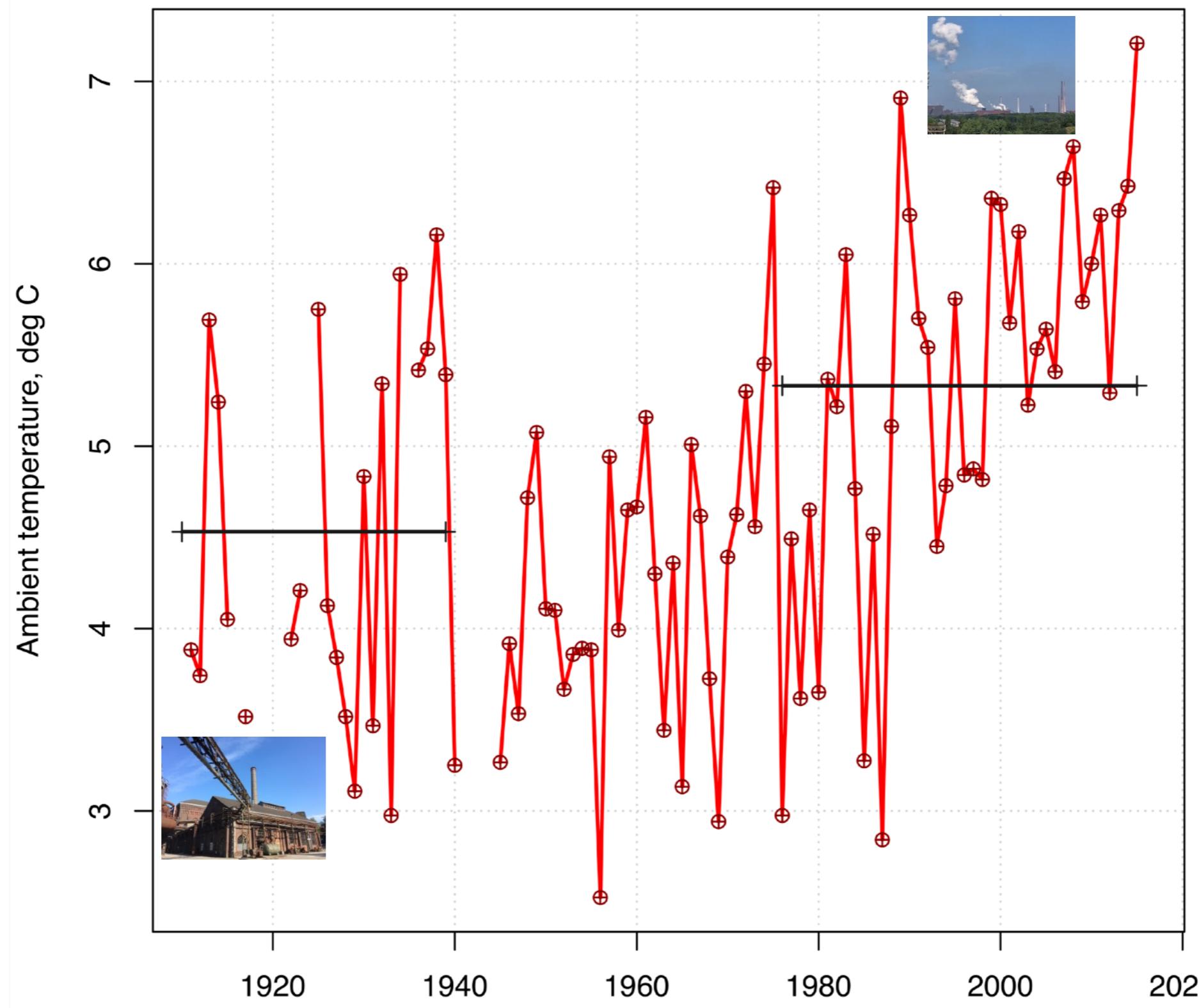
Summers are becoming hotter and hotter since the Industrial Revolution. If humanity cannot decrease the use of carbon-dioxide and other greenhouse gases, the temperature will keep on rising. This phenomenon seems to affect Budapest in particular, according to 24.hu.

Climate problems need accurate treatment

Energy under climate change



Meteorological observations



DATASET

Project 1 ▲

type to filter... Sort by ▾

Show all

IPCC-AR5_CMIP5 (IPCC As... 12155

Topic Name 1 ▲

type to filter... Sort by ▾

Show all

air_temperature 12155

Keywords 133 ▾

Aggregation 4 ▲

type to filter... Sort by ▾

Show all

mon 6358

day 4468

6hr 1044

3hr 285

CMIP5 simulation data

- netCDF format
- spatial: global area
- temporary resolution?

Multi-annual averages
are of interest

R-MINDED APPROACH

Classic R, ::raster, ::RCMIP5

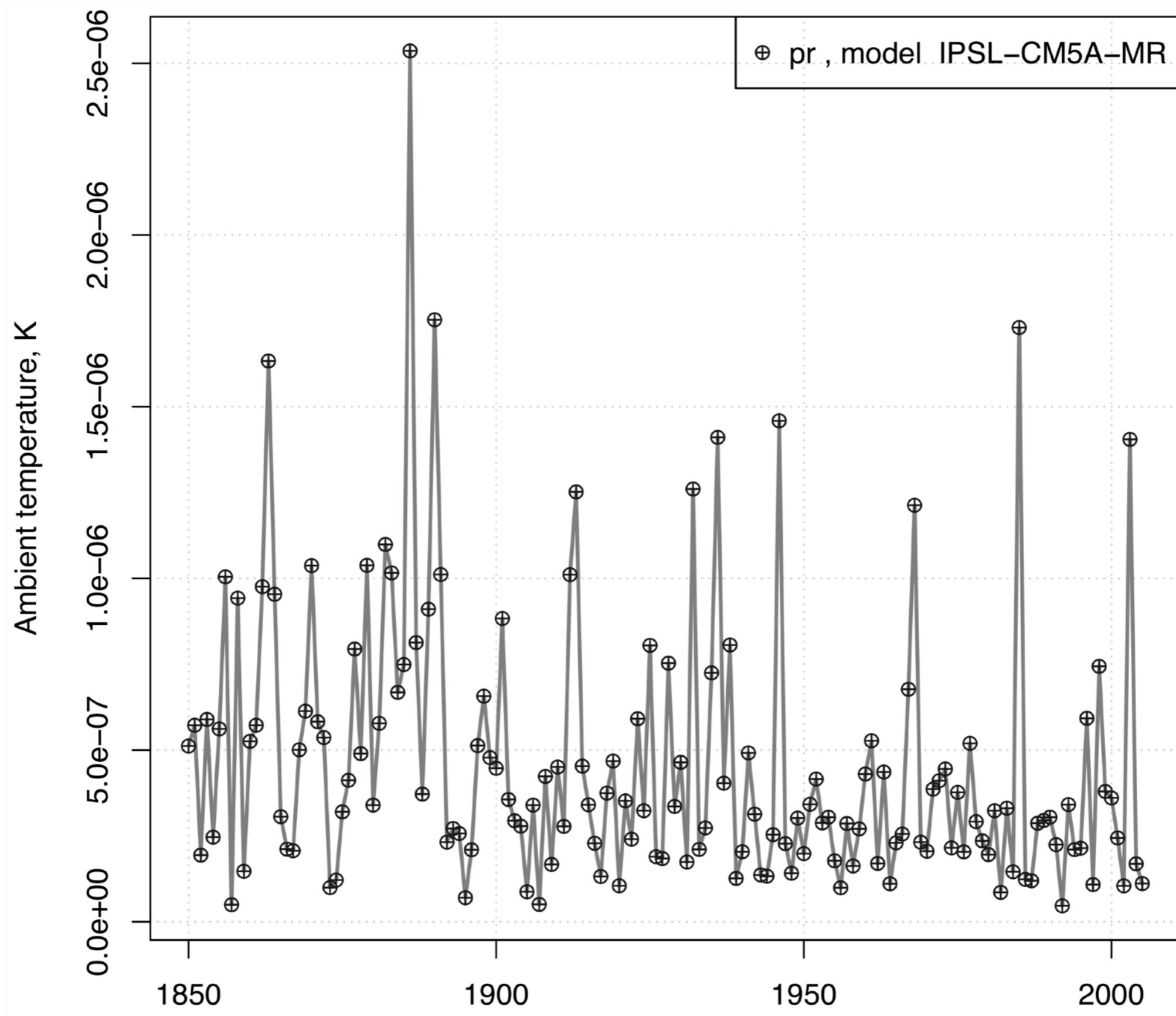
- 1) set the items' ids to select
- 2) subset
- 3) apply a function (spacial averaging)

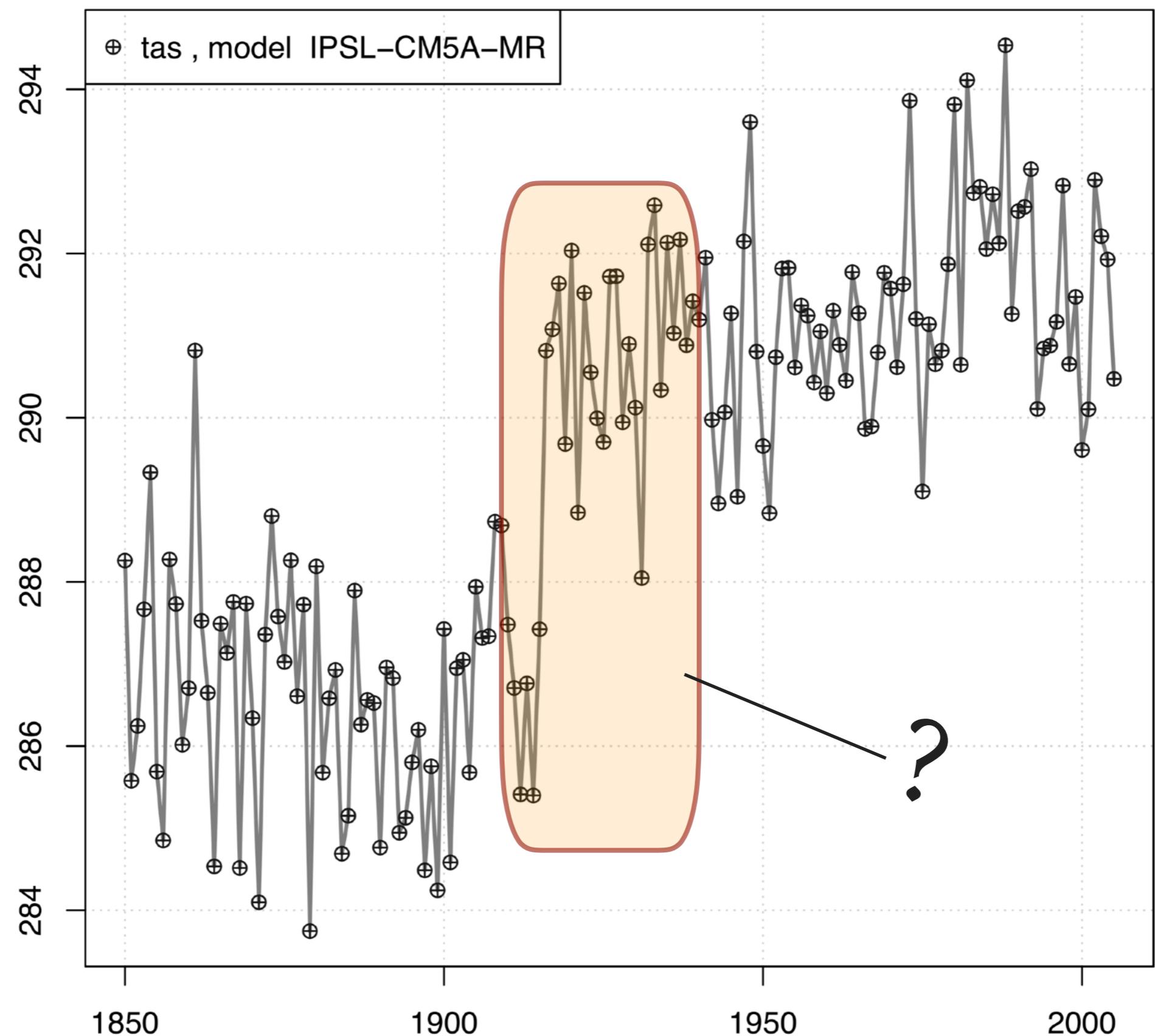
```
# 1) set a processed month
month_nL <- 3L

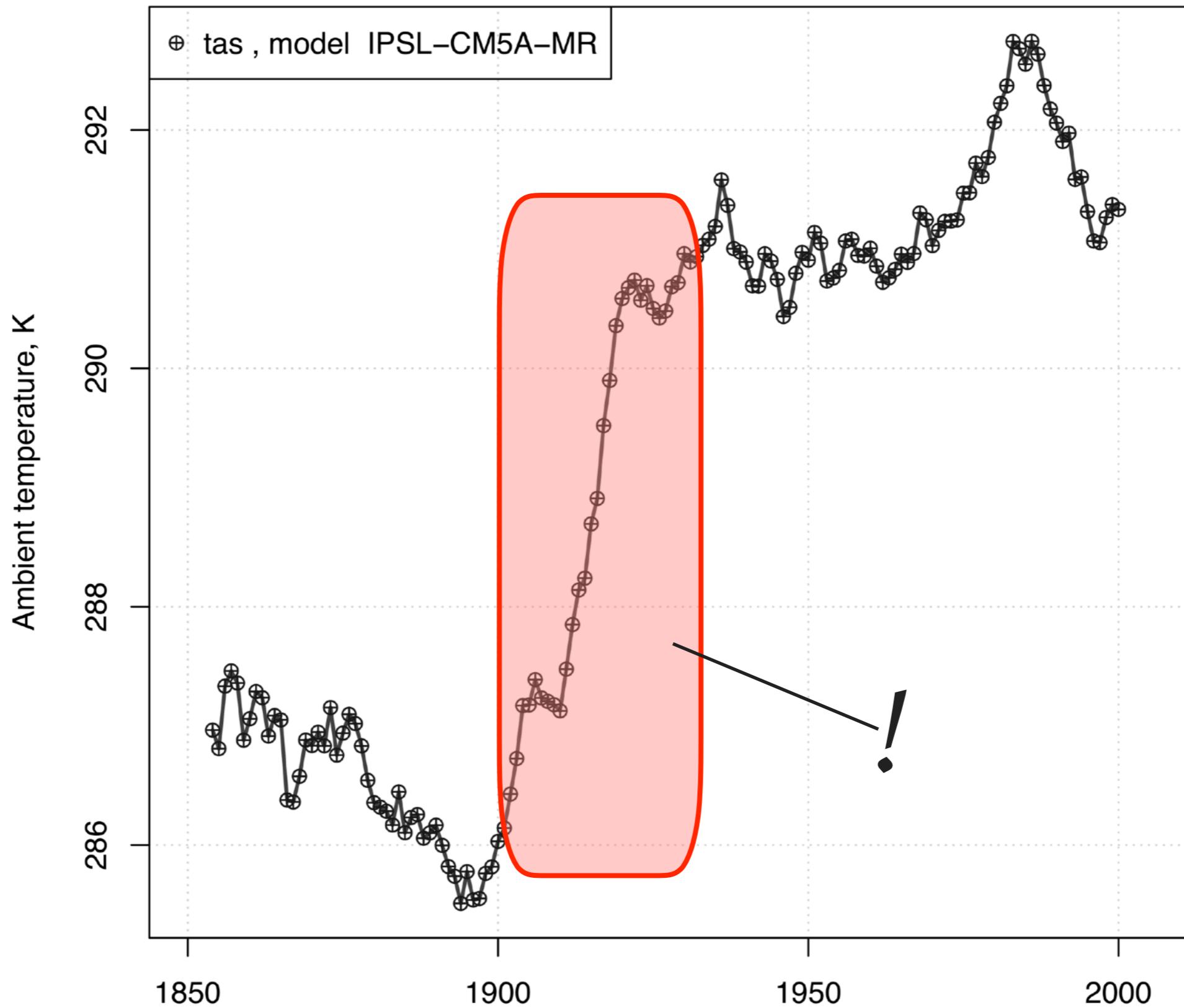
# 2) subset the data
months_nc <- as.numeric(format(time_nc_date, "%m"))
nc_dates_slctd <- time_nc_date[which(months_nc %in% month_nL)]
T_3D_array_slctd <- T_3D_array_to_process[ , , which(months_nc %in% month_nL)]

# 3) make calculations
T_time_series_slctd <- sapply(function(i) mean(T_3D_array_slctd[, , i]),
  X = seq(along.with = T_3D_array_slctd[1, 1, 1]))
```

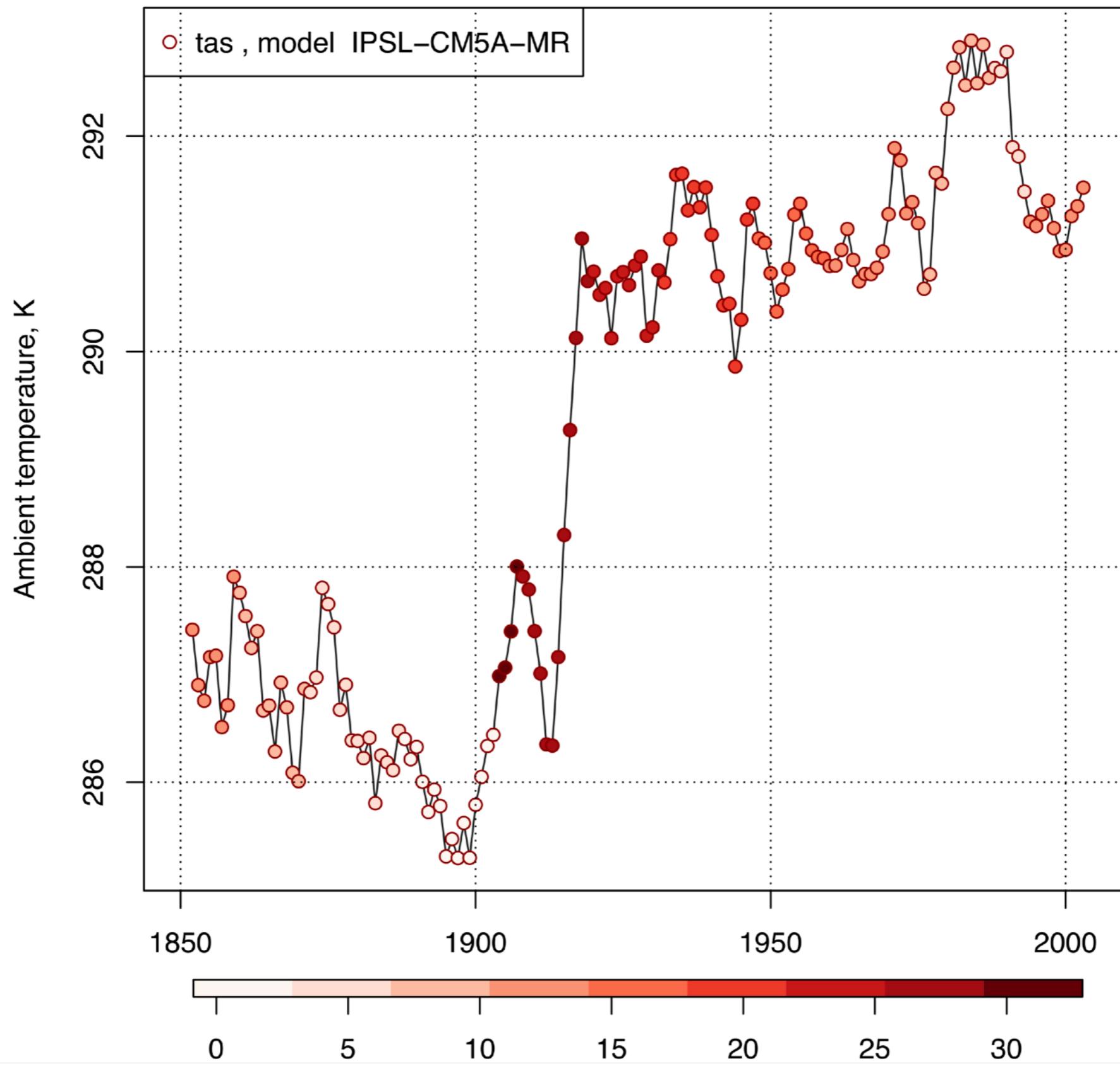








Points colors according to the day of the month



SOLUTION

Use interpolation to regular seasonally time

instead of

04" "1901-03-04" "1902-03-04" "1903-03-04" "1904-03-03" "1905-03-03" "1906-03-03" "1907-03-03" "1908-03-02" "1909-03-02"
02" "1911-03-02" "1912-03-01" "1913-03-01" "1914-03-01" "1915-03-01" "1916-03-31" "1917-03-31" "1918-03-31" "1919-03-31"
30" "1921-03-30" "1922-03-30" "1923-03-30" "1924-03-29" "1925-03-29" "1926-03-29" "1927-03-29" "1928-03-28" "1929-03-28"

work with

	1892-04-04	1892-04-05	1894-04-04	1894-04-05	1896-04-04	1896-04-05	1897-04-04	1897-04-05
[1,]	[,50]	[,51]	[,52]	[,53]	[,54]	[,55]	[,56]	
[2,]	"1899-02-03"	"1900-02-03"	"1901-02-03"	"1902-02-03"	"1903-02-03"	"1904-02-03"	"1905-02-02"	
[3,]	"1899-03-04"	"1900-03-04"	"1901-03-04"	"1902-03-04"	"1903-03-04"	"1904-03-03"	"1905-03-03"	
	"1899-04-04"	"1900-04-04"	"1901-04-04"	"1902-04-04"	"1903-04-04"	"1904-04-03"	"1905-04-03"	
	[,57]	[,58]	[,59]	[,60]	[,61]	[,62]	[,63]	
[1,]	"1906-02-02"	"1907-02-02"	"1908-02-02"	"1909-02-01"	"1910-02-01"	"1911-02-01"	"1912-02-01"	
[2,]	"1906-03-03"	"1907-03-03"	"1908-03-02"	"1909-03-02"	"1910-03-02"	"1911-03-02"	"1912-03-01"	
[3,]	"1906-04-03"	"1907-04-03"	"1908-04-02"	"1909-04-02"	"1910-04-02"	"1911-04-02"	"1912-04-01"	
	[,64]	[,65]	[,66]	[,67]	[,68]	[,69]	[,70]	
[1,]	"1913-01-31"	"1914-01-31"	"1915-01-31"	"1916-02-29"	"1917-02-28"	"1918-02-28"	"1919-02-28"	
[2,]	"1913-03-01"	"1914-03-01"	"1915-03-01"	"1916-03-31"	"1917-03-31"	"1918-03-31"	"1919-03-31"	
[3,]	"1913-04-01"	"1914-04-01"	"1915-04-01"	"1916-04-30"	"1917-04-30"	"1918-04-30"	"1919-04-30"	
	[,71]	[,72]	[,73]	[,74]	[,75]	[,76]	[,77]	
[1,]	"1920-02-28"	"1921-02-27"	"1922-02-27"	"1923-02-27"	"1924-02-27"	"1925-02-26"	"1926-02-26"	
[2,]	"1920-03-30"	"1921-03-30"	"1922-03-30"	"1923-03-30"	"1924-03-29"	"1925-03-29"	"1926-03-29"	
[3,]	"1920-04-29"	"1921-04-29"	"1922-04-29"	"1923-04-29"	"1924-04-28"	"1925-04-28"	"1926-04-28"	
	[,78]	[,79]	[,80]	[,81]	[,82]	[,83]	[,84]	
[1,]	"1927-02-26"	"1928-02-26"	"1929-02-25"	"1930-02-25"	"1931-02-25"	"1932-02-25"	"1933-02-24"	



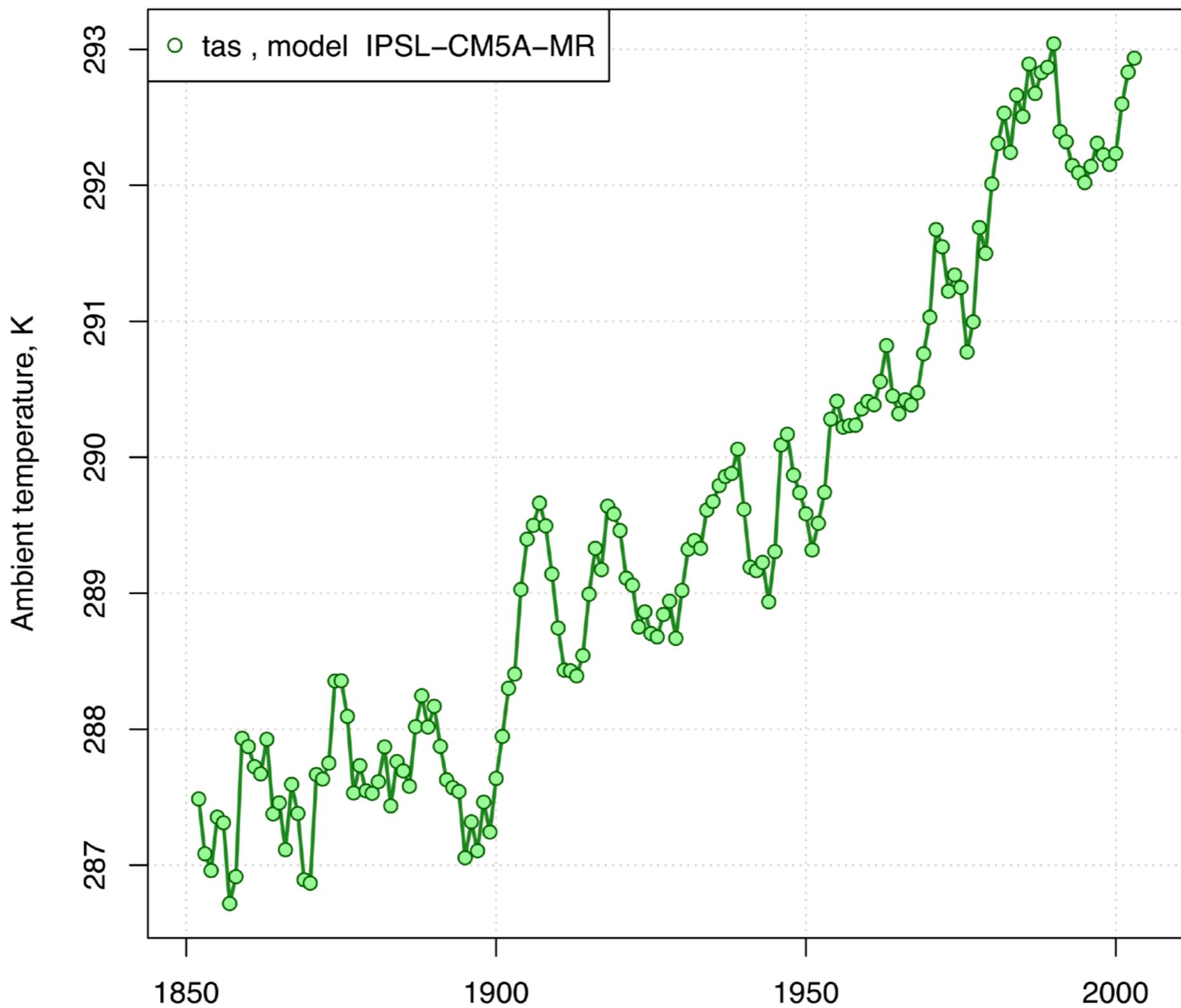
SOLUTION

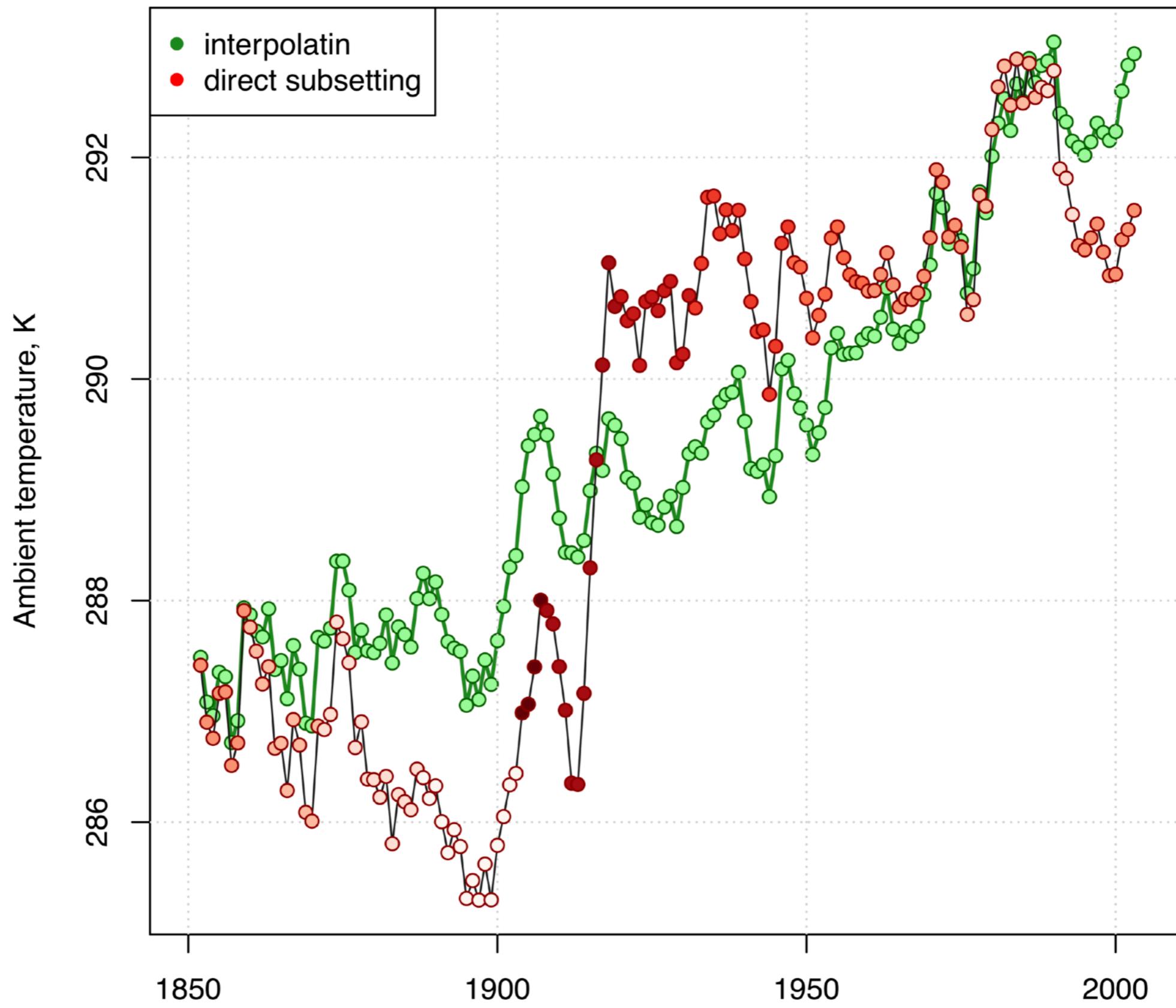
```
# 1) construct an interpolating function
# @ind_to_interp is a three-column matrix of indices to interpolate from
# @regular_date is a list data sequences to interpolate to
# @param_3D is a 3D array to process
▼ Month_Approx <- function(i, indices_to_int, regular_date, param_3D) {
  tau_intp_from <- time_nc_date[indices_to_int[i, ]]
  dates_seq_into <- regular_date[[i]]
  T_3D_array_intp_from <- param_3D[, , indices_to_int[i, ]]
  T_area_avr_intp_from <- lapply(function(j) mean(param_3D[, , indices_to_int[i, j]]),
    | X = seq(along.with = indices_to_int[i, ]))
  appr_res <- approx(x = tau_intp_from, y = T_area_avr_intp_from, xout = regular_date[[i]])
  T_res <- mean(appr_res$y)
  return(T_res)
}

# 2) set a data sequence
first_month_day <- ymd(paste(as.numeric(format(nc_dates_slctd, "%Y")), month_nL, 1, sep = "-"))
last_month_day <- ymd(paste(as.numeric(format(nc_dates_slctd, "%Y")),
  | (month_nL + 1), 1, sep = "-")) - 1
dates_seq_intp_to <- lapply(function(k) seq.Date(from = first_month_day[k],
  | to = last_month_day[k], by = 1), X = 1:length(nc_dates_slctd))

# 3) interpolate the monthly-aggregated value for all selected years
▼ T_monthly_intpd <- sapply(function(i) Month_Approx(i, indices_to_int = ind_to_interp,
  | regular_date = dates_seq_intp_to, param_3D = T_3D_array_to_process),
  | X = 1:length(nc_dates_slctd))
```

After accurate interpolation





SUMMARY

Modellers have right to their own way of thinking

Practical points to be kept in mind while work with netCDF

- 1) quick-and-easy solutions may be dangerous
- 2) careful *examination of netCDF structure* is essential
- 3) implementation to netCDF/CMIP5 packages?

*Many thanks for your
attention!*

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