Joined-up planetary information: in the cloud and on devices.

Matthew J. Smith (Matthew.Smith@Microsoft.com, @JungleTeuch)

http://research.microsoft.com/science/tools
www.fetchclimate.org

Planetary Intelligence

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COMPUTER MODELS

Coming Soon to a Lab Near You: Drag-and-Drop Virtual Worlds

Researchers at Microsoft hope to convince scientists that transparent, easy-to-tweak numerical simulations are as straightforward as clicking a mouse

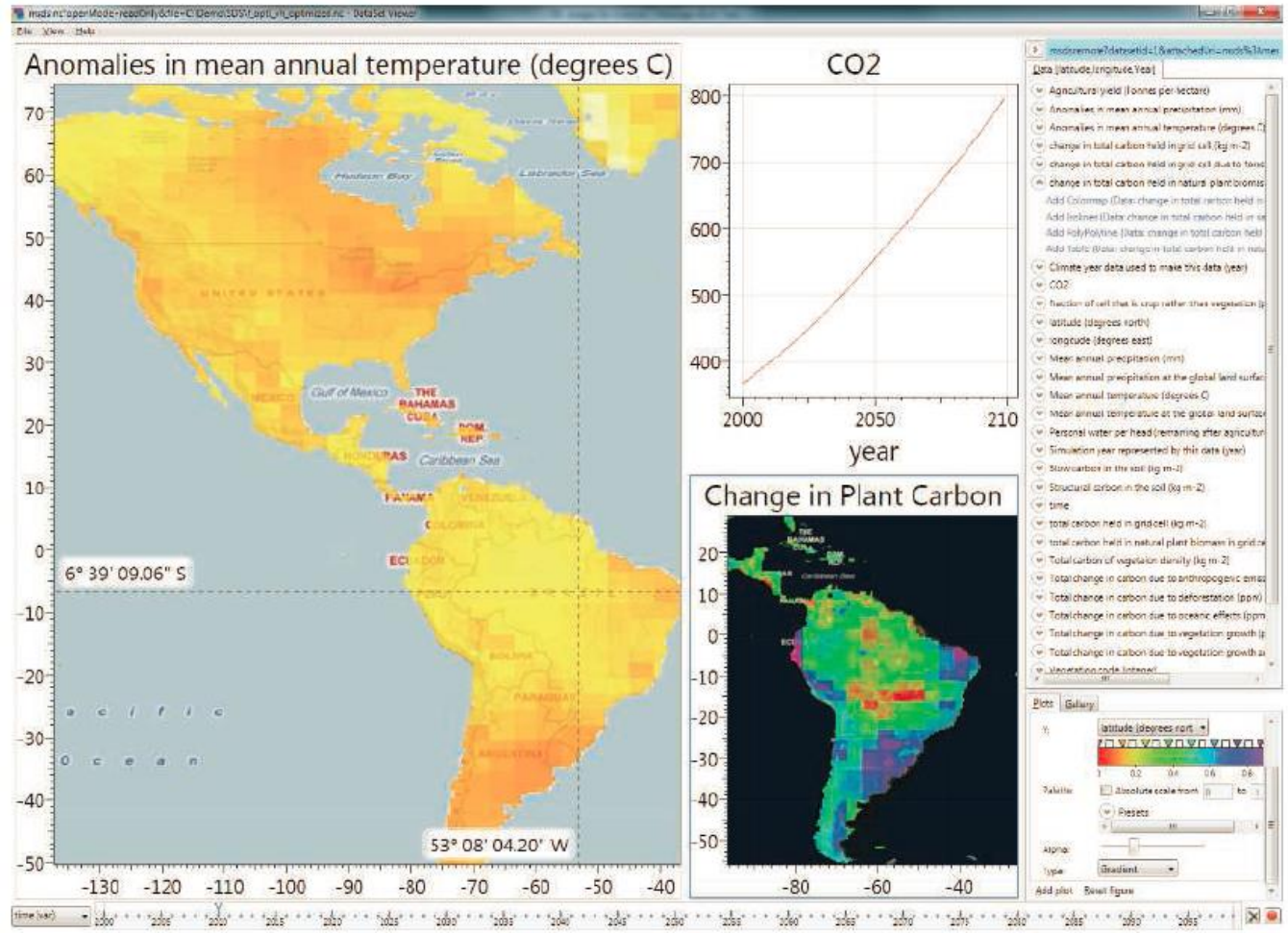
CAMBRIDGE, UNITED KINGDOM—Techies love to hate Microsoft. They curse the "blue screen of death" that appears when a com- and his colleagues plan to share their wares freely with the academic scientific community. But Emmott's vision is now in full gear.

Model builder. "I'm interested in t the way science is done," Stepher

Prototype versions of se tools are now up and running through their paces by researc soft. One program, currently soft Computational Science tains components that are a disparate types of data, quic into a model, and visualize th Other packages help biologi simulate DNA circuits for bi puters and manage wireless se for tracking animal behavior. an ecologist at the University Madison, says she has used packages produced by acade and visualize complex model began working with Microso investigate how future clima narios might affect agricultu around the globe. "It's the sli ever seen," she says.

Capturing complexity

So why is a computer softw known primarily for its operati business software mucking aro eling the global carbon cycle understand the human immun ting in his ground-floor office from the University of Camb Cavendish Laboratory where discovered the electron and Ja



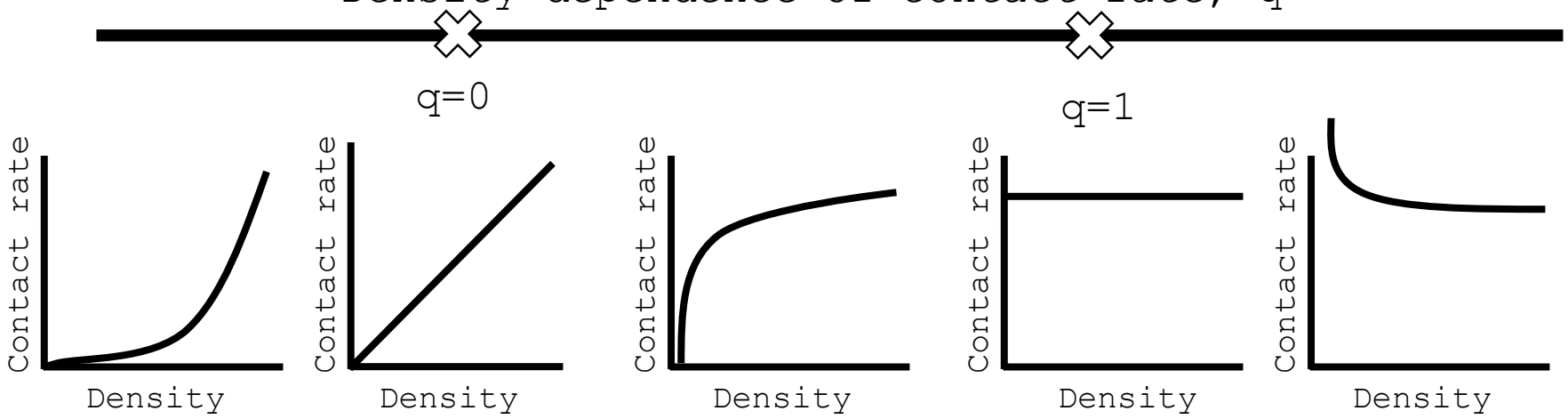
Model builder. "I'm interested in tools that change the way science is done," Stephen Emmott says.

But the Cambridge team's new software languages and models could bring such work—which now requires heavy lifting by highly specialized labs—within reach of a far broader audience. If so, their stock among scientists could be on the rise.

"The promise of the cloud is that every individual and organization has unlimited access to information."

Satya Nadella, CEO of Microsoft

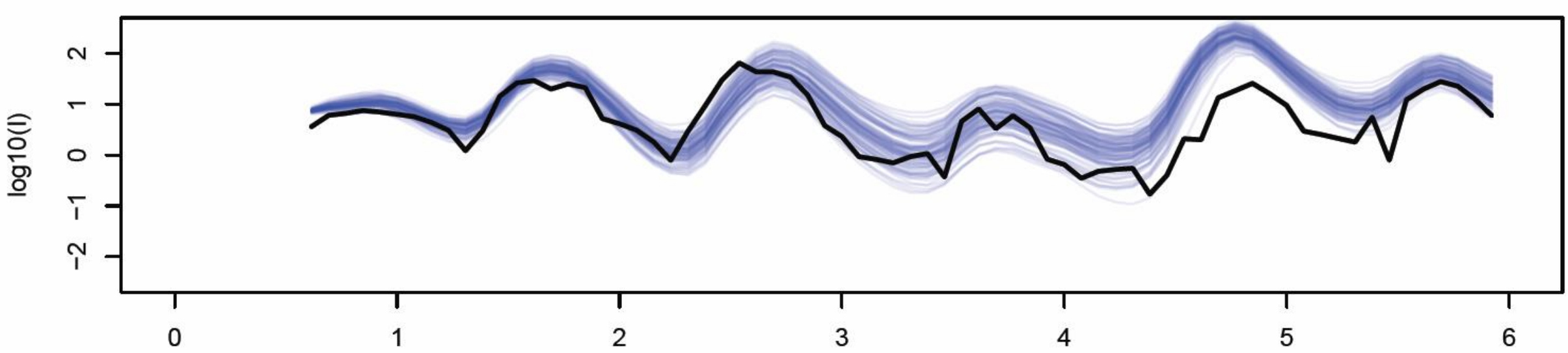
Density-dependence of contact rate, q



$$c = \kappa\left[\frac{N(t)^{(1-q)}}{A}\right]$$

$$\text{Infection rate} = \kappa\left[\frac{N(t)^{(1-q)}}{A}\right]\upsilon S(t)\left[\frac{I(t)}{N(t)}\right] = \frac{\beta_{qD}S(t)I(t)}{N(t)^q} = \frac{\beta K^q S(t)I(t)}{N(t)^q}$$

$$\frac{dI(t)}{dt} = \frac{\beta K^q S(t)I(t)}{N(t)^q} - M(1 + \alpha \sin(2\pi(t - \Delta)))I(t)$$


log10(I)
2
1
0
−1
−2
0
1
2
3
4
5
6

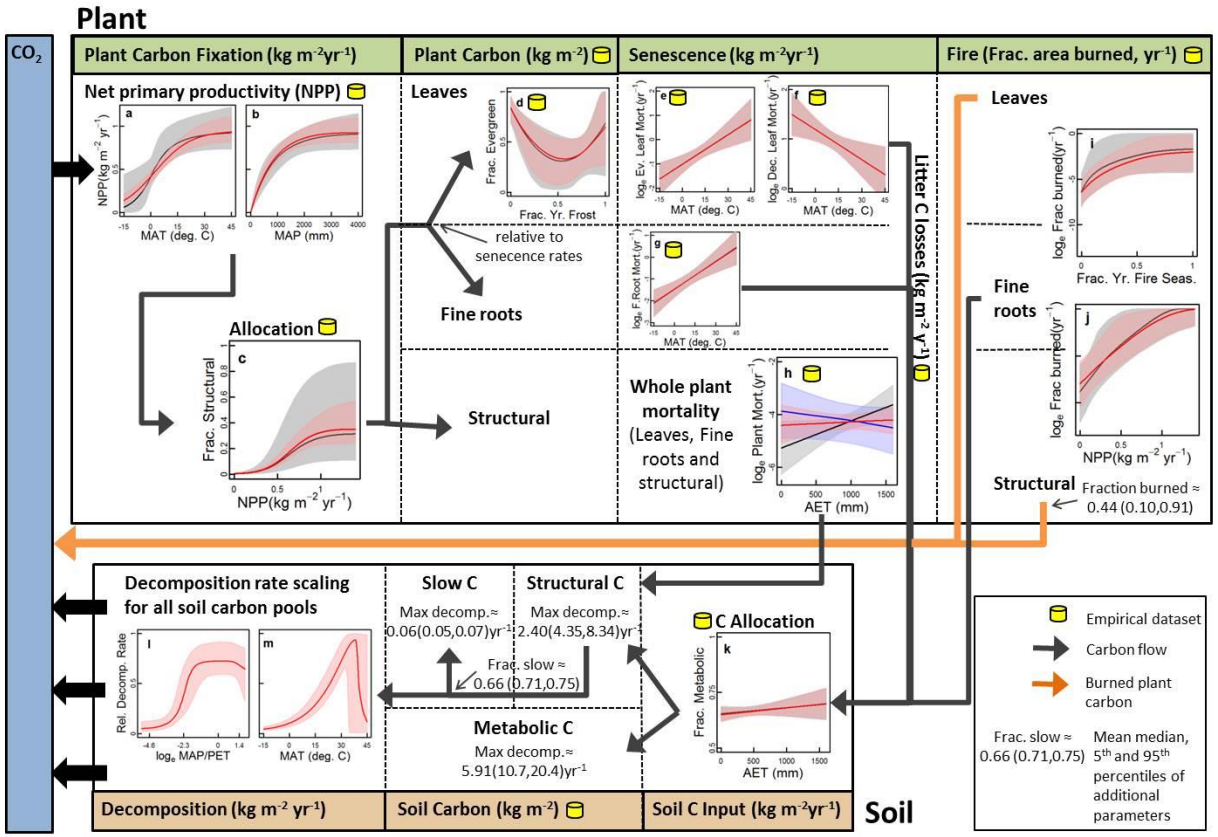
Biogeosciences, 10, 583–606, 2013
www.biogeosciences.net/10/583/2013/
doi:10.5194/bg-10-583-2013

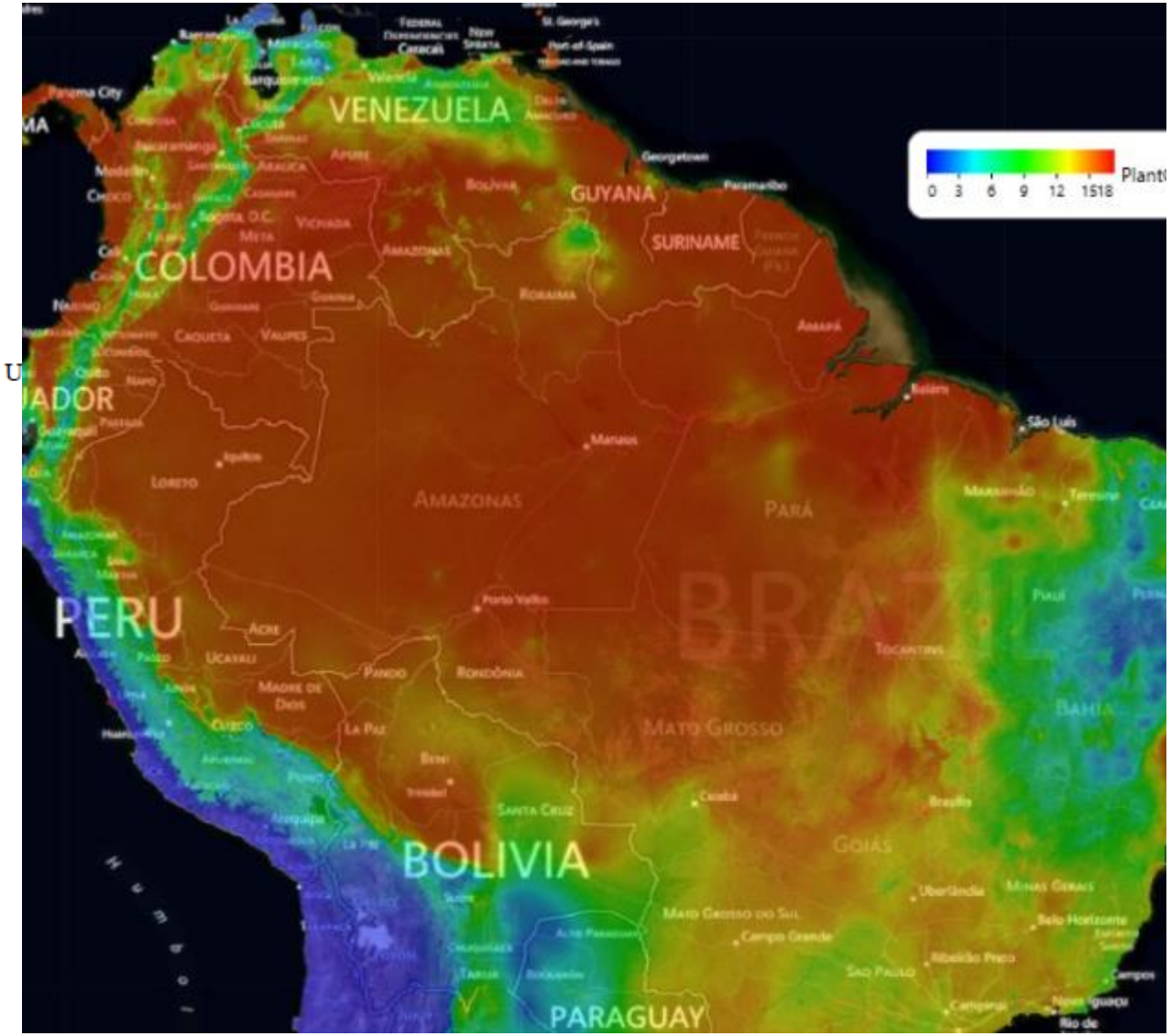
Biogeosciences

The climate dependence of the terrestrial carbon cycle, including parameter and structural uncertainties

M. J. Smith, D. W. Purves, M. C. Vanderwel, V. Lyutsarev, and S. Emmott

Computational Science Laboratory, Microsoft Research Cambridge, 21 Station Road, Cambridge, CB1 2FB, U






CANADA
NORTH AMERICA
KAZAKHSTAN
MONGOLIA
CHI
ALGERIA
LIBYA
NIGER
SUDAN
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Pacific Ocean
Arabian Sea
Indian Ocean
AUSTRALIA
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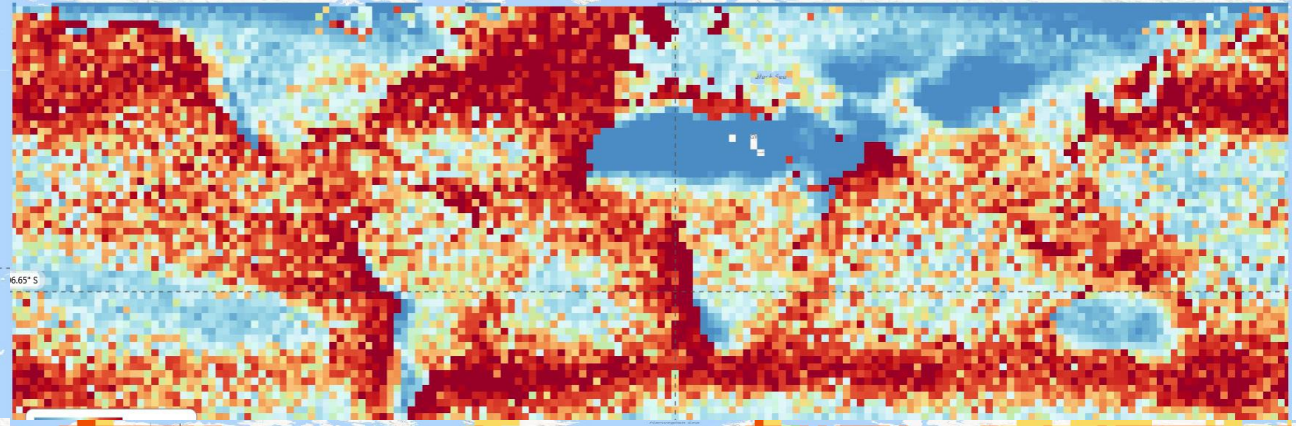

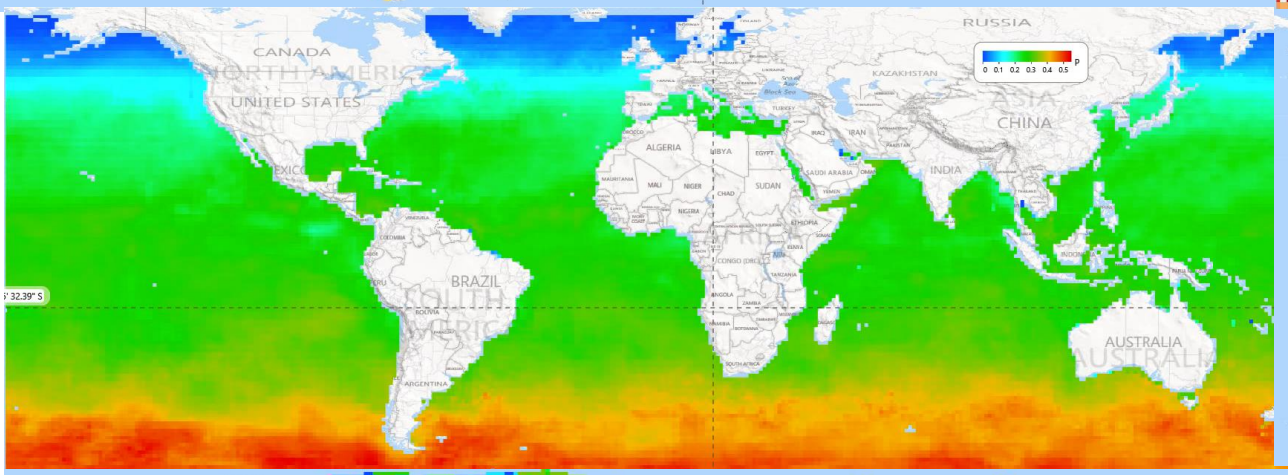
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CANADA
NORTH AMERICA
UNITED STATES
KAZAKHSTAN
CHINA
INDIA
ALGERIA
LIBYA
EGYPT
SAUDI ARABIA
MALI
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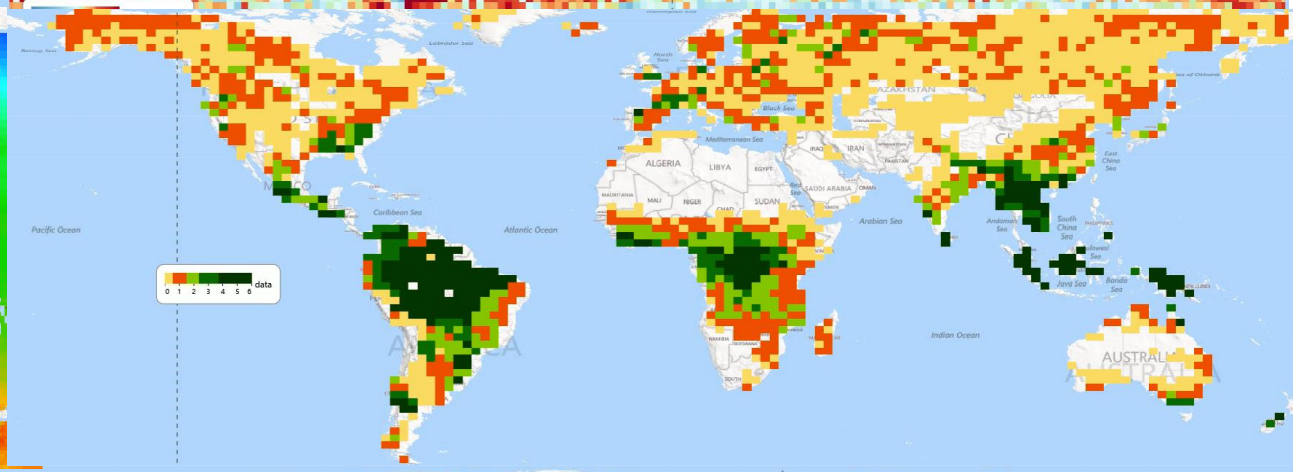
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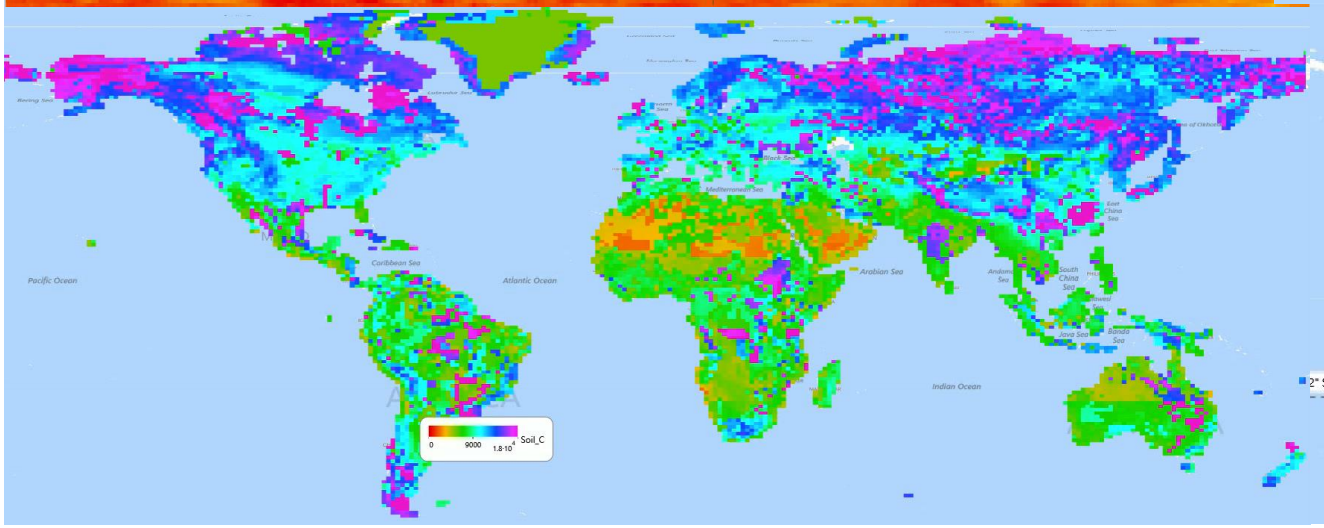
Pacific Ocean
Atlantic Ocean
Arabian Sea
Indian Ocean
AUSTRALIA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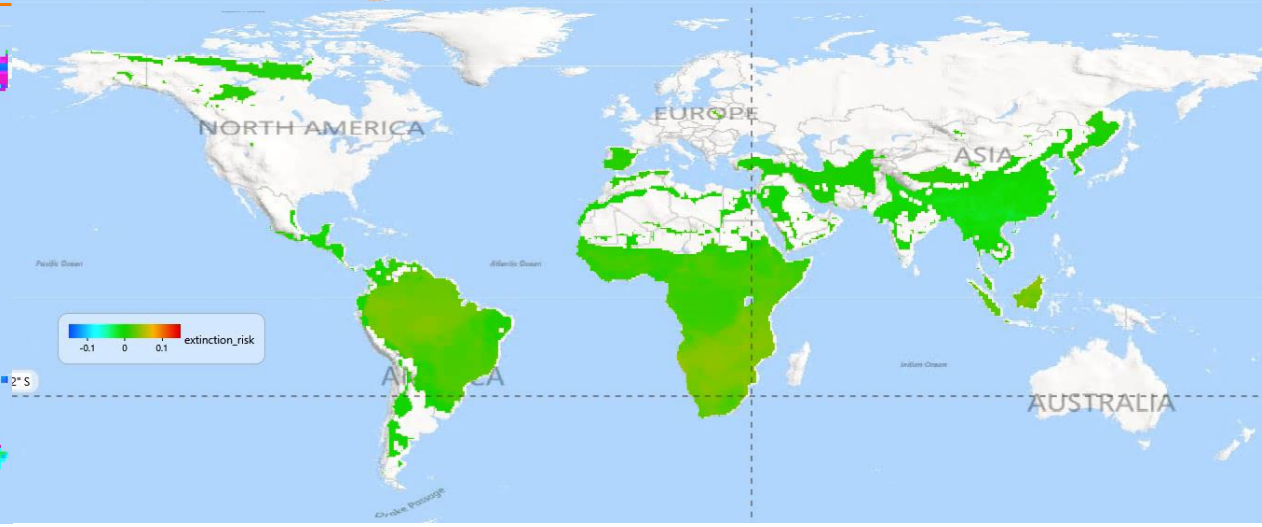
Pacific Ocean
Atlantic Ocean
Arabian Sea
Indian Ocean


NORTH AMERICA
EUROPE
ASIA
AUSTRALIA
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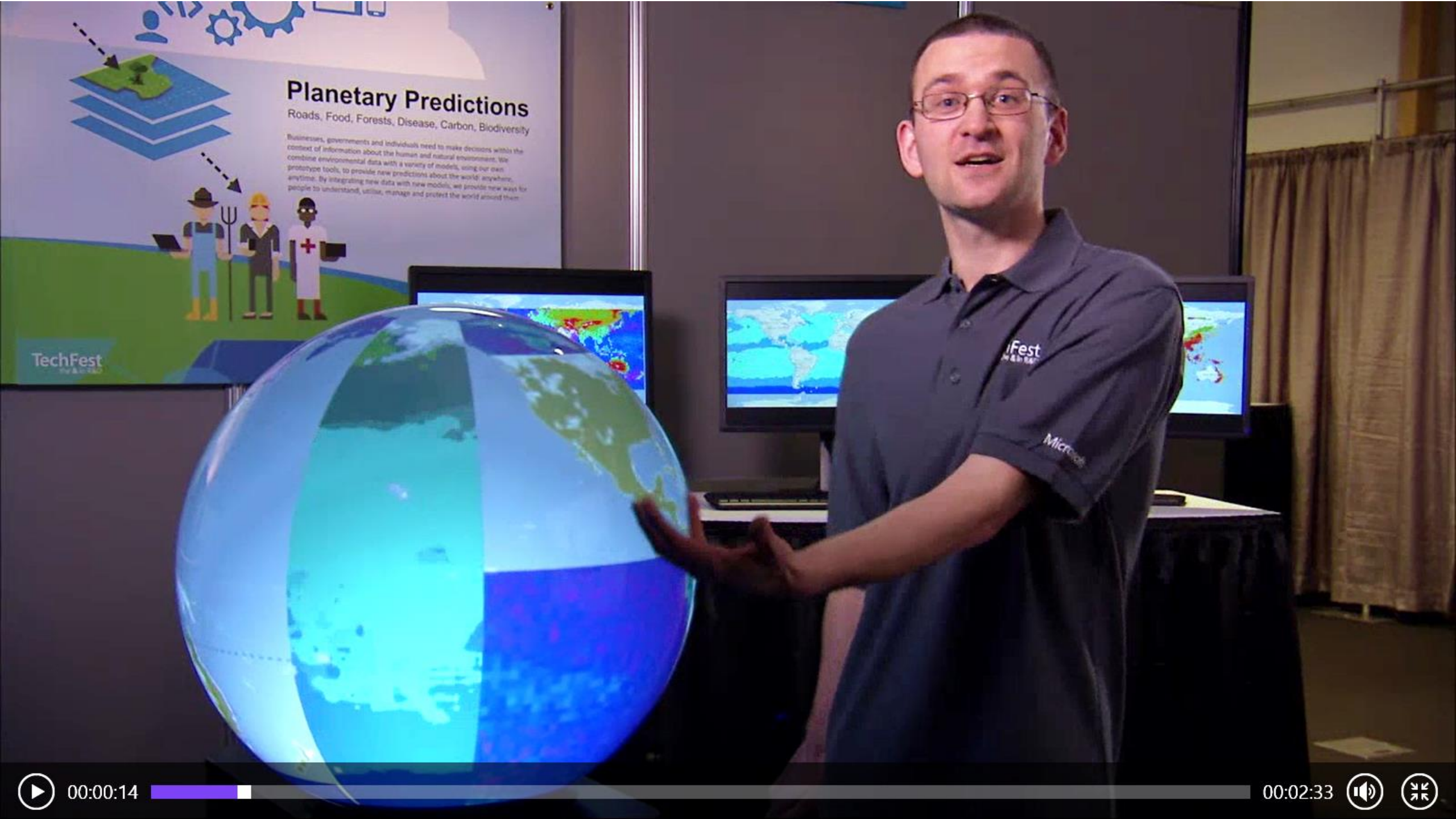
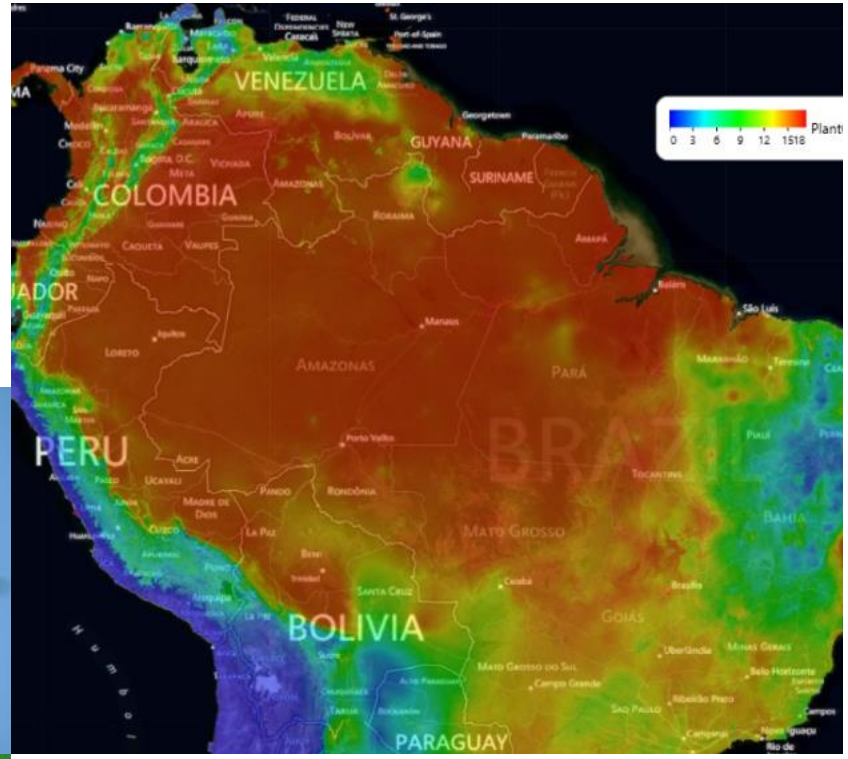
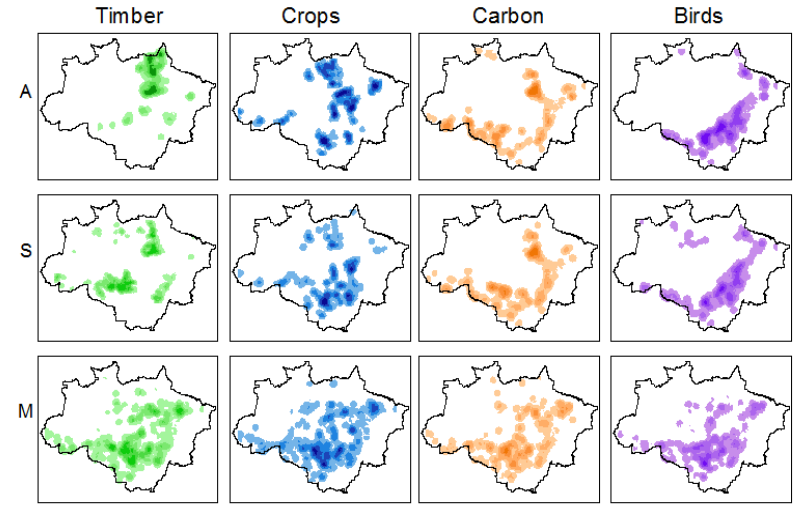
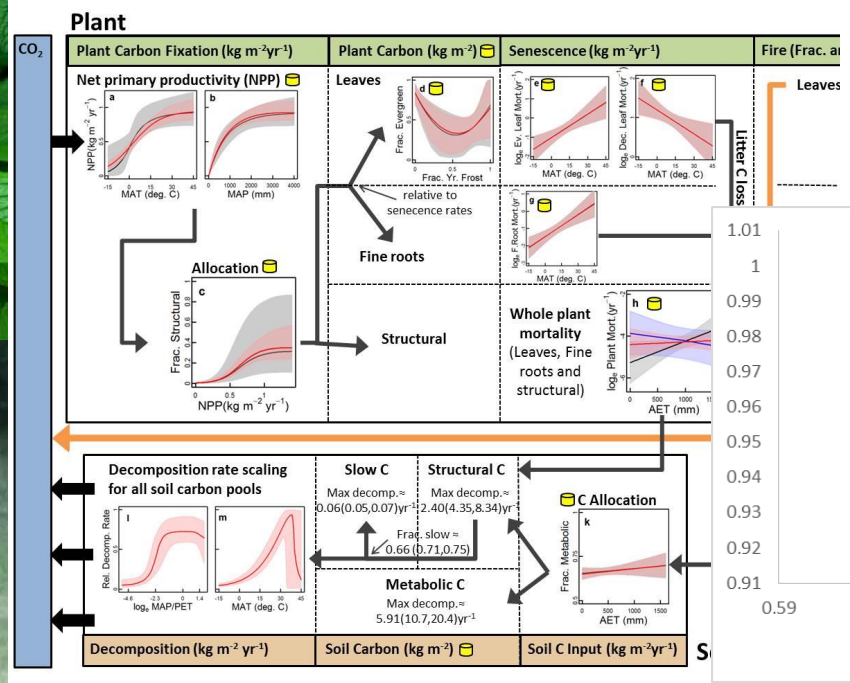
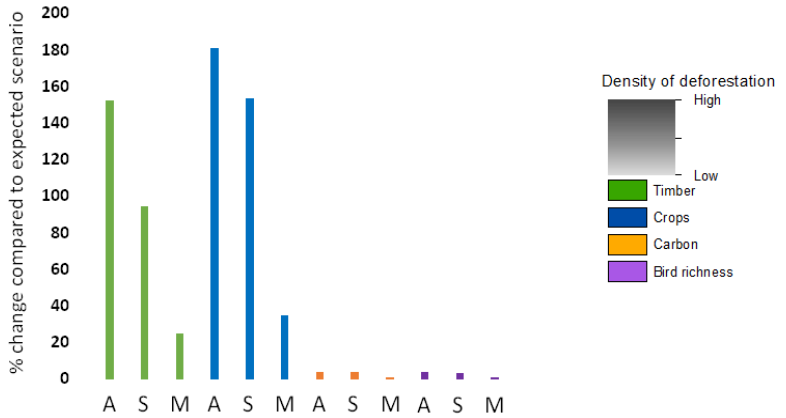
0.1

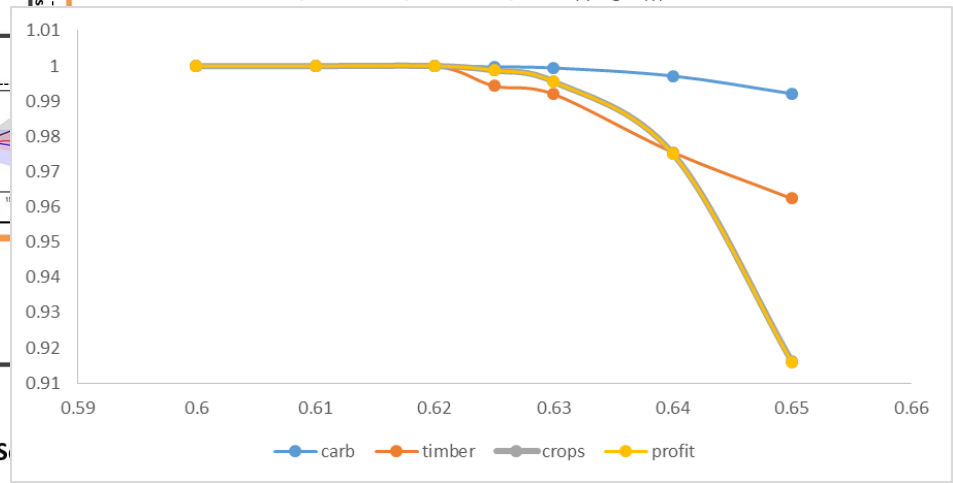

Planetary Predictions
Roads, Food, Forests, Disease, Carbon, Biodiversity
Businesses, governments and individuals need to make decisions within the context of information about the human and natural environment. We combine environmental data with a variety of models, using our own prototype tools, to provide new predictions about the world: anywhere, anytime. By integrating new data with new models, we provide new ways for people to understand, utilise, manage and protect the world around them
TechFest
00:00:14
00:02:33

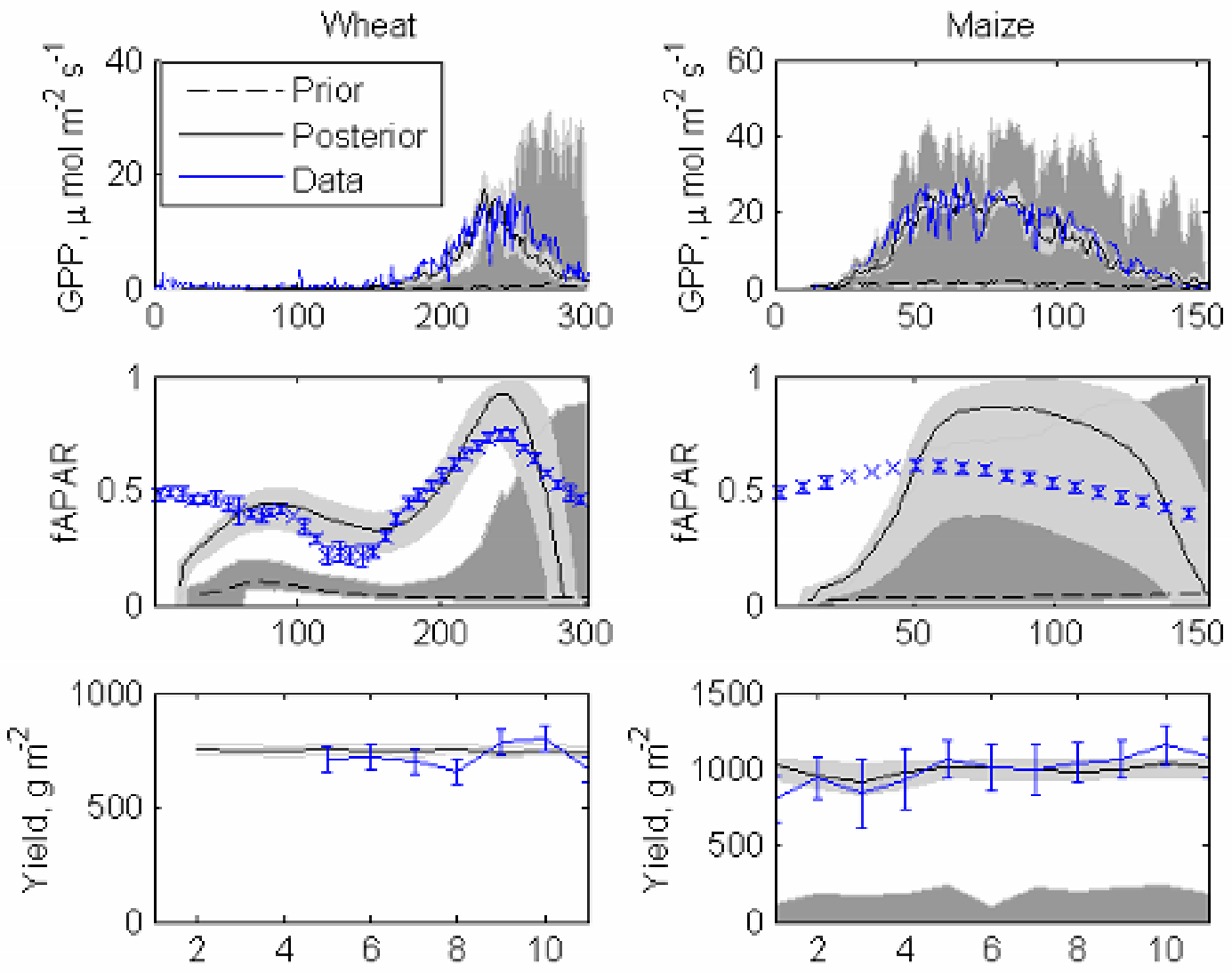

VENEZUELA
GUYANA
SURINAME
COLOMBIA
PERU
BRAZIL
BOLIVIA
PARAGUAY
AMAZONAS
PARÁ
MATO GROSSO
GOIÁS


Timber
Crops
Carbon
Birds
A
S
M


Plant
CO2
Plant Carbon Fixation (kg m-2yr-1)
Net primary productivity (NPP)
Allocation
Plant Carbon (kg m-2)
Leaves
Fine roots
Structural
relative to senescence rates
Senescence (kg m-2yr-1)
Whole plant mortality (Leaves, Fine roots and structural)
Litter C loss
Decomposition rate scaling for all soil carbon pools
Slow C
Structural C
Metabolic C
C Allocation
Frac. slow ≈ 0.66 (0.71,0.75)
Decomposition (kg m-2 yr-1)
Soil Carbon (kg m-2)
Soil C Input (kg m-2yr-1)


% change compared to expected scenario
Density of deforestation
High
Low
Timber
Crops
Carbon
Bird richness
A S M A S M A S M A S M


carb
timber
crops
profit



<- carbon flux
Eddy covariance data

<- greenness
MODIS – MOD15a product

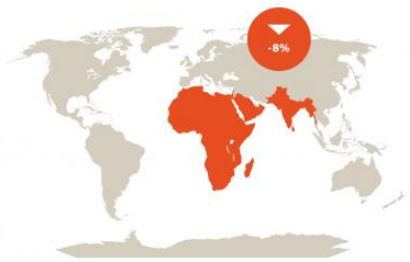
<- county and
country level yield

The future of food and farming: 2050s

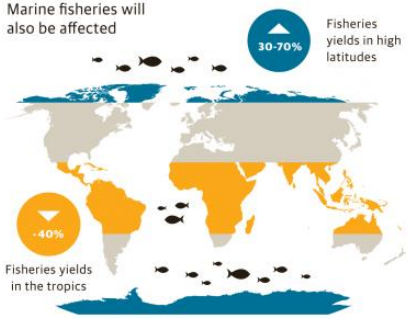
By 2050, climatic impacts on food security will be unmistakable. There are likely to be 9 billion people on the planet, most people will live in cities and demand for food will increase significantly.

Widespread impacts on food and farming are highly likely

Average decline in yields for eight major crops across Africa and South Asia

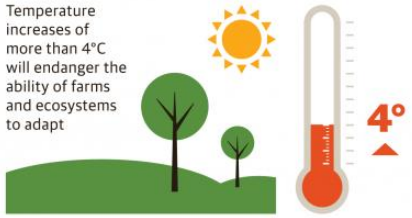


Marine fisheries will also be affected



Heat and water may pass critical thresholds

Temperature increases of more than 4°C will endanger the ability of farms and ecosystems to adapt



Water cycles will be very different and less predictable

Changes in the intensity, frequency and seasonality of precipitation

Sea level rises and melting glaciers

Changes in groundwater and river flows

We will need major innovations in how we eat and farm

To cope with climatic changes, we may need to consider:

Completely different diets

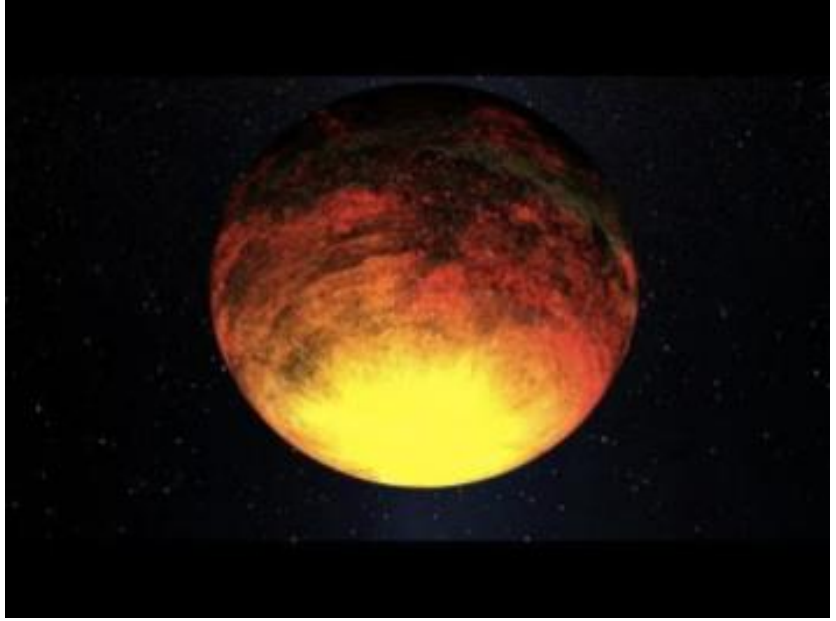
Shifting production areas for familiar crops, livestock and fisheries

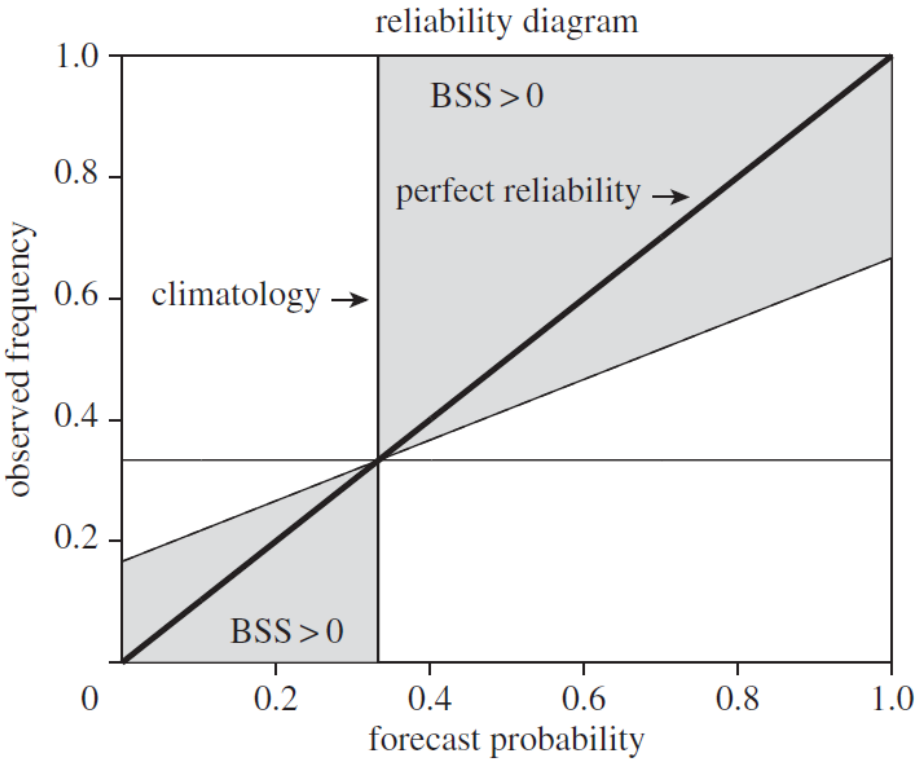
New approaches to managing waste, water and energy in food supply chains

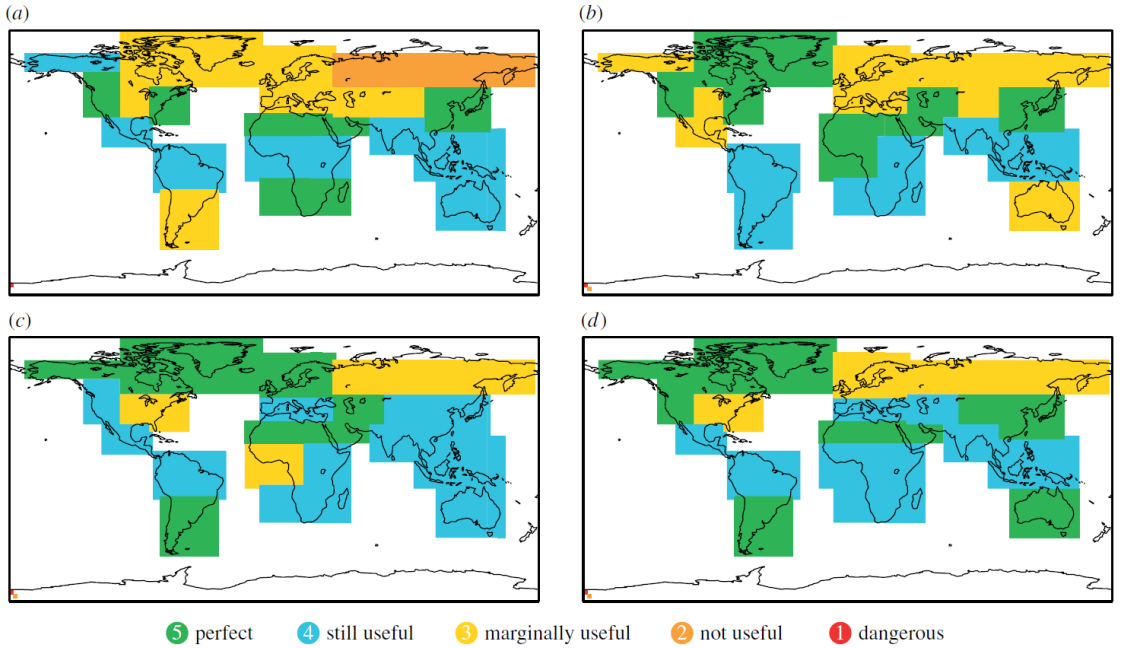
Restoring degraded farmlands, wetlands and forests

SOURCES: Porter, J. R., Xie, L., Challinor, A., Cochrane, K., Howden, M., Iqbal, M. M., Lobell, D., Travasso, M. I. 2014. Food Security and Food Production Systems. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. http://www.ipcc-wg2.gov/
With data from Cheung et al 2010, Cochrane et al 2009, Knox et al 2012

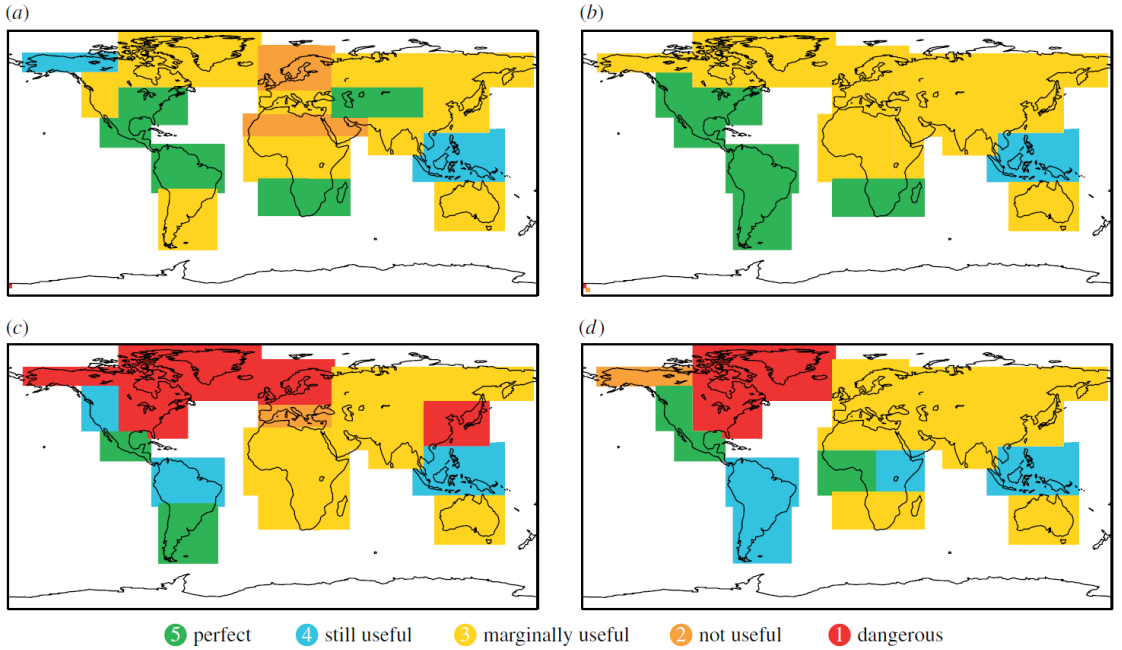
CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS







gure 4. Reliability of System 4 seasonal forecasts for 2 m temperature. (*a*) Cold DJF, (*b*) warm DJF, (*c*) cold JJA and (*d*) warm JJA.



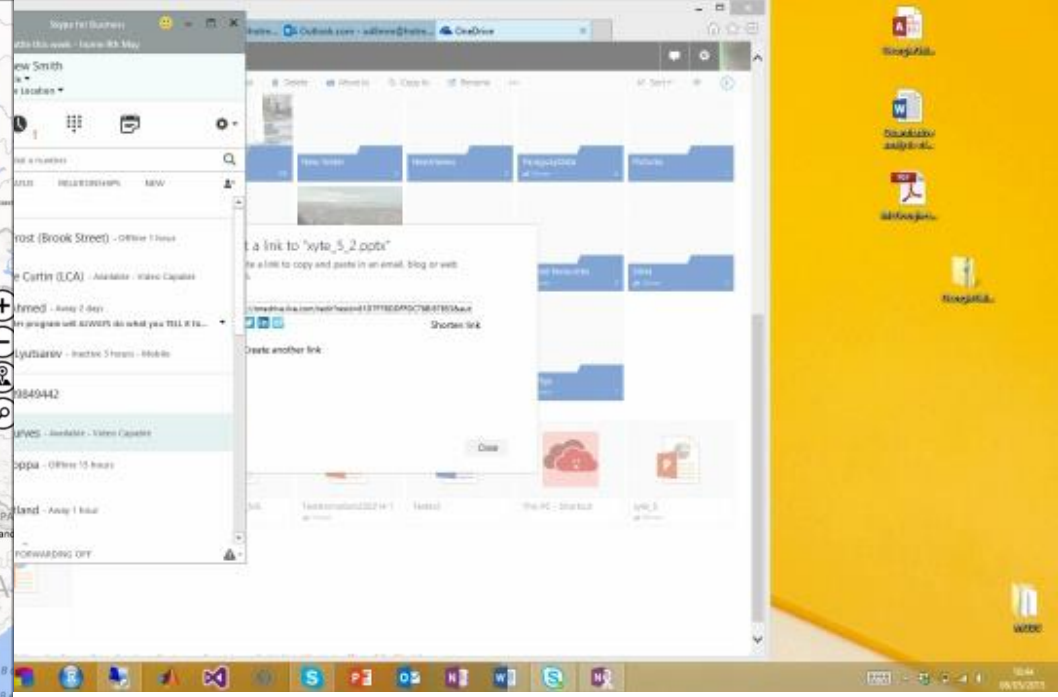
gure 5. Reliability of System 4 seasonal forecasts for precipitation. (*a*) Dry DJF, (*b*) wet DJF, (*c*) dry JJA and (*d*) wet JJA.


7
8

"The promise of the cloud is that every individual and organization has unlimited access to information."

Satya Nadella, CEO of Microsoft

Select geography



Fetch Climate

create new

constrain code
start cross-validation
design model
estimate parameters
fetch climate
import file
import OData
join tables
make data
compile F#
run MATLAB
make chart

objects 17 items

chart simulateNPZData 3/21/2014 10:21:55 AM
data ParameterSummaries 3/14/2014 7:25:39 AM
module ParameterSummaries 3/14/2014 7:17:27 AM
data NPZRates 3/13/2014 6:05:35 PM
chart NPZRates 3/13/2014 6:05:35 PM
chart AverageAnnualDynamics 3/13/2014 6:00:55 PM
data AverageAnnualDynamics 3/13/2014 6:00:55 PM
chart PlotKnockOuts 3/13/2014 6:00:55 PM
data simulateNPZData 3/13/2014 6:00:55 PM
chain NPZModel 3/13/2014 5:58:46 PM
data PdataTimeSeries 3/13/2014 5:47:12 PM
code NPZModel 3/13/2014 5:47:12 PM
file Site1Synthesis.csv 3/13/2014 5:46:58 PM
module NPZCode 3/13/2014 5:55:23 AM
module ProduceAnnualAverages 3/13/2014 4:50:15 AM
module ReportNPZRates 3/12/2014 7:11:28 AM
module TimeSeriesProcessor 3/12/2014 6:04:26 AM

actions 17 items

compile F# NPZCode 3/21/2014 10:21:27 AM
make data ParameterSummaries 3/14/2014 7:25:39 AM
compile F# ParameterSummaries 3/14/2014 7:17:32 AM
make chart NPZRates 3/13/2014 6:05:35 PM
make data NPZRates 3/13/2014 6:04:52 PM
make chart... 3/13/2014 6:00:55 PM
make chart simulateNPZData 3/13/2014 6:00:55 PM
make chart PlotKnockOuts 3/13/2014 6:00:55 PM
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import file Site1Synthesis.csv 3/13/2014 5:46:58 PM
make data PdataTimeSeries 3/13/2014 5:46:58 PM
constrain code NPZModel 3/13/2014 5:46:58 PM
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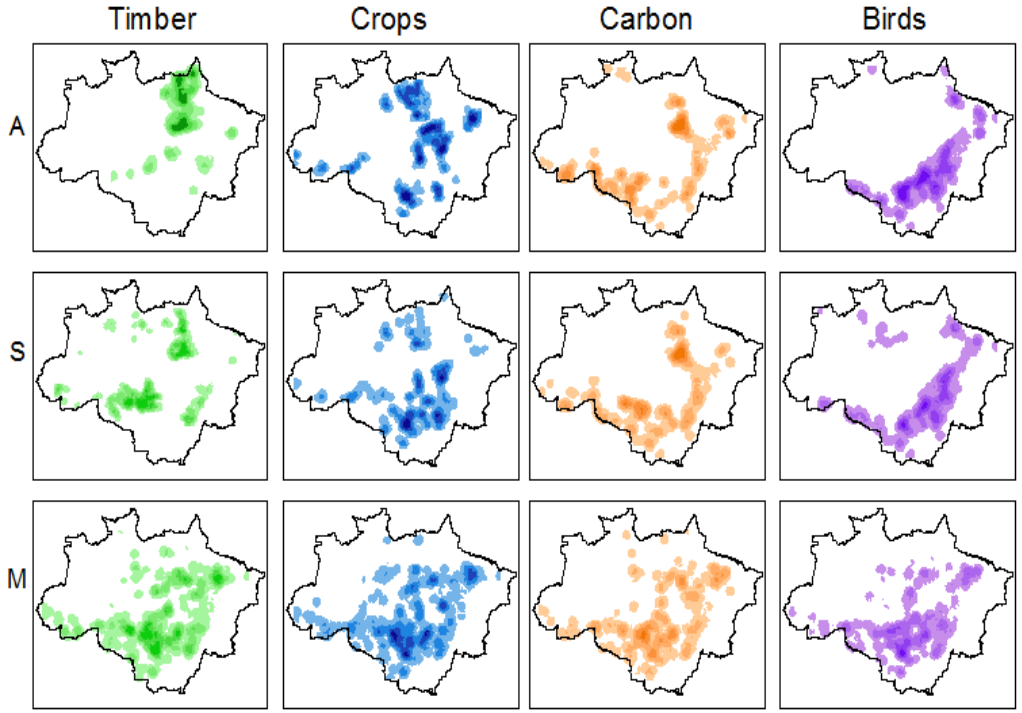
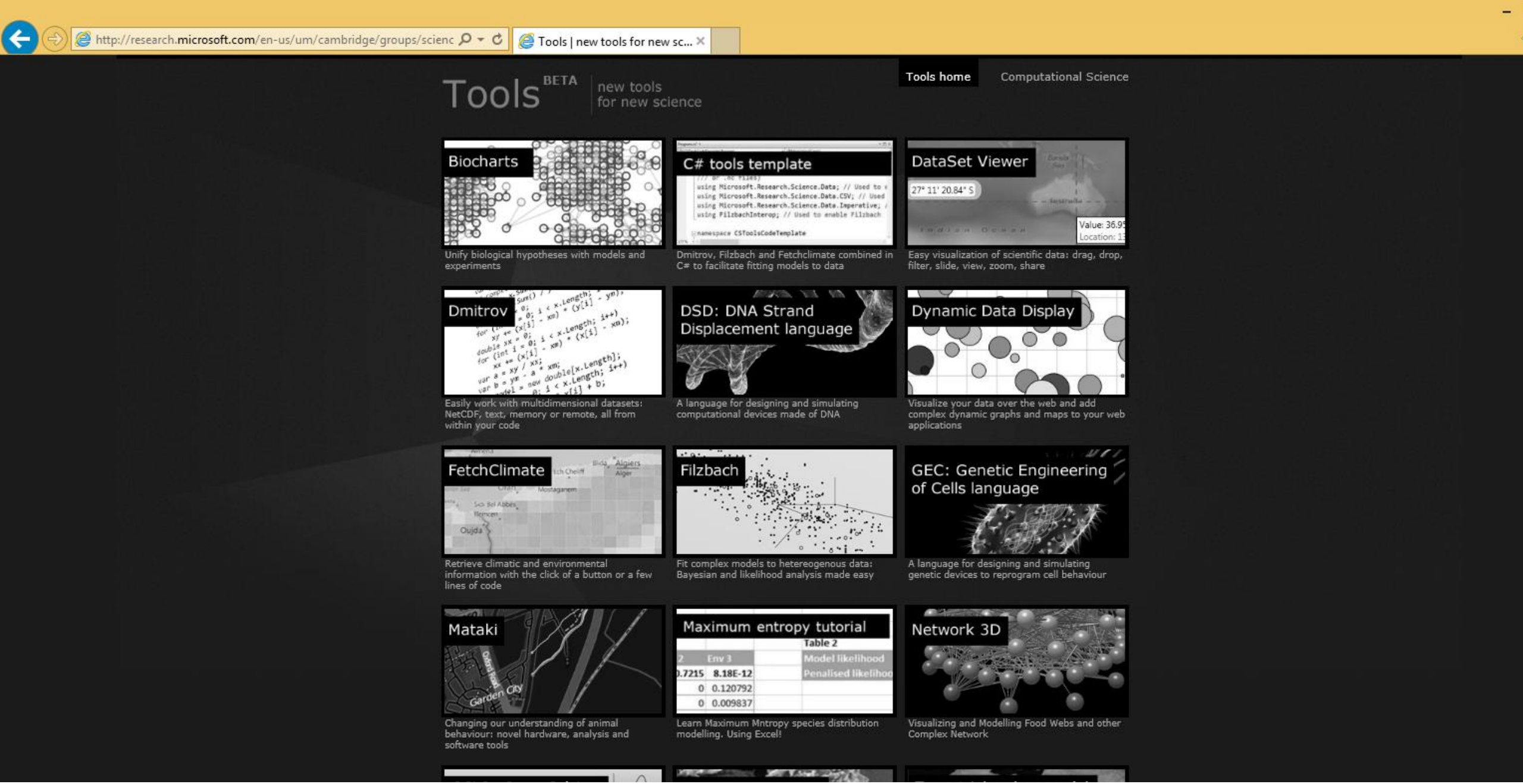
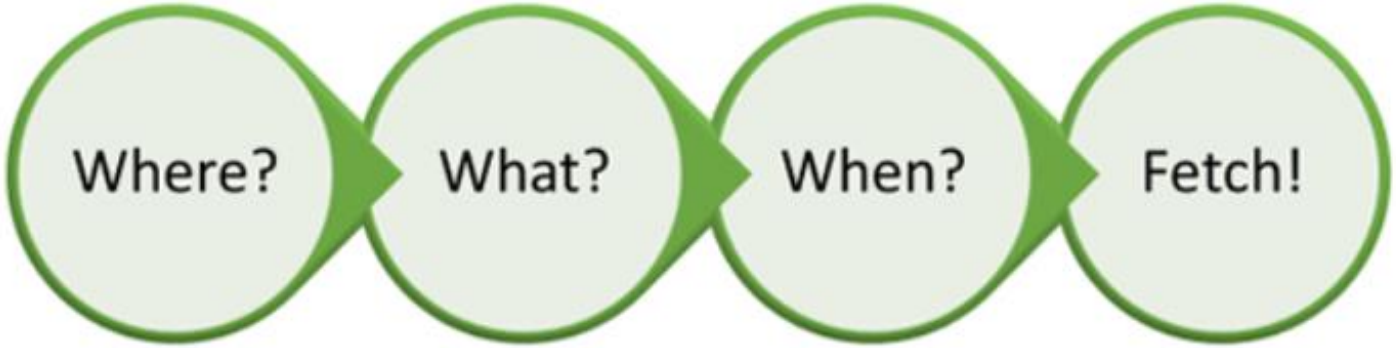




http://research.microsoft.com/science/tools

FetchClimate

Get environmental information in four easy steps



FetchClimate provides ready access to complex geographical data.

FetchClimate provides ready access to complex geographical information including, but not limited to, climatological information. On accessing the FetchClimate Azure web service, you simply need to perform four steps to find what you are looking for:

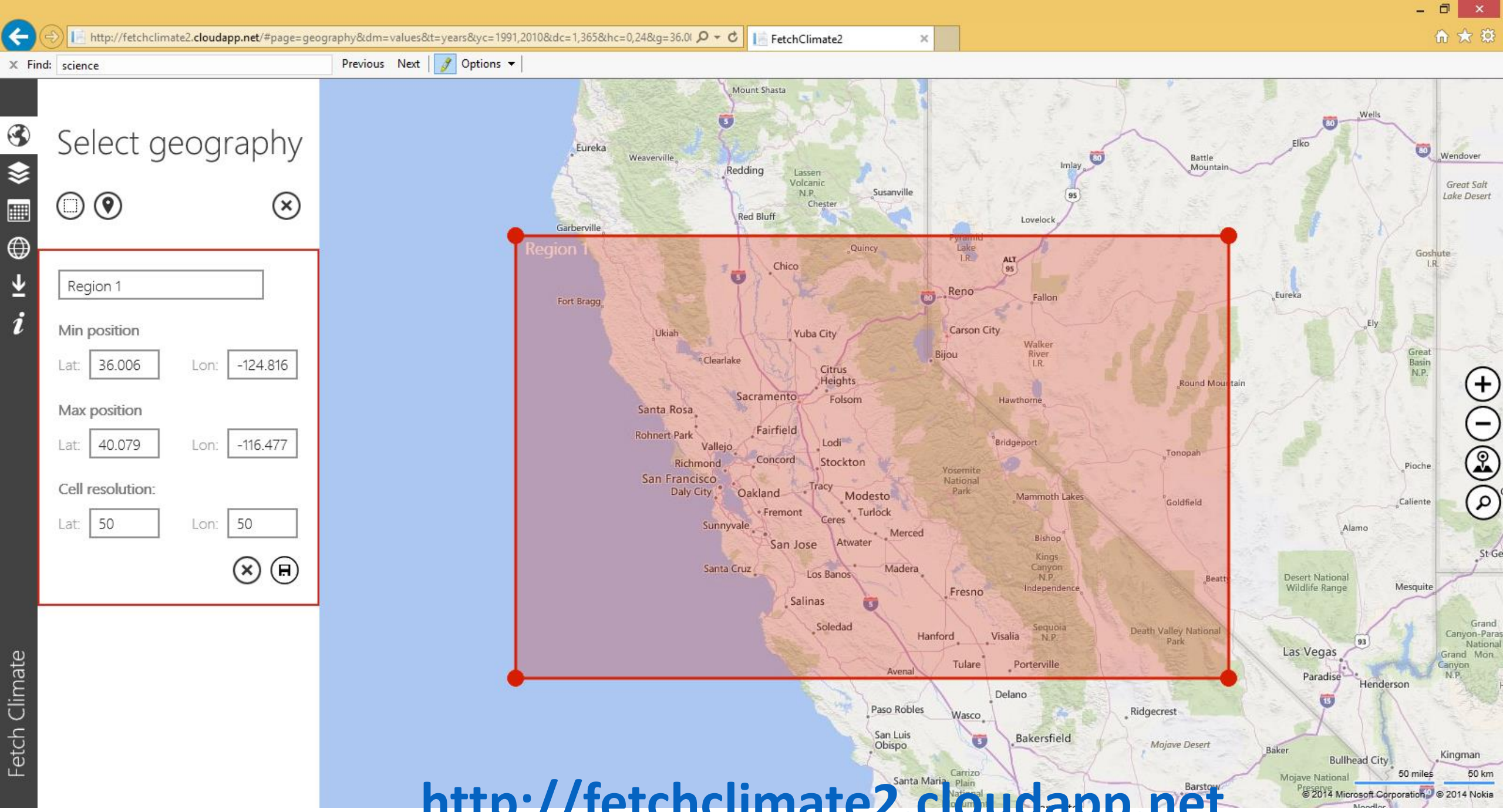
1. Draw the location on the Earth via points or grids (Where?)
2. Specify the data of interest (What?)
3. Set the timeframe, including future predictions, and a combination of averages over—or steps through—years, days, and hours (When?)
4. Fetch and view your results.

Related links

- Try FetchClimate online
- Download the FetchClimate user guide (PDF, 2.24 MB)
- Download the FetchClimate deployment guide (PDF, 1.16 MB)
- Deploy your own instance of FetchClimate on Microsoft Azure
- Visit the FetchClimate landing page
- Download the FetchClimate client
- Watch the latest tutorial video

Videos

FetchClimate: a tutorial



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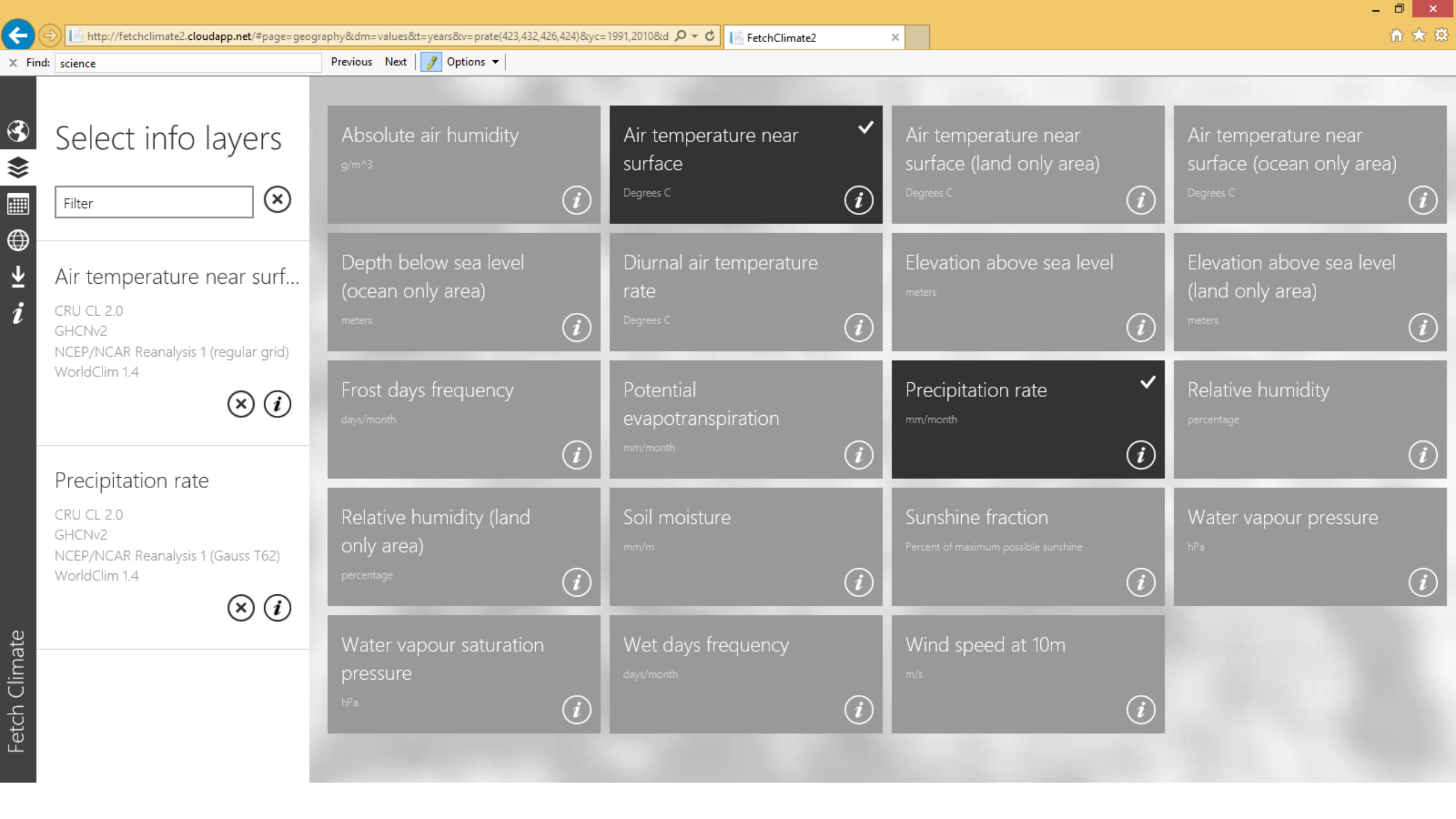
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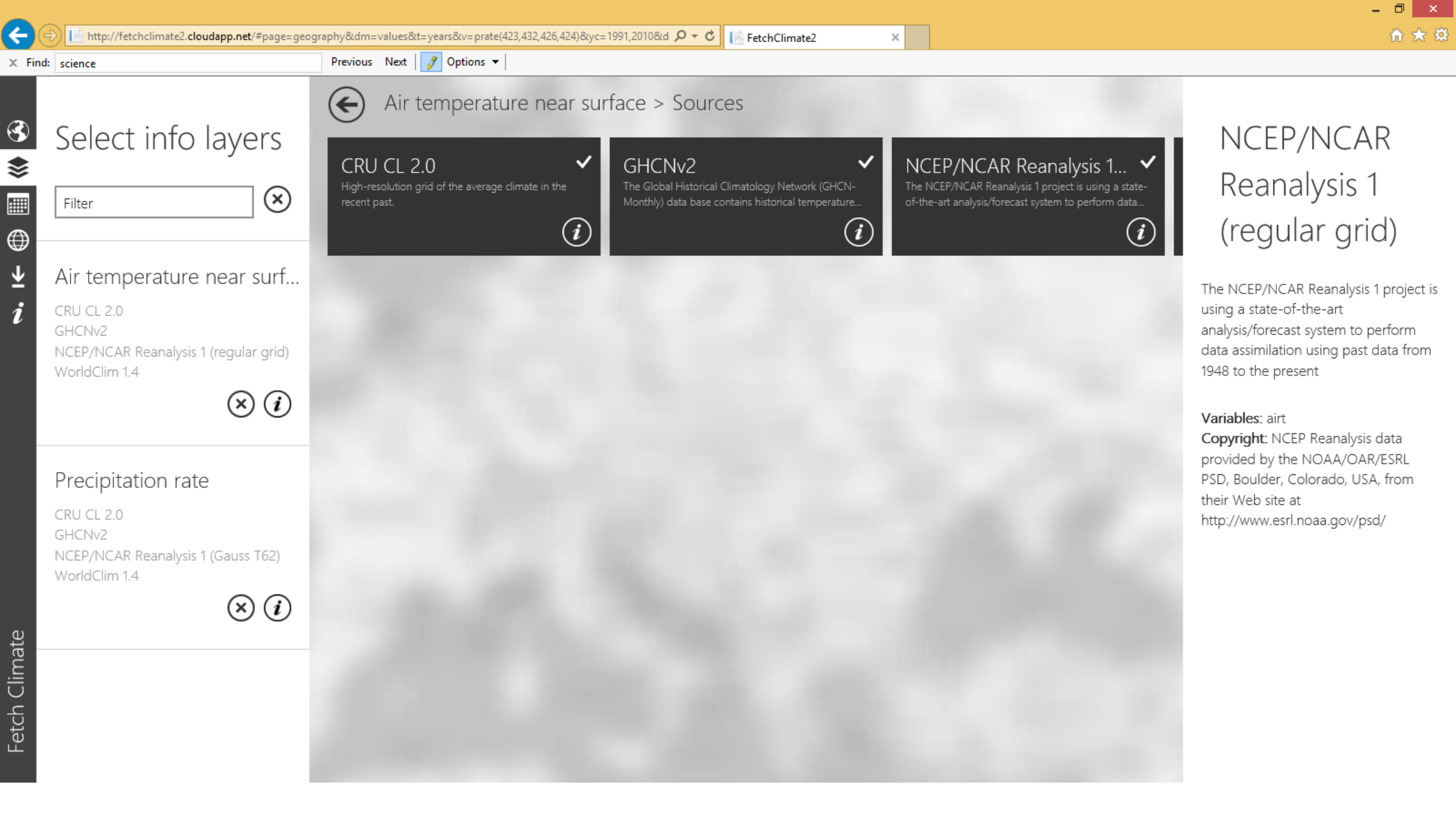
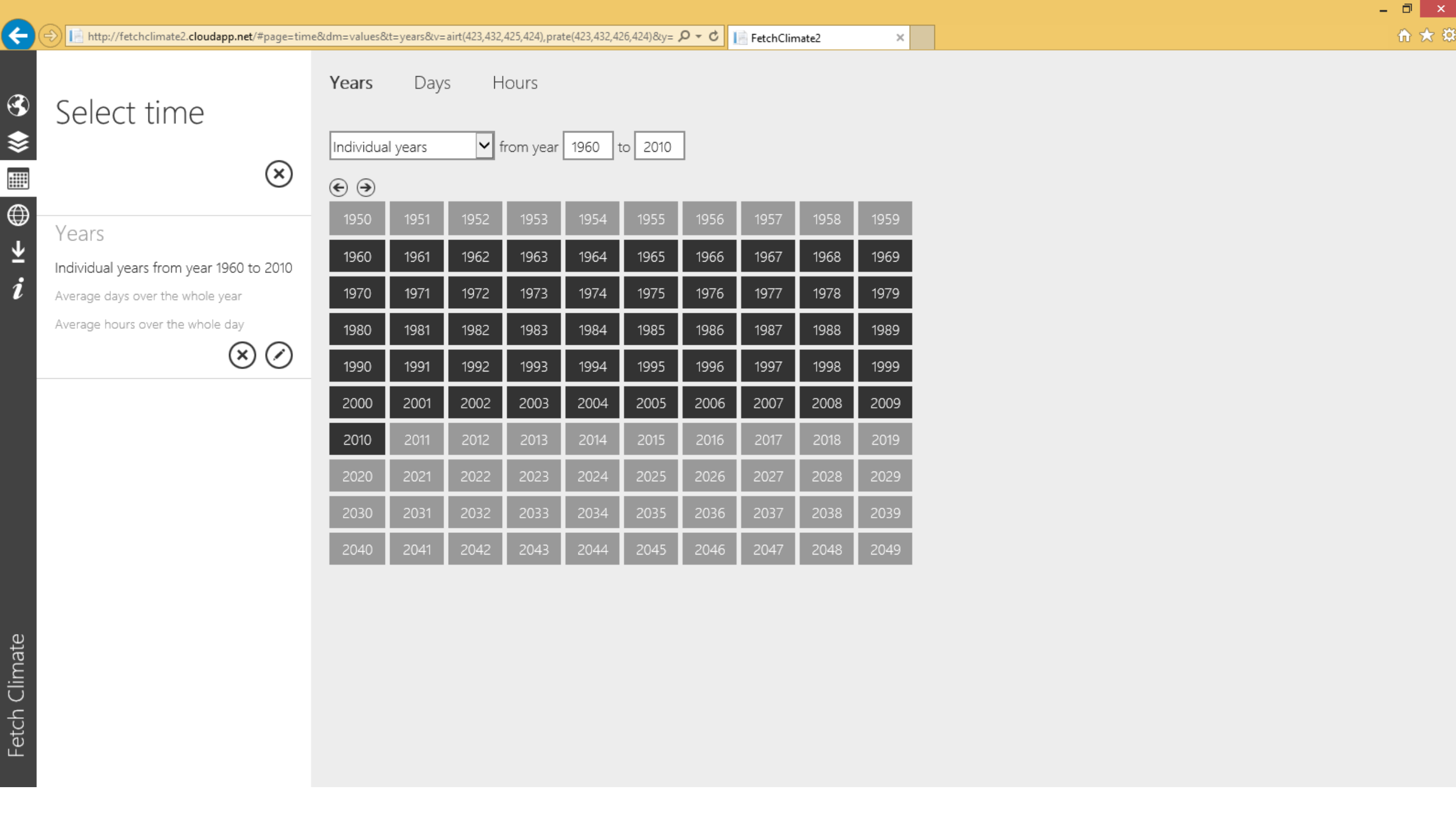
FetchClimate2
Find: science
Previous
Next
Options
Select info layers
Filter
Air temperature near surf...
CRU CL 2.0
GHCNv2
NCEP/NCAR Reanalysis 1 (regular grid)
WorldClim 1.4
Precipitation rate
CRU CL 2.0
GHCNv2
NCEP/NCAR Reanalysis 1 (Gauss T62)
WorldClim 1.4
Fetch Climate
Absolute air humidity
g/m^3
Air temperature near surface
Degrees C
Air temperature near surface (land only area)
Degrees C
Air temperature near surface (ocean only area)
Degrees C
Depth below sea level (ocean only area)
meters
Diurnal air temperature rate
Degrees C
Elevation above sea level
meters
Elevation above sea level (land only area)
meters
Frost days frequency
days/month
Potential evapotranspiration
mm/month
Precipitation rate
mm/month
Relative humidity
percentage
Relative humidity (land only area)
percentage
Soil moisture
mm/m
Sunshine fraction
Percent of maximum possible sunshine
Water vapour pressure
hPa
Water vapour saturation pressure
hPa
Wet days frequency
days/month
Wind speed at 10m
m/s


http://fetchclimate2.cloudapp.net/#page=geography&dm=values&t=years&v=prate(423,432,426,424)&yc=1991,2010&d
FetchClimate2
Find: science
Previous
Next
Options
Select info layers
Filter
Air temperature near surf...
CRU CL 2.0
GHCNv2
NCEP/NCAR Reanalysis 1 (regular grid)
WorldClim 1.4
Precipitation rate
CRU CL 2.0
GHCNv2
NCEP/NCAR Reanalysis 1 (Gauss T62)
WorldClim 1.4
Fetch Climate
Air temperature near surface > Sources
CRU CL 2.0
High-resolution grid of the average climate in the recent past.
GHCNv2
The Global Historical Climatology Network (GHCN-Monthly) data base contains historical temperature...
NCEP/NCAR Reanalysis 1...
The NCEP/NCAR Reanalysis 1 project is using a state-of-the-art analysis/forecast system to perform data...
NCEP/NCAR Reanalysis 1 (regular grid)
The NCEP/NCAR Reanalysis 1 project is using a state-of-the-art analysis/forecast system to perform data assimilation using past data from 1948 to the present
Variables: airt
Copyright: NCEP Reanalysis data provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado, USA, from their Web site at http://www.esrl.noaa.gov/psd/


http://fetchclimate2.cloudapp.net/#page=time&dm=values&t=years&v=airt(423,432,425,424),prate(423,432,426,424)&y=
FetchClimate2
Select time
Years
Individual years from year 1960 to 2010
Average days over the whole year
Average hours over the whole day
Years
Days
Hours
Individual years
from year 1960 to 2010
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029
2030 2031 2032 2033 2034 2035 2036 2037 2038 2039
2040 2041 2042 2043 2044 2045 2046 2047 2048 2049
Fetch Climate

http://fetchclimate2.cloudapp.net/#page=results&dm=values&t=years&v=airt(423,432,425,424),prate(423,432,426,424)&

FetchClimate2

View results

Layers Details

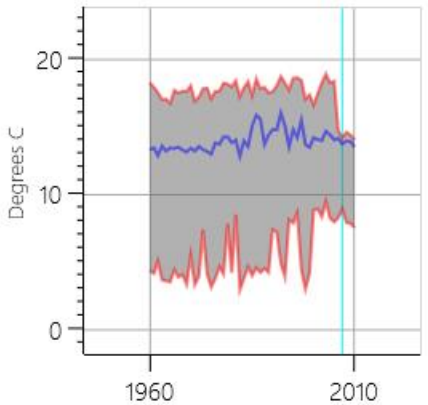
Values Degrees C

5 10 15

Discrete Bands: 10

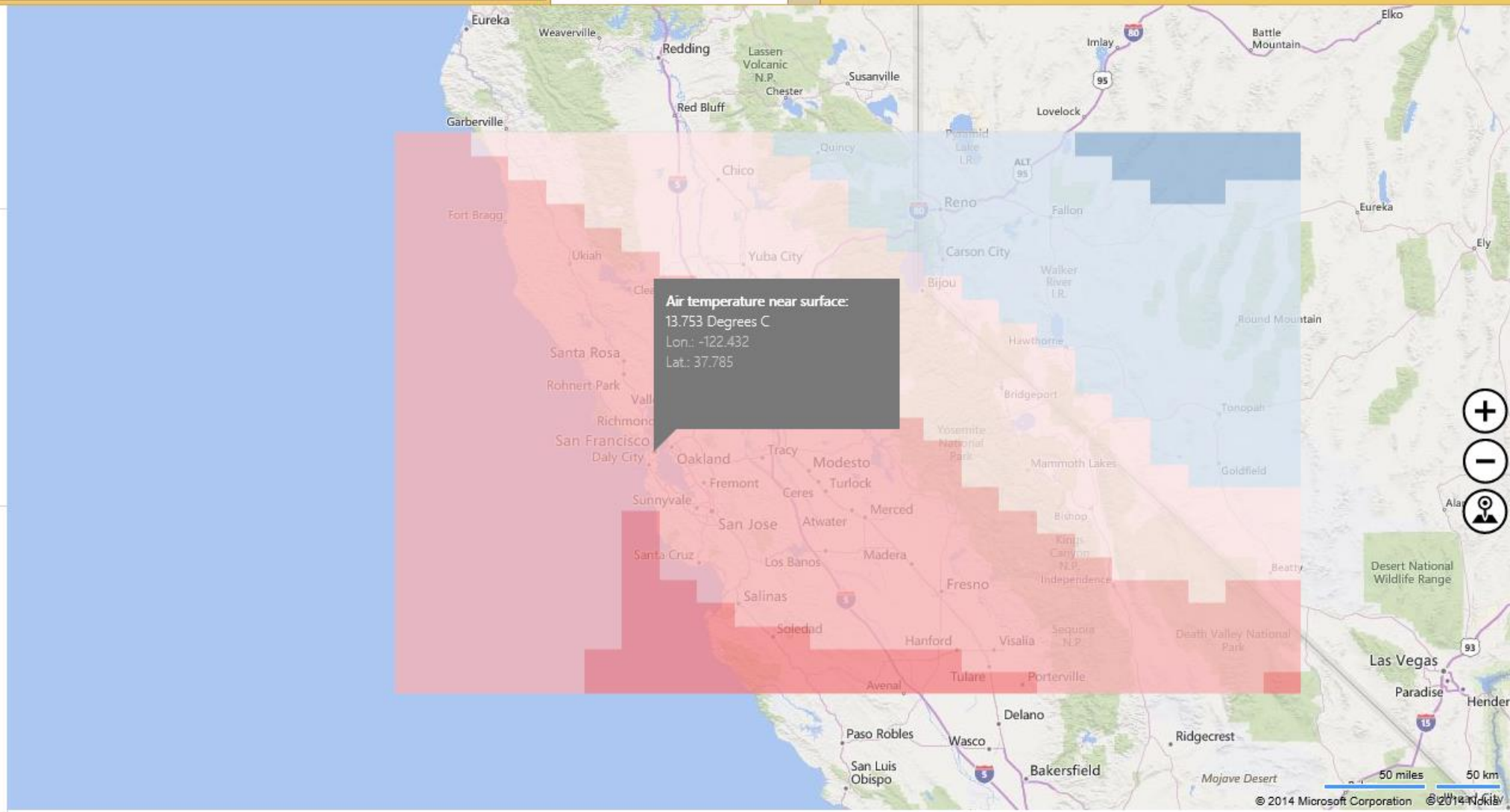
Min: 2.99 Max: 18.73

Years



Show timeline

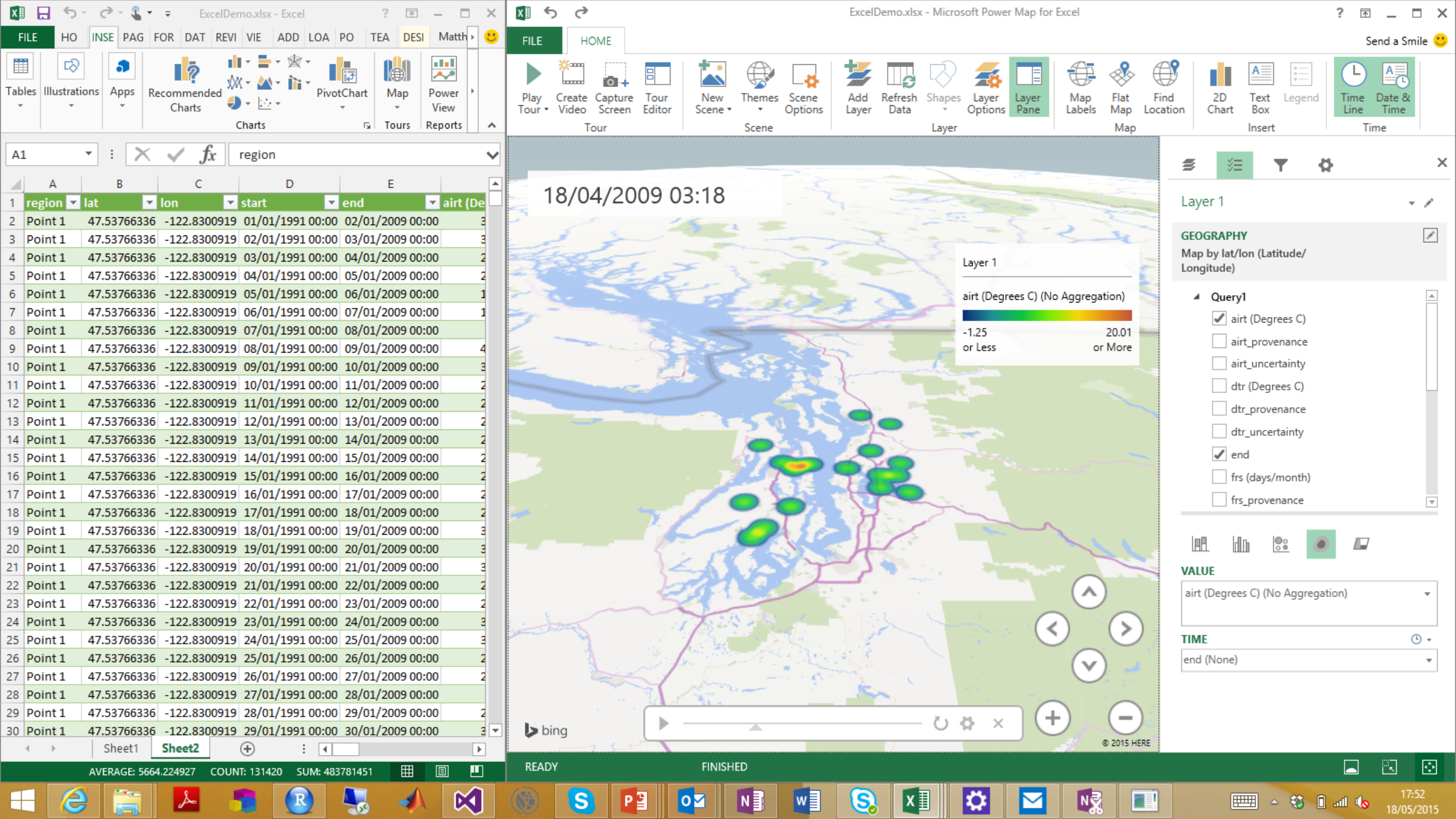
Fetch Climate



Average value for 2007

1960 2010

```
africaJulyTemp <- fcGrid(variable="airt",
   latitudeFrom=-35, latitudeTo=35, latitudeBy=1,
   longitudeFrom=-20,longitudeTo=60,longitudeBy=1,
   firstDay=182,lastDay=212, #July
   firstYear=1950,lastYear=2000)
```



region	lat	lon	start	end	airt (De
Point 1	47.53766336	-122.8300919	01/01/1991 00:00	02/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	02/01/1991 00:00	03/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	03/01/1991 00:00	04/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	04/01/1991 00:00	05/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	05/01/1991 00:00	06/01/2009 00:00	1
Point 1	47.53766336	-122.8300919	06/01/1991 00:00	07/01/2009 00:00	1
Point 1	47.53766336	-122.8300919	07/01/1991 00:00	08/01/2009 00:00	
Point 1	47.53766336	-122.8300919	08/01/1991 00:00	09/01/2009 00:00	4
Point 1	47.53766336	-122.8300919	09/01/1991 00:00	10/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	10/01/1991 00:00	11/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	11/01/1991 00:00	12/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	12/01/1991 00:00	13/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	13/01/1991 00:00	14/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	14/01/1991 00:00	15/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	15/01/1991 00:00	16/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	16/01/1991 00:00	17/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	17/01/1991 00:00	18/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	18/01/1991 00:00	19/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	19/01/1991 00:00	20/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	20/01/1991 00:00	21/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	21/01/1991 00:00	22/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	22/01/1991 00:00	23/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	23/01/1991 00:00	24/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	24/01/1991 00:00	25/01/2009 00:00	3
Point 1	47.53766336	-122.8300919	25/01/1991 00:00	26/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	26/01/1991 00:00	27/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	27/01/1991 00:00	28/01/2009 00:00	
Point 1	47.53766336	-122.8300919	28/01/1991 00:00	29/01/2009 00:00	2
Point 1	47.53766336	-122.8300919	29/01/1991 00:00	30/01/2009 00:00	3

View results

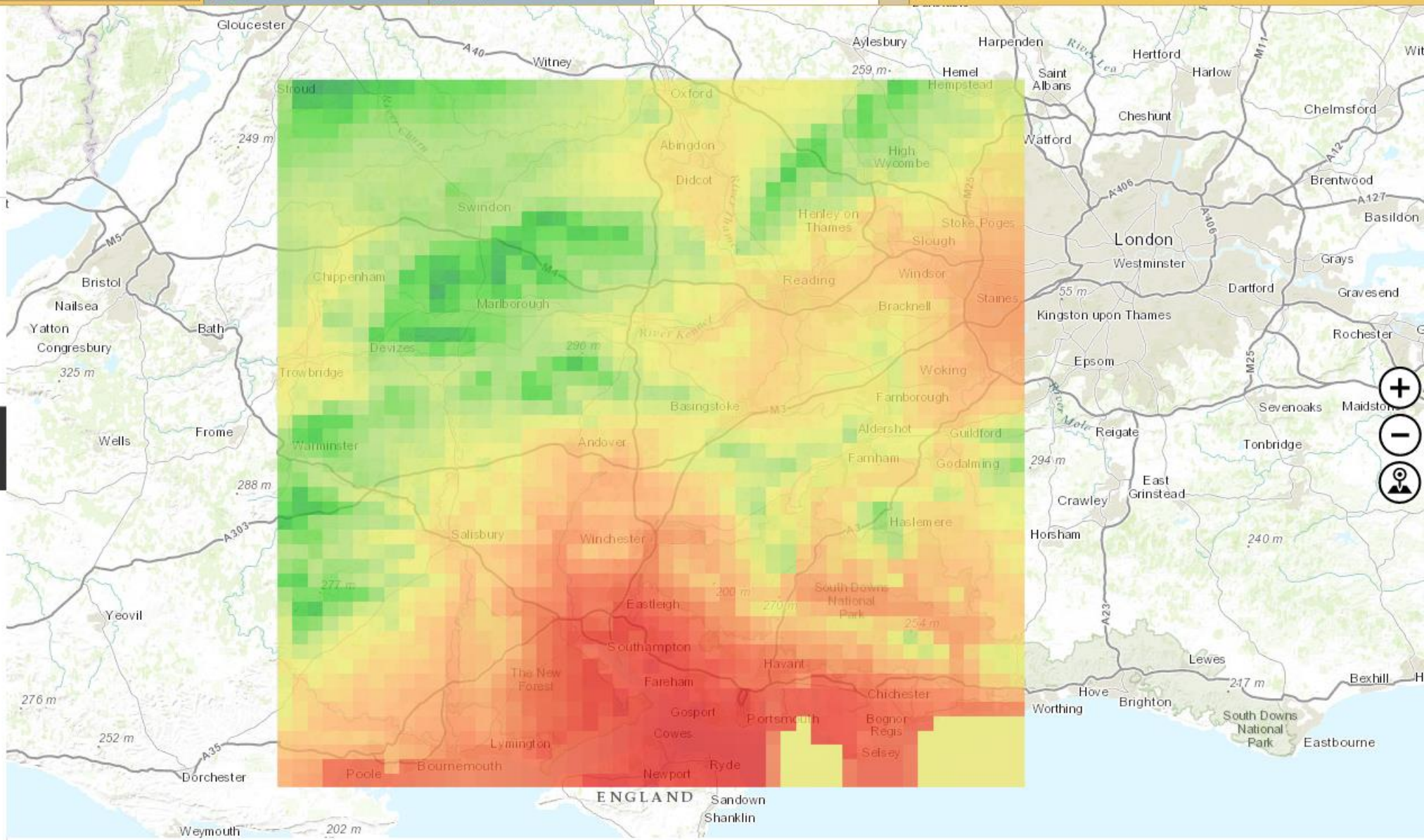
Layers Details

Values undefined

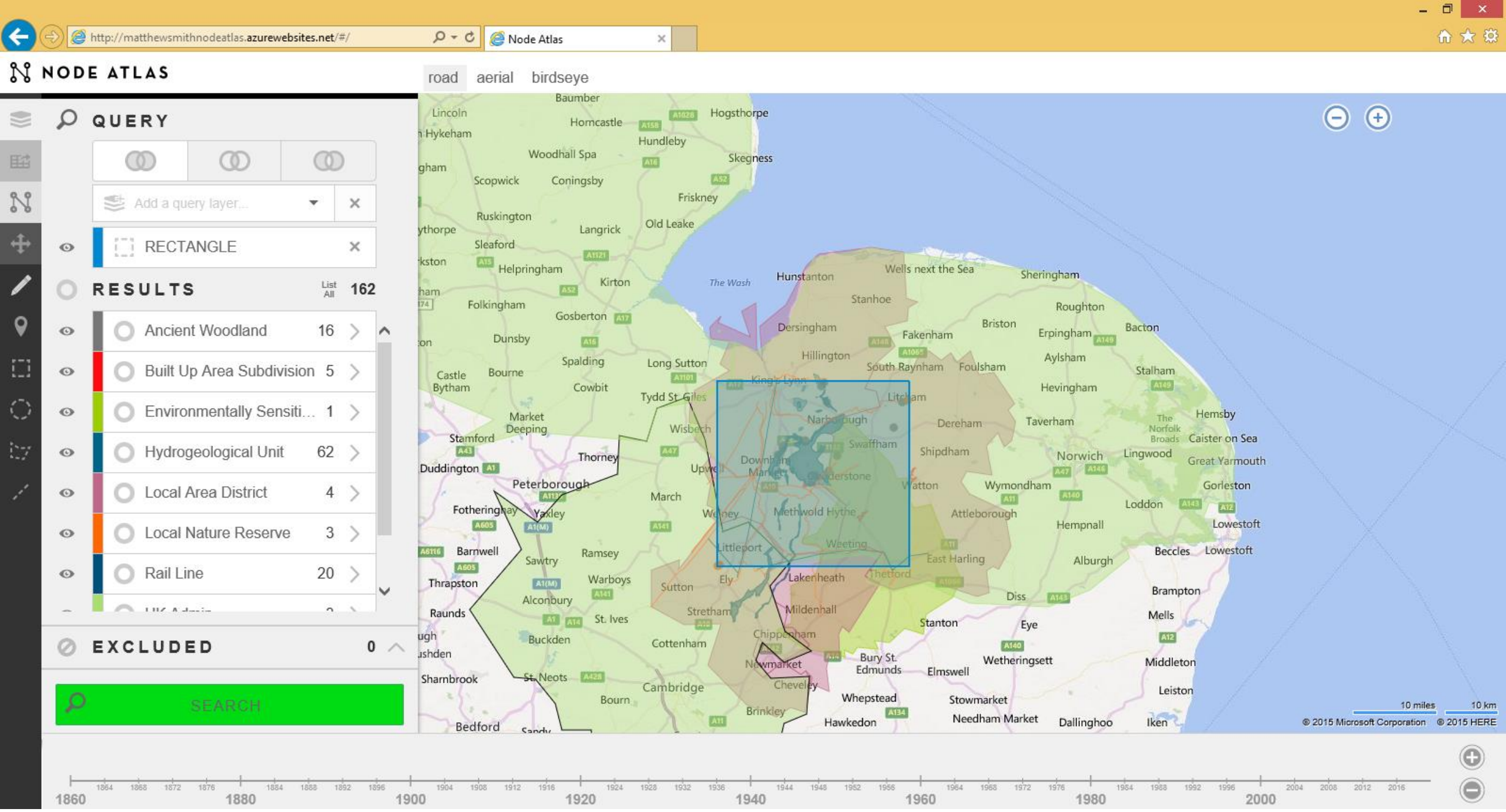
1.41 1.47

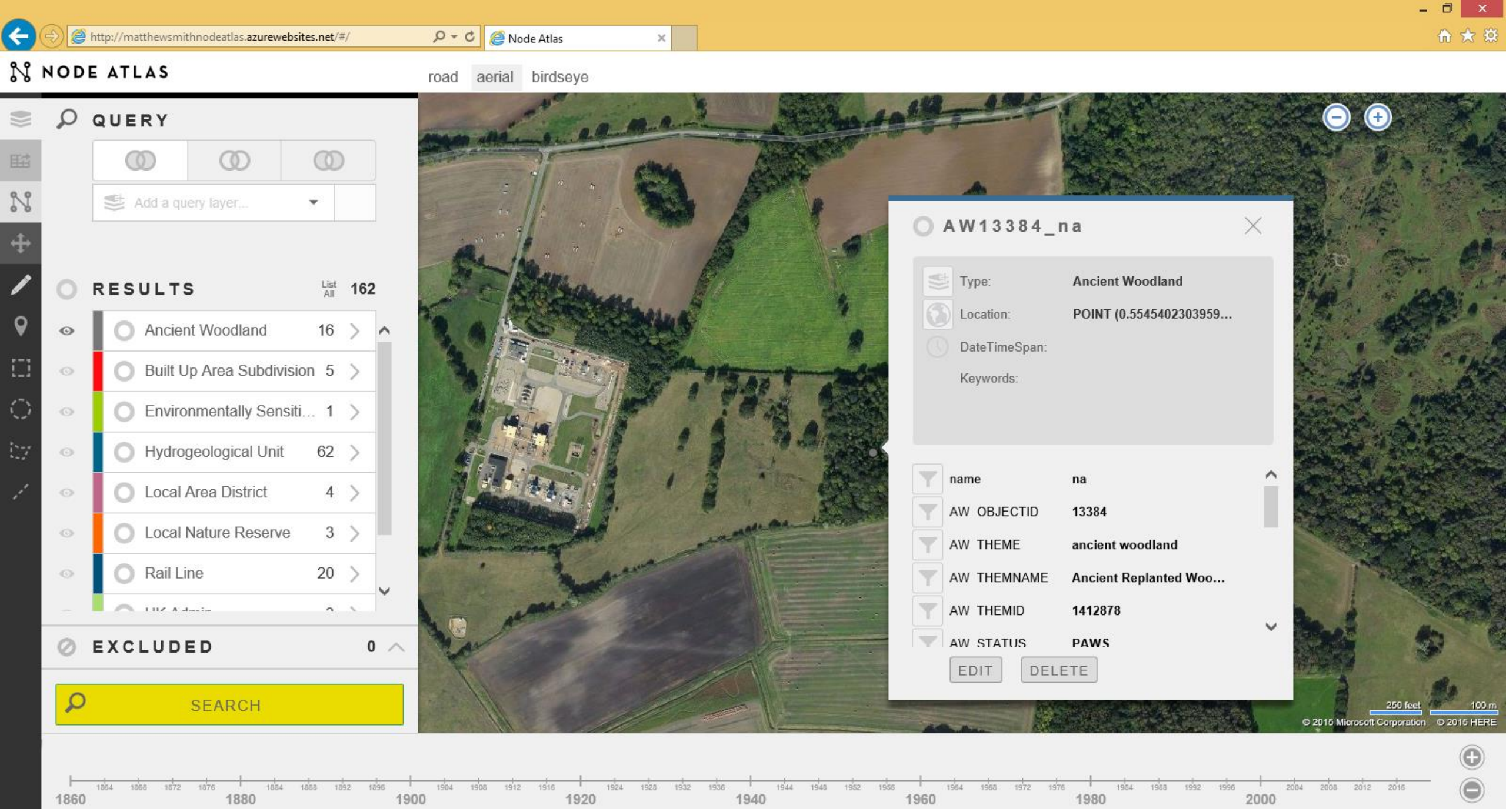
pred_wheat (model derivative)
Completed

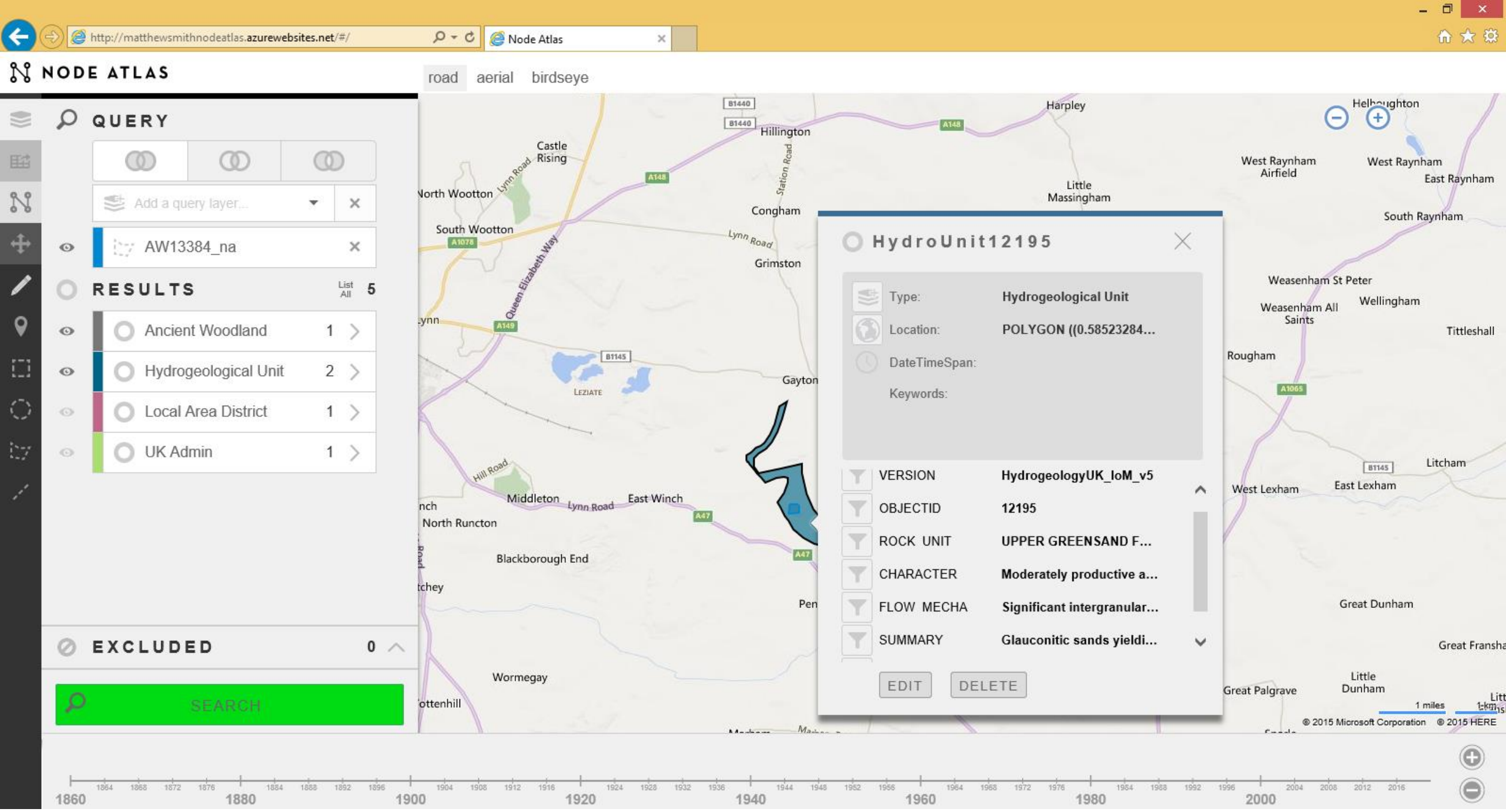
Fetch Climate



Average value for 1961-1990


http://matthewsmithnodeatlas.azurewebsites.net/#/
Node Atlas
NODE ATLAS
road
aerial
birdseye
QUERY
Add a query layer...
RECTANGLE
RESULTS
List All
162
Ancient Woodland 16
Built Up Area Subdivision 5
Environmentally Sensiti... 1
Hydrogeological Unit 62
Local Area District 4
Local Nature Reserve 3
Rail Line 20
EXCLUDED
0
SEARCH
Lincoln
Hykeham
Baumber
Homcastle
Hogsthorpe
Hundleby
Skegness
Woodhall Spa
Scopwick
Coningsby
Friskney
Ruskington
Langrick
Old Leake
Sleaford
Helpringham
Kirton
Folkingham
Gosberton
Dunsby
Spalding
Long Sutton
Castle Bytham
Bourne
Cowbit
Tydd St. Giles
Market Deeping
Stamford
Wisbech
Thorney
Duddington
Peterborough
Fotheringhay
Yaxley
March
Barnwell
Sawtry
Ramsey
Thrapston
Warboys
Alconbury
Raunds
St. Ives
Buckden
Cottenham
Sharnbrook
St. Neots
Cambridge
Bourn
Bedford
The Wash
Hunstanton
Wells next the Sea
Sheringham
Stanhoe
Dersingham
Fakenham
Briston
Roughton
Erpingham
Bacton
Hillington
South Raynham
Foulsham
Aylsham
Stalham
Hevingham
Litcham
Narborough
Dereham
Taverham
Hemsby
Caister on Sea
Swaffham
Shipdham
Norwich
Lingwood
Great Yarmouth
Watton
Wymondham
Gorleston
Loddon
Lowestoft
Methwold Hythe
Attleborough
Hempnall
Weeting
Littleport
East Harling
Alburgh
Beccles
Lowestoft
Ely
Lakenheath
Thetford
Brampton
Diss
Mells
Sutton
Stretham
Mildenhall
Stanton
Eye
Chippenham
Newmarket
Bury St. Edmunds
Elmswell
Wetheringsett
Middleton
Cheveley
Whepstead
Stowmarket
Leiston
Brinkley
Hawkedon
Needham Market
Dallinghoo
Iken
10 miles
10 km
© 2015 Microsoft Corporation
© 2015 HERE
1860
1880
1900
1920
1940
1960
1980
2000


http://matthewsmithnodeatlas.azurewebsites.net/#/
Node Atlas
NODE ATLAS
road
aerial
birdseye
QUERY
Add a query layer...
RESULTS
List All
162
Ancient Woodland 16
Built Up Area Subdivision 5
Environmentally Sensiti... 1
Hydrogeological Unit 62
Local Area District 4
Local Nature Reserve 3
Rail Line 20
EXCLUDED
0
SEARCH
AW13384_na
Type: Ancient Woodland
Location: POINT (0.5545402303959...
DateTimeSpan:
Keywords:
name na
AW_OBJECTID 13384
AW_THEME ancient woodland
AW_THEMNAME Ancient Replanted Woo...
AW_THEMID 1412878
AW_STATUS PAWS
EDIT
DELETE
250 feet
100 m
© 2015 Microsoft Corporation
© 2015 HERE
1860
1880
1900
1920
1940
1960
1980
2000


http://matthewsmithnodeatlas.azurewebsites.net/#/
Node Atlas
NODE ATLAS
road
aerial
birdseye
QUERY
Add a query layer...
AW13384_na
RESULTS
List All
5
Ancient Woodland 1
Hydrogeological Unit 2
Local Area District 1
UK Admin 1
EXCLUDED
0
SEARCH
HydroUnit12195
Type: Hydrogeological Unit
Location: POLYGON ((0.58523284...
DateTimeSpan:
Keywords:
VERSION HydrogeologyUK_IoM_v5
OBJECTID 12195
ROCK UNIT UPPER GREENSAND F...
CHARACTER Moderately productive a...
FLOW MECHA Significant intergranular...
SUMMARY Glauconitic sands yieldi...
EDIT
DELETE
Harpley
Hillington
Castle Rising
North Wootton
South Wootton
Congham
Grimston
Little Massingham
West Raynham Airfield
West Raynham
East Raynham
South Raynham
Weasenham St Peter
Weasenham All Saints
Wellingham
Tittleshall
Rougham
Gayton
Middleton
East Winch
North Runcton
Blackborough End
Wormegay
West Lexham
East Lexham
Litcham
Great Dunham
Great Fransham
Little Dunham
Great Palgrave
1 miles
© 2015 Microsoft Corporation
© 2015 HERE
1860
1880
1900
1920
1940
1960
1980
2000

action

provenance

module
Crop_Model

23.05.2014 06:07:25

Working for sim but now trying to get to work for inference

unsaved work

<no comment>

...

compile F# Crop_Model

delete search home

metadata

action

```
1  type generalModelPars = {
2                          sowDate:int // prescribed
3                          harvDate:int // prescribed
4                          n0:float // inferred
5                          mSeed0:float // prescribed
6                          r:float // target C:N ratio
7                          rtot:float // inferred
8                          theta:float /// Nitrogen uptake efficiency
9                          lma:float // inferred
10                         trans:float // inferred
11                         germLim:float // inferred
12                         tBGerm:float // inferred
13                         mc:float
14                         cFrac:float
15                         fr:float
16                         }
17
18 type farquarModelPars = {
19                         pcO2:float // prescribed
20                         v25:float // inferred
21                         pSynthType:int //prescribed
22                         }
23
24 type allocDumbModel = {
25                        par1:float // prescribed
26                        par2:float // prescribed
27                        }
28
29 type site = {
30              lat:float // prescribed
31              lon:float // prescribed
32              harvDate:int // prescribed
33              sowDate:int // prescribed
34              }
35
```

module
Crop_Model

code
Simulator

data
Simulation

chart
Simulation

code
Crop_Model

tand(r : float) : float

acosd(r : float) : float

cosd(r : float) : float

sind(r : float) : float

quadratic(a : float, b : float, c : float) : float[]

estimate parameters NPZModel2Site3

delete search home

action

provenance

code NPZModel2Site

chain NPZModel2Site

07.04.2015 18:14:13

Updating outputs

unsaved work

<no comment>

...

metadata

action

model code

code NPZModel2Site3

random seed	1989432283
burn-in	50000
sampling	100000

The model contains the following parameters

K	(scalar)	Scale	0.25	4
Q	(scalar)	Scale	0.5	8
al	(scalar)	Scale	2.5	40
alpha	(scalar)	Scale	0.01	0.16
c1	(scalar)	Scale	0.25	4
f	(scalar)	Scale	0.125	1
g	(scalar)	Scale	0.0175	0.28
j	(scalar)	Scale	0.125	2
k	(scalar)	Scale	0.025	0.4
l	(scalar)	Scale	0.03	0.48
m	(scalar)	Scale	0.75	12

chain NPZModel2Site3

code PropModel2Site3

data PropModel2Site3

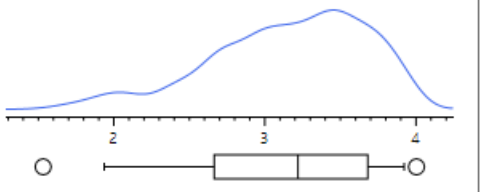
chart PosteriorSimulationSite3

data AnAvS3M2

data S3M2Test

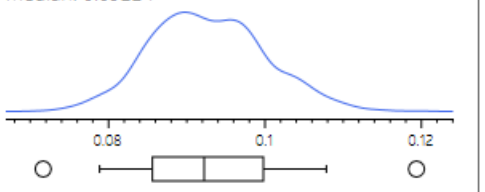
K float[1001]

min/max: 1.536/3.999
lb95/ub95: 1.939/3.919
lb68/ub68: 2.664/3.678
mean/std: 3.155/0.510
median: 3.218



l float[1001]

min/max: 0.07173/0.11928
lb95/ub95: 0.07891/0.10780
lb68/ub68: 0.08563/0.09977
mean/std: 0.09275/0.00723
median: 0.09224



extra

provenance

make chart DemonstrateSit

13.11.2014 13:31:00

Fixed aako 3

unsaved work

<no comment>

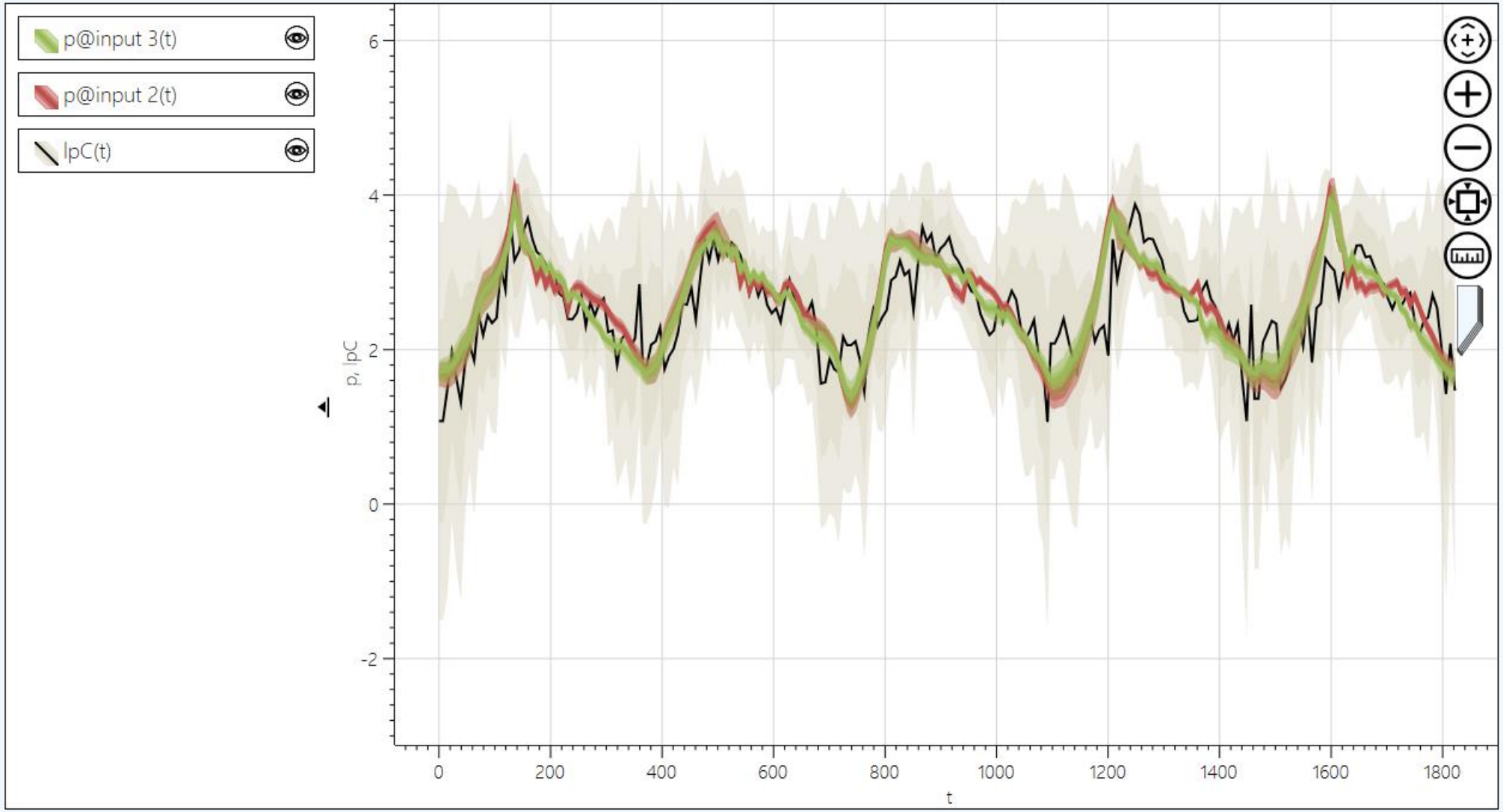
...

chart DemonstrateSite5Training

search home

metadata

values



Provenance for compile F# Crop_Model

search home

action

provenance

module Crop_Model

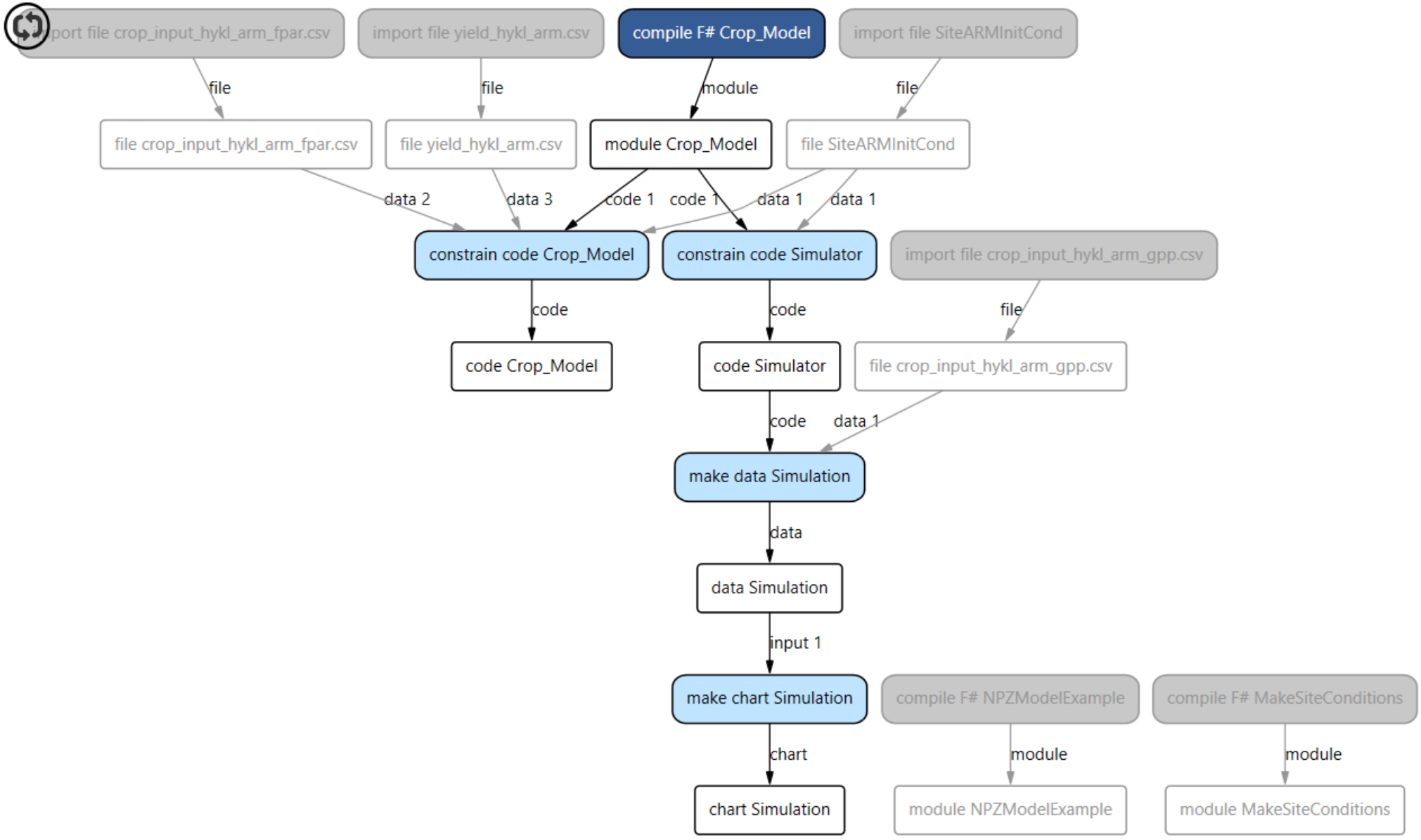
23.05.2014 06:07:25

Working for sim but now trying to get to work for inference

unsaved work

<no comment>

...



View results

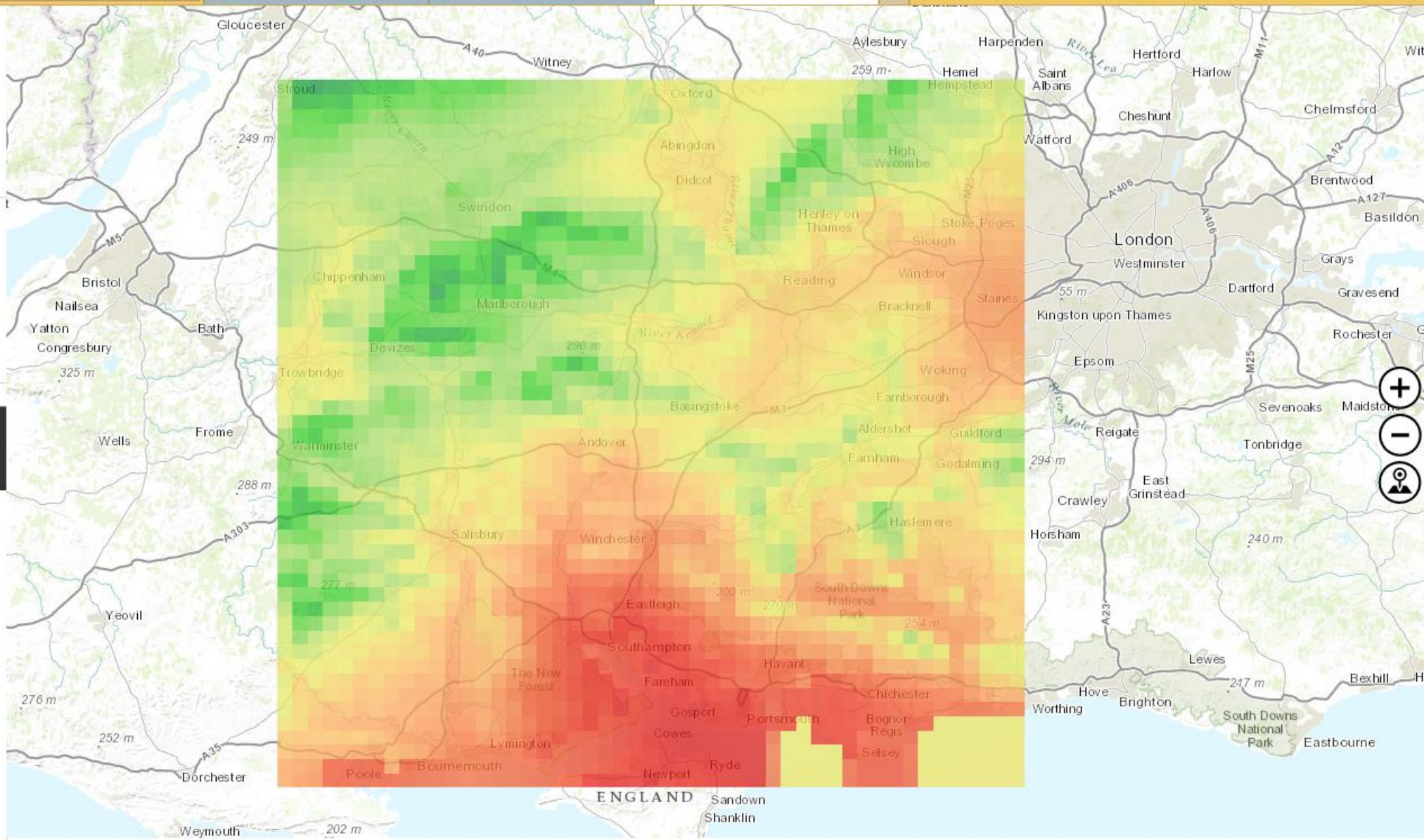
Layers Details

Values undefined

1.41 1.47

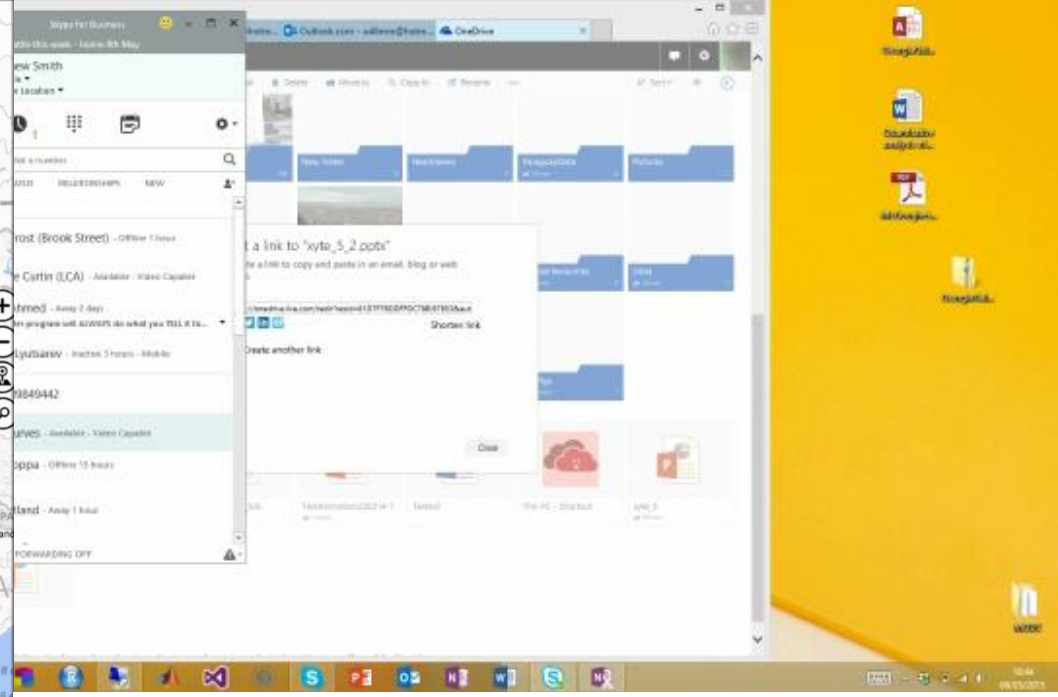
pred_wheat (model derivative)
Completed

Fetch Climate



Average value for 1961-1990

Select geography



Fetch Climate

create new

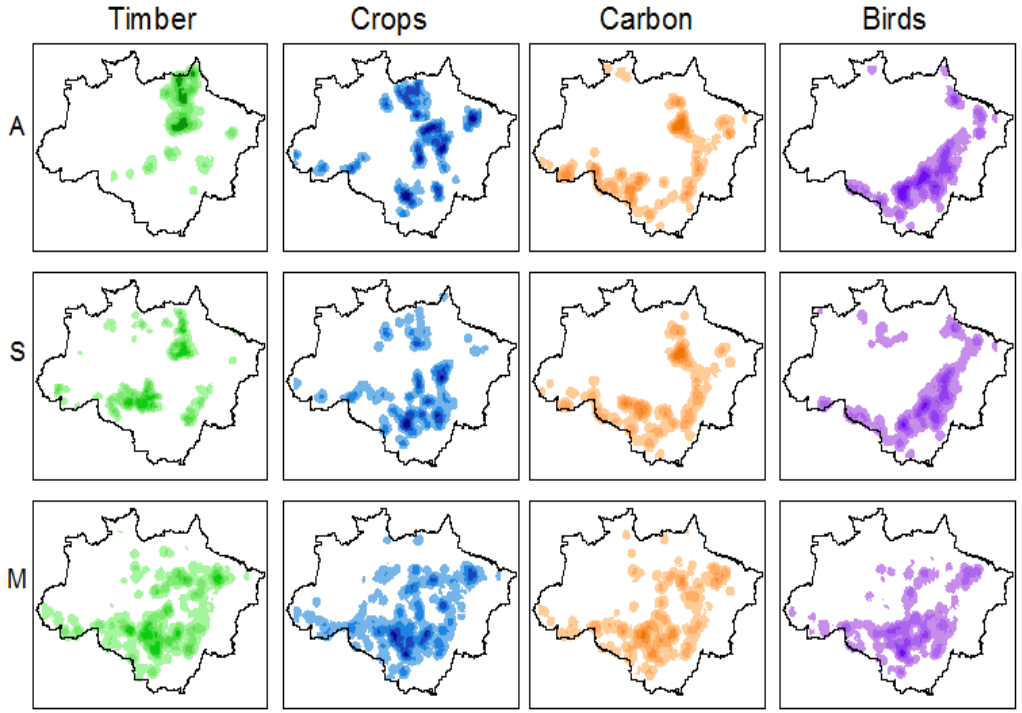
constrain code
start cross-validation
design model
estimate parameters
fetch climate
import file
import OData
join tables
make data
compile F#
run MATLAB
make chart

objects 17 items

chart simulateNPZData 3/21/2014 10:21:55 AM
data ParameterSummaries 3/14/2014 7:25:39 AM
module ParameterSummaries 3/14/2014 7:17:27 AM
data NPZRates 3/13/2014 6:05:35 PM
chart NPZRates 3/13/2014 6:05:35 PM
chart AverageAnnualDynamics 3/13/2014 6:00:55 PM
data AverageAnnualDynamics 3/13/2014 6:00:55 PM
chart PlotKnockOuts 3/13/2014 6:00:55 PM
data simulateNPZData 3/13/2014 6:00:55 PM
chain NPZModel 3/13/2014 5:58:46 PM
data PdataTimeSeries 3/13/2014 5:47:12 PM
code NPZModel 3/13/2014 5:47:12 PM
file Site1Synthesis.csv 3/13/2014 5:46:58 PM
module NPZCode 3/13/2014 5:55:23 AM
module ProduceAnnualAverages 3/13/2014 4:50:15 AM
module ReportNPZRates 3/12/2014 7:11:28 AM
module TimeSeriesProcessor 3/12/2014 6:04:26 AM

actions 17 items

compile F# NPZCode 3/21/2014 10:21:27 AM
make data ParameterSummaries 3/14/2014 7:25:39 AM
compile F# ParameterSummaries 3/14/2014 7:17:32 AM
make chart NPZRates 3/13/2014 6:05:35 PM
make data NPZRates 3/13/2014 6:04:52 PM
make chart... 3/13/2014 6:00:55 PM
make chart simulateNPZData 3/13/2014 6:00:55 PM
make chart PlotKnockOuts 3/13/2014 6:00:55 PM
make data... 3/13/2014 6:00:55 PM
make data simulateNPZData 3/13/2014 5:58:46 PM
estimate parameters NPZModel 3/13/2014 5:47:12 PM
import file Site1Synthesis.csv 3/13/2014 5:46:58 PM
make data PdataTimeSeries 3/13/2014 5:46:58 PM
constrain code NPZModel 3/13/2014 5:46:58 PM
compile F#... 3/13/2014 7:28:45 AM
compile F# TimeSeriesProcessor 3/13/2014 7:22:38 AM
compile F# ReportNPZRates 3/12/2014 9:21:53 PM

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