Global Seasonal Climate Update
November 2013

Summary

Prediction Summary: December 2013-February 2014

A neutral ENSO state is predicted during Dec-Feb 2013-14, although sea surface temperatures are expected to be slightly warmer than average in the west-central tropical Pacific. Pacific sea surface temperatures are also predicted to be above average over substantial parts of the mid-latitudes of both hemispheres, in the south tropical Indian Ocean and in the subtropical North Atlantic Ocean. Consistent with the predicted neutral ENSO state, the forecast indicates few strong or spatially extensive signals for precipitation. However, some noteworthy signals for temperature are present. These predominantly indicate raised probability of above normal (as expected with global warming and a "baseline" of 1983-2001) but noteworthy probabilities for below normal are also indicated in some regions.

Probabilities lean towards above normal 2 metre temperature in Europe, Indonesia, the western tropical Pacific islands, most of northern Asia, Africa and South America, and some portions of Australia and southern North America. A tendency towards below normal temperature is predicted over part of northwestern North America and over small portions of southern Asia.

A tilt of the odds towards above normal precipitation is forecast for portions of Indonesia, the western tropical Pacific islands, portions of Central America, the Caribbean and west-central South America. Above normal precipitation is also favoured in scattered areas across central Asia and northern and northwestern North America. A tendency towards below normal precipitation is noted in northern southeast Asia, eastern equatorial South America and southern Africa. The west coast of mid-latitude North America also shows an enhanced probability for below normal precipitation.

In addition to the near-average ENSO-related sea surface temperatures, sea surface temperatures across the tropical Indian Ocean and in the northern and southern tropical Atlantic are also predicted to be near average during December 2013 to February 2014. Hence, except for the slightly above-average sea surface temperatures expected in the west-central tropical Pacific, tropical sea temperatures are expected to be near average for the period.

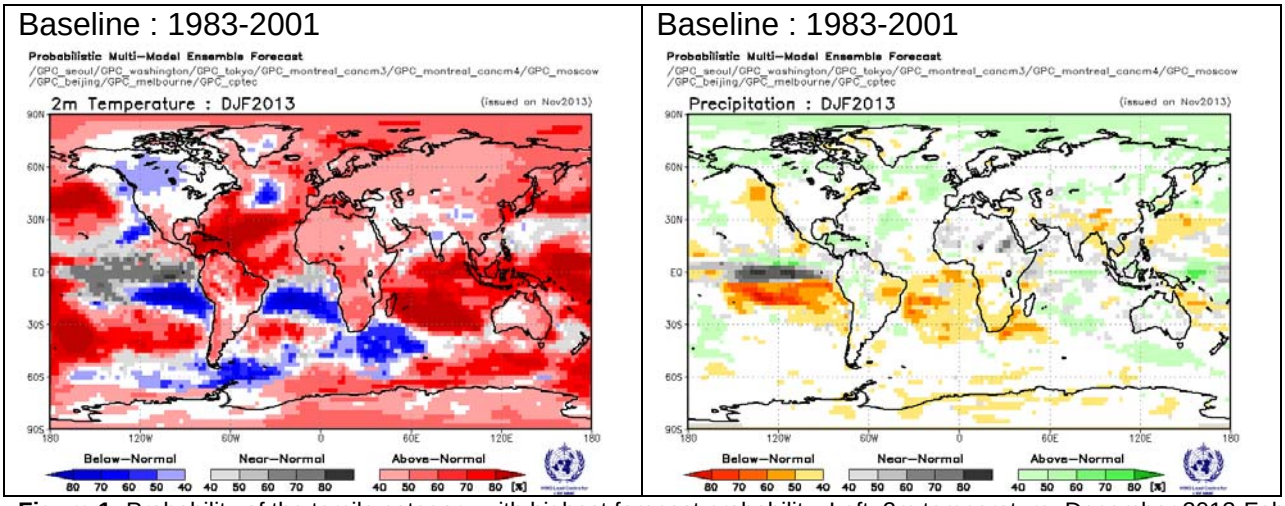


Figure 1: Probability of the tercile category with highest forecast probability. Left: 2m temperature, December 2013-February 2014. Blue shading: below-normal most likely; red shading: above-normal most likely; grey shading: near-normal most likely; white: equal chances. Right: As left, but for precipitation, December 2013-February 2014. Orange shading: below-normal most likely; green shading: above-normal most likely; grey shading: near-normal most likely; white: equal chances.

2. Potential evolution of the state of the climate over the next three months (December 2013-February 2014)

2.1 SST-based indices

Month	Niño 1+2	Niño3.4	IOD	NTA	STA
December	-0.26±0.19	0.09±0.16	-0.21±0.16	0.07±0.09	-0.17±0.10
January	-0.18±0.17	0.02±0.20	-0.04±0.09	0.07±0.10	-0.12±0.08
February	-0.09±0.12	0.03±0.20	-0.03±0.09	0.08±0.09	-0.06±0.09
DJF	-0.18±0.16	0.05±0.19	-0.09±0.11	0.07±0.09	-0.12±0.09

Table 7: Multi-model forecasts for oceanic indices (°C), with standard deviation. Values are the average of those derived, using each GPC models own hindcast climate mean, from the 9 GPCs supplying SST forecasts (Seoul, Washington, Montreal, Tokyo, ECMWF, Exeter, Toulouse, Beijing, Melbourne). The standard deviation is calculated on all 9 individual GPC ensemble means.

2.2 Predicted temperature, December 2013-February 2014

For information on the construction of the multi-model forecast maps refer to Appendix 3.

Baseline : 1983-2001

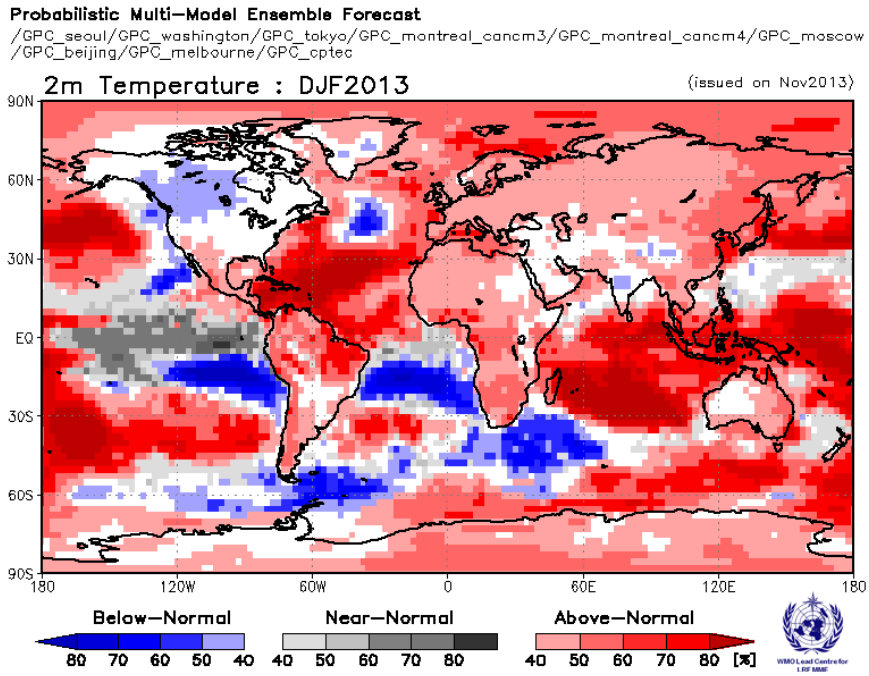


Figure 6: Forecast probability of the tercile category with the highest forecast probability: 2m temperature, December 2013-February 2014. Blue shading: below-normal most likely; red shading: above-normal most likely; grey shading: near normal most likely; white: equal chances.

An influence from large-scale positive sea surface temperature anomalies exists in this forecast, despite ENSO being expected to maintain its neutral condition. A global warming trend also has some effect on the forecast, contributing to a positive bias in anomalies defined using the climatological base period (1983-2001) centred in the past.

RAI (Africa): An enhanced probability for above normal temperature is predicted in most of Africa. The tilt of the odds towards above normal is most notable in the west-central and southern portions. Enhanced probabilities for above normal temperature are most consistent across individual models in southern Africa. An exception to the warm tendency is found in parts of northwestern Africa.

RAII (Asia): An enhanced probability for above normal temperature is predicted in more than half of Asia, including all of the northern half of the continent. The tendency towards above normal is strongest in the eastern portion of the continent, where model consistency is also greatest. Areas lacking a warm forecast signal are the Middle East and much of south central Asia.

RAIII (South America): An enhanced probability for above normal temperature is predicted in the majority of South America, the main exception being in the subtropical southeastern part of the continent. Enhanced probabilities for above normal temperature are most consistent across individual models in the northeastern portion of the continent.

RAIV (North America, Central America, Caribbean): Enhanced probabilities for above normal temperature are predicted in the southern portion of North America, including Central America and the Caribbean. The most substantially enhanced probabilities for above normal are seen in the Caribbean and southern Central America, where the models unanimously predict above normal. Enhanced probabilities for below normal temperature are forecast in a sizable portion of northwestern North America. No forecast signal is found in most of the eastern portion of extratropical North America.

RAV (Indonesia, W. Pacific, Australia, New Zealand): A strongly enhanced probability for above normal temperature is predicted in Indonesia and the western Pacific islands. A tilt of the odds towards above normal is also forecast for the eastern half of Australia, all coasts of Australia, and portions of New Zealand. Most of the individual models support the warm-leaning forecast tendency in most of this region.

RAVI (Europe, Greenland): An enhanced probability for above normal temperature is predicted for nearly all of Europe, including Iceland and eastern Greenland. Individual models are most consistent in predicting above normal along the western and northern coastal regions of Europe.

2.3 Predicted precipitation, December 2013-February 2014

Baseline : 1983-2001

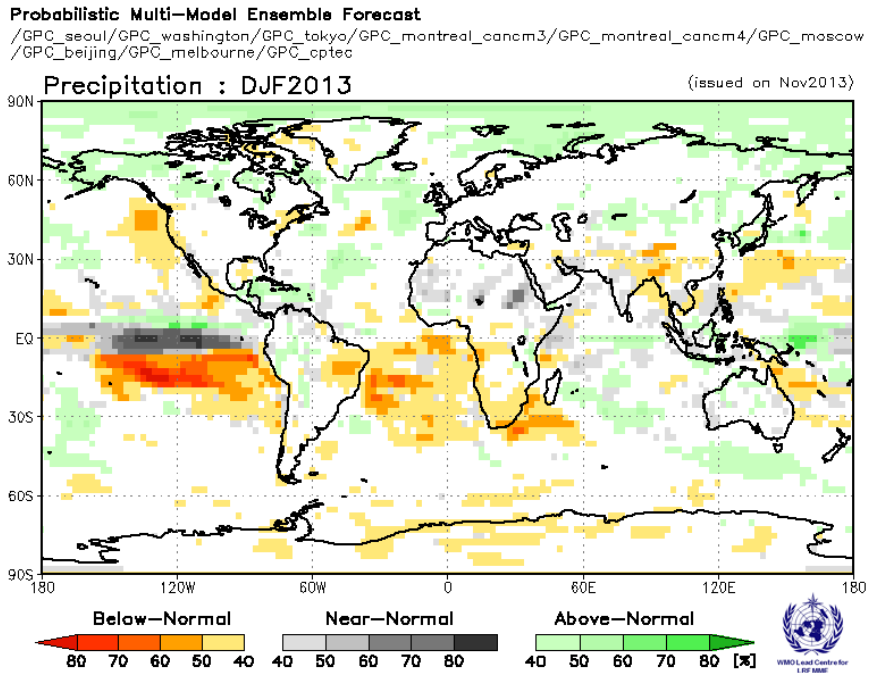


Figure 7: As Fig. 6, but for precipitation December 2013-February 2014. Orange shades: below-normal most likely; green shades: above-normal most likely; grey: near normal most likely; white: equal chances.

Although there is no significant ENSO signal driving the precipitation forecast, influences from predicted positive sea surface temperature anomalies in the west-central tropical Pacific oceans as well as in some subtropical and extratropical ocean regions are expected in this forecast. Some precipitation anomalies and shifts from climatological probabilities are actually found, although none are very strong or spatially extensive.

RAI (Africa): Enhanced probabilities for below normal precipitation are predicted in part of southern and western equatorial Africa, with consistency among individual models relatively greater for the latter region. Near normal precipitation is favoured in many arid or semi-arid areas of northern subtropical Africa, and is also predicted most likley for parts of eastern equatorial Africa.

RAII (Asia): An enhanced probability for below normal precipitation is predicted in the region straddling southeastern and southern Asia, with moderate consistency across individual models. An enhanced probability for above normal precipitation is predicted in scattered parts of central and northeastern Asia.

RAIII (South America): Enhanced probabilities for below normal precipitation are predicted in southern tropical South America, supported by high consistency across models. Scattered areas of slightly enhanced probability for above normal precipitation are forecast for central and west-central parts of the continent, mainly in the southern tropics.

RAIV (North America, Central America, Caribbean): An enhanced probability for above normal precipitation is predicted in portions of northern and northwestern North America, as well as in much of the Caribbean and portions of Central America. A weak tilt of the odds towards below normal precipitation is forecast along the west coast of mid-latitude North America, with fairly high model consistency for this region.

RAV (Indonesia, W. Pacific, Australia, New Zealand): An enhanced probability for above normal precipitation is predicted in parts of Indonesia and the western tropical Pacific islands. An indication of enhanced probability of above normal is also seen over parts of central and northern Australia and is supported by model consistency. Enhanced probabilities for near normal precipitation are forecast in parts of northeastern and southwestern Australia.

RAVI (Europe, Greenland): No forecast signal is found in nearly all of Europe.

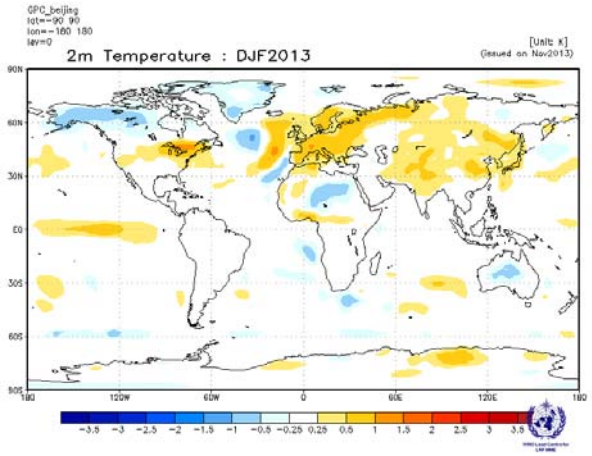
APPENDIX 2 - Prediction

This appendix contains supporting material for the probabilistic forecast maps and SST indices described in the main part of this Update. The same sequence of global maps is shown for each of 5 variables in the following order: T2m, precipitation, SST, 500hPa height and PMSL. For each variable the following sequence of maps is shown:

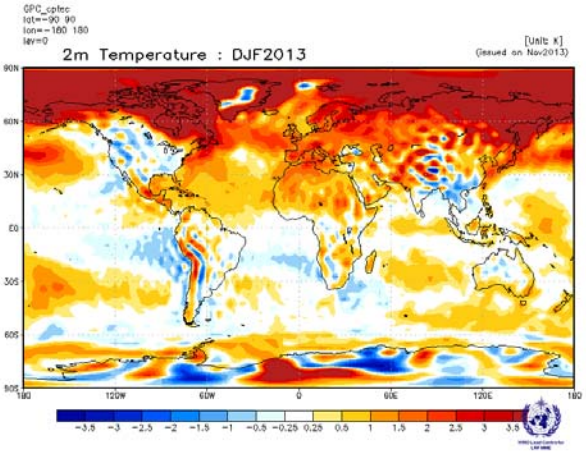
1. Ensemble mean anomalies for each GPC relative to the common baseline of 1983-2001.
2. Ensemble mean anomalies for those GPCs with hindcasts not currently including the common baseline.
3. Consistency map (all 12 GPCs): showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).
4. Deterministic Multi-Model Ensemble (DMME) forecast constructed using 8 GPCs and the common baseline (1983-2001). The same 8 GPCs used for the PMME forecasts (those supplying hindcast data for 1983-2001) are used for consistency.
5. DMME forecast constructed using 12 GPCs and each model's own baseline
6. Probabilistic Multi-Model Ensemble (PMME) forecast constructed using 8 GPCs and the 1983-2001 common baseline
7. MSSS verification for DMME and each GPC over the period 1983-2001; and against own baseline for GPCs with hindcasts not covering the period 1983-2001
8. ACC verification for each GPC over the period 1983-2001; and against own baseline for GPCs with hindcasts not covering the period 1983-2001.

Individual GPC ensemble mean forecasts of 2m temperature anomalies relative to 1983-2001

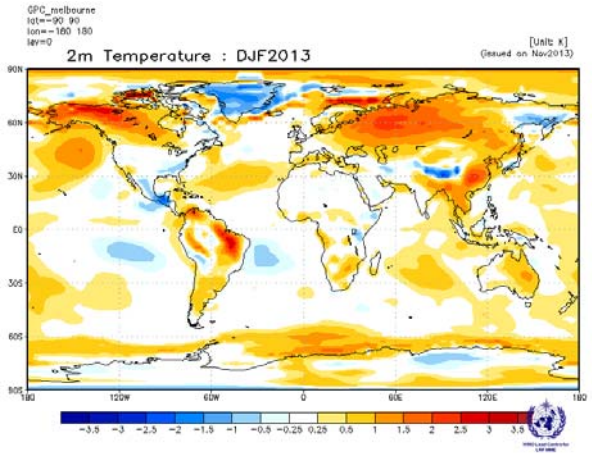
Beijing
Baseline : 1983-2001



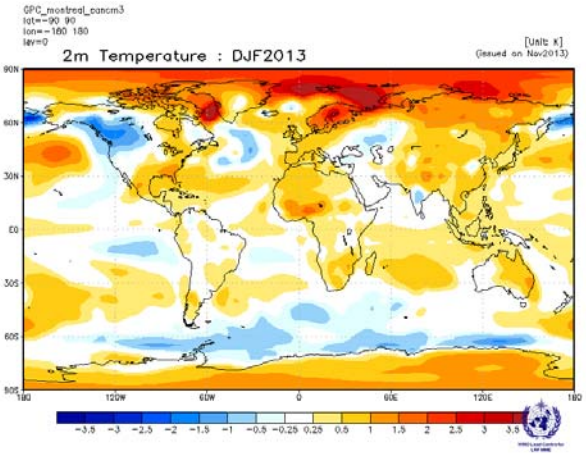
CPTEC
Baseline : 1983-2001



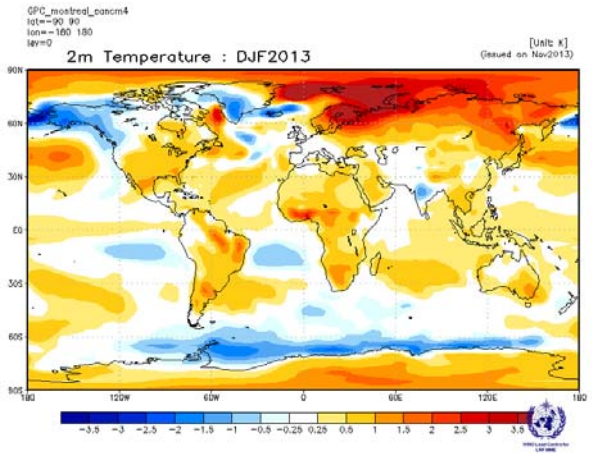
Melbourne
Baseline : 1983-2001



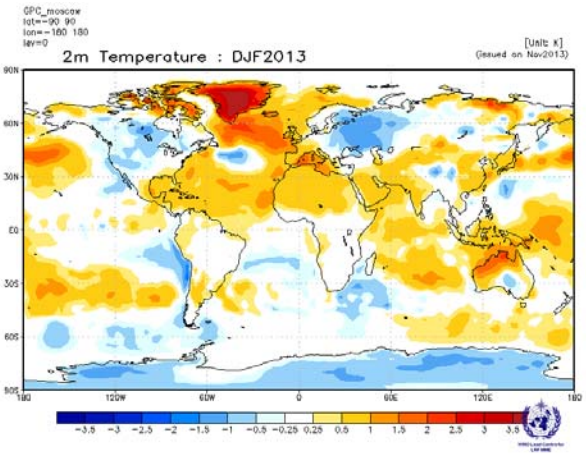
Montreal_cancm3
Baseline : 1983-2001



Montreal_cancm4
Baseline : 1983-2001

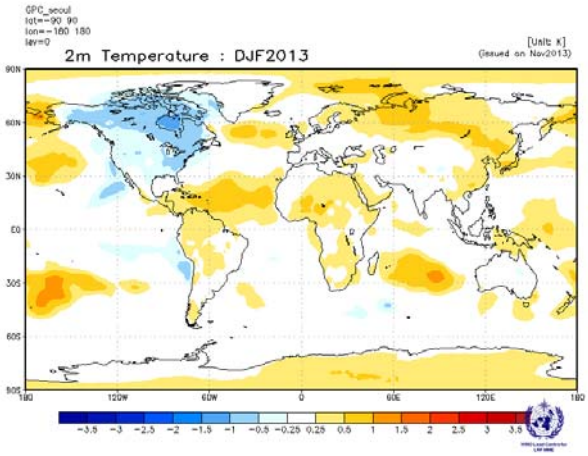


Moscow
Baseline : 1983-2001



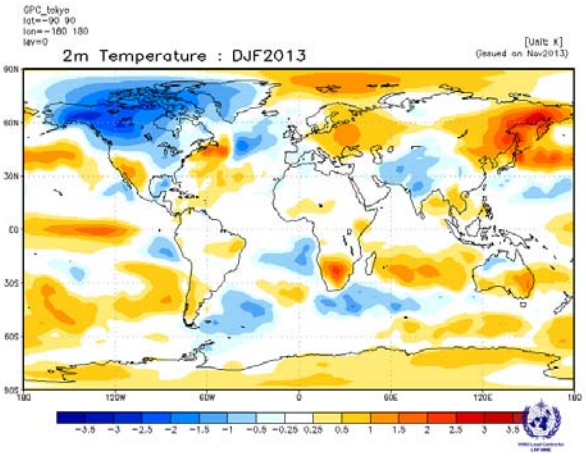
Seoul

Baseline : 1983-2001



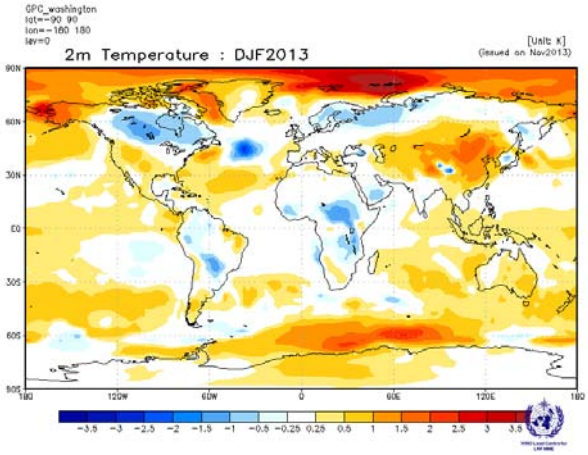
Tokyo

Baseline : 1983-2001



Washington

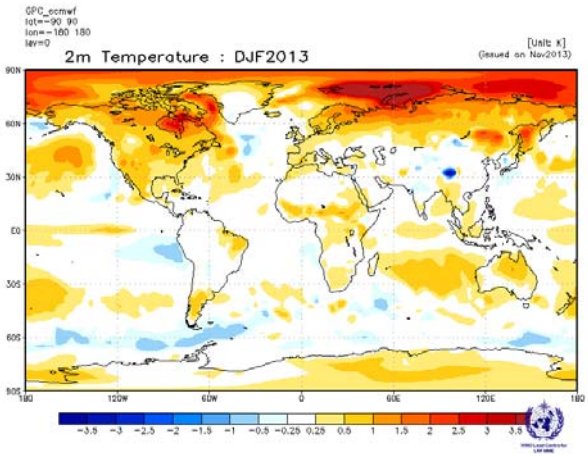
Baseline : 1983-2001



Individual GPC ensemble mean forecasts of 2m temperature anomalies from other GPCs for which forecast anomalies relative to 1983-2001 are not available.

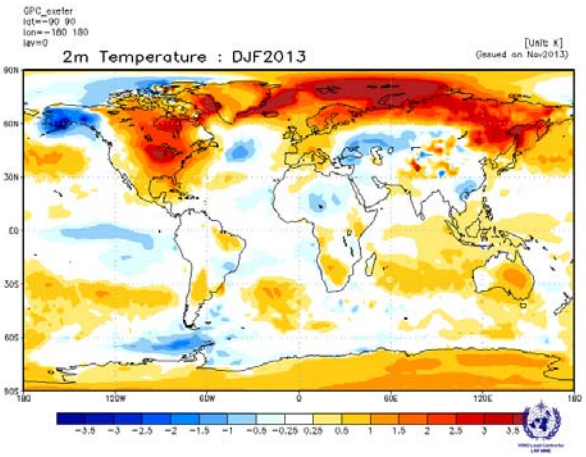
ECMWF

Baseline: 1981-2010

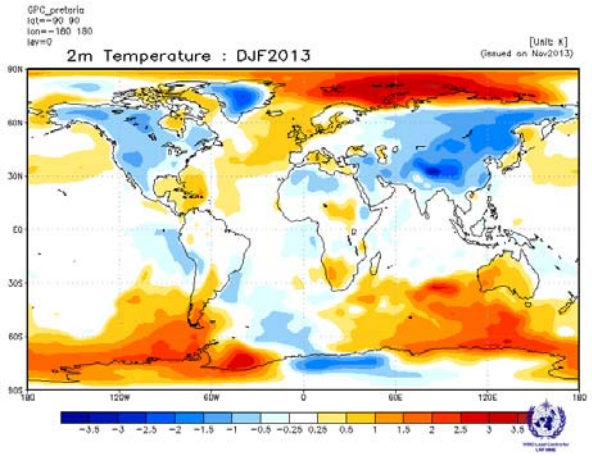


Exeter

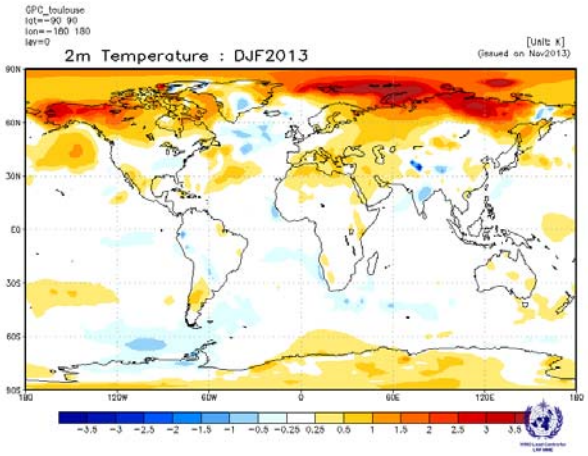
Baseline : 1996-2009



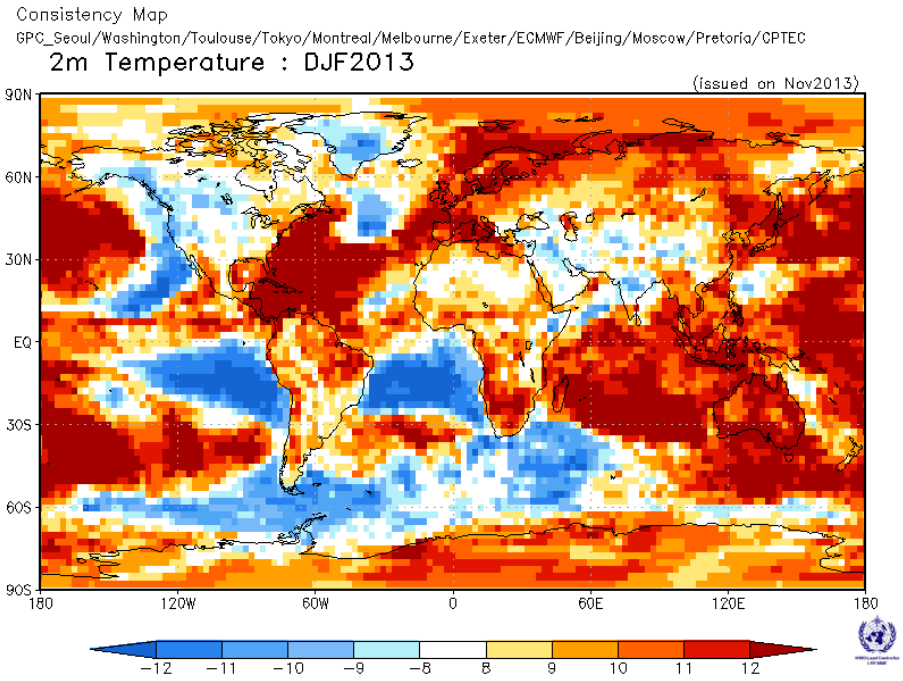
Pretoria
Baseline: 1981-2001



Toulouse
Baseline: 1979-2007

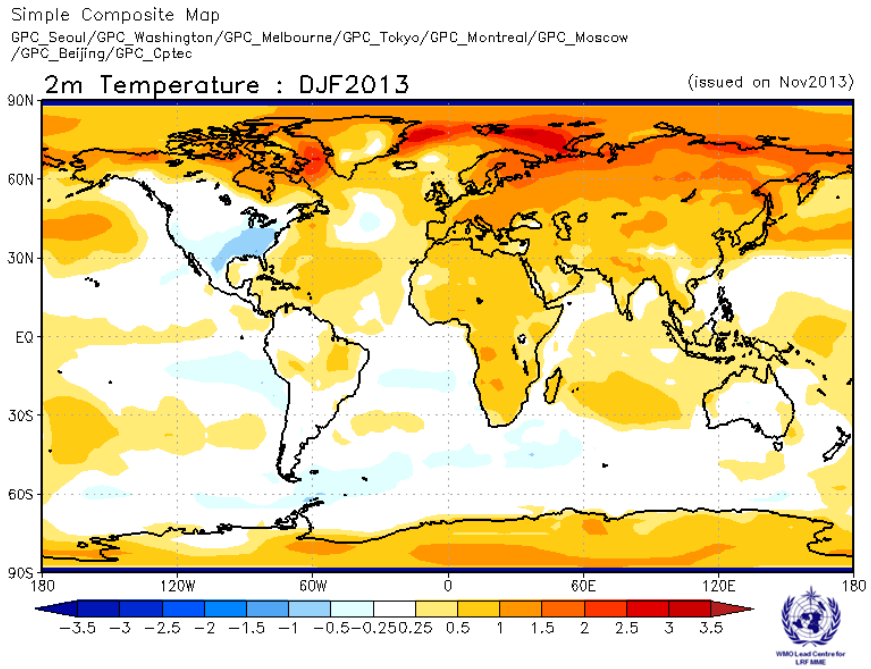


Consistency Map of 2m Temperature (all 12 GPCs)



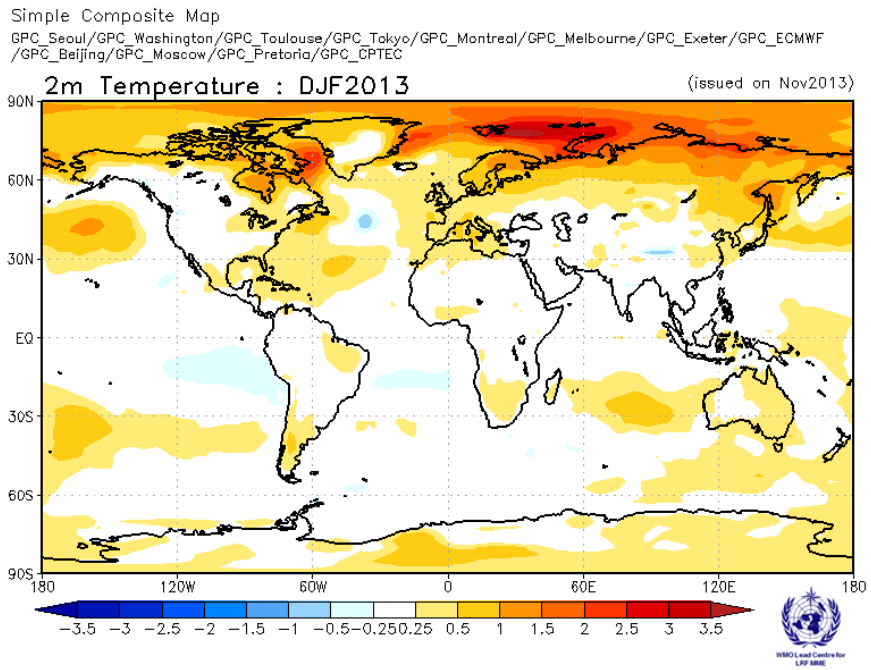
Showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).

DMME (8GPCs), using the same baseline for all models (1983-2001): 2m temperature Ensemble mean anomaly



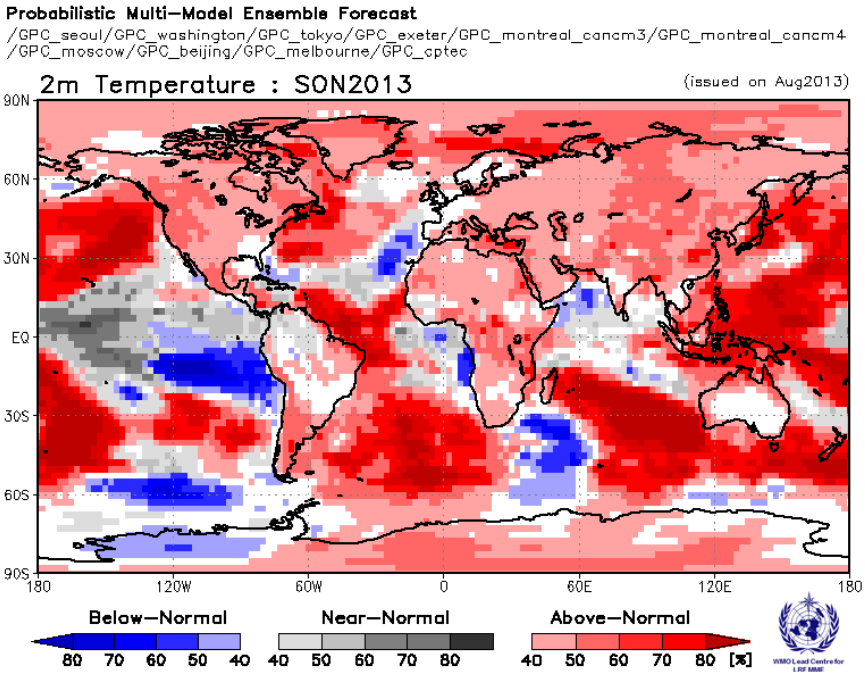
DMME (12GPCs), for each model using its own baseline: 2m temperature

Ensemble mean anomaly



PMME (8GPCs), using the same baseline for all models (1983-2001): 2m temperature

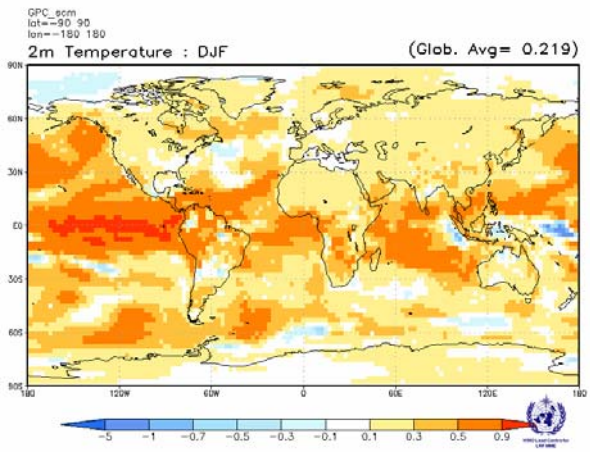
Probability of most likely tercile category



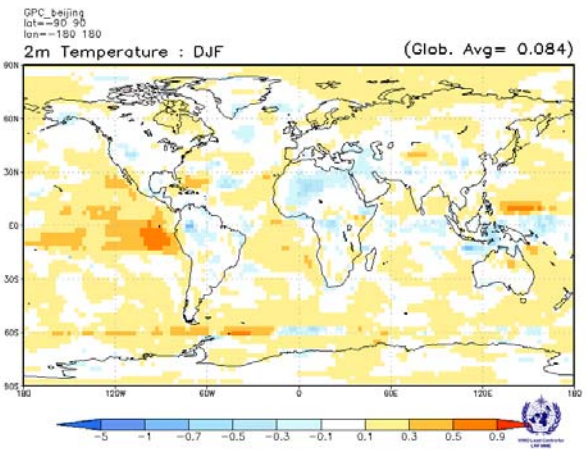
Verification of GPC ensemble mean 2m temperature anomaly forecasts, 1983-2001

Verification measure: Mean Square Skill Score (MSSS)
Verification dataset: ERA-interim

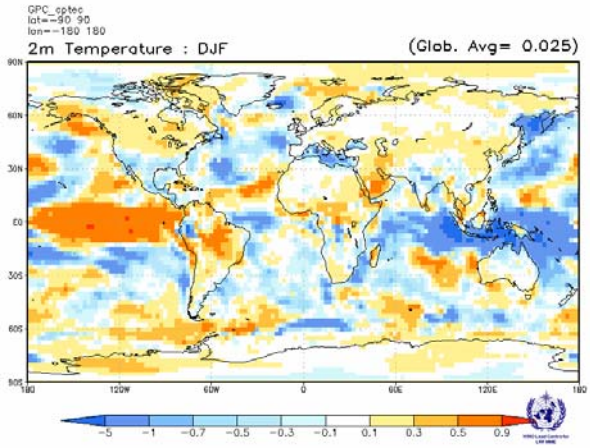
DMME



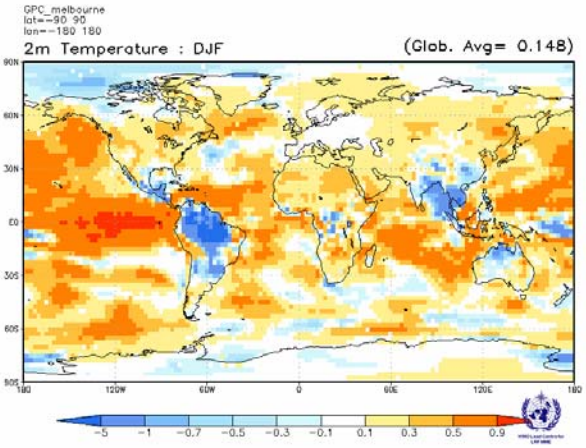
Beijing



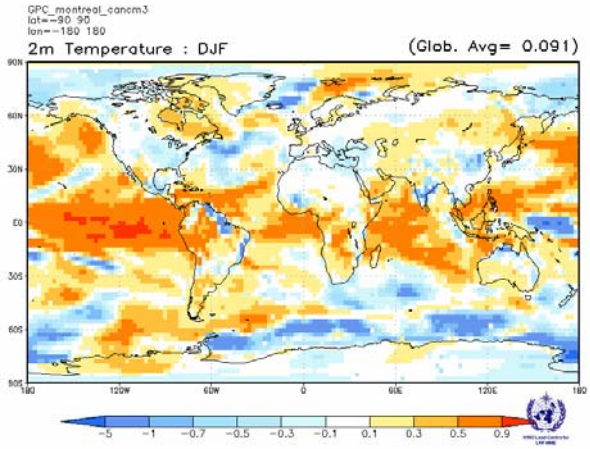
CPTEC



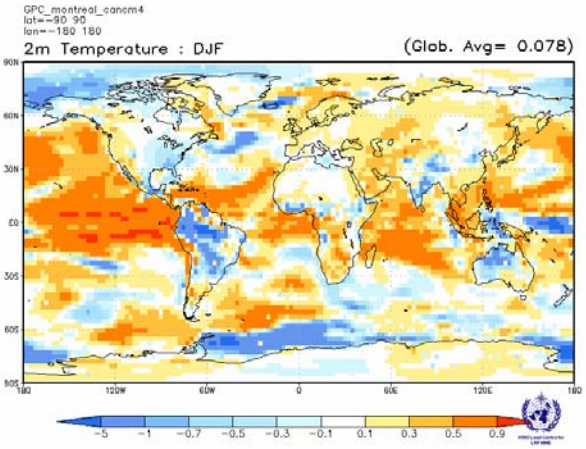
Melbourne



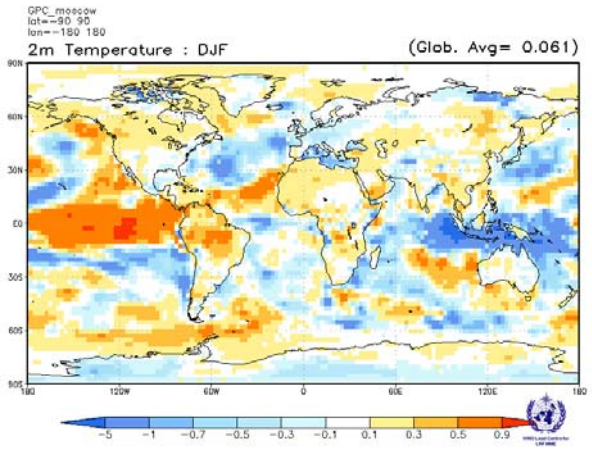
Montreal_cancm3



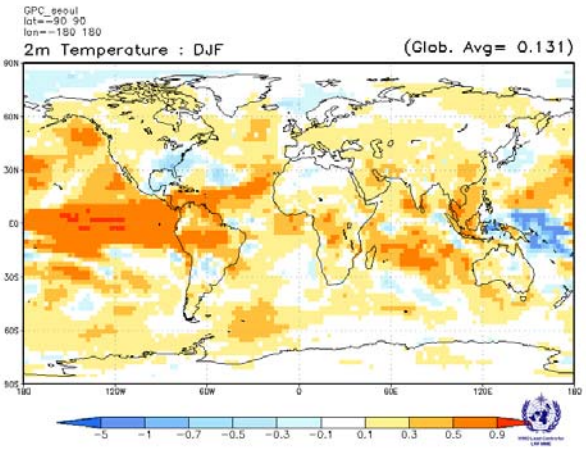
Montreal_cancm4



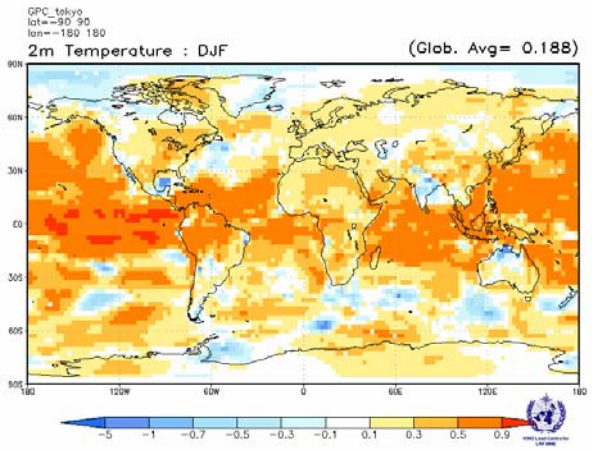
Moscow



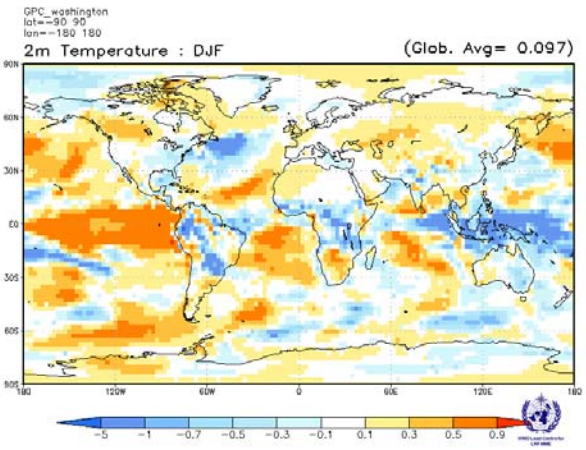
Seoul



Tokyo



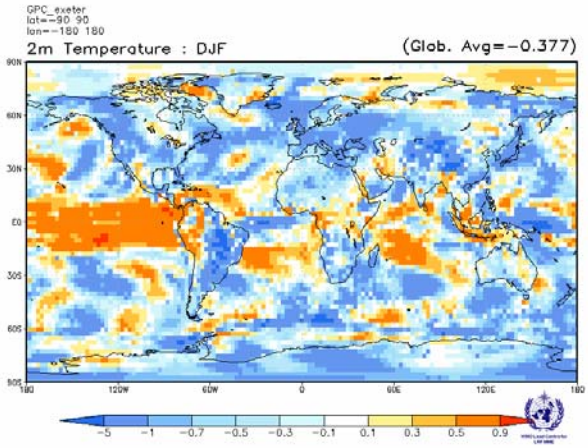
Washington



MSSS verification of 2m temperature anomaly forecasts from other GPCs

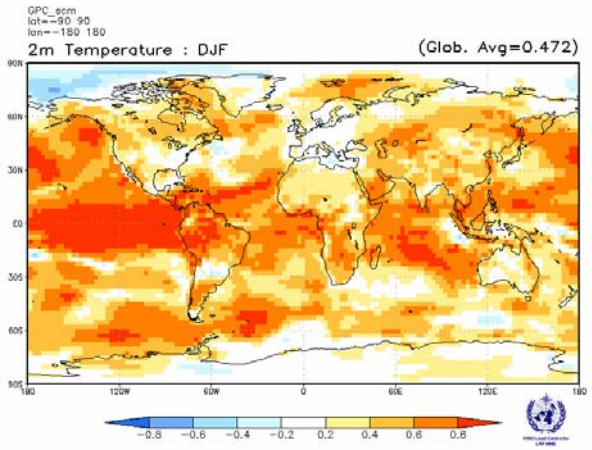
Exeter

Verification period: 1996-2009

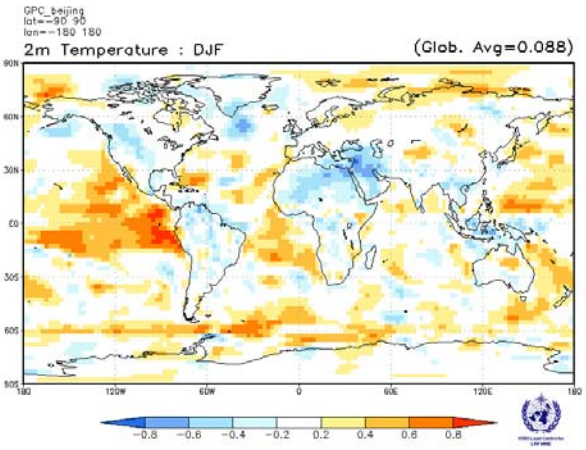


Verification measure: Anomaly Correlation Coefficient (ACC)
Verification dataset: ERA-interim

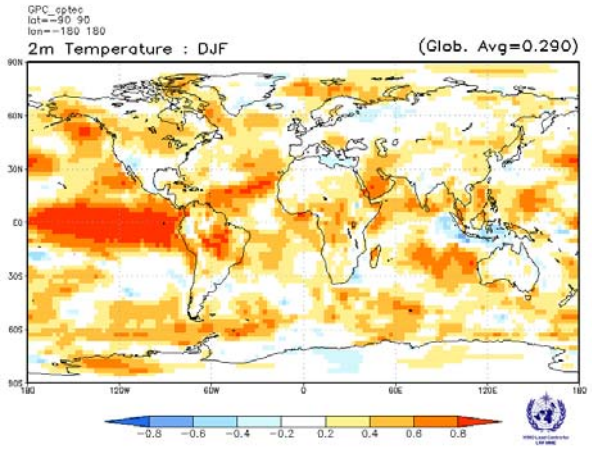
DMME



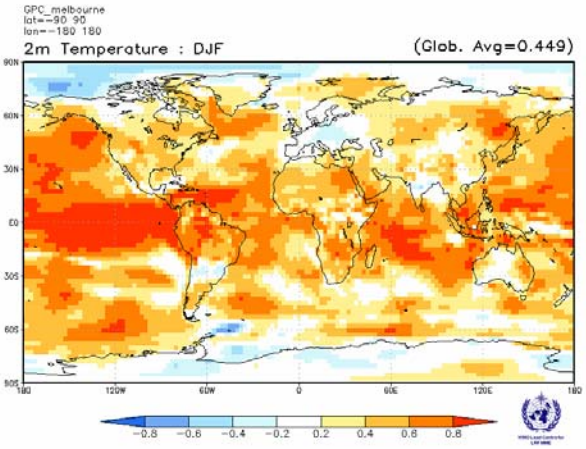
Beijing



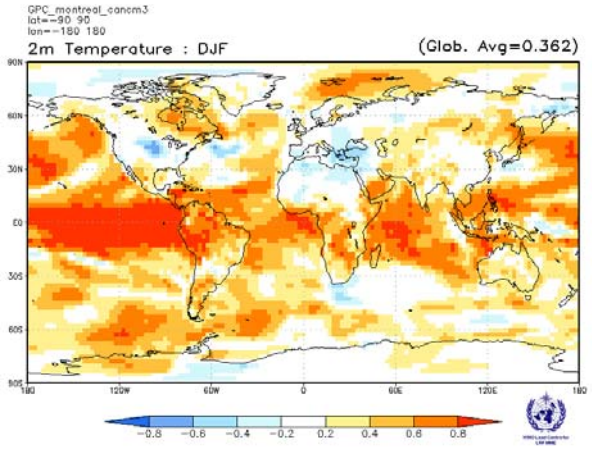
CPTEC



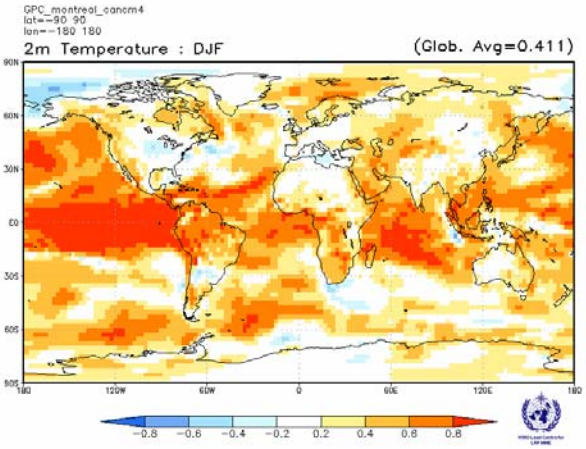
Melbourne



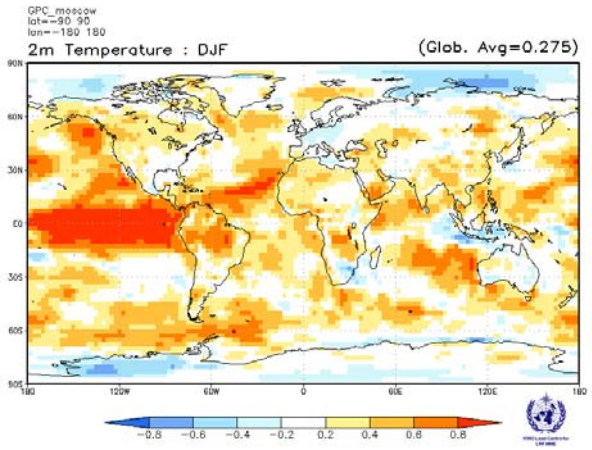
Montreal_cancm3



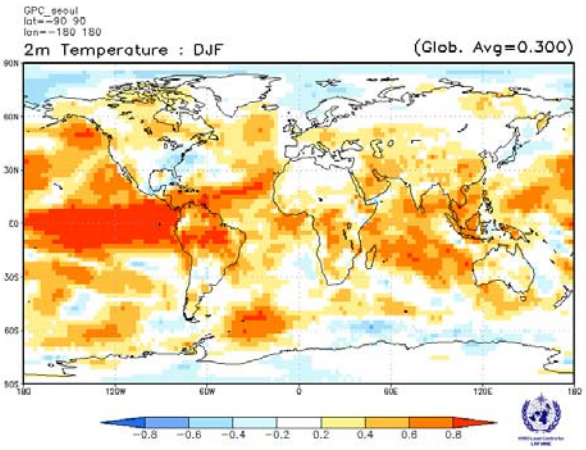
Montreal_cancm4



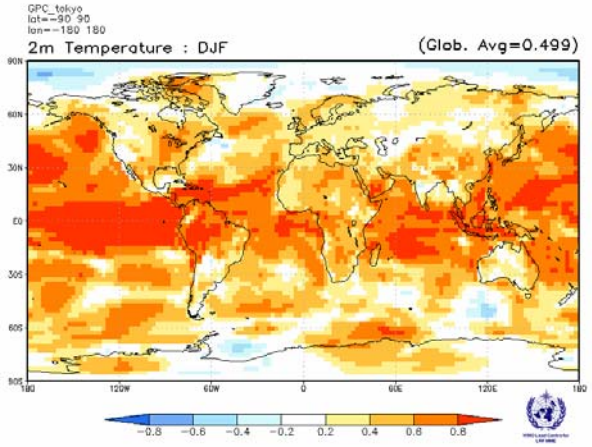
Moscow



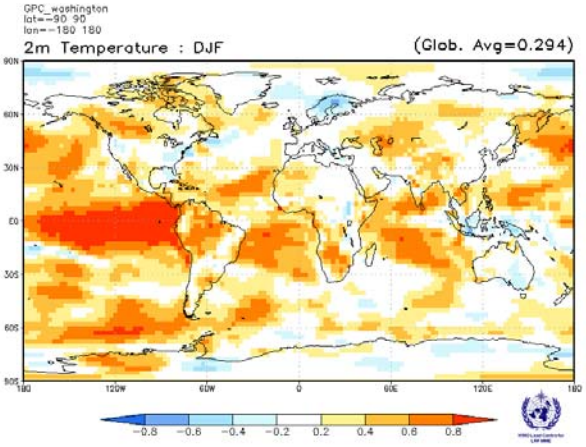
Seoul



Tokyo



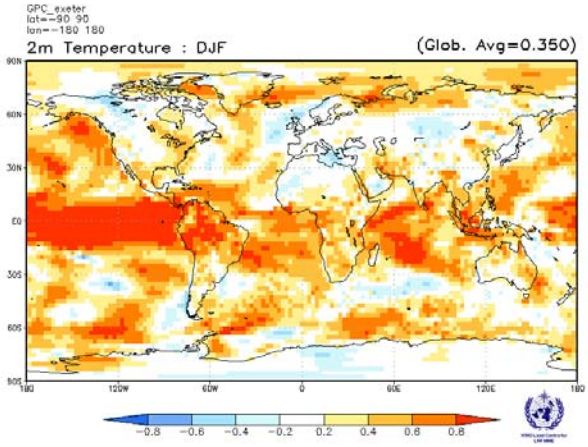
Washington



ACC verification of 2m temperature anomaly forecasts from other GPCs

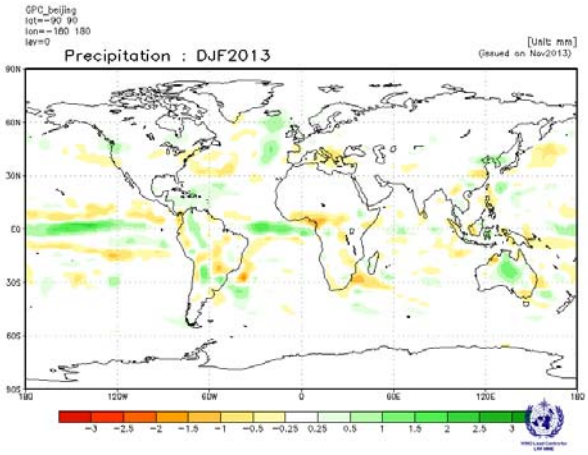
Exeter

Verification period: 1996-2009

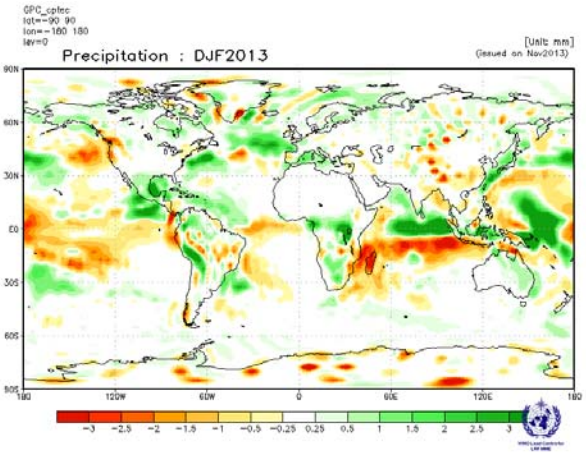


Individual GPC ensemble mean forecasts of precipitation anomalies relative to 1983-2001

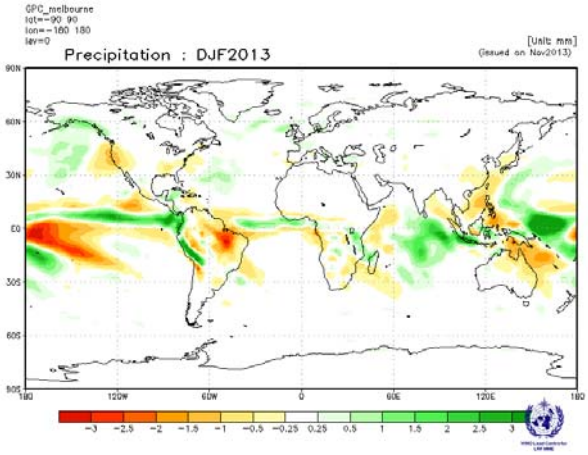
Beijing
Baseline : 1983-2001



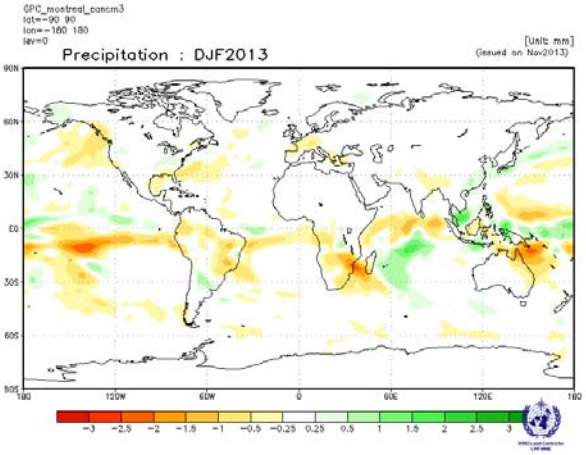
CPTEC
Baseline : 1983-2001



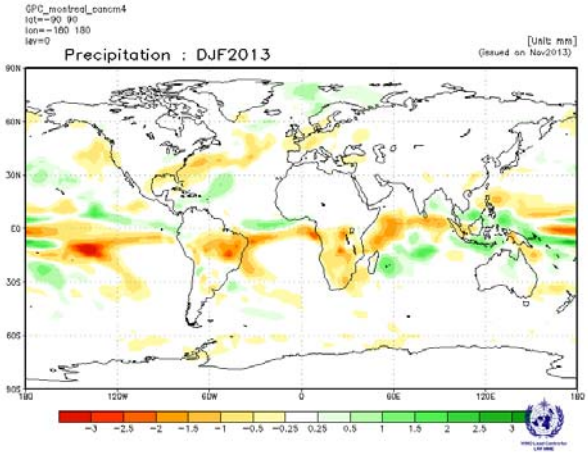
Melbourne
Baseline : 1983-2001



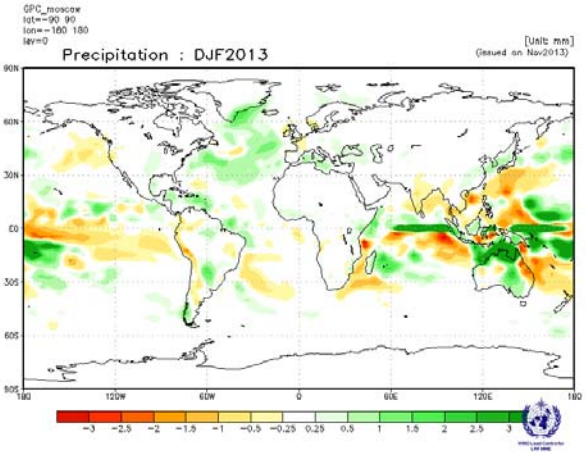
Montreal_cancm3
Baseline : 1983-2001



Montreal_cancm4
Baseline : 1983-2001

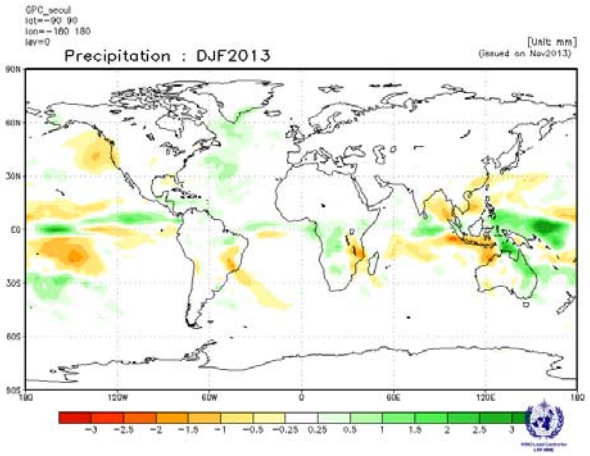


Moscow
Baseline : 1983-2001



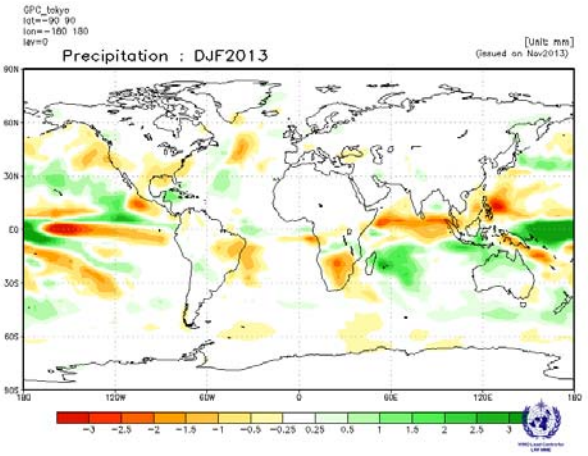
Seoul

Baseline : 1983-2001



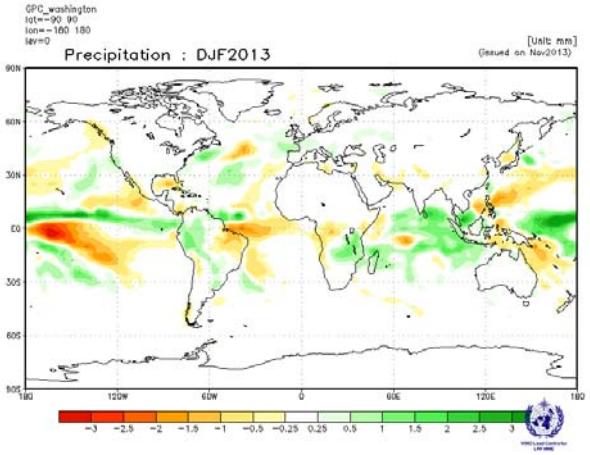
Tokyo

Baseline : 1983-2001



Washington

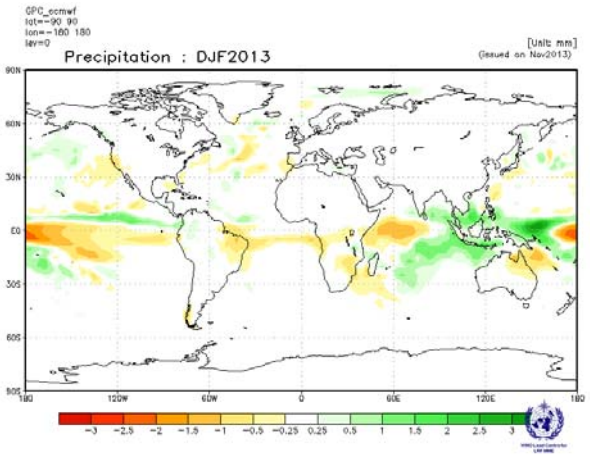
Baseline : 1983-2001



Individual GPC ensemble mean forecasts of precipitation anomalies from other GPCs for which forecast anomalies relative to 1983-2001 are not available.

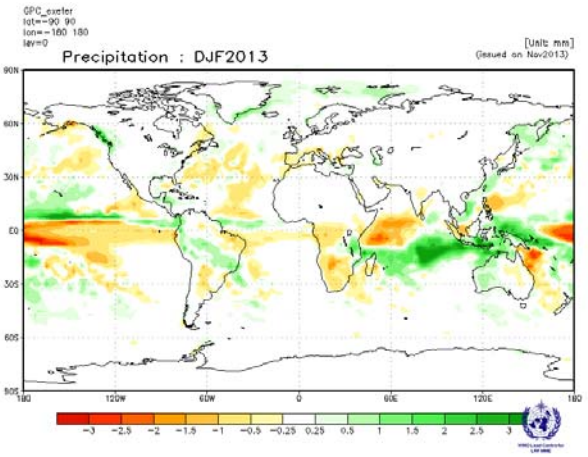
ECMWF

Baseline: 1981-2010

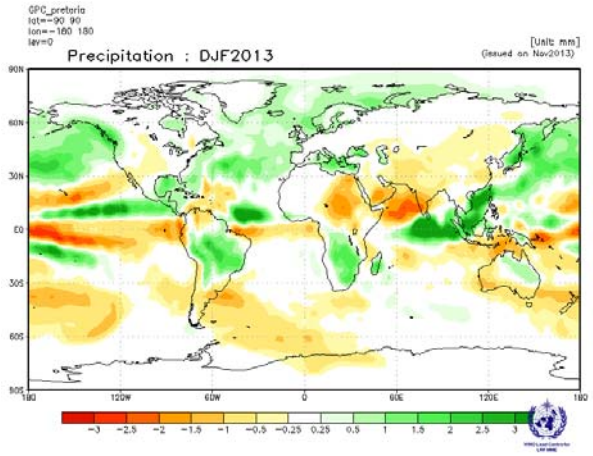


Exeter

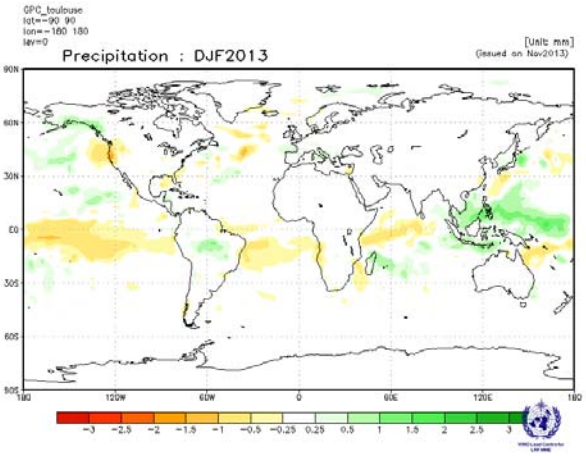
Baseline : 1996-2009



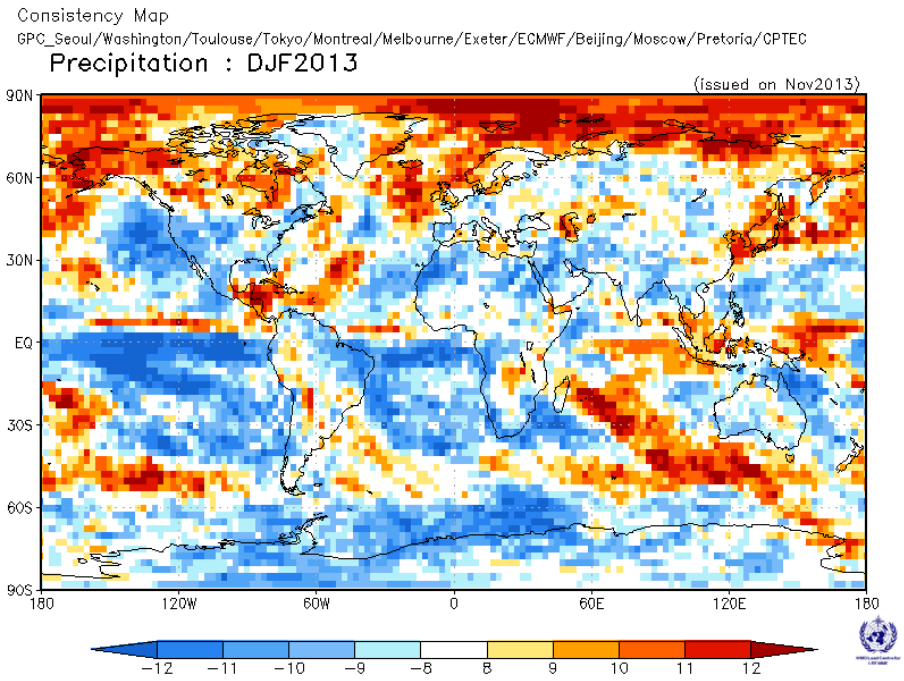
Pretoria
Baseline: 1981-2001



Toulouse
Baseline: 1979-2007

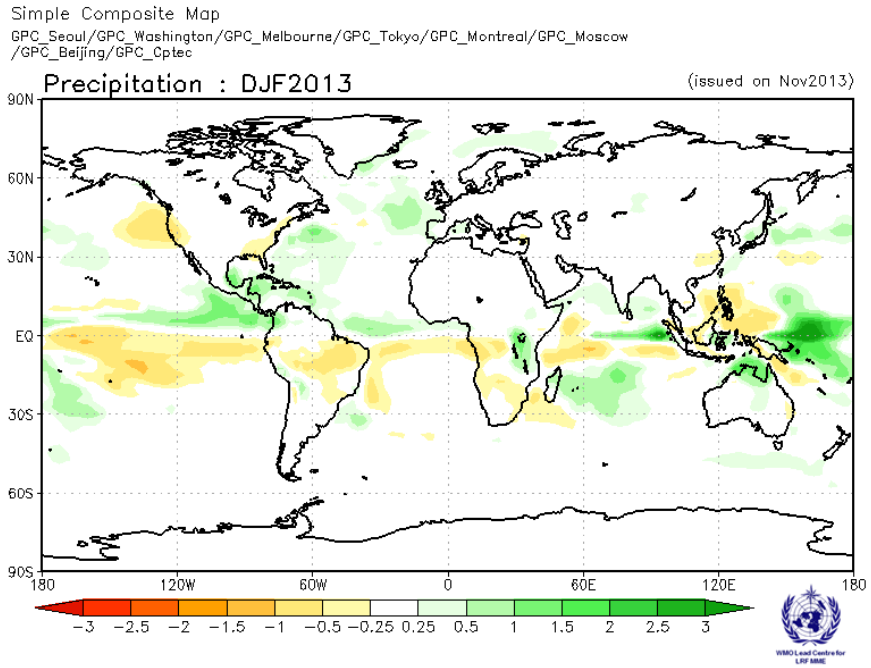


Consistency Map of Precipitation (all 12 GPCs)



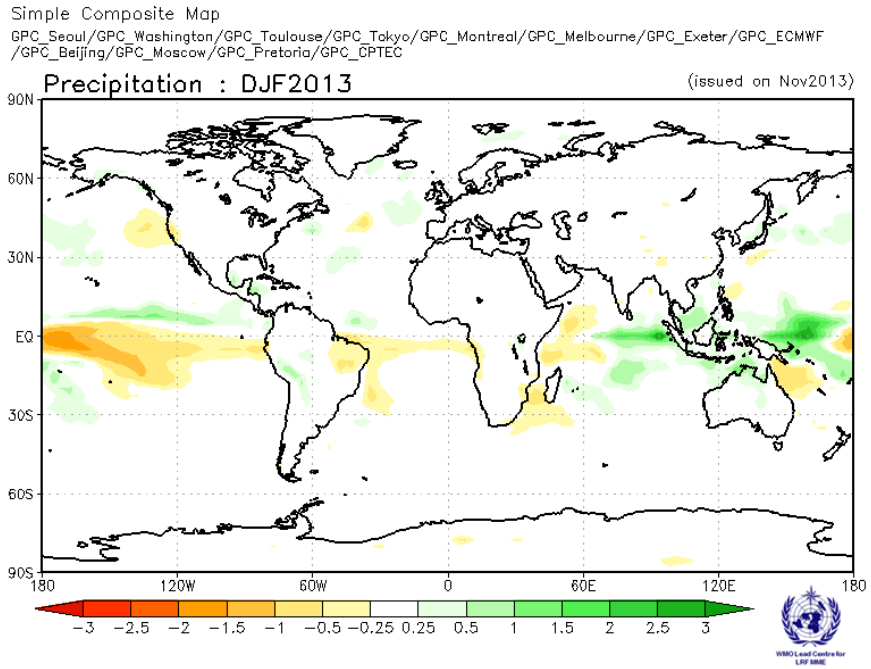
Showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).

DMME (8GPCs), using the same baseline for all models (1983-2001): precipitation Ensemble mean anomaly



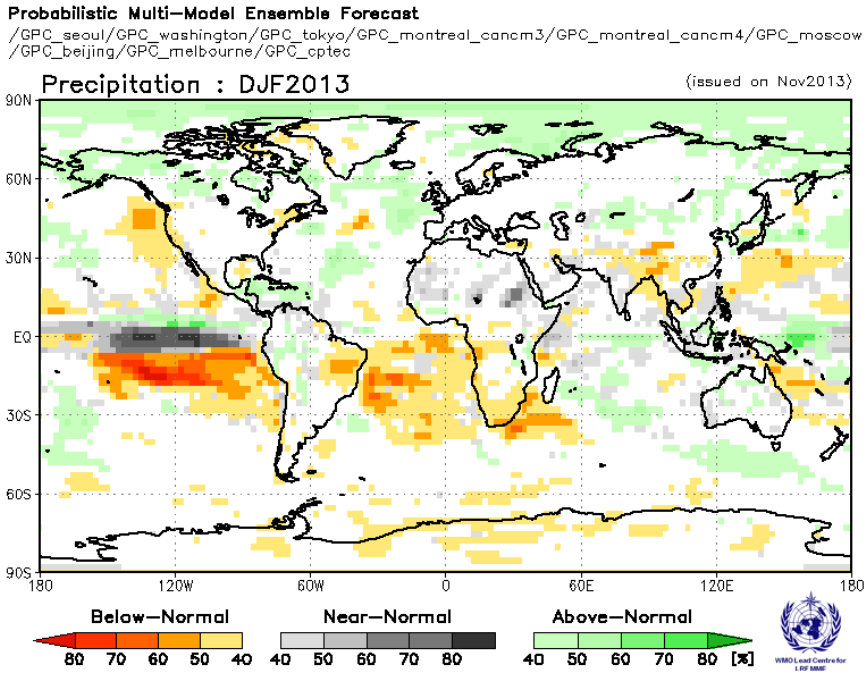
DMME (12GPCs), for each model using its own baseline: precipitation

Ensemble mean anomaly



PMME (8GPCs), using the same baseline for all models (1983-2001): precipitation

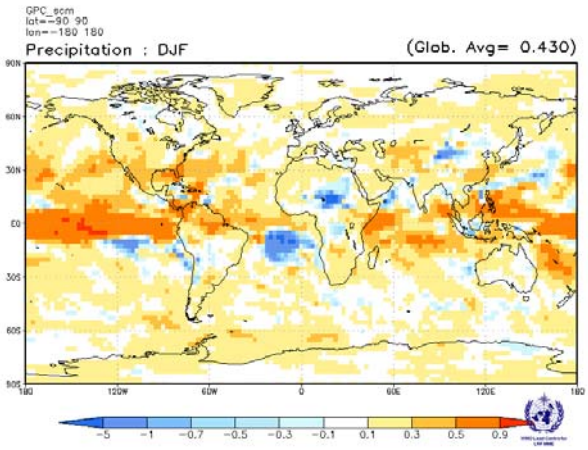
Probability of most likely tercile category



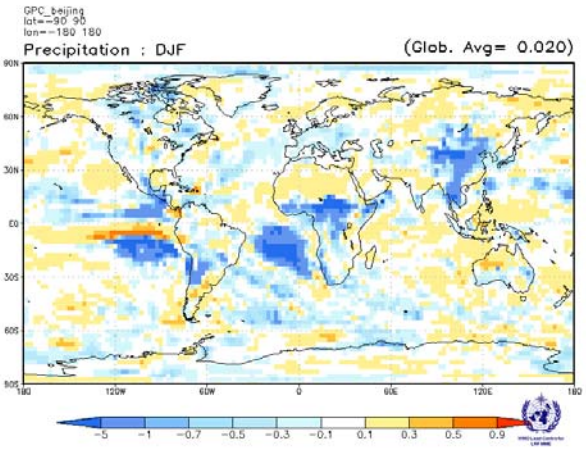
Verification of GPC ensemble mean precipitation anomaly forecasts, 1983-2001

Verification measure: Mean Square Skill Score (MSSS)
Verification dataset: GPCP

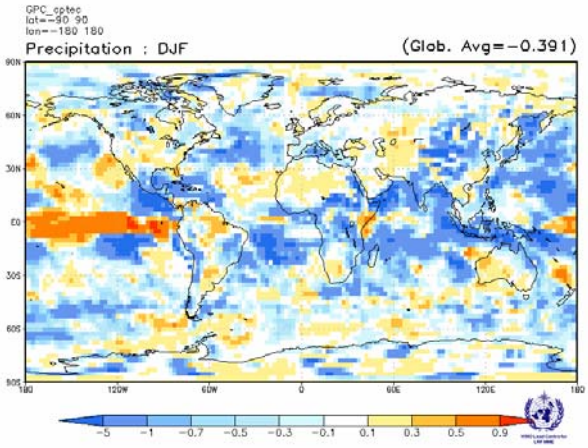
DMME



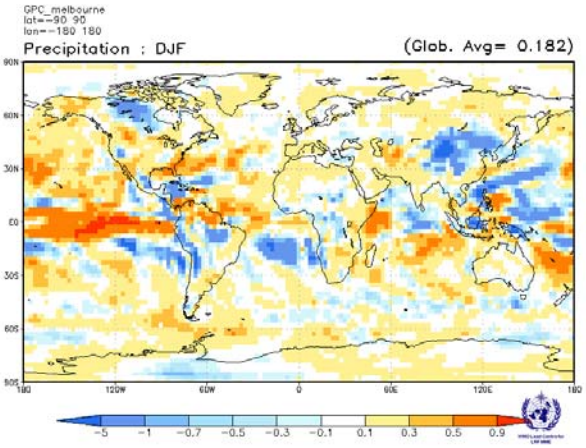
Beijing



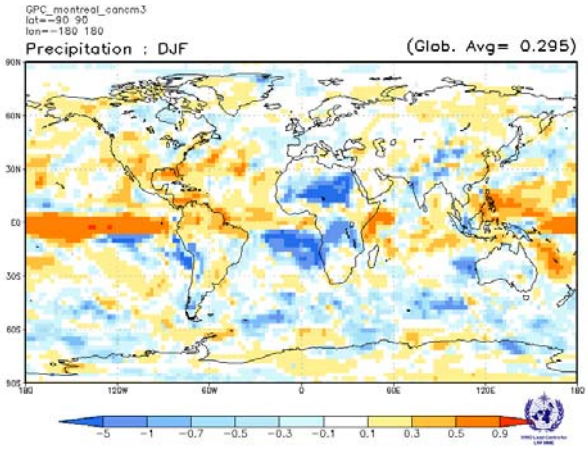
CPTEC



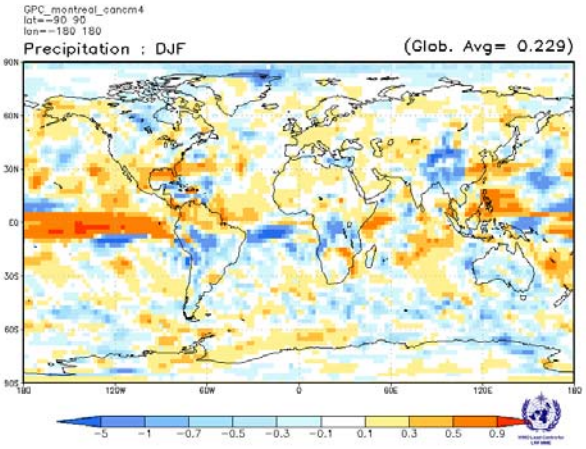
Melbourne



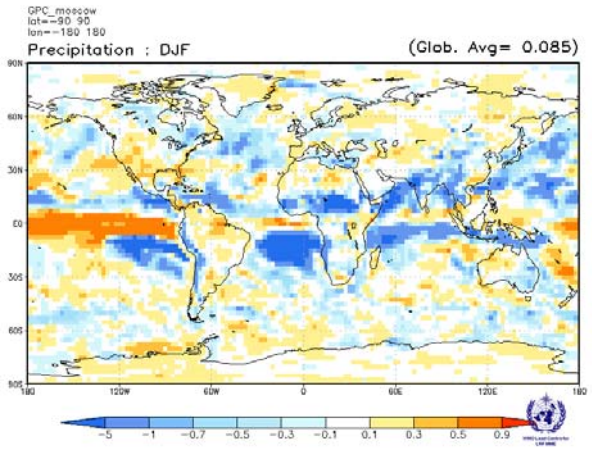
Montreal_cancm3



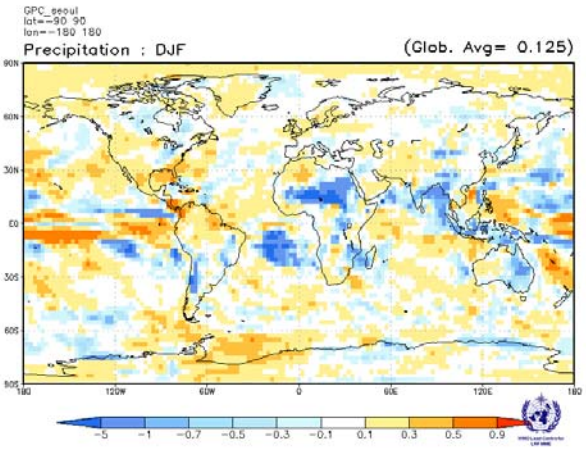
Montreal_cancm4



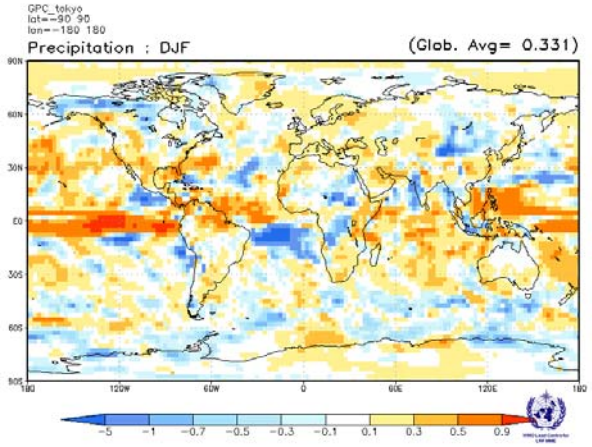
Moscow



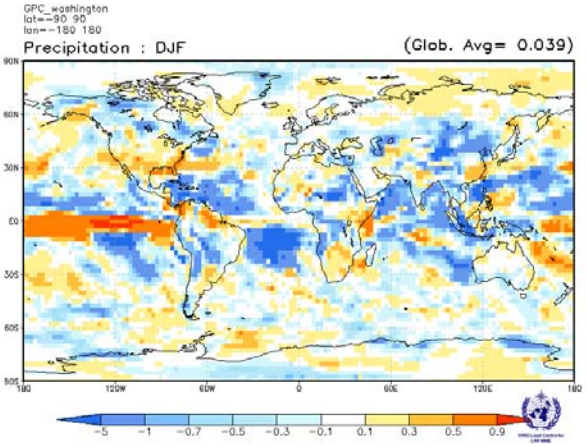
Seoul



Tokyo



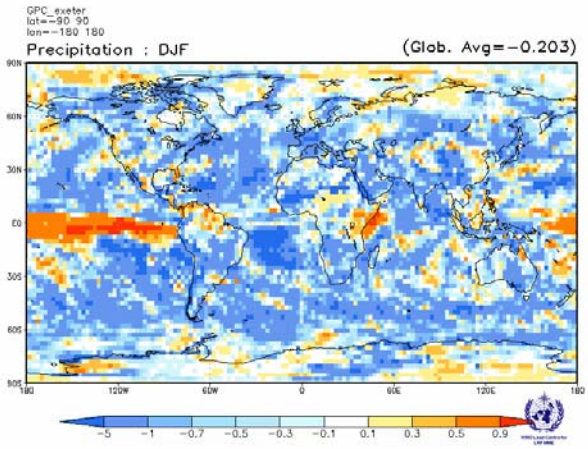
Washington



MSSS verification of precipitation anomaly forecasts from other GPCs

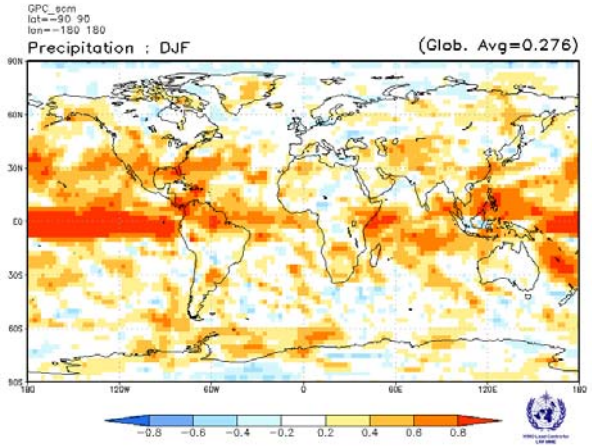
Exeter

Verification period: 1996-2009

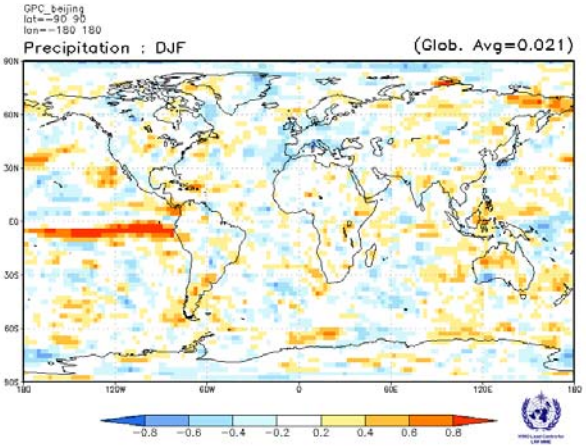


Verification measure: Anomaly Correlation Coefficient (ACC)
Verification dataset: GPCP

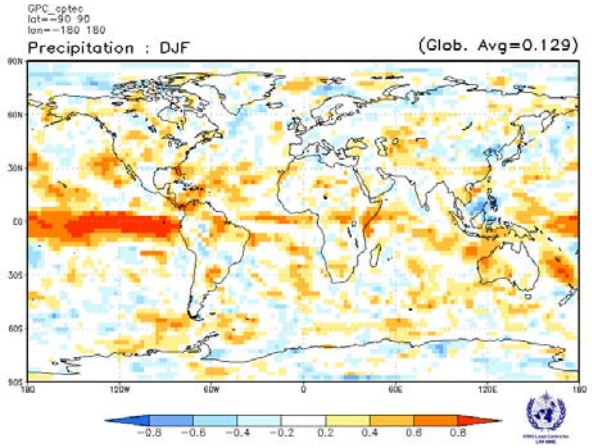
DMME



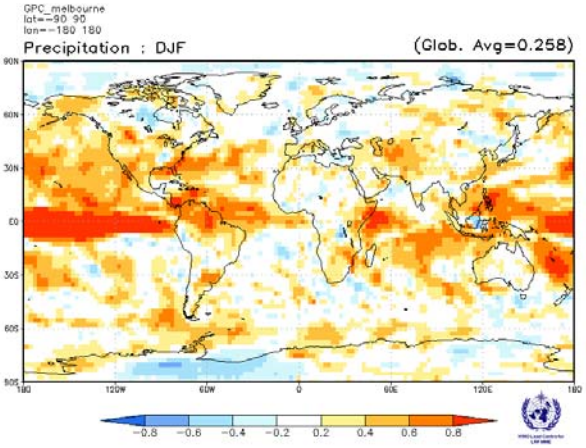
Beijing



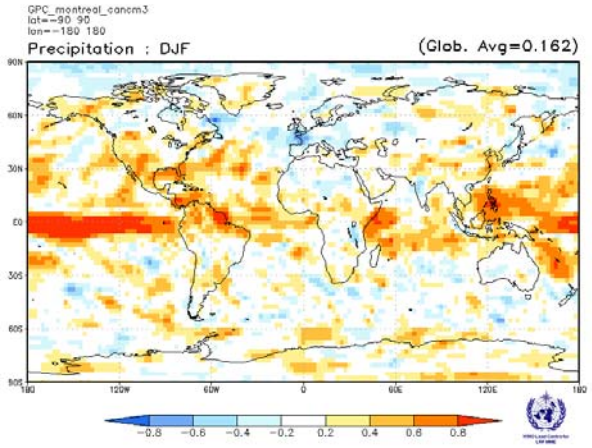
CPTEC



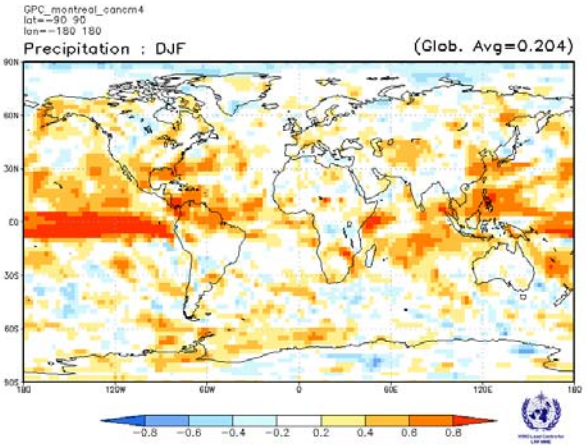
Melbourne



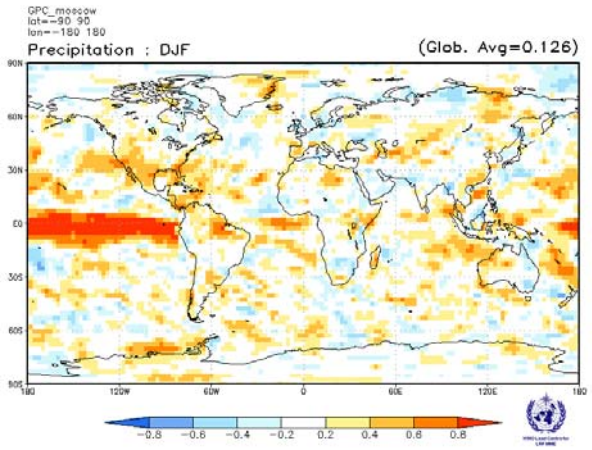
Montreal_cancm3



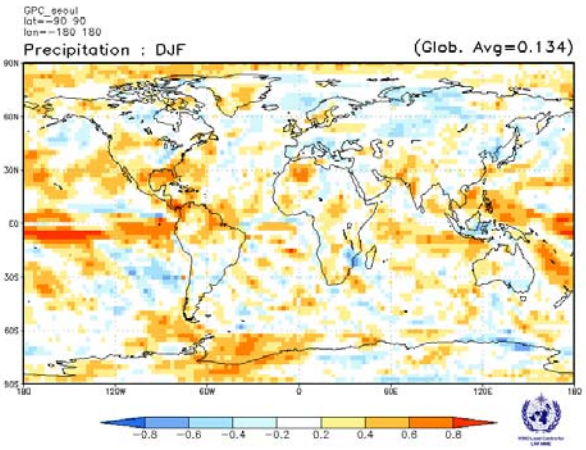
Montreal_cancm4



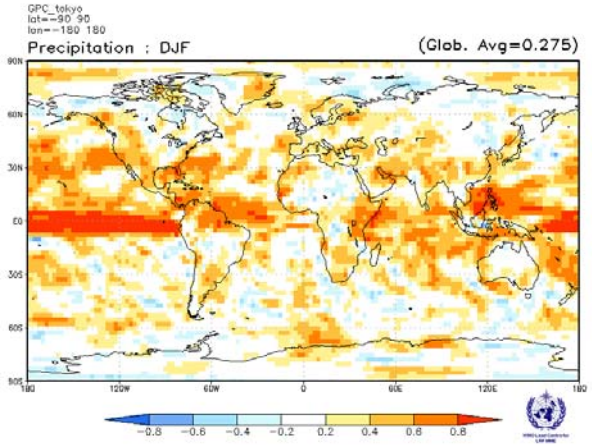
Moscow



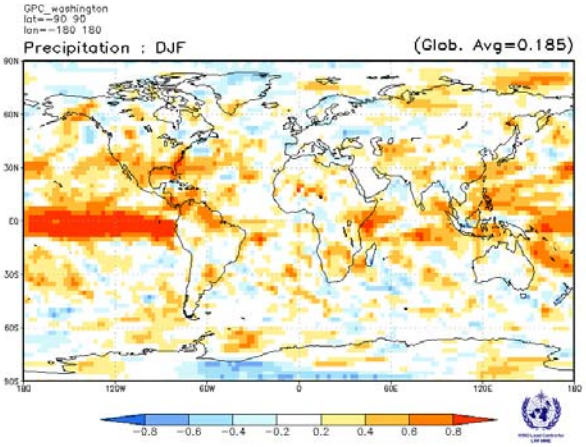
Seoul



Tokyo



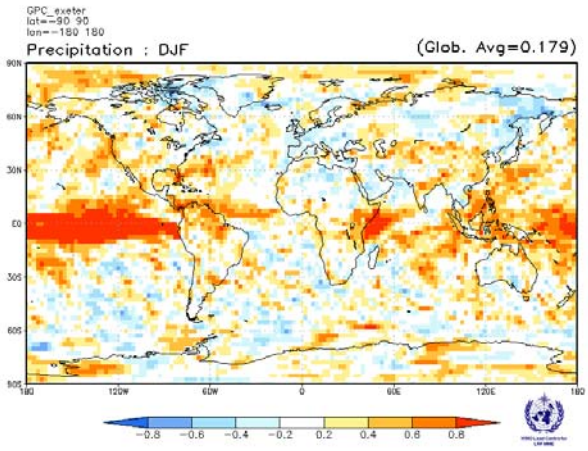
Washington



ACC verification of precipitation anomaly forecasts from other GPCs

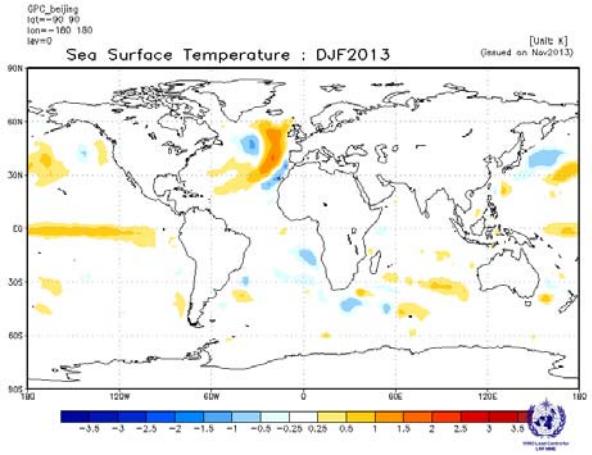
Exeter

Verification period: 1996-2009

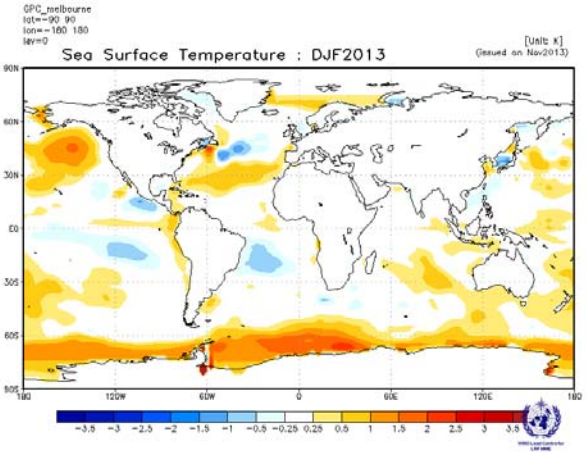


Individual GPC ensemble mean forecasts of SST anomalies relative to 1983-2001

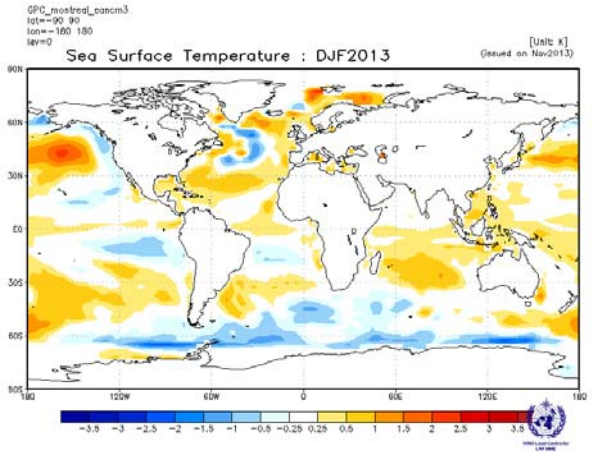
Beijing
Baseline : 1983-2001



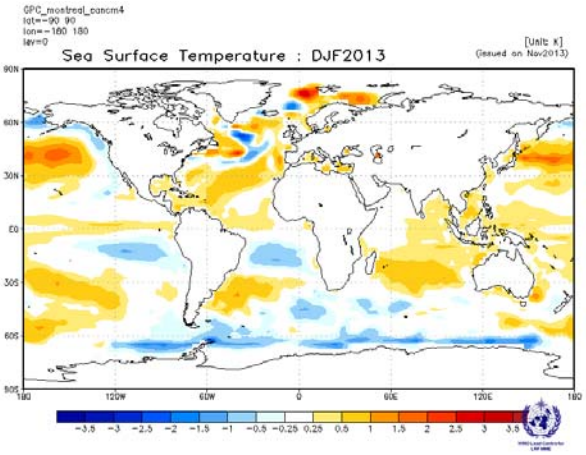
Melbourne
Baseline : 1983-2001



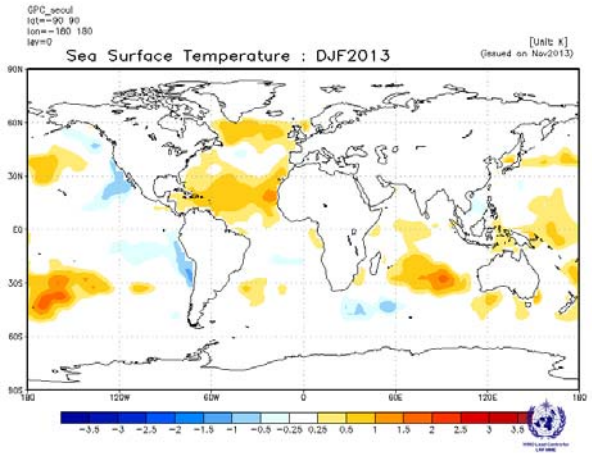
Montreal_cancm3
Baseline : 1983-2001



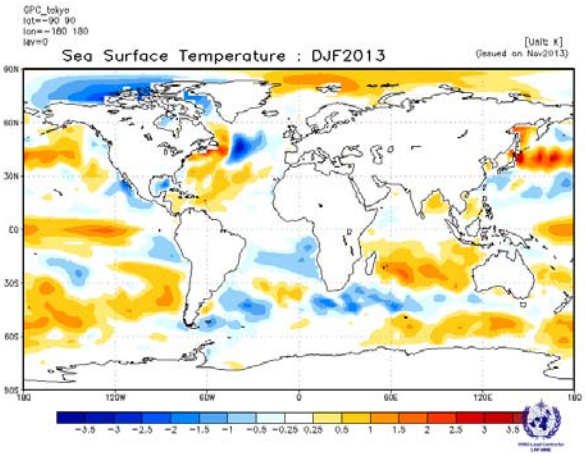
Montreal_cancm4
Baseline : 1983-2001



Seoul
Baseline : 1983-2001

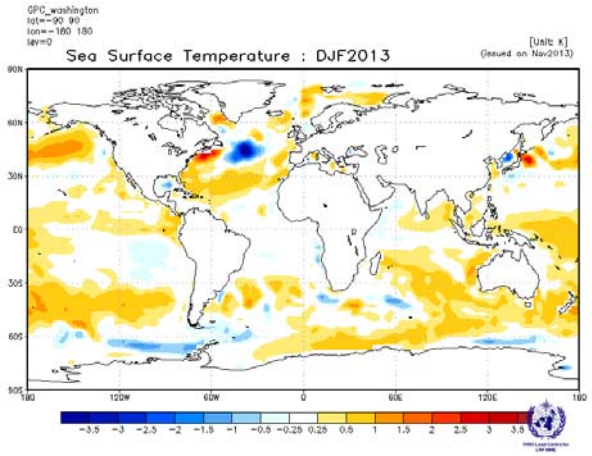


Tokyo
Baseline : 1983-2001



Washington

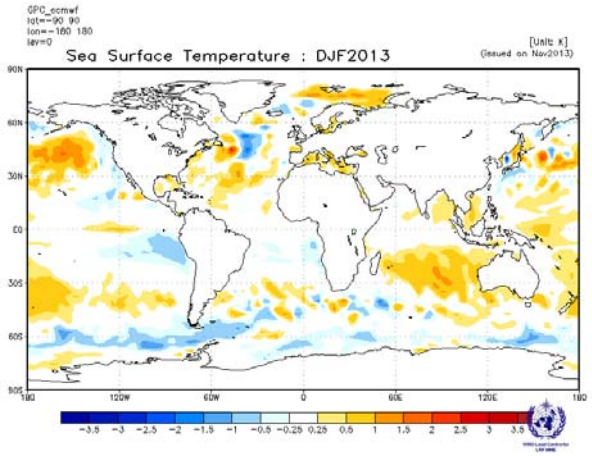
Baseline : 1983-2001



Individual GPC ensemble mean forecasts of SST anomalies from other GPCs for which forecast anomalies relative to 1983-2001 are not available.

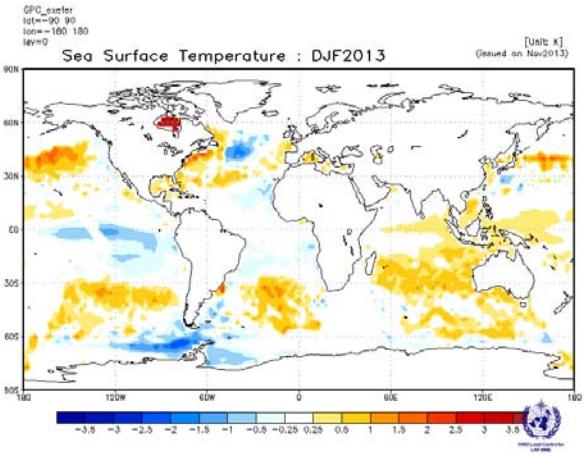
ECMWF

Baseline: 1981-2010



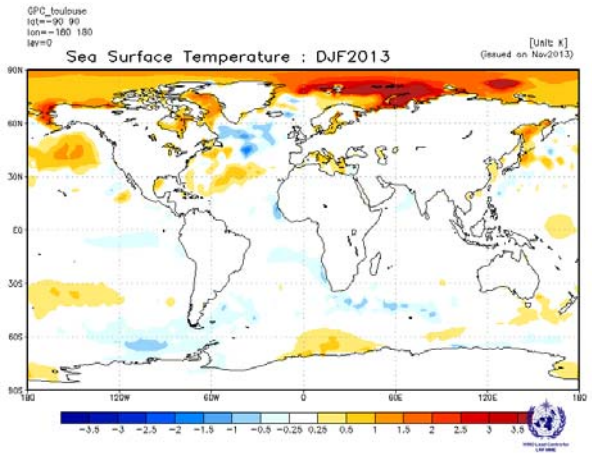
Exeter

Baseline : 1996-2009

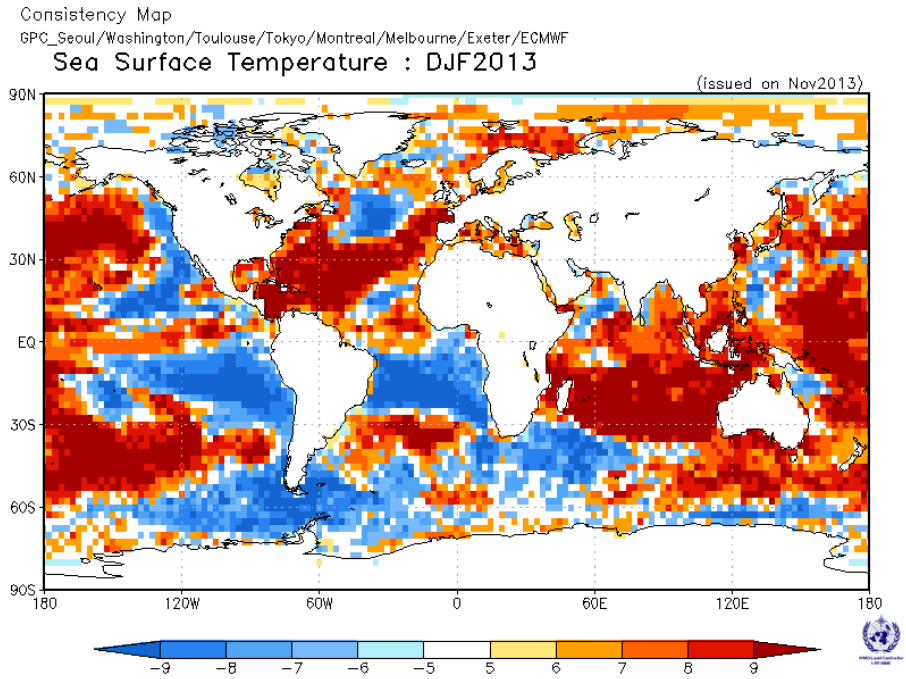


Toulouse

Baseline: 1979-2007

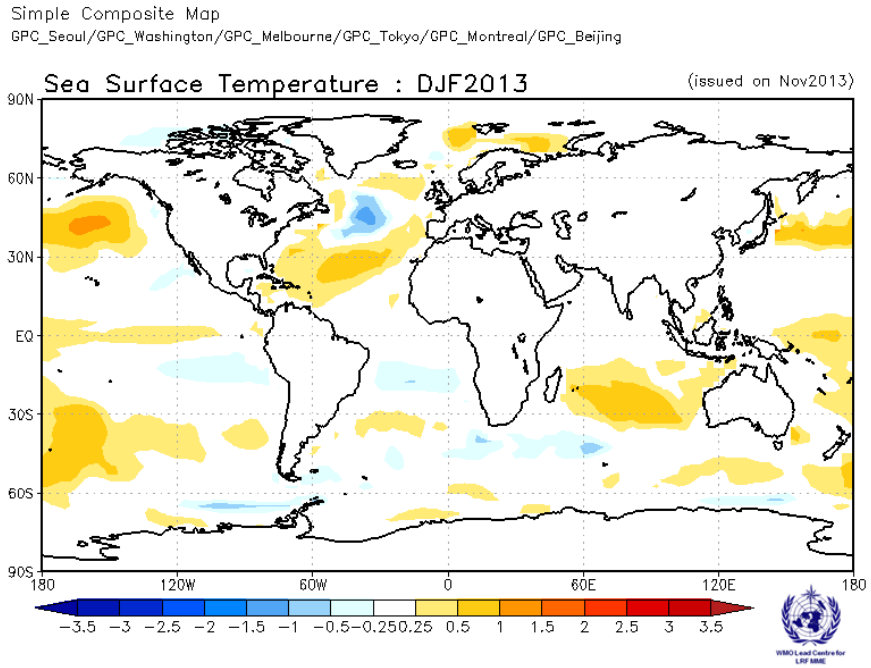


Consistency Map of SST (all 12 GPCs)



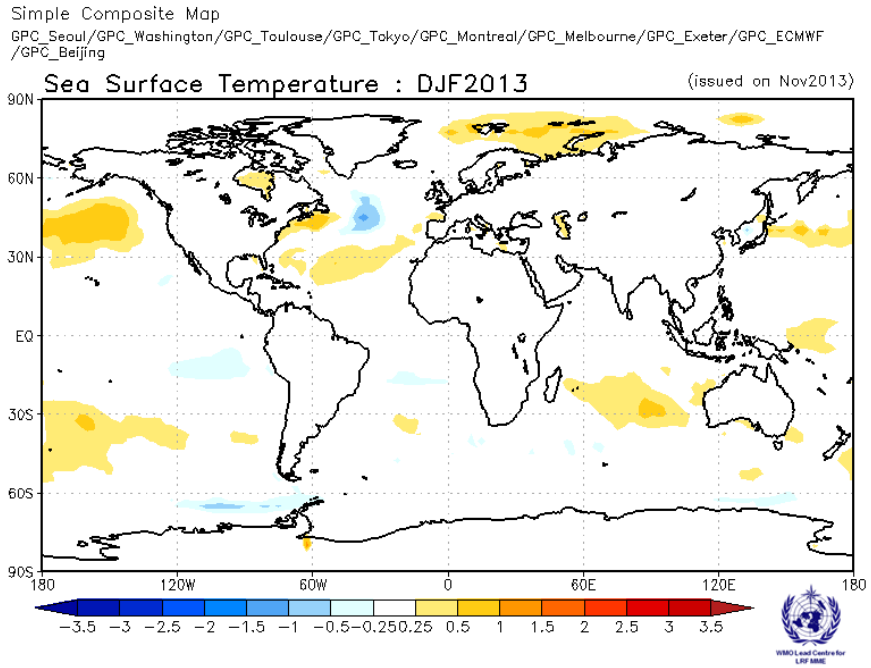
Showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).

DMME (6GPCs), using the same baseline for all models (1983-2001): SST Ensemble mean anomaly



DMME (9 GPCs), for each model using its own baseline: SST

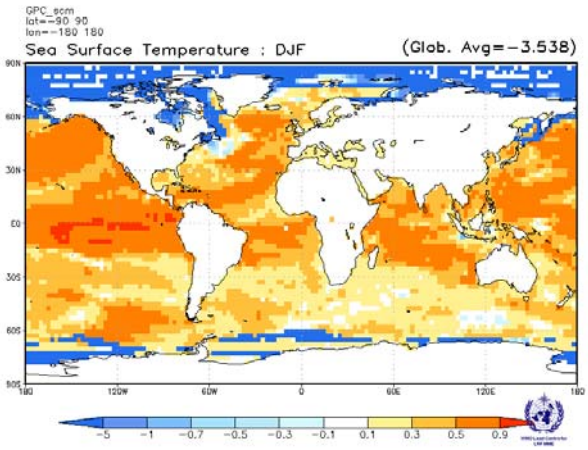
Ensemble mean anomaly



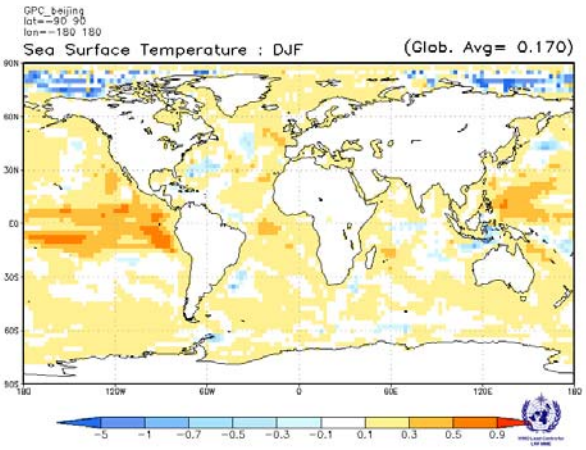
Verification of GPC ensemble mean SST anomaly forecasts, 1983-2001

Verification measure: Mean Square Skill Score (MSSS)
Verification dataset: Reynolds SST

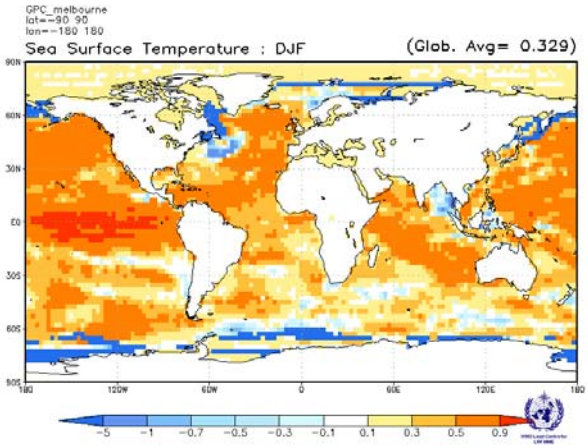
DMME



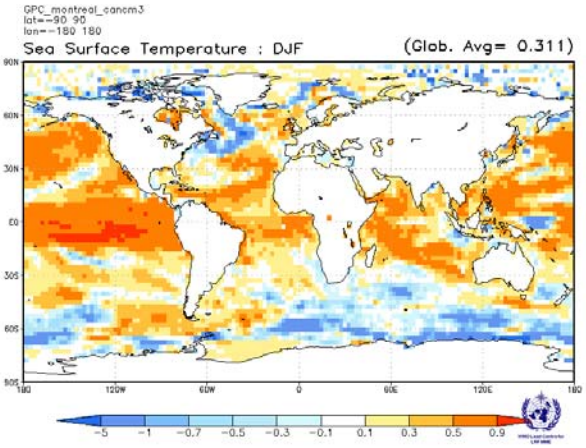
Beijing



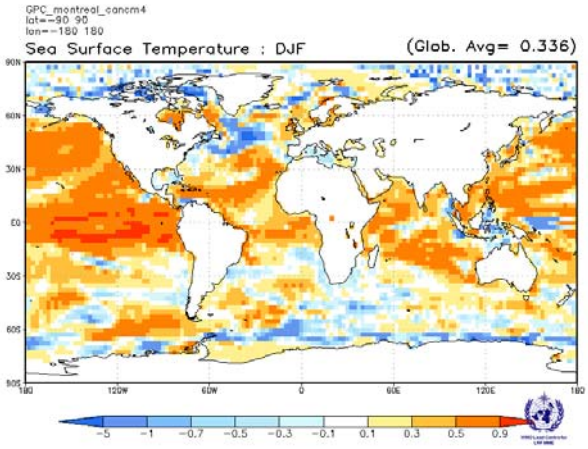
Melbourne



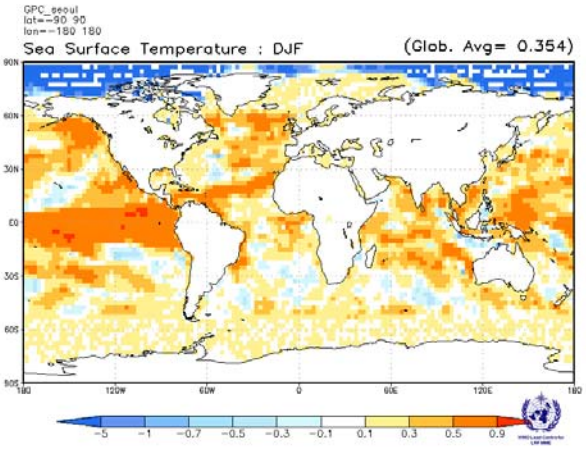
Montreal_cancm3



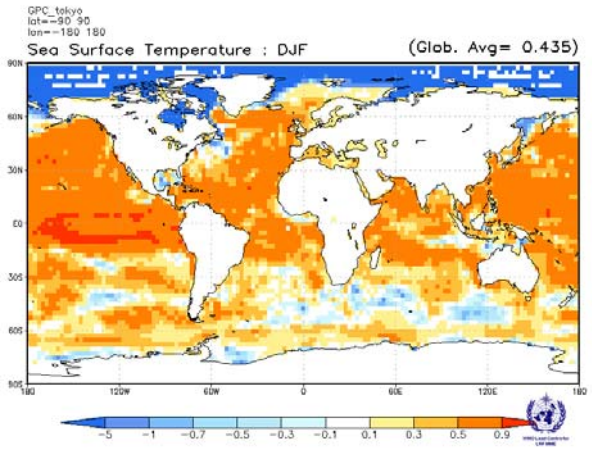
Montreal_cancm4



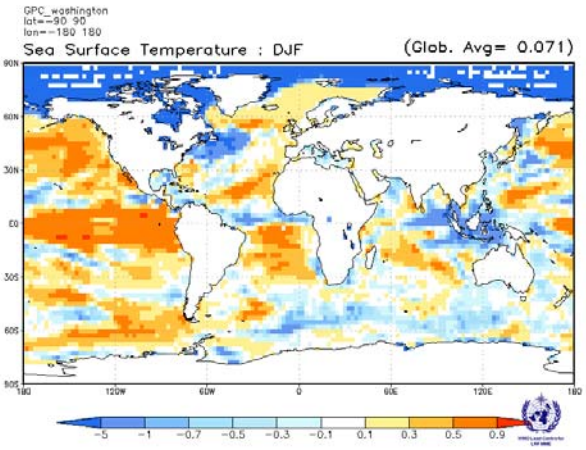
Seoul



Tokyo



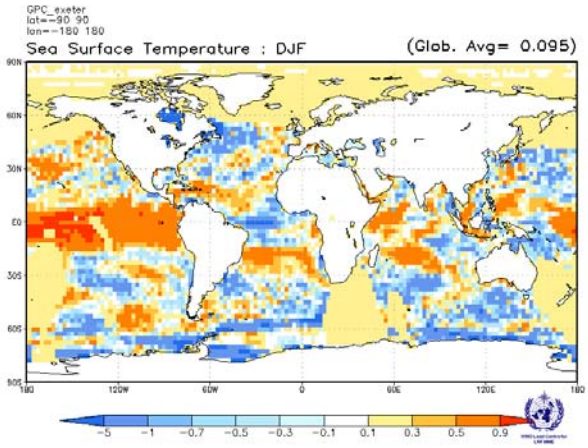
Washington



MSSS verification of SST anomaly forecasts from other GPCs

Exeter

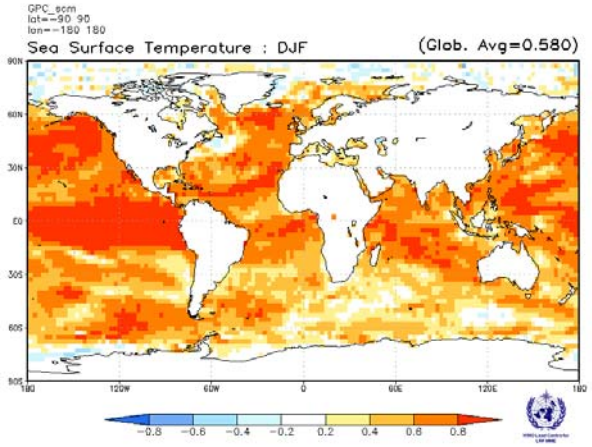
Verification period: 1996-2009



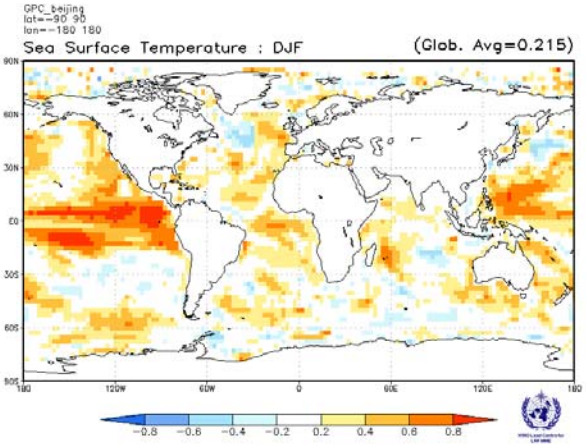
Verification measure: Anomaly Correlation Coefficient (ACC)

Verification dataset: Reynolds SST

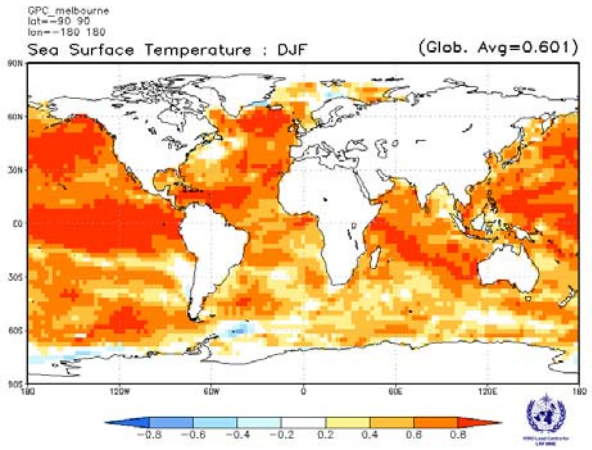
DMME



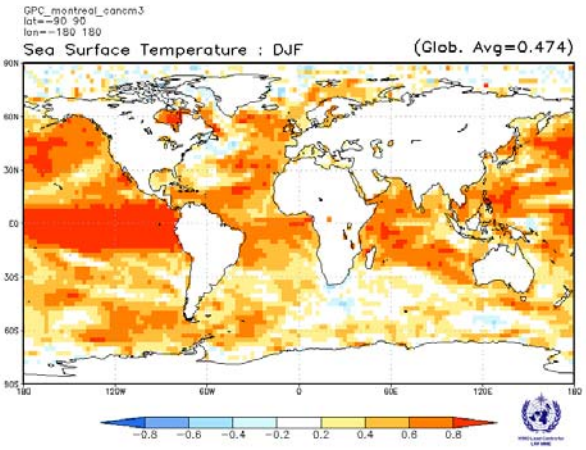
Beijing



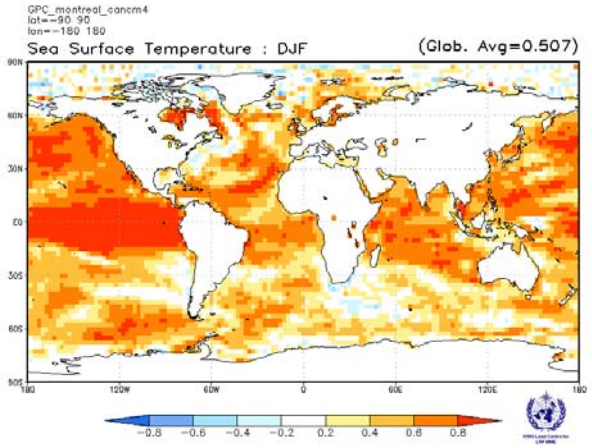
Melbourne



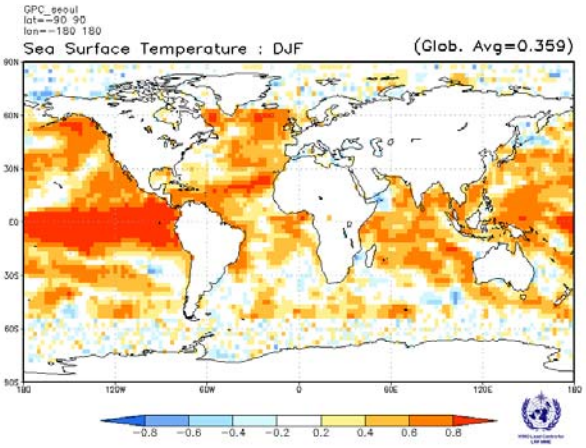
Montreal_cancm3



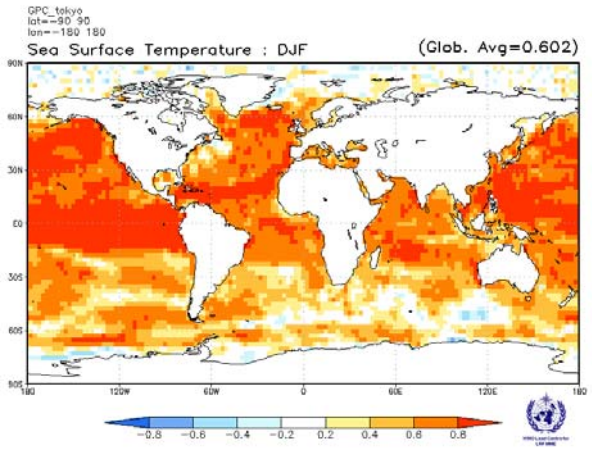
Montreal_cancm4



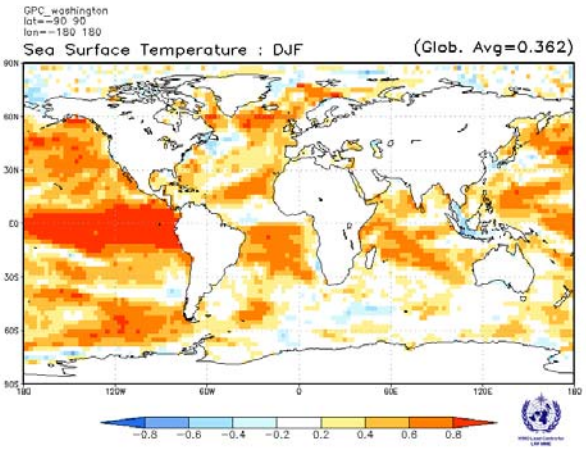
Seoul



Tokyo



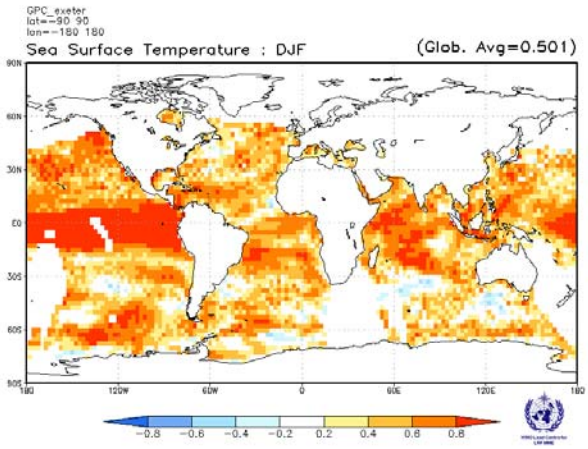
Washington



ACC verification of SST anomaly forecasts from other GPCs

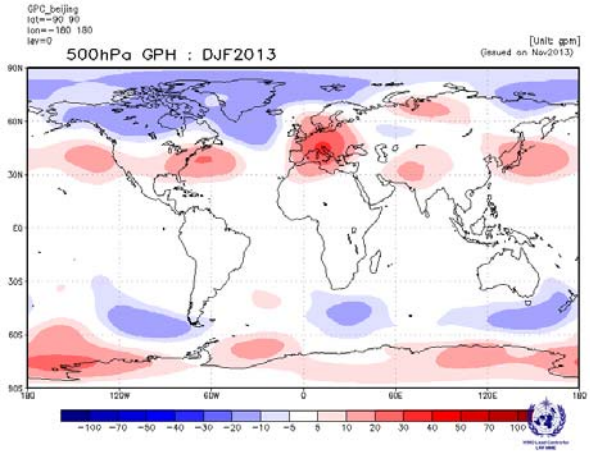
Exeter

Verification period: 1996-2009

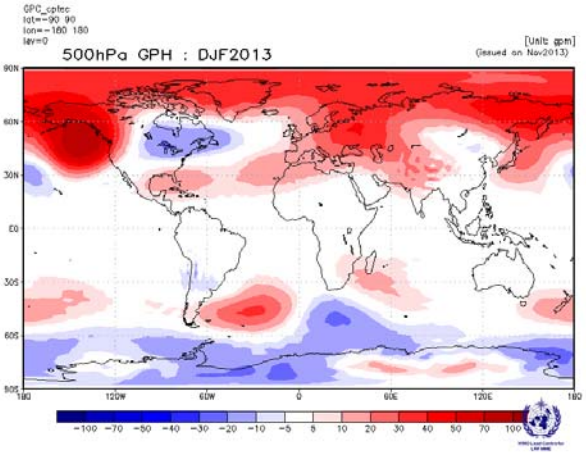


Individual GPC ensemble mean forecasts of 500hPa height anomalies relative to 1983-2001

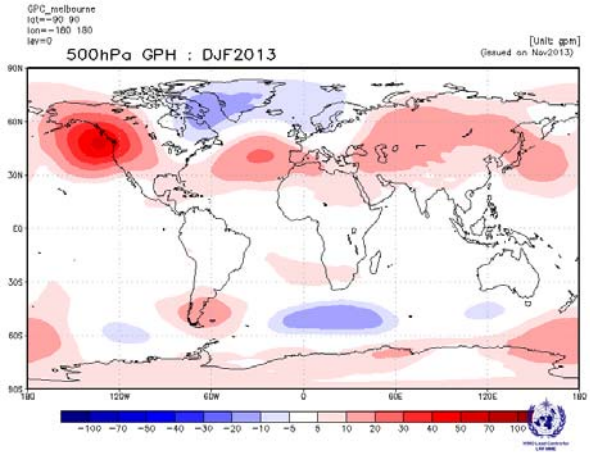
Beijing
Baseline : 1983-2001



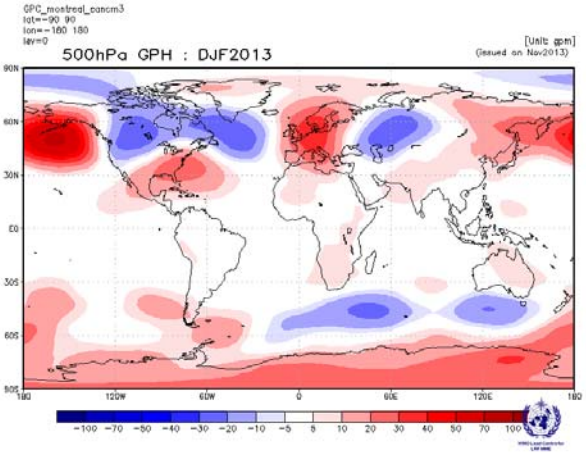
CPTEC
Baseline : 1983-2001



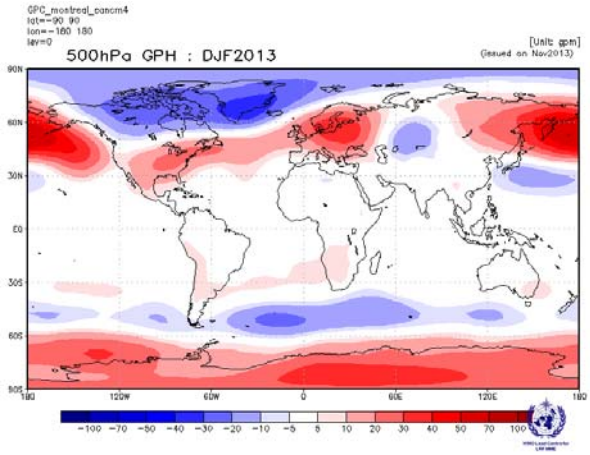
Melbourne
Baseline : 1983-2001



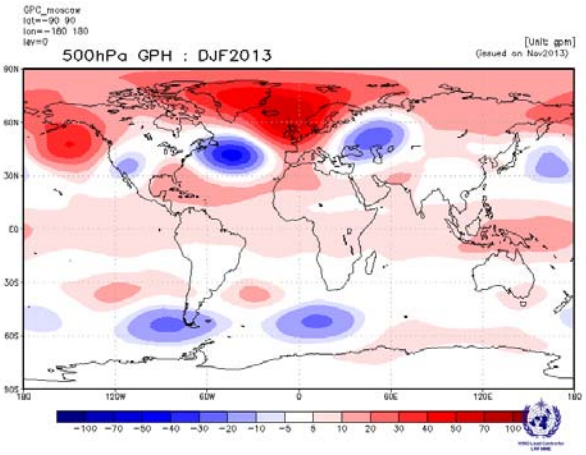
Montreal_cancm3
Baseline : 1983-2001



Montreal_cancm4
Baseline : 1983-2001

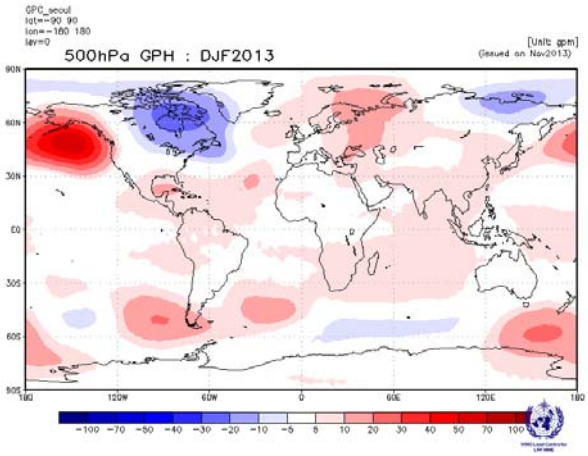


Moscow
Baseline : 1983-2001



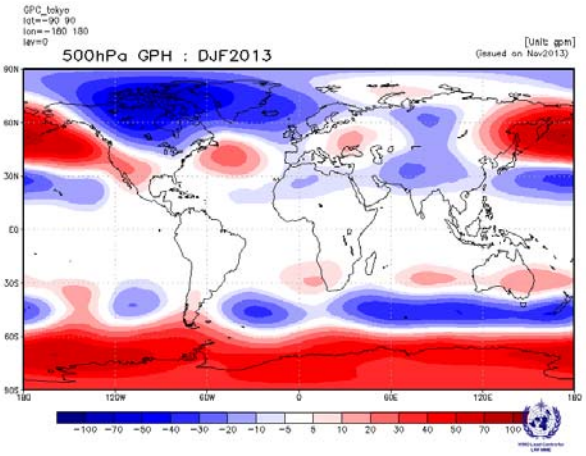
Seoul

Baseline : 1983-2001



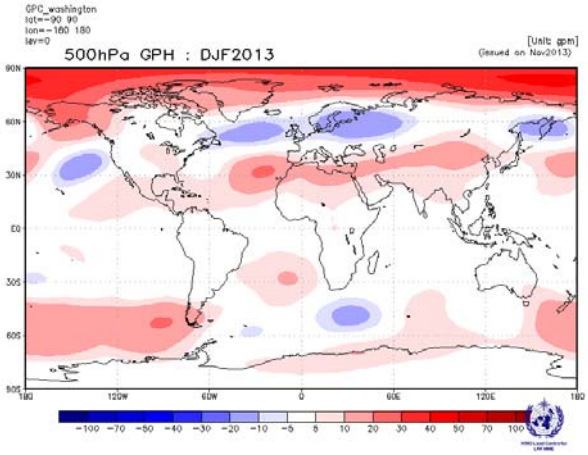
Tokyo

Baseline : 1983-2001



Washington

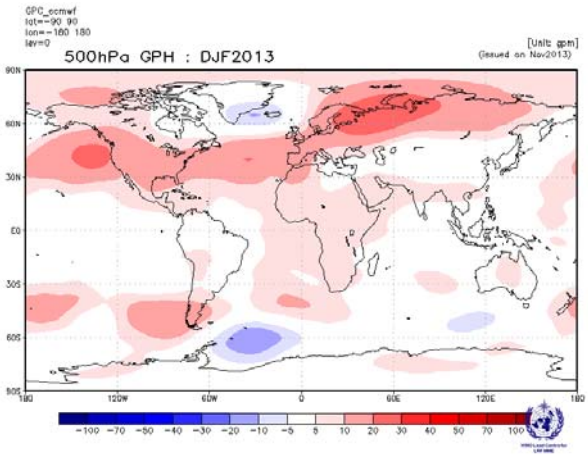
Baseline : 1983-2001



Individual GPC ensemble mean forecasts of 500hPa height anomalies from other GPCs for which forecast anomalies relative to 1983-2001 are not available.

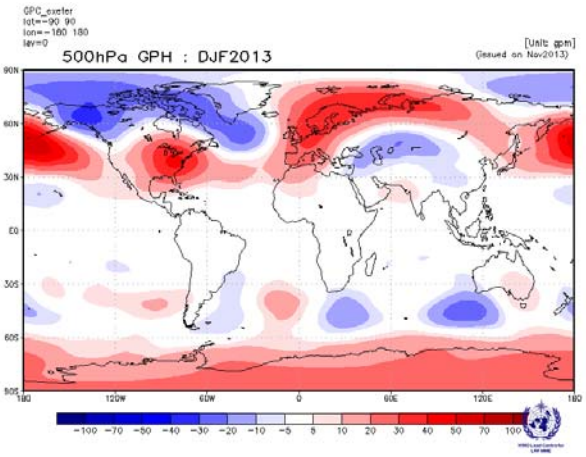
ECMWF

Baseline: 1981-2010

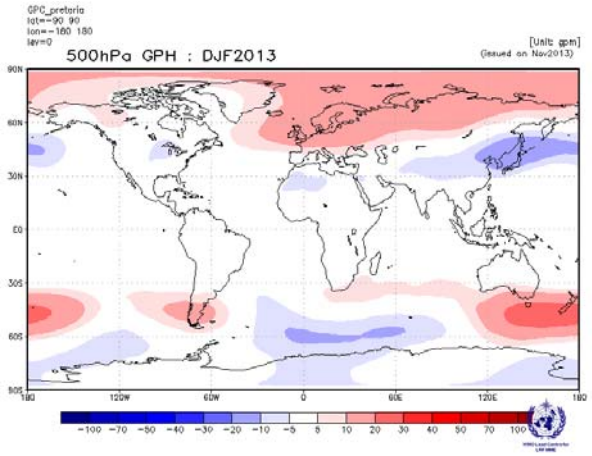


Exeter

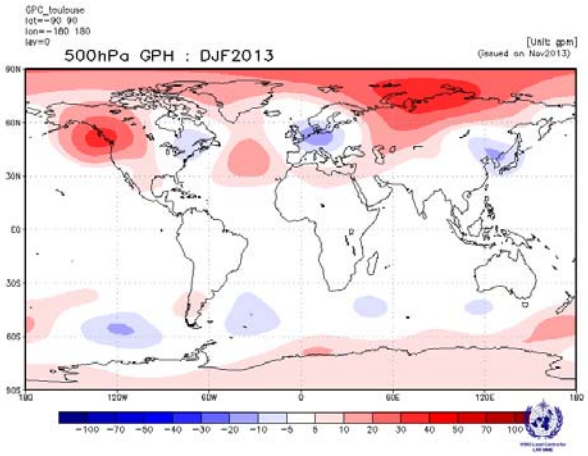
Baseline : 1996-2009



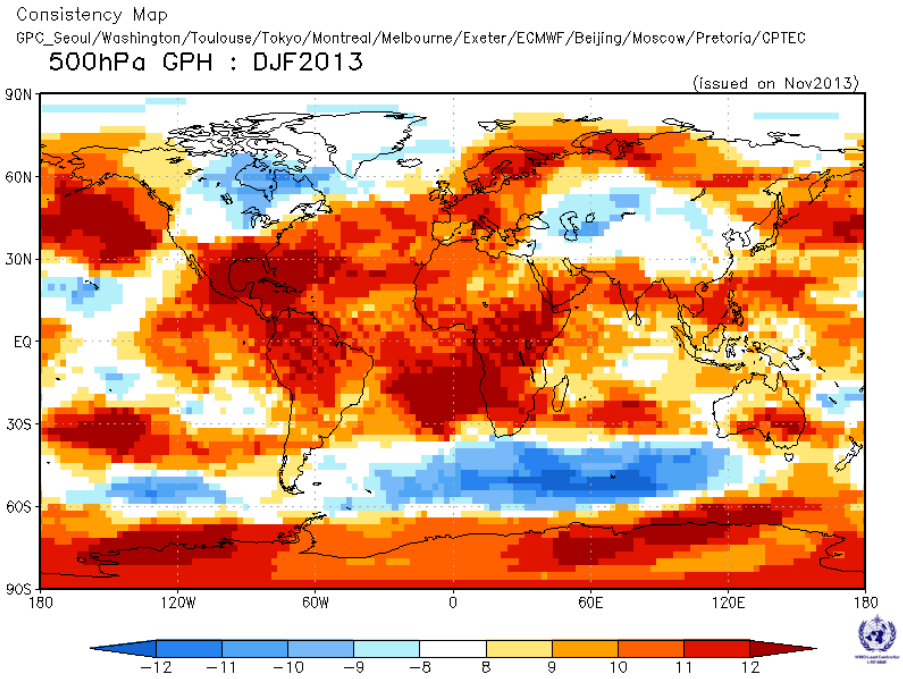
Pretoria
Baseline: 1981-2001



Toulouse
Baseline: 1979-2007

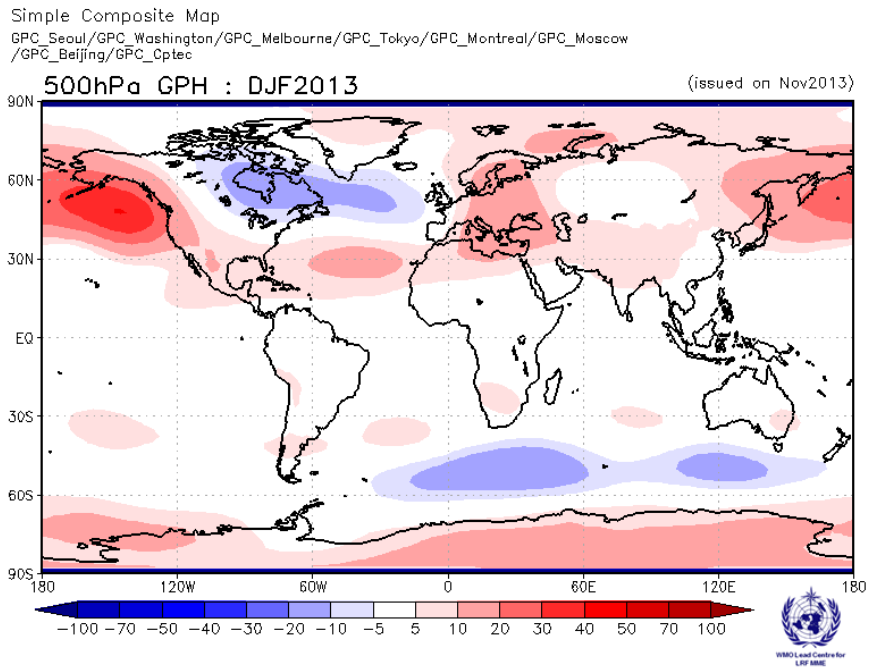


Consistency Map of 500hPa height (all 12 GPCs)



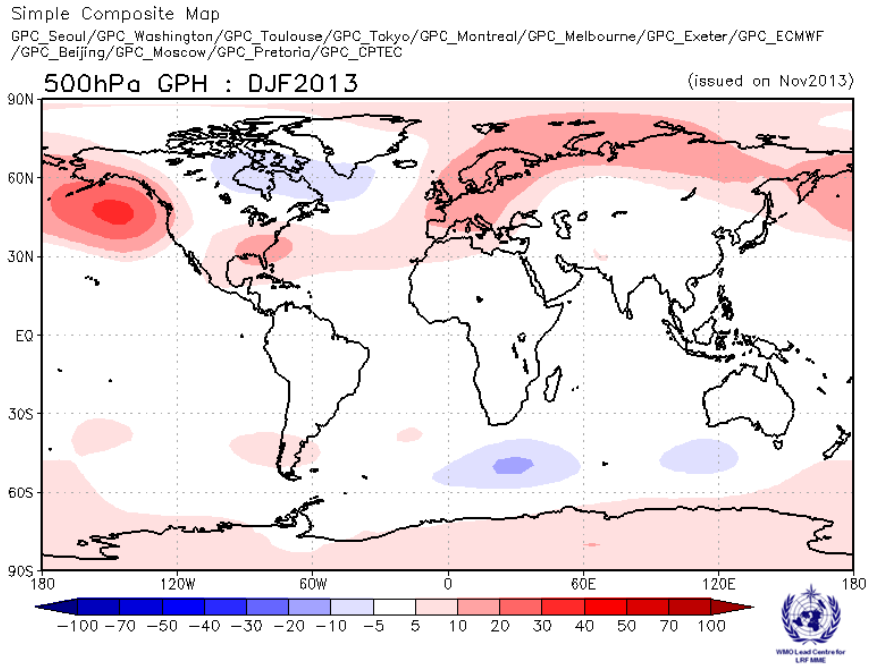
Showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).

DMME (8GPCs), using the same baseline for all models (1983-2001): 500hPa height Ensemble mean anomaly



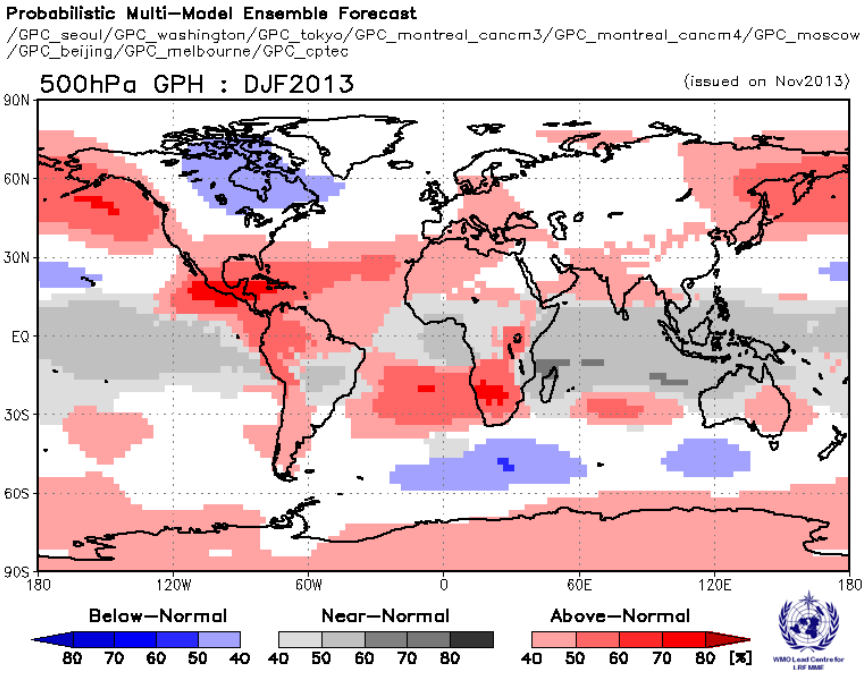
DMME (12 GPCs), for each model using its own baseline: 500hPa height

Ensemble mean anomaly



PMME (8GPCs), using the same baseline for all models (1983-2001): 500hPa height

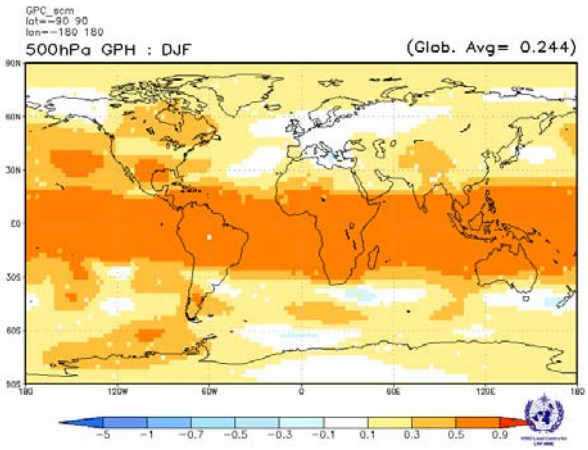
Probability of most likely tercile category



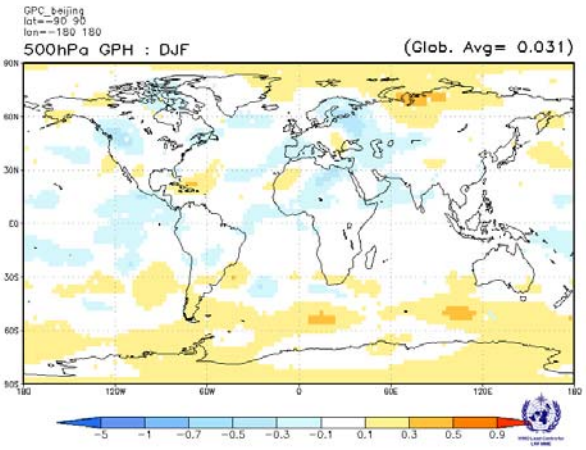
Verification GPC ensemble mean 500hPa height anomaly forecasts, 1983-2001

Verification measure: Mean Square Skill Score (MSSS)
Verification dataset: ERA-Interim

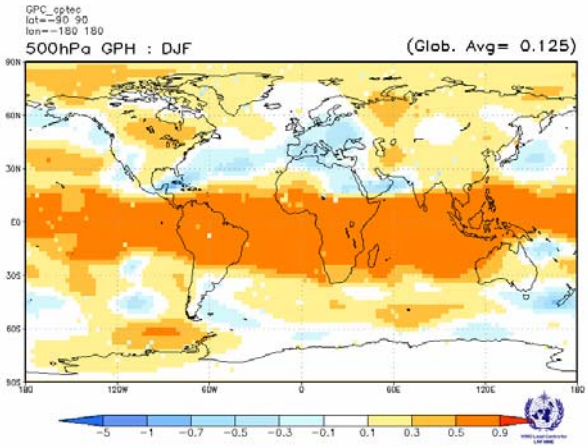
DMME



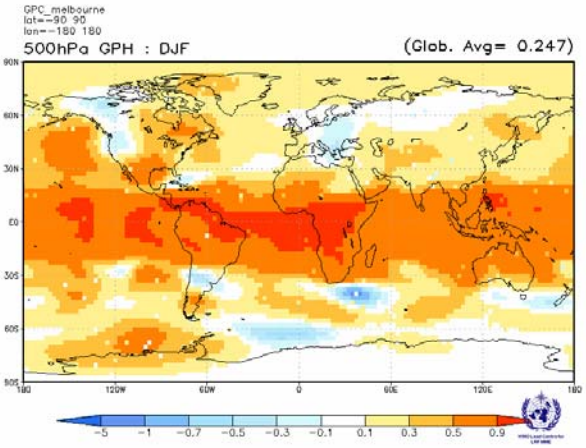
Beijing



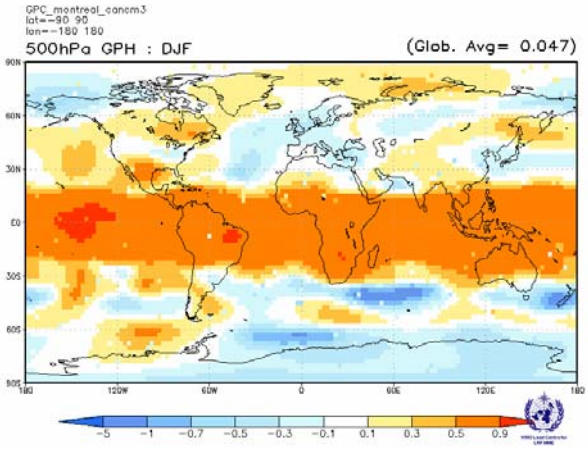
CPTEC



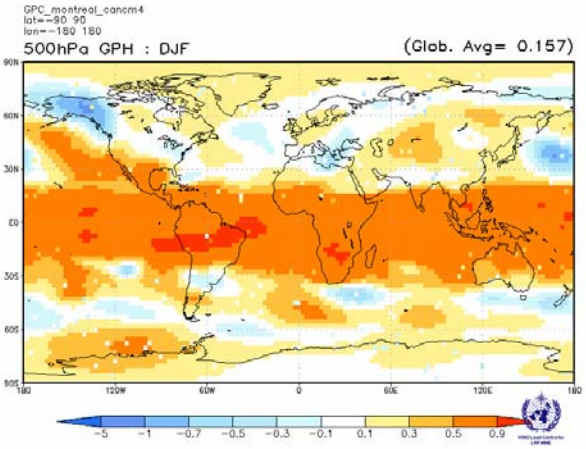
Melbourne



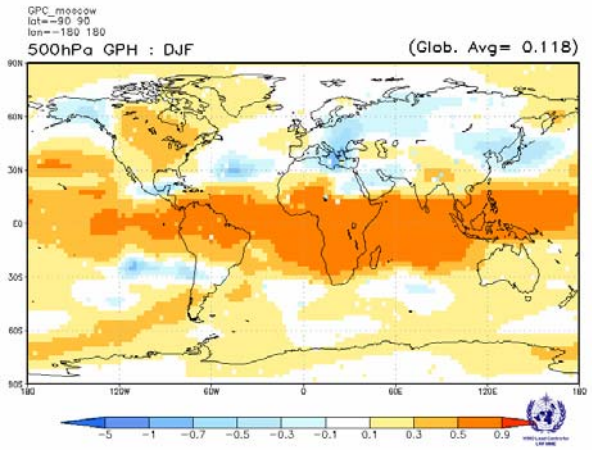
Montreal_cancm3



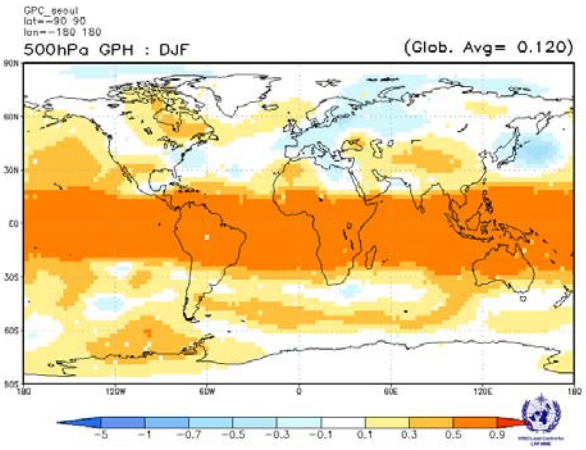
Montreal_cancm4



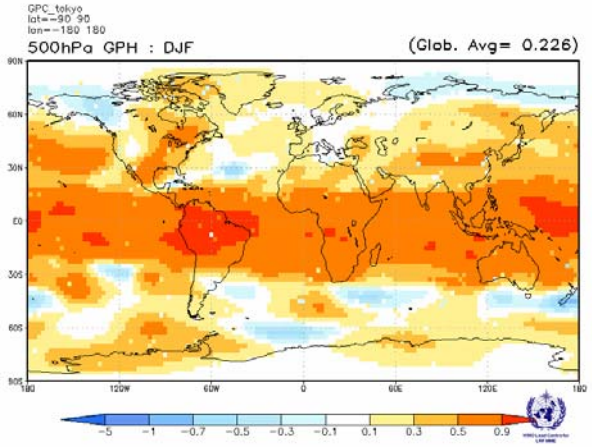
Moscow



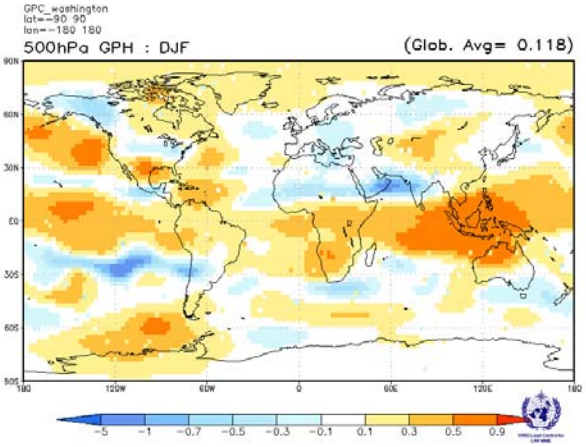
Seoul



Tokyo



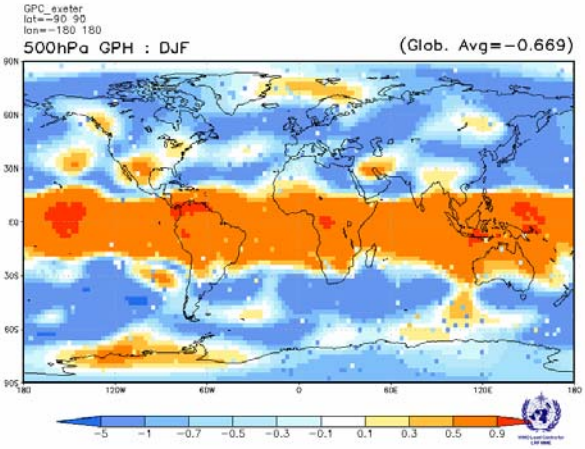
Washington



MSSS verification of 500hPa height anomaly forecasts from other GPCs

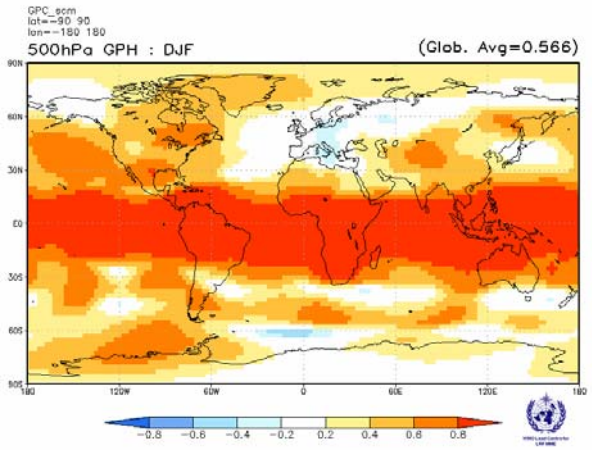
Exeter

Verification period: 1996-2009

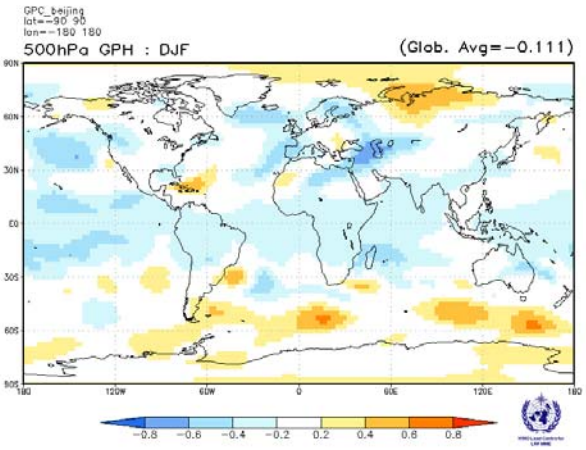


Verification measure: Anomaly Correlation Coefficient (ACC)
Verification dataset: ERA-Interim

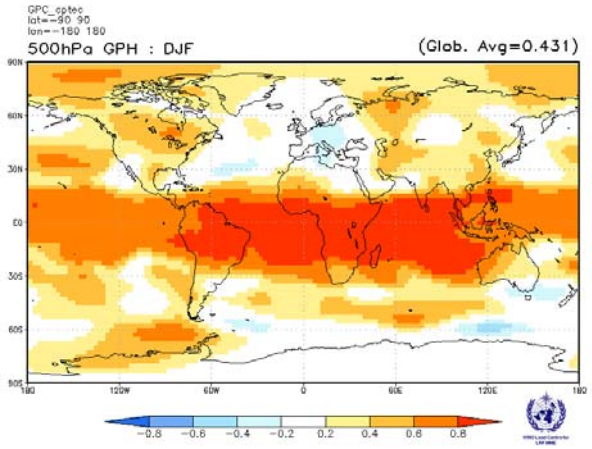
DMME



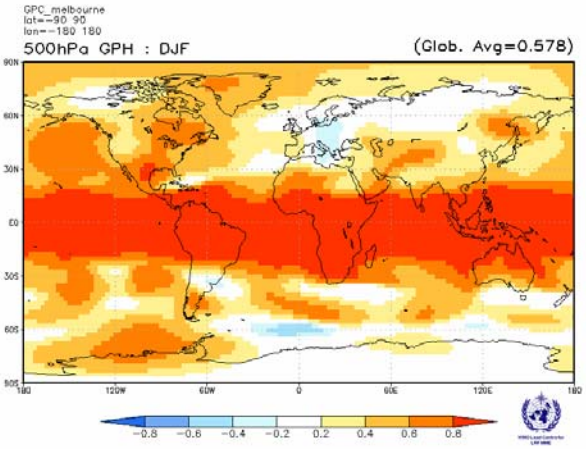
Beijing



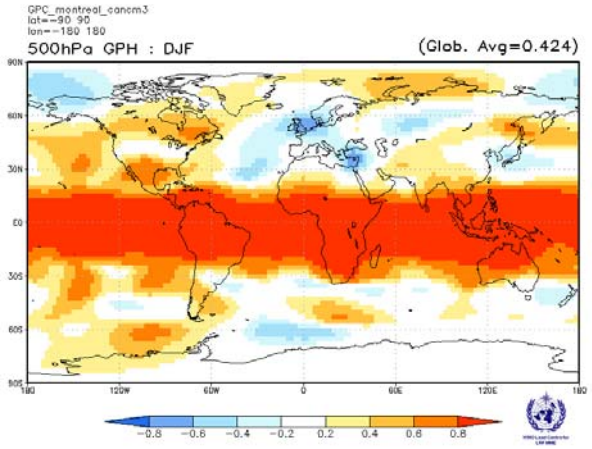
CPTEC



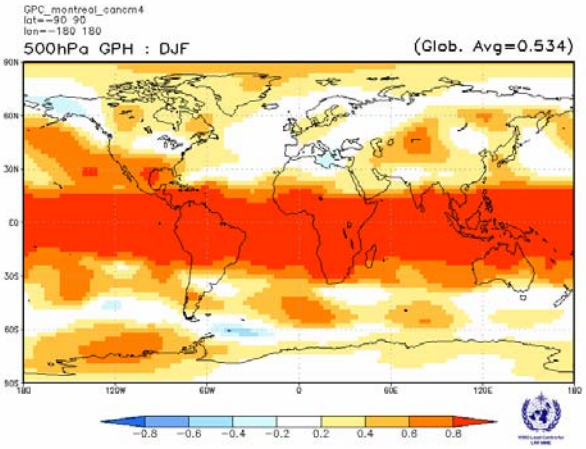
Melbourne



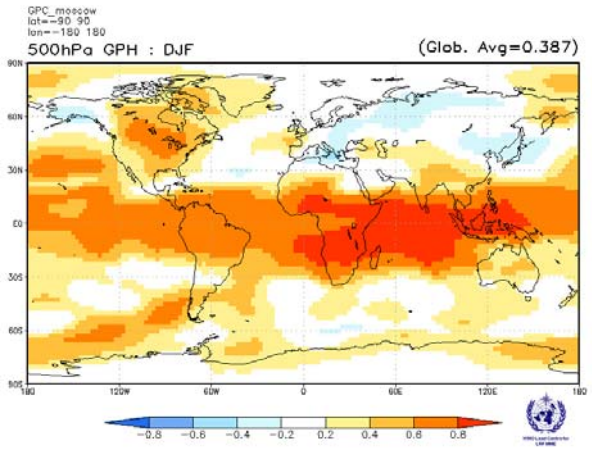
Montreal_cancm3



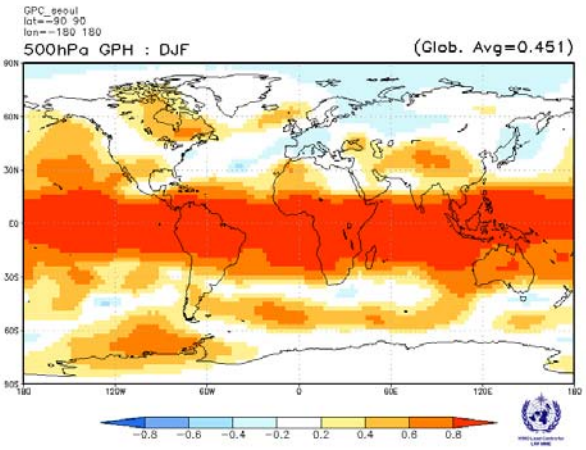
Montreal_cancm4



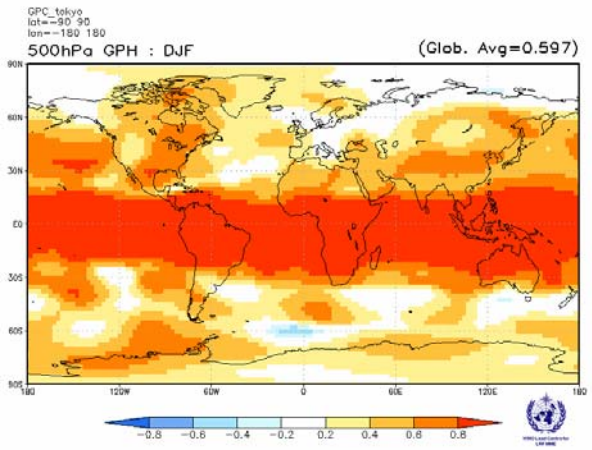
Moscow



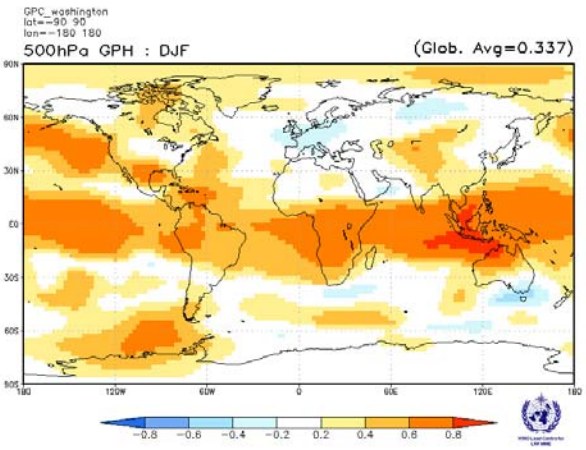
Seoul



Tokyo



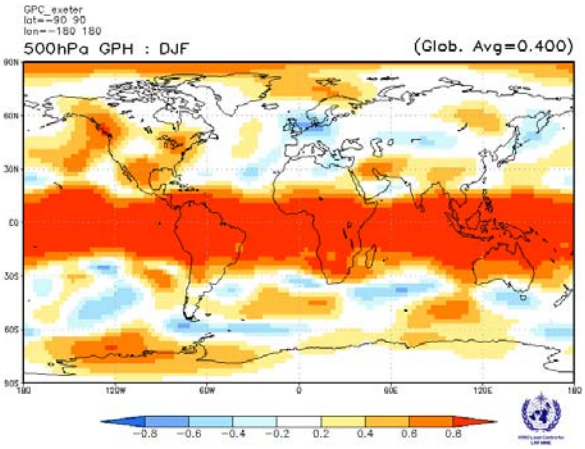
Washington



ACC verification of 500hPa height anomaly forecasts from other GPCs

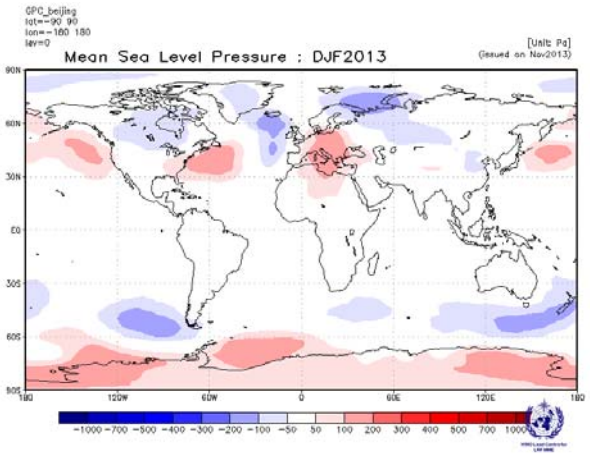
Exeter

Verification period: 1996-2009

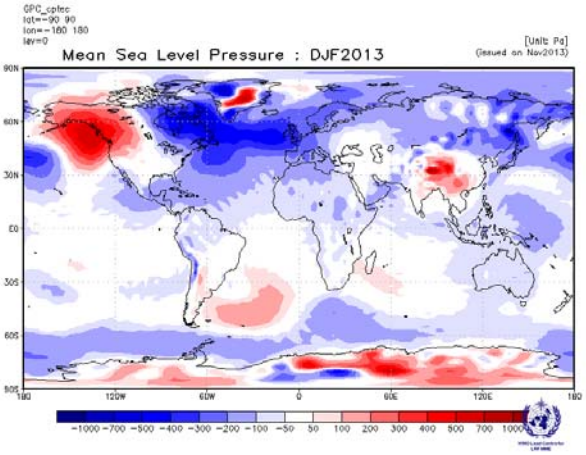


Individual GPC ensemble mean forecasts of MSLP anomalies relative to 1983-2001

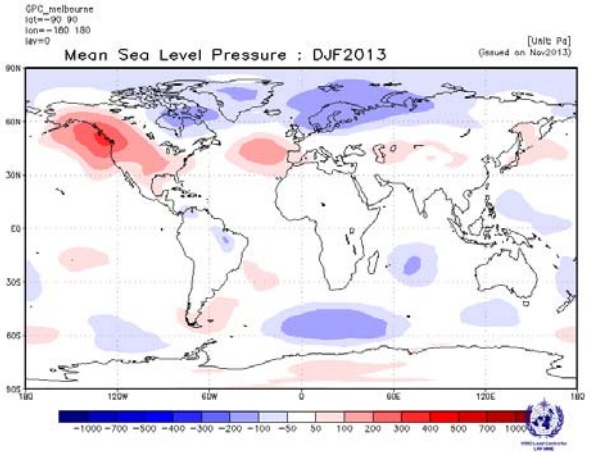
Beijing
Baseline : 1983-2001



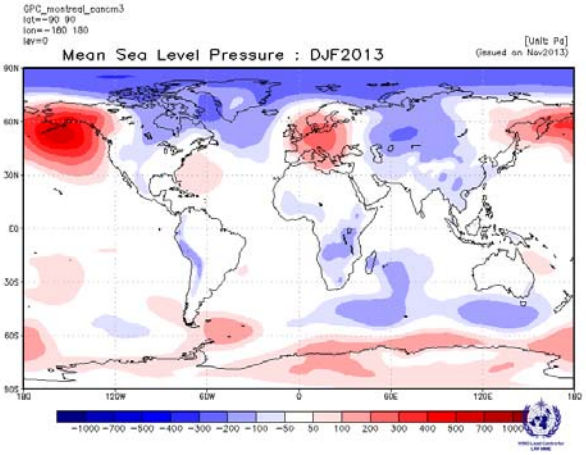
CPTEC
Baseline : 1983-2001



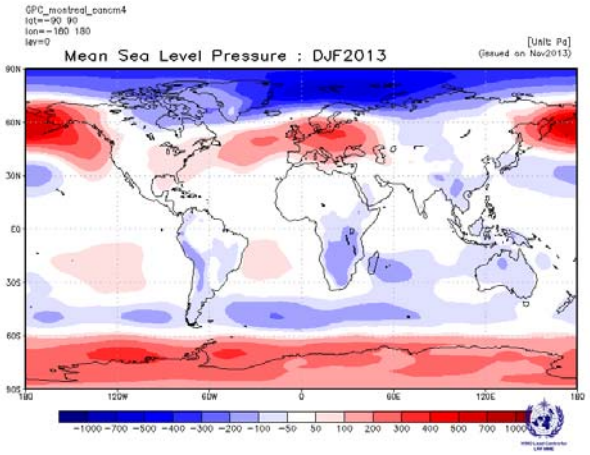
Melbourne
Baseline : 1983-2001



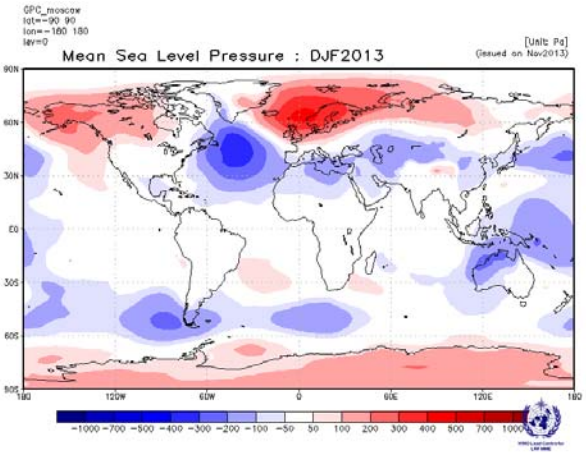
Montreal_cancm3
Baseline : 1983-2001



Montreal_cancm4
Baseline : 1983-2001

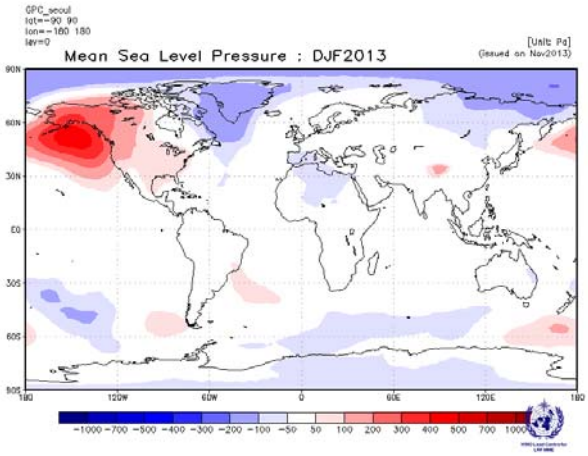


Moscow
Baseline : 1983-2001



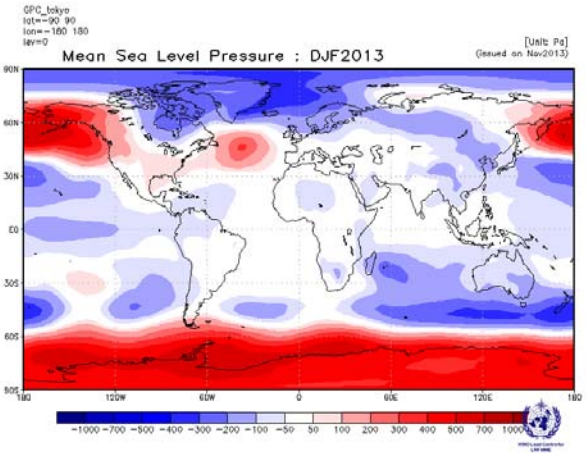
Seoul

Baseline : 1983-2001



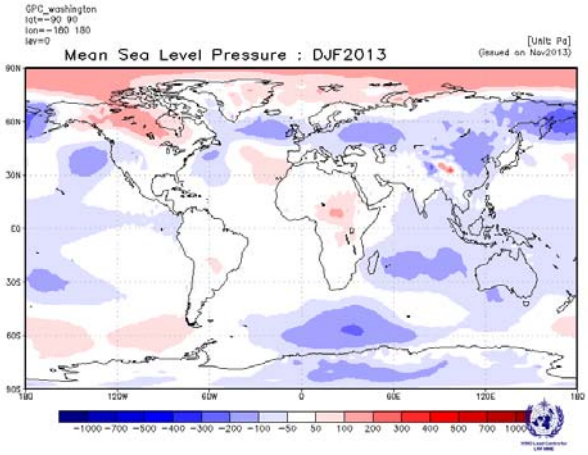
Tokyo

Baseline : 1983-2001



Washington

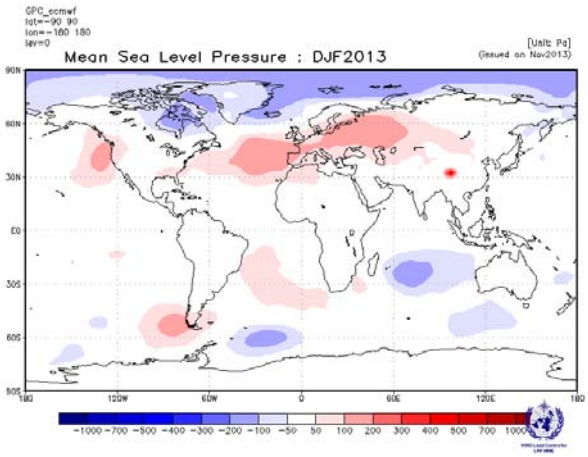
Baseline : 1983-2001



Individual GPC ensemble mean forecasts of MSLP anomalies from other GPCs for which forecast anomalies relative to 1983-2001 are not available.

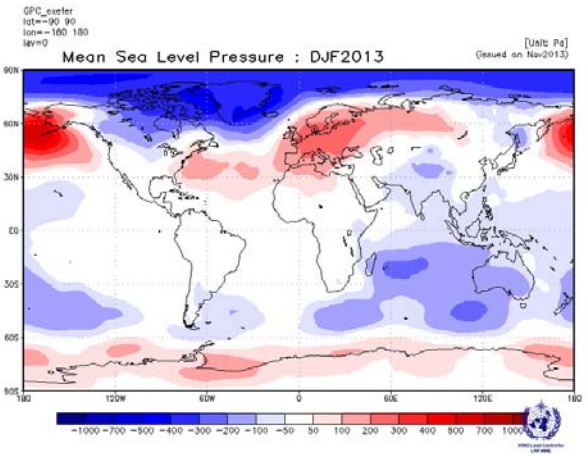
ECMWF

Baseline: 1981-2010

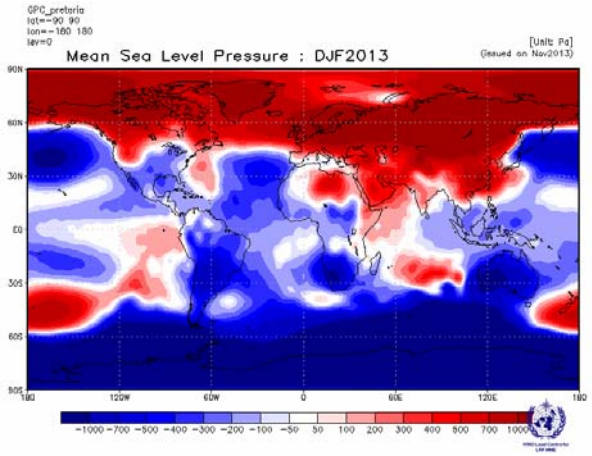


Exeter

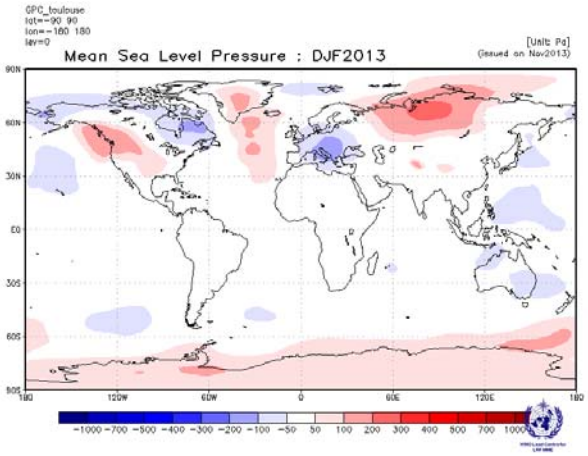
Baseline : 1996-2009



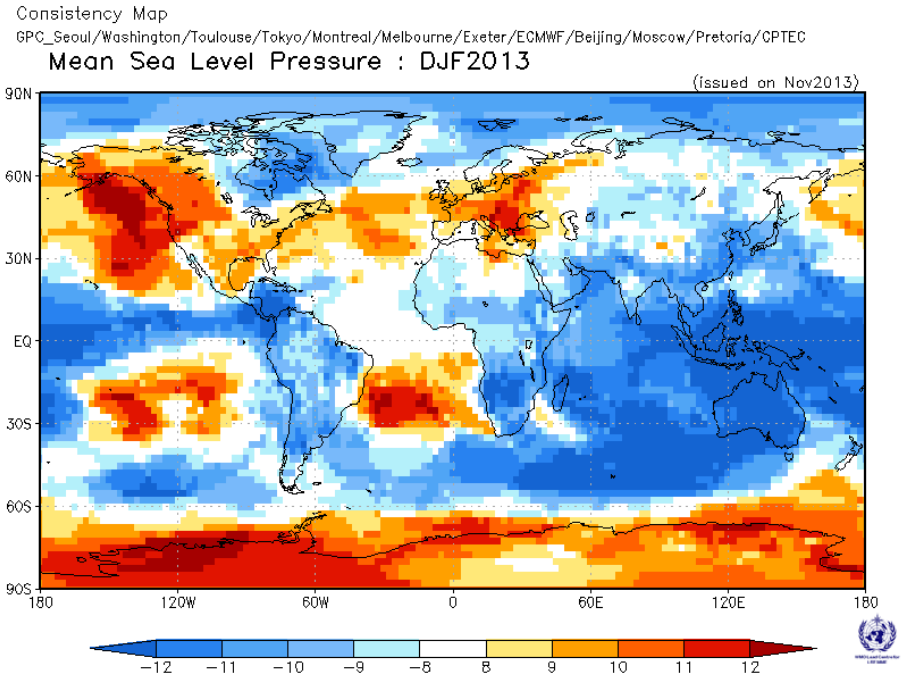
Pretoria
Baseline: 1981-2001



Toulouse
Baseline: 1979-2007

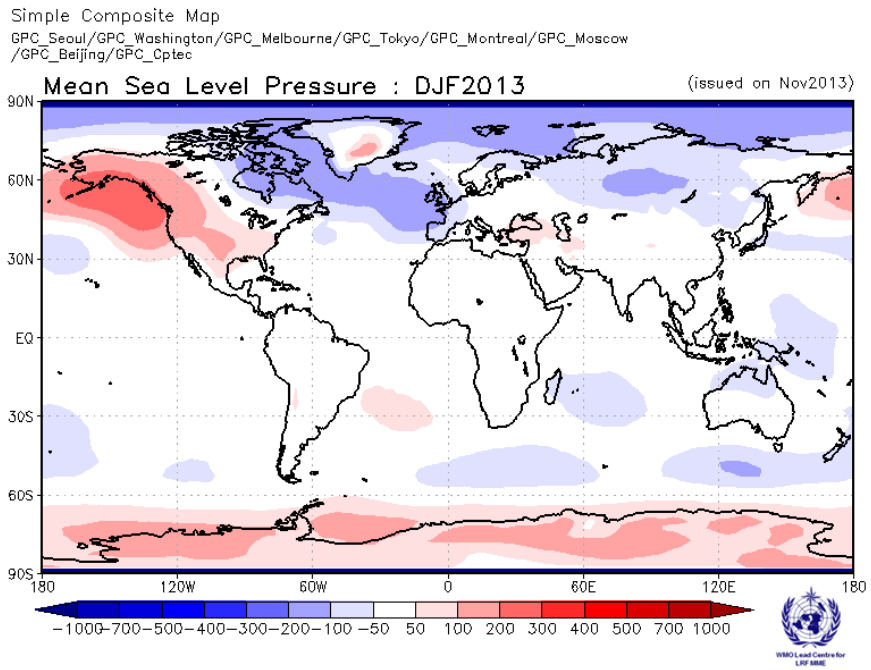


Consistency Map of MSLP (all 12 GPCs)



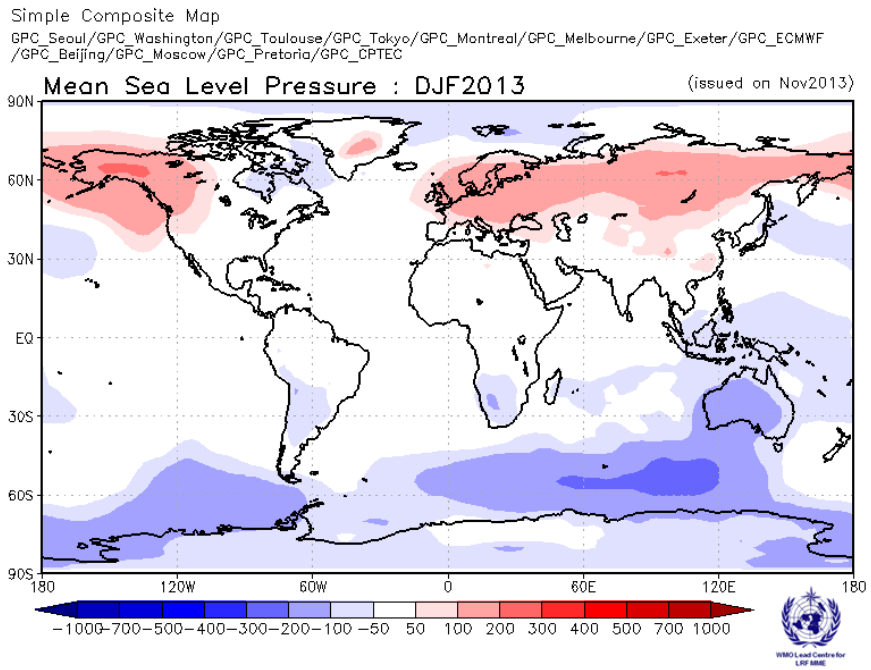
Showing where most GPC models predict above median values relative to own climatology (yellow/red) and the number of models that do so (positive numbers); and where most predict below median values (blue) and the number of models that do so (negative numbers).

DMME (8GPCs), using the same baseline for all models (1983-2001): MSLP Ensemble mean anomaly



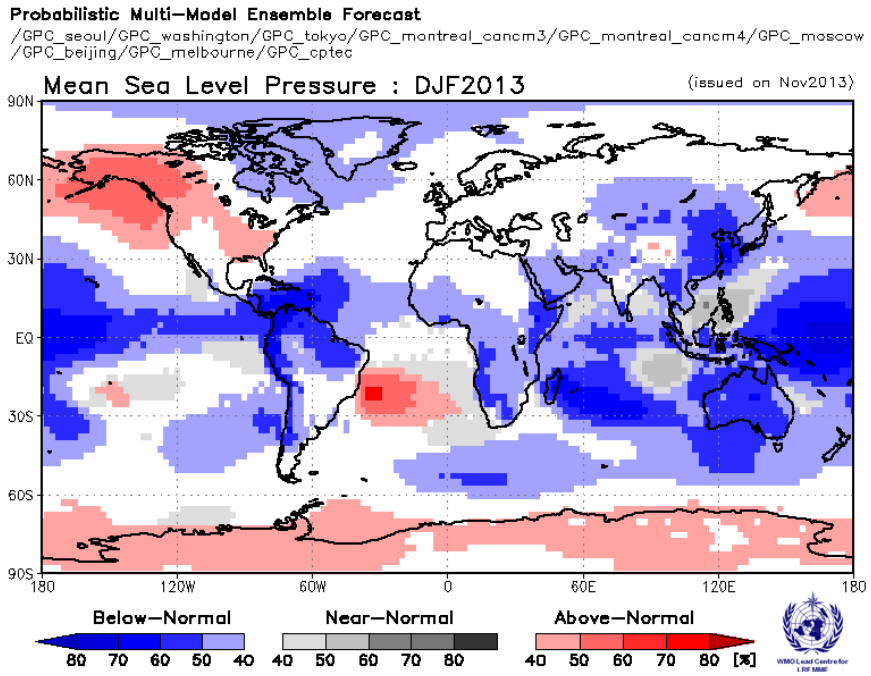
DMME (12 GPCs), for each model using its own baseline: MSLP

Ensemble mean anomaly



PMME (8GPCs), using the same baseline for all models (1983-2001): MSLP

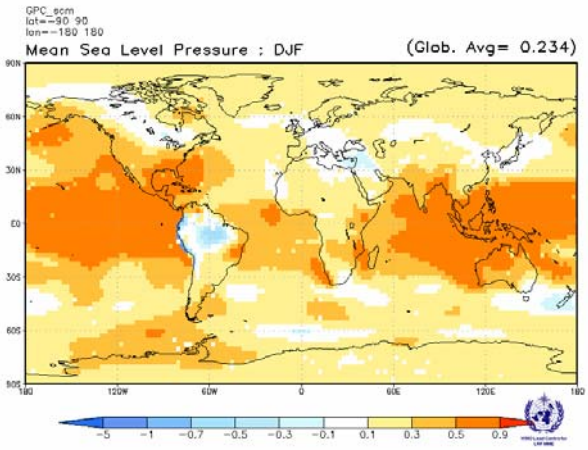
Probability of most likely tercile category



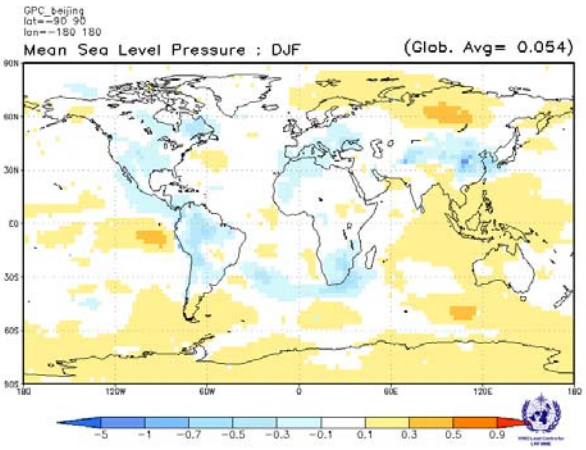
Verification of GPC deterministic MSLP anomaly forecasts, 1983-2001

Verification measure: Mean Square Skill Score (MSSS)
Verification dataset: ERA-Interim

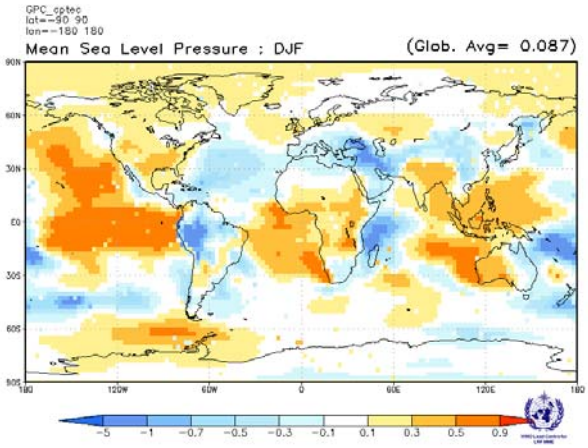
DMME



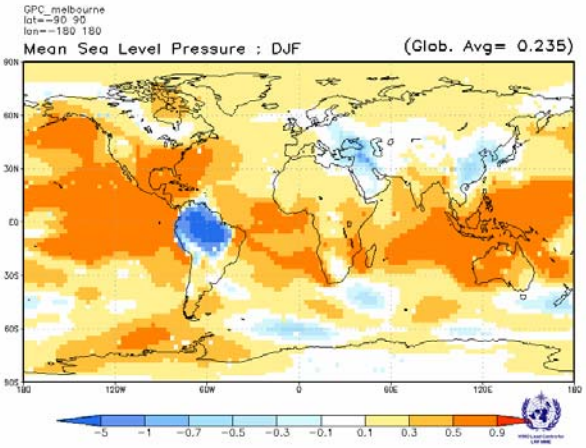
Beijing



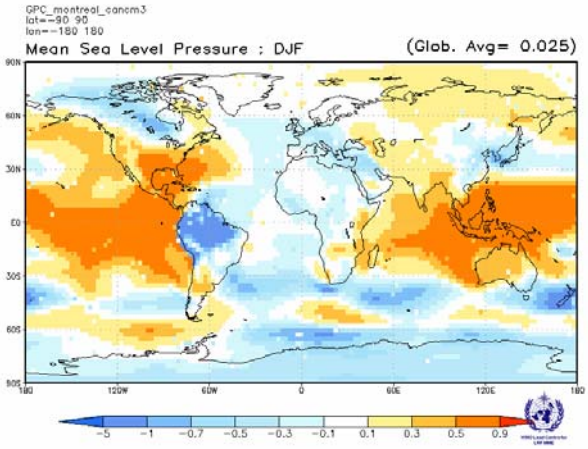
CPTEC



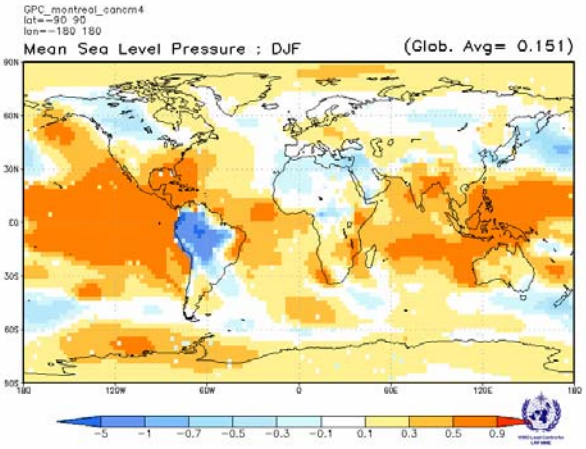
Melbourne



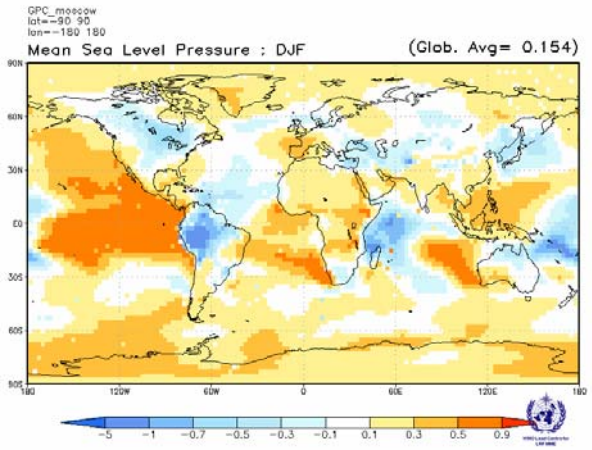
Montreal_cancm3



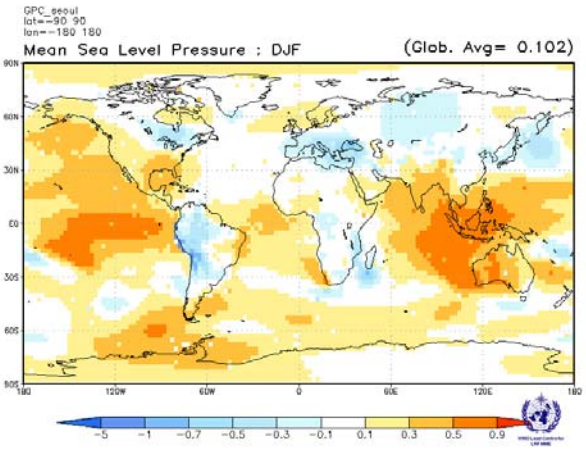
Montreal_cancm4



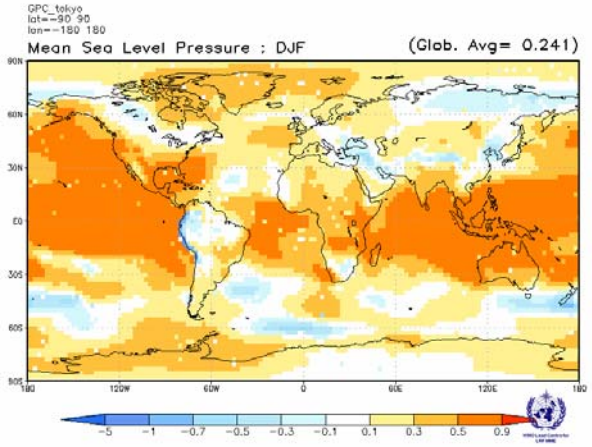
Moscow



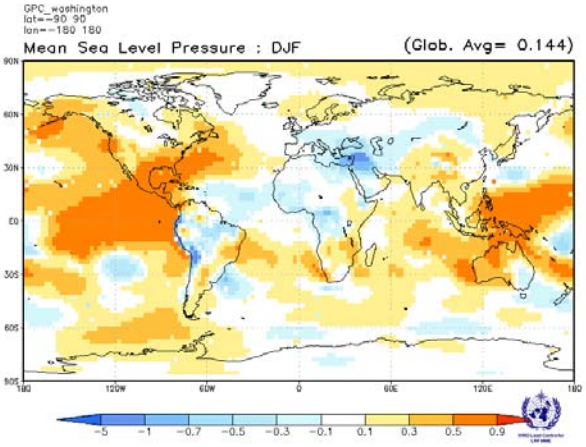
Seoul



Tokyo



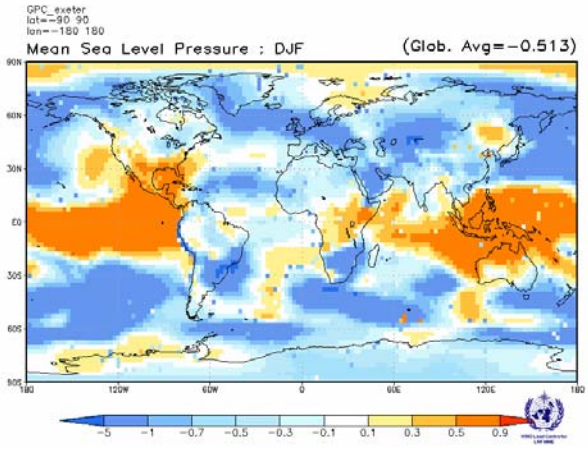
Washington



MSSS verification of MSLP anomaly forecasts from other GPCs

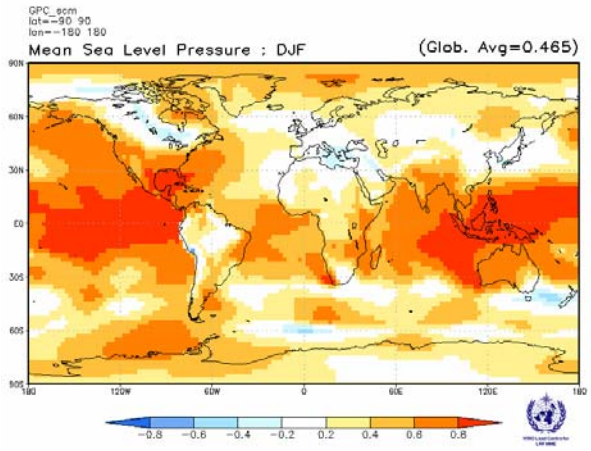
Exeter

Verification period: 1996-2009

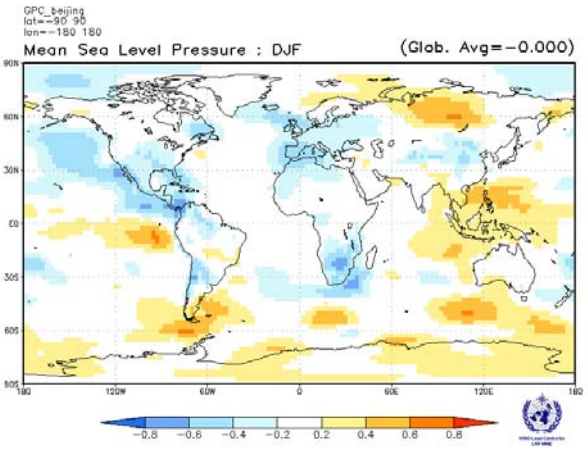


Verification measure: Anomaly Correlation Coefficient (ACC)
Verification dataset: ERA-interim

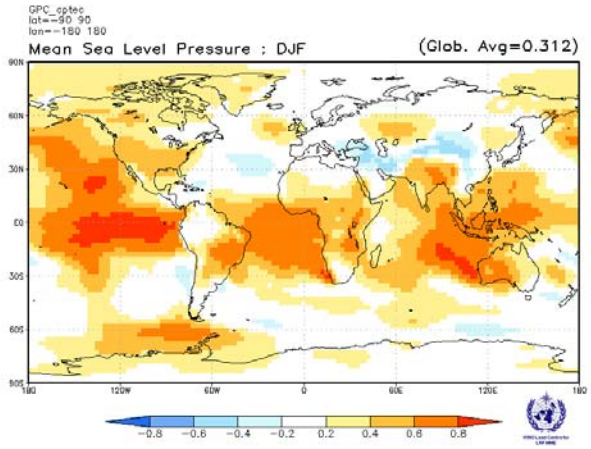
DMME



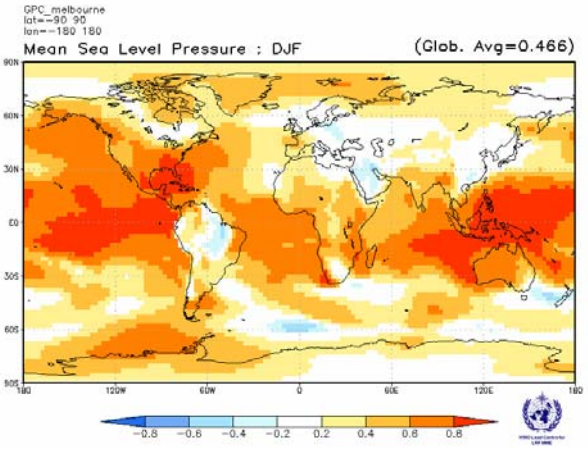
Beijing



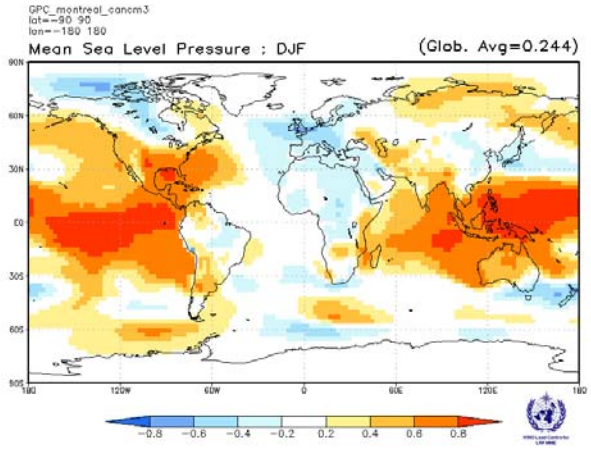
CPTEC



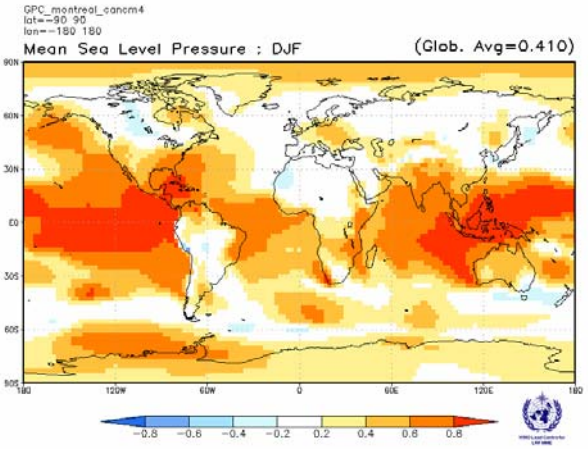
Melbourne



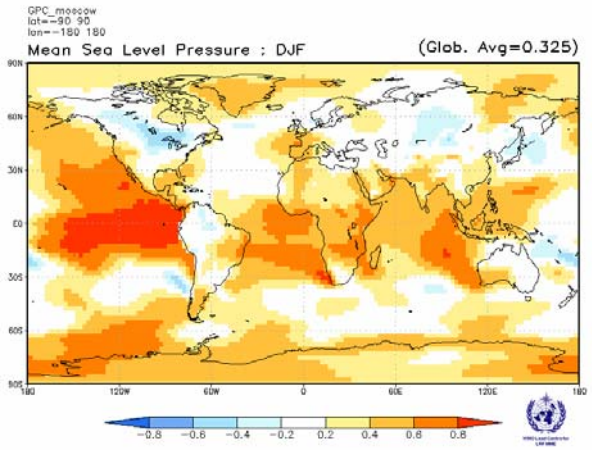
Montreal_cancm3



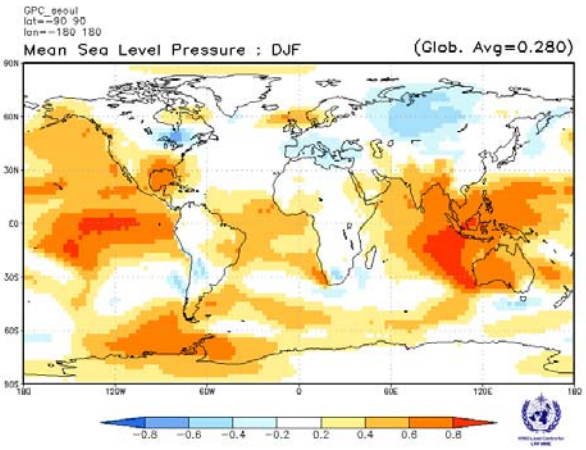
Montreal_cancm4



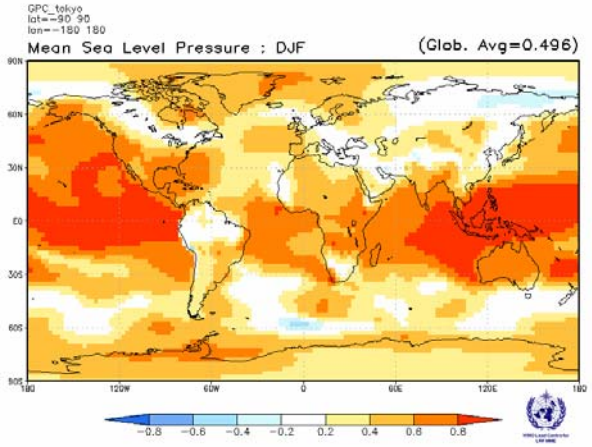
Moscow



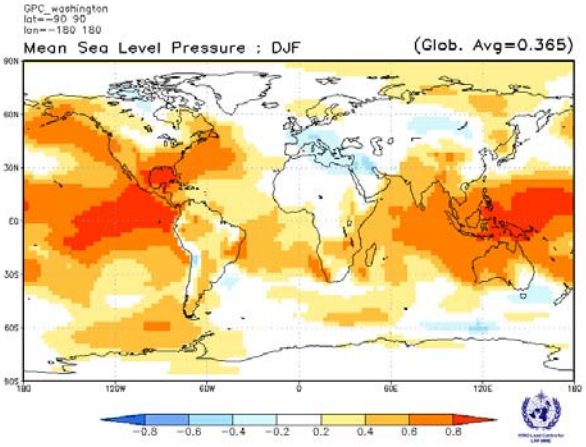
Seoul



Tokyo



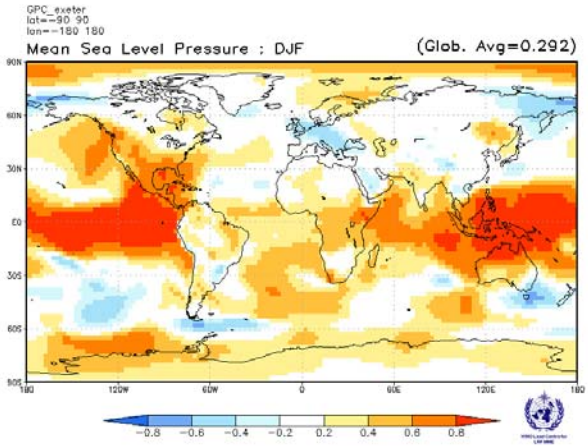
Washington



ACC verification of MSLP anomaly forecasts from other GPCs

Exeter

Verification period: 1996-2009



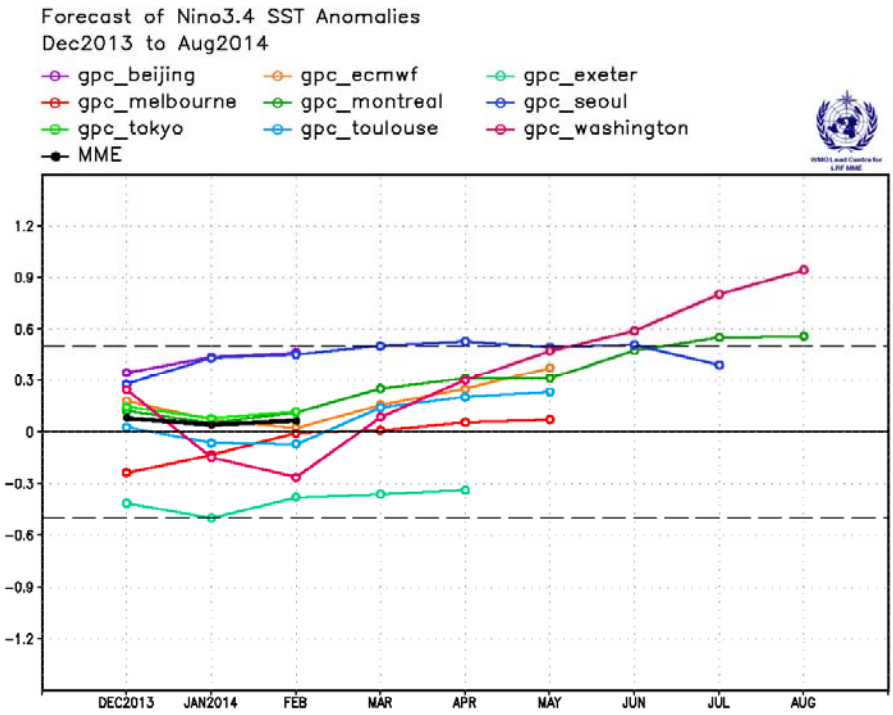
Ensemble mean predictions of global mean temperature

GPC	Global average Temp.(K) (baseline of 1983-2001)	Global average Temp.(K) (with models own baseline)
Beijing	0.04	0.04
CPTEC	0.79	0.81
ECMWF	N/A	0.24
EXETER	N/A	0.28
Melbourne	0.28	0.20
Montreal_cancm3	0.31	0.22
Montreal_cancm4	0.22	0.23
Moscow	0.28	0.15
Pretoria	N/A	0.12
Seoul	0.13	0.09
Tokyo	0.10	0.06
Toulouse	N/A	0.15
Washington	0.26	0.23
MME (12 GPCs)	N/A	0.22
MME (8 GPCs, 9 Models)	0.27	N/A

Predictions of monthly SST indices: each model with its own baseline

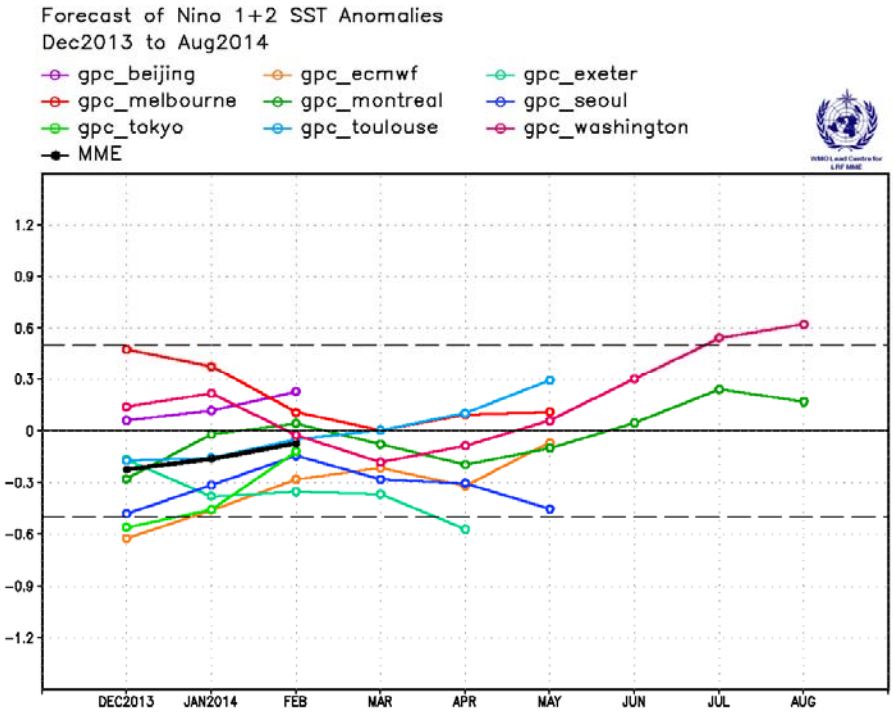
Nino 3.4

SSTA[170°W-120°W, 5°S-5°N]



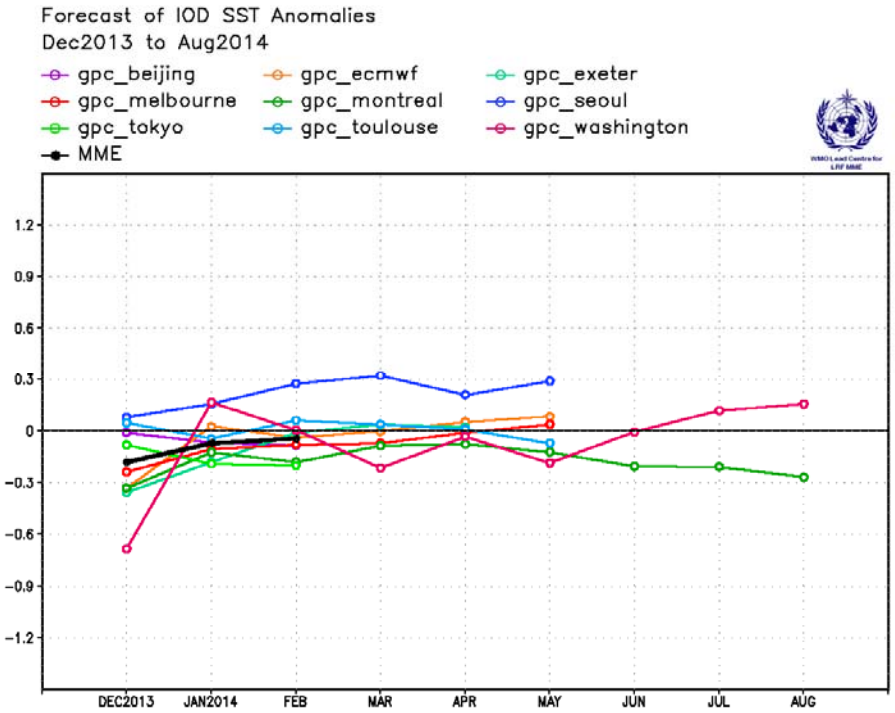
Nino 1+2

SSTA[90°W-80°W, 10°S-0°]



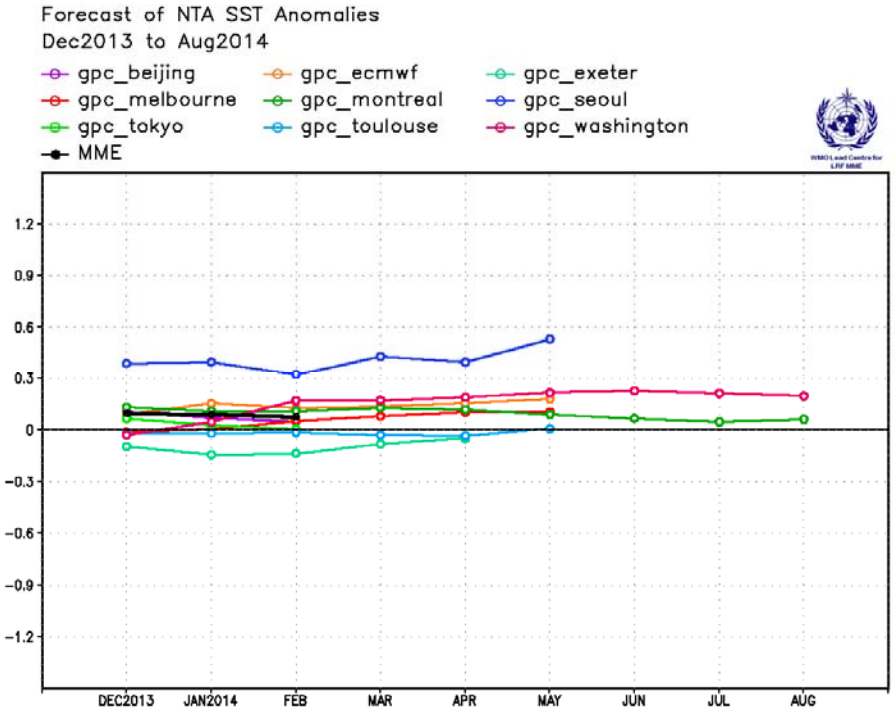
IOD

SSTA[50°E-70°E, 10°S -10°N]-SSTA[90°E-110°E, 10°S -0°]



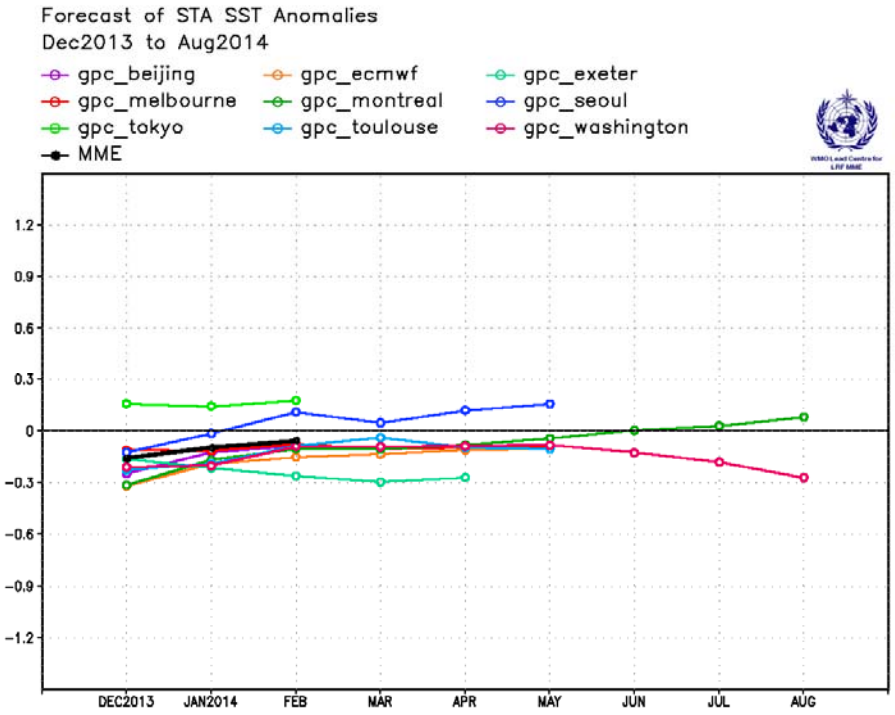
North Tropical Atlantic (NTA)

SSTA[60°W-30°W, 5°N-20°N]



Southern Tropical Atlantic (STA)

SSTA[30°W-10°E, 20°S-0°]



APPENDIX 3 - Supplementary information

The probabilistic multi-model ensemble (PMME) prediction maps are generated from 8 GPCs operating models with hindcast periods that include the 1983-2001 (19 year) period, which is used as a common baseline in the multi-model products.

GPC	Beijing	CPTEC	ECMWF	EXETER	Melbourne	Montreal	Moscow	Pretoria	Seoul	Tokyo	Toulouse	Washington
	BCC	CPTEC	ECMWF	Met Office	BoM	CMC	HMC	SAWS	KMA	JMA	Météo-France	NCEP
Hindcast period	1983-2004	1979-2001	1981-2010	1996-2009	1980-2011	1981-2010	1981-2010	1981-2001	1979-2012	1979-2010	1979-2007	1981-2010
Hindcast Data	O	O	X	O	O	O	O	X	O	O	X	O
Hindcast Members	48	10	15	11/12	99	10 x 2	10	6	20	10	11	20
Forecast Members	48	15	41	41/42	33	10 x 2	20	6	20	51	41	40

Information on the hindcast period, number of hindcast members and number of forecast members supplied by each of the 12 GPCs. A "X" indicates that hindcast data is not currently available from the GPC.

Designated and developing Regional Climate Centres and Regional Climate Centre Networks

RAI

Continent-wide responsibility

African Centre for Meteorological Applications for Development (ACMAD)
http://www.acmad.net
dgacmad@acmad.org

Greater Horn of Africa

IGAD Climate Prediction and Applications Centre (ICPAC)
http://www.icpac.net/
director@icpac.net

southern Africa

Southern African Development Community Climate Services Centre (SADC-CSC)
http://www.sadc.int/sadc-secretariat/services-centres/climate-services-centre/

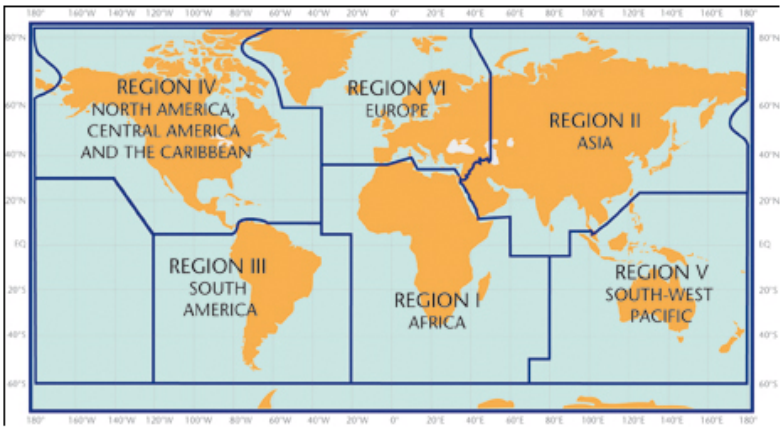
RAII

To be completed

APPENDIX 4 - How to use the Global Seasonal Climate Update

a) Seasonal outlooks for any region or nation should be obtained from the relevant Regional Climate Centre (RCC) or National Meteorological and Hydrological Service (NMHS). The GSCU is intended as guidance for RCCs and NMHSs. It does not constitute an official forecast for any region or nation.
b) Seasonal forecasts are probabilistic in nature. Although the text and figures used in the GSCU highlight the tercile categories with highest predicted probability, it is important to recognise that the other tercile categories may also have substantial (though lower) probability.
c) The geographical areas occupied by the forecast signals should not be considered precise. Similarly, signals with small spatial extent may be unreliable.
d) The skill of seasonal forecasts is substantially lower than that of shorter range and skill may vary considerably with region and season. It is important to view the forecast maps together with the skill maps provided.

For reference, the 6 WMO Regional Association regions are provided in the figure below.



References

Sources for the graphics used in the GSCU:
NOAA National Climatic Data Centre: http://www.ncdc.noaa.gov/oa/ncdc.html
The WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble prediction (LC-LRFMME): http://www.wmolc.org
International Research Institute for Climate and Society (IRI):
http://portal.iri.columbia.edu/portal/server.pt
APEC Climate Center: www.apcc21.net
The WMO Lead Centre for the Standard Verification System for Long-Range Forecasts (LC-SVSLRF):
http://www.bom.gov.au/wmo/lrfvs/

WMO resources:
WMO portal to the Global Producing Centres (GPC) for Long-range Forecasts:
http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html
WMO Portal for Regional Climate Outlook Forums (RCOFs):
http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html

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- WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble;
- International Research Institute for Climate and Society;
- Met Office;
- Meteo France;
- TBC…