

The Paradox of Choice: Streamlining Climate Model Choice and Accessibility for Integration of Climate Data into Localized Life Science Research

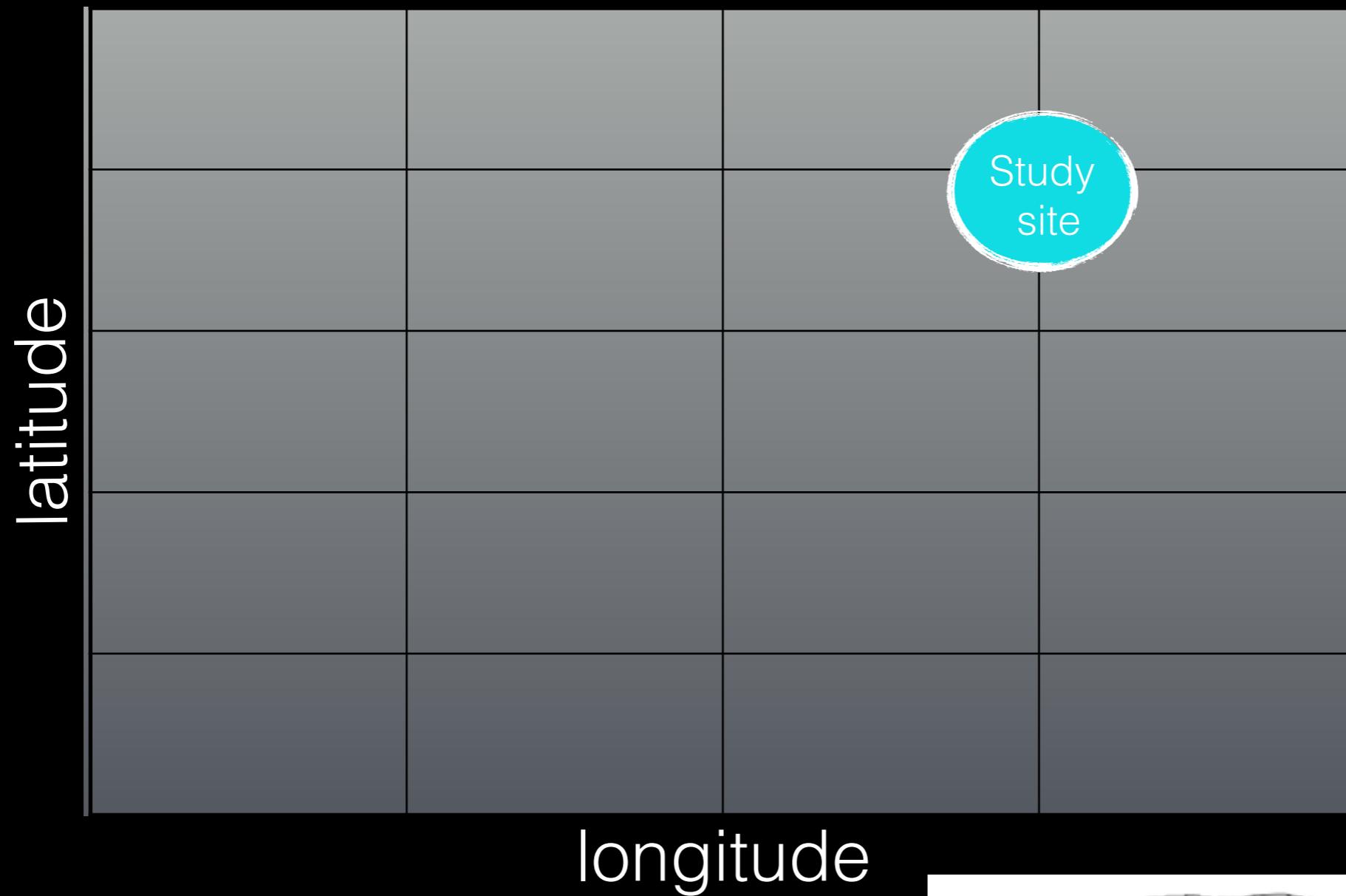
Jenna Baughman and Sara Stoudt

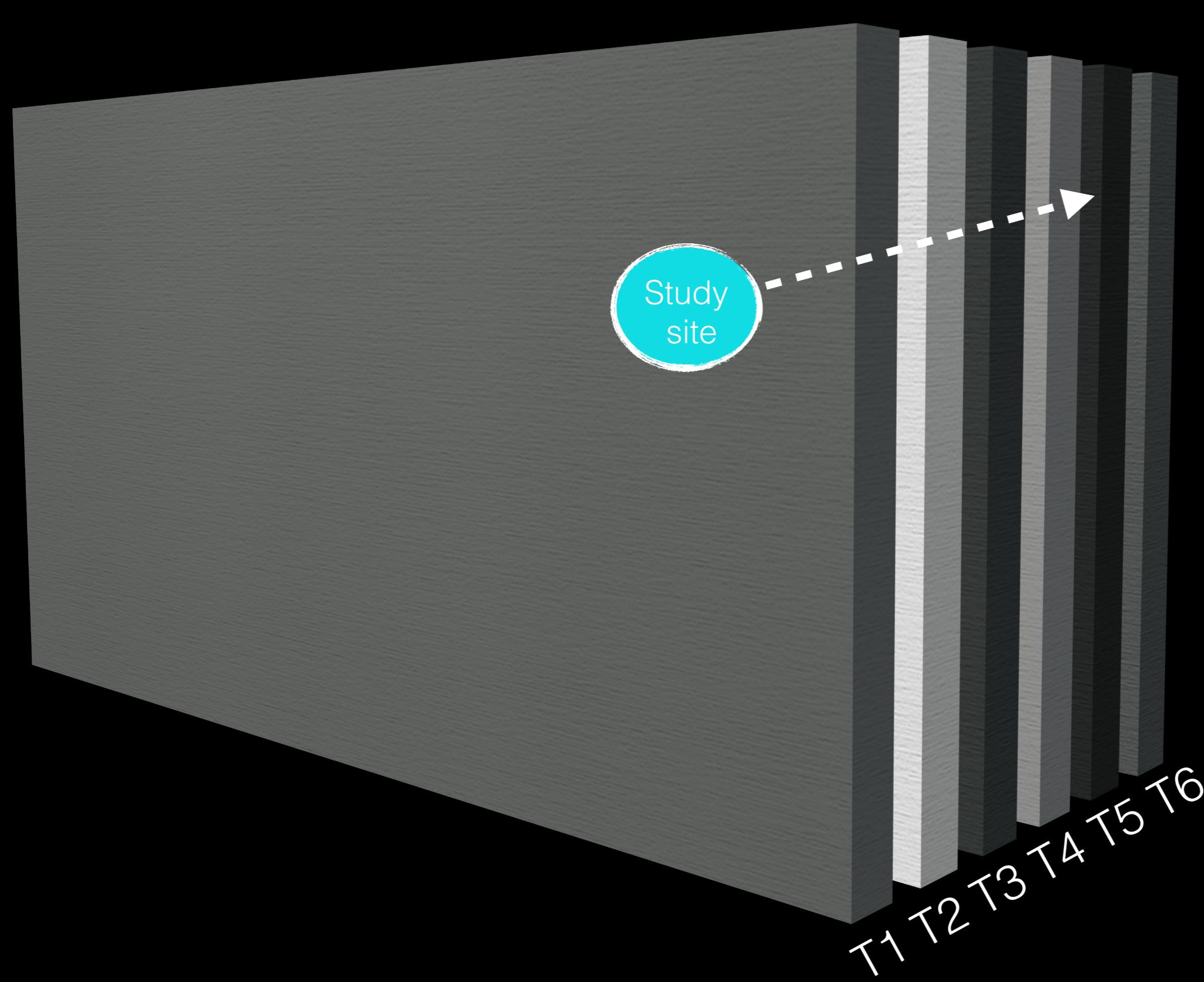


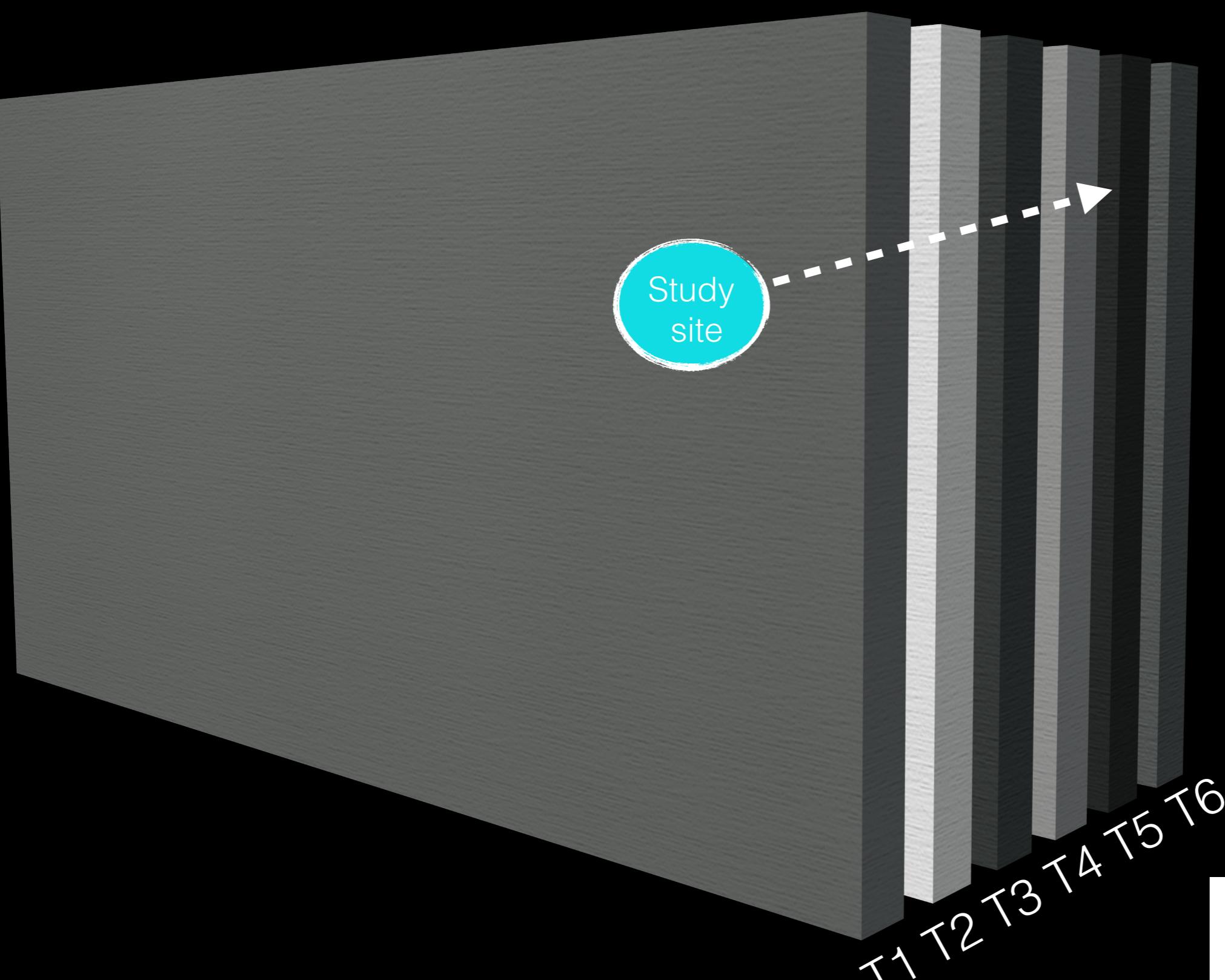


the problem

spatial climate data



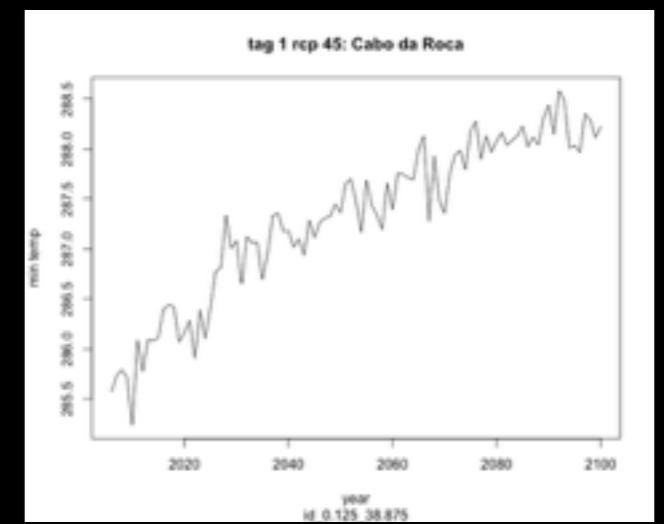
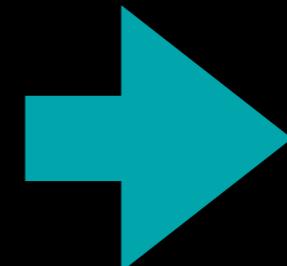




Study
site

T1 T2 T3 T4 T5 T6

data you want:

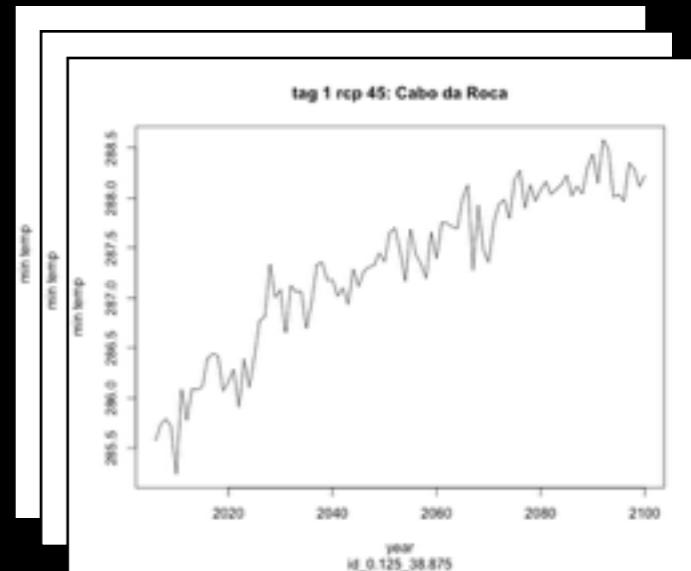
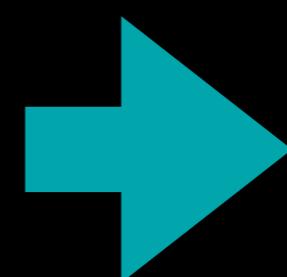


Study site

T1 T2 T3 T4 T5 T6

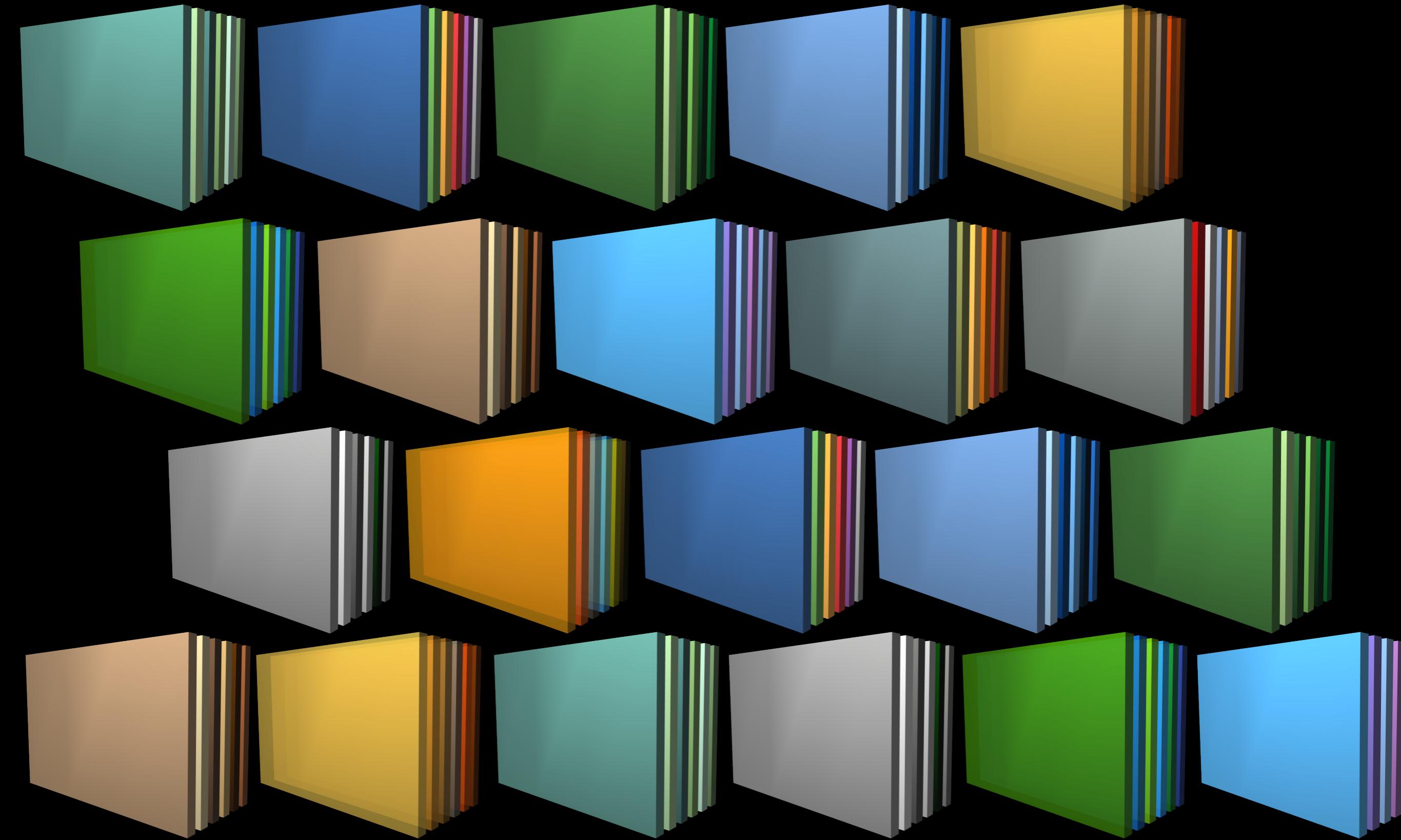
precipitation
minimum temperature
maximum temperature

data you want:





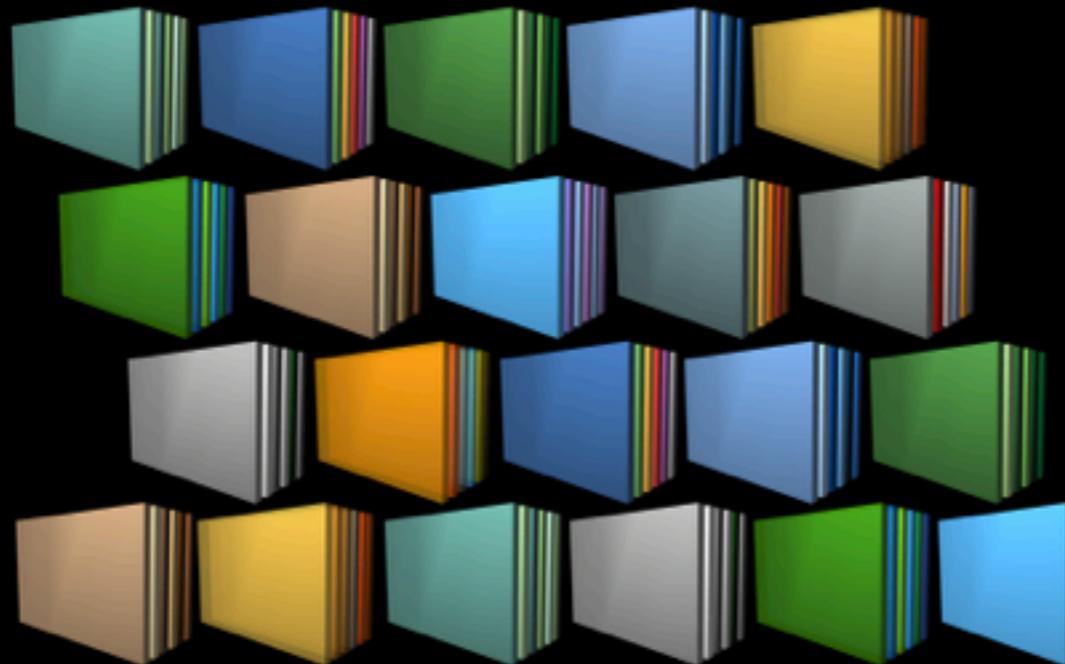
21 climate models



2 climate scenarios
+ historical

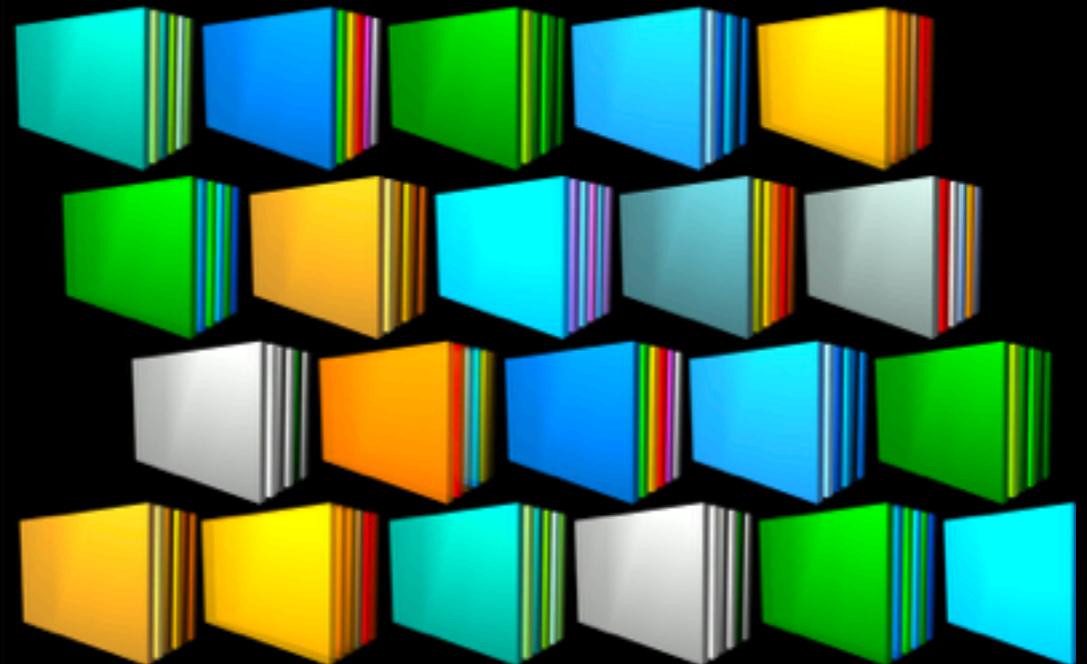
rcp45

21 climate models



rcp85

21 climate models



history

21 climate models

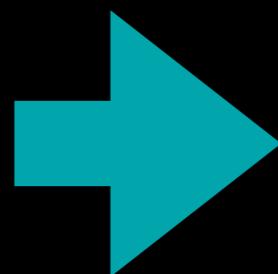


for 3 different
variables

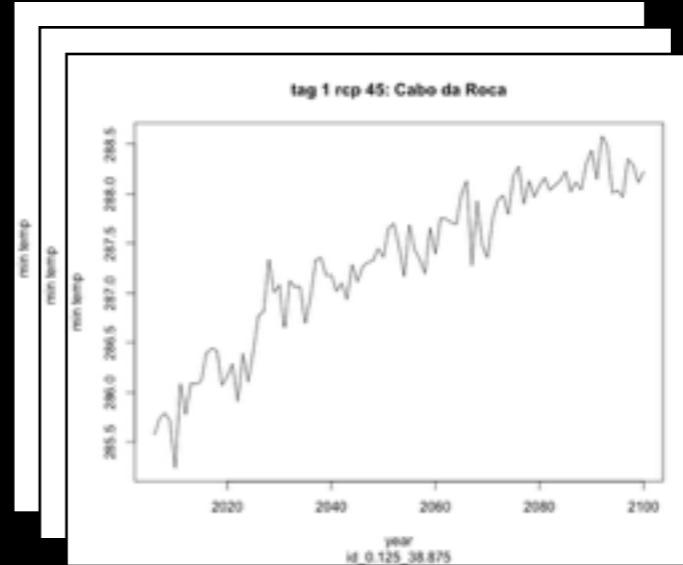
11 TB of data

11 TB of data

all you want:



precipitation
minimum temperature
maximum temperature





where we come in

- **our goals:**
 - create a simplified method for scanning the 21 climate models for different properties and weather variables over small regions across the globe
 - make pipeline for obtaining site specific temporal data
- precipitation, maximum temperature, and minimum temperature
 - **both directional trends and variability shifts in future scenarios until 2100**
 - 55 years of annual modeled historical climate

methods

- bash scripting: download data (*takes days)
- R: aggregate daily to yearly, make map images and time series plots (*takes hours for one model/variable combo)
- d3: interactive slider stitching together historical maps over time, dropdown menus for comparing snapshot summaries of climate products (learning curve, requires JavaScript and html)
- summary statistics
 - directional trends (robust OLS) & variability shifts (track SD over time)

*all computational times are for a personal laptop

case study

- bird researcher in Portugal
- collects daily population data for all birds at a particular site
- wants to know how climate change will affect the populations



user research question



- Q: how will bird population demographics change with future climate scenarios?
 - what if we get warmer winters?
 - what if we get less precipitation?
 - what if we get more variable precipitation?

user work flow



- look through future climate scenarios
- choose climate products with properties of interest for research question
- check historical data

user work flow



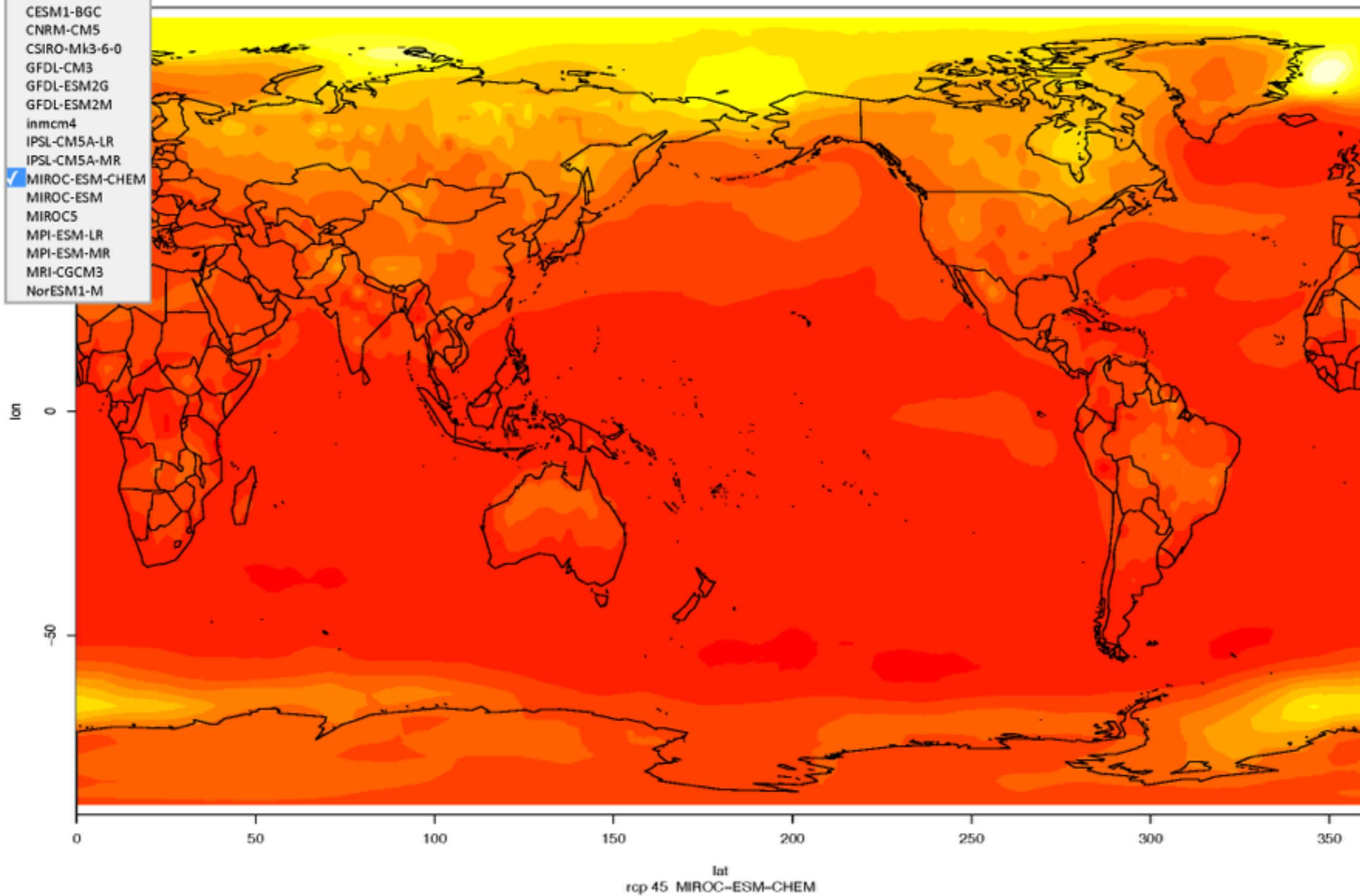
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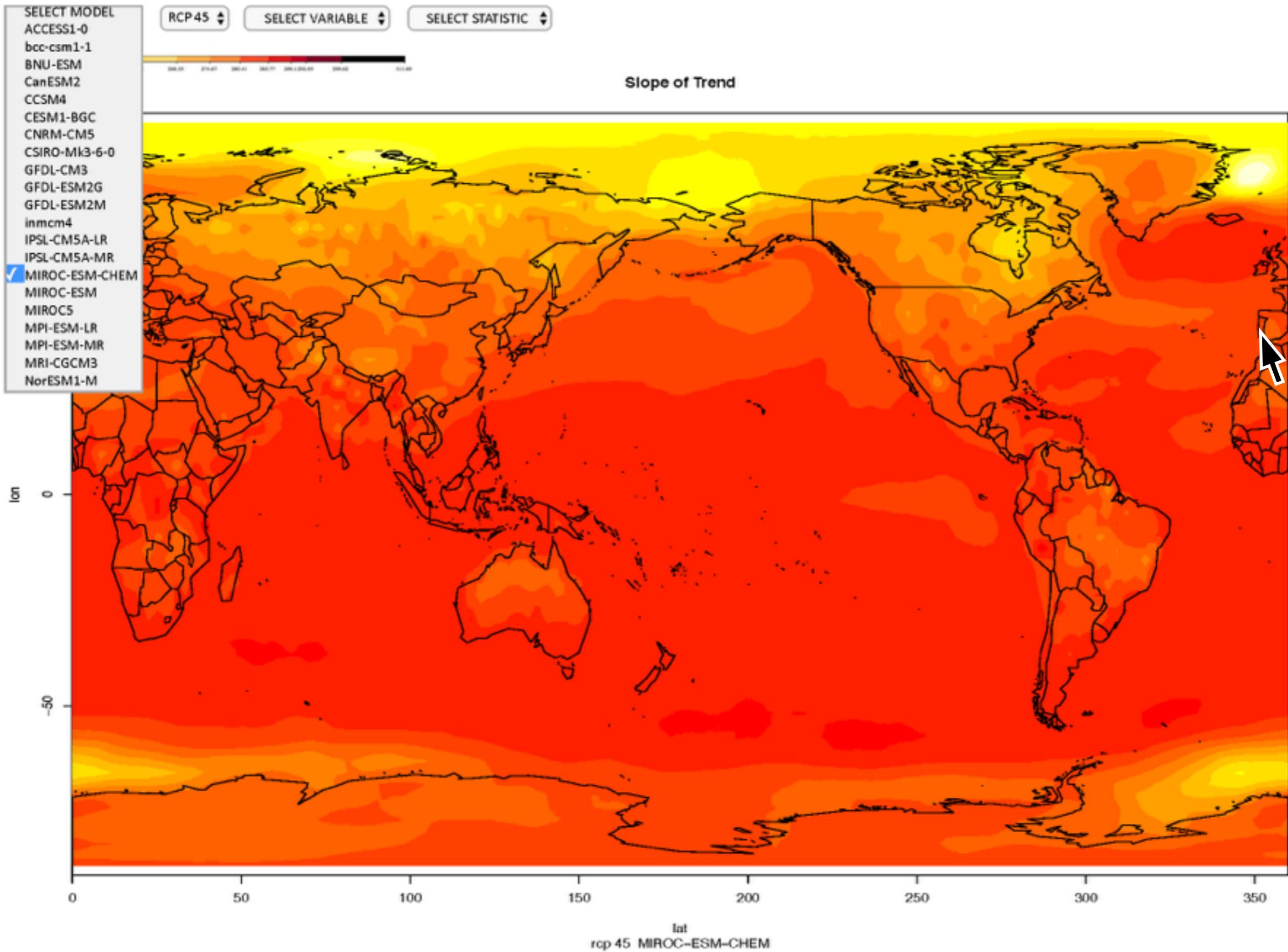
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ACCESS1-0
bcc-csm1-1
BNU-ESM
CanESM2
CCSM4
CESM1-BGC
CNRM-CM5
CSIRO-Mk3-6-0
GFDL-CM3
GFDL-ESM2G
GFDL-ESM2M
inmcm4
IPSL-CM5A-LR
IPSL-CM5A-MR
 MIROC-ESM-CH
MIROC-ESM
MIROC5
MPI-ESM-LR
MPI-ESM-MR
MRI-CGCM3
NorESM1-M

RCP45 ▾

SELECT VARIABLE

SELECT STATISTIC





SELECT MODEL

- ACCESS1-0
- bcc-csm1-1
- BNU-ESM
- CanESM2
- CCSM4
- CESM1-BGC
- CNRM-CM5
- CSIRO-Mk3-6-0
- GFDL-CM3
- GFDL-ESM2G
- GFDL-ESM2M
- inmcm4
- IPSL-CM5A-LR
- IPSL-CM5A-MR
- MIROC-ESM-CHEM
- MIROC-ESM
- MIROC5
- MPI-ESM-LR
- MPI-ESM-MR
- MRI-CGCM3
- NorESM1-M

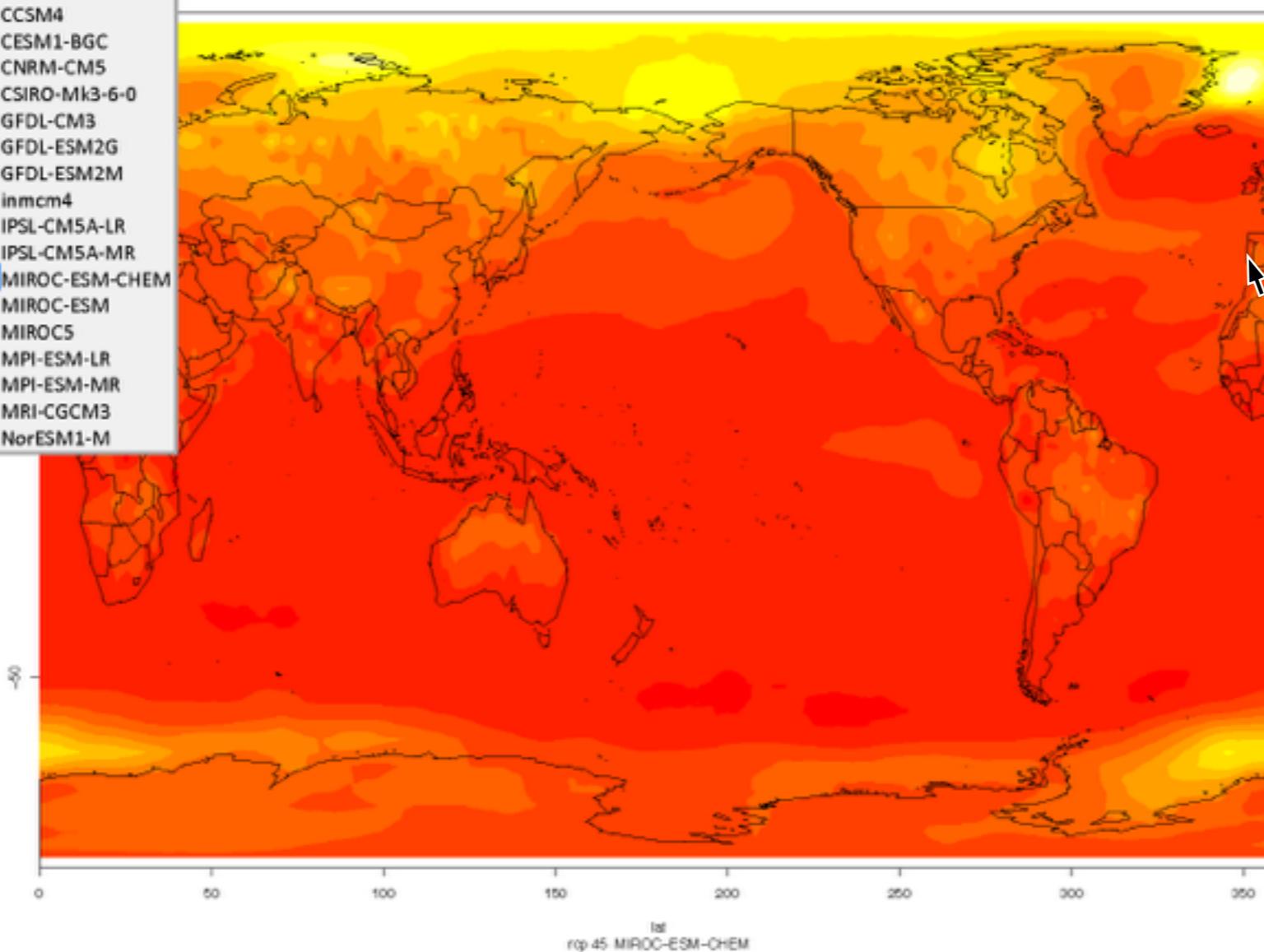
RCP 45 ▾

SELECT VARIABLE ▾

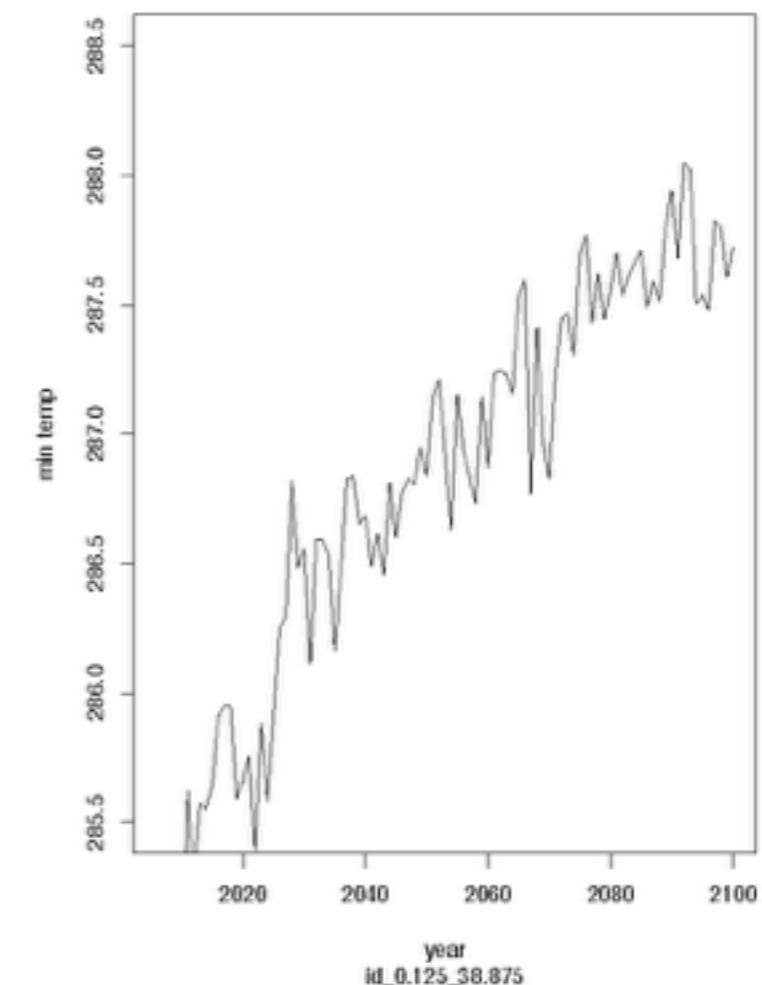
SELECT STATISTIC ▾



Slope of Trend



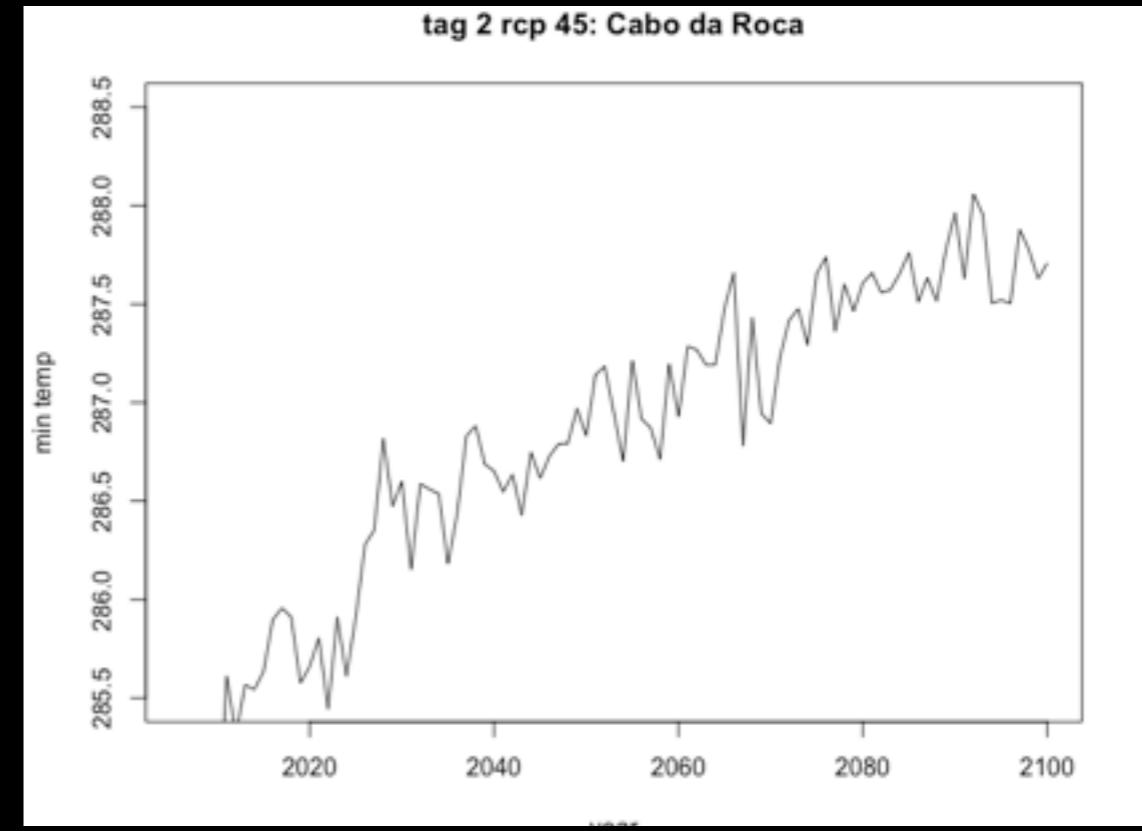
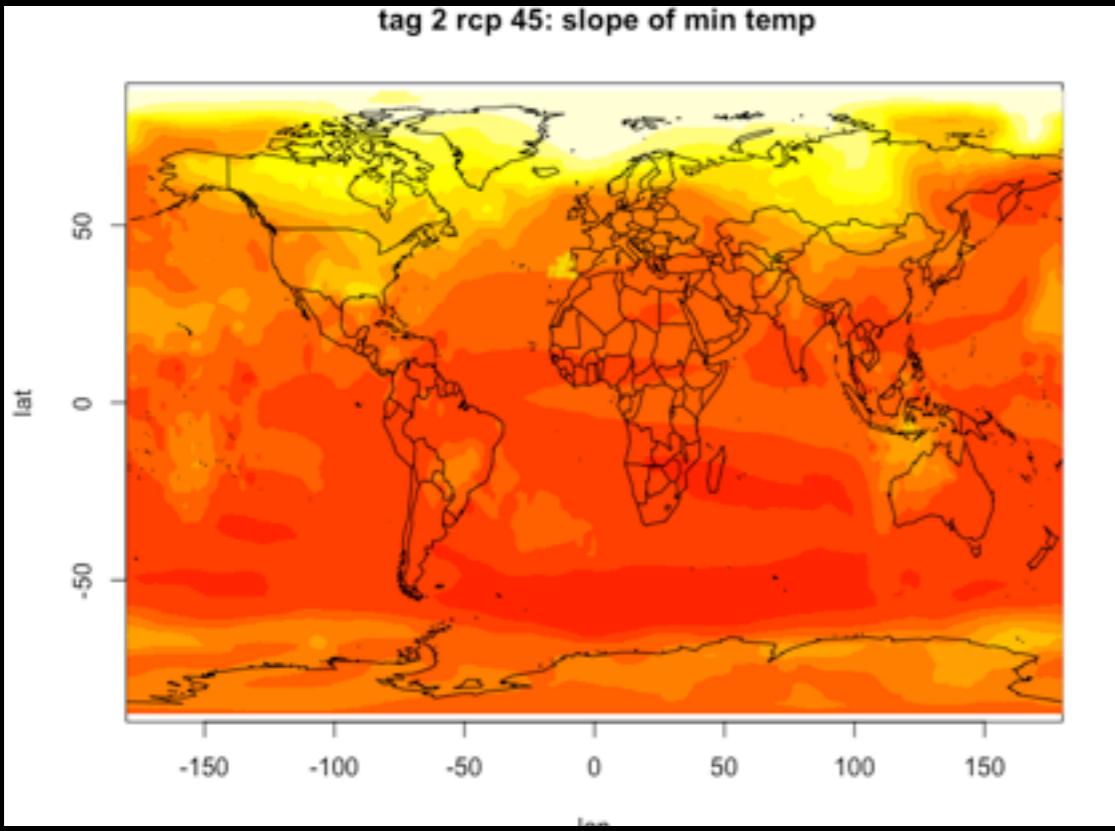
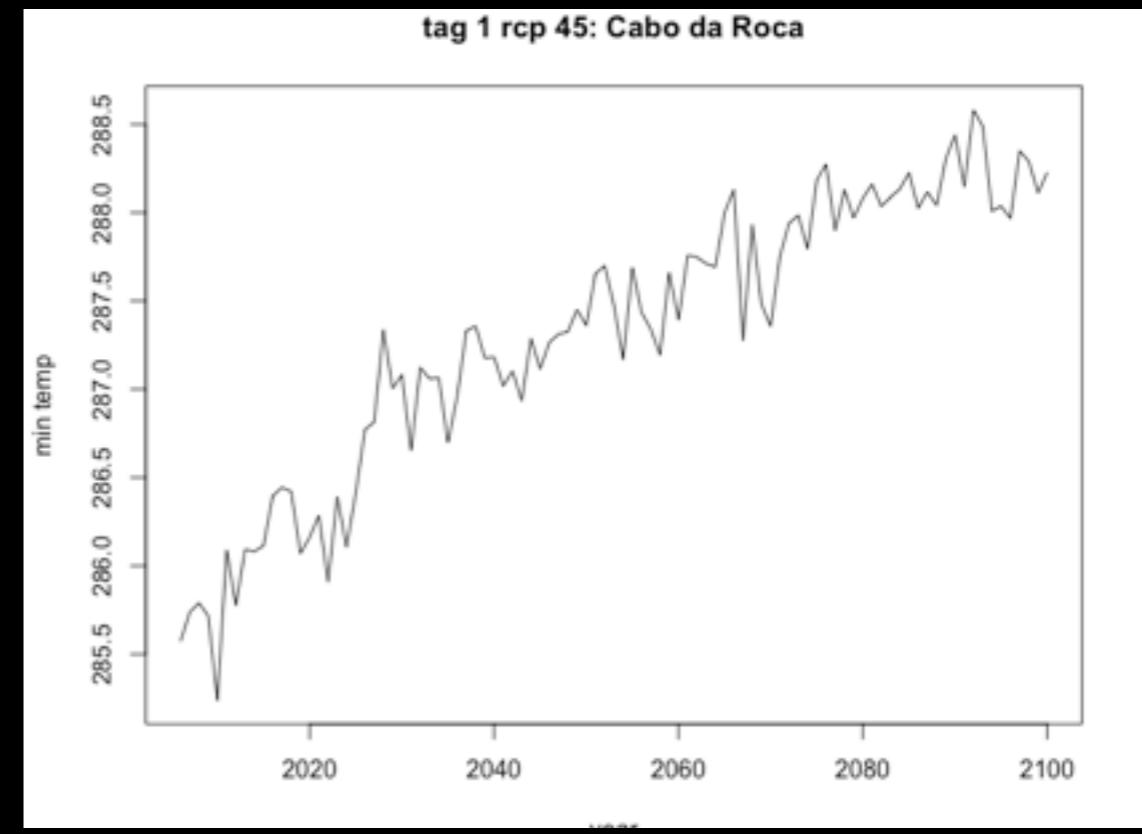
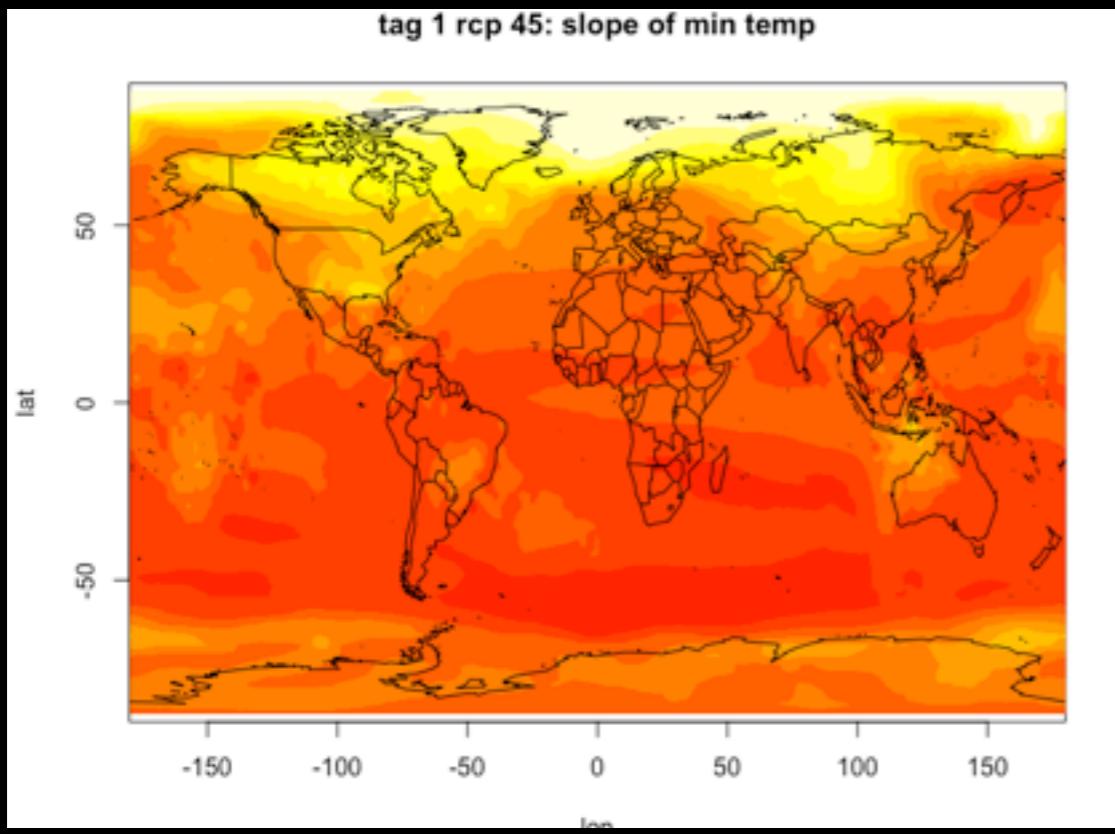
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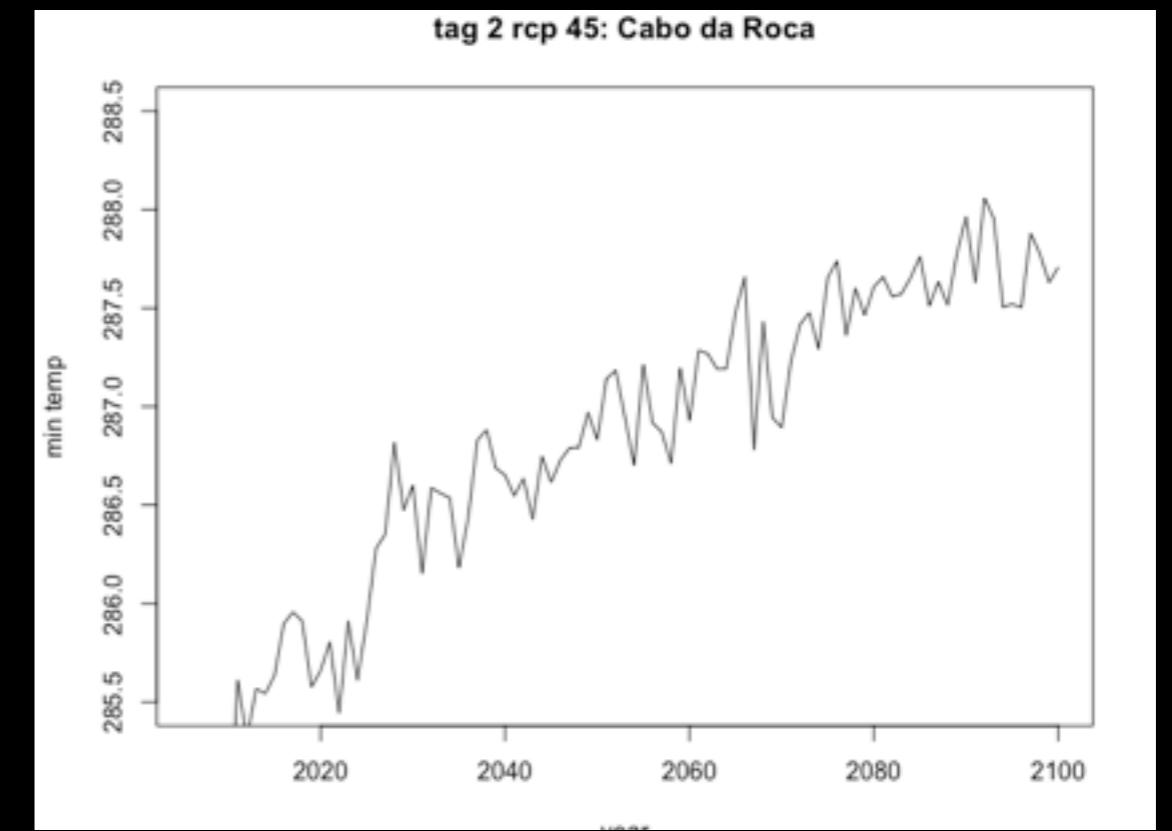
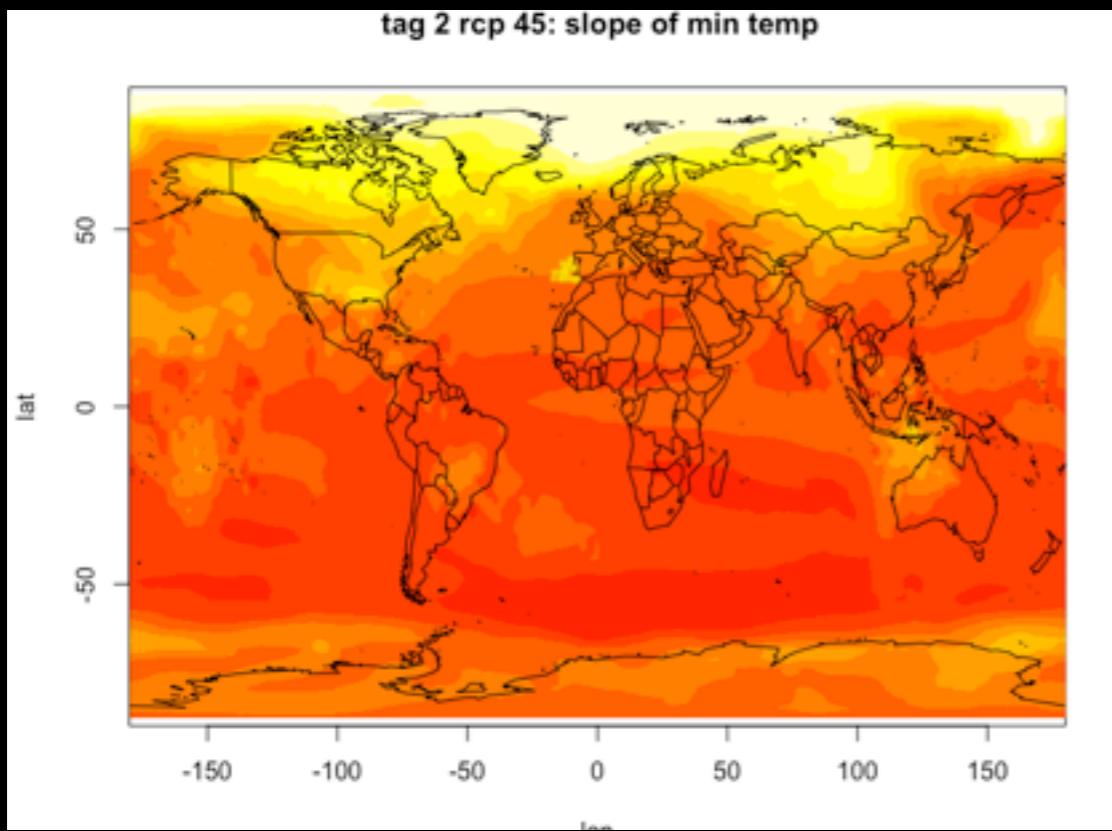
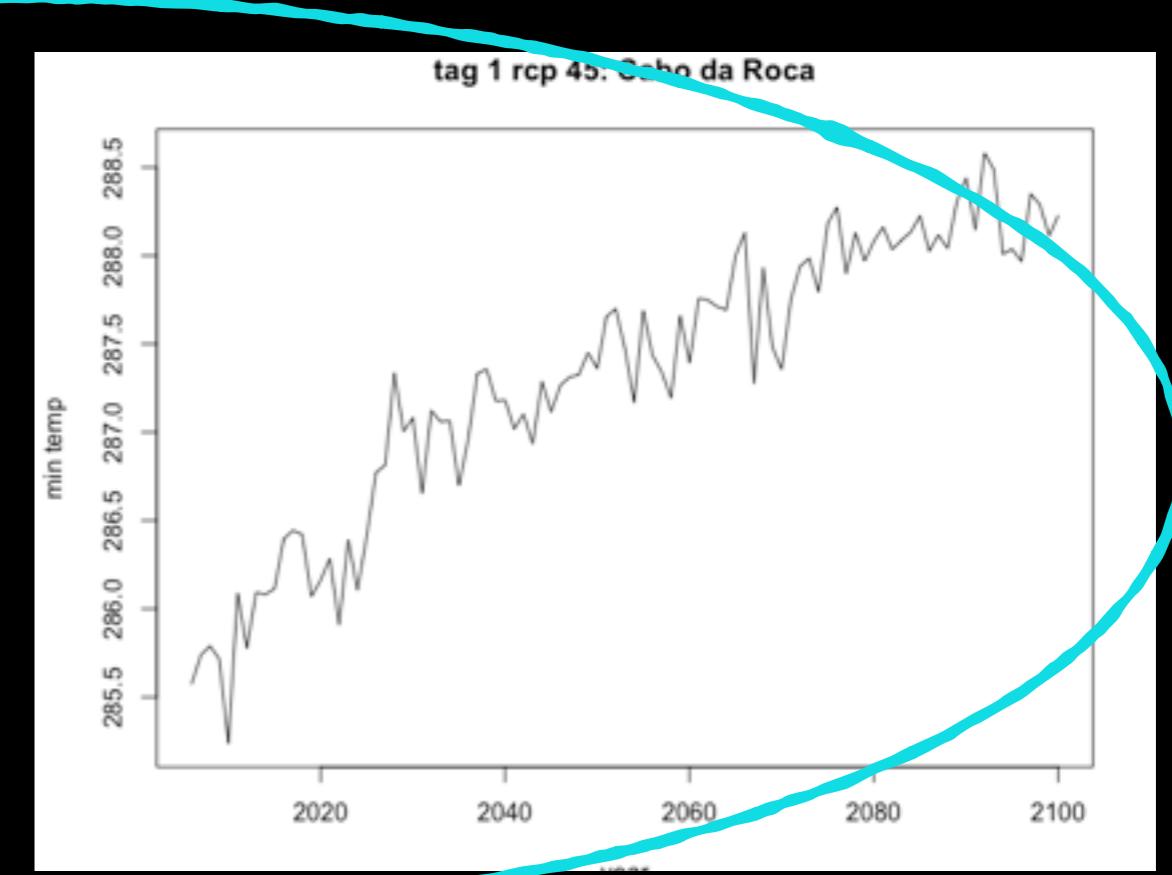
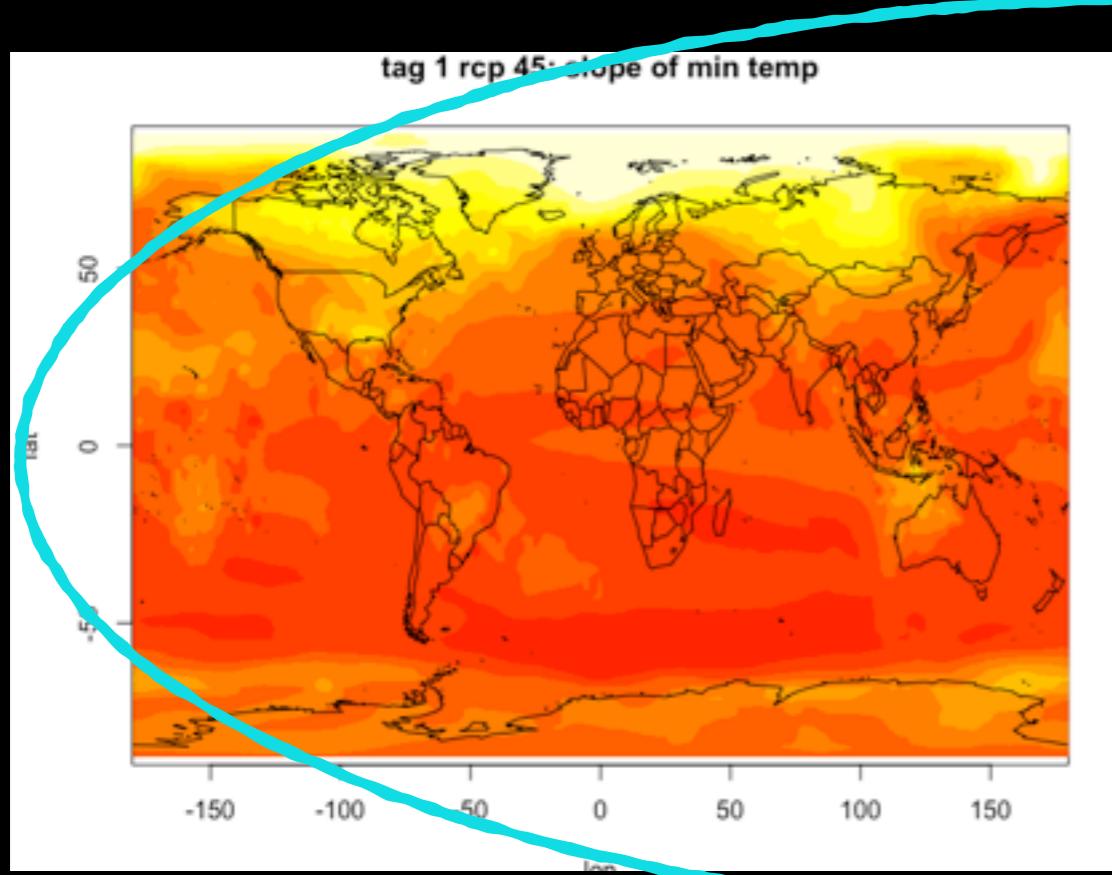


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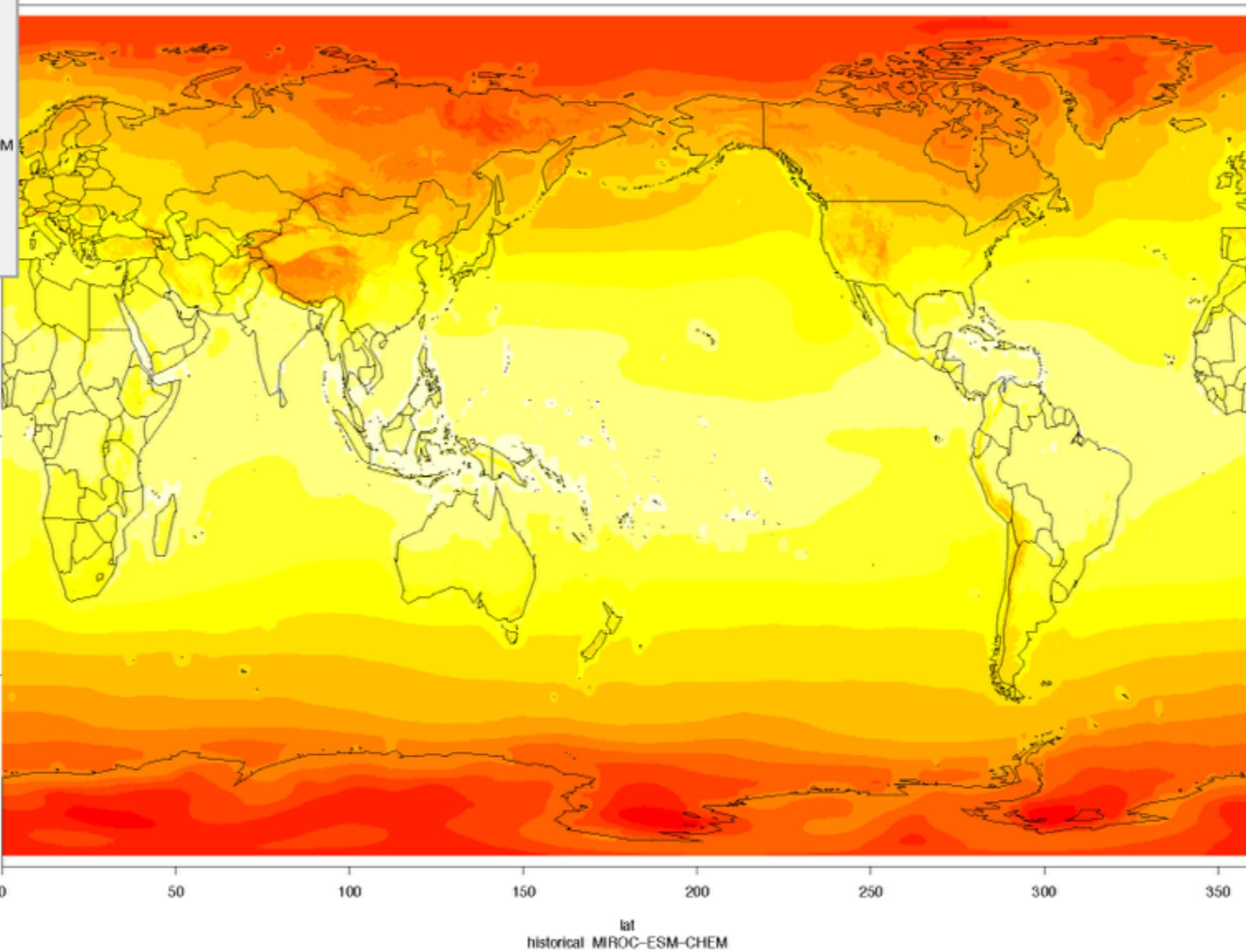
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 - MRI-CGCM3
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SELECT VARIABLE

SELECT STATISTIC



Mean Min Temp 1970



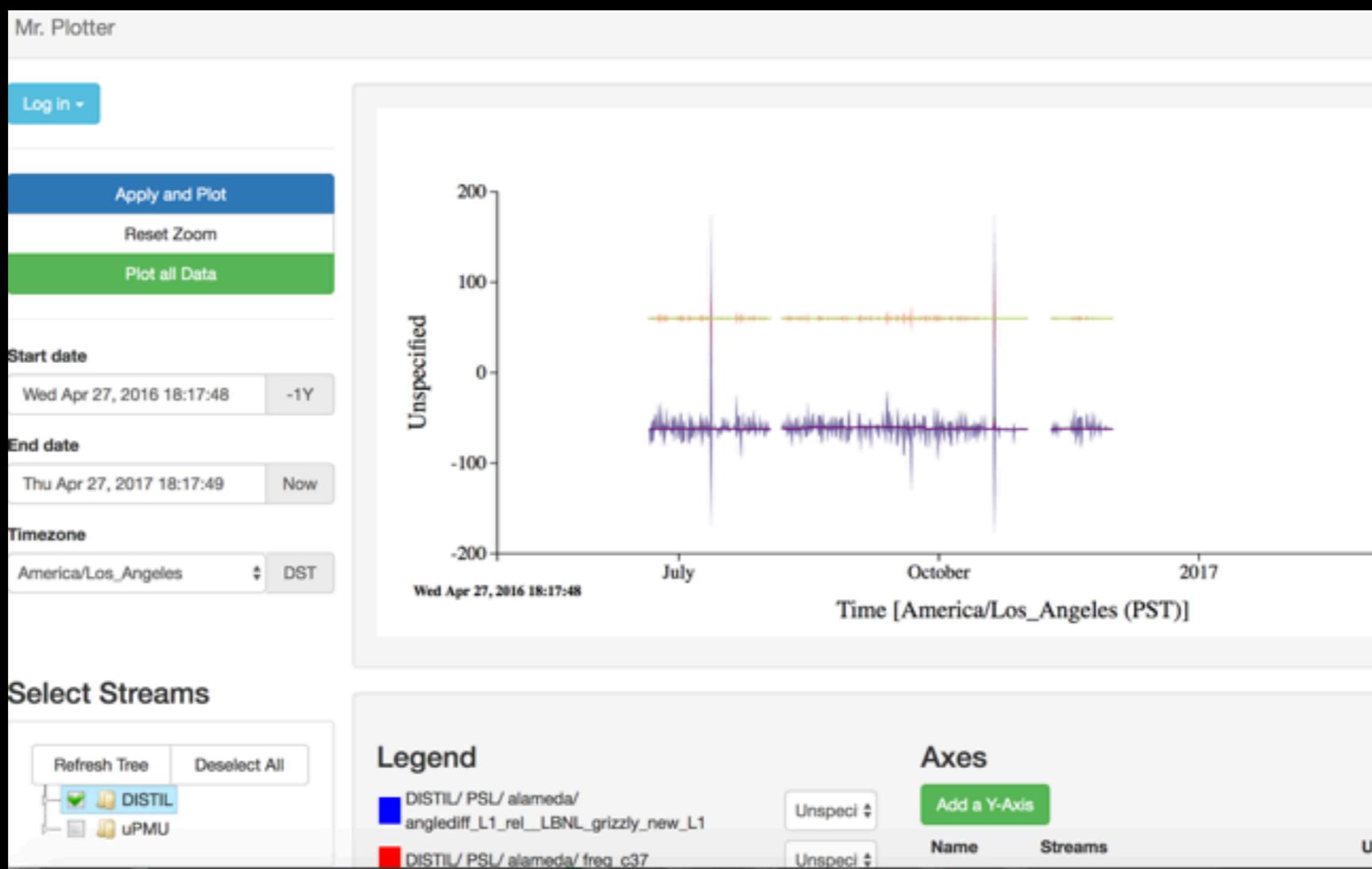
user data pipeline



- using our code on GitHub (https://github.com/sastoudt/UCB_DS421_NEX_partnerProject)
 - scrape chosen model data from NEX
 - process data (ID for grid cell of interest given)

future work

- interface with Berkeley Tree Database
(download time series directly given a location or bounding box)





special thanks to Proxima for her d3 help!