



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure and the
Environment*

KNMI Climate Explorer

A tool for climate analysis [...and seasonal prediction]

MedCOF Training Workshop
Madrid, 26-30 October 2015

Jonathan Eden

Royal Netherlands Meteorological Institute (KNMI)



An introduction to Climate Explorer

- Setup in the late 1990s to analyse the teleconnections from the big El Nino event in 1997-98.
- Developed and maintained by Geert Jan van Oldenborgh at KNMI.
- Basically a website for making sense of climate data.
 - Data for easy access to user.
 - Programs for statistical analysis.
 - Visualisation and plotting tools



An introduction to Climate Explorer

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- Basically a website for making sense of climate data.
 - Data for easy access to user.
 - Programs for statistical analysis.
 - Visualisation and plotting tools
- Every month:
 - 3000 unique users.
 - 100,000 plots.
 - 10-15 peer-reviewed journal articles.



Some key features

- Access climate data on a wide range of temporal scales.
- Correlation and regression analysis.
- Generate EOFs.
- Calculate and analyse extremes.
- Download data in different formats (inc netCDF) for your own analysis.
- Create and download your own figures (.png, .eps).
- Upload your own time series/fields.

- Email support... also for reporting bugs!

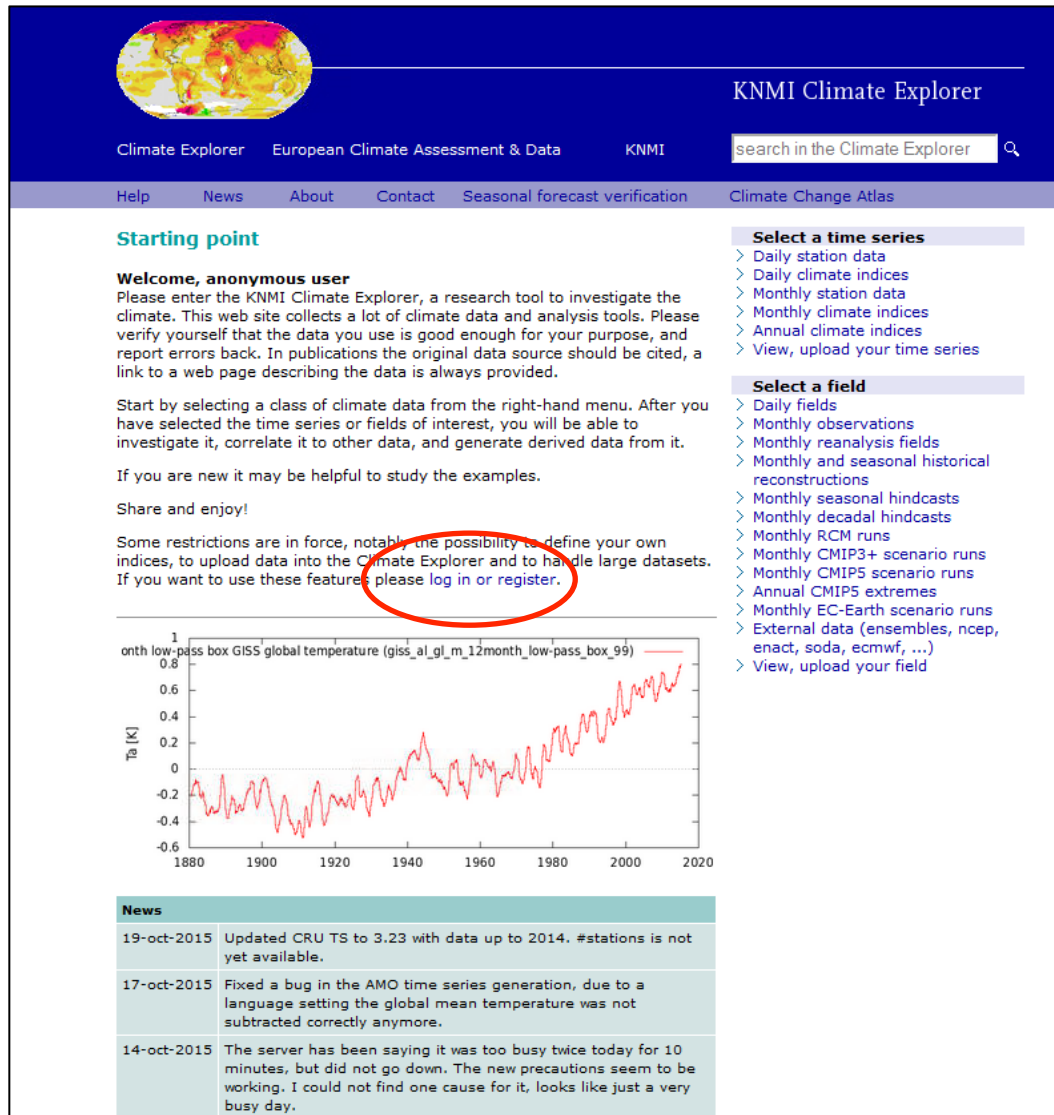


As a tool for seasonal prediction: a hands-on tutorial

- Quick introduction
- Examples: designed for you to follow on the website itself
 - Analysis of time series.
 - Statistical comparison with other fields.
 - Diagnosing ENSO teleconnections.
 - Seasonal forecast verification tool.
- Climate Change Atlas

Getting started – registration!

climexp.knmi.nl



The screenshot shows the KNMI Climate Explorer website. At the top left is a globe icon. The main header is dark blue with the text 'KNMI Climate Explorer'. Below the header is a navigation bar with links for 'Climate Explorer', 'European Climate Assessment & Data', and 'KNMI'. A search bar is located to the right of these links. Below the navigation bar is a secondary menu with links for 'Help', 'News', 'About', 'Contact', 'Seasonal forecast verification', and 'Climate Change Atlas'. The main content area is divided into two columns. The left column has a 'Starting point' section with a 'Welcome, anonymous user' message and instructions on how to use the tool. The right column has two sections: 'Select a time series' and 'Select a field', each with a list of options. A red circle highlights the text 'please log in or register.' in the 'Starting point' section. Below the text is a line graph showing 'onth low-pass box GISS global temperature (giss_ai_gl_m_12month_low-pass_box_99)' from 1880 to 2020. The y-axis is labeled 'Tb [K]' and ranges from -0.6 to 1.0. The x-axis shows years from 1880 to 2020 in increments of 20. The graph shows a clear upward trend with seasonal fluctuations. At the bottom of the page is a 'News' section with three entries dated 19-oct-2015, 17-oct-2015, and 14-oct-2015.

Starting point

Welcome, anonymous user
Please enter the KNMI Climate Explorer, a research tool to investigate the climate. This web site collects a lot of climate data and analysis tools. Please verify yourself that the data you use is good enough for your purpose, and report errors back. In publications the original data source should be cited, a link to a web page describing the data is always provided.

Start by selecting a class of climate data from the right-hand menu. After you have selected the time series or fields of interest, you will be able to investigate it, correlate it to other data, and generate derived data from it.

If you are new it may be helpful to study the examples.

Share and enjoy!

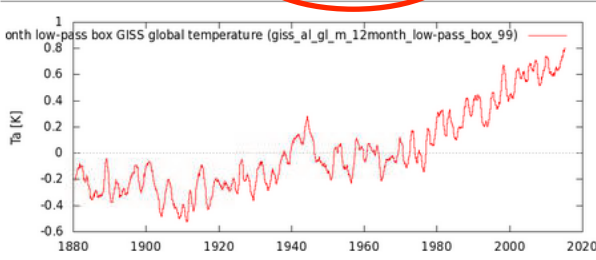
Some restrictions are in force, notably the possibility to define your own indices, to upload data into the Climate Explorer and to handle large datasets. If you want to use these features **please log in or register.**

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field



onth low-pass box GISS global temperature (giss_ai_gl_m_12month_low-pass_box_99)

Tb [K]

1880 1900 1920 1940 1960 1980 2000 2020

News

19-oct-2015	Updated CRU TS to 3.23 with data up to 2014. #stations is not yet available.
17-oct-2015	Fixed a bug in the AMO time series generation, due to a language setting the global mean temperature was not subtracted correctly anymore.
14-oct-2015	The server has been saying it was too busy twice today for 10 minutes, but did not go down. The new precautions seem to be working. I could not find one cause for it, looks like just a very busy day.

Getting started – registration!



climexp.knmi.nl

- Registration is free (of course) and only requires a name, email address and institute.

climexp.knmi.nl

KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI search in the Climate Explorer

Help News About Contact Seasonal forecast verification Climate Change Atlas

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12-month low-pass box GISS global temperature (giss_ai_gl_m_12month_low-pass_box_99)

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Register or log in

Please register as a user so that we can trace usage of the system, and mail you if I find bugs. If you have already registered just give your e-mail address to log in. The service is also available anonymously, but some features (notably the ability to define your own indices, to upload your own data and to use large datasets) are then disabled. As a registered user many forms remember their settings for a few days.

Register / Log in

E-mail address

Name

Institute

register/log in

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What data is available?



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- Data generally split between time series (including station data) and spatial fields.
- Station data at daily and monthly time scales.
- Climate indices (NINO indices, AMO, NAO)
- Reanalysis products.
- Climate model output.
- Seasonal forecasts.
- Decadal forecasts.

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- Data generally split between time series (including station data) and spatial fields.
- Station data at daily and monthly time scales.
- Climate indices (NINO indices, AMO, NAO)
- Reanalysis products.
- Climate model output.
- Seasonal forecasts.
- Decadal forecasts.
- Possibility to upload and view your own data.

Some examples...



KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI

search in the Climate Explorer

Help News About Contact Seasonal forecast verification Climate Change Atlas

Select a monthly time series

Historical observations

GHCN-M (adjusted)	GHCN-M (all)	other
<input type="radio"/> precipitation i	<input checked="" type="radio"/> precipitation i	<input type="radio"/> PSMSL sealevel i
<input type="radio"/> mean temperature i	<input type="radio"/> mean temperature i	<input type="radio"/> sealevel (JASL)
<input type="radio"/> minimum temperature i	<input type="radio"/> minimum temperature i	<input type="radio"/> world river discharge (RivDis)
<input type="radio"/> maximum temperature i	<input type="radio"/> maximum temperature i	<input type="radio"/> USA river discharge (HCDN)
	<input type="radio"/> sealevel pressure	<input type="radio"/> european SLP (ADVICE)
(full lists)		<input type="radio"/> N-America snowcourses (NRCS)

Select stations [i](#)

- stations with a name containing
- stations near °N, °E [\(select on world map\)](#)
- all stations in the region °N - °N, °E - °E
- the stations with station numbers

Time, distance [i](#)

At least years of data in the season starting in in years -

At least ° apart and with m < elevation <

- Click on monthly station data.

Some examples... August rainfall in Tomboctou



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Get stations **Clear Form**

- Click on monthly station data.
- The GHCN-M (all) 'precipitation'.

Some examples... August rainfall in Tomboctou



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Select stations

stations with a name containing Tomboctou

10 stations near °N, °E (select on world map)

all stations in the region °N - °N, °E - °E

the stations with station numbers

lon1 lon2 lat1 lat2 (optional)
station number (one per line)

Time, distance

At least 10 years of data in the monthly season starting in any month in years

At least * apart and with m < elevation <

Get stations Clear Form

- Click on monthly station data.
- The GHCN-M (all) 'precipitation'.
- Type Tomboctou in station field.

Some examples... August rainfall in Tomboctou



Climate Explorer European Climate Assessment & Data KNMI

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Select stations [i](#)

- stations with a name containing
- 10 stations near °N, °E (select on world map)
- all stations in the region °N - °N, °E - °E
- the stations with station numbers

Time, distance [i](#)

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At least * apart and with m < elevation <

Get stations **Clear Form**

Select a time series

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- Click on monthly station data.
- The GHCN-M (all) 'precipitation'.
- Type Tomboctou in station field.
- Get stations

Some examples... August rainfall in Tomboctou



The screenshot shows the KNMI Climate Explorer interface. At the top, there is a navigation bar with links for 'Climate Explorer', 'European Climate Assessment & Data', and 'KNMI'. A search bar is present with the text 'search in the Climate Explorer'. Below the navigation bar, there are several tabs: 'Help', 'News', 'About', 'Contact', 'Seasonal forecast verification', and 'Climate Change Atlas'. The main content area is titled 'Select a monthly time series' and 'Historical observations'. It features a table with columns for 'GHCN-M (adjusted)' and 'GHCN-M (all)'. The table lists various climate variables such as precipitation, mean temperature, minimum temperature, maximum temperature, and sea level pressure. A red arrow points from the 'precipitation' row in the table to the 'Found station data' section below. The 'Found station data' section is titled 'monthly precipitation_all station TOMBOUCTOU' and contains the following text: 'Looking for stations with substring TOMBOUCTOU', 'Found 0 stations', 'TOMBOUCTOU MALI (MALI)', 'coordinates: 16.80N, -3.00E, 263m', 'WMO station code: 61223 (get data)', and 'Found 109 years with data in 1897-2012'. Below this section, there are search filters for 'Time, distance' and 'Get stations' and 'Clear Form' buttons.

- Click on monthly station data.
- The GHCN-M (all) 'precipitation'.
- Type Tomboctou in station field.
- Get stations
- 'get data'



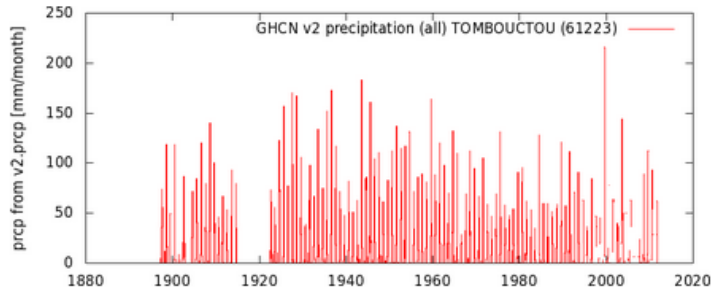
Some examples... August rainfall in Tomboctou

Time series

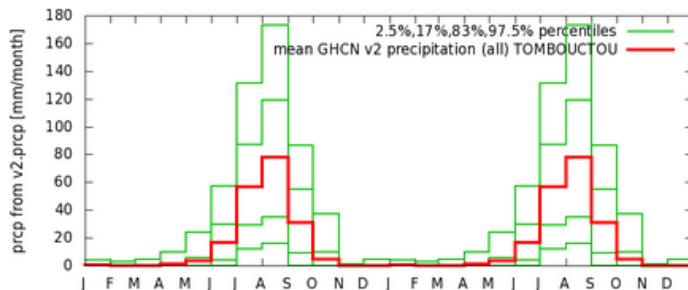
monthly TOMBOUCTOU GHCN v2 precipitation (all)

Retrieving data from GHCN-M v2/v3 (adjusted) database ...

TOMBOUCTOU MALI (MALI), coordinates: 16.80N, -3.00E, 263m, WMO station code: 61223
TOMBOUCTOU , prcp from v2.prcp [mm/month], (eps, pdf, raw data, netcdf)



Two annual cycles, computed with all data available (eps, pdf, raw data)



KNMI Climate Explorer

search in the Climate Explorer

Select a time series

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Investigate this time series

- > View per month, season, half year or full year (Jan-Dec or Jul-Jun)
- > View last 1, 5, 10 years
- > Correlate with other time series
- > Correlate with a field (correlation, regression, composite)
 - > only observations
 - > only reanalyses
 - > only seasonal forecasts
 - > only scenario runs
 - > only user-defined fields
- > Verify against another time series
- > Spectrum, autocorrelation function
- > Wavelet

- Time series of monthly precip at Tomboctou.
- Annual cycle of precip, peaking in August.



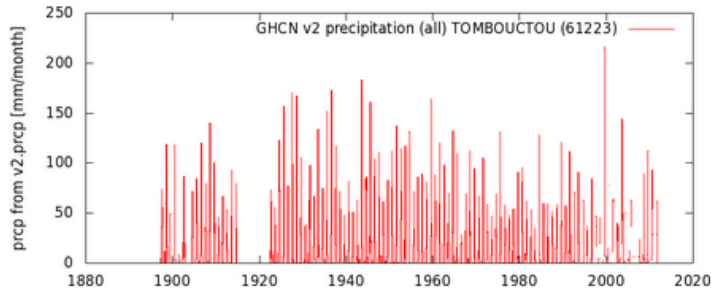
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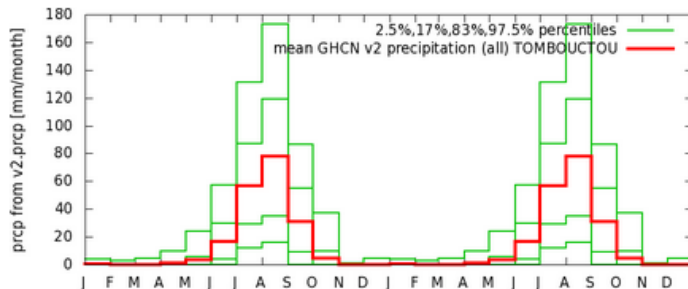
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- Click 'view per month'.



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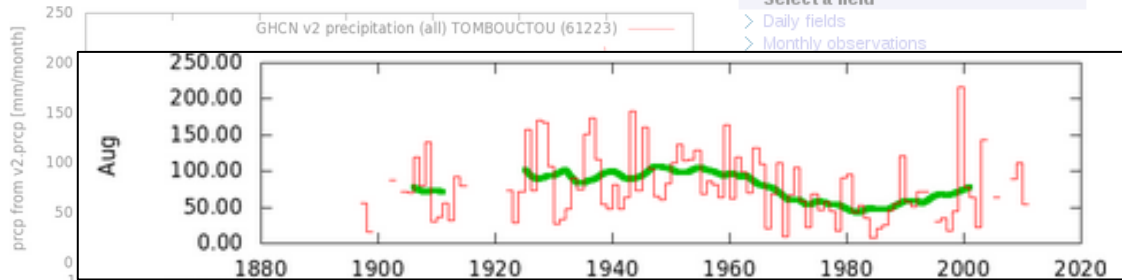
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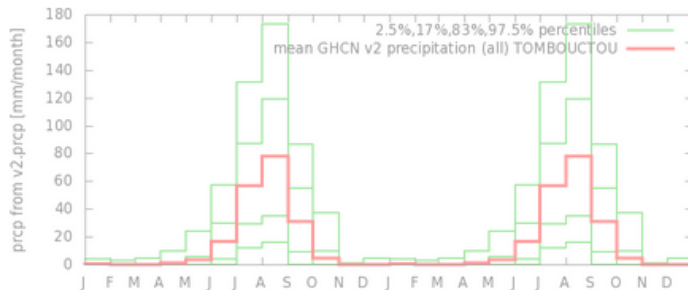
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- Time series of monthly precip at Tomboctou.
- Annual cycle of precip, peaking in August.
- Click 'view per month'.
- The August plot reveals decadal variability: drier in the 1970s and 1980s.



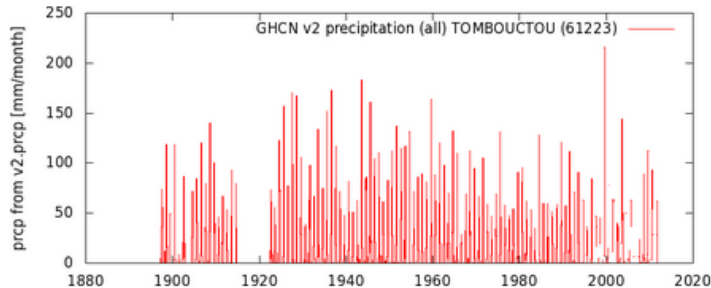
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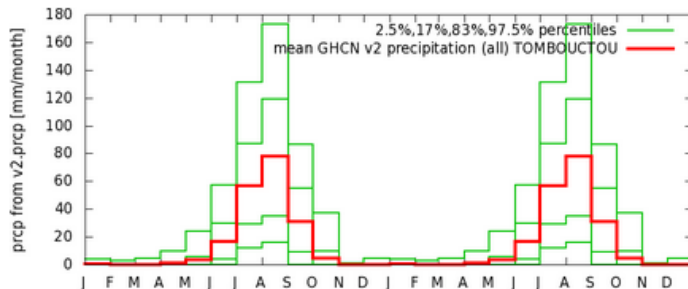
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- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecwf, ...)
- > View, upload your field

Investigate this time series

- > View per month, season, half year or full year (Jan-Dec or Jul-Jun)
- > View last 1, 5, 10 years
- > Correlate with other time series
- > Correlate with a field (correlation, regression, composite)
 - > only observations
 - > only reanalyses
 - > only seasonal forecasts
 - > only scenario runs
 - > only user-defined fields
- > Verify against another time series
- > Spectrum, autocorrelation function
- > Wavelet

- Time series of monthly precip at Tomboctou.
- Annual cycle of precip, peaking in August.
- Click 'view per month'.
- The August plot reveals decadal variability: drier in the 1970s and 1980s.
- Click 'correlate with other time series.'



Some examples... August rainfall in Tomboctou

The screenshot shows the KNMI Climate Explorer interface. At the top, there is a search bar and navigation links. The main content area is titled "Correlate with another time series" and "TOMBOUCTOU GHCN_v2_precipitation_(all)". Under "System-defined monthly timeseries", the "NINO3.4" checkbox is selected. The "Options" section is configured as follows:

- Variable: correlation coefficient, regression
- Starting month: Jul of timeseries
- Season: averaging over 3 month(s) of the timeseries same month(s) of the index
- Anomalies: subtract seasonal cycle
- Lag: 3 months (lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging index)
- Years: [] - []
- Only for: [] < index selected above < []
- Apply: logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU
- Output: rank correlation or contingency tables.
- Detrend: detrend everything
- Filters: take year-on-year differences
- Running correlation: show/hide running correlation options
- Fit: straight line, parabola, cubic, straight line + a []
- Plot range: X [] : [] , Y [] : []
- Decorrelation scale: 0 months

A red arrow points from the "NINO3.4" checkbox to the "Investigate this time series" section on the right, specifically to the "NINO3.4" link.

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'



Some examples... August rainfall in Tomboctou

KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI

search in the Climate Explorer

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Correlate with another time series

TOMBOUCTOU GHCN_v2_precipitation_(all)

System-defined monthly timeseries

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries

Options

Variable: correlation coefficient, regression

Starting month: Jul of timeseries

Season: averaging over 3 month(s) of the timeseries same month(s) of the index,

Anomalies: subtract seasonal cycle

Lag: 3 months
(lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging index)

Years: -

Only for: < index selected above <
 < GHCN_v2_precipitation_(all) TOMBOUCTOU <

Apply: logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU

Output: rank correlation or contingency tables.

Detrend: detrend everything

Filters: take year-on-year differences
subtract mean of previous years no overlap

Running correlation: show/hide running correlation options

Fit: straight line, parabola, cubic, straight line + a

month time derivative, phase diagram, ...

Plot range: X : , Y :

Decorrelation scale: months

Correlate

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months; Lag: 3 months



Some examples... August rainfall in Tomboctou

KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI

search in the Climate Explorer

Help News About Contact Seasonal forecast verification Climate Change Atlas

Correlate with another time series
TOMBOUCTOU GHCN_v2_precipitation_(all)

System-defined monthly timeseries

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries

Options

Variable: correlation coefficient, regression

Starting month: Jul of timeseries

Season: averaging over 3 month(s) of the timeseries same month(s) of the index,

Anomalies: subtract seasonal cycle

Lag: 3 months
(lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging index)

Years: -

Only for: < index selected above <
 < GHCN_v2_precipitation_(all) TOMBOUCTOU <

Apply: logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU

Output: rank correlation or contingency tables.

Detrend: detrend everything

Filters: take year-on-year differences
subtract mean of previous years no overlap

Running correlation: show/hide running correlation options

Fit: straight line, parabola, cubic, straight line + a

month time derivative, phase diagram, ...

Plot range: X Y

Decorrelation scale: 0 months

Correlate

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, schwf, ...)
- > View, upload your field

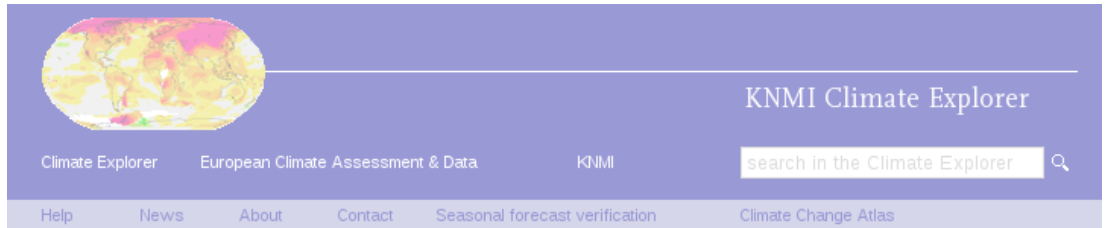
Investigate this time series

- > View per month, season, half year or full year (Jan-Dec or Jul-Jun)
- > View last 1, 5, 10 years
- > Correlate with other time series
- > Correlate with a field (correlation, regression, composite)
 - > only observations
 - > only reanalyses
 - > only seasonal forecasts
 - > only scenario runs
 - > only user-defined fields
- > Verify against another time series
- > Spectrum, autocorrelation function
- > Wavelet
- > Running mean/s.d./skew/curtosis
- > Trends in return times of extremes
- > Plot and fit distribution

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.



Some examples... August rainfall in Tomboctou



Correlate with another time series
TOMBOUCTOU GHCN_v2_precipitation_[all]

System-defined monthly timeseries

NINO3 NINO3.4 NINO4 SOI

User-defined monthly timeseries

Options

Variable: correlation coefficient, regression

Starting month: Jul of timeseries

Season: averaging over 3 month(s) of the index,

Anomalies: subtract seasonal cycle

Lag: 3 months
(lag positive: GHCN_v2_precipitation)

Years: [] - []

Only for: [] < index selected above <

[] < GHCN_v2_precipitation

Apply: logarithm, sqrt to GHCN_v2

Output: rank correlation or contingency

Detrend: detrend everything

Filters: take year-on-year differences

subtract mean of []

Running correlation: show/hide running correlation options

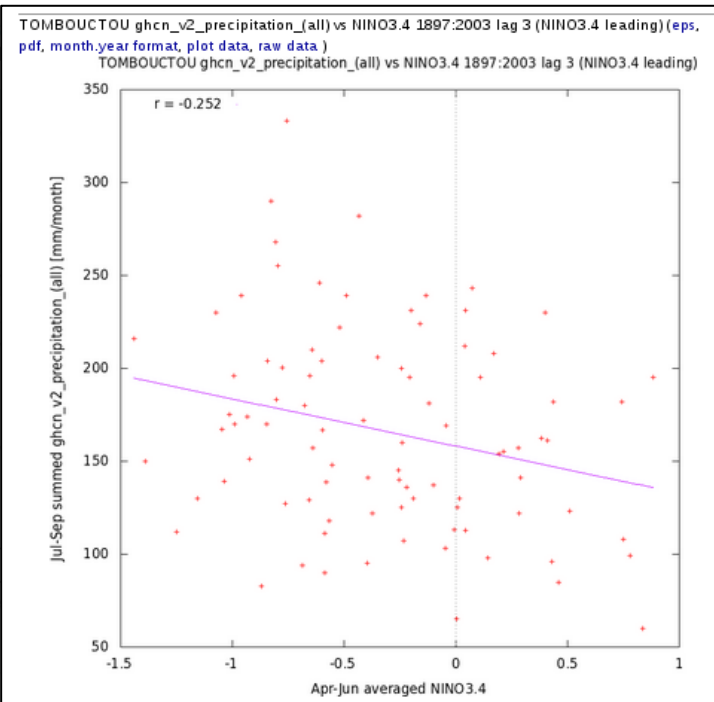
Fit: straight line, parabola, cubic, straight line + a []

month time derivative, phase diagram, ...

Plot range: X [] : [] , Y [] : []

Decorrelation scale: 0 months

Correlate



- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.

- > only observations
- > only reanalyses
- > only seasonal forecasts
- > only scenario runs
- > only user-defined fields
- > Verify against another time series
- > Spectrum, autocorrelation function
- > Wavelet
- > Running mean/s.d./skew/curtosis
- > Trends in return times of extremes
- > Plot and fit distribution



Some examples... August rainfall in Tomboctou

The screenshot shows the KNMI Climate Explorer interface. At the top, there is a search bar and navigation links. The main content area is titled "Correlate with another time series" and "TOMBOUCTOU GHCN_v2_precipitation_(all)". The interface is divided into several sections:

- Select a time series:** A list of options including "Daily station data", "Daily climate indices", "Monthly station data", "Monthly climate indices", "Annual climate indices", and "View, upload your time series".
- Select a field:** A list of options including "Daily fields", "Monthly observations", "Monthly reanalysis fields", "Monthly and seasonal historical reconstructions", "Monthly seasonal hindcasts", "Monthly decadal hindcasts", "Monthly RCM runs", "Monthly CMIP3+ scenario runs", "Monthly CMIP5 scenario runs", "Annual CMIP5 extremes", "Monthly EC-Earth scenario runs", "External data (ensembles, ncep, enact, soda, ecmwf, ...)", and "View, upload your field".
- Options:** A section for configuring the correlation analysis. It includes:
 - Variable:** Radio buttons for "correlation coefficient" (selected) and "regression".
 - Starting month:** A dropdown menu set to "Jul" of "timeseries".
 - Season:** A dropdown menu set to "averaging" over "3" month(s) of the timeseries, with "same" selected for the index.
 - Anomalies:** A checkbox for "subtract seasonal cycle" (unchecked).
 - Lag:** A dropdown menu set to "3" months, with a note "(lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging index)".
 - Years:** Input fields for the time range.
 - Only for:** Input fields for filtering data.
 - Apply:** Checkboxes for "logarithm" and "sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU" (unchecked).
 - Output:** Checkboxes for "rank correlation or" and "contingency tables" (unchecked).
 - Detrend:** A checkbox for "detrend everything" (unchecked).
 - Filters:** A checkbox for "take year-on-year differences" (unchecked).
 - Running correlation:** A checkbox for "show/hide running correlation options" (unchecked).
 - Fit:** Radio buttons for "straight line" (selected), "parabola", "cubic", and "straight line + a" (unchecked).
 - Plot range:** Input fields for X and Y axes.
 - Decorrelation scale:** Input field set to "0" months.

At the bottom of the "Options" section, there is a blue "Correlate" button.

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.
- Click 'correlate with a field'.





Some examples... August rainfall in Tomboctou

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Correlate time series with a field

TOMBOUCTOU GHCN_v2_precipitation_[all]

Observations	
Temperature	1850-now anomalies: <input checked="" type="radio"/> HadCRUT4 median, <input type="radio"/> 1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1
	1850-now anomalies: <input type="radio"/> HadCRUT4 filled-in by Cowtan and Way
Land	1850-2010 anomalies: <input type="radio"/> CRUTEM4
	1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1
	1948-now: CPC GHCN/CAMS t2m analysis (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°
	1901-2014: CRU TS3.23 (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°, <input type="radio"/> #/cell, <input type="radio"/> #/value

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensemble, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.
- Click 'correlate with a field'.
- Select HadCRU4 temperature.



Some examples... August rainfall in Tomboctou

KNMI Climate Explorer

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Correlate time series with a field

TOMBOUCTOU GHCN_v2_precipitation_(all)

Observations

Temperature	1850-now anomalies: <input checked="" type="radio"/> HadCRUT4 median, <input type="radio"/> 1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km	<input type="button" value="i"/>
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1	<input type="button" value="i"/>
	1850-now anomalies: <input type="radio"/> HadCRUT4 filled-in by Cowtan and Way	<input type="button" value="i"/>
Land	1850-2010 anomalies: <input type="radio"/> CRUTEM4	<input type="button" value="i"/>
	1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km	<input type="button" value="i"/>
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1	<input type="button" value="i"/>
	1948-now: CPC GHCN/CAMS t2m analysis (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°	<input type="button" value="i"/>
	1901-2014: CRU TS3.23 (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°, <input type="radio"/> #/cell, <input type="radio"/> #value	<input type="button" value="i"/>

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMP3+ scenario runs
- > Monthly CMP5 scenario runs
- > Annual CMP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Options

Starting month: Jul of timeseries

Season: averaging over 3 month(s) of the timeseries same

Anomalies: subtract seasonal cycle

Lag: 3 months (lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging field)

Years: -

Only for: < field selected above < < GHCN_v2_precipitation_(all) TOMBOUCTOU <

Apply: logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU

Output: rank correlation

Detrend: detrend everything

Filters: take year-on-year differences

Running correlation: show/hide running correlation options

Fit: straight line, parabola

Correlate

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.
- Click 'correlate with a field'.
- Select HadCRU4 temperature.
- Again, select JAS and a lag of 3 months.



Some examples... August rainfall in Tomboctou

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Correlate time series with a field

TOMBOUCTOU GHCN_v2_precipitation_(all)

Observations

Temperature	1850-now anomalies: <input checked="" type="radio"/> HadCRUT4 median, <input type="radio"/> 1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km	i
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1	i
	1850-now anomalies: <input type="radio"/> HadCRUT4 filled-in by Cowtan and Way	i
Land	1850-2010 anomalies: <input type="radio"/> CRUTEM4	i
	1880-now anomalies: GISS <input type="radio"/> 250km, <input type="radio"/> 1200km	i
	1880-now anomalies: <input type="radio"/> HCDC v3.2.1	i
	1948-now: CPC GHCN/CAMS t2m analysis (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°	i
	1901-2014: CRU TS3.23 (land) <input type="radio"/> 0.5°, <input type="radio"/> 1.0°, <input type="radio"/> 2.5°, <input type="radio"/> #/cell, <input type="radio"/> #value	i

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Options

Starting month: Jul of timeseries

Season: averaging over 3 month(s) of the timeseries same month(s) of the field

Anomalies: subtract seasonal cycle

Lag: 3 months (lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging field)

Years: -

Only for: < field selected above < < GHCN_v2_precipitation_(all) TOMBOUCTOU <

Apply: logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU

Output: rank correlation

Detrend: detrend everything

Filters: take year-on-year differences

Running correlation: show/hide running correlation options

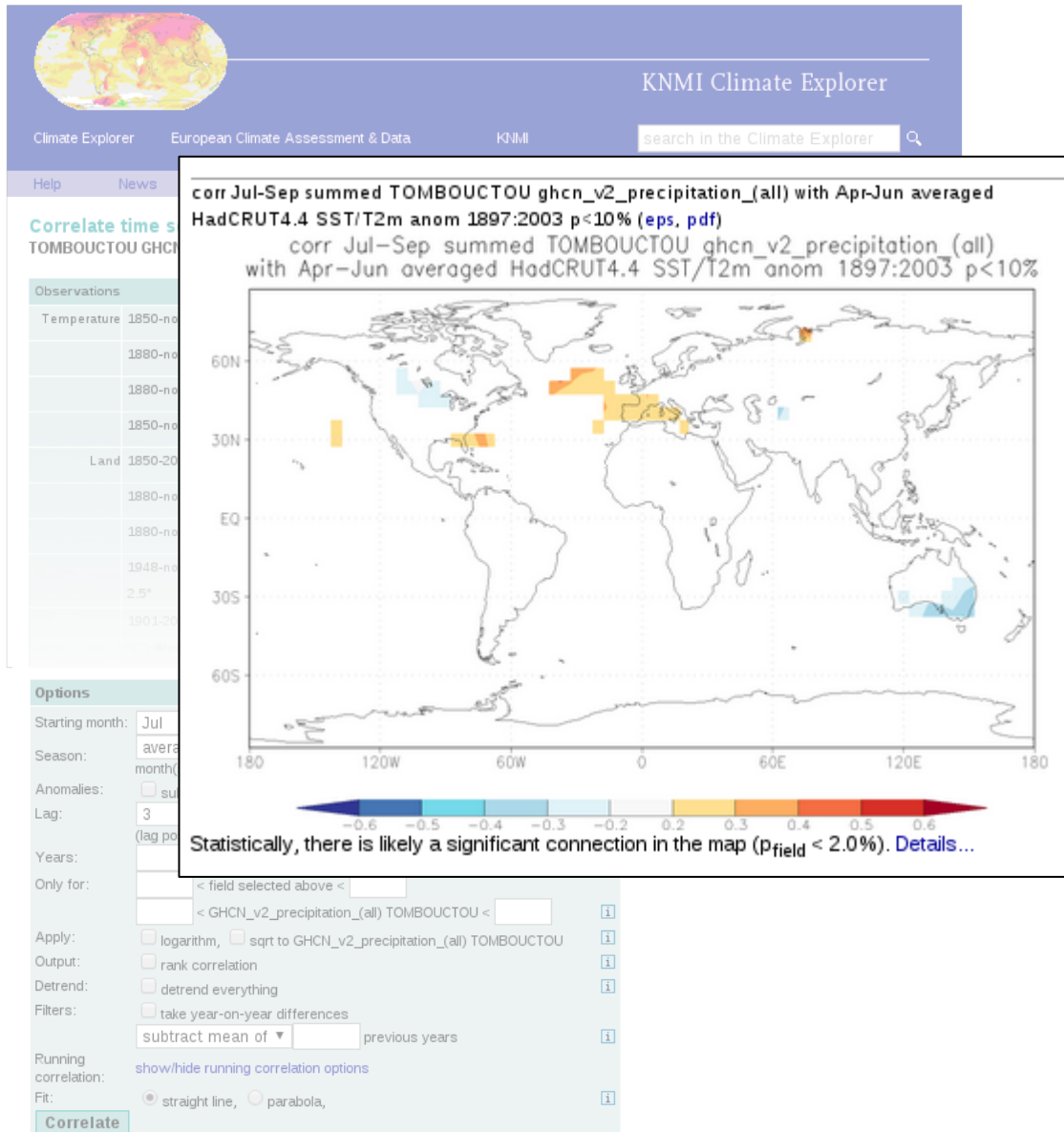
Fit: straight line, parabola

Correlate

- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.
- Click 'correlate with a field'.
- Select HadCRU4 temperature.
- Again, select JAS and a lag of 3 months.
- 'Correlate'.



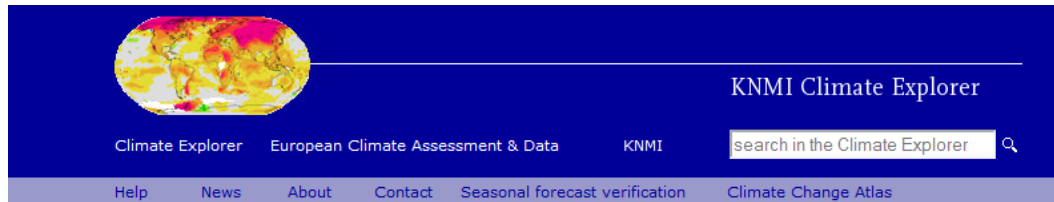
Some examples... August rainfall in Tomboctou



- Is there a relationship between rainfall and ENSO?
- Click 'NINO3.4'.
- Starting month: Jul; average over 3 months.
- 'Correlate'.
- Correlate is significant but weak.
- Click 'correlate with a field'.
- Select HadCRU4 temperature.
- Again, select JAS and a lag of 3 months.
- 'Correlate'.



Computing ENSO teleconnections



- Select 'monthly observations.'

Starting point

Welcome, anonymous user

Please enter the KNMI Climate Explorer, a research tool to investigate the climate. This web site collects a lot of climate data and analysis tools. Please verify yourself that the data you use is good enough for your purpose, and report errors back. In publications the original data source should be cited, a link to a web page describing the data is always provided.

Start by selecting a class of climate data from the right-hand menu. After you have selected the time series or fields of interest, you will be able to investigate it, correlate it to other data, and generate derived data from it.

If you are new it may be helpful to study the examples.

Share and enjoy!

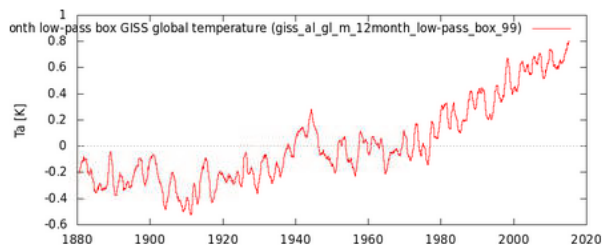
Some restrictions are in force, notably the possibility to define your own indices, to upload data into the Climate Explorer and to handle large datasets. If you want to use these features please [log in](#) or [register](#).

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field



News

19-oct-2015	Updated CRU TS to 3.23 with data up to 2014. #stations is not yet available.
17-oct-2015	Fixed a bug in the AMO time series generation, due to a language setting the global mean temperature was not subtracted correctly anymore.
14-oct-2015	The server has been saying it was too busy twice today for 10 minutes, but did not go down. The new precautions seem to be working. I could not find one cause for it, looks like just a very busy day.



Computing ENSO teleconnections

Select a monthly field

Observations

Select a field by following its link (old list)		
Temperature	1850-now anomalies: HadCRUT4 median,	i
	1880-now anomalies: GISS 250km, 1200km	i
	1880-now anomalies: NCDC v3.2.1	i
	1850-now anomalies: HadCRUT4 filled-in by Cowtan and Way	i
Land	1850-2010 anomalies: CRUTEM4	i
	1880-now anomalies: GISS 250km, 1200km	i
	1880-now anomalies: NCDC v3.2.1	i
	1948-now: CPC GHCN/CAMS 2m analysis (land) 0.5°, 1.0°, 2.5°	i
	1901-2014: CRU TS3.23 (land) 0.5°, 1.0°, 2.5°, #/cell, #/value	i
	1750-now: Berkeley 1°	i
	0.25° 1950-now: E-OBS v11.0 Tg, 0.5° 1901-now with CRU TS (Europe)	i
Tmax	1901-2014: CRU TS3.23 (land) 0.5°, 1.0°, 2.5°, #/cell, #/value	i
	1833-now: Berkeley 1°	i
	0.25° 1950-now: E-OBS v11.0 Tx, 0.5° 1901-now with CRU TS (Europe)	i
Tmin	1901-2014: CRU TS3.23 (land) 0.5°, 1.0°, 2.5°, #/cell, #/value	i
	1833-now: Berkeley 1°	i
	0.25° 1950-now: E-OBS v11.0 Tn, 0.5° 1901-now with CRU TS (Europe)	i
Tmax-Tmin (DTR)	1901-2014: CRU TS3.23 (land) 0.5°, 1.0°, 2.5°	i
SST	1870-now: HadISST1 1° reconstruction	i
	1854-now: NCDC v4 ERSST reconstruction, (v3b)	i
	1850-2006: Hadley Centre HadSST3.1.1.0 5°	i
	1800-2007: 2° ICOADS v2.5 SST, number of obs	i
	1982-now: 1° Reynolds OI v2 SST, v1	i
	1980-now: TAO buoys SST, Air Temperature	i
Air Temperature	1880-2010: HadNMAT2, anomalies, large-scale uncertainties, (1856-2002 HadMAT1)	i
	1800-2007: 2° ICOADS v2.5 Tair, number of obs	i
Lower Troposphere	1979-now: Spencer & Christy MSU anomalies v5.6 (v6.0beta3)	i
	1978-now: RSS MSU 3.3 TLT, anomalies (3.2, anomalies)	i
Precipitation	1901-2014: CRU TS3.23 (land) 0.5°, 1.0°, 2.5°	i
	0.25° 1950-now: E-OBS v11.0 precip, 0.5° 1901-now with CRU TS (Europe)	i
	1900-now anomalies: NCDC analysis (land)	i
	1901-2013: GPCC V7 analysis (land) 2.5°, 1.0°, 0.5°, only observations: 2.5°, 1.0°, 0.5°, number of gauges 0.5°, 1.0°, 2.5°	i
	1986-now: 1° GPCC monitoring product + first guess (land); only observations, number of gauges	i
	1900-now: home-merged 1° GPCC V7 + monitoring product + first guess (land); 1°, 2.5°, only observations: 1°, 2.5°	i

- Select 'monthly observations.'
- 'GPCC 2.5 deg'.





Computing ENSO teleconnections

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Field
GPCC V7 2.5 precipitation

GPCC Full Data Product version 7, precipitation in mm/month, 2.5 degree
X axis: whole world in 144 2.50° steps, first point at 178.75° W, last point at 178.75° E
Y axis: regular grid with 72 -2.50° steps, first point at 88.75° N, last point at 88.75° S

Monthly data available from Jan1901 to Dec2013 (1356 months)
Variable p (full data precipitation version7) in mm/month

Get grid points, average area or generate subset

Mask: no mask

Latitude: *N - *N

Longitude: *E - *E

Boundaries: halfway grid points

Make: average set of grid points subset of the field

Demand at least: 30 % valid points in this region

Apply monthly high/low-pass filter

high-pass filter

cut-off value 1 months

requiring at least 75 % valid data

Apply year-on-year high/low-pass filter

high-pass filter

cut-off value 1 years

requiring at least 75 % valid data

Create a field with lower time resolution

New time scale: annual (Jul-Jun)

New variable: mean of precipitation

Threshold: no cut mm/month

Minimum: % valid data

First apply: 1-month running mean

Missing data: ignore climatology, trend, persistence.

getfieldtype: please ask me to add "p" to the lists in getfieldtype

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CIMP3+ scenario runs
- > Monthly CIMP5 scenario runs
- > Annual CIMP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate this field

- > Plot this field
- > Plot difference with a field
- > Compute mean, s.d. or extremes
- > Trends in extremes
- > Make EOFs
- > Correlate with a time series
- > Pointwise correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CIMP5 scenario runs
 - > only user-defined fields
- > Spatial correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CIMP5 scenario runs
 - > only user-defined fields
- > SVD
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only CIMP5 scenario runs
 - > only user-defined fields
- > Verify field against observations

- Select 'monthly observations.'
- 'GPCC 2.5 deg'
- 'Correlate with time series'



Computing ENSO teleconnections

Correlate with a time series

GPCC V7 2.5 precipitation

System-defined monthly timeseries i

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries i

Plot options

correlation covariance significance
 regression (error reverse
 composite (error)

extreme dependence measures χ_c χ_{bar} threshold %

Demand at least % valid points

Map type: projection i

Region: °N to °N, °E to °E in a i

Contours: to mask out % i

Colours: i

Shading: shading and contours shading contours grid boxes i

Plot options: no color bar no title on plot, no grid i

label distance × or no labels i

Output to: browser Google Earth (kml) GIS (geotiff) i

Options

Starting month: of i

Season: over month(s) of the selected field i

Anomalies: subtract seasonal cycle i

Lag: months i
(lag positive: field GPCC V7 2.5 precipitation lagging time series)

Years: - i

Only for: < time series selected above <
 < field < i

Apply: logarithm, sqrt to field GPCC V7 2.5 precipitation i

Output: rank correlation i

Detrend: detrend everything i

Filters: take year-on-year differences i
 previous years

Running correlation: [show/hide running correlation options](#)

Fit: straight line, parabola, i

Correlate

- Select a time series**
- > Daily station data
 - > Daily climate indices
 - > Monthly station data
 - > Monthly climate indices
 - > Annual climate indices
 - > View, upload your time series
- Select a field**
- > Daily fields
 - > Monthly observations
 - > Monthly reanalysis fields
 - > Monthly and seasonal historical reconstructions
 - > Monthly seasonal hindcasts
 - > Monthly decadal hindcasts
 - > Monthly RCM runs
 - > Monthly CMIP3+ scenario runs
 - > Monthly CMIP5 scenario runs
 - > Annual CMIP5 extremes
 - > Monthly EC-Earth scenario runs
 - > External data (ensembles, ncep, enact, soda, ecmwf, ...)
 - > View, upload your field
- Investigate this field**
- > Plot this field
 - > Plot difference with a field
 - > Compute mean, s.d. or extremes
 - > Trends in extremes
 - > Make EOFs
 - > Correlate with a time series
 - > Pointwise correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > Spatial correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > SVD
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > Verify field against observations

- Select 'monthly observations.'
- 'GPCC 2.5 deg'.
- 'Correlate with time series'
- Select 'NINO3.4'.



Computing ENSO teleconnections

Correlate with a time series

GPCC V7 2.5 precipitation

System-defined monthly timeseries i

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries i

Plot options

correlation covariance significance
 regression (error reverse
 composite (error)

extreme dependence measures χ_c χ_{bar} threshold %

Demand at least % valid points

Map type: projection i

Region: °N to °N, °E to °E in a i

Contours: to mask out % i

Colours: i

Shading: shading and contours shading contours grid boxes i

Plot options: no color bar no title on plot, no grid i

label distance × or no labels i

Output to: browser Google Earth (kml) GIS (geotiff) i

Options

Starting month: of i

Season: over month(s) of the selected field i

month(s) of the time series,

Anomalies: subtract seasonal cycle i

Lag: months i

(lag positive: field GPCC V7 2.5 precipitation lagging time series)

Years: - i

Only for: < time series selected above <
 < field < i

Apply: logarithm, sqrt to field GPCC V7 2.5 precipitation i

Output: rank correlation i

Detrend: detrend everything i

Filters: take year-on-year differences i

previous years i

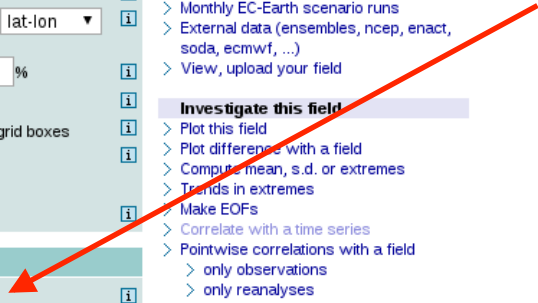
Running correlation: [show/hide running correlation options](#)

Fit: straight line, parabola, i

Correlate

- Select a time series**
 - > Daily station data
 - > Daily climate indices
 - > Monthly station data
 - > Monthly climate indices
 - > Annual climate indices
 - > View, upload your time series
- Select a field**
 - > Daily fields
 - > Monthly observations
 - > Monthly reanalysis fields
 - > Monthly and seasonal historical reconstructions
 - > Monthly seasonal hindcasts
 - > Monthly decadal hindcasts
 - > Monthly RCM runs
 - > Monthly CMIP3+ scenario runs
 - > Monthly CMIP5 scenario runs
 - > Annual CMIP5 extremes
 - > Monthly EC-Earth scenario runs
 - > External data (ensembles, ncep, enact, soda, ecmwf, ...)
 - > View, upload your field
- Investigate this field**
 - > Plot this field
 - > Plot difference with a field
 - > Compute mean, s.d. or extremes
 - > Trends in extremes
 - > Make EOFs
 - > Correlate with a time series
 - > Pointwise correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > Spatial correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > SVD
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
 - > Verify field against observations

- Select 'monthly observations.'
- 'GPCC 2.5 deg'.
- 'Correlate with time series'
- Select 'NINO3.4'.
- Starting month: Oct; averaged over 3 months





Computing ENSO teleconnections

Correlate with a time series

GPCC V7 2.5 precipitation

System-defined monthly timeseries i

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries i

Plot options

correlation covariance significance
 regression (error reverse
 composite (error)

extreme dependence measures χ_c χ_{bar} threshold %

Demand at least % valid points

Map type: projection i

Region: °N to °N, °E to °E in a i

Contours: to mask out % i

Colours: i

Shading: shading and contours shading contours grid boxes i

Plot options: no color bar no title on plot, no grid i

label distance × * or no labels i

Output to: browser Google Earth (kml) GIS (geotiff) i

Options

Starting month: of i

Season: over month(s) of the selected field i

Anomalies: subtract seasonal cycle i

Lag: months i
(lag positive: field GPCC V7 2.5 precipitation lagging time series)

Years: - i

Only for: < time series selected above <
 < field < i

Apply: logarithm, sqrt to field GPCC V7 2.5 precipitation i

Output: rank correlation i

Detrend: detrend everything i

Filters: take year-on-year differences i
 subtract mean of previous years

Running correlation: show/hide running correlation options i

Fit: straight line, parabola, i

Correlate

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate this field

- > Plot this field
- > Plot difference with a field
- > Compute mean, s.d. or extremes
- > Trends in extremes
- > Make EOFs
- > Correlate with a time series
- > Pointwise correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
- > Spatial correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
- > SVD
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields
- > Verify field against observations

- Select 'monthly observations.'
- 'GPCC 2.5 deg'.
- 'Correlate with time series'
- Select 'NINO3.4'.
- Starting month: Oct;
- averaged over 3 months.
- 'Correlate'.



Computing ENSO teleconnections

Correlate with a time series

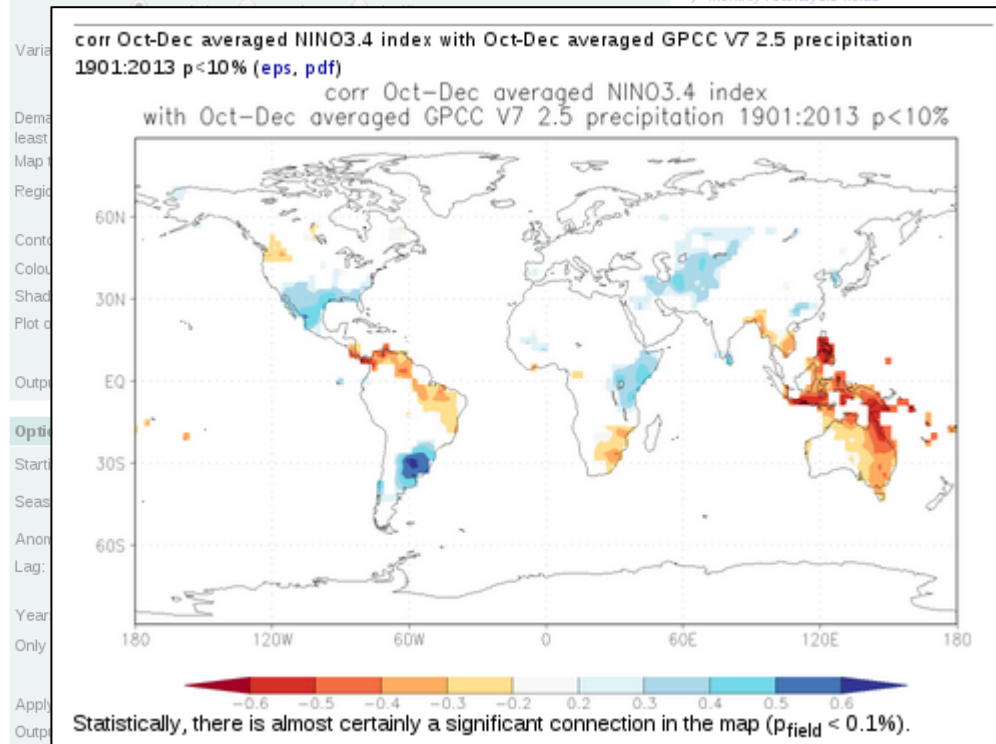
GPCC V7 2.5 precipitation

System-defined monthly timeseries i

NINO3 NINO3.4 NINO4 SOI NAO CO2 GMST time

User-defined monthly timeseries i

Plot options



Detrend: detrend everything i

Filters: take year-on-year differences

subtract mean of previous years i

Running correlation: show/hide running correlation options

Fit: straight line, parabola, i

Correlate

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

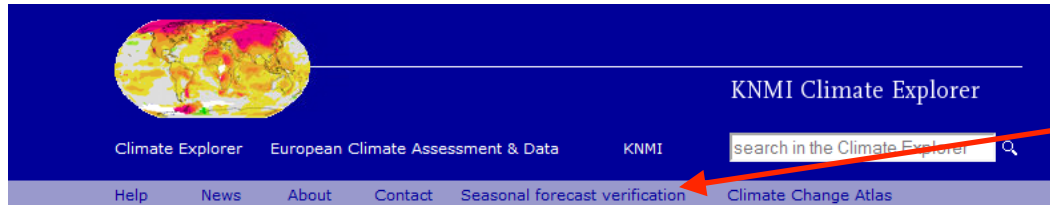
- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields

- Select 'monthly observations.'
- 'GPCC 2.5 deg'.
- 'Correlate with time series'
- Select 'NINO3.4'.
- Starting month: Oct; averaged over 3 months.
- 'Correlate'.

- Reveals well-known teleconnections...
- Climate Explorer allows you to focus on specific regions, seasons.
- Analysis extends to regression, composites etc.



Seasonal forecast verification tool



- Click 'seasonal forecast verification'.

Starting point

Welcome, anonymous user

Please enter the KNMI Climate Explorer, a research tool to investigate the climate. This web site collects a lot of climate data and analysis tools. Please verify yourself that the data you use is good enough for your purpose, and report errors back. In publications the original data source should be cited, a link to a web page describing the data is always provided.

Start by selecting a class of climate data from the right-hand menu. After you have selected the time series or fields of interest, you will be able to investigate it, correlate it to other data, and generate derived data from it.

If you are new it may be helpful to study the examples.

Share and enjoy!

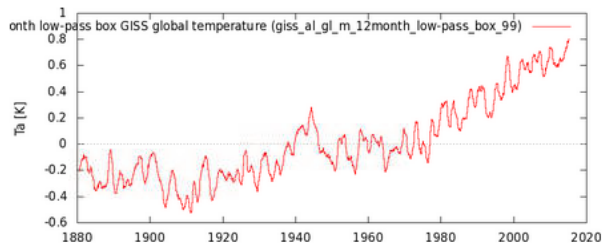
Some restrictions are in force, notably the possibility to define your own indices, to upload data into the Climate Explorer and to handle large datasets. If you want to use these features please [log in](#) or [register](#).

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field



News

19-oct-2015	Updated CRU TS to 3.23 with data up to 2014. #stations is not yet available.
17-oct-2015	Fixed a bug in the AMO time series generation, due to a language setting the global mean temperature was not subtracted correctly anymore.
14-oct-2015	The server has been saying it was too busy twice today for 10 minutes, but did not go down. The new precautions seem to be working. I could not find one cause for it, looks like just a very busy day.



Seasonal forecast verification tool

KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI search in the Climate Explorer

Help News About Contact Seasonal forecast verification Climate Change Atlas

Seasonal forecast verification

Monthly means

If you [register](#) or [log in](#) the form will remember its settings between sessions.

Make your choices

Forecast system

Select system

- ECMWF S3
- choose a seasonal forecast system
- ECMWF S3
- ECMWF S2
- UKMO GloSea
- NCEP CFS
- IRI ECHAM4.5
- Demeter Météo France
- Demeter CERFACS
- Demeter LODYC
- Demeter INGV
- Demeter ECMWF
- Demeter MPI
- Demeter UKMO
- Demeter all
- Demeter MF+EC+UK

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMP3+ scenario runs
- > Monthly CMP5 scenario runs
- > Annual CMP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

© KNMI

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.



Seasonal forecast verification tool

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Seasonal forecast verification

Monthly means

Make your choices

Forecast system: ECMWF S3
Members: all (1-11) | 1 | 11

Forecast initial conditions: 1 September

Variable: mean 2m temperature

Observations: ... 2.5°

Verification season: 1850-now anomalies: HadCRUT4 median Temperature

Verification period: 1880-now anomalies: GISS 250km

Area: 1880-now anomalies: NCDC v3.2.1

Measure: 1880-now anomalies: HadCRUT4 filled-in by Cowtan and Way

1850-2010 anomalies: CRUTEM4 Land

1880-now anomalies: GISS 250km

... 1200km

1880-now anomalies: NCDC v3.2.1

1948-now: CPC GHCN/CAMS t2m analysis (land) 0.5°

... 1.0°

... 2.5°

1901-2014: CRU TS3.23 (land) 0.5°

... 1.0°

... 2.5°

...#/cell

...#/value

1750-now: Berkeley 1° ...

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC Earth scenario runs
- > External data (ensembles, ncep, enact, sora, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3 1Sep T2m

- > Plot difference with a field
- > Compute mean, s.d. or extremes
- > Trends in extremes
- > Make EOFs
- > Correlate with a time series
- > Pointwise correlations with a field
 - > only observations
 - > only reanalyses
 - > only seasonal hindcasts
 - > only decadal hindcasts
 - > only CMIP5 scenario runs
 - > only user-defined fields

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°



Seasonal forecast verification tool

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Seasonal forecast verification

Monthly means

Make you choices

Forecast system: ECMWF S3
Members: all (1-11) 1 11

Forecast initial conditions: 1 September

Variable: mean 2m temperature

Observations: ...2.5°
Correct for bias in mean Detrend

Verification season: 3 -month season starting in October

Verification period: all (1981-2006) 1981 2006

Area: S.America

Measure: Correlation of the ensemble mean

Compute map

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP3 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3 1Sep T2m

- > Plot difference with a field
- > Compute mean, s.d. or extremes

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Verification: 3-month starting in October.



Seasonal forecast verification tool

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Seasonal forecast verification

Monthly means

Make you choices

Forecast system: ECMWF S3
Members: all (1-11) 1 11

Forecast initial conditions: 1 September

Variable: mean 2m temperature

Observations: ...2.5°
Correct for bias in mean Detrend

Verification season: 3 -month season starting in October

Verification period: all (1981-2006) 1981 2006

Area: S.America

Measure: Correlation of the ensemble mean

Compute map

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3

- 1Sep T2m**
- > Plot difference with a field
- > Compute mean, s.d. or extremes

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Verification: 3-month starting in October.
- Area: South America



Seasonal forecast verification tool

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Seasonal forecast verification

Monthly means

Make your choices

Forecast system	ECMWF S3
Members	<input checked="" type="radio"/> all (1-11) <input type="radio"/> 1 <input type="radio"/> 11
Forecast initial conditions	1 September
Variable	mean 2m temperature
Observations	...2.5° Correct for bias in mean <input type="checkbox"/> Detrend
Verification season	3 -month season starting in October
Verification period	<input checked="" type="radio"/> all (1981-2006) <input type="radio"/> 1981 <input type="radio"/> 2006
Area	S.America
Measure	Correlation of the ensemble mean

Compute map

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3 1Sep T2m

- > Plot difference with a field
- > Compute mean, s.d. or extremes

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Verification: 3-month starting in October.
- Area: South America
- Measure: 'correlation of ensemble mean'



Seasonal forecast verification tool

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Seasonal forecast verification

Monthly means

Make you choices

Forecast system: ECMWF S3
Members: all (1-11) 1 11

Forecast initial conditions: 1 September

Variable: mean 2m temperature

Observations: ...2.5°
Correct for bias in mean Detrend

Verification season: 3 -month season starting in October

Verification period: all (1981-2006) 1981 2006

Area: S.America

Measure: Correlation of the ensemble mean

Compute map

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

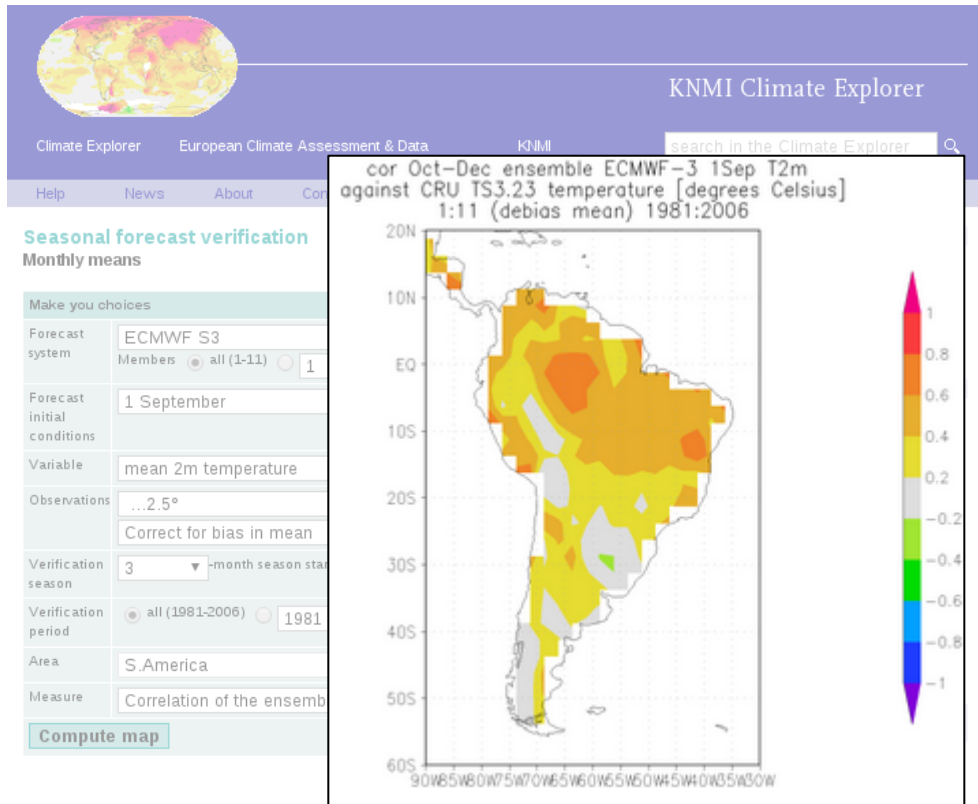
- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
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- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3 1Sep T2m

- > Plot difference with a field
- > Compute mean, s.d. or extremes

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Verification: 3-month starting in October.
- Area: South America
- Measure: 'correlation of ensemble mean'
- 'Compute map'

Seasonal forecast verification tool



- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions: 1 September
- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Verification: 3-month starting in October.
- Area: South America
- Measure: 'correlation of ensemble mean'
- 'Compute map'



Seasonal forecast verification tool

KNMI Climate Explorer

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search in the Climate Explorer

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Seasonal forecast verification

Monthly means

1974-now: NOAA Interpolated OLR OLR
=== Reanalyses ===
1979-now: ERA-interim Precipitation
1958-2002: 1.5° Precipitation
...2.5° ERA-40
1979-now: NCEP/DOE R2 Precipitation
1871-now: 20C Precipitation
perfect model

Correct for bias in mean Detrend

Make you choices

Forecast system: ECMWF S3
Members: all (1-11) 1 11

Forecast initial conditions: 1 September

Variable: precipitation

Observations: ...2.5°

Verification season: 3 month season starting in October

Verification period: all (1981-2006) 1981 2006

Area: S.America

Measure: Quintile RPSS wrt climatology
The BSS and RPSS include a bias correction for finite ensemble size

Compute map

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMP3+ scenario runs
- > Monthly CMP5 scenario runs
- > Annual CMP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

Investigate ensemble ECMWF-3 1Sep precipitation

- > Plot difference with a field
- > Compute mean, s.d. or extremes
- > Trends in extremes
- > Make EOFs
- > Correlate with a time series

- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Measure: 'Quintile RPSS wrt climatology'
- 'Compute map'



Seasonal forecast verification tool

KNMI Climate Explorer

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search in the Climate Explorer

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Seasonal forecast verification

Monthly means

Select a time series
> Daily station data
> Daily climate indices

1974-now: NOAA Interpolated OLR OLR
=== Reanalyses ===
1979-now: ERA-interim Precipitation
1958-2002: 1.5° Precipitation
...2.5° ERA-40
1979-now: NCEP/DOE R2 Precipitation
1871-now: 20C Precipitation
perfect model

Correct for bias in mean Determine

Make your choices

Forecast system: ECMWF S3
Members: all (1-11) 1 11

Forecast initial conditions: 1 September

Variable: precipitation

Observations: ...2.5°

Verification season: 3 months starting in Oct

Verification period: all (1981-2006) 1981 2006

Area: S. America

Measure: Quintile RPSS wrt climatology
The BSS and RPSS include a bias correction

Compute map

cor Oct-Dec ensemble ECMWF-3 1 Sep precipitation against CRU TS3.23 precipitation [mm/day] 1:11 (debias mean) 1981:2006

- Variable: mean 2m temperature
- Observations: CRU 2.5°
- Measure: 'Quintile RPSS wrt climatology'
- 'Compute map'.

Climate Change Atlas



KNMI Climate Explorer

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Help News About Contact Seasonal forecast verification **Climate Change Atlas**

Starting point

Welcome, anonymous user
Please enter the KNMI Climate Explorer, a research tool to investigate the climate. This web site collects a lot of climate data and analysis tools. Please verify yourself that the data you use is good enough for your purpose, and report errors back. In publications the original data source should be cited, a link to a web page describing the data is always provided.

Start by selecting a class of climate data from the right-hand menu. After you have selected the time series or fields of interest, you will be able to investigate it, correlate it to other data, and generate derived data from it.

If you are new it may be helpful to study the examples.

Share and enjoy!

Some restrictions are in force, notably the possibility to define your own indices, to upload data into the Climate Explorer and to handle large datasets. If you want to use these features please [log in](#) or [register](#).

Select a time series

- > Daily station data
- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

Select a field

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly decadal hindcasts
- > Monthly RCM runs
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly EC-Earth scenario runs
- > External data (ensembles, ncep, enact, soda, ecmwf, ...)
- > View, upload your field

News	
19-oct-2015	Updated CRU TS to 3.23 with data up to 2014. #stations is not yet available.
17-oct-2015	Fixed a bug in the AMO time series generation, due to a language setting the global mean temperature was not subtracted correctly anymore.
14-oct-2015	The server has been saying it was too busy twice today for 10 minutes, but did not go down. The new precautions seem to be working. I could not find one cause for it, looks like just a very busy day.

- Click “Climate Change Atlas”

Climate Change Atlas



KNMI Climate Explorer

Climate Explorer European Climate Assessment & Data KNMI search in the Climate Explorer

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KNMI Climate Change Atlas

Users are strongly advised to study the short introduction. Specific help is available under the [i](#) icons.

Select a region

Type: IPCC WG1 countries place box

IPCC WG1: World

Select a season

Season: First month Jan, length 12 months

Select a dataset and variable

Dataset: GCM: CMIP5 (IPCC AR5 Atlas subset)

Variable: near-surface temperature

absolute relative changes are shown

Output: map time series

Map options

Scenario: Historical + RCP4.5

Measure: Difference of two periods

Reference period: 1986 - 2005

Future period: 2081 - 2100

Mean/percentiles: mean

Make map May take up to 15 minutes the first time a season / measure is selected

Further information

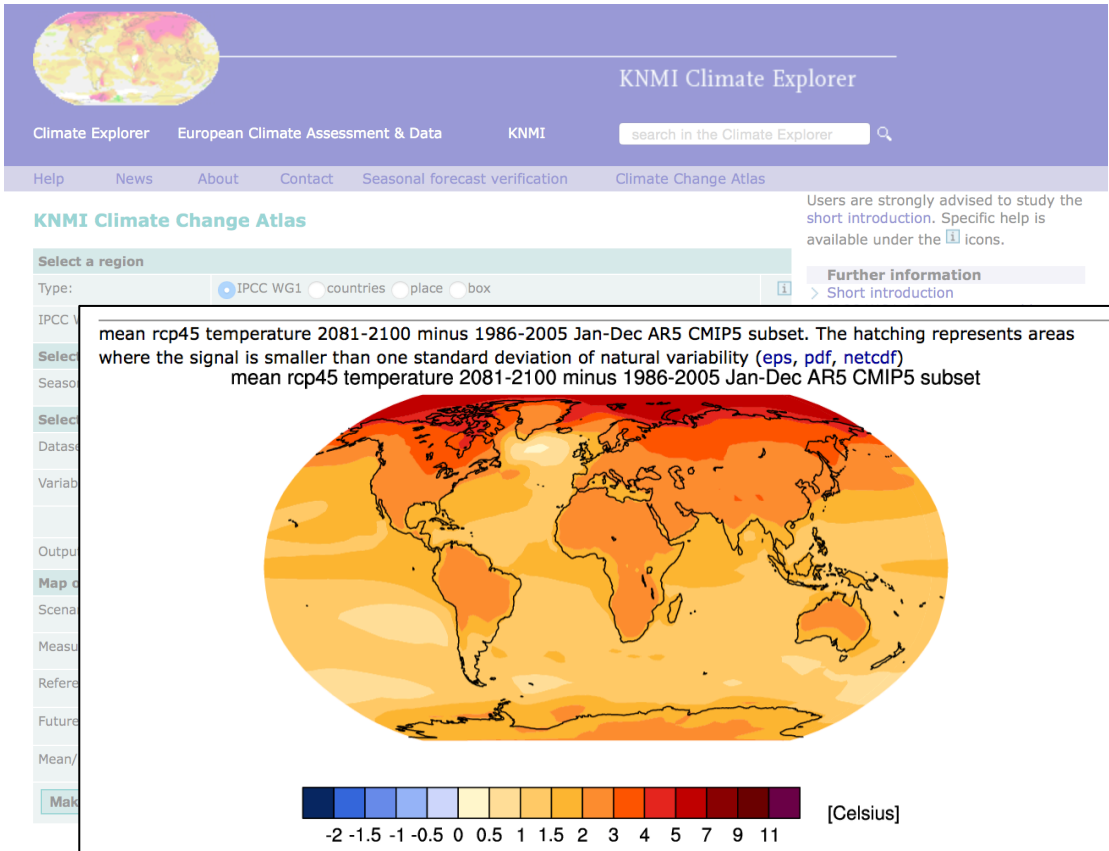
- > Short introduction
- > IPCC WG1 AR5 report, notably Annex I "Atlas"
- > CMIP5 co-ordinated climate model experiments
- > RCP scenario's

Funding

- > KNMI
- > Red Cross / Red Crescent Climate Centre
- > Dutch Ministry of Infrastructure and Environment, DGMI

- Click “Climate Change Atlas”
- Several different options... select the ones you want and click ‘Make map’.

Climate Change Atlas



- Click “Climate Change Atlas”
- Several different options... select the ones you want and click ‘Make map’.
- Global temperature change plot (from IPCC AR5) – very familiar... but what about particular regions?

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Select a region

Type: IPCC WG1 countries place box

IPCC WG1: South Europe/Mediterranean

Select a season

Season: First month Oct length 12 months

Select a dataset and variable

Dataset: GCM: CMIP5 (IPCC AR5 Atlas subset)

Variable: near-surface temperature

absolute relative changes are shown

Output: map time series

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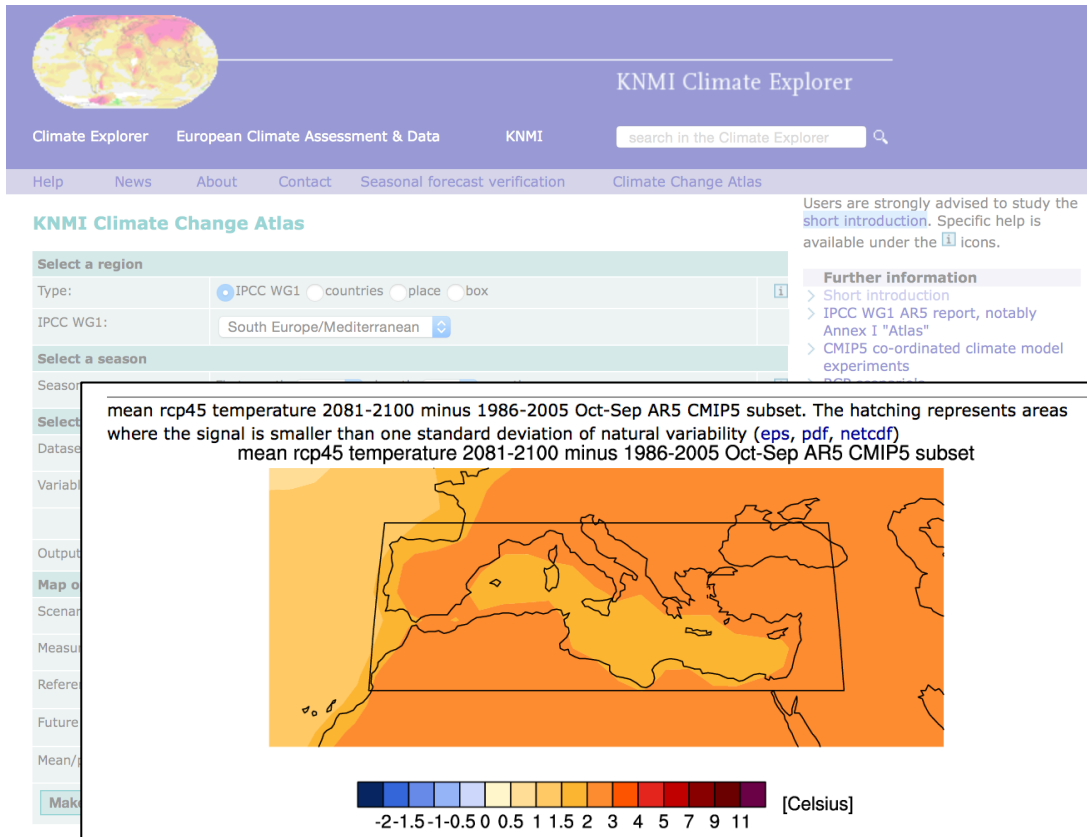
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- Select ‘South Europe/Mediterranean’ and ‘Make map’.

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Select a region

Type: IPCC WG1 countries place box

IPCC WG1: South Europe/Mediterranean

Select a season

Season: First month Sep, length 3 months

Select a dataset and variable

Dataset: GCM: CMIP5 (IPCC AR5 Atlas subset)

Variable: precipitation

absolute relative changes are shown

Output: map time series

Map options

Scenario: Historical + RCP4.5

Measure: Difference of two periods

Reference period: 1986 - 2005

Future period: 2081 - 2100

Mean/percentiles: mean

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- How about precipitation change?

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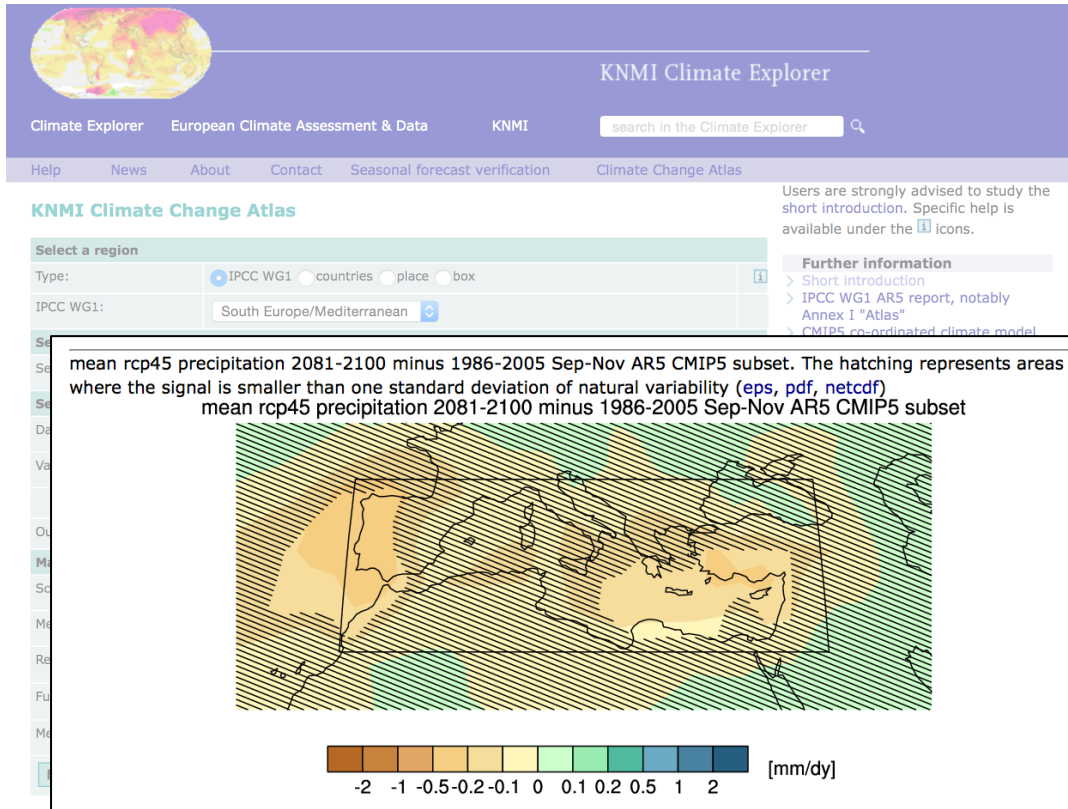
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- How about precipitation change?
- Select variable: 'precipitation' and 'Make map'.

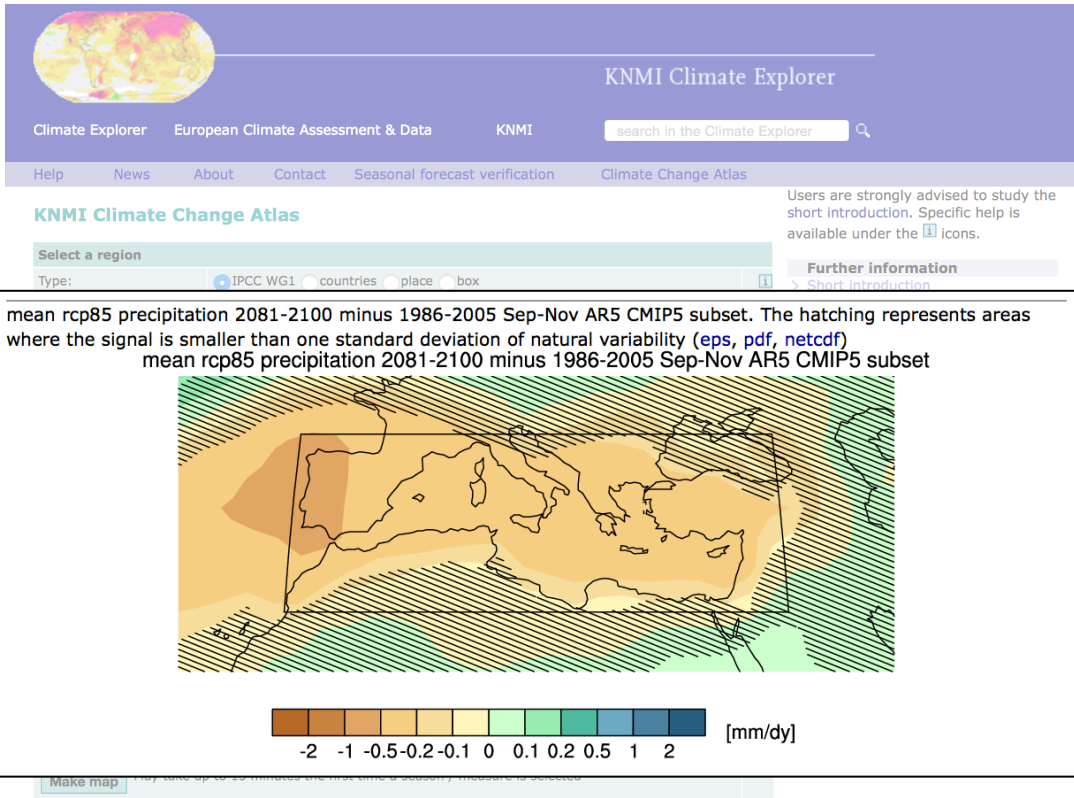


Climate Change Atlas



- How about precipitation change?
- Select variable: 'precipitation' and 'Make map'.
- The hatching represents areas where the signal-noise ratio is low.

Climate Change Atlas



- How about precipitation change?
- Select variable: 'precipitation' and 'Make map'.
- The hatching represents areas where the signal-noise ratio is low.
- We can also look at RCP8.5 where the signal is clearer.

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KNMI Climate Change Atlas

Select a region

Type: IPCC WG1 countries place box

Place: 40 °N - 3 °E

Select a season

Season: First month Sep, length 3 months

Select a dataset and variable

Dataset: GCM: CMIP5 (IPCC AR5 Atlas subset)

Variable: near-surface temperature

absolute relative changes are shown

Output: map time series

Time series options

Scenario(s): RCP2.6 RCP4.5 RCP6.0 RCP8.5

Plot period: 1900 - 2100

Anomalies: Take anomalies wrt 1986 - 2005 Full values

Transparency: on off

Make time series May take up to 15 minutes per scenario the first time a region is selected

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- We can also look at time series.

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Make time series May take up to 15 minutes per scenario the first time a region is selected

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- We can also look at time series.
- Select 'Place' and 40N 3E; approximate location of Madrid.

Climate Change Atlas



- We can also look at time series.
- Select 'Place' and 40N 3E; approximate location of Madrid.
- Select 'Variable': 'near surface temperature'.
- Select 'Output': time series.

Climate Change Atlas



- We can also look at time series.
- Select 'Place' and 40N 3E; approximate location of Madrid.
- Select 'Variable': 'near surface temperature'.
- Select 'Output': time series.
- I chose to look at all scenarios.

Climate Change Atlas



The screenshot shows the KNMI Climate Explorer interface. At the top, there is a search bar and navigation links. The main content area is divided into several sections:

- Select a region:** Type: IPCC WG1 countries place box. Place: 40 °N - 3 °E.
- Select a season:** Season: First month Sep, length 3 months.
- Select a dataset and variable:** Dataset: GCM: CMIP5 (IPCC AR5 Atlas subset). Variable: near-surface temperature. absolute relative changes are shown. Output: map time series.
- Time series options:** Scenario(s): RCP2.6 RCP4.5 RCP6.0 RCP8.5. Plot period: 1900 - 2100. Anomalies: Take anomalies wrt 1986 - 2005 Full values. Transparency: on off.

A red arrow points to the RCP8.5 checkbox in the 'Time series options' section. Below the form, there is a 'Make time series' button and a note: 'May take up to 15 minutes per scenario the first time a region is selected'.

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- We can also look at time series.
- Select 'Place' and 40N 3E; approximate location of Madrid.
- Select 'Variable': 'near surface temperature'.
- Select 'Output': time series.
- I chose to look at all scenarios.
- **WARNING:** don't do this yourself as the calculations will take 10-15 mins.



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Select a region

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Place: 40 °N - 3 °E

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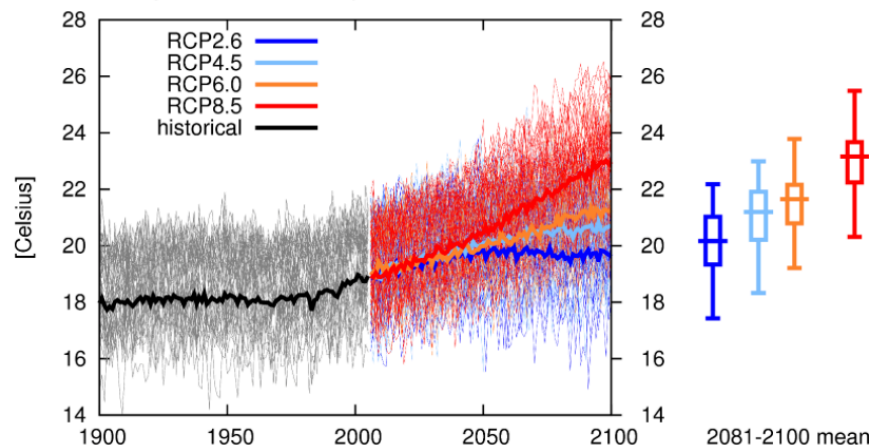
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- We can also look at time series.
- Select 'Place' and 40N 3E; approximate location of Madrid.
- Select 'Variable': 'near surface temperature'.

Temperature 40N, 3E Sep-Nov AR5 CMIP5 subset. On the left, for each scenario one line per model is shown plus the multi-model mean, on the right percentiles of the whole dataset: the box extends from 25% to 75%, the whiskers from 5% to 95% and the horizontal line denotes the median (50%). ([png](#), [eps](#), [pdf](#), [plotscript](#), [all data](#), [means](#))

Temperature 40N, 3E Sep-Nov AR5 CMIP5 subset



output': time series.
 to look at all
 ;.
 G: don't do this
 as the calculations
 10-15 mins.



The future of the Climate Explorer

- We hope that you find the Climate Explorer useful... its future development is driven by its users.
- Statistical functions are usually added on an ad-hoc basis... and often as a result of user feedback!
- Addition of hindcasts from ECMWF Season Forecast System 4.
- Possibility of dedicated funding at KNMI for future development...



Thank you



jonathan.eden@knmi.nl

geert.jan.van.oldenborgh@knmi.nl