

Royal Netherlands Meteorological Institute Ministry of Infrastructure and the Environment

KNMI Climate Explorer A tool for climate analysis [...and seasonal prediction]

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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



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 - 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!

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climexp.knmi.nl

Getting started – registration!



Monthly station data Monthly climate indices

Annual climate indices

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. Af 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

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 of indices, to upload data into the Climate Explorer and to handle large of If you want to use these features please log in or register.



> View, upload your time series KNMI Climate Explorer Climate Explorer European Climate Assessment & Data KNM search in the Climate Explorer Climate Change Atlas Help News About Contact Seasonal forecast verification Register or log in Select a time series > Daily station data > Daily climate indices Please register as a user so that can trace usage of the system, and mail you if I find bugs. If > Monthly station data 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 > Monthly climate indices > Annual climate indices upload your own data and to use large datasets) are then disabled. As a registered user > View, upload your time series many forms remember their settings for a few days. Select a field Register / Log in > Daily fields E-mail address your e-mail address > Monthly observations > Monthly reanalysis fields Name vour real name (only first time) > Monthly and seasonal historical Institute reconstructions > Monthly seasonal hindcasts register/log in > 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



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

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.



What data is available?



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- Reanalysis products.
- Climate model output.
- Seasonal forecasts.
- Decadal forecasts.
- Possibility to upload and view your own data.

Some examples...

Click on monthly station data.

			KNMI Climate Explorer
Climate Explorer Europe	an Climate Assessment & Da	ta KNMI	search in the Climate Explorer
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- Click on monthly station data.
- The GHCN-M (all)
 - 'precipitation' .

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

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Get stations Clear Form

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

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- Get stations
- 'get data'

> Spectrum, autocorrelation function

> Wavelet

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

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- The August plot reveals decadal variability: drier in the 1970s and 1980s.
- Click 'correlate withother time series.

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scale:		> Running mean/s.d./skew/curtosis

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

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

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Correlat	e		 > Trends in return times of extremes > Plot and fit distribution

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

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- Starting month: Jul; average over 3 months.
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- Correlate is significant but weak.

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- 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'.

- Is there a relationship between rainfall and ENSO?
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- Select HadCRU4 temperature.

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previous years

- 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.

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1880-now anomalies: GISS 250km, 1200km Image: Select a field 1880-now anomalies: NCDC v3.2.1 Image: Select a field Nonthly conservations 1850-now anomalies: HadCRUT4 filled-in by Cowtan and Way Image: Select a field Nonthly conservations 1850-now anomalies: HadCRUT4 filled-in by Cowtan and Way Image: Select a field Nonthly conservations Land 1850-2010 anomalies: CRUTEM4 Image: Select a field Nonthly conservations 1880-now anomalies: GISS 250km, 1200km Image: Select a field Nonthly conservations 1880-now anomalies: NCDC v3.2.1 Image: Select a field Nonthly cMIP3 + scenario runs 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Image: Select a field 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Image: Select a field 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Image: Select a field 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Image: Select a field 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Image: Select a field	Temperature	1850-now anomalies: 💿 HadCRUT4 median,	Annual climate indices New unload your time series
1880-now anomalies: NCDC v3.2.1 NCDC v3.2.1 1850-now anomalies: HadCRUT4 filled-in by Cowtan and Way Nonthly reanalysis fields 1850-now anomalies: CRUTEM4 Nonthly reanalysis fields 1880-now anomalies: CRUTEM4 Nonthly reanalysis fields 1880-now anomalies: CRUTEM4 Nonthly desconal historical reconstructions 1880-now anomalies: OKCDC v3.2.1 Nonthly descala hindcasts 1880-now anomalies: NCDC v3.2.1 Nonthly CMIP5 scenario runs 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Nonthly EC-Earth scenario runs 2.5* Xeternal data (ensembles, ncep), Nonthly EC-Earth scenario runs Scetternal data (ensembles, ncep),		1880-now anomalies: GISS 🔵 250km, 🔵 1200km	i Select a field
1850-now anomalies: HadCRUT4 filled-in by Cowtan and Way Image: Solution of the second historical reconstructions Land 1850-2010 anomalies: CRUTEM4 Image: Solution of the second historical reconstructions 1880-now anomalies: CRUTEM4 Image: Solution of the second historical reconstructions 1880-now anomalies: NCDC v3.2.1 Image: Solution of the second runs 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, 2.5* 1001-2014 GBU 152 22 (land) 0.05*, 0.10*, Image: Solution of the second runs 1001-2014 GBU 152 22 (land) 0.05*, 0.10*, Image: Solution of the second runs Solution runs		1880-now anomalies: 🔵 NCDC v3.2.1	i > Daily fields
Land 1850-2010 anomalies: CRUTEM4 I 1880-now anomalies: GISS 250km, 1200km Monthly seasonal hindcasts 1880-now anomalies: NCDC v3.2.1 Monthly CMIP3+ scenario runs 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5*, 1.0*, Monthly EC-Earth scenario runs 2.5* Monthly EC2 and data (ensembles, ncep, total) Offset analysis, ncep, total Monthly EC-Earth scenario runs		1850-now anomalies: 🔵 HadCRUT4 filled-in by Cowtan and Way	Monthly observations Monthly reanalysis fields
1880-now anomalies: GISS 250 km. 1200 km > Monthly seasonal hindcasts 1880-now anomalies: NCDC v3.2.1 > Monthly CMIP3+ scenario runs 1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5°. 1.0°. > 2.5° > Monthly EC-Earth scenario runs > Monthly EC-Earth scenario runs 1001-3014: CMIP5 action runs > Monthly EC-Earth scenario runs	Land	1850-2010 anomalies: 😑 CRUTEM4	 Monthly and seasonal historical reconstructions
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1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5°. 1.0°. Image: Second control of the second control		1880-now anomalies: ONCDC v3.2.1	Monthly KCM runs Monthly CMIP3+ scenario runs
1001 2014: CBU TS2 22 (Josef) 0 55: 0 105: 0 255: 0 #Josef D > External data (ensembles, ncep,		1948-now: CPC GHCN/CAMS 12m analysis (land) 0.5°, 1.0°, 2.5°	S Monthly CMIP5 scenario runs Annual CMIP5 extremes Monthly EC-Earth scenario runs
			External data (ensembles, ncep, enal)

Options

options		
Starting month:	Jul 🔻 of timeseries 🔻	i
Season:	averaging ▼ over 3 ▼ month(s) of the timeseries same ▼	
	month(s) of the field,	
Anomalies:	subtract seasonal cycle	i
Lag:	3 Tomonths	
	(lag positive: GHCN_v2_precipitation_(all) TOMBOUCTOU lagging field)	i
Years:	-	i
Only for:	< field selected above <	
	< GHCN_v2_precipitation_(all) TOMBOUCTOU <	i
Apply:	logarithm, sqrt to GHCN_v2_precipitation_(all) TOMBOUCTOU	i
Output:	rank correlation	i
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		

- 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'.

- 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'.

	KNMI Climate Explorer
limate Explorer European Climate Assessment & Data KNMI	search in the Climate Explorer
elp News About Contact Seasonal forecast verification	Climate Change Atlas
Velcome, anonymous user lease enter the KNMI Climate Explorer, a research tool to investigate the limate. This web site collects a lot of climate data and analysis tools. Please erify yourself that the data you use is good enough for your purpose, and aport errors back. In publications the original data source should be cited, a nk to a web page describing the data is always provided. tart by selecting a class of climate data from the right-hand menu. After you ave 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. hare and enjoy! ome restrictions are in force, notably the possibility to define your own idices, to upload data into the Climate Explorer and to handle large datasets 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 decadal hindcasts > Monthly RCM runs > Monthly RCM runs > Monthly CMIP3+ scenario runs > Monthly CMIP3 scenario runs
nth $\log^{-1} pass box GISS global temperature (giss_al_gl_m_12month_low-pass_box_99)$ $\otimes^{-1} 0.8$ $\otimes^{-1} 0.2$ 0.2 0.4 0.6 0.4 0.2 0.4 0.6 0.4 0.2 0.4 0.6 0.4 0.2 0.4 0.6 0.4 0.2 0.4 0.6 0.4 0.2 0.4 0.6 0.4 0.2 0.4 0.5 0.4 0.2 0.4 0.4 0.5 0.4 0.2 0.4 0.2 0.4 0.4 0.2 0.4 0.4 0.2 0.4	 Annual CMIPS extremes Monthly EC-Earth scenario runs External data (ensembles, ncep, enact, soda, ecmwf,) View, upload your field

19-oct-2015 Updated CRU TS to 3.23 with data up to 2014. #stations is not

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

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.

yet available.

busy day.

News

• Select 'monthly observations.'

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 t2m 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: 1º Reynolds OI v2 SST, v1	i					
	1980-now: TAO buoys SST, Air Temperature	i					
Air Temperature	1880-2010: HadNMAT2, anomalies, large-scale uncertainties, (1856-002 HadMAT1)	i					
	1800-2007: 2° ICOADS v2.5 Tair, number of obs	i					
Lower Troposphere	1979-now: Spencer & Christy MSU anomalies v5.6 (v6.01-eta3)	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° anly observations: 1° 2.5°	i					

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

		KNMI Climate Ext	olorer
Climate Explorer European Climate Assessm	nent&Data KNMI	search in the Climate Exu	plorer
Help News About Contact	Seasonal forecast verification	on Climate Change Atlas	
Field GPCC V7 2.5 precipitation SPCC Full Data Product version 7, precipitation in X axis: whole world in 144 2.50° steps, first point Y axis: regular grid with 72 -2.50° steps, first point Y axis: regular grid with 72 -2.50° steps, first point Oracional (Variable p (full data precipitation version?) in mm/r Get grid points, average area or generate s Mask: no mask ▼ add a mask Latitude: "N - "N Longitude: "E - "E Boundaries: halfway grid points ▼ Make: @ average ③ set of grid Demand at least: 30 % avail points in this reference Apply monthly high/Now-pass filter	mm/month, 2.5 degree at 178.75' W, last point at 178.75' t at 88.75' N, last point at 88.75' S (1356 months) month subset k to the list points O subset of the field egion	Select a time series > Daily station data > Daily climate indices > Monthly station data > Monthly climate indices > Monthly observations > Monthly observations > Monthly beservations > Monthly easonal bindcast > Monthly Recadal bindcasts > Monthly CMIP5 scenarior or > Monthly CMIP5 externes > Monthly CLP5 stermes > Monthly CLP5 externes > Monthly CLP3 th scenarior > Monthly CLP3 th scenarior > Sternal data (ensembles, soda, ecrwrf,) > View, upload your field	ries orical ts s uns or uns ncep, enact
high-pass ▼ running-mean ▼ filter cut-off value 1 ▼ months requiring at least 75 % valid data Filter consecutive months		Investigate this field > Plot this field > Plot this field > Compute mean, s.d. or ext > Trends in extremes > Make EOFs > Correlate with a time serie	remes s
high-pass ▼ running-mean ▼ filter cut-off value 1 ▼ years requiring at least 75 % valid data Filter consecutive years Create a field with lower time resolution		 > Pointwise correlations with > only observations > only reanalyses > only reanalyses > only decadal hindcasts > only CMIP5 scenario ru > only USer-defined field > Spatial correlations with a > only observations 	h a field :s : ns s field
New time scale: annual (Jul-Jun) New variable: mean of precipitation Threshold: no cut Minimum: % valid data First apply: 1 -month running mean Missing data: ignore, climatology, Make new field getfieldtype: please ask me to add "p" to the lists i	on mm/month trend, persistence.	 > only reanalyses > only seasonal hindcasts > only decadal hindcasts > only User-defined fields > SVD > only observations > only reanalyses > only ceasonal hindcasts > Verify field against observ 	s ns s s rs s vations

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

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

GPCC V7 2.5 precipitation

System-define	d monthly timeseries	i
<u>— NINO3</u>	NINO3.4 ONINO4 OSOI ONAO OCO2 OGMST Otime	
User-defined n	nonthly timeseries	i
Plot options		
	• correlation • covariance • significance	
Variable	regression (error) reverse	
	Composite (Cerror)	
Downwal at	extreme dependence measures $\bigcup \chi$, $\bigcup \chi$ bar, threshold 90 %	
least	% valid points	
Map type:	default Trojection	
Region:	°N to °N, °E to °E in a lat-lon ▼	E
	plot	
Contours:	to mask out ▼ : p>10 %	
Colours:	blue-grey-red 🔻	
Shading:	\bigcirc shading and contours $\ ullet$ shading $\ igcap$ contours $\ igcap$ grid boxes	
Plot options:	🗌 no color bar 📃 no title on plot, 📃 no grid	
	label distance 💦 × 🔤 ° or 📃 no labels	
Output to:	● browser 🦳 Google Earth (kml) 💛 GIS (geotiff)	E
Options		
Starting month	Oct 🔻 of selected field 🔻 🥌	
Season:	averaging vover 3 v month(s) of the selected field same v month(s) of the time series.	
Anomalies:	subtract seasonal cycle	E
Lag:	0 T months	
	(lag positive: field GPCC V7 2.5 precipitation lagging time series)	
Years:		
Only for:	< time series selected above <	
	< field <	
Apply:	logarithm, sqrt to field GPCC V7 2.5 precipitation	
Output:	rank correlation	
Detrend:	detrend everything	
Filters:	take year-on-year differences	
	subtract mean of 🔻 previous years	
Running correlation:	show/hide running correlation options	
Fit:	💌 straight line, 🔍 parabola,	E
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 Trands 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

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

GPCC V7 2.5 precipitation

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 i > 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 reanaly > only seasonal hindcasts decadal hindcasts nly 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 i > 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'.

- 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.

)				KNMI Climate Explorer
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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.

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.

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
- \geq Monthly EC-Earth scenario runs
- > External data (ensembles, ncep,
 - enact, soda, ecmwf, ...)
- \succ View, upload your field

Click 'seasonal forecast verification'.

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

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Seasonal Monthly mea Make you cha	forecast verification Ins		Select a time series > Daily station data > Daily climate indices > Monthly station data > Monthly climate indices
Forecast System	ECMWFS3 Members () all (1-11) () 1 ()	T 11 T	 > Annual climate indices > View, upload your time series
Foreca t nitial conditi ns variabl : Dbserv tions verific: tion verific: tion period Area	1 September mean 2m temperature ▼ 2.5° Select a verifying field === Observations === 1850-now anomalies: HadCR 1880-now anomalies: GISS 2 1200km 1880-now anomalies: NCDC v 1850-now anomalies: NCDC v 1850-now anomalies: CRUT	▼ UT4 median Temperature 50km /3.2.1 CRUT4 filled-in by Cowtan and Wa	Select a field > Daily fields > Monthly canalysis fields > Monthly reanalysis fields > Monthly reanalysis fields > Monthly and seasonal historical reconstructions > Monthly decadal hindcasts > Monthly RCM runs > Monthly CMIP3+ scenario runs > Monthly CMIP3 corrange runs > Monthly CMIP3 corrange runs > Monthly CMIP5 scenario runs > Annual CMIP5 scenario runs > Monthly CMIP5 scenario runs > View, upload your field
Compute	1880-now anomalies: CROF 1880-now anomalies: GISS 2 1200km 1880-now anomalies: NCDC v 1948-now: CPC GHCN/CAMS 1.0° 2.5° 1901-2014: CRU TS3.23 (land 1.0° 2.5° #/cell #/value 1750-now: Berkeley 1°	50km /3.2.1 5 t2m analysis (land) 0.5° d) 0.5°	Investigate ensemble ECMWF-3 ISep 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 reanalyses > only reanalyses > only decadal hindcasts > only CMIP5 scenario runs > only CMIP5 scenario runs

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

Climate Exp	lorer European Climate Assessment & Data KNMI	KNMI Climate Explorer
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Seasonal Monthly me	forecast verification ans	Select a time series > Daily station data > Daily climate indices > Monthly station data
Make you ch	oices	> Monthly climate indices
Forecast system	ECMWF S3 • Members @ all (1-11) 1 • 11 •	 > Annual climate indices > View, upload your time series
Forecast	1 Sentember	Select a field
initial conditions	1 September	Daily fields Monthly observations Monthly reanalysis fields
Variable	mean 2m temperature	 Monthly and seasonal historical reconstructions
Observations	2.5°	 Monthly seasonal hindcasts
	Correct for bias in mean 🔹 📄 Detrend	> Monthly decadal hindcasts > Monthly RCM runs
Verification season	3 • -month season starting in October •	 Monthly CMIP3+ scenario runs Monthly CMIP5 scenario runs
Verification period	● all (1981-2006) ○ 1981 ▼ ⁻ 2006 ▼	 Annual Chin S statemes Monthly EC-Earth scenario runs External data (ensembles, ncep, enact,
Area	S.America 🔻	soda, ecmwf,) > View, upload your field
Measure	Correlation of the ensemble mean	Investigate ensemble ECMWF-3
Compute	e map	1Sep T2m > Plot difference with a field
		Compute mean is di 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.

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Seasonal Monthly me	forecast verification ans	Select a time series > Daily station data > Daily climate indices > Meethky station data
Make you ch	oices	 Monthly station data Monthly climate indices
Forecast	ECMWF S3	> Annual climate indices
system	Members 💿 all (1-11) 💿 1 🔻 - 11 🔻	> view, upload your time series
Forecast	1 September	Select a field
initial		Monthly observations
conditions		> Monthly reanalysis fields
Variable	mean 2m temperature	 Monthly and seasonal historical reconstructions
Observations	2.5°	Monthly seasonal hindcasts
	Correct for bias in mean 🔻 🕞 Detrend	Monthly decadal hindcasts Monthly BCM runs
Verification	2 -month season starting in October	 Monthly CMIP3+ scenario runs
eason	CCCOper +	> Monthly CMIP5 scenario runs
Verific ation	● all (1981-2006) ● 1981 ▼ - 2006 ▼	 Annual CMIP5 extremes Monthly EC-Earth scenario runs
period	1001 . 2000 .	 External data (ensembles, ncep, enact,
Area	S.America	soda, ecmwf,)
Measure	Correlation of the ensemble mean	y trow, oproce your note
0		Investigate ensemble ECMWF-3
Compute	map	> 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

		K	NMI Climate Explorer
Climate Expl	orer European Climate Assessment & Data H	3NMI se	earch in the Climate Explorer
Help	News About Contact Seasonal forecast v	erification Clim	nate Change Atlas
Seasonal Monthly me Make you ch	forecast verification ans oices		Select a time series > Daily station data > Daily climate indices > Monthly station data > Monthly climate indices
Forecast system	ECMWF S3 V Members • all (1-11) • 1 • 11 •		 > Annual climate indices > View, upload your time series
Forecast initial conditions	1 September		Select a field > Daily fields > Monthly observations Monthly exception fields
Variable	mean 2m temperature		 Monthly reanalysis fields Monthly and seasonal historical reconstructions
Observations	2.5° Correct for bias in mean	•	 Monthly seasonal hindcasts Monthly decadal hindcasts Monthly RCM runs
Verification season	3 ▼ -month season starting in October ▼		> Monthly CMIP3+ scenario runs > Monthly CMIP5 scenario runs
Verification period	● all (1981-2006) ○ 1981 ▼ - 2006 ▼		 Annual CMIP5 extremes Monthly EC-Earth scenario runs External data (ensembles, ncep, enal
Area	S.America 🔻		soda, ecmwf,) > View, upload your field
Measure	Correlation of the ensemble mean		Investigate ensemble ECMWF-3 1Sep T2m
Compate	map		 > 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'

Climate Expl	orer European Climate Assessment & Data KNMI	search in the Climate Explorer
Help	News About Contact Seasonal forecast verification	Climate Change Atlas
easonal onthly me	forecast verification ans	Select a time series > Daily station data > Daily climate indices
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orecast /stem	ECMWF S3 V Membes all (1-11) 1 V - 11 V	 > Annual climate indices > View, upload your time series
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ariable	mean 2m temperature 🔻	> Monthly and seasonal historical
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e as u re	Correlation of the ensemble mean	y view, upload your neid
Comnute	man	1Sep T2m
oompate		> Plot difference with a field
		> Compute mean, s.d. or extremes

- Click 'seasonal forecast verification'.
- Select 'ECMWF S3' and click.
- Initial conditions:
 1 September
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- Measure: 'correlation of ensemble mean'
- 'Compute map'

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- 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'

						KNMI Cli	mate Explorer
Clim	ate Explorer	European Climate	Assessment &	Data	KNMI	search in the	Climate Explorer 🤇
Help	News	About	Contact S	Seasonal forecast	verification	Climate Change	Atlas
Seasonal Monthly me: 1974-now: N === Reanalys 1979-now: EF 1958-2002: 1	forecast ve ans OAA Interpolated es === RA-interim Precip 5° Precipitation	d OLR OLR					Select a time series > Daily station data > Daily climate indices > Monthly station data > Monthly climate indices > Annual climate indices > View, upload your time series
2.5° ERA-4 1979-now: NO 1871-now: 20 perfect model Correct for	0 CEP/DOE R2 Pre- DC Precipitation I bias in mean	cipitation T	Detrend				Select a field > Daily fields > Monthly observations > Monthly reanalysis fields > Monthly and seasonal historical reconstructions > Monthly account
Make you ch	oices						hindcasts
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/ariab <mark>e</mark>	precipitation	•	'				runs
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Verification period) ali (1981-20	006) 🔵 1981 🔻	2006 ▼				Investigate ensemble ECMWF-3 1Sep
Area.	S.America		•				> Plot difference with a field
/leasure	Quintile RPS The BSS and R	SS wrt climatolo PSS include a bias	gy correction for fi	▼ nite ensemble size			 Compute mean, s.d. or extremes Trends in extremes
Compute	map						> Make EOFs > Correlate with a time

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

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

busy day.

Click "Climate Change Atlas"

- Click "Climate Change Atlas"
- Several different options... select the ones you want and click 'Make map'.

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- Global temperature change plot (from IPCC AR5) – very familiar... but what about particular regions?

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- 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?
- Select 'South Europe/ Mediterranean' and 'Make map'.

- 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?
- Select 'South Europe/ Mediterranean' and 'Make map'.

	<u></u>	KNMI Climate E	Explorer
Climate Explorer	European Climate Assessment & Data KNMI	search in the Climate I	Explorer
Help News	About Contact Seasonal forecast verification	Climate Change Atlas	
KNMI Climate	e Change Atlas		Users are strongly advised to study the short introduction. Specific help is available under the 🗊 icons.
Select a region			Further information
Type:	• IPCC WG1 _ countries _ place _ box	[Short introduction
IPCC WG1:	South Europe/Mediterranean		> IPCC WG1 AR5 report, notably Annex I "Atlas"
Select a season			 CMIPS co-ordinated climate model experiments
Season:	First month Sep ᅌ , length 3 ᅌ months	[1 > RCP scenario's
Select a dataset a	nd variable		Funding
Dataset:	GCM: CMIP5 (IPCC AR5 Atlas subset)	[KNM1 Red Cross / Red Crescent Climate Control
Variable:	precipitation	[Dutch Ministry of Infrastructure and Environment_DCMI
	• absolute relative changes are shown	[i
Output:	• map time series	[i
Map options			
Scenario:	Historical + RCP4.5	[1
Measure:	Difference of two periods ᅌ	[1
Reference period:	1986 - 2005		
Future period:	2081 - 2100		
Mean/percentiles:	mean 📀	[1
Make map May	take up to 15 minutes the first time a season / measure is selected		
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• How about precipitation change?

Climate Explorer	uronean Climate Ascessment & Data KNMI	KNMI Climate Explorer
Help News	About Contact Seasonal forecast verification	Climate Change Atlas
KNMI Climate C	hange Atlas	Users are strongly advised to study th short introduction. Specific help is available under the I icons.
Select a region Type: IPCC WG1: Select a season Season:	IPCC WG1 countries place box South Europe/Mediterranean First month con Ox length a C months	Further information Short introduction Short introduction Short introduction PiPCC WcI ARS report, notably Annex I "Atlas" CMIP5 co-ordinated clinate model experiments Sconfors
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Output:	• map time series	i
Scenario:	Historical + RCP4.5	I
Measure:	Difference of two periods	(I)
Reference period:	1986 - 2005	
Future period:	2081 - 2100	
Mean/percentiles: Make map May take	mean 📀	

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

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

- 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.

	<u>}</u>	KNMI Climate I	Explorer
Climate Explorer	European Climate Assessment & Data KNMI	search in the Climate	Explorer
Help News	About Contact Seasonal forecast verification	Climate Change Atlas	
KNMI Climato	e Change Atlas		Users are strongly advised to study the short introduction. Specific help is available under the 1 icons.
Select a region			Further information
Туре:	IPCC WG1 countries oplace box		Short introduction
Place:	40 °N - 3 °E		 Annex I "Atlas" AMUSE as ardiasted climate model
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Season:	First month Sep ᅌ , length 3 ᅌ months	1	i > RCP scenario's
Select a dataset a	nd variable		Funding
Dataset:	GCM: CMIP5 (IPCC AR5 Atlas subset)		KNMI Red Cross / Red Crescent Climate Centre
Variable:	near-surface temperature		Dutch Ministry of Infrastructure and Environment, DGMI
	 absolute relative changes are shown 	1	i
Output:	map otime series		i
Time series optio	ns		
Scenario(s):	✓ RCP2.6 ✓ RCP4.5 ✓ RCP6.0 ✓ RCP8.5	1	1
Plot period:	1900 - 2100		
Anomalies:	Take anomalies wrt 1986 - 2005 Full values		i
Transparency:	on off		i
Make time series	May take up to 15 minutes per scenario the first time a region is	selected	

We can also look at time series.

KNMI Climate Explorer				
Climate Explorer	European Climate Assessment & Data KNMI	search in the Climate E	xplorer	
Help News	About Contact Seasonal forecast verification	Climate Change Atlas		
KNMI Climate	Change Atlas		Users are strongly advised to study the short introduction. Specific help is available under the i icons.	
Select a region			Further information	
Туре:	IPCC WG1 countries place box	Li .	Short introduction	
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Season:	First month Sep 📀 , length 3 📀 months	0	RCP scenario's	
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Output:	map otime series	6		
Time series options				
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Plot period:	1900 - 2100			
Anomalies:	Take anomalies wrt 1986 - 2005 Full values	Ū		
Transparency:	on off	6		
Make time series	May take up to 15 minutes per scenario the first time a region is s	elected		

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

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Help News	About Contact Seasonal forecast verification	Climate Change Atlas	
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Select a region			Further information
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Make time series	May take up to 15 minutes per scenario the first time a region i	is selected	

- 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.

KNMI Climate Explorer				
Climate Explorer	European Climate Assessment & Data KNMI	search in the Climate Ex	xplorer Q	
Help News	About Contact Seasonal forecast verification	Climate Change Atlas		
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Make time series	May take up to 15 minutes per scenario the first time a region is	selected		

- 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 Explorer European Climate Assessment & Data KNMI Search in the			mate Explorer	
Help News	About Contact Seasonal forecast verification	Climate Change Atlas		
KNMI Climate	Change Atlas		Users are strongly advised to study the short introduction. Specific help is available under the 🚺 icons.	
Select a region				
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Make time series	May take up to 15 minutes per scenario the first time a region is so	elected		

- 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.

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

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