

Statistical relationship between ENSO and East Asian climate

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Outline

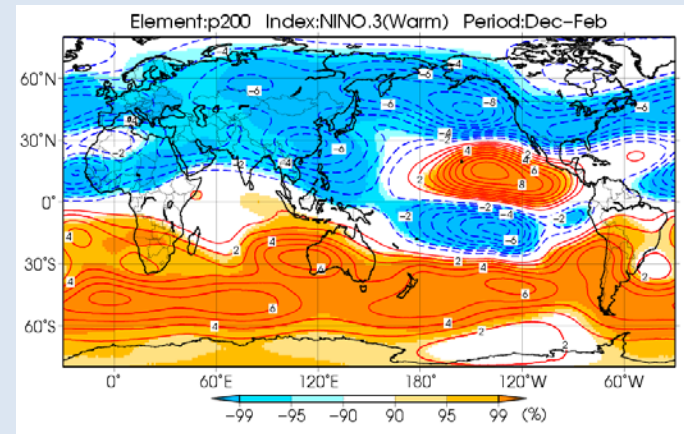
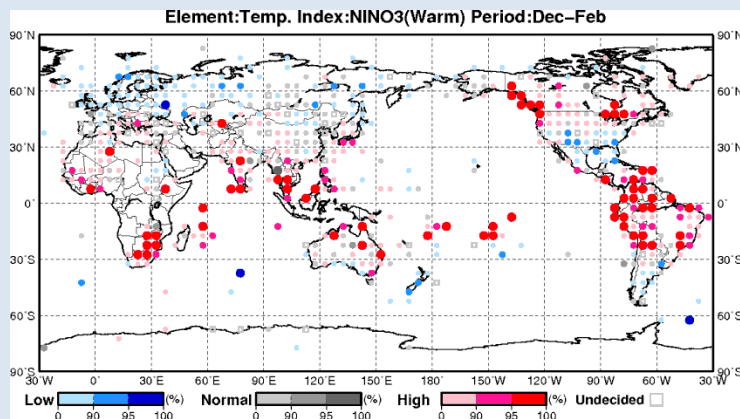
1. Introduction
2. analysis method
3. Result (characteristics for winter and summer)
4. Summary

Introduction

- ENSO is the most dominant mode of the climate system and the most reliable signal for seasonal prediction.
- JMA produced the products on statistical relationship between ENSO and the climate system using JRA-25 between 1979 and 2008 as atmospheric circulation data and provides the products in TCC website.
- JMA is currently producing new statistical products using JRA-55 between 1958 and 2012.

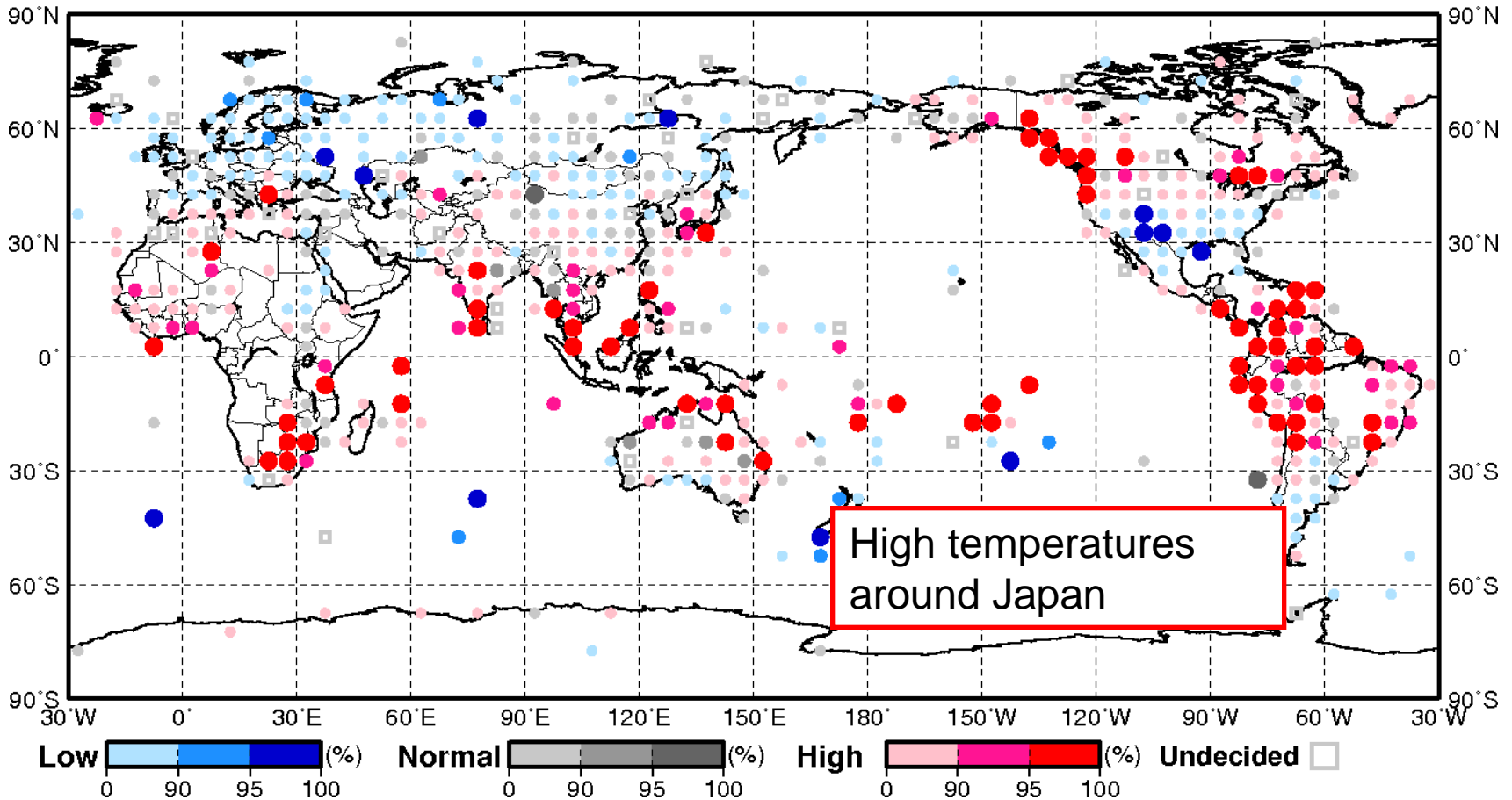
Analysis method

- We produced composite maps of climate and atmospheric circulations in El Nino and La Nina events from 1958 to 2012.
- Please see the details of data and method in TCC website.



Winter(DJF) in El Nino events

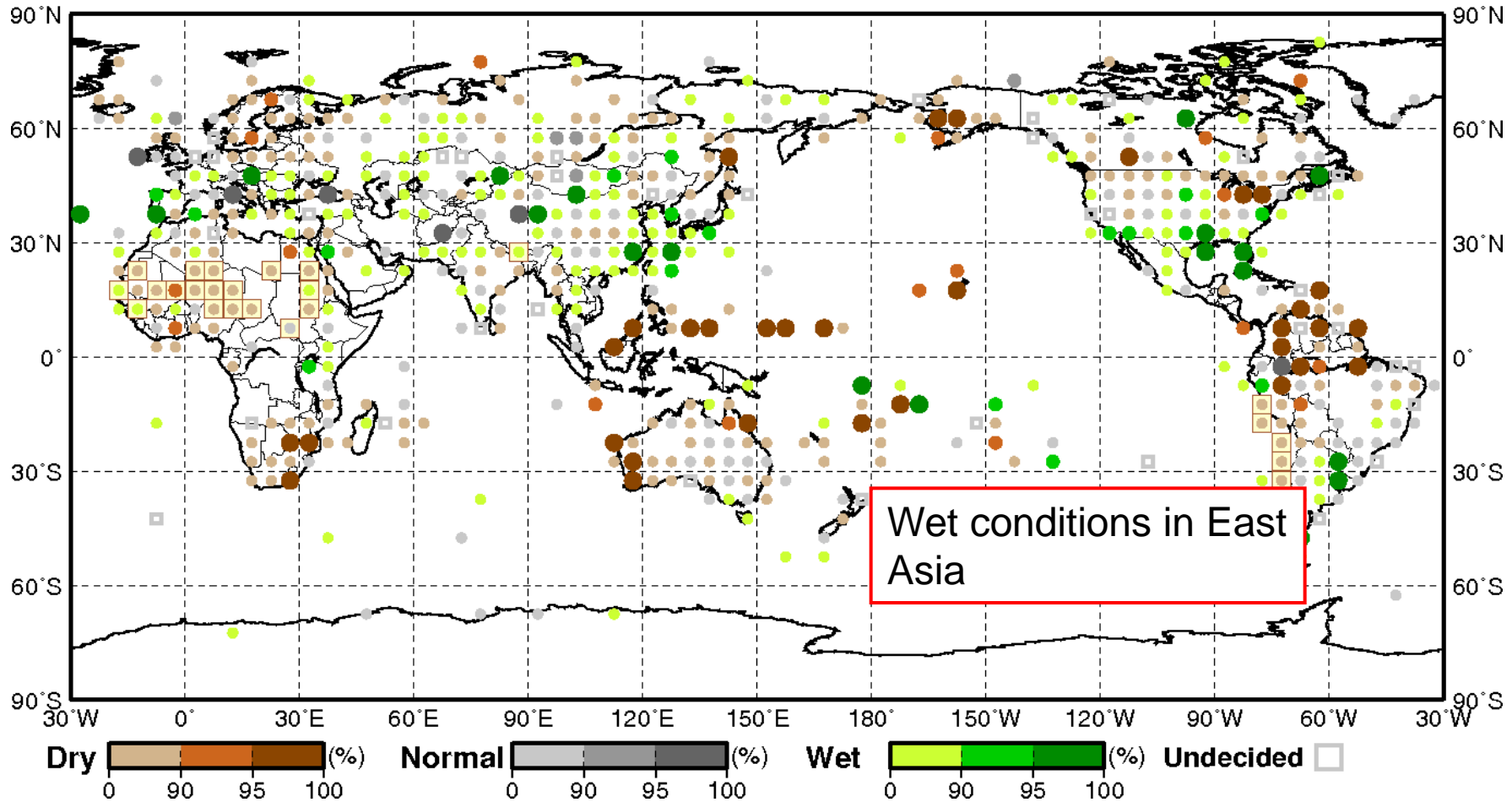
Element:Temp. Index:NINO3(Warm) Period:Dec-Feb



Red: above normal Blue: below normal Grey: near normal
Color density: statistical confidence level as color bar.

Winter(DJF) in El Nino events

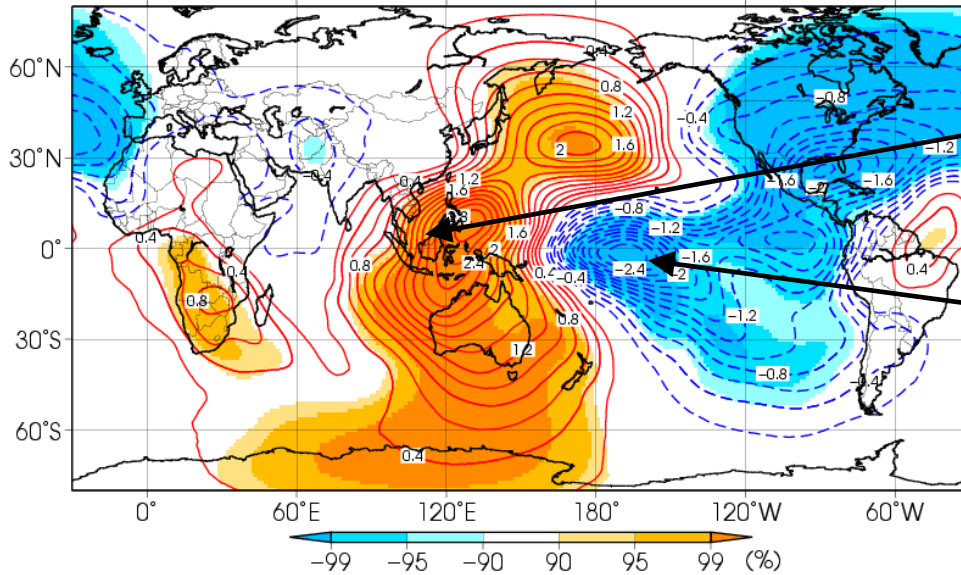
Element:Prec. Index:NINO3(Warm) Period:Dec-Feb



Green: above normal Brown: below normal Grey: near normal
Color density: statistical confidence level as color bar.

Winter(DJF) in El Nino events

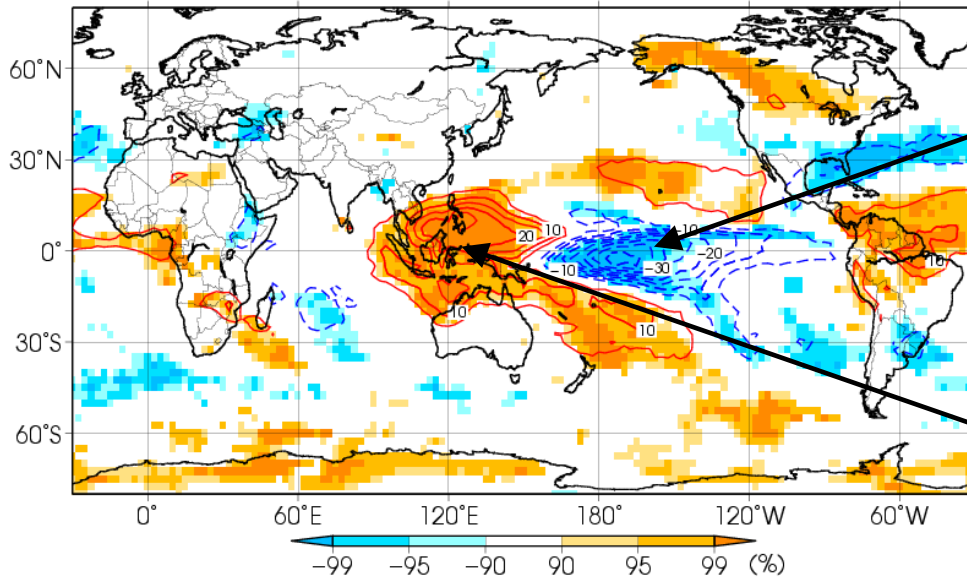
Element:c200 Index:NINO.3(Warm) Period:Dec-Feb



Large scale convergence anomalies

Large scale divergence anomalies

Element:olr Index:NINO.3(Warm) Period:Dec-Feb



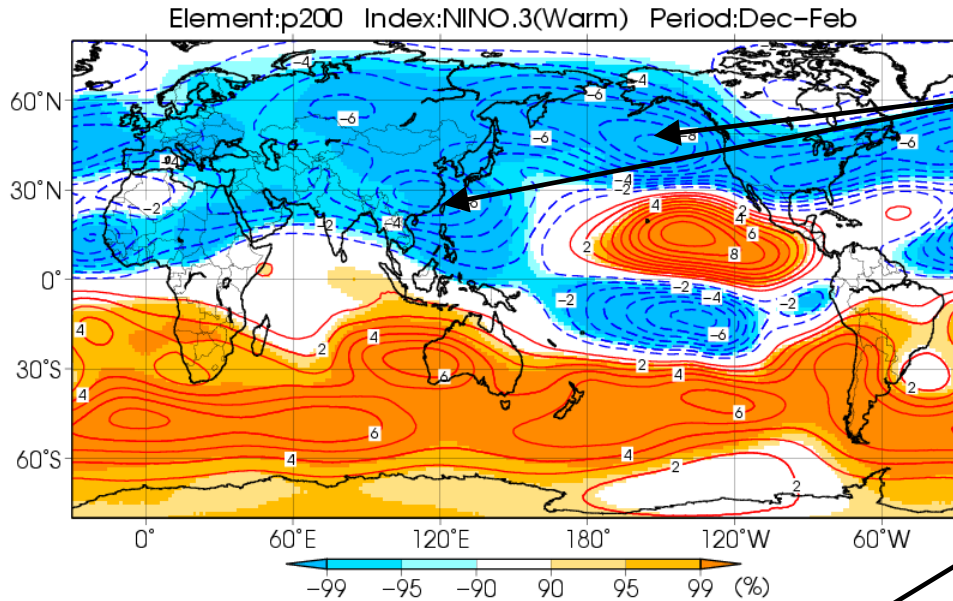
Active convection anomalies

Suppressed convection anomalies

200hPa
Velocity
Potential
anomalies

OLR
anomalies

Winter(DJF) in El Nino events



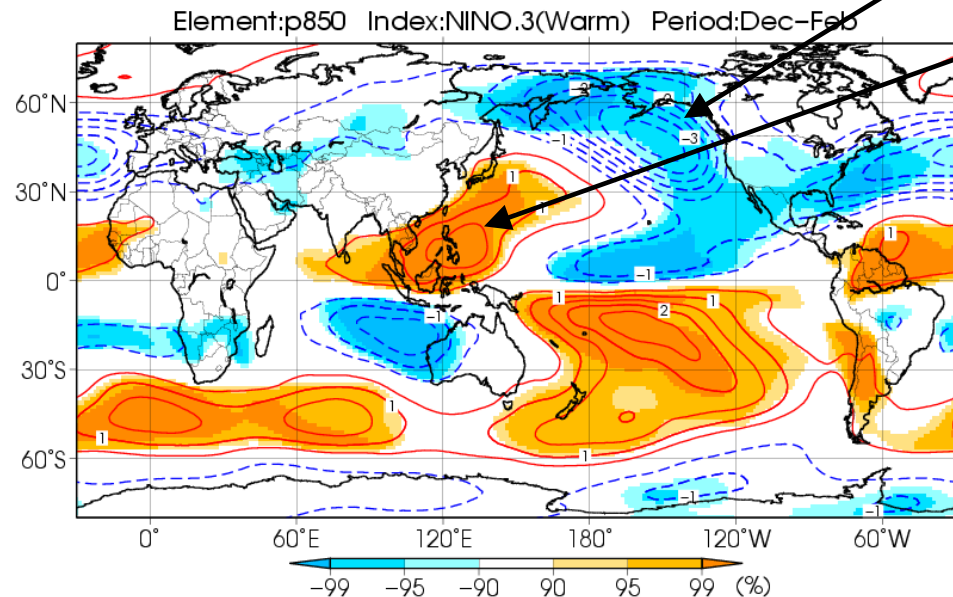
Cyclonic circulation anomalies

Heat source response

Cyclonic circulation anomalies

Anti-cyclonic circulation anomalies

The Aleutian low shift eastward.
Southerly wind anomalies are seen around south of Japan, meaning winter monsoon is weaker than normal.

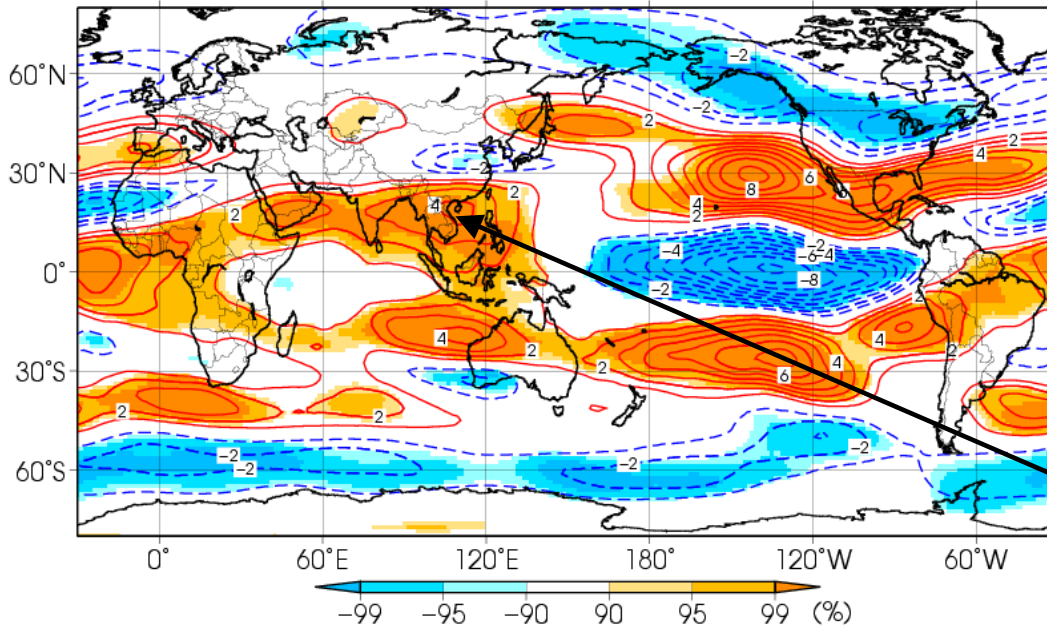


200hPa
stream
function
anomalies

850hPa
stream
function
anomalies

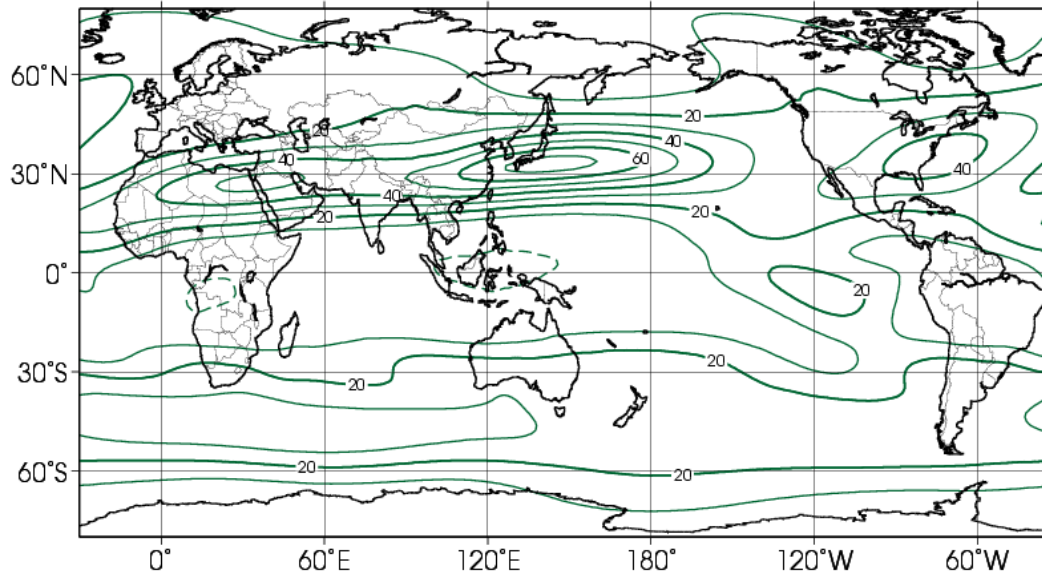
Winter(DJF) in El Nino events

Element:u200 Index:NINO.3(Warm) Period:Dec-Feb



Shift southward

Element:u200 Normal Period:Dec-Feb



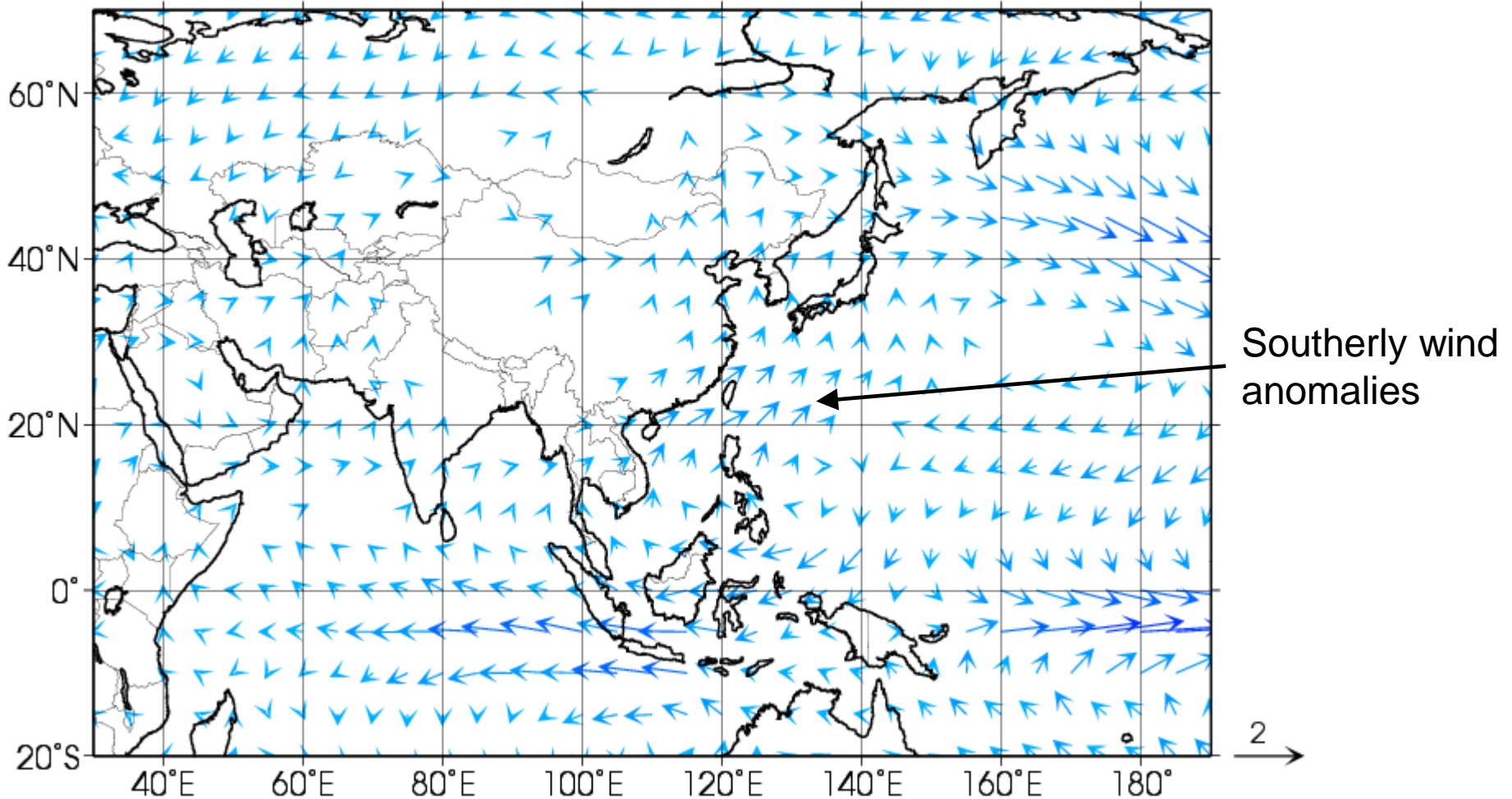
200-hPa zonal wind anomalies

200-hPa zonal wind normal

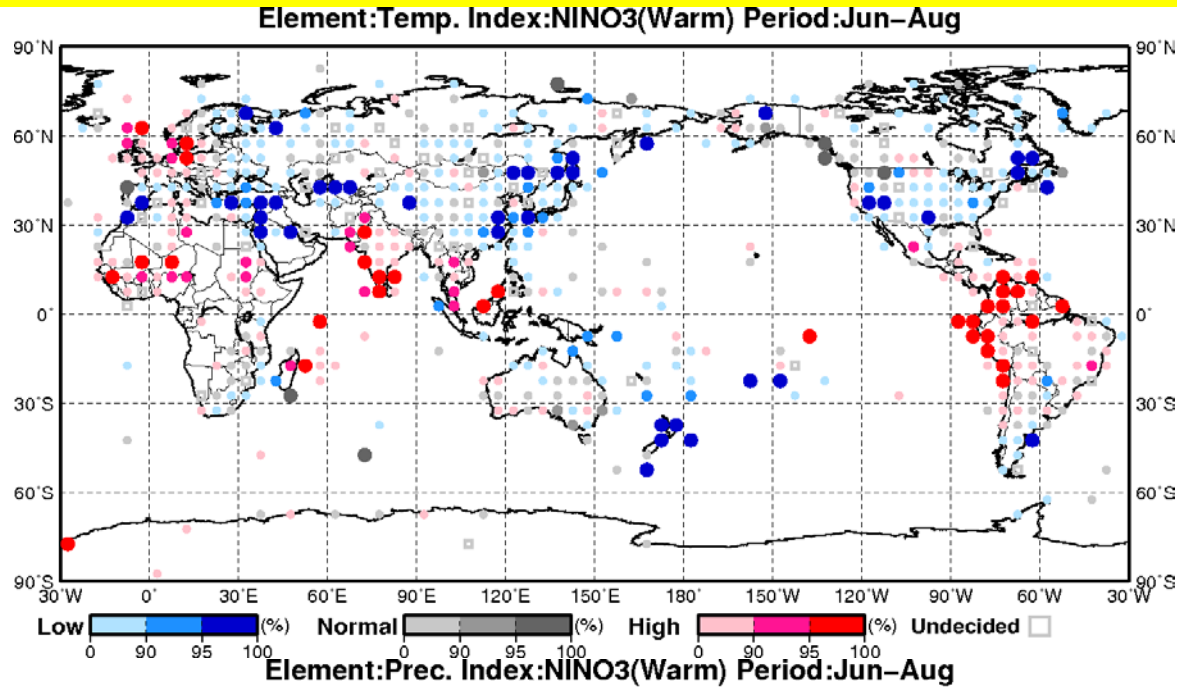
Winter(DJF) in El Nino events

850-hPa wind vector anomalies

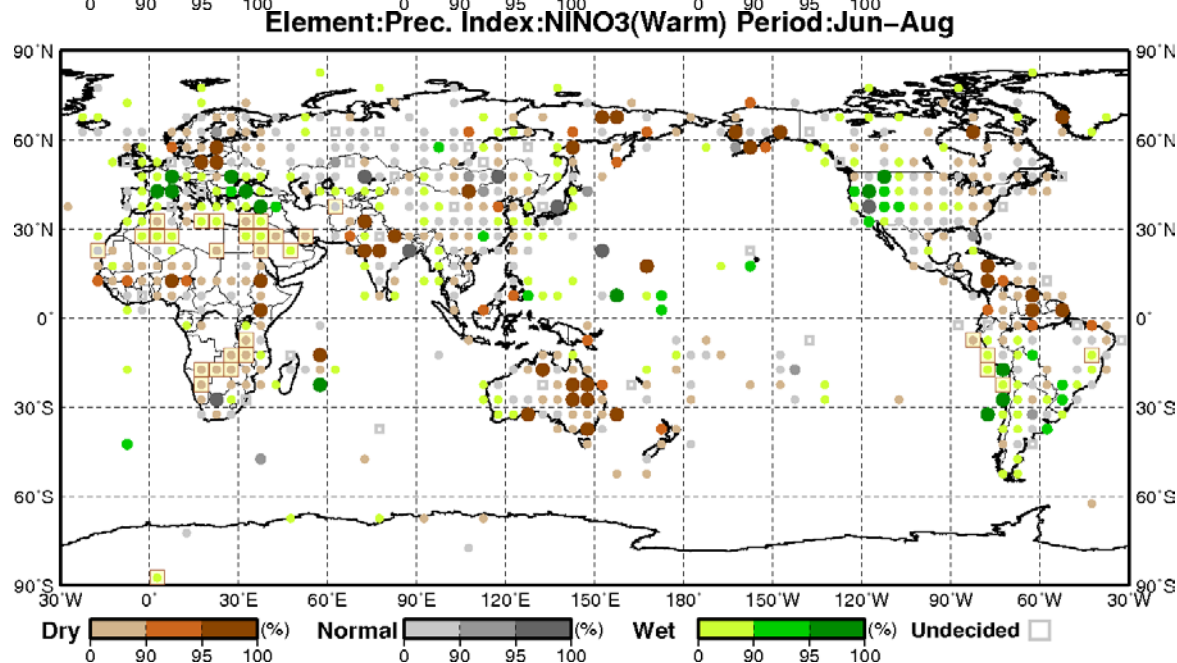
Element:uv850 Index:NINO.3(Warm) Period:Dec-Feb



Summer(JJA) in El Nino events

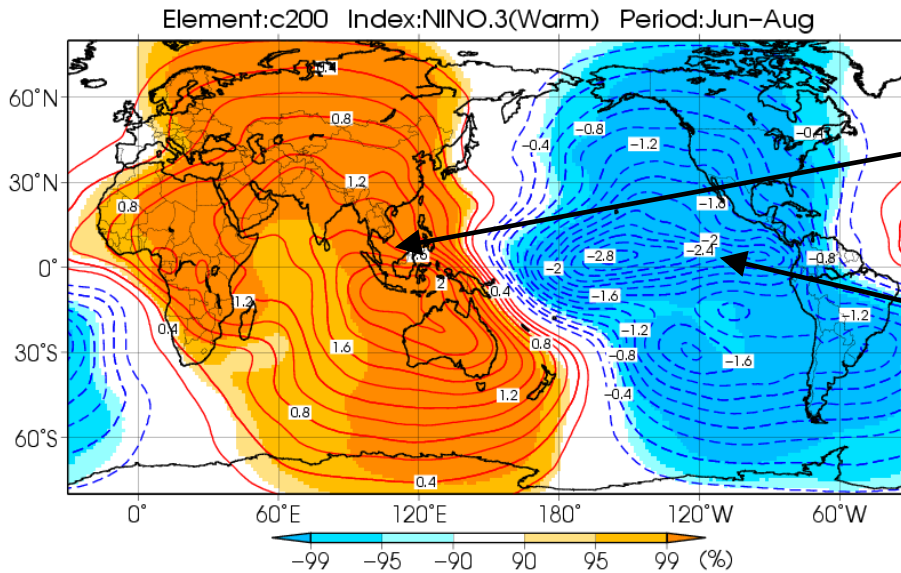


Low temperatures in eastern East Asia



Dry conditions in northern China and southern Mongolia.

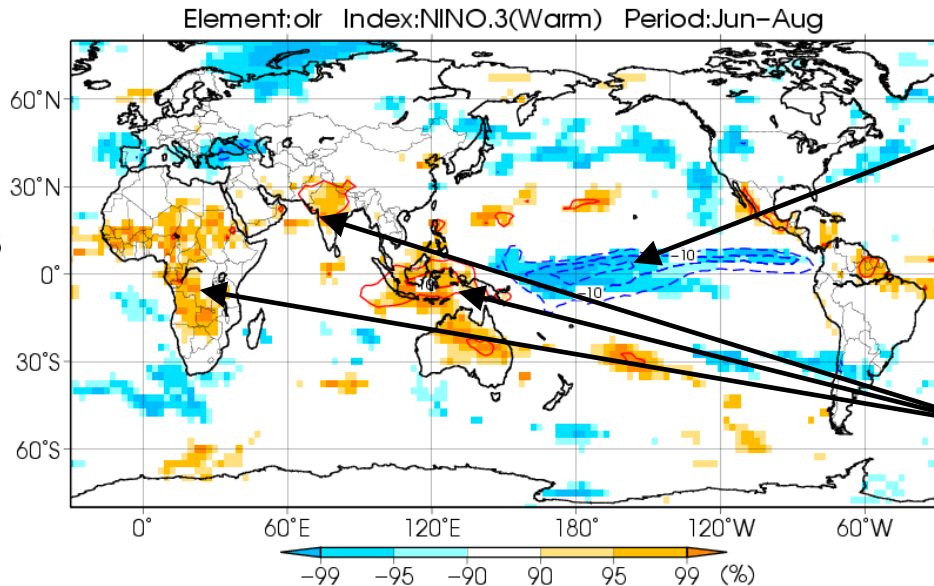
Summer(JJA) in El Nino events



200hPa
Velocity
Potential
anomalies

Large scale convergence
anomalies

Large scale divergence
anomalies



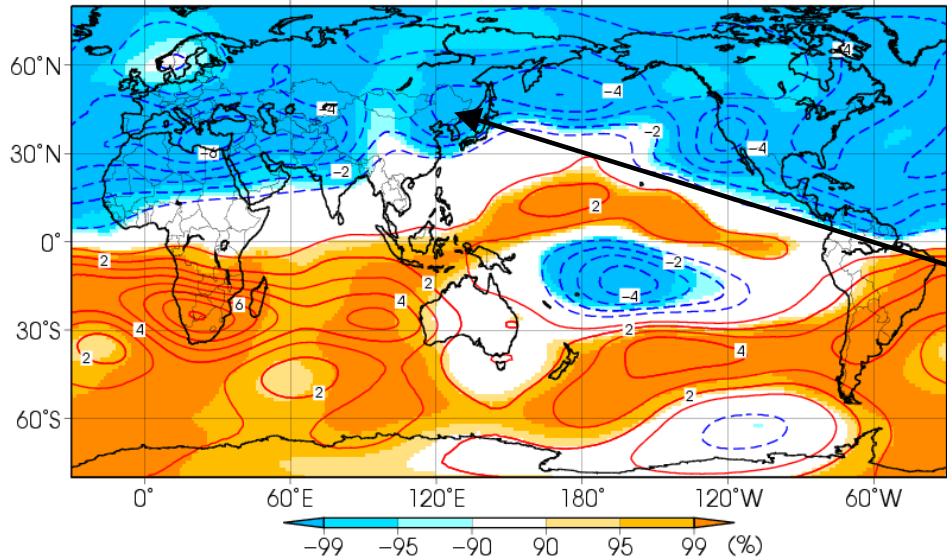
OLR
anomalies

Active convection
anomalies

Suppressed convection
anomalies

Summer(JJA) in El Nino events

Element:p200 Index:NINO.3(Warm) Period:Jun-Aug



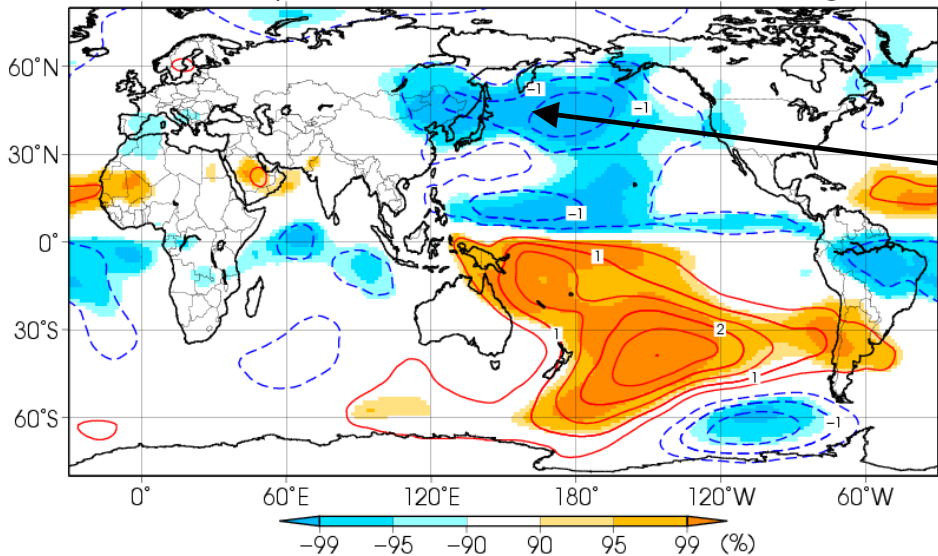
200hPa
stream
function
anomalies

Cyclonic circulation
anomalies

Cyclonic circulation
anomalies

The Tibetan High is
weaker than normal
over its northeastern
part.

Element:p850 Index:NINO.3(Warm) Period:Jun-Aug



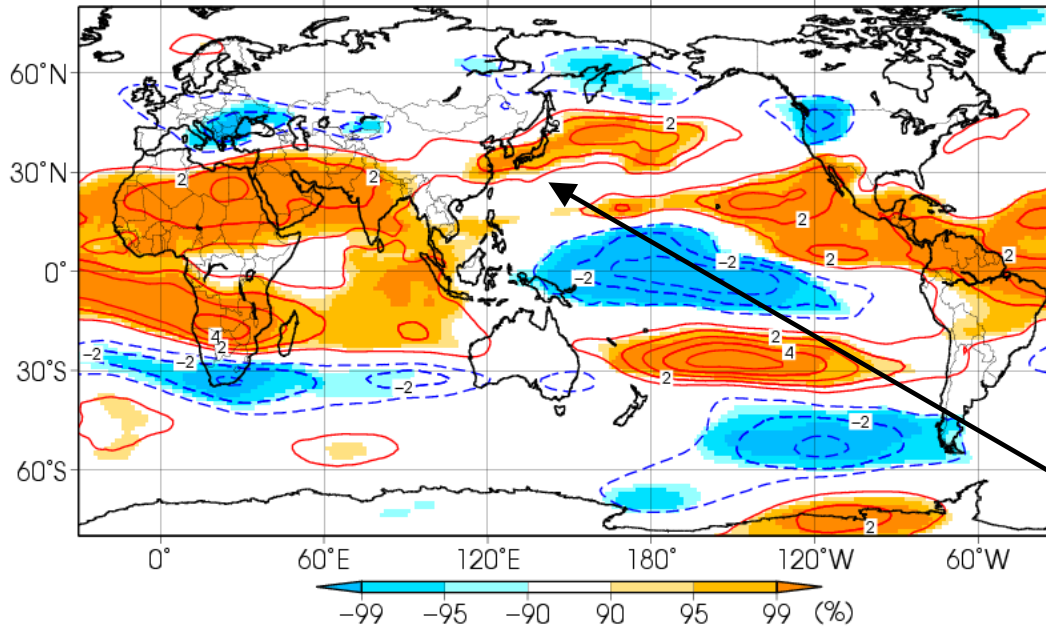
850hPa
stream
function
anomalies

Cyclonic circulation
anomalies

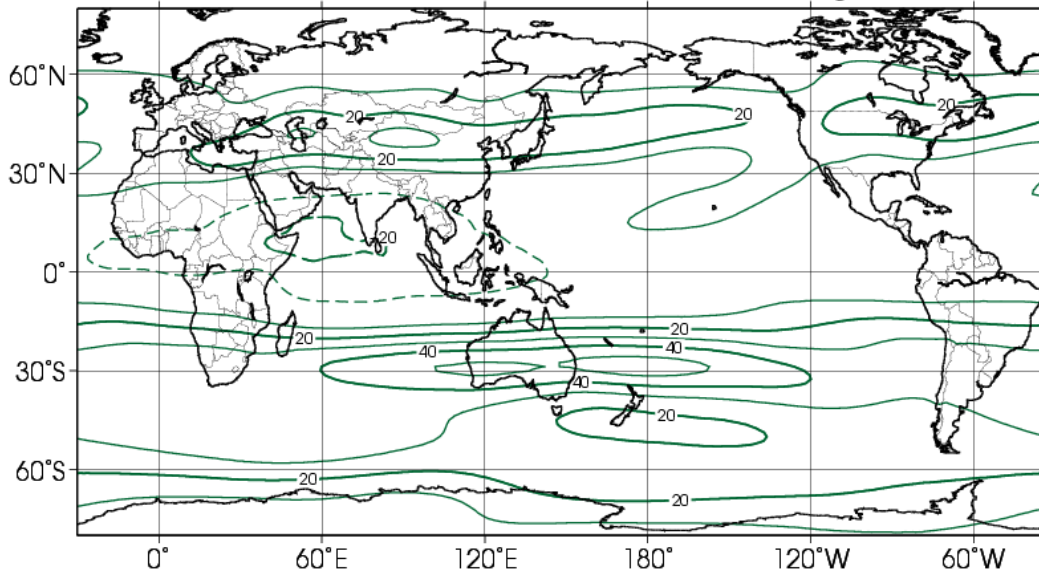
The Northwestern
Pacific High is weaker
than normal.

Summer(JJA) in El Nino events

Element:u200 Index:NINO.3(Warm) Period:Jun-Aug

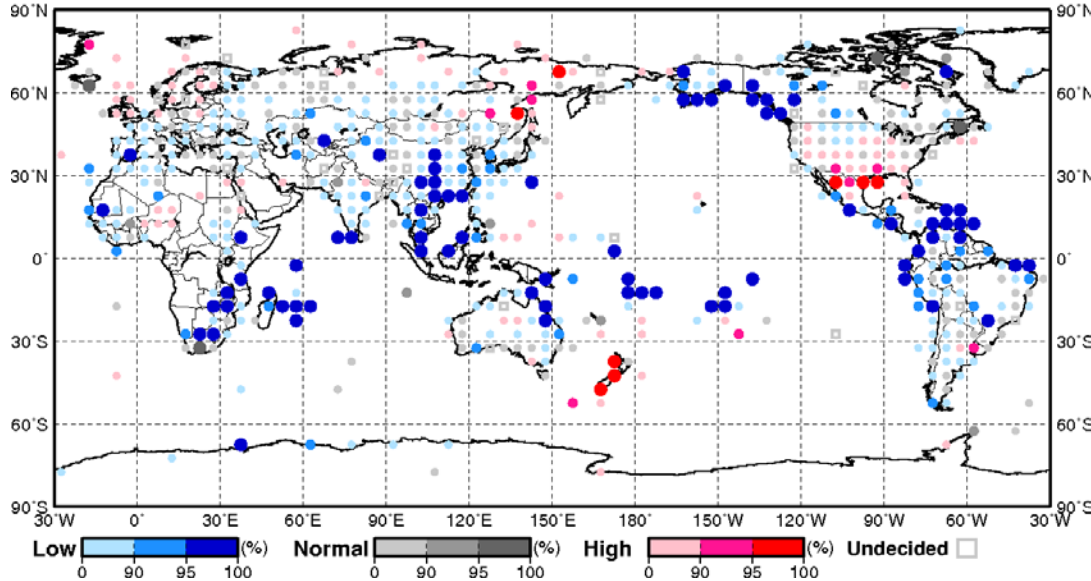


Element:UZUW Normal Period:Jun-Aug



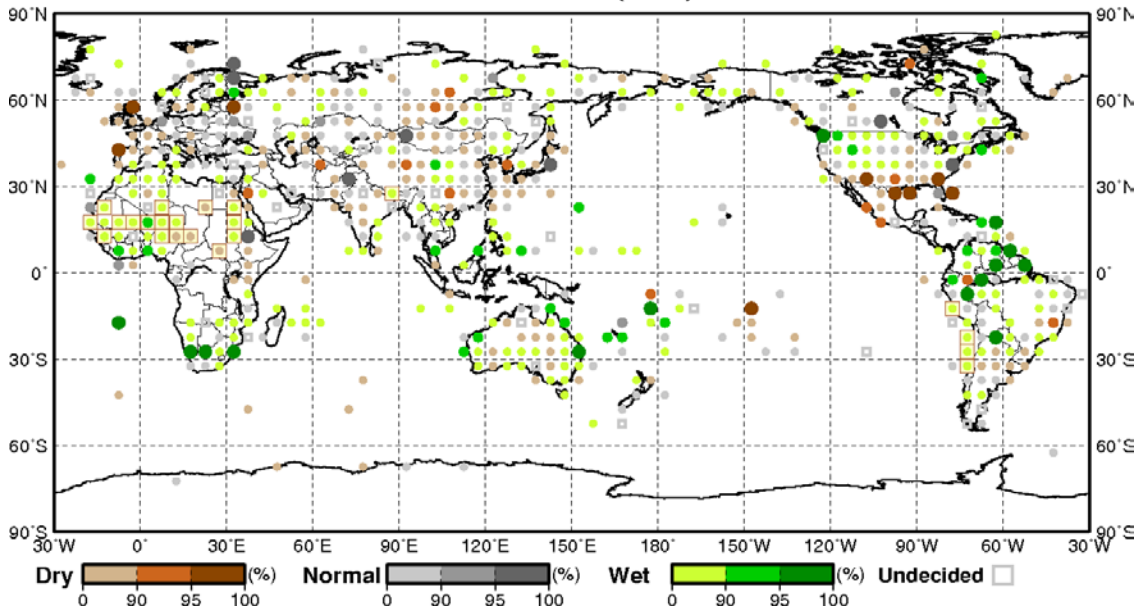
Winter(DJF) in La Nina events

Element:Temp. Index:NINO3(Cold) Period:Dec-Feb



Low temperatures in southern East Asia

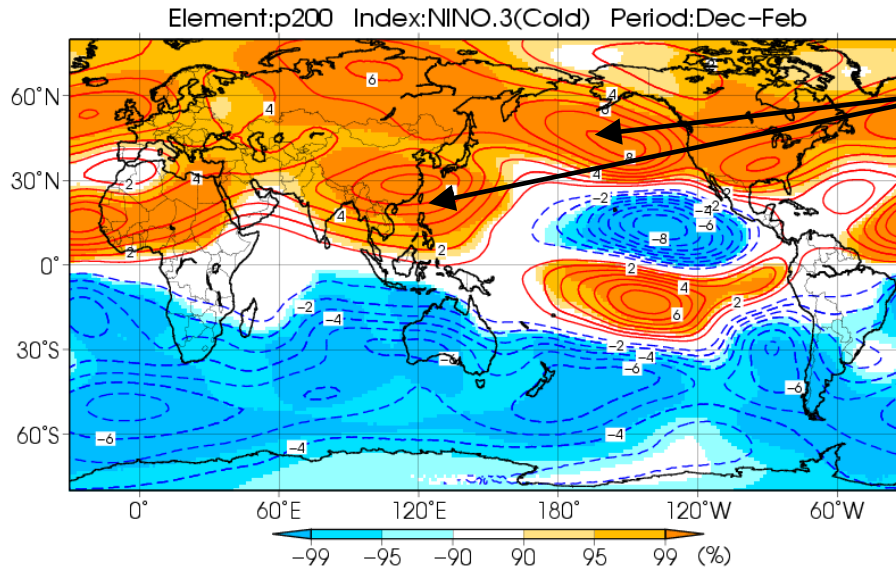
Element:Prec. Index:NINO3(Cold) Period:Dec-Feb



Dry conditions in the Korean Peninsula and a part of China

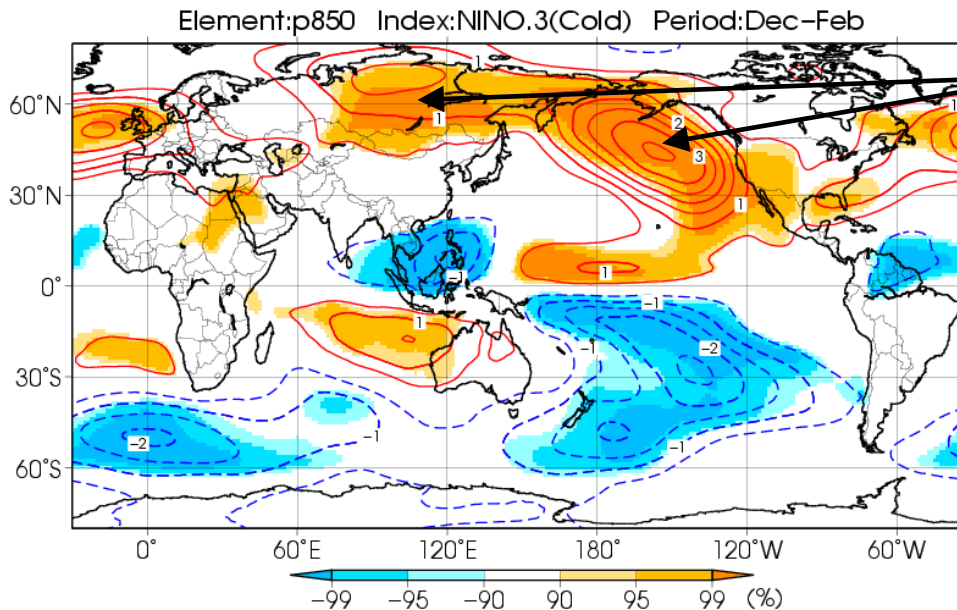
Winter(DJF) in La Nina events

200hPa
stream
function
anomalies



Anti-cyclonic circulation
anomalies

850hPa
stream
function
anomalies

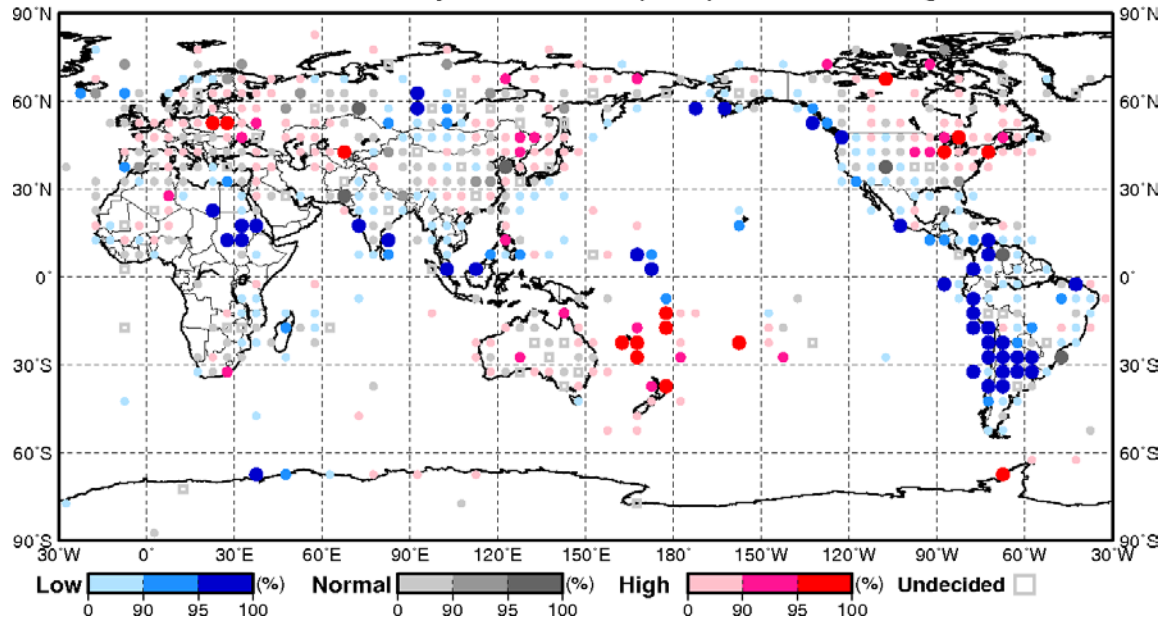


Anti-cyclonic circulation
anomalies

The Aleutian low is
weaker than normal.
The Siberian high is
stronger than normal.

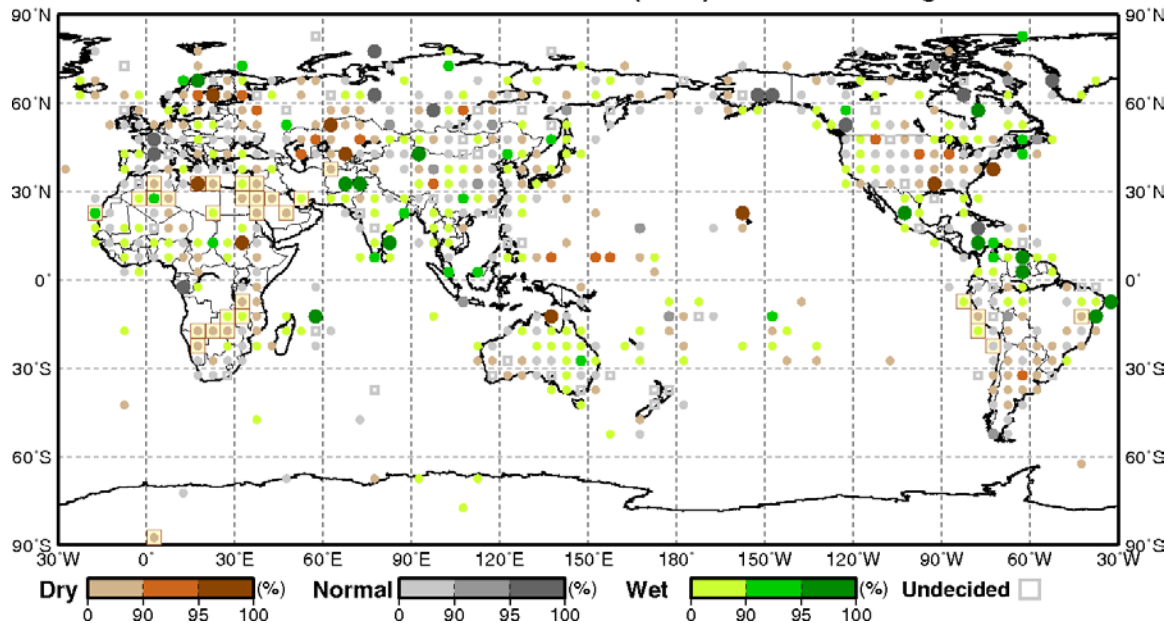
Summer(JJA) in La Nina events

Element:Temp. Index:NINO3(Cold) Period:Jun-Aug



High temperatures in north east China.
Low temperature in central Siberia.

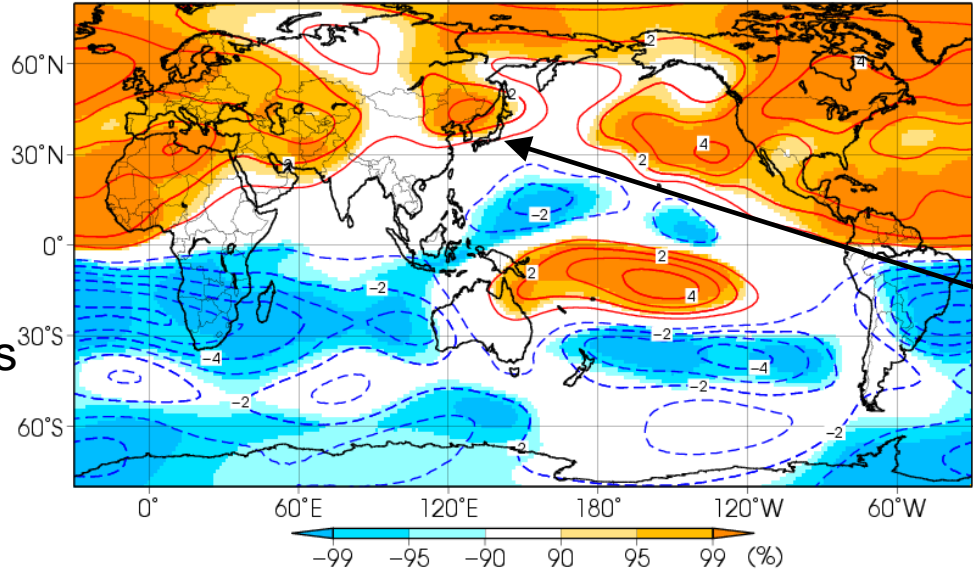
Element:Prec. Index:NINO3(Cold) Period:Jun-Aug



Wet conditions in some area of East Asia

Summer(JJA) in La Nina events

Element:p200 Index:NINO.3(Cold) Period:Jun-Aug



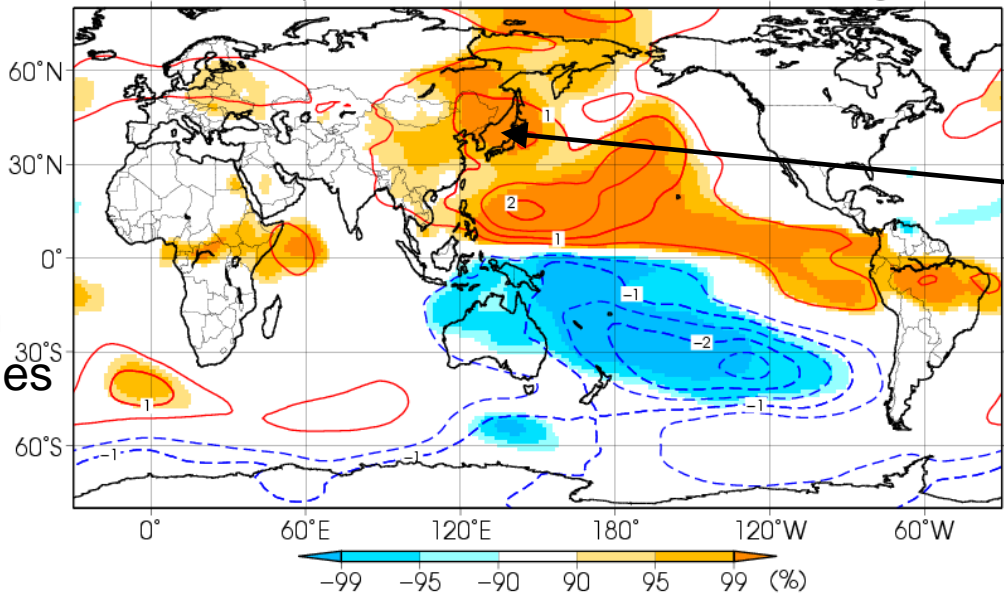
200hpa
stream
function
anomalies

Anti-cyclonic
circulation
anomalies

Anti-cyclonic circulation
anomalies

The Tibetan high is
stronger than normal
over its northeast side.

Element:p850 Index:NINO.3(Cold) Period:Jun-Aug



850hpa
stream
function
anomalies

Anti-cyclonic circulation
anomalies

The Northwestern
Pacific High is stronger
than normal.

Summary

- We produced the statistical relationship between ENSO and Climate by the period 1958-2012.
- Characteristics of East Asian winter monsoon seen in El Nino events are as follows.
 - Weaker-than-normal monsoon in southern and eastern parts of East Asia.
 - Wet conditions in a southeastern part of East Asia.
 - Warm conditions around Japan.

Summary

We expect that it will be used

- in understanding of the mechanism how ENSO affect atmospheric circulations.
- in interpretation of the product of seasonal predicted model and in estimating reliability of one.
- in explanation of seasonal forecast and extreme climate.

El Niño Monitoring

- ENSO Impacts are available on the TCC website.

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

The screenshot shows a web browser displaying the Tokyo Climate Center (TCC) website. The page title is "El Niño Monitoring and Outlook / TCC". The header includes the logos of the Japan Meteorological Agency (JMA) and the WMO Regional Climate Center in RA II (Asia). A navigation menu is visible, with "El Niño Monitoring" highlighted in a red box. Below the menu, the page content is titled "El Niño Monitoring and Outlook". A paragraph states: "JMA operates the Ocean Data Assimilation System and the El Niño Prediction System (an ocean-atmosphere coupled model) for monitoring and prediction of El Niño-Southern Oscillation (ENSO). Monthly diagnosis reports, ENSO monitoring products, ENSO indices and El Niño outlooks are available on this page." Below this, there are two main sections: "Latest Products" and "ENSO Impacts". The "Latest Products" section lists: "El Niño Outlook", "Figures and Tables", "Historical El Niño and La Niña Events", "Download El Niño Monitoring Indices", and "Model forecast of SST anomalies for Niño regions". The "ENSO Impacts" section lists: "Global Climate" and "Atmosphere Circulation (Explanatory Notes)". A red box highlights the text "JMA plans to update in next year (2015)." in the bottom right corner of the page. The browser's taskbar at the bottom shows the system tray with the date 2014/10/26 and time 13:48.

JMA plans to update in next year (2015).

Thank you