climate information and prediction service from TCC website

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URL http://ds.data.jma.go.jp/tcc/tcc/index.html

Contents

- WMO Framework for climate information services (GPC, RCC ……)
- Climate-related activities and services for NMHSs in RA II (provided by TCC) in accordance with RCC functions

World Meteorological Organization (WMO)

Located in
Geneva, Switzerland

Scientific and Technical Programmes of WMO

World Weather Watch (WWW) Programme

WMO Space Programme
Disaster Risk Reduction Programme

World Climate Programme (WCP)

Atmospheric Research and Environment Programme

Applications of Meteorology Programme

Hydrology and Water Resources Programme

Education and Training Programme
Technical Cooperation Programme
Regional Programme

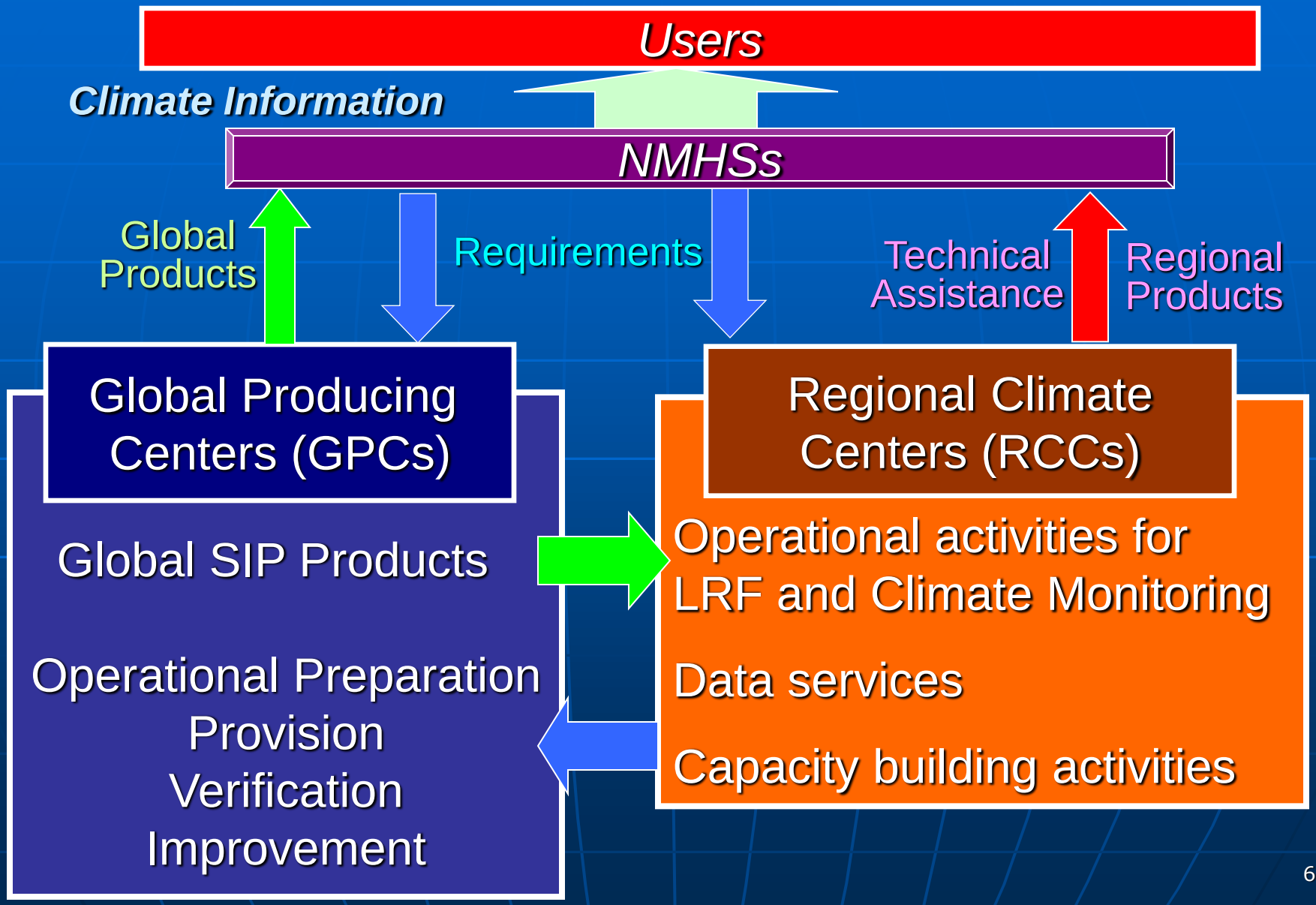
WMO Programmes for Climate Services

- **World Climate Programme (WCP)**

The World Climate Programme (WCP) is an authoritative international scientific programme whose goals are to improve understanding of the climate system and to apply that understanding for the benefit of societies coping with climate variability and change.

WCP was established following the staging of the First World Climate Conference in Geneva, Switzerland in February 1979.

Framework proposed by WMO for Advanced Climate Service



Global Producing Center (GPC)

Mission

To operate Seasonal to Inter-annual prediction (SIP) system routinely and provide the products for NMHSs and RCCs on the website or disseminate them via GTS or Internet.

- **To provide global analysis GPV**
- **To provide global prediction GPV including Sea Surface Temperatures**
- **To provide verification products including hindcasts**

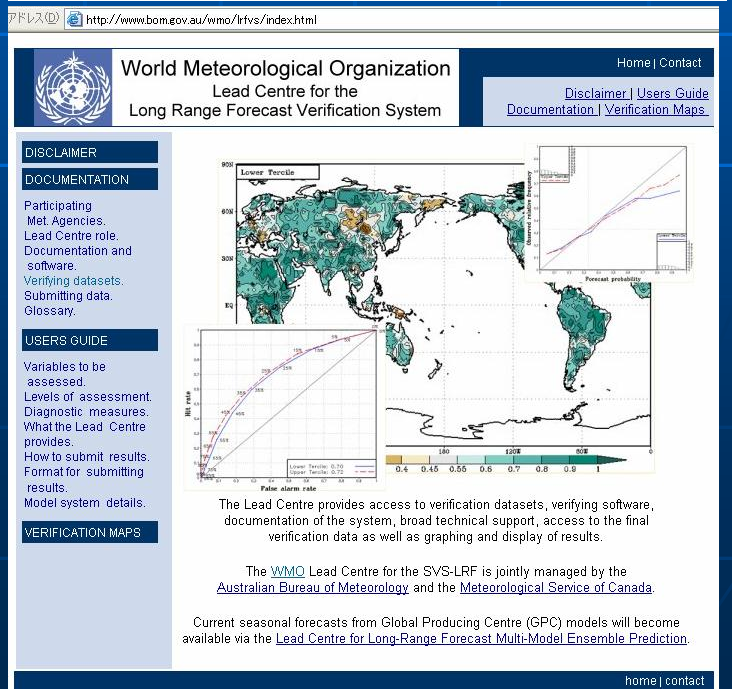
Currently, 11 GPCs have been designated worldwide.

Beijing, Exeter, Melbourne, Montreal, Moscow, Pretoria, Seoul, Tokyo, Toulouse, Washington and ECMWF

Global Producing Center (GPC) (cont.)

- Access to all GPCs can be found through WMO page: http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html

- A comprehensive set of standard verification measures, with which to communicate the skill of forecasts, has been defined (the WMO Standard Verification System for Long-Range Forecasts – SVSLRF) http://www.bom.gov.au/wmo/lrfvs/index.html



Regional Climate Center (RCC)

- The Regional Climate Center is responsible for providing necessary supports to the NMHSs in the region in order to strengthen their climate information and prediction services.

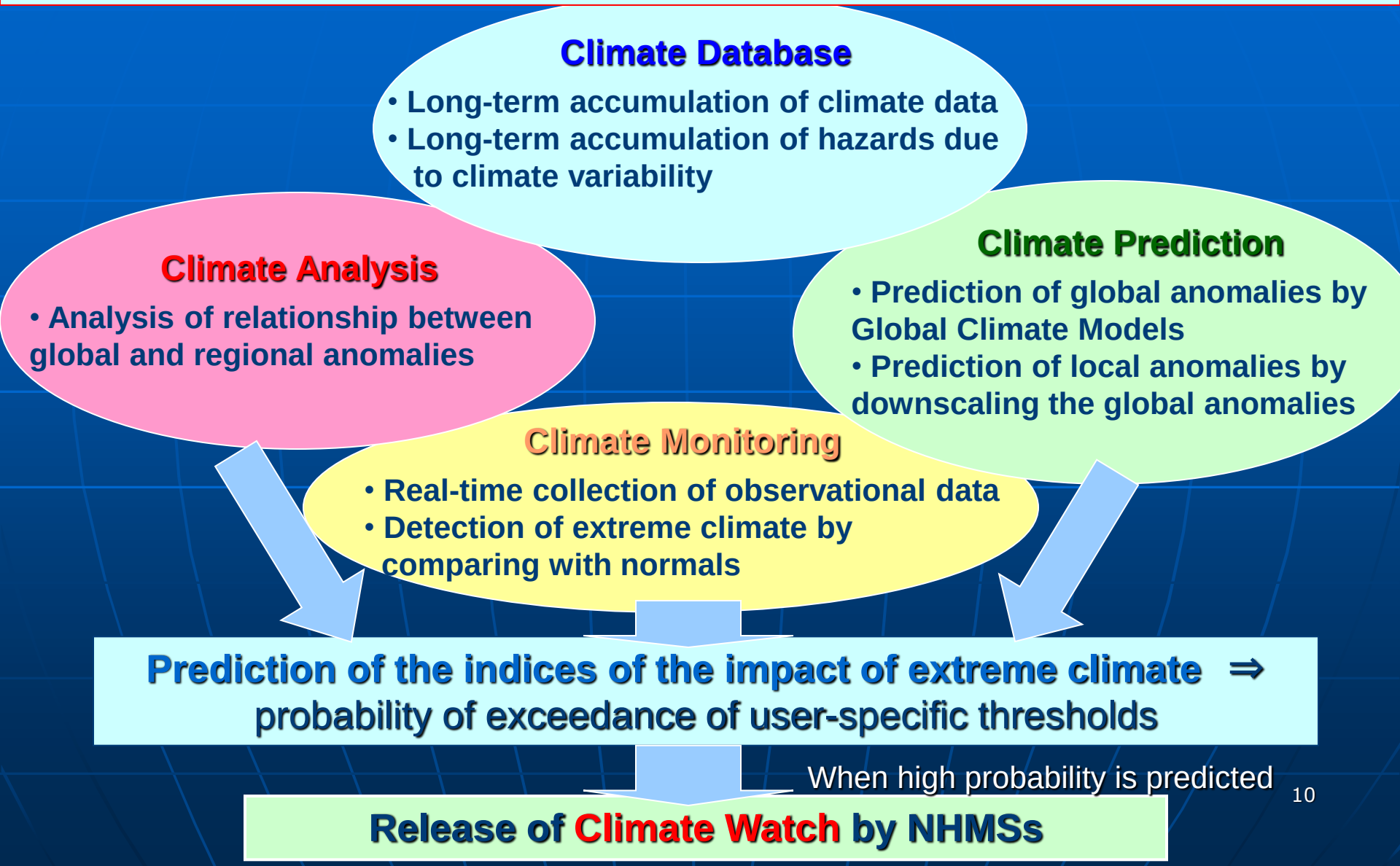
RCC Mandatory Functions

- Operational Activities for LRF
- Operational Activities for Climate Monitoring
- Operational Data Service, to support operational LRF and climate monitoring
- Training in the use of operational RCC products and services

- Establishment of RCCs will be initiated by Regional Associations, based on regional needs and priorities.

Goal of RCC

Mitigation of hazards due to climatic variability



Organization of TCC

Global Environment and Marine Department

- Administration Division
- **Climate Prediction Division**
- Marine Division
- Atmospheric Environment Division

Director — Deputy-Director

- Forecast Unit
- Global Climate Monitoring Unit
- Global Warming Unit
- Climate System Monitoring Unit
- Numerical Weather Prediction and Re-analysis Unit
- El Niño Unit

Tokyo Climate Center (TCC)

Tokyo Climate Center (TCC)

- **Established in April 2002 at the headquarters of JMA**

✓ Main Tasks and Activities

- **Provision of Climate Information to the Government and Public**
  - Climate system monitoring
  - Seasonal outlook & El Niño outlook
  - Climate Change Projection

- **Development of Climate Models to support the above tasks**

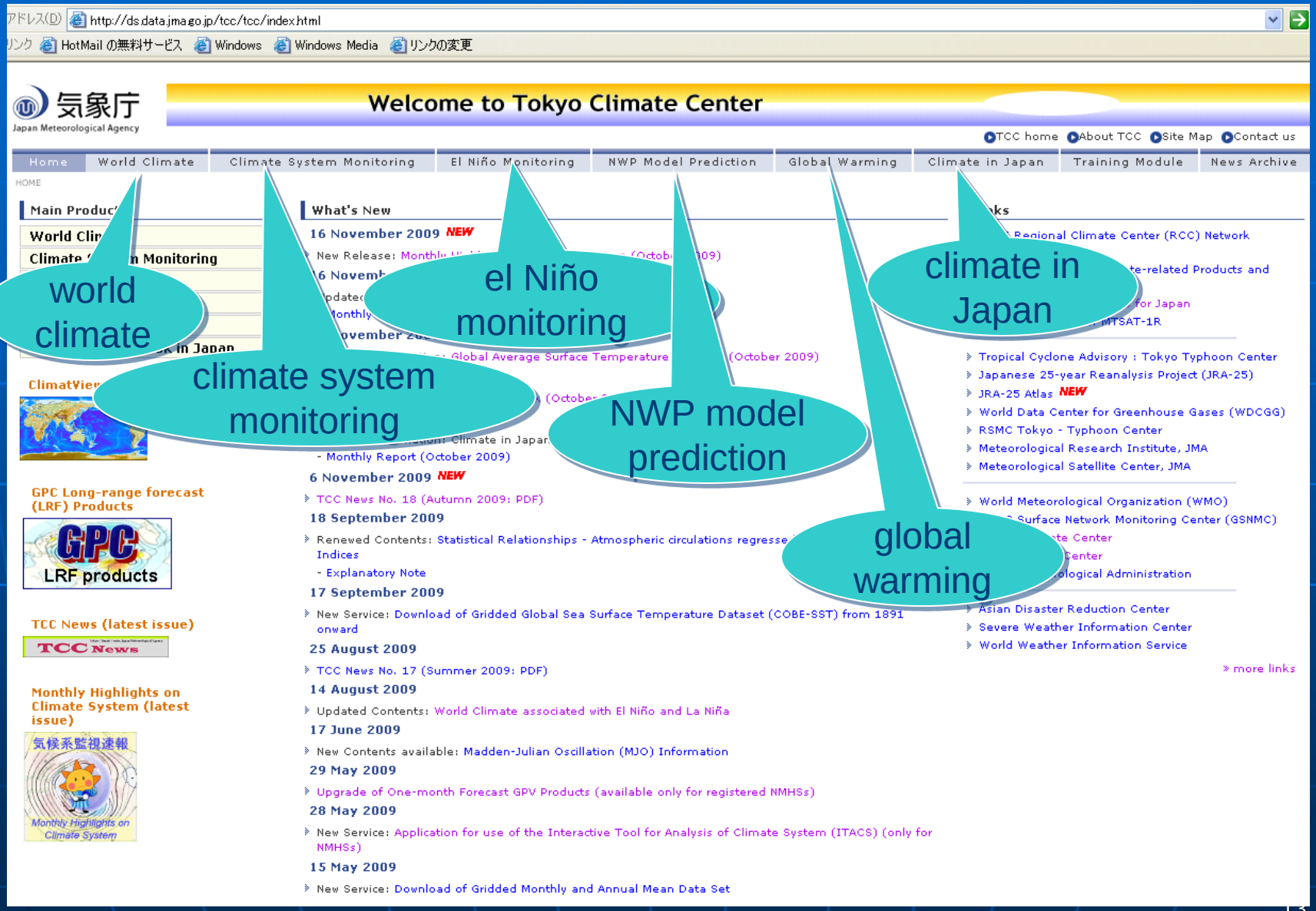
  (in cooperation with the Meteorological Research Institute of JMA)

  » Atmospheric GCM & Data assimilation system
  » Oceanic GCM & Data assimilation system
  » Coupled Atmosphere-Ocean Global Climate Model (CGCM)
  » Long-term Re-Analysis Project (JRA-25)

- **Support of climate services of NMHSs in Asia & Pacific region**

TCC is responsible for
- **Support of climate services of NMHSs in Asia & Pacific region** as an RCC in RA II
- Provision of LRF products from GPC Tokyo

TCC Homepage

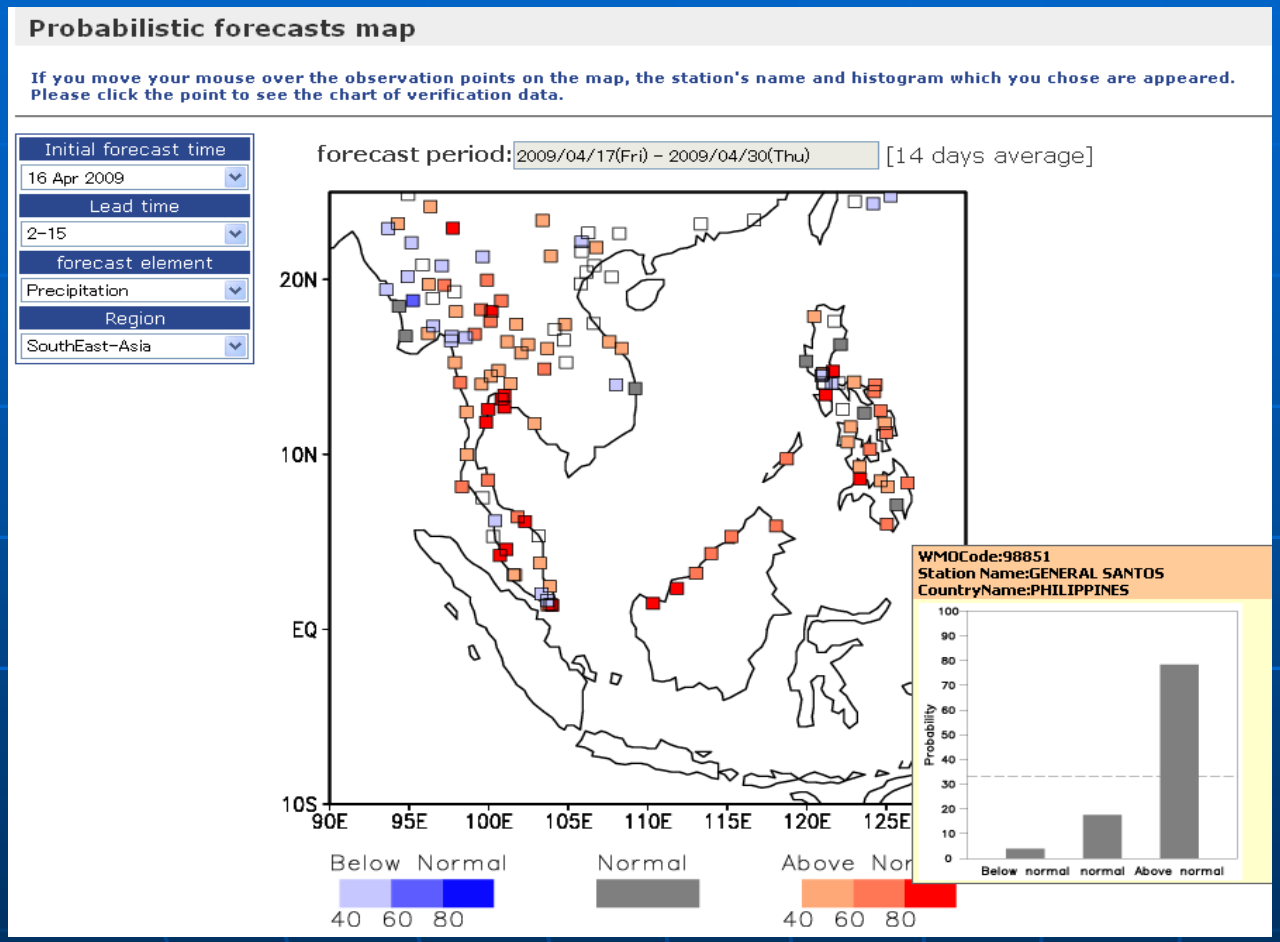


http://ds.data.jma.go.jp/tcc/tcc/index.html

RCC Mandatory Functions

- **Operational Activities for LRF**
- **Operational Activities for Climate Monitoring**
- **Operational Data Service, to support operational LRF and climate monitoring**
- **Training in the use of operational RCC products and services**

One-month Probabilistic Forecast for Southeast Asia

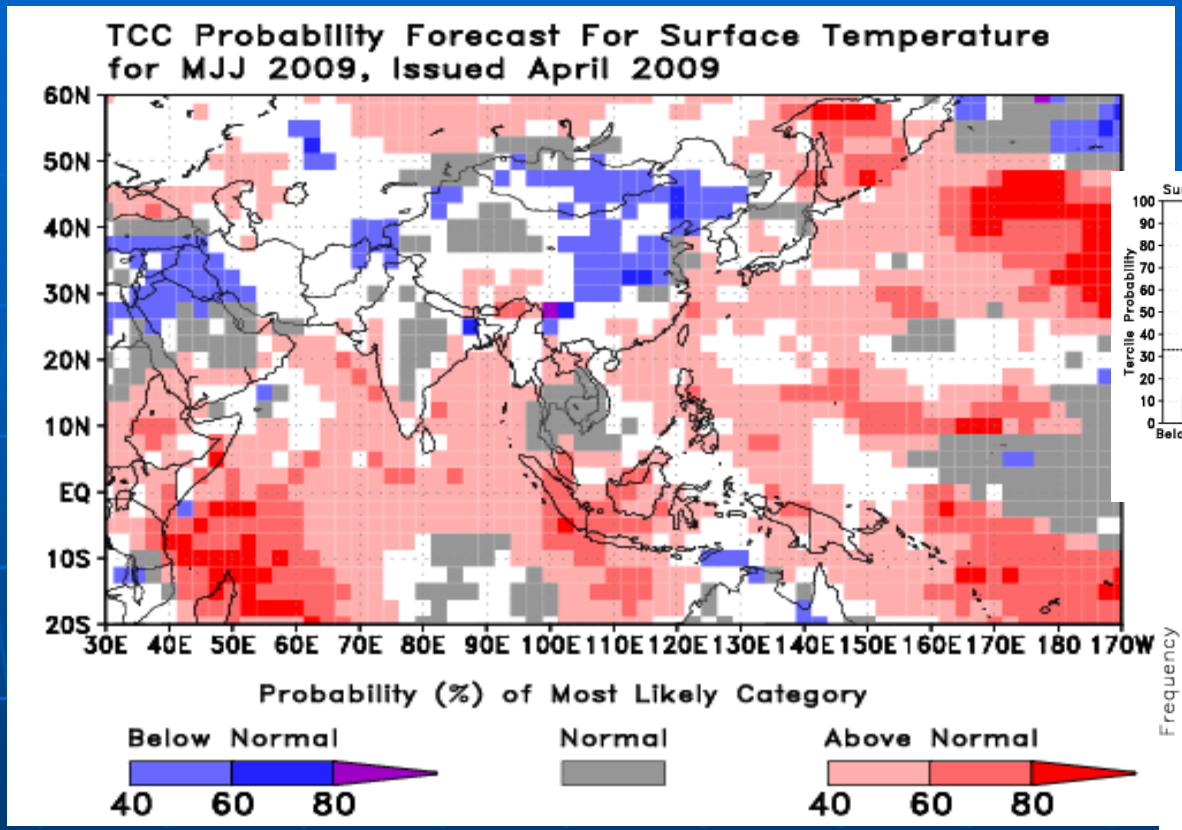


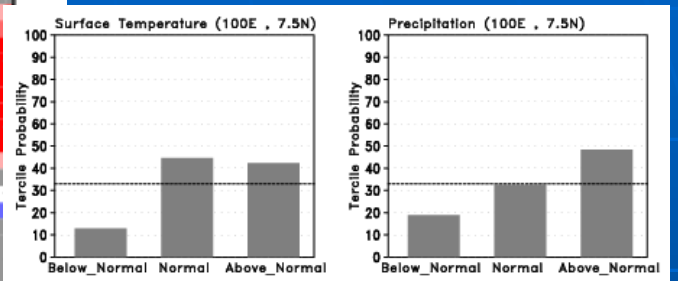
TCC provides tercile probabilistic forecasts of 2m temperature and total precipitation at a number of major stations in Southeast Asia, based on the needs of regional and sub-regional scale forecasts from NMHSs

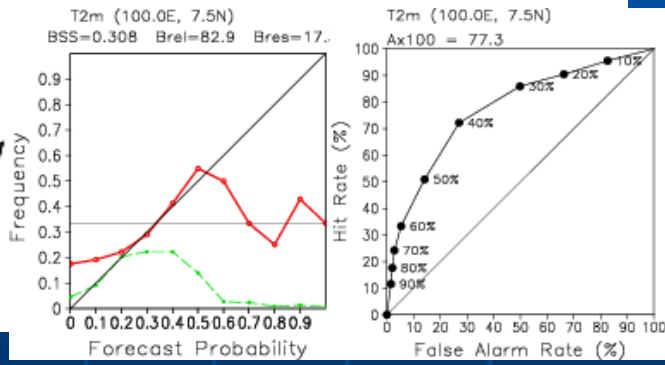
Initial Forecast Time: 16 Apr. 2009
Lead time: 2-15 days, Element: Precipitation

http://ds.data.jma.go.jp/tcc/tcc/products/guidancetst/

Probabilistic three-month forecasts







TCC produces tercile probabilistic three-month forecasts of such temperature and precipitation for each 5 ˚ x 5˚ grid box over the globe.

http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/index.html

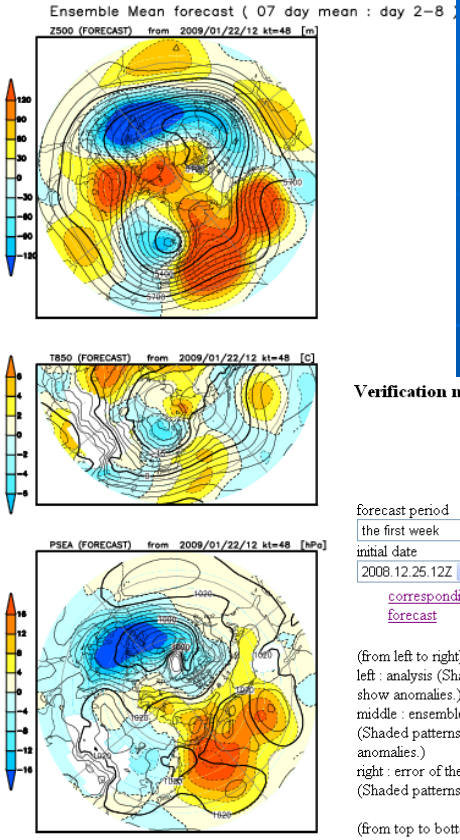
LRF products available on the TCC website (1)

forecast map

forecast period
the first week
initial date
2009.01.22.12Z

coresponding verification

(from top to bottom)
top : Contours show 500hPa height in an interval of 60m.
middle : Contours show 850hPa temperature in an interval of 3C.
bottom : Contours show sea level pressure in an interval of 4hPa.
(Shaded patterns show anomalies.)



Forecast map

Verification map of one month forecast for each

Verification map

forecast period
the first week
initial date
2008.12.25.12Z

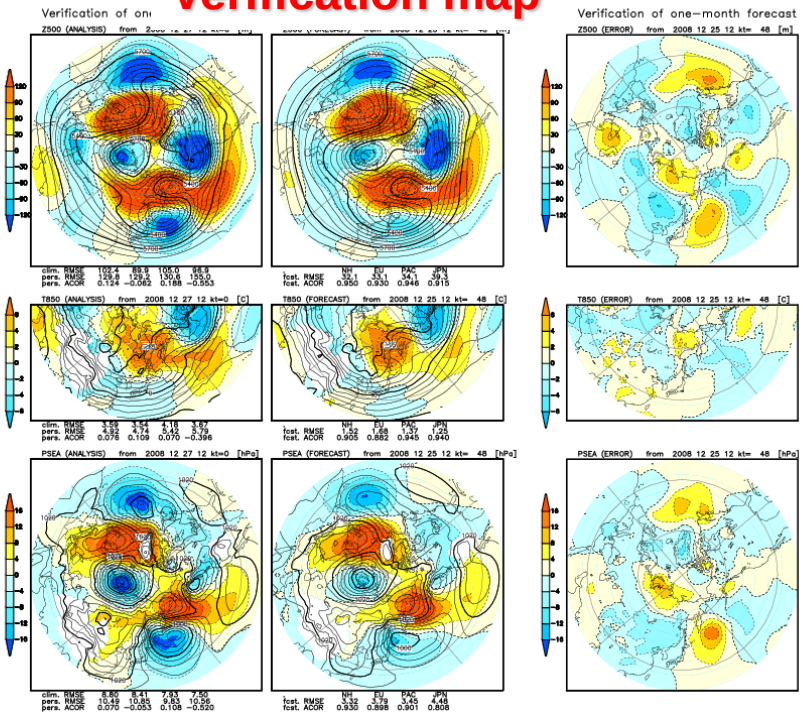
corresponding recent forecast

(from left to right)
left : analysis (Shaded patterns show anomalies.)
middle : ensemble mean forecast (Shaded patterns show anomalies.)
right : error of the forecast (Shaded patterns show errors.)

(from top to bottom)
top : Contours show 500hPa height in an interval of 60m.
middle : Contours show 850hPa temperature in an interval of 3C.
bottom : Contours show sea level pressure in an interval of 4hPa.

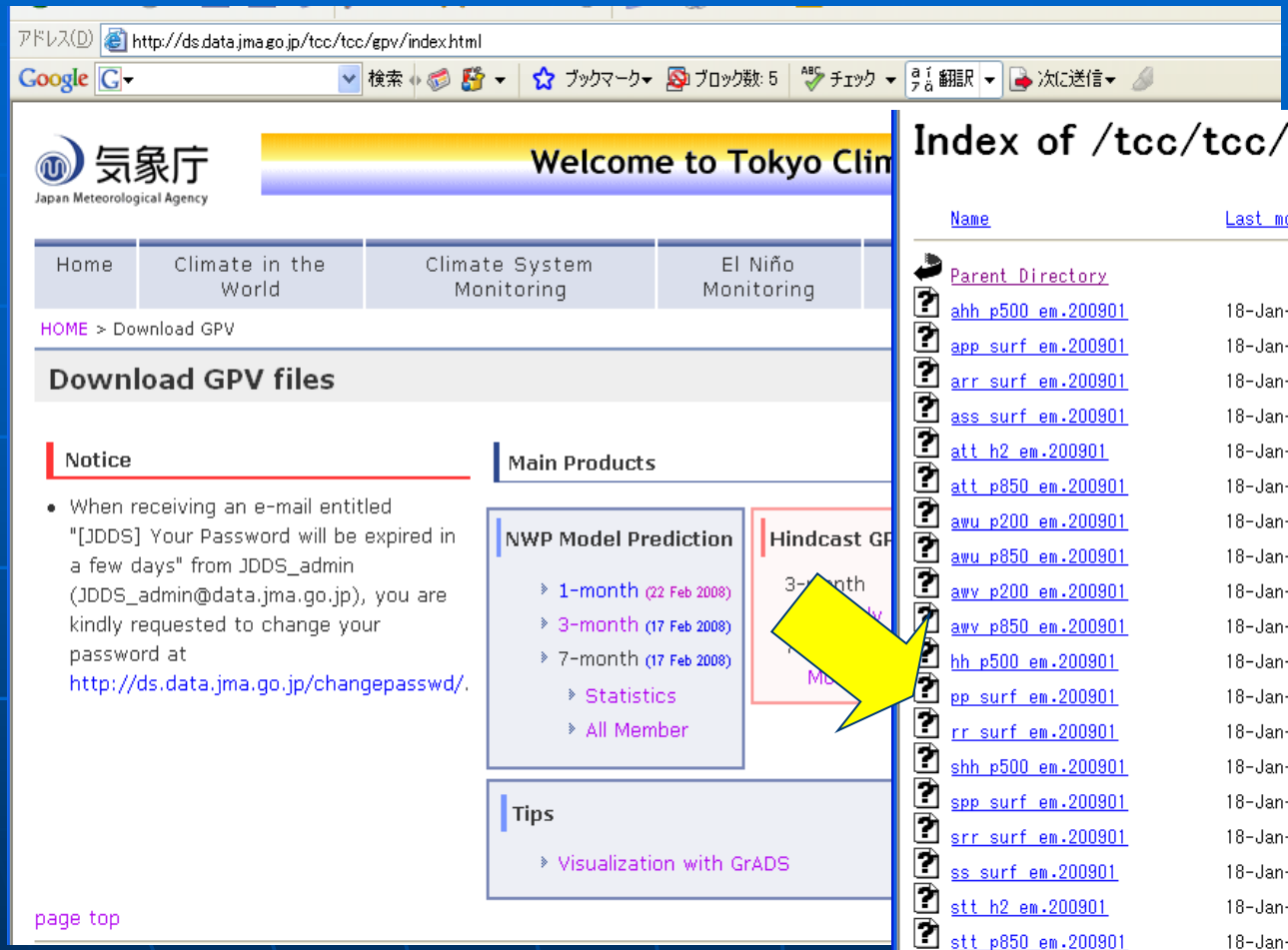
ACOR : anomally correration
RMSE : root mean square error
fcst : ensemble mean forecast
clim : climate forecast
pers : persistency forecast

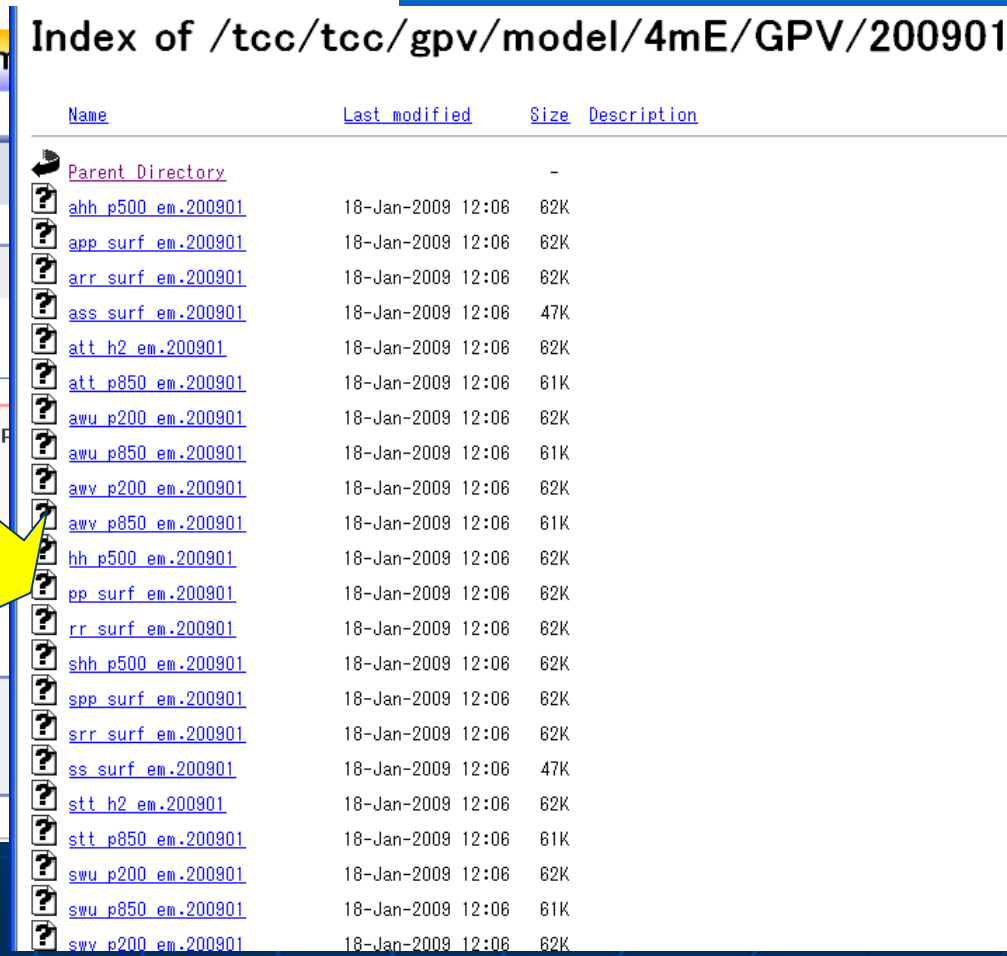
NH : 0-360,20N-90N
EU : 0-180,20N-90N
PAC : 90E-90W,20N-90N
JPN : 100E-170E,20N-60N



http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/index.html

LRF products available on the TCC website (2)



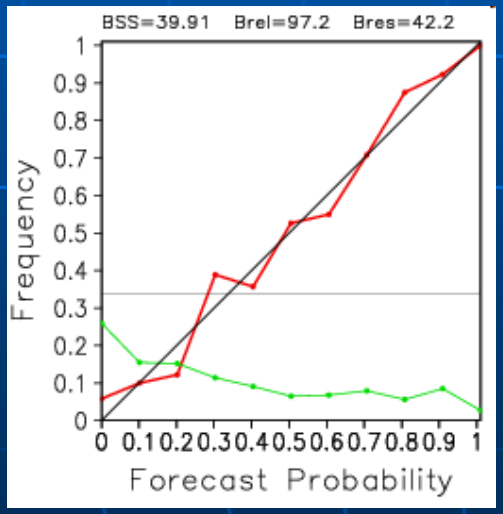


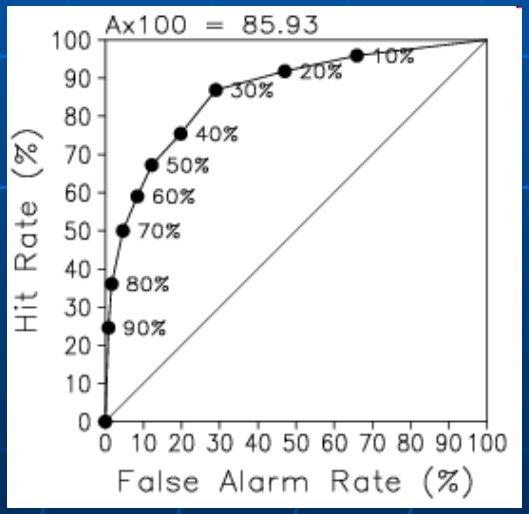
Registered NMHSs can download and visualize LRF products.

http://ds.data.jma.go.jp/tcc/tcc/gpv/index.html

Verification of RCC quantitative LRF products, including the exchange of basic forecasts and hindcast data

TCC provides verification results (e.g., SVS LRF scores, Brier Skill Scores, ROC, Hit Rate Skill Score) and hindcast data for several elements including 2-m temperature and total precipitation. Whenever an LRF system is updated, a set of hindcasts is implemented and verification datasets are distributed.





Verification results (Brier Skill Score (left) and ROC (right)) for 2-m mean temperature

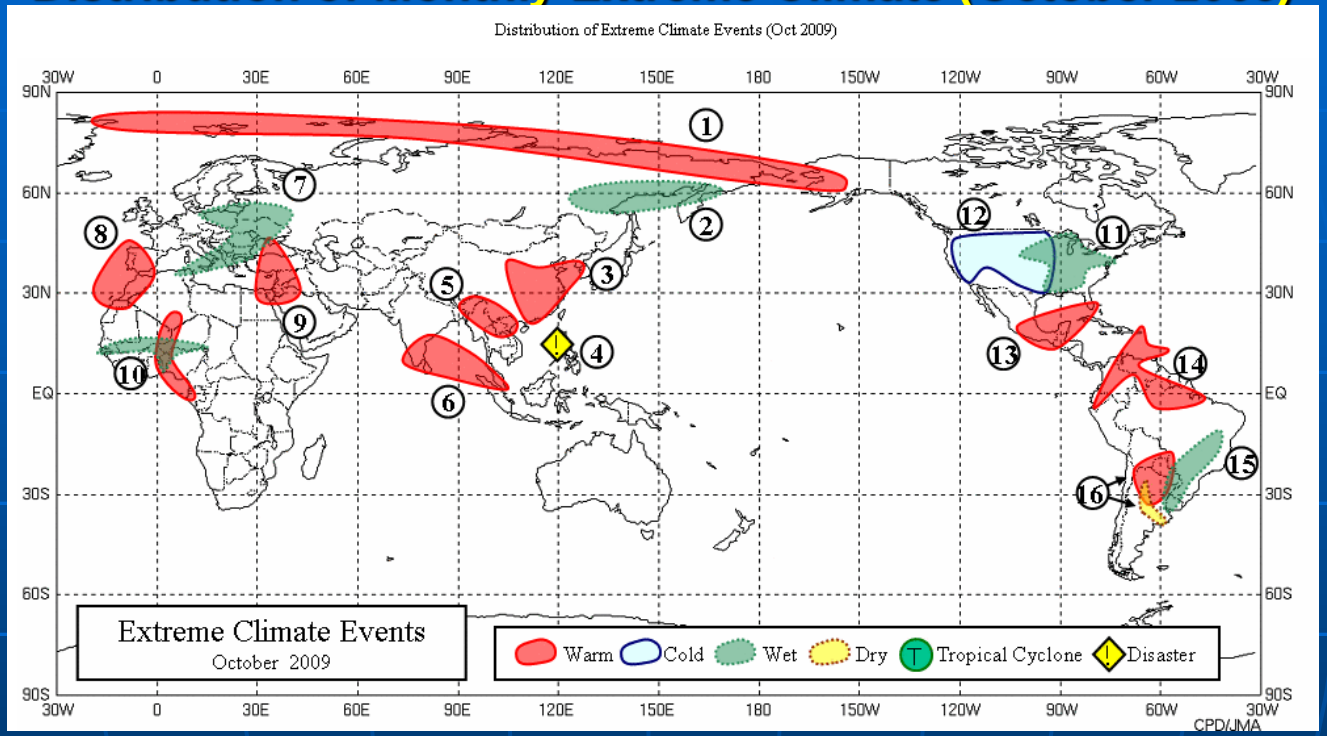
RCC Mandatory Functions

- Operational Activities for LRF
- Operational Activities for Climate Monitoring
- Operational Data Services, to support operational LRF and climate monitoring
- Training in the use of operational RCC products and services

Global Climate Monitoring

Weekly, Monthly, Seasonal and Annual Temperature/Precipitation
Hazardous Climatic Events (Flood / Drought / Tropical Cyclone)

Distribution of Monthly Extreme Climate (October 2009)



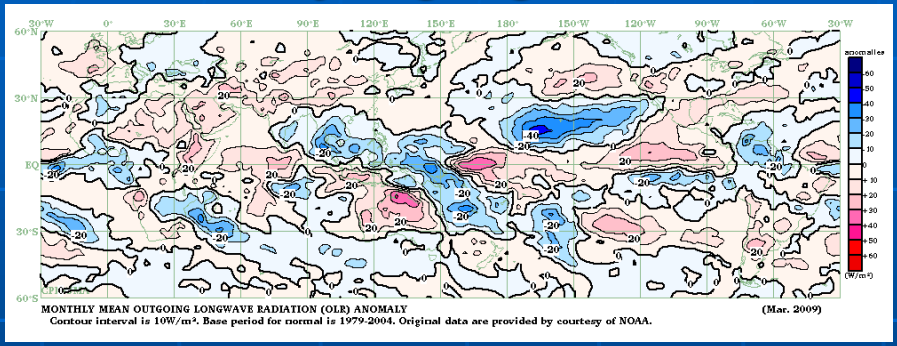
1. High temperature around the Arctic Sea
2. Heavy precipitation in eastern Siberia
3. High temperature in eastern China
4. Typhoon in the Philippines
5. High temperature around southern China
6. High temperature from the southern Malay Peninsula to southern India
7. Heavy precipitation in eastern Europe
8. High temperature from the Iberian Peninsula to northwestern Africa
9. High temperature around Turkey
10. High temperature and heavy precipitation in western Africa
11. Heavy precipitation in the eastern USA
12. Low temperature in the central USA
13. High temperature around southern Mexico
14. High temperature in northern South America
15. Heavy precipitation around southern Brazil
16. High temperature and light precipitation around northern Argentina

http://ds.data.jma.go.jp/tcc/tcc/products/climate/index.html

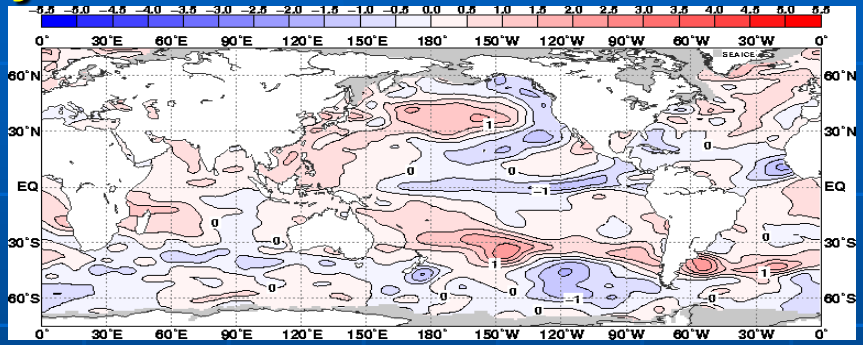
Climate System Monitoring

Atmospheric Circulation: Global Objective Analysis Data by JMA
Tropical Convective Activity: Satellites Observations (NOAA/NESDIS)
Sea Surface Temperature: Global SST Analysis Data by JMA
Snow and Sea Ice: CLIMAT Reports & Satellite Observations (SSM/I)

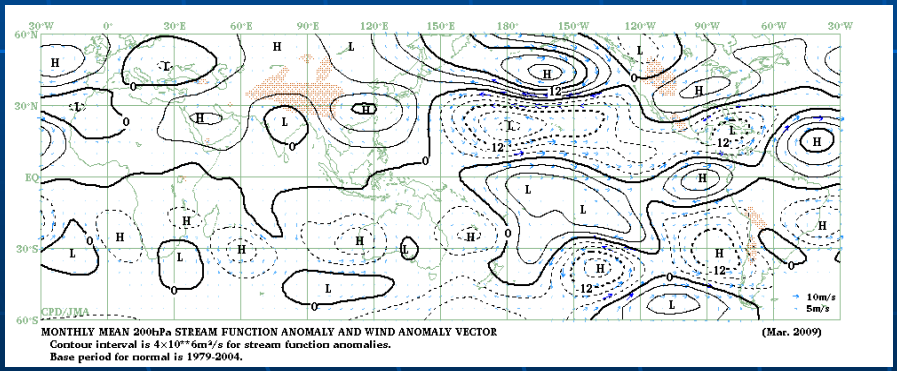
⇒ **Monthly Highlights on Climate System**



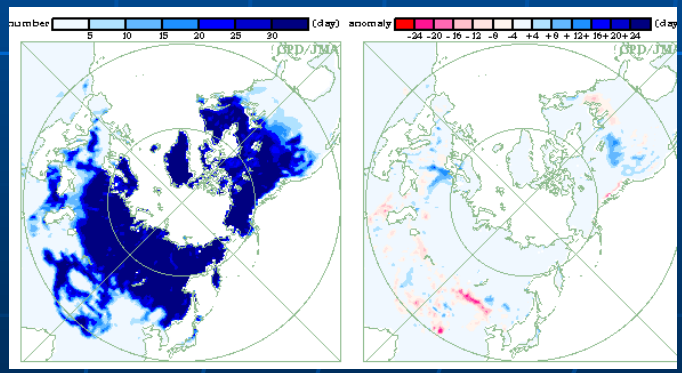
OLR Anomaly (March 2009)



SST Anomaly (March 2009)



200hPa Stream Function & Wind Anomalies (March 2009)



Number of days covered with snow observed by SSM/I (left) and its anomaly (right) (March 2009)

http://ds.data.jma.go.jp/tcc/tcc/products/clisys/index.html

Reports & Figures

Report on Climate System

Monthly features of extratropical circulation&, tropical circulation and convection, conditions of ocean are described with figures and tables.

- Monthly Highlights on Climate System
- Explanation of figures
- New Climatological

Current Month (Octol

- Report on Climate S
- Extratropics (Highli
- Tropics (Highlights
- Oceanic Condition

Seasonal Report (Su

- Report on Climate S
- Extratropics (Highli
- Tropics (Highlights
- Oceanic Condition

Annual Report

- Annual Report on C

Back Number

- Select Past Months

Figures and Tables

- 5-day Mean Figu
- 10-day Mean Figur
- Monthly Mean Figu
- 3-month Mean Figu
- Time Cross Section
- GPV data (text for
- Oceanic Figures an

16 November, 2009

Japan Meteorological Agency

Monthly Highlights on Climate System (October 2009)

Highlights in October 2009

- Monthly precipitation amounts were above normal on the Pacific side of Japan and Okinawa/Amami, due to the landfall or approach of Typhoons.
- Monthly mean temperatures were extremely low in western North America due to cold northerly winds.
- In the sea level pressure field, high and low pressure anomalies dominated in the high and mid-latitudes, respectively.
- Enhanced convective activities persisted in the western Pacific throughout the month and westerly wind anomalies were dominant in the lower troposphere of the equatorial Pacific.
- Positive SST anomalies were found over the whole equatorial Pacific and they were remarkable in the central part.

Climate in Japan (Fig. 1):

The weather generally changed periodically through the month. In the first 10 days, Typhoon Melor (0918) made landfall on the mainland of Japan with heavy rainfall and strong winds. And in the last 10 days, Typhoon Ketsana (0920) passed on the south of Eastern Japan. In Okinawa/Amami, rainy and cloudy days were dominant and monthly sunshine durations were significantly below normal due to the Typhoons and fronts. Although monthly mean temperature was above normal, temperature

activities of high frequency disturbances shifted southward in the North Pacific and North Atlantic storm track regions.

Tropics (Figs. 6, 7 and 8):

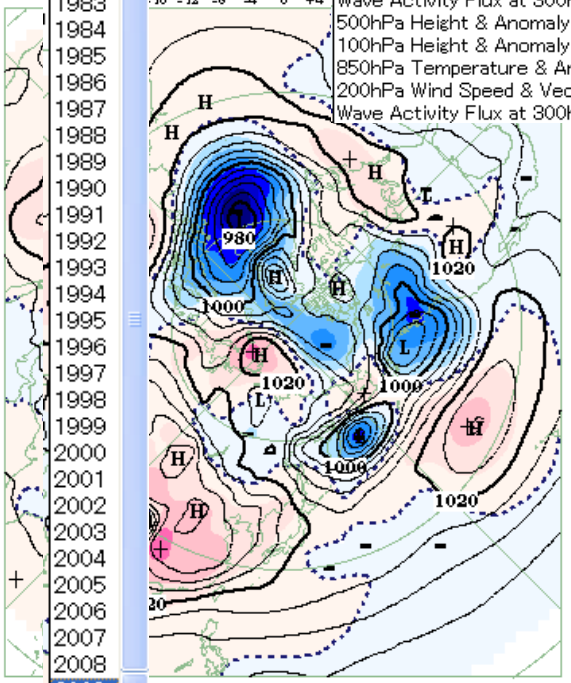
Enhanced convective activities persisted in the western Pacific throughout the month. Convective activities were also enhanced in the Inter-tropical Convergence Zone (ITCZ), the South Pacific Convergence Zone (SPCZ), the Sahel and the western Indian Ocean (Fig. 6). On the other hand, they were suppressed from around Indonesia to

Pentad Mean Figures of Atmospheric Circulation

Region Extratropics Hist Hist & Anom
Element & Pressure Surface Sea Level Pressure & Anomaly in the Northern Hemisphere
Year 2009 17Nov.-21
Oldest +1 pentad ection Normal

Sea Level Pressure & Anomaly in the Northern Hemisphere
500hPa Height & Anomaly in the Northern Hemisphere
100hPa Height & Anomaly in the Northern Hemisphere
30hPa Height & Anomaly in the Northern Hemisphere
850hPa Temperature & Anomaly in the Northern Hemisphere
200hPa Wind Speed & Vectors in the Northern Hemisphere
Wave Activity Flux at 300hPa in the Northern Hemisphere
500hPa Height & Anomaly in the Southern Hemisphere
100hPa Height & Anomaly in the Southern Hemisphere
850hPa Temperature & Anomaly in the Southern Hemisphere
200hPa Wind Speed & Vectors in the Southern Hemisphere
Wave Activity Flux at 300hPa in the Southern Hemisphere

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009



5-DA A LEVEL PRESSURE AND ANOMALY
IN THE NORTHERN HEMISPHERE (17Nov.-21Nov.2009)
Contours show sea level pressure in an interval of 4hPa.
Shaded patterns show SLP anomalies.
Base period for normal is 1979-2004.

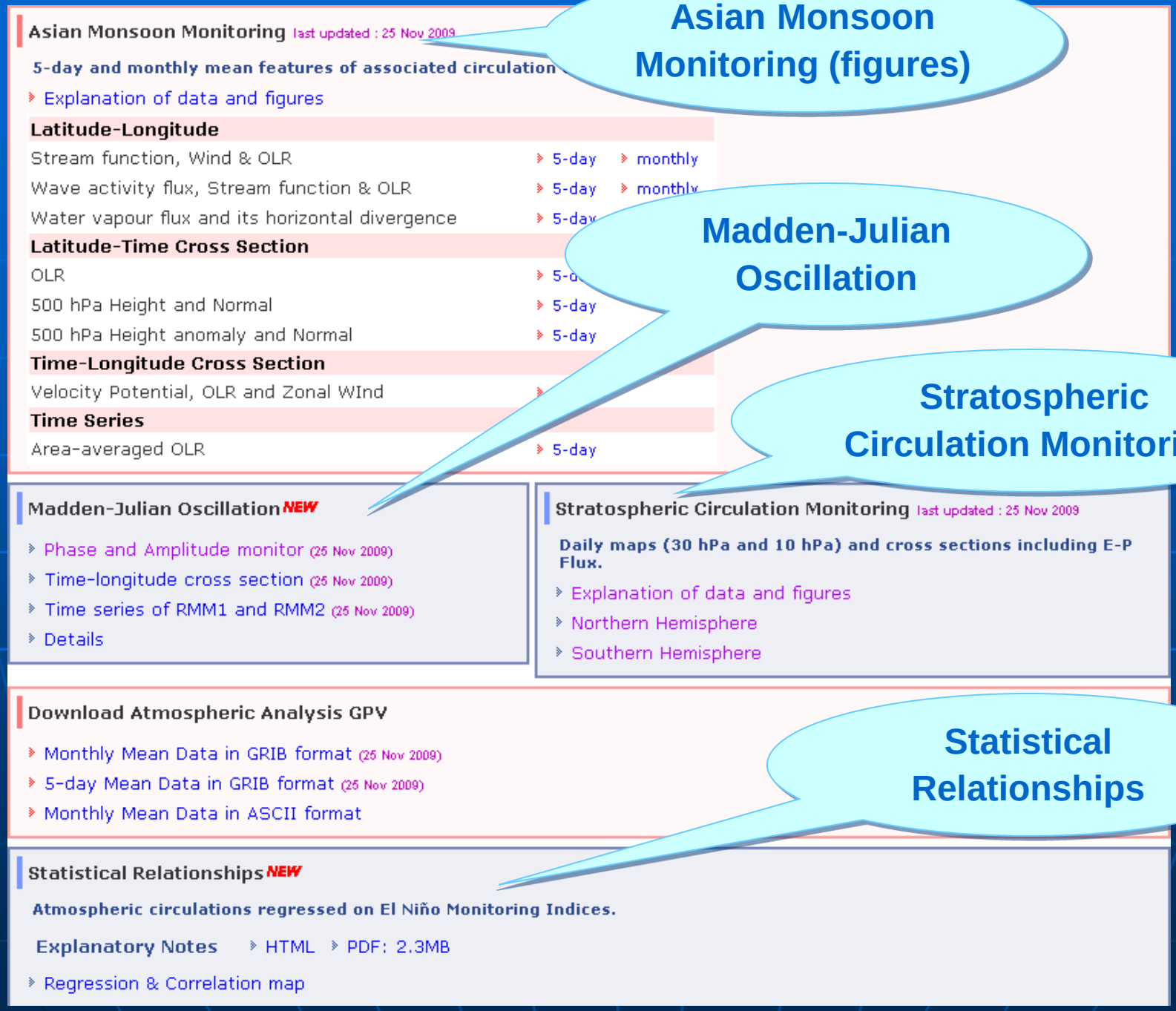
Other figures

- Pentad Mean
- 10-day Mean
- Monthly Mean
- 3-Month Mean
- Time Cross Section & Indices
- GPV data (text)

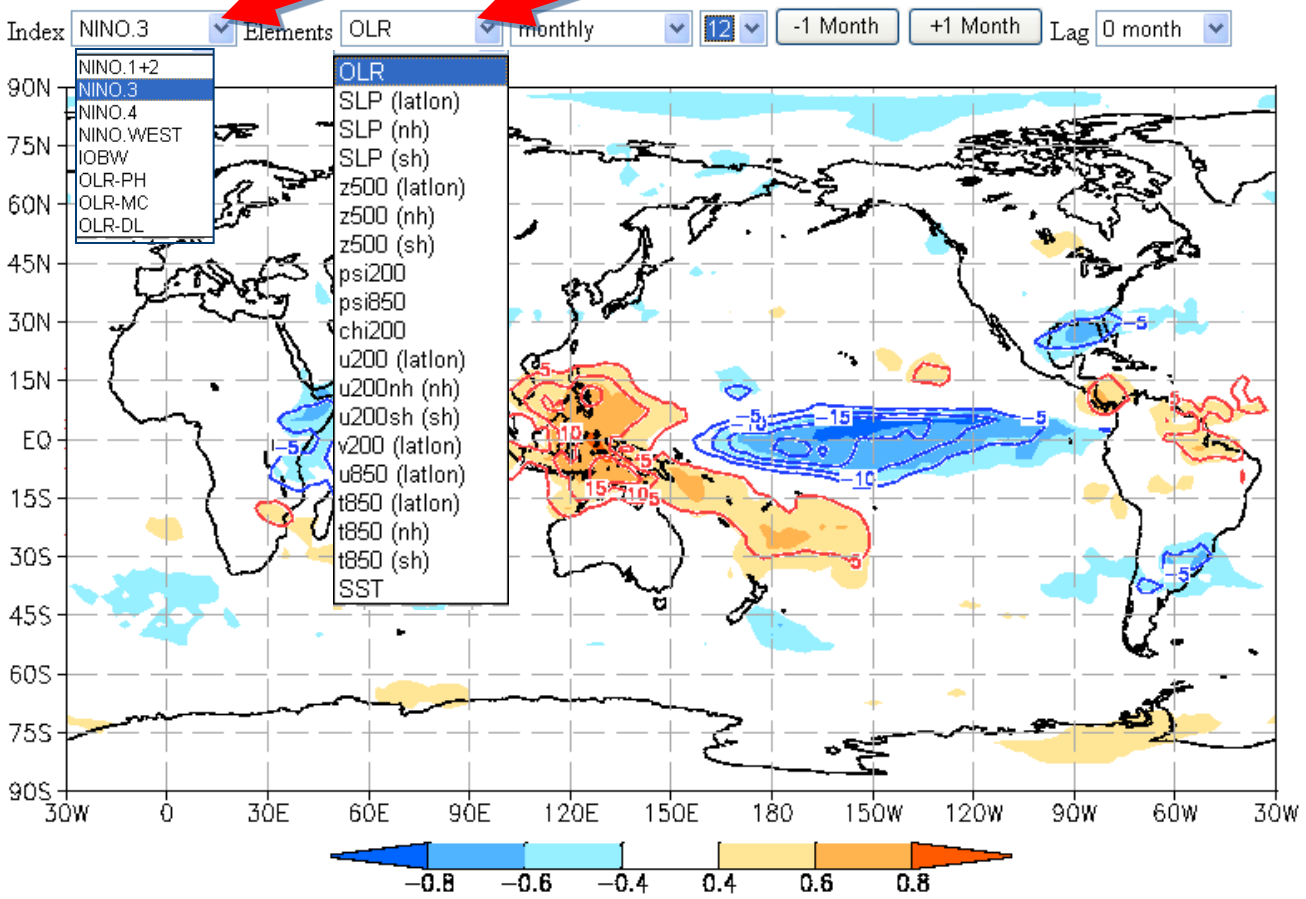
select a region (Extratropics, Tropics)

select a year(1979-latest)

select an element


Asian Monsoon Monitoring last updated : 25 Nov 2009
5-day and monthly mean features of associated circulation
Explanation of data and figures
Latitude-Longitude
Stream function, Wind & OLR 5-day monthly
Wave activity flux, Stream function & OLR 5-day monthly
Water vapour flux and its horizontal divergence 5-day
Latitude-Time Cross Section
OLR 5-d
500 hPa Height and Normal 5-day
500 hPa Height anomaly and Normal 5-day
Time-Longitude Cross Section
Velocity Potential, OLR and Zonal WInd
Time Series
Area-averaged OLR 5-day
Asian Monsoon Monitoring (figures)
Madden-Julian Oscillation
Stratospheric Circulation Monitoring
Madden-Julian Oscillation NEW
Phase and Amplitude monitor (25 Nov 2009)
Time-longitude cross section (25 Nov 2009)
Time series of RMM1 and RMM2 (25 Nov 2009)
Details
Stratospheric Circulation Monitoring last updated : 25 Nov 2009
Daily maps (30 hPa and 10 hPa) and cross sections including E-P Flux.
Explanation of data and figures
Northern Hemisphere
Southern Hemisphere
Download Atmospheric Analysis GPV
Monthly Mean Data in GRIB format (25 Nov 2009)
5-day Mean Data in GRIB format (25 Nov 2009)
Monthly Mean Data in ASCII format
Statistical Relationships
Statistical Relationships NEW
Atmospheric circulations regressed on El Niño Monitoring Indices.
Explanatory Notes HTML PDF: 2.3MB
Regression & Correlation map

Regression and Correlation map

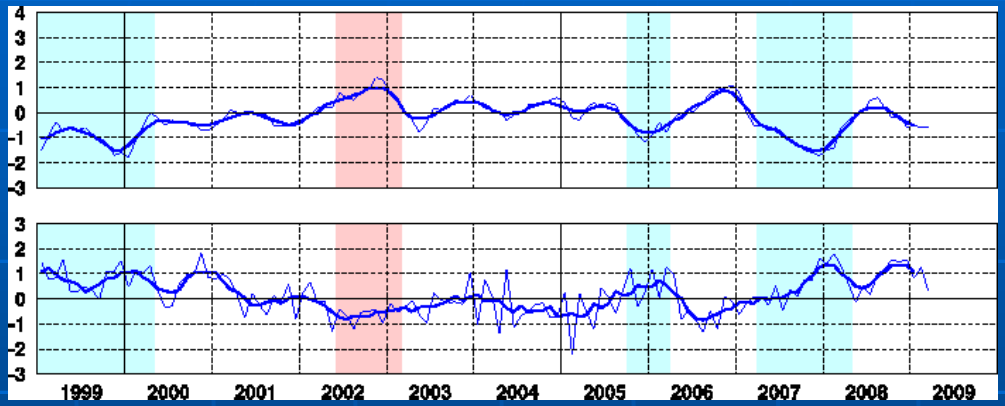


Regression and correlation coefficients between each indices and atmospheric circulation fields.
Contours show atmospheric circulation anomalies when normalized indices are +1.0.
Red (blue) contours show positive (negative) anomalies.
0 lines are not shown.
Shadings show correlation coefficients.
"3-month mean" means 3-month mean centered shown month.
For example, when "Elements=SLP", "Month=3" and "Lag=-2" are selected,
regression and correlation map of "SLP in March" for "index in January" is shown.

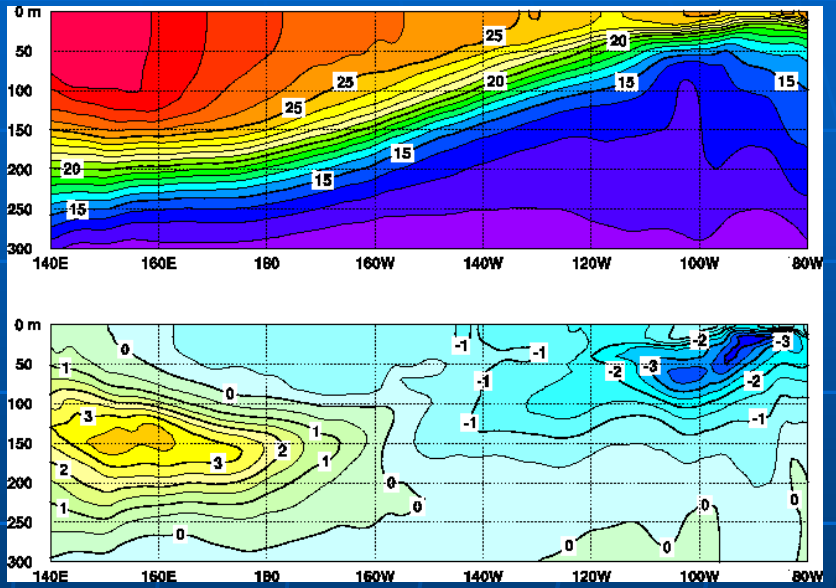
El Niño Monitoring and Prediction

Analysis : the Ocean Data Assimilation System (ODAS)
Prediction : the El Niño Prediction Model (JMA/MRI-CGCM)

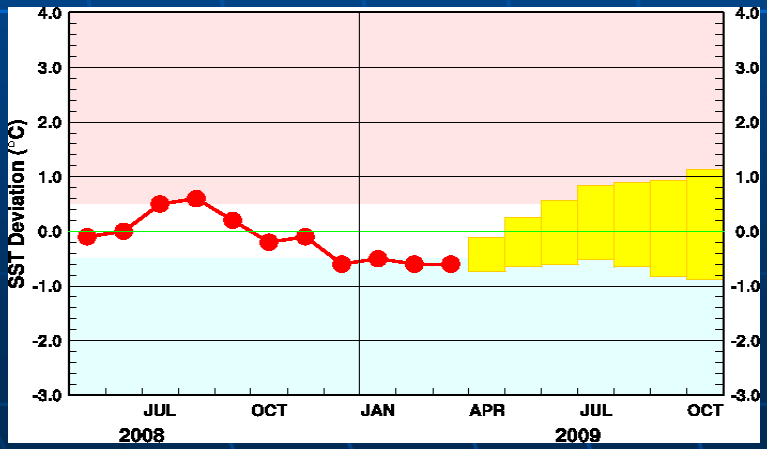
⇒ **El Niño Monitoring and Outlook**



Time Sequence of ENSO indices
upper: Nino.3 SST lower: SOI



Longitude-Depth Cross-section of
Temperature (upper) and Anomaly (lower)
along the Equator (March 2009)

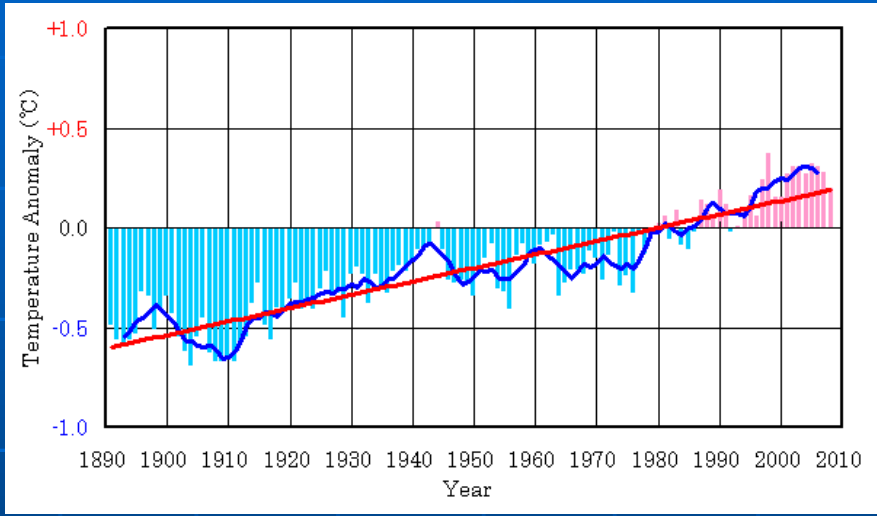


Outlook of the SST Deviation for Nino.3

http://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html

Global Warming Monitoring and Projection

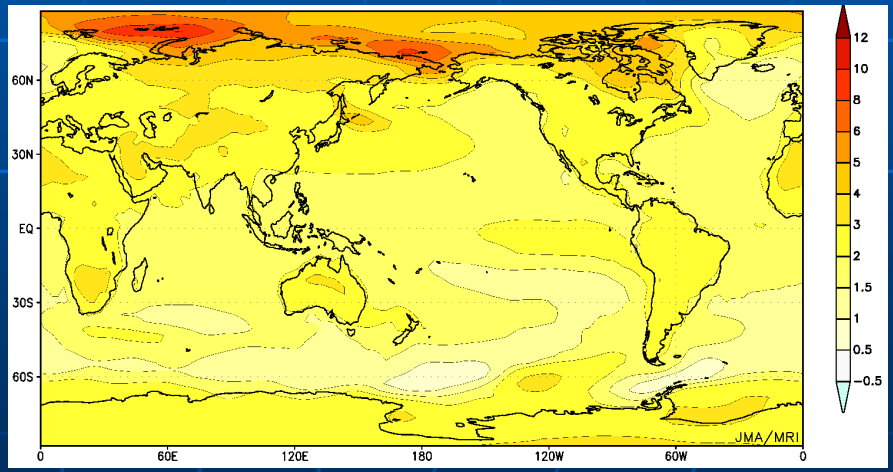
Annual anomaly of surface temperature over the globe (combined temperature of near-surface air temperature over land, and sea surface temperature)



Annual anomalies of surface temperature over the globe and Japan are monitored to get hold of climate change due to global warming.

JMA has conducted global warming experiment toward the year 2100 by using the "Coupled atmosphere-ocean General Circulation Model" developed at MRI (MRI-CGCM) . A series of "Global Warming Projection" was published to provide scientific estimation for the government organizations and research institutions responsible for preventing global warming and assessing its impact.

Change in the annual mean temperature for the SRES scenario A2 (Unit: ºC)



This panel shows the change in the annual mean temperature for the period from 2071 to 2100 relative to the period from 1971 to 2000.

http://ds.data.jma.go.jp/tcc/tcc/products/gwp/gwp.html

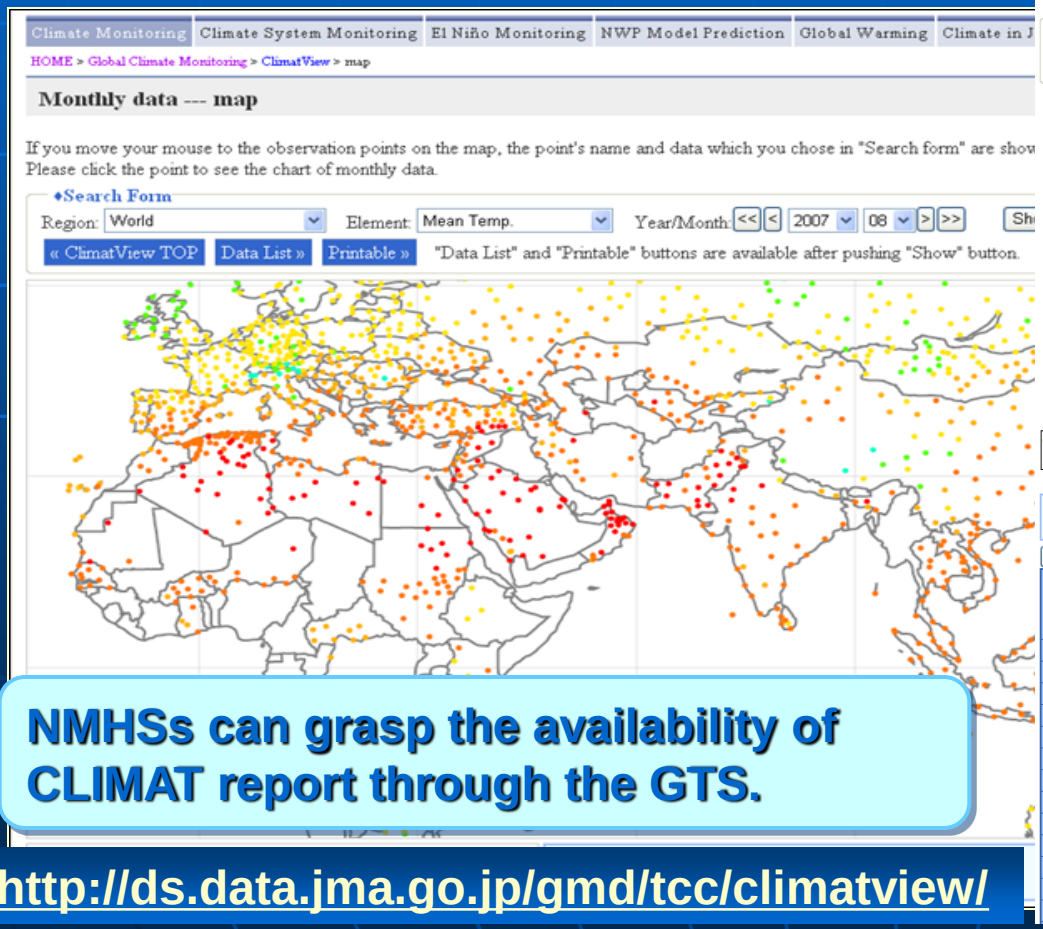
RCC Mandatory Functions

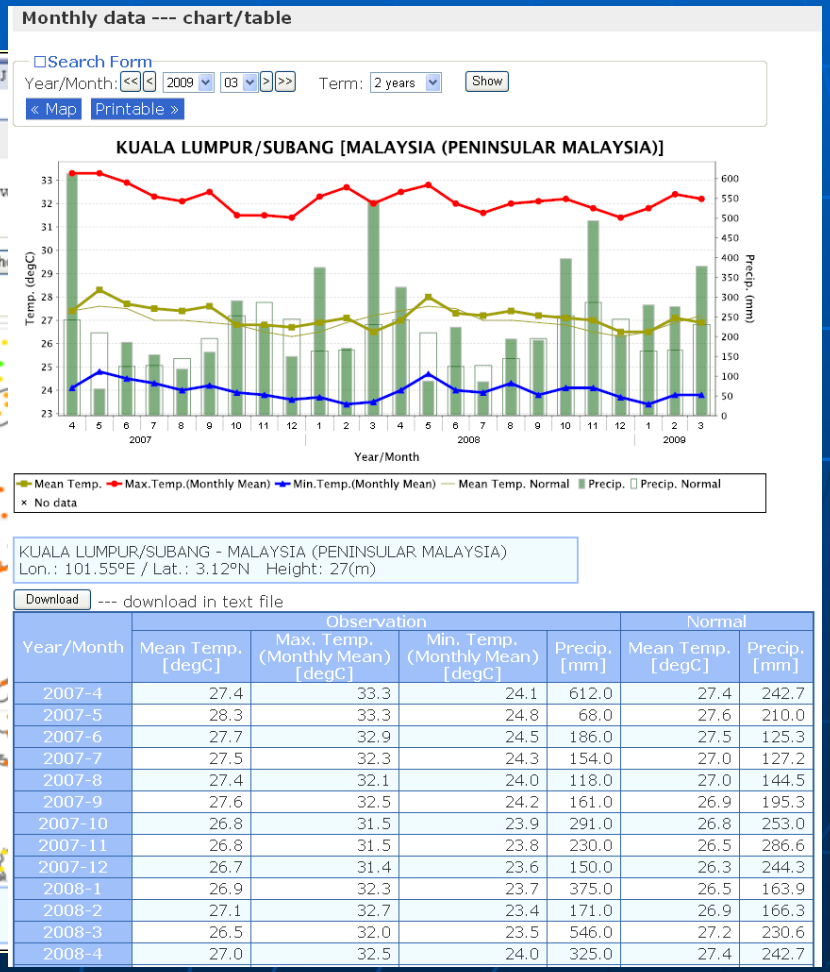
- Operational Activities for LRF
- Operational Activities for Climate Monitoring
- Operational Data Services, to support operational LRF and climate monitoring
- Training in the use of operational RCC products and services

Climate Database
(ClimatView: Web-based Interactive Tool)

- Monthly temperature and precipitation data from CLIMAT report from 1982 onward are available.

- ClimatView enables users to view or download monthly mean temperature and monthly total precipitation.





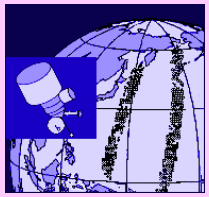
Year/Month	Observation				Normal	
	Mean Temp. [degC]	Max. Temp. (Monthly Mean) [degC]	Min. Temp. (Monthly Mean) [degC]	Precip. [mm]	Mean Temp. [degC]	Precip. [mm]
2007-4	27.4	33.3	24.1	612.0	27.4	242.7
2007-5	28.3	33.3	24.8	68.0	27.6	210.0
2007-6	27.7	32.9	24.5	186.0	27.5	125.3
2007-7	27.5	32.3	24.3	154.0	27.0	127.2
2007-8	27.4	32.1	24.0	118.0	27.0	144.5
2007-9	27.6	32.5	24.2	161.0	26.9	195.3
2007-10	26.8	31.5	23.9	291.0	26.8	253.0
2007-11	26.8	31.5	23.8	230.0	26.5	286.6
2007-12	26.7	31.4	23.6	150.0	26.3	244.3
2008-1	26.9	32.3	23.7	375.0	26.5	163.9
2008-2	27.1	32.7	23.4	171.0	26.9	166.3
2008-3	26.5	32.0	23.5	546.0	27.2	230.6
2008-4	27.0	32.5	24.0	325.0	27.4	242.7

NMHSs can grasp the availability of CLIMAT report through the GTS.

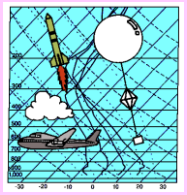
http://ds.data.jma.go.jp/gmd/tcc/climatview/

Climate System Database (Long-term Re-Analysis Project: JRA-25)

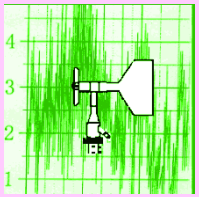
Historical Observational Dataset



Satellite

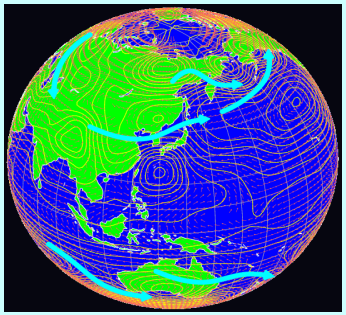


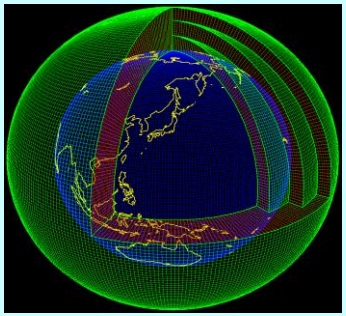
Upper Air



Surface

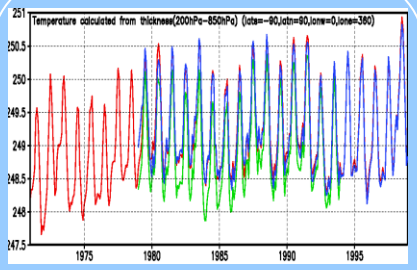
Ship

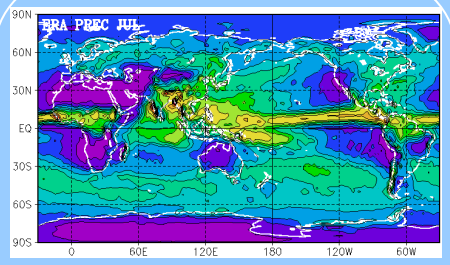




JRA-25 Project
(2001-2005)
6-hourly Climate System Datasets from 1979 to 2004 was computed based on Past Observation and the Numerical Weather Prediction Technology by JMA and CRIEPI

The Best Estimate of the State and Evolution of the Climate System





Physically Consistent Time- Series Data (No Artificial Gap)

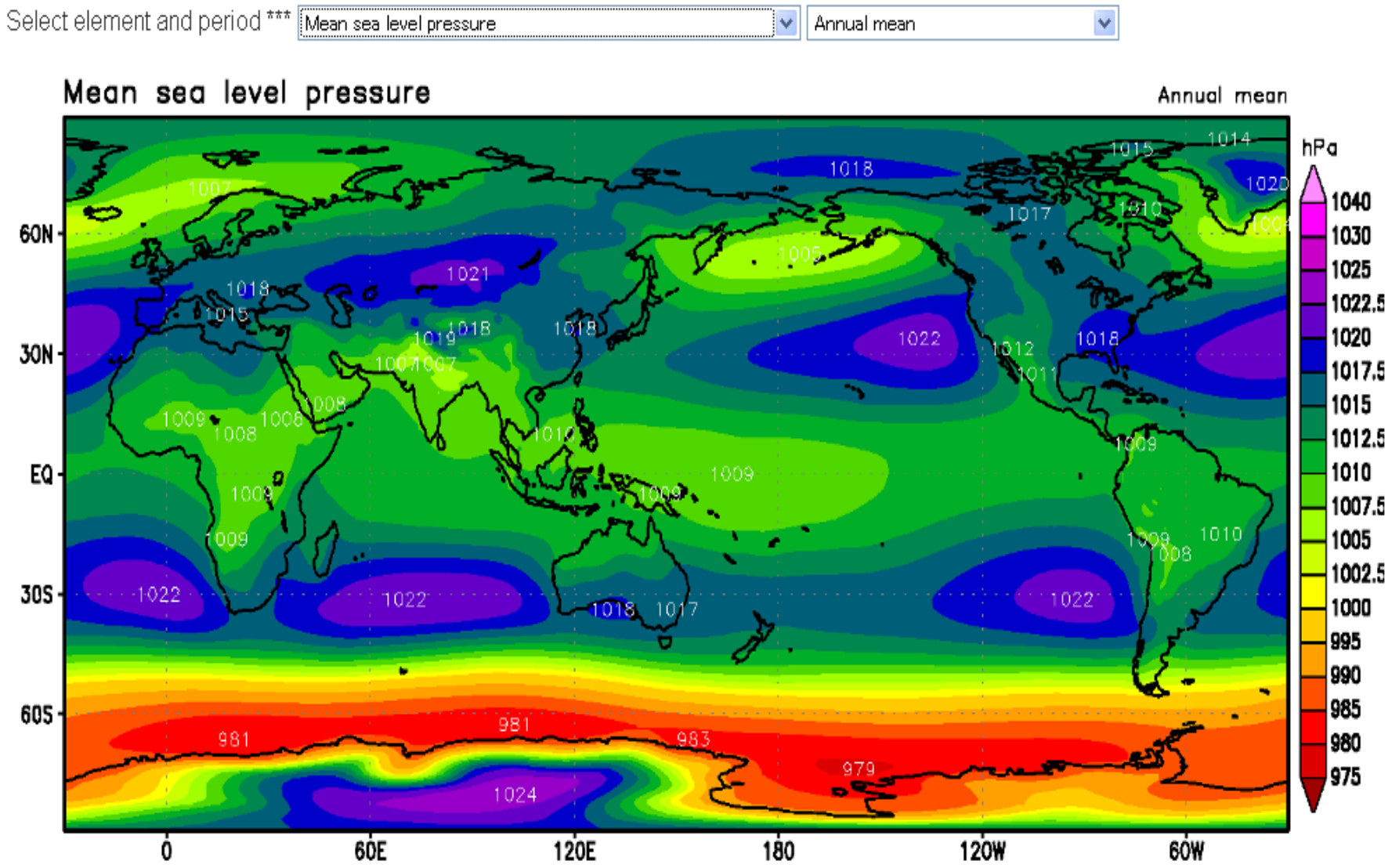
Physically Consistent Gridded Data over the Globe (No Empty Area)

Wind, Air Temperature, Moisture, Precipitation, Evaporation, Soil Moisture, Snow Depth, Surface Fluxes, Radiation, Ground Temperature, etc.

- **Improving Initial Conditions for Seasonal Prediction**
- **Analyzing the mechanisms of Unusual Climate**
- **Monitoring Global Climate Change**

http://jra.kishou.go.jp/JRA-25/index_en.html

JRA-25 Atlas



http://ds.data.jma.go.jp/gmd/jra/atlas/eng/atlas-tope.htm