Global Ocean Monitoring: Recent Evolution, Current Status, and Predictions

Prepared by

Climate Prediction Center, NCEP/NOAA

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http://www.cpc.ncep.noaa.gov/products/GODAS/

This project to deliver real-time ocean monitoring products is implemented by CPC in cooperation with NOAA's Climate Observation Division (COD)

Outline

- **Overview**
- **Recent highlights**
  - **Global Oceans**
  - **Pacific/Arctic Ocean**

  (Uncertainty in Ocean Reanalysis)
  - **Indian Ocean**
  - **Atlantic Ocean**
- **Global SST Predictions**

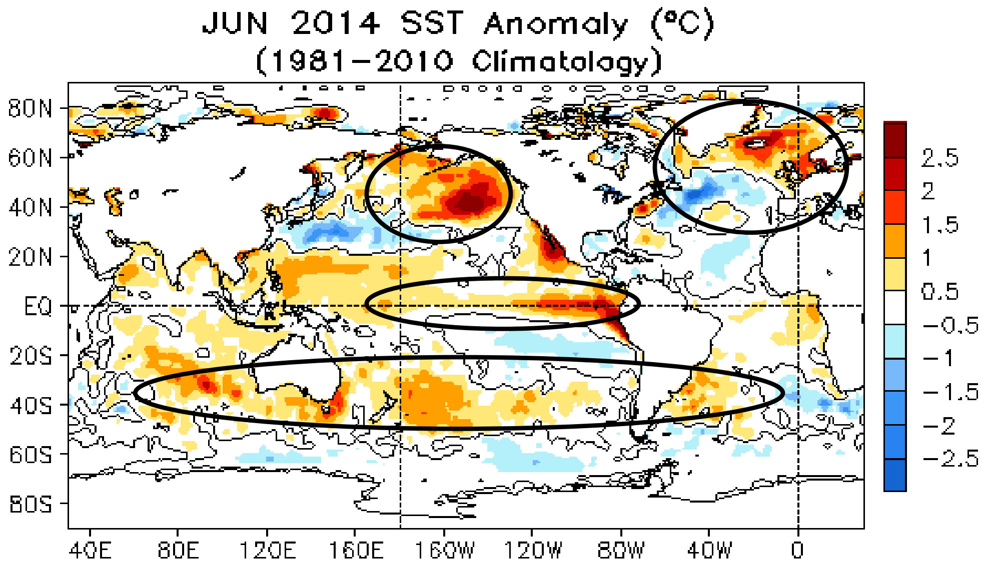
(Possibility of occurrence of an El Nino in 2014/15)

Overview

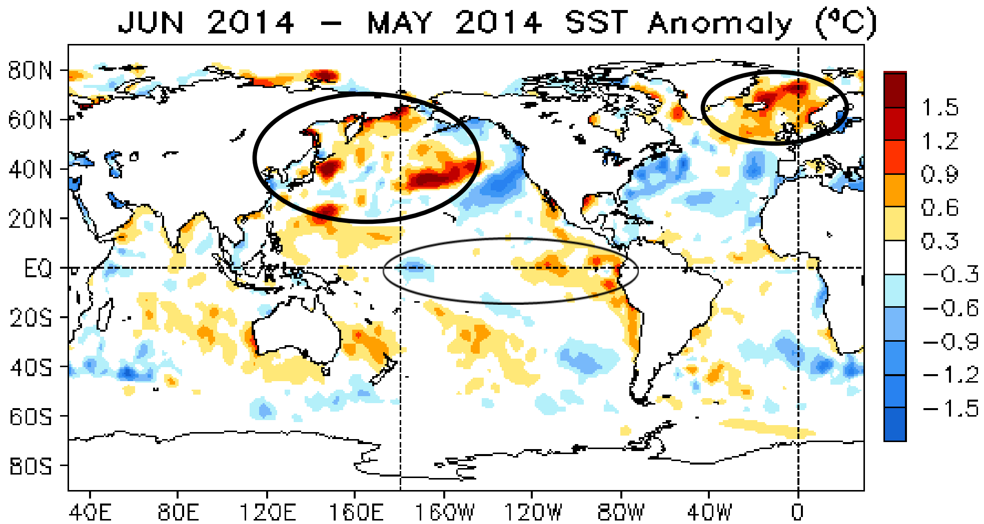
- **Pacific Ocean**
  - **ENSO neutral condition continued with OIv2 NINO3.4=0.5^{o}C in June 2014.**
  - **Subsurface warming along the equator weakened substantially in central equatorial Pacific in June 2014.**
  - **Ocean reanalysis products exhibited large uncertainty in subsurface temperature.**
  - **Majority of models predicted an El Nino starting this summer.**
  - **PDO weakened substantially from +1.2 to -0.13 in last month.**
- **Indian Ocean**
  - **Positive SSTA presented in the whole Indian Ocean in June 2014.**
- **Atlantic Ocean**
  - **Negative NAO persisted in June 2014.**
  - **Tripole pattern of SSTA presented in North Atlantic in June 2014.**
  - **NOAA predicted near-normal or below-normal 2014 Atlantic hurricane season.**

Global Oceans

Global SST Anomaly (^{0}C) and Anomaly Tendency



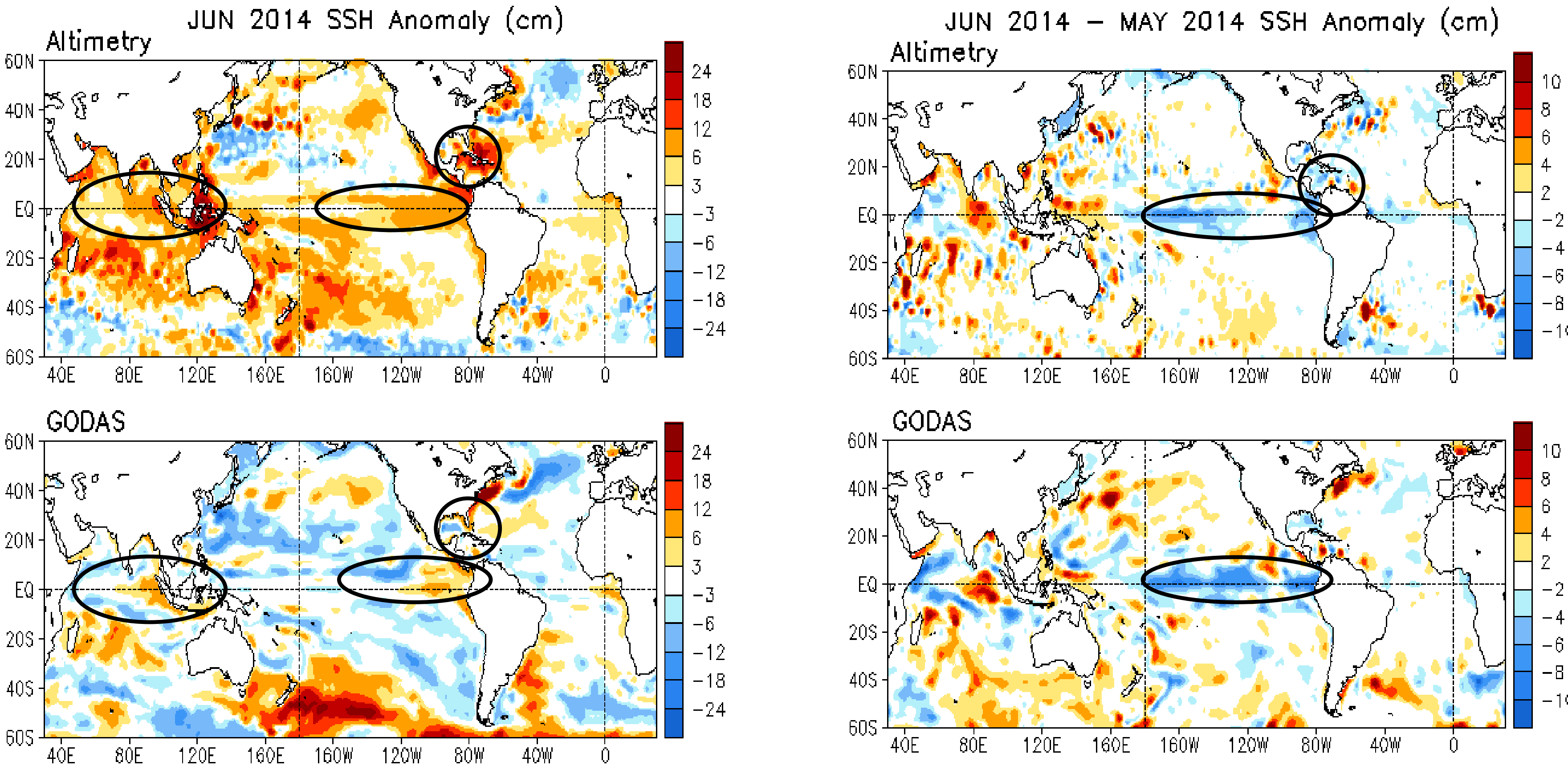
- **SST were above-average across the tropical Pacific Ocean especially in the eastern Pacific.**
- **Strong warming continued in the northern-eastern Pacific Ocean.**
- **Positive SSTA was observed in the Norwegian Sea, while negative SSTA presented in the central N. Atlantic Ocean.**
- **Positive SSTA dominated in the South Ocean.**



- **Positive (negative) SSTA tendencies were observed in the eastern tropical Pacific (near Date line).**
- **A strong warming (cooling) tendency was observed in the western and central N. Pacific (northeastern N. Pacific), leading to weakening PDO.**

Fig. G1. Sea surface temperature anomalies (top) and anomaly tendency (bottom). Data are derived from the NCEP OI SST analysis, and anomalies are departures from the 1981-2010 base period means.

Global SSH Anomaly & Anomaly Tendency

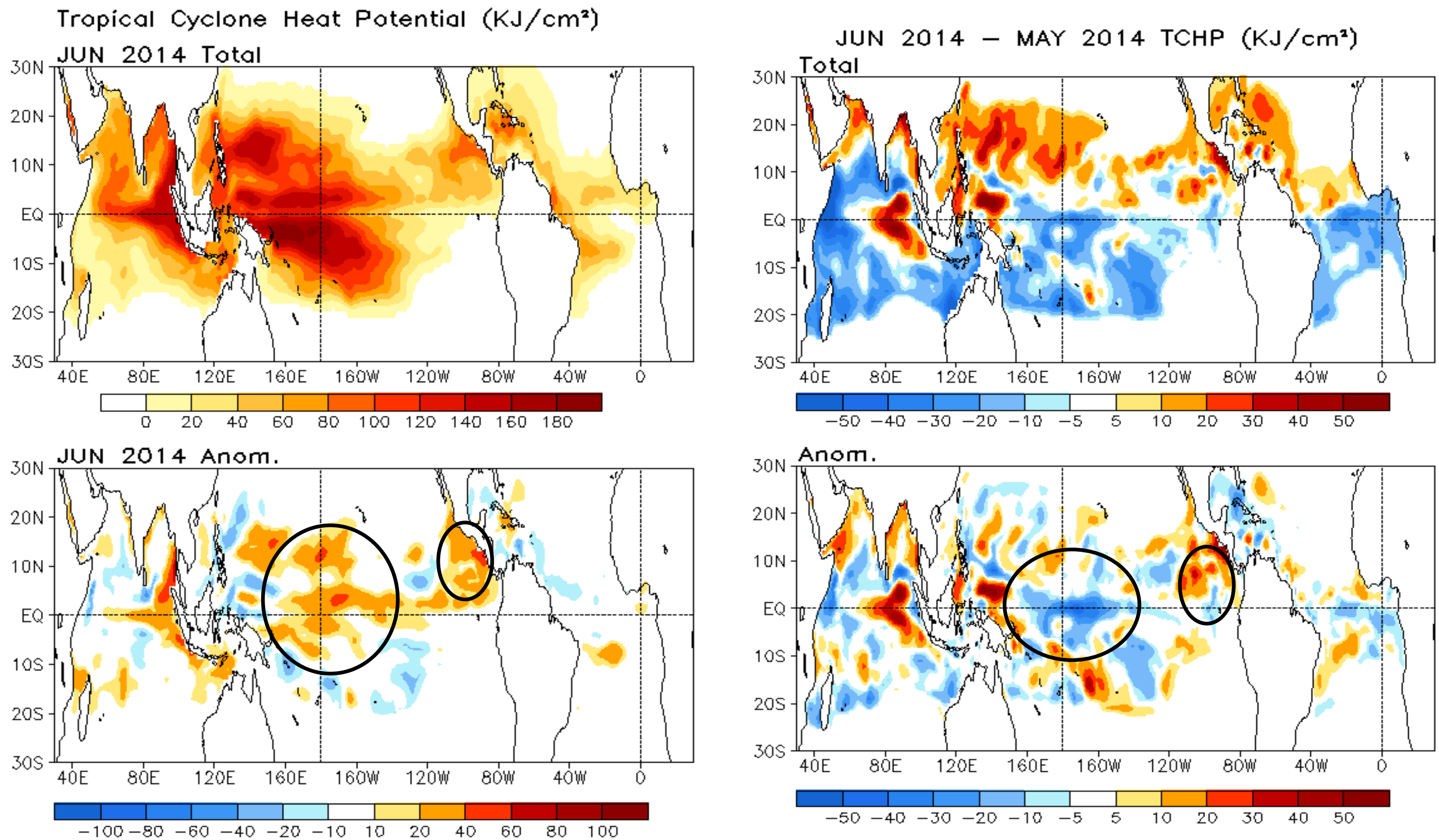


- Compared to altimetry, positive SSHA in GODAS has much narrower meridional extend and confined to further east in the eastern Pacific.

- Altimetry showed positive SSHA in the Caribbean sea and tropical Indian Ocean , while near average SSH was observed in GODAS.

- Negative SSHA tendency presented the central and eastern equatorial Pacific in both altimetry and GODAS.

Tropical Cyclone Heat Potential and Tendency



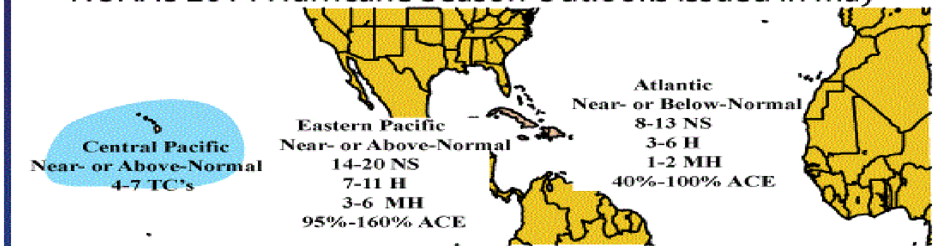
- **Positive TCHP anomalies presented in C. equatorial Pacific and northeast tropical Pacific.**
- **TCHP anomaly tendency was negative (positive) near Dateline (in northeast tropical Pacific).**

TCHP field is the anomalous heat storage associated with temperatures larger than 26℃.

NOAA's 2014 Hurricane Outlooks Issued in May

(http://www.cpc.ncep.noaa.gov/products/outlooks)

NOAA's 2014 Hurricane Season Outlooks Issued in May



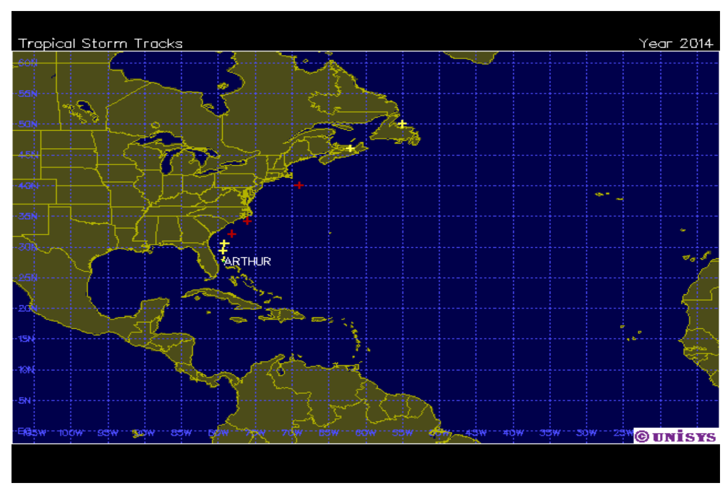
NOAA's 2014 Atlantic and Eastern Pacific hurricane season outlooks indicate the likely ranges (each with a70% chance) of Named Storms (NS), Hurricanes (H), Major Hurricanes (MH), and percentage of the median Acccumulated Cyclone Energy (ACE).

NOAA's 2014 Central Pacific hurricane season outlook indicates the likely number of tropical cyclones (TC), which include tropical depressions, tropical storms and hurricanes.

For 2014 the probabilities of each season type are:

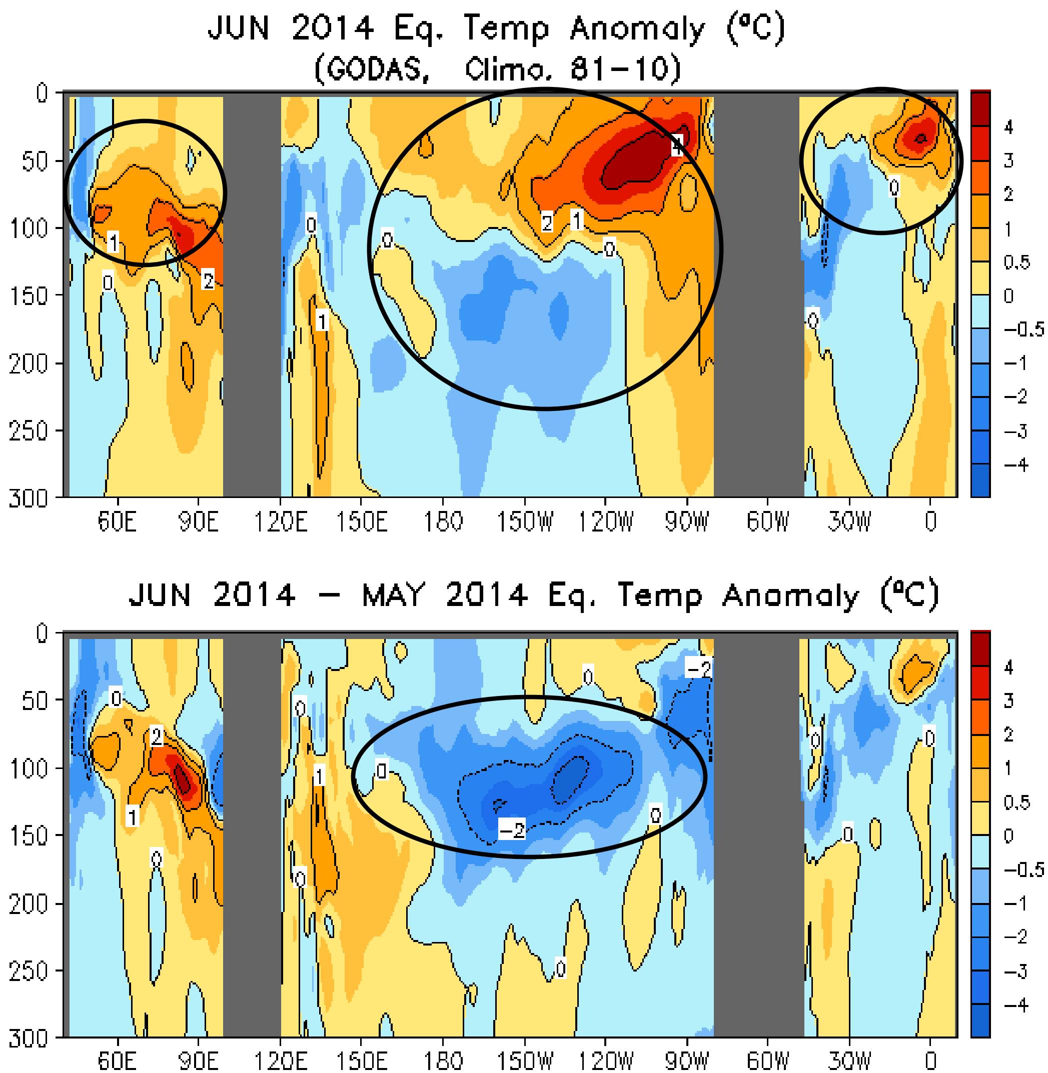
	Atlantic	Eastern Pacific	Central Pacific
Above Normal	10%	50%	40%
Near Normal	40%	40%	40%
Below Normal	50%	10%	20%

- NOAA's 2014 hurricane outlook called for a 50% chance of a below-normal season in Atlantic and a 50% chance of a above-normal season in E. Pacific.
- One hurricane was formed in Atlantic by July 5.
- Two hurricanes and three tropical storms was formed in E. Pacific by July 5.



(http://weather.unisys.com/hurricane/)

Longitude-Depth Temperature Anomaly and Anomaly Tendency in 2^{O}S-2^{O}N

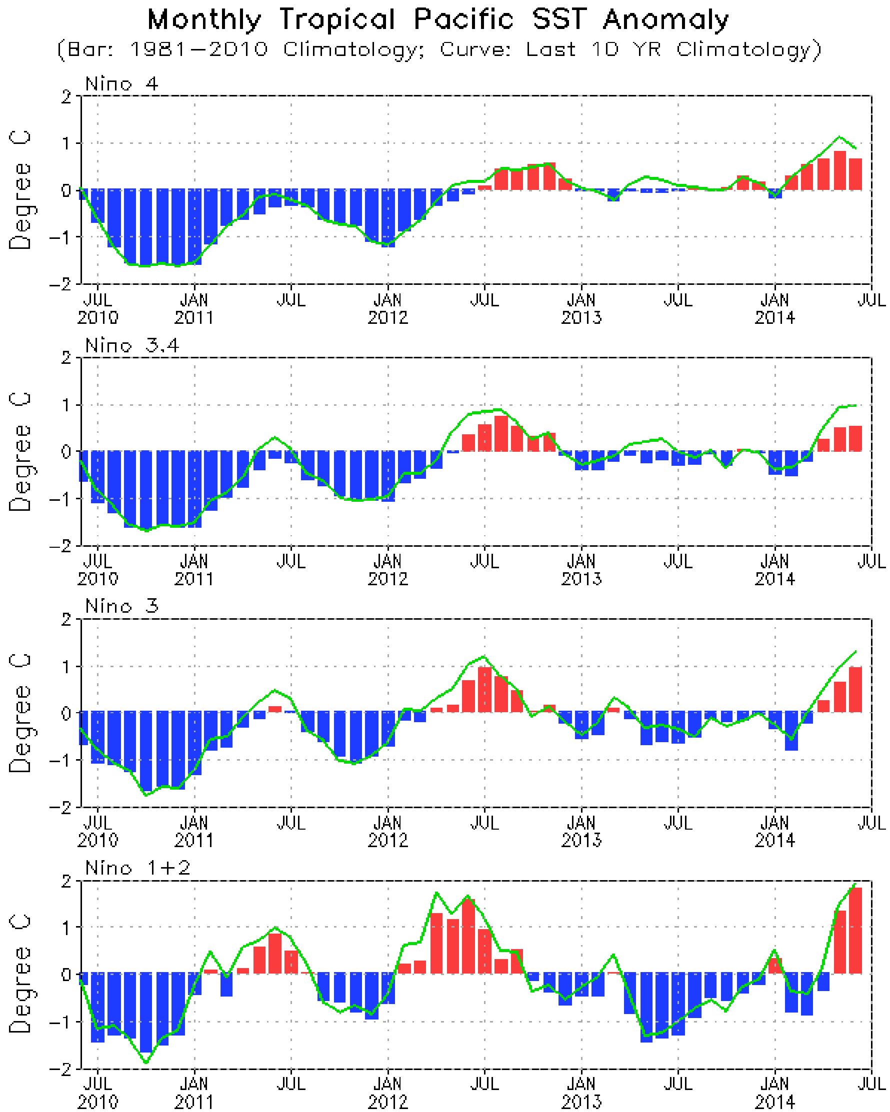


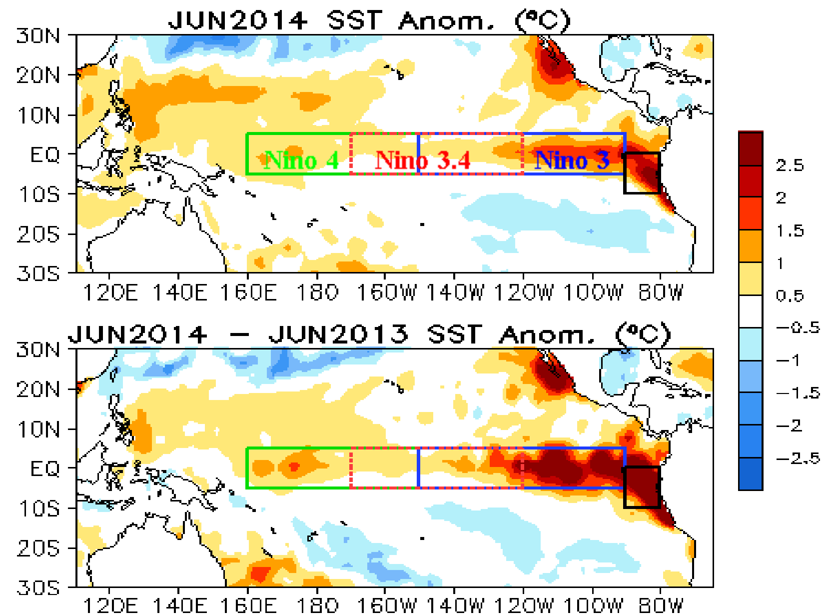
- **Positive subsurface anomalies continued to occupy the top 100m across most of the equatorial Pacific, while negative temperature anomalies strengthened below 100m in the C. Pacific.**
- **A strong negative temperature tendency was observed near the thermocline in the central-eastern Pacific.**
- **Ocean temperature anomalies were mainly positive in both Indian and Atlantic Oceans.**
- **A negative temperature tendency emerged in the upper Atlantic Ocean.**

Fig. G3. Equatorial depth-longitude section of ocean temperature anomalies (top) and anomaly tendency (bottom). Data are derived from the NCEP's global ocean data assimilation system which assimilates oceanic observations into an oceanic GCM. Anomalies are departures from the 1981-2010 base period means.

Tropical Pacific Ocean and ENSO Conditions

Evolution of Pacific NINO SST Indices

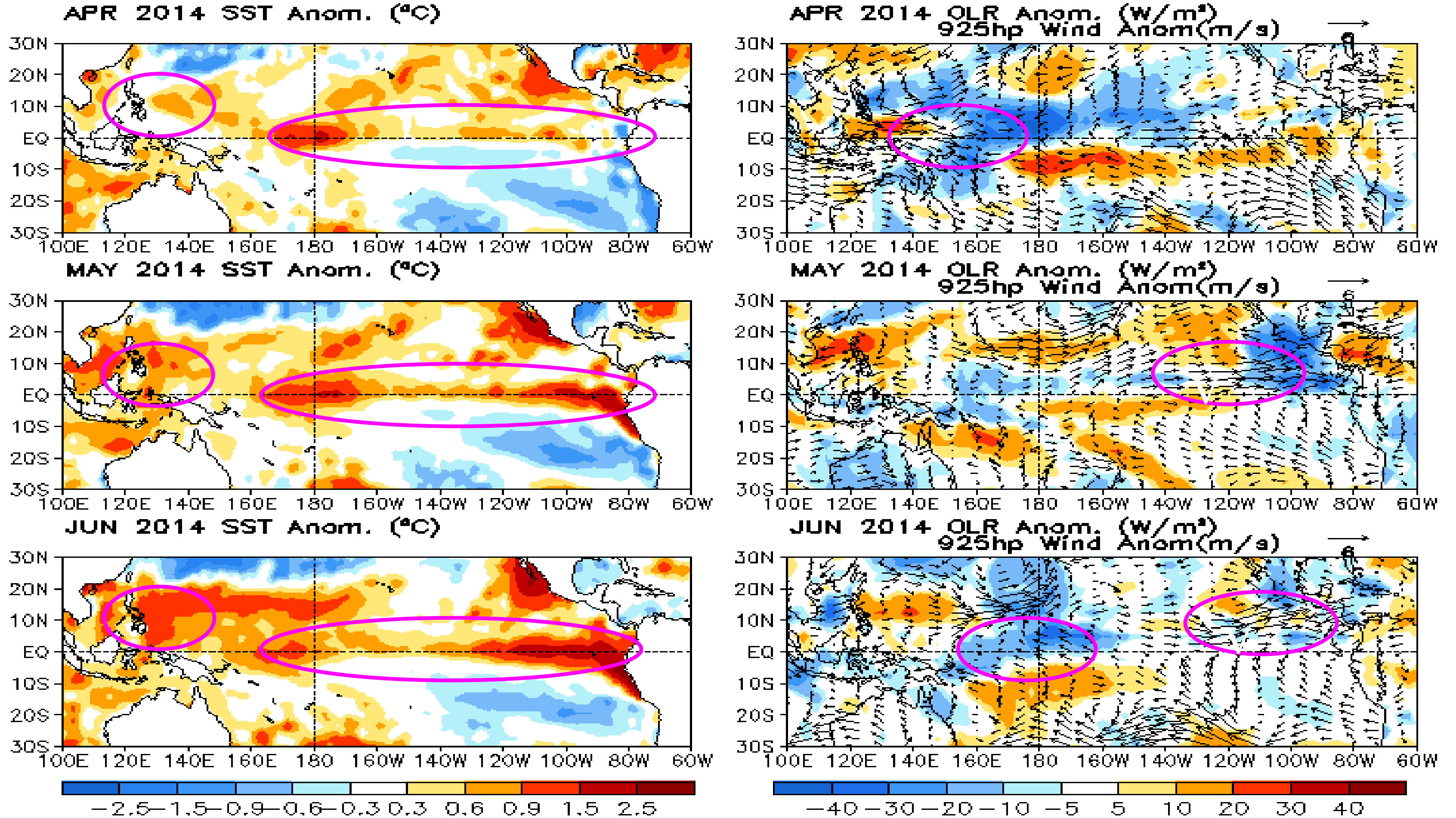




- **Except for Nino 4, other NINO indices increased in June 2014.**
- **Nino3.4 = +0.5°C in June 2014.**
- **Compared with June 2013, SST was much warmer in the tropical Pacific in June 2014.**
- **The indices were calculated based on OISST. They may have some differences compared with those based on ERSST.v3b.**

Fig. P1a. Nino region indices, calculated as the area-averaged monthly mean sea surface temperature anomalies (°C) for the specified region. Data are derived from the NCEP OI SST analysis, and anomalies are departures from the 1981-2010 base period means.

Last Three Month SST, OLR and 925hp Wind Anom.



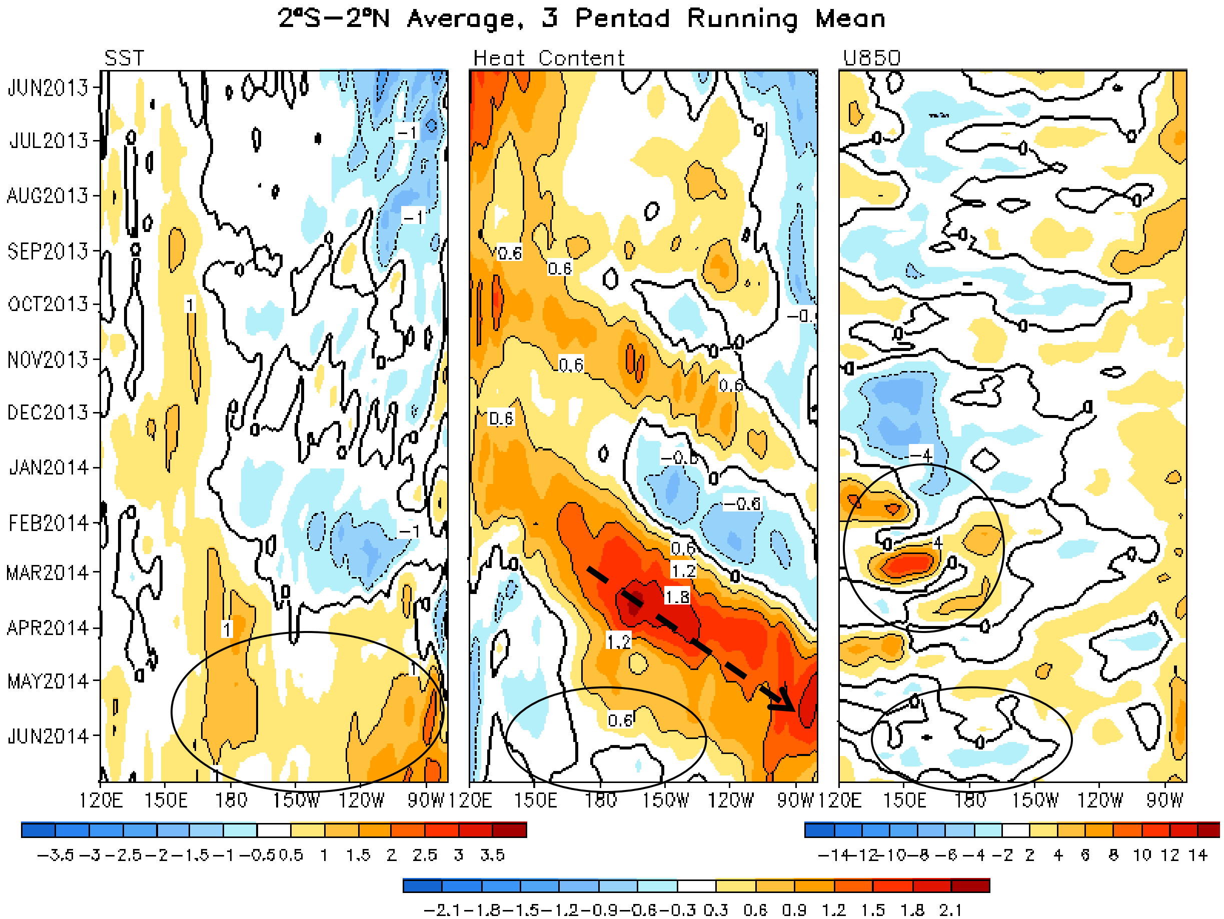
- **In the past three months, positive SSTA strengthened in the eastern Pacific and north-western Pacific, while positive SSTA weakened near the dateline.**

- **Westerly wind anomalies presented in the western equatorial Pacific in April, and then near-normal winds dominated in the last two months.**

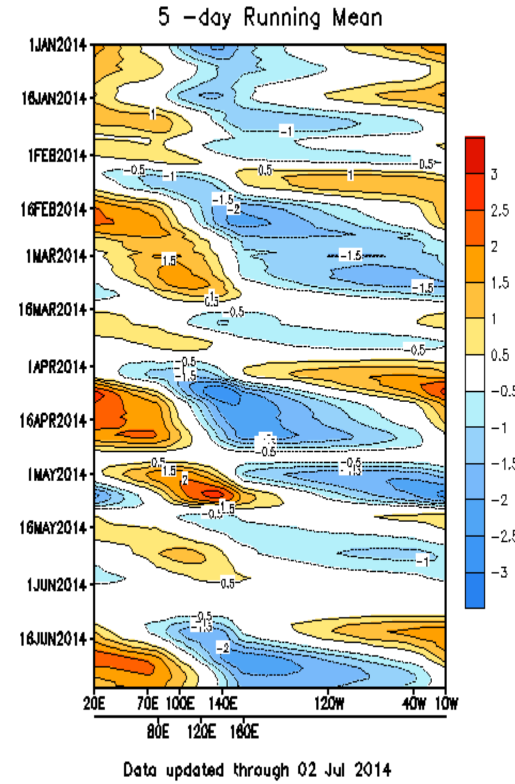
- **Westerly wind anomalies were observed north of the equator in the eastern Pacific in May-Jun.**

- **Negative OLR anomalies were observed near Dateline in Jun.**

Equatorial Pacific SST (ºC), HC300 (ºC), and u850 (m/s) Anomalies



CPC MJO Indices

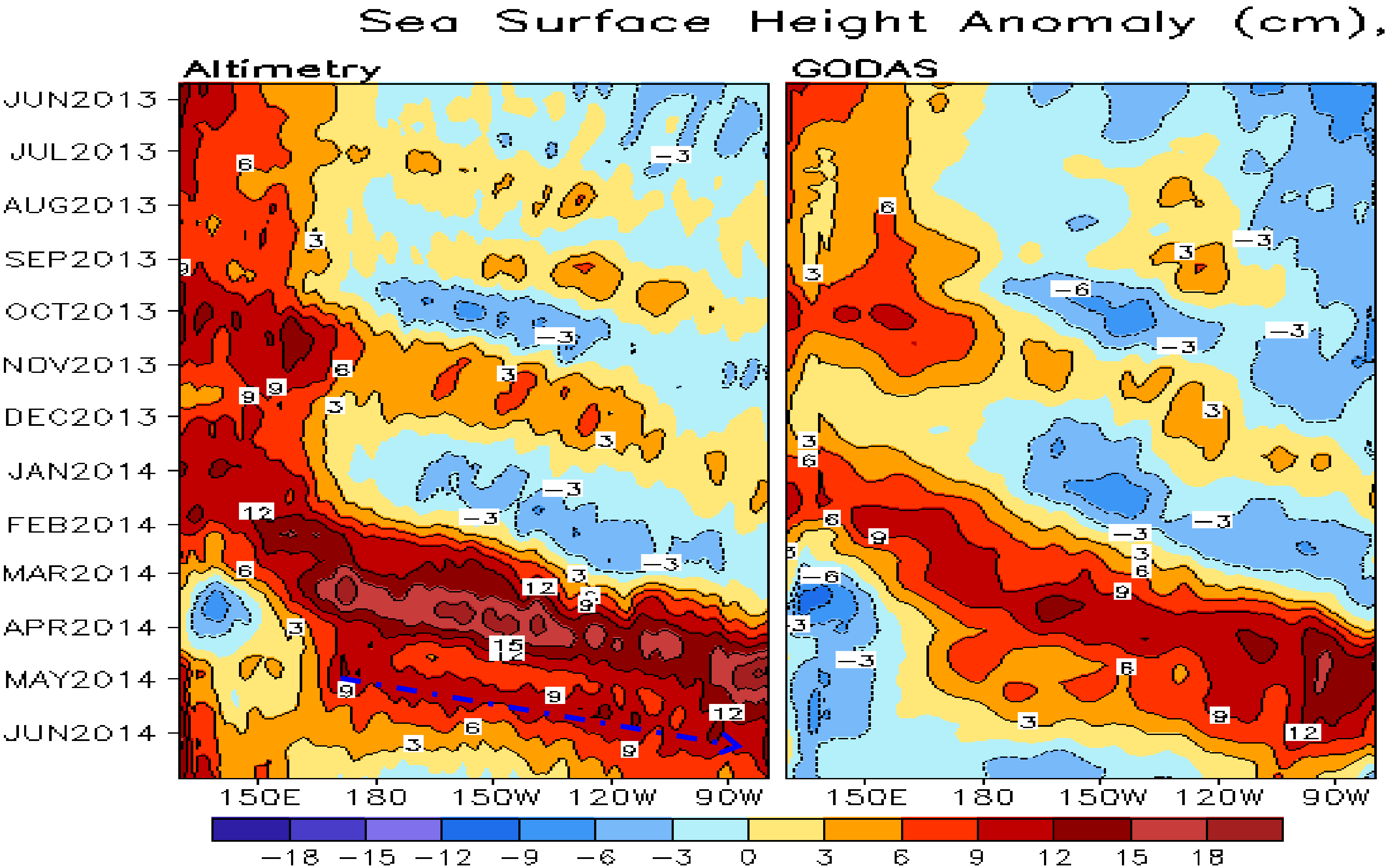


http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_mjo_index/mjo_index.shtml

- **Positive SSTA strengthened in the eastern Pacific while weakened near the date line in June.**
- **H300 anomaly was well above-average in the eastern Pacific, owing to two strong downwelling Kelvin waves triggered by strong westerly wind bursts in Jan-Mar.**
- **HC300 returned to near-normal in western and central Pacific in June.**

Fig. P4. Time-longitude section of anomalous pentad sea surface temperature (left), upper 300m temperature average (heat content, middle-left), 850-mb zonal wind (U850, middle-right) averaged in 2ºS-2ºN and Outgoing Long-wave Radiation (OLR, right) averaged in 5ºS-5ºN. SST is derived from the NCEP OI SST, heat content from the NCEP's global ocean data assimilation system, U850 from the NCEP CDAS. Anomalies for SST, heat content and U850/OLR are departures from the 1981-2010 base period pentad means respectively.

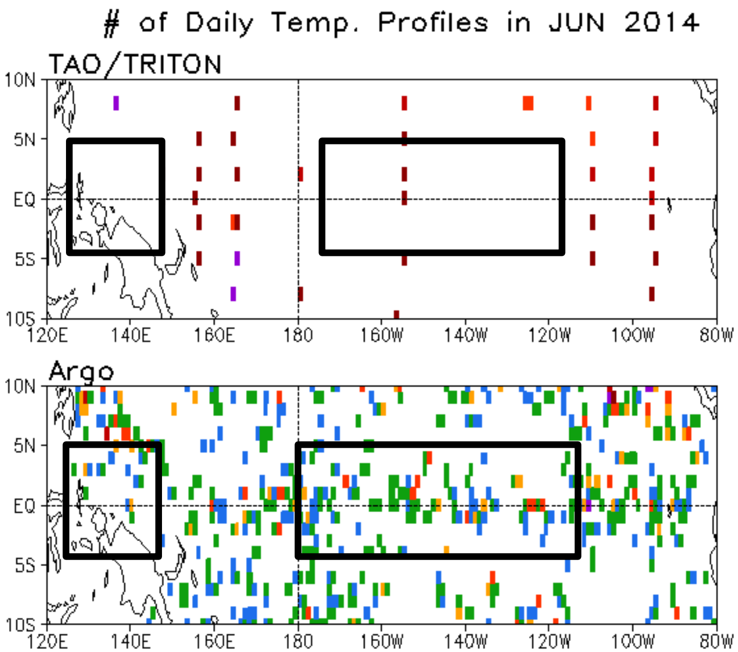
Evolution of Equatorial Pacific Sea Surface Height Anomaly



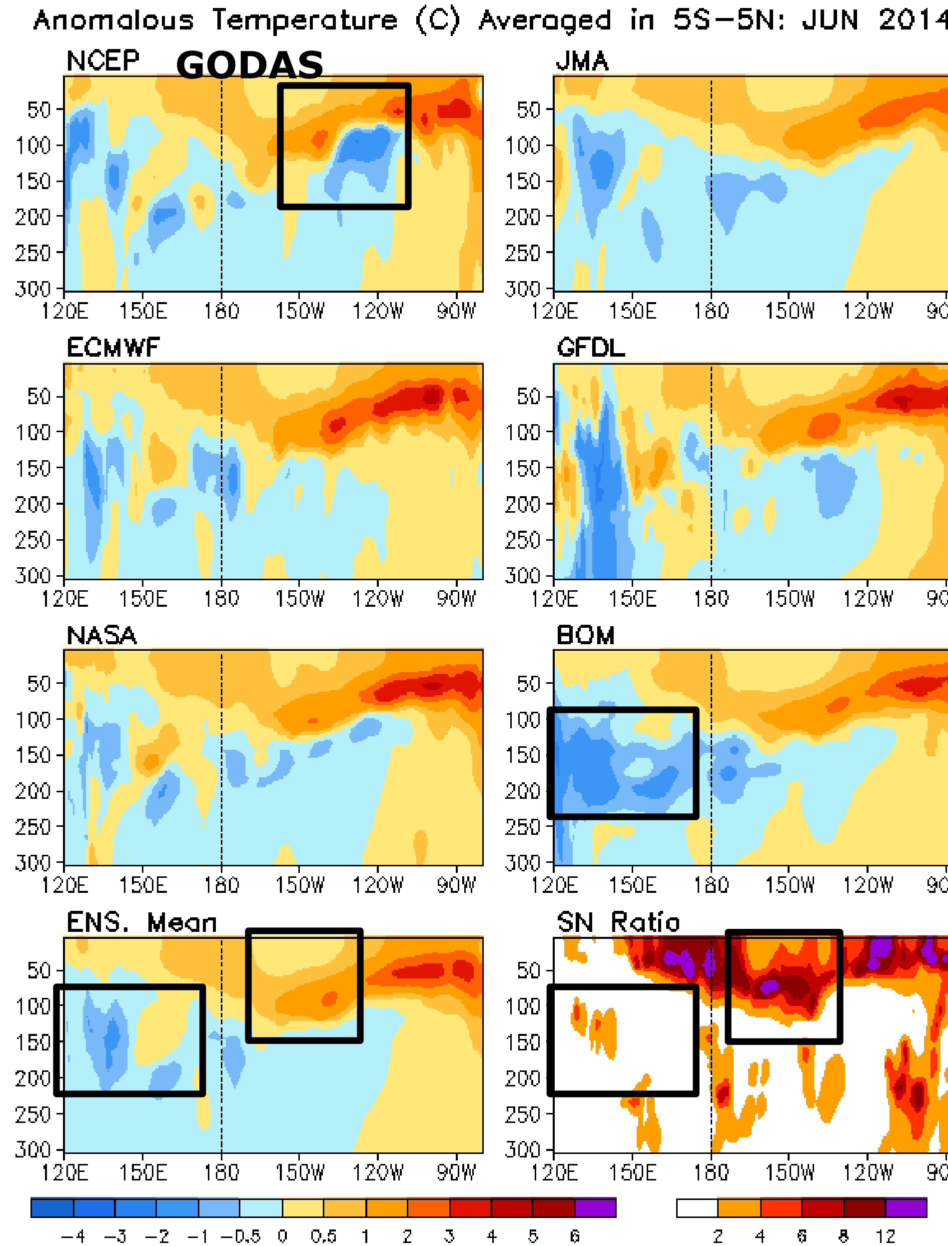
- A weak downwelling oceanic kelvin wave starting in early May was evident in altimetry, but was not well resolved by GODAS.
- Negative SSHA presented across most of the equatorial Pacific in Jun in GODAS, but SSH was mostly positive in altimetry.
- The negative bias in GODAS SSHA was partially associated with easterly wind bias near Dateline in R2 used to force GODAS(see slide 17).

Real-Time Multiple Ocean Reanalysis Intercomparison

http://www.cpc.ncep.noaa.gov/products/GODAS/multiora_body.html

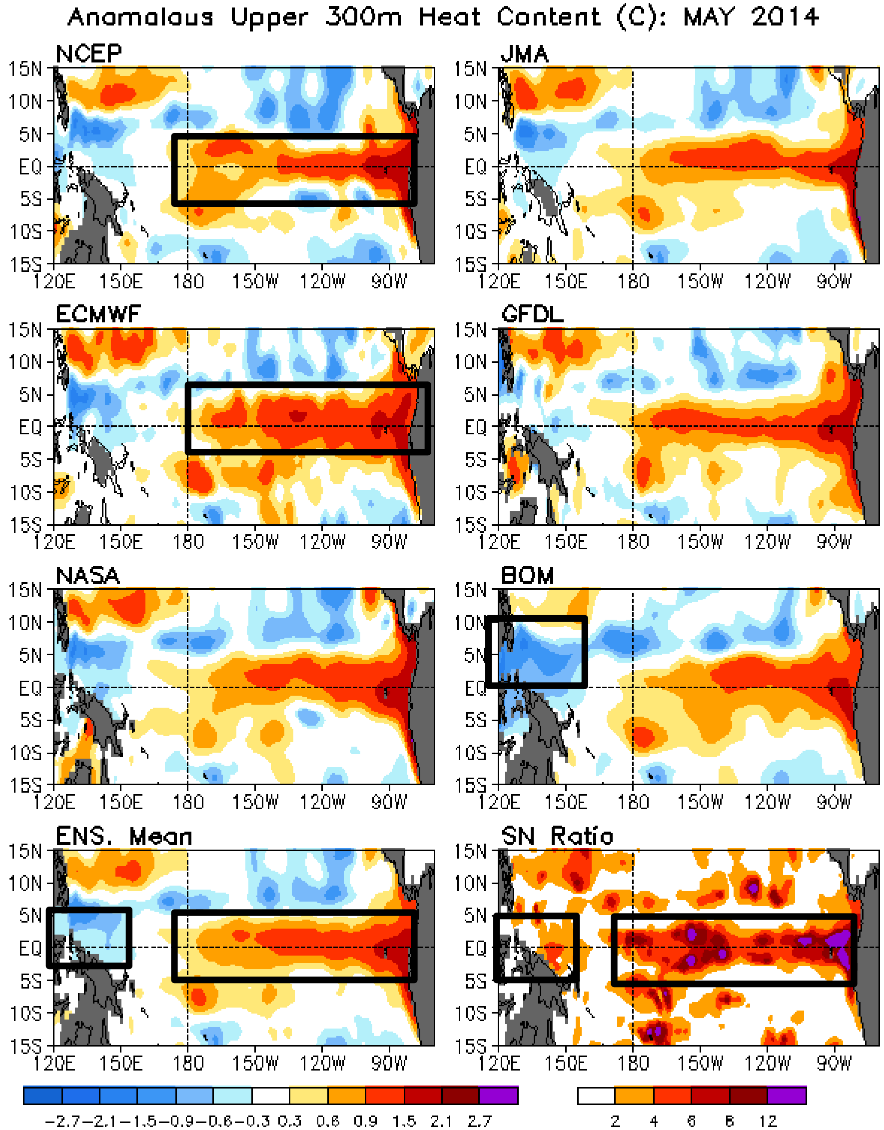


-The signal (ensemble mean) to noise (ensemble spread) ratio is relativlye small in the western Pacific where negative anomalies dominated near the thermocline and in the central-eastern Pacific where positive anomalies dominated in the top 100m. The small signal-to-noise ratio is partially related to sparse observations.

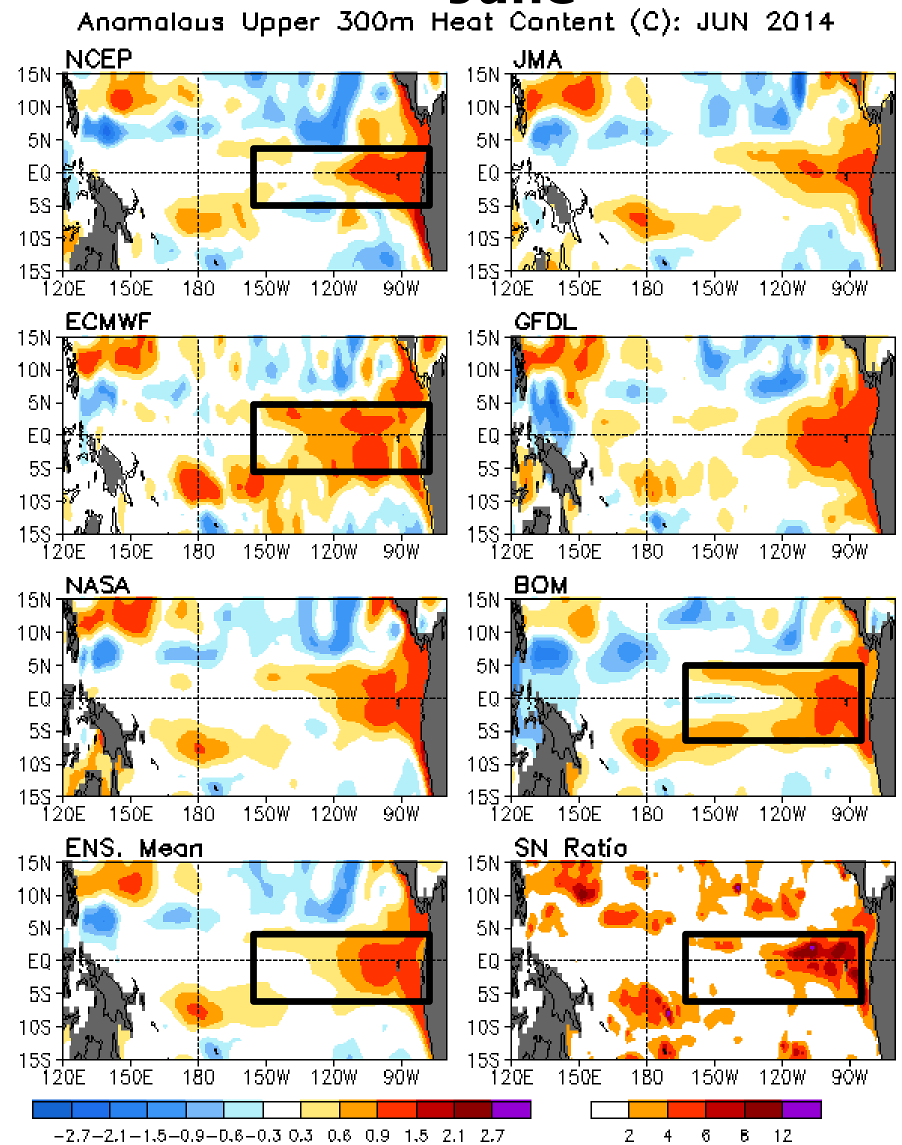


Upper 300m Heat Content Anomaly

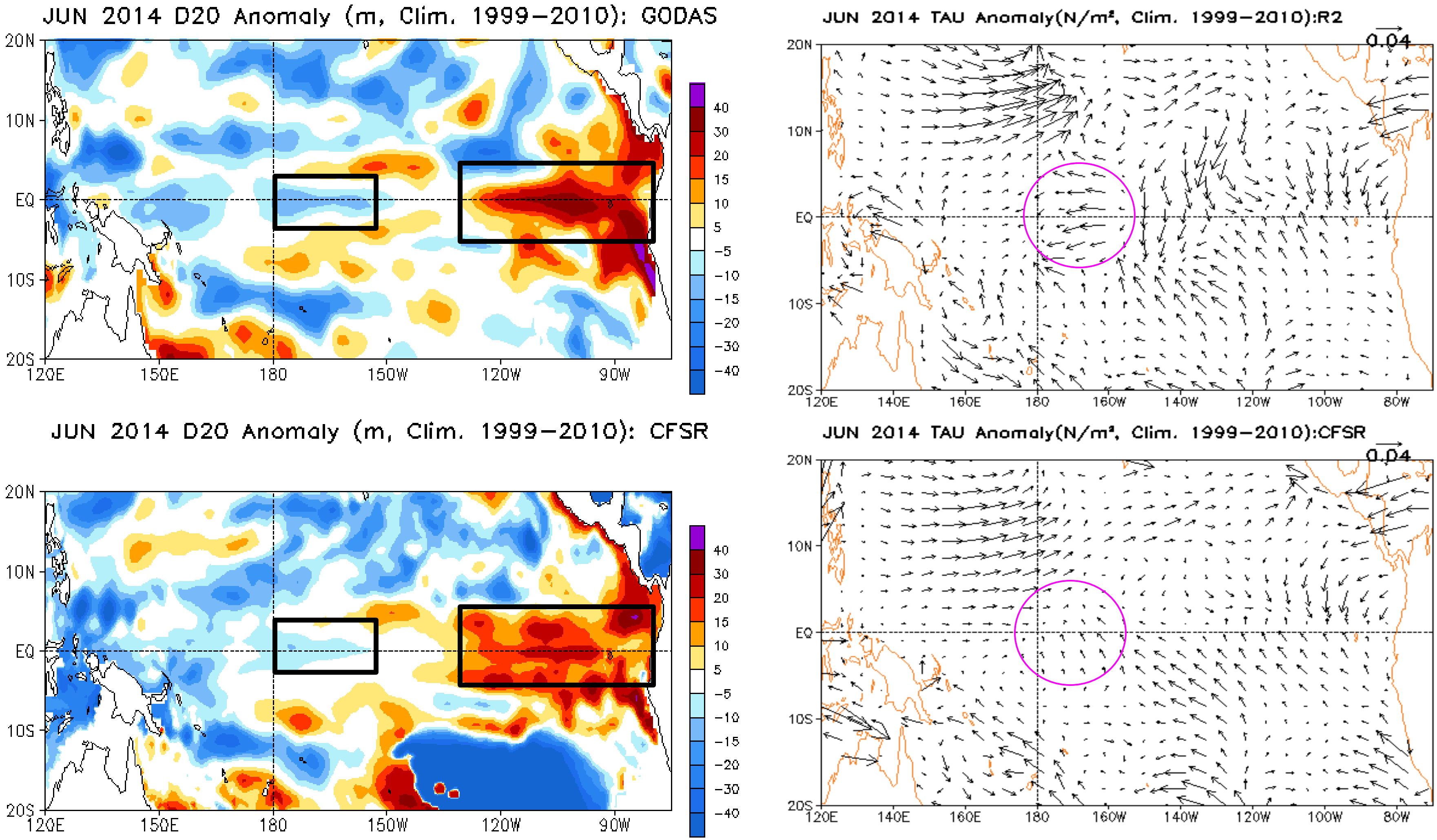
May



June



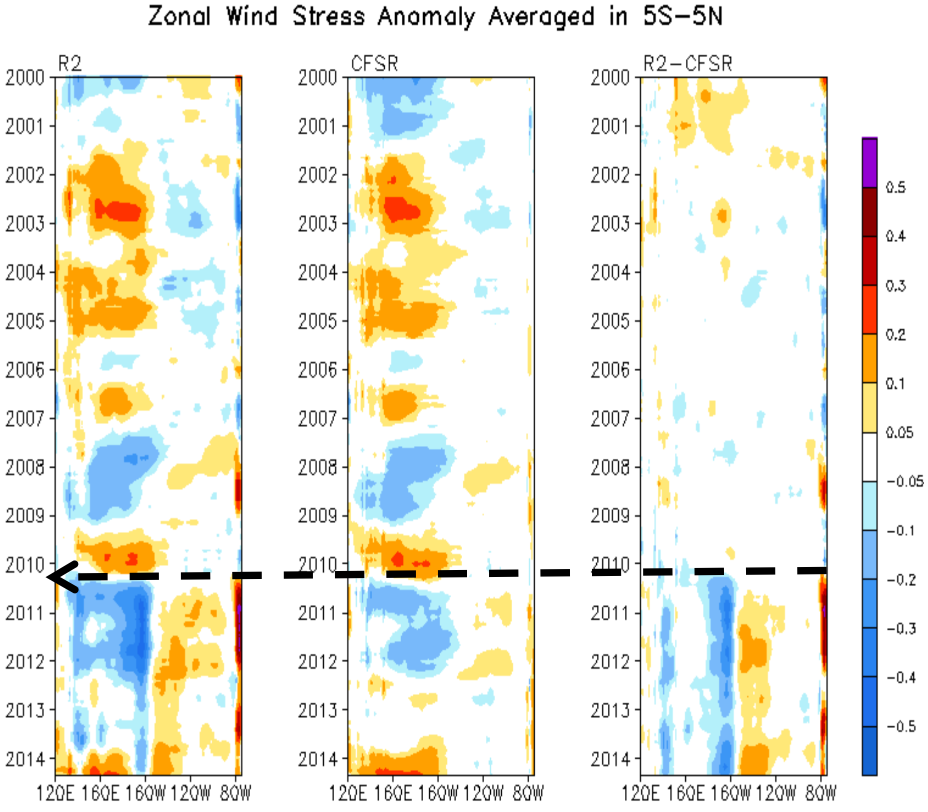
Difference between GODAS and CFSR



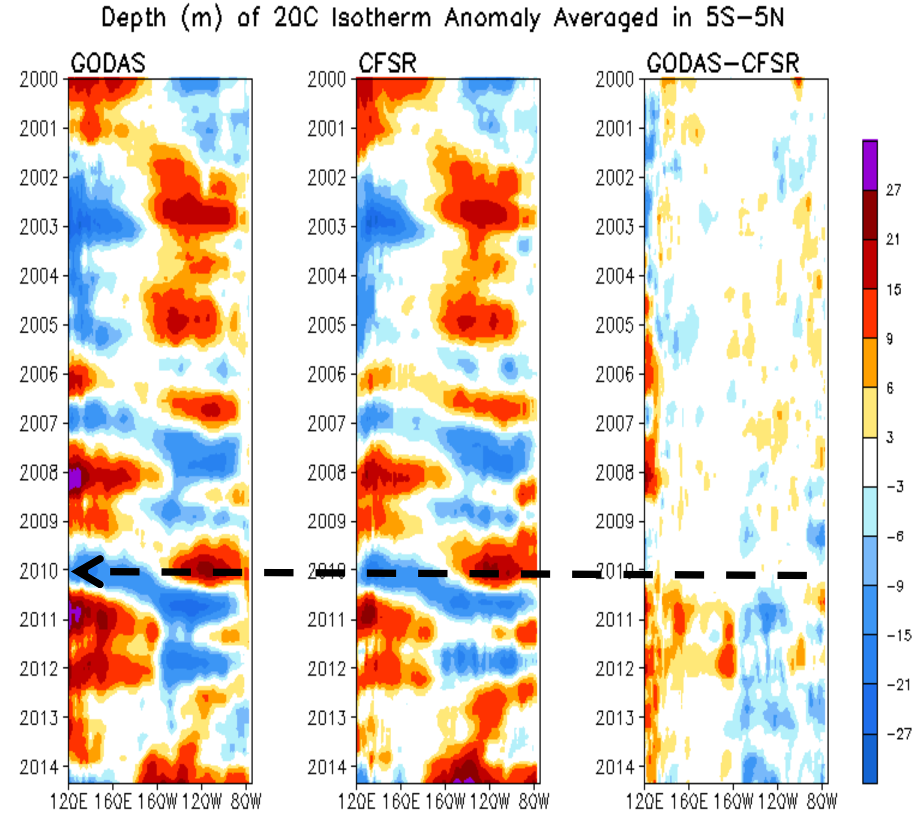
- **Positive D20 anomaly in GODAS has much narrower meridional extend than CFSR between 130W-100W, and negative D20 anomaly east of Dateline was stronger than that in CFSR.**
- **Easterly trade wind anomaly east of Dateline was stronger in R2 than that in CFSR.**

Difference between GODAS and CFSR

Zonal Wind Stress Anomaly



Depth of 20C Isotherm Anomaly

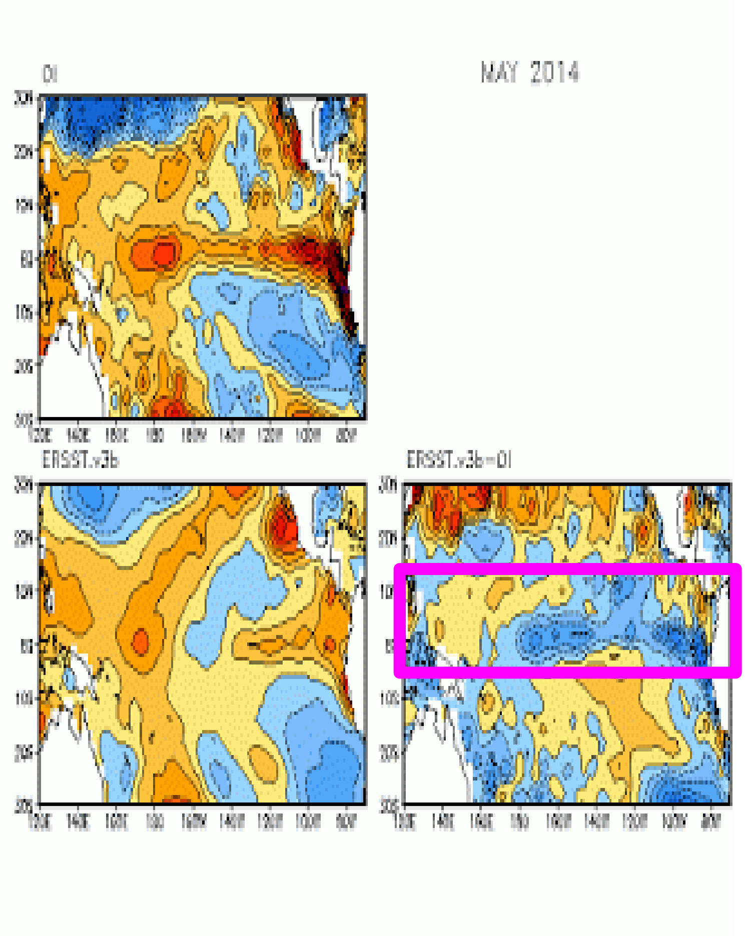


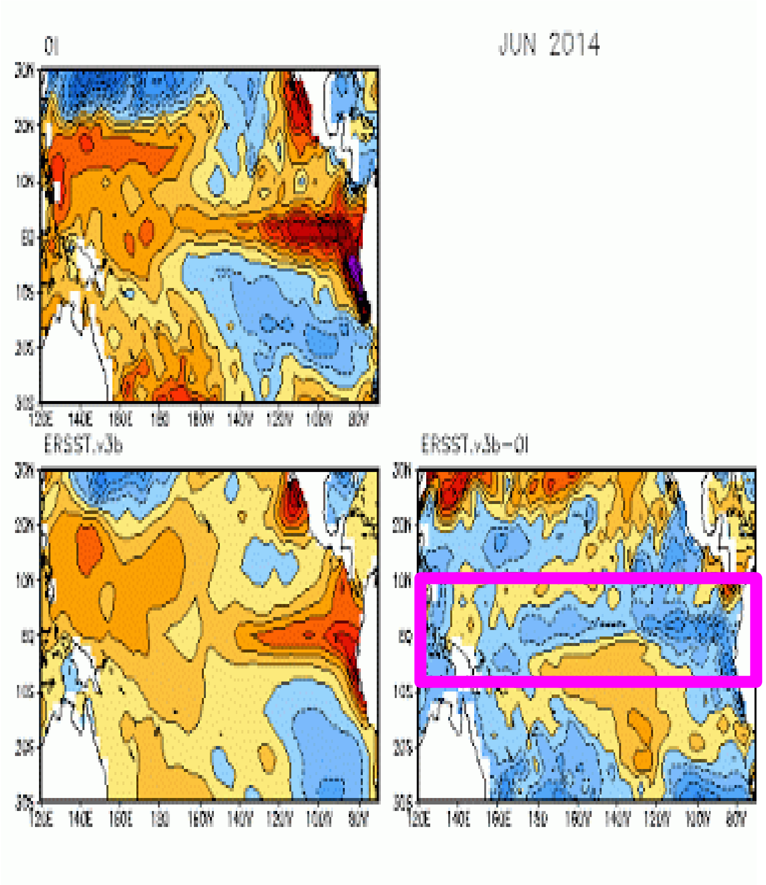
- Trade winds in R2 are much stronger than those in CFSR near 170W since 2010.
- Consistent to the stronger trade winds in R2, D20 anomaly in GODAS is about 3-6m lower than that in CFSR east of 150W since 2010.

SST Differences between OIv2 and ERSSTv3b (From: Michelle L'Heureux)

OIv2 is warmer than ERSSTv3b in the equatorial Pacific in the past months, especially in the far eastern Pacific .

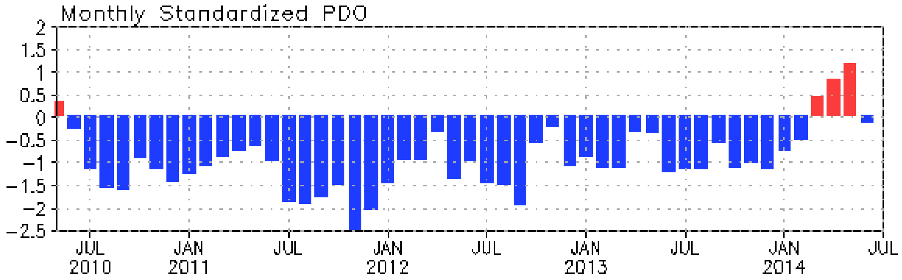
(Details see: Huang, et al., 2013: Why did large differences arise in the sea surface temperature datasets across the tropical Pacific during 2012? J. Atmos. Ocean. Tech., 30 (12), 2944-2953.)

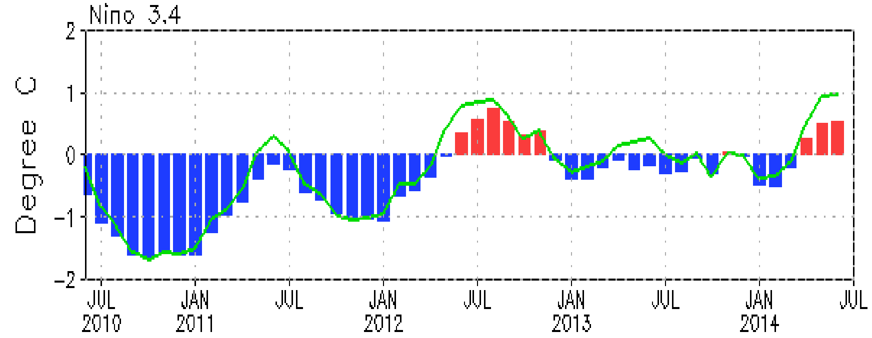


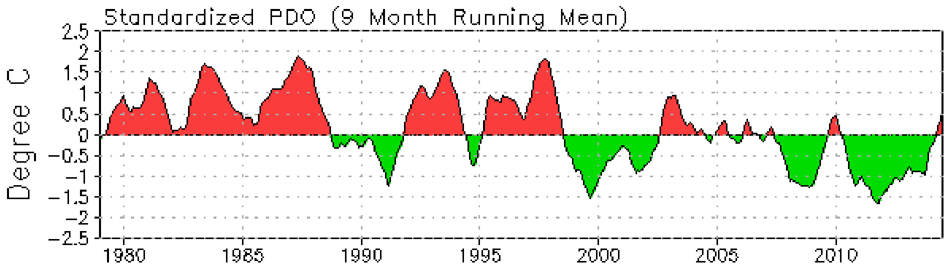


North Pacific & Arctic Oceans

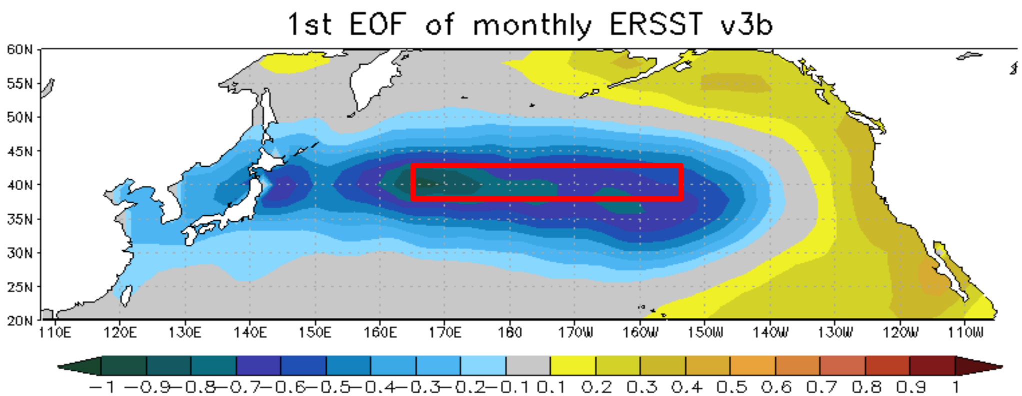
PDO index





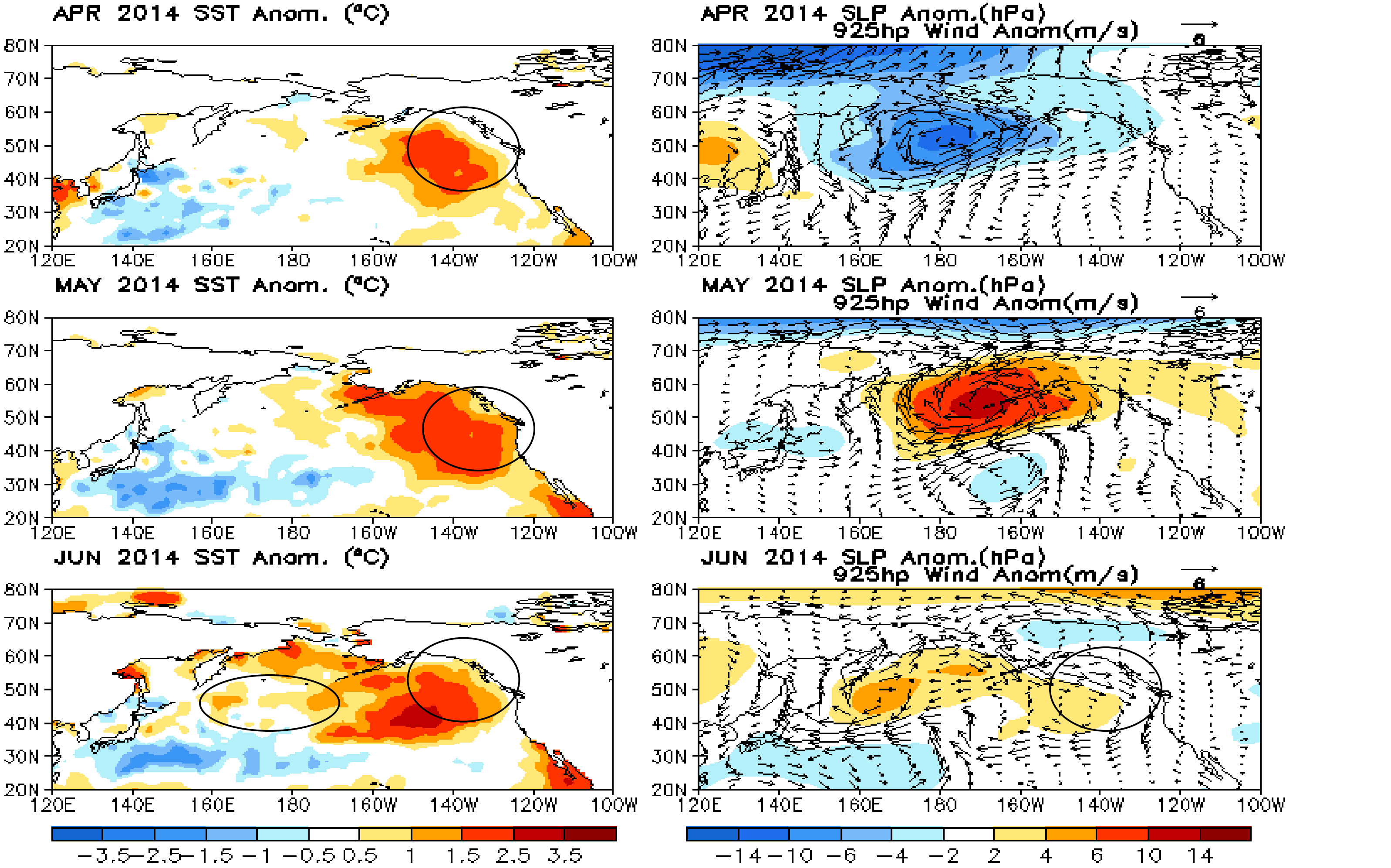


- **PDO switched to positive phase in Mar-May 2014, but returned to negative phase in Jun with PDO index =-0.13.**



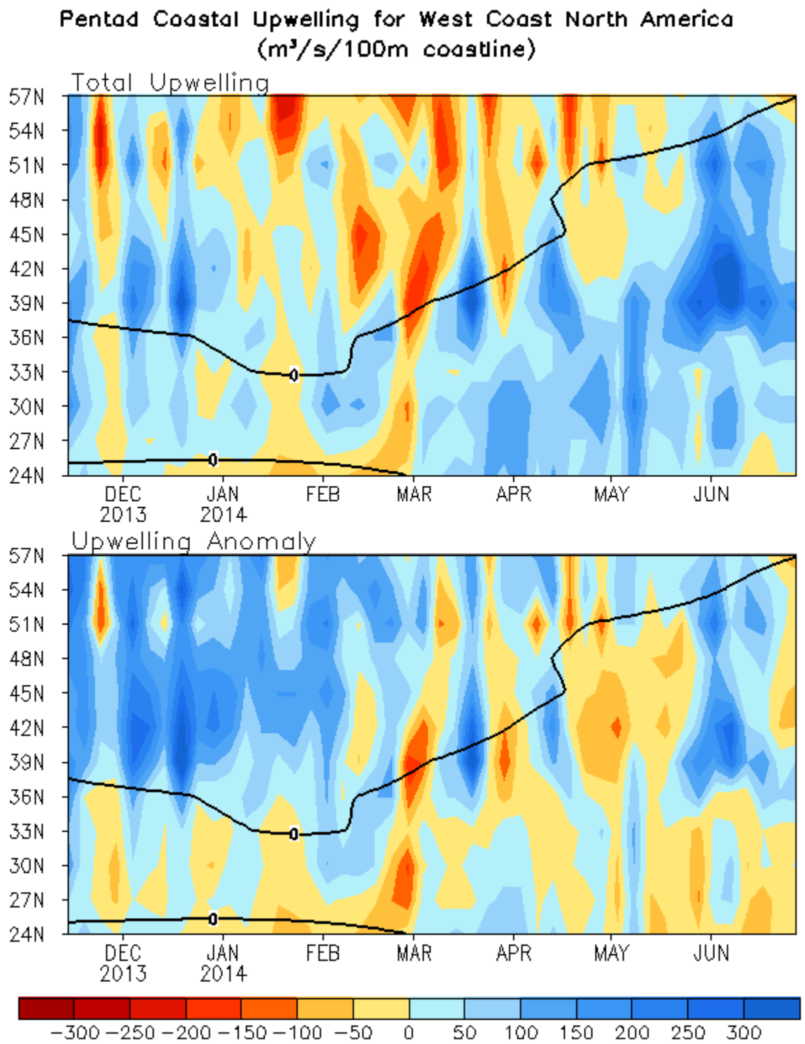
- **Pacific Decadal Oscillation is defined as the 1st EOF of monthly ERSST v3b in the North Pacific for the period 1900-1993. PDO index is the standardized projection of the monthly SST anomalies onto the 1st EOF pattern.**
- **The PDO index differs slightly from that of JISAO, which uses a blend of UKMET and OIv1 and OIv2 SST.**

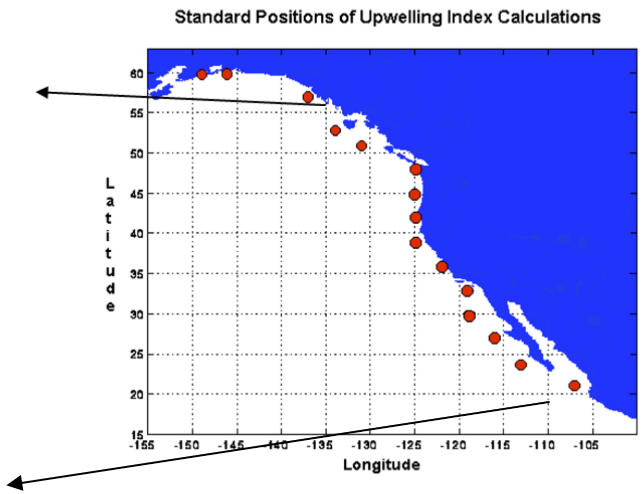
Last Three Month SST, OLR and 925hp Wind Anom.



- **Positive SSTA near the west coast of N. America weakened.**
- **North-westerly wind anomaly prevailed along the west coast of N. American north 40N, favorable for upwelling.**

North America Western Coastal Upwelling





- Upwelling in 36-51N enhanced in June, consistent with north-westerly wind anomaly.

Fig. NP2. Total (top) and anomalous (bottom) upwelling indices at the 15 standard locations for the western coast of North America. Upwelling indices are derived from the vertical velocity of the NCEP's global ocean data assimilation system, and are calculated as integrated vertical volume transport at 50 meter depth from each location to its nearest coast point ($m^3/s/100m$ coastline). Anomalies are departures from the 1981-2010 base period pentad means.

- Area below (above) black line indicates climatological upwelling (downwelling) season.

- Climatologically upwelling season progresses from March to July along the west coast of North America from 36ºN to 57ºN.

Indian Ocean

Tropical Indian: SST Anom., SST Anom. Tend., OLR, Sfc Rad, Sfc Flx, 925-mb & 200-mb Wind Anom.

- **Positive SSTA dominated across the whole Indian Ocean.**
- **During the last four weeks, changes in SSTA were mostly negative in India Ocean**
- **Convection was suppressed over Indian.**

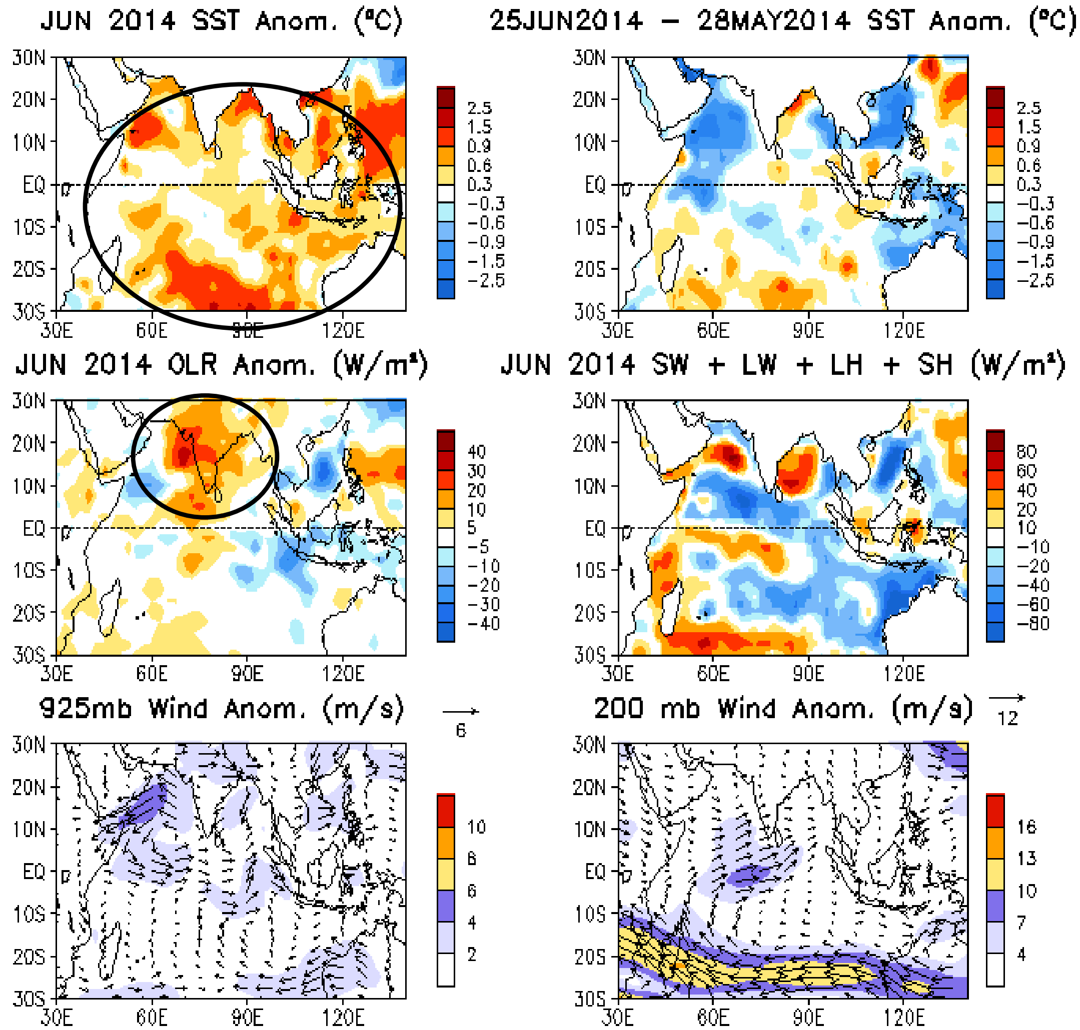
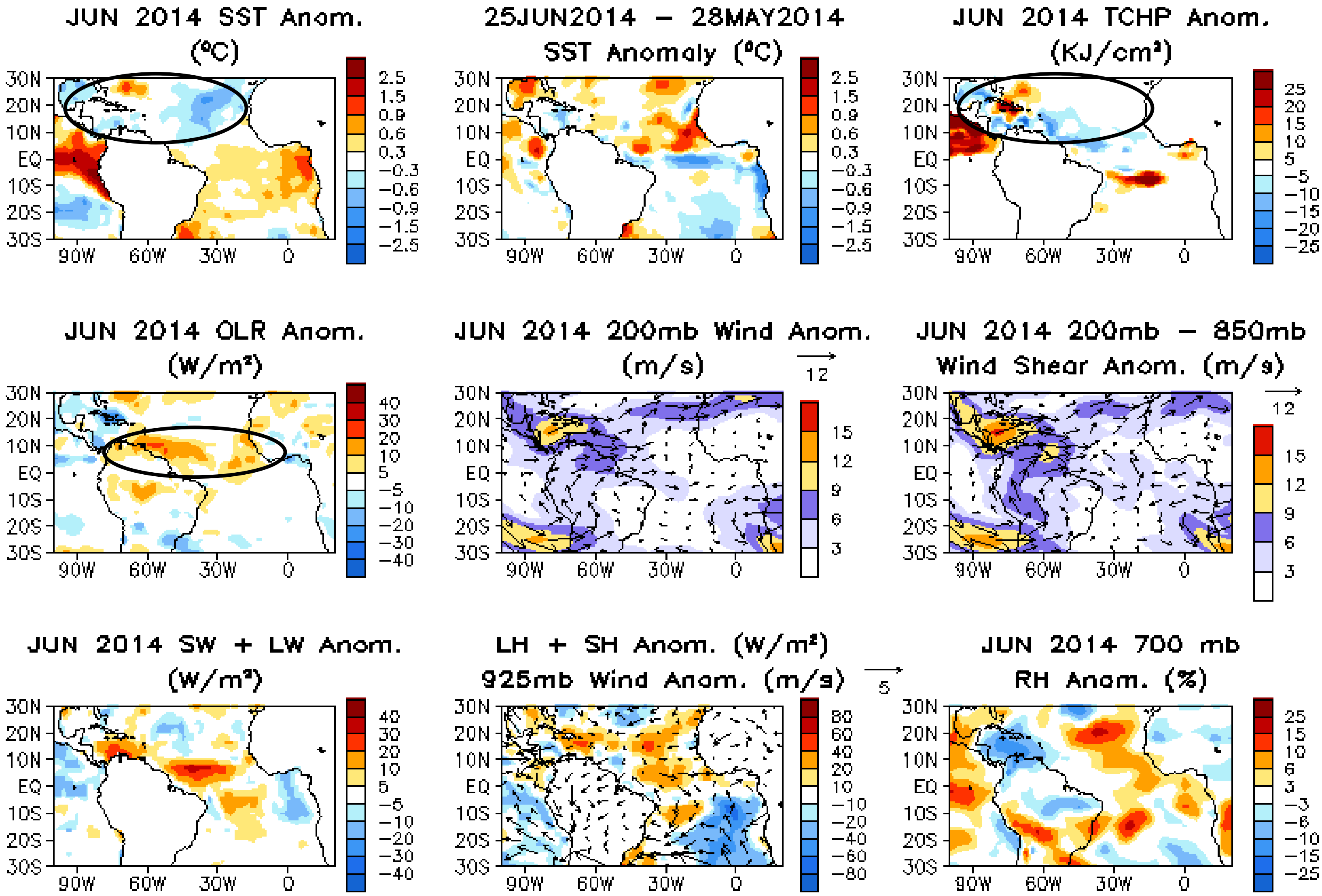


Fig. I2. Sea surface temperature (SST) anomalies (top-left), anomaly tendency (top-right), Outgoing Long-wave Radiation (OLR) anomalies (middle-left), sum of net surface short- and long-wave radiation, latent and sensible heat flux anomalies (middle-right), 925-mb wind anomaly vector and its amplitude (bottom-left), 200-mb wind anomaly vector and its amplitude (bottom-right). SST are derived from the NCEP OI SST analysis, OLR from the NOAA 18 AVHRR IR window channel measurements by NESDIS, winds and surface radiation and heat fluxes from the NCEP CDAS. Anomalies are departures from the 1981-2010 base period means.

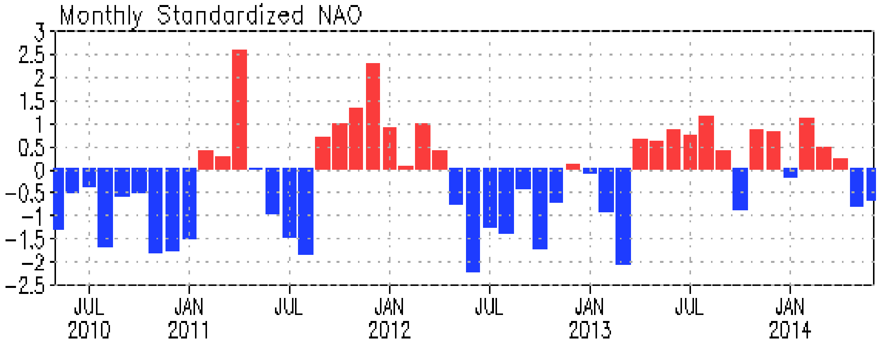
Tropical and North Atlantic Ocean

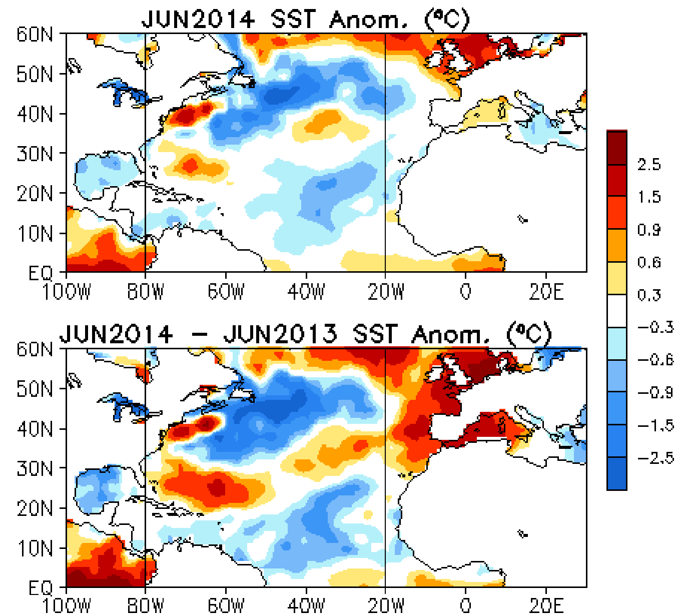
Tropical Atlantic:

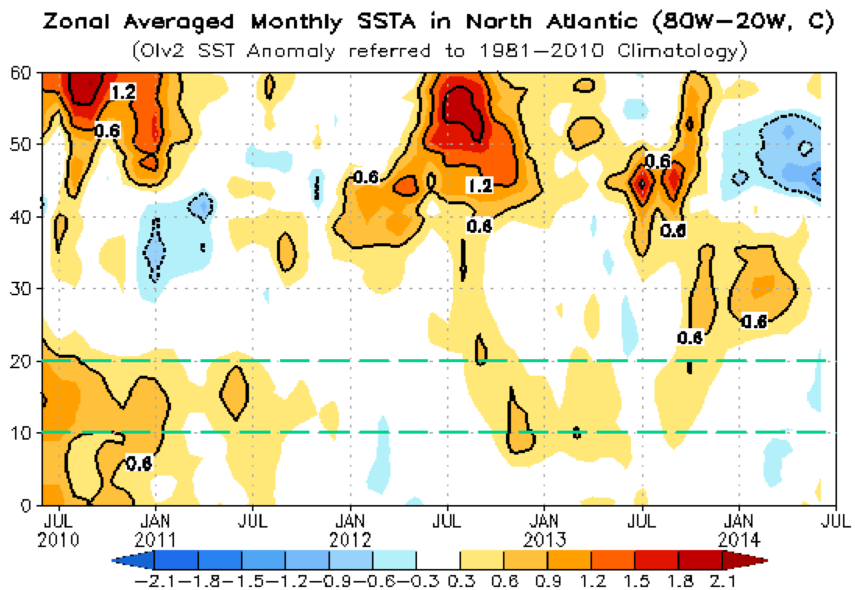


- Below-normal SSTA dominated the North tropical Atlantic.
- Convection was suppressed in the hurricane main development region.

NAO and SST Anomaly in North Atlantic





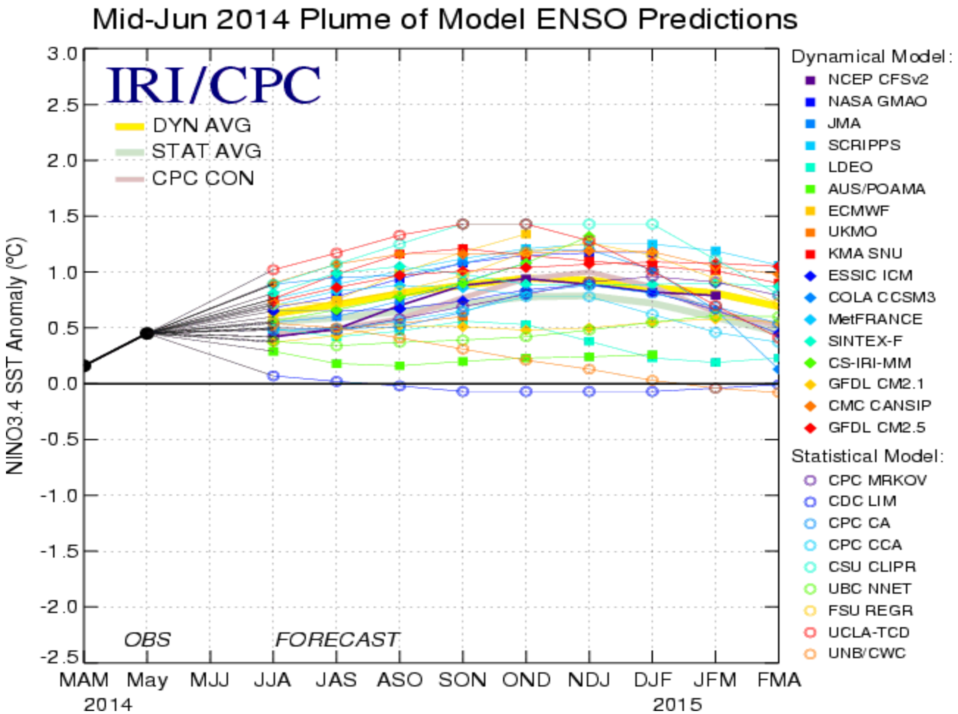


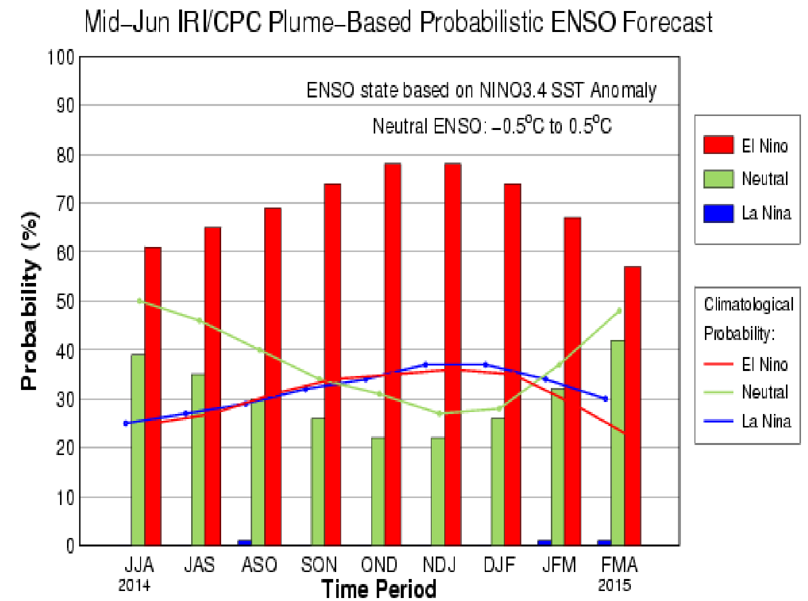
- **Negative NAO Index persisted in June 2014.**
- **North Atlantic tripole-like SSTAs were observed.**

Fig. NA2. Monthly standardized NAO index (top) derived from monthly standardized 500-mb height anomalies obtained from the NCEP CDAS in 20ºN-90ºN (http://www.cpc.ncep.noaa.gov). Time-Latitude section of SST anomalies averaged between 80ºW and 20ºW (bottom). SST are derived from the NCEP OI SST analysis, and anomalies are departures from the 1981-2010 base period means.

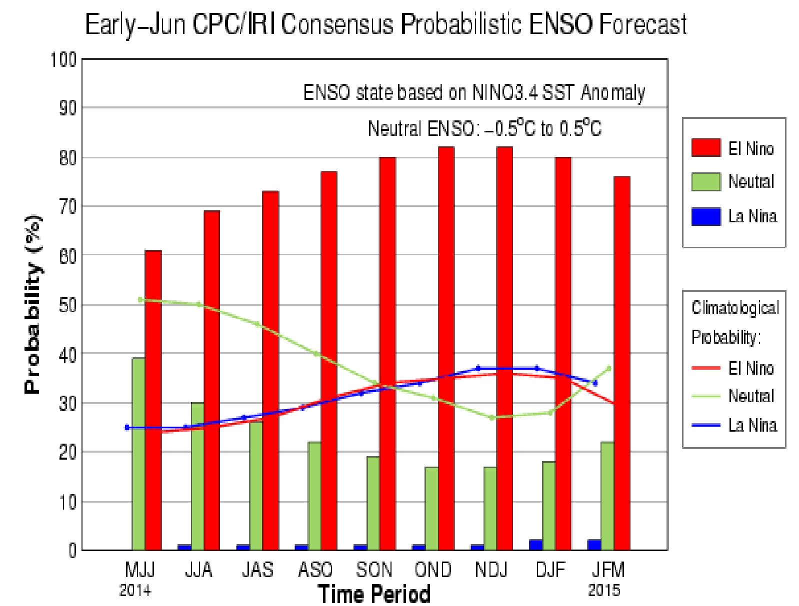
ENSO and Global SST Predictions

IRI/CPC NINO3.4 Forecast Plum

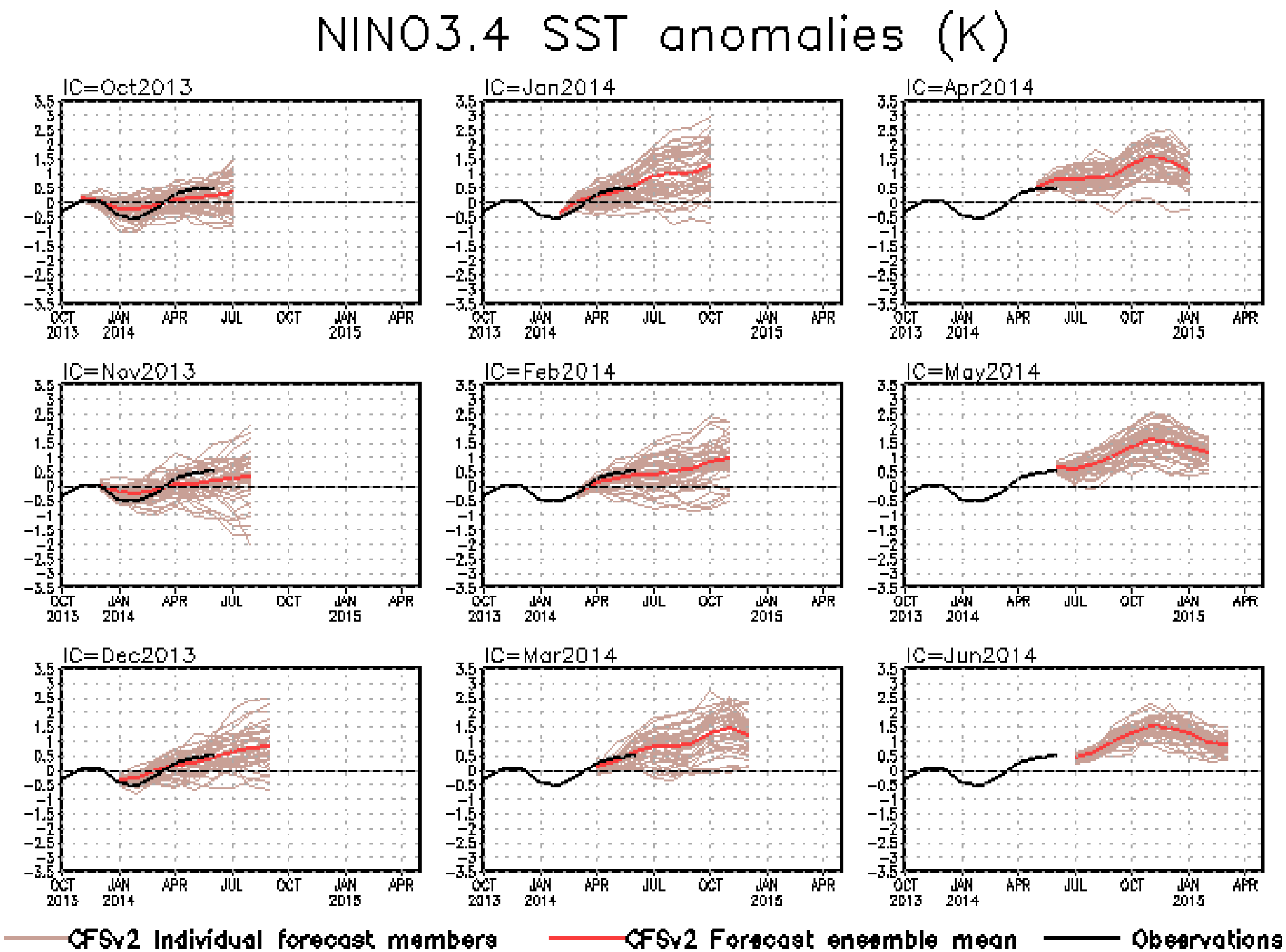




- **Most of models predicted that an El Niño will develop in the next several months and persist through Northern hemisphere winter 2014-15.**
- **The consensus forecast suggested that chance of El Niño is about 60% in JJA and rises to 80% by Oct-Dec.**



CFSv2 Niño3.4 SST Predictions from Different Initial Months



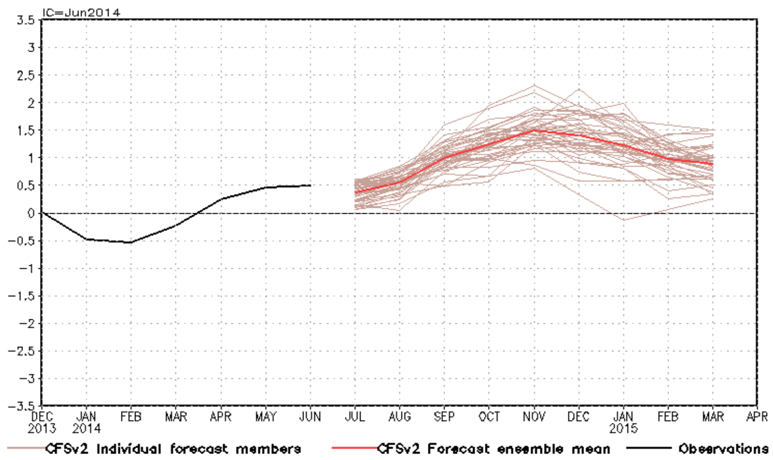
- Latest CFSv2 prediction suggested an El Niño will start in Aug and last through early 2015.

- CFSv2 made good predictions of the onset of warming in the past several months.

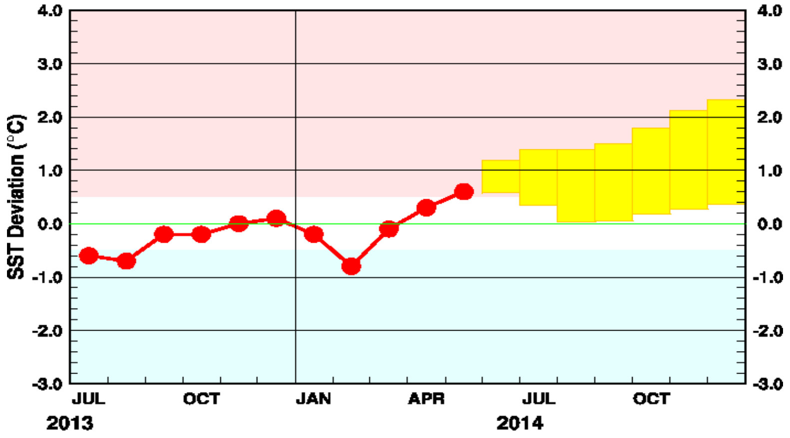
Fig. M1. CFS Nino3.4 SST prediction from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labelled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). Anomalies were computed with respect to the 1981-2010 base period means.

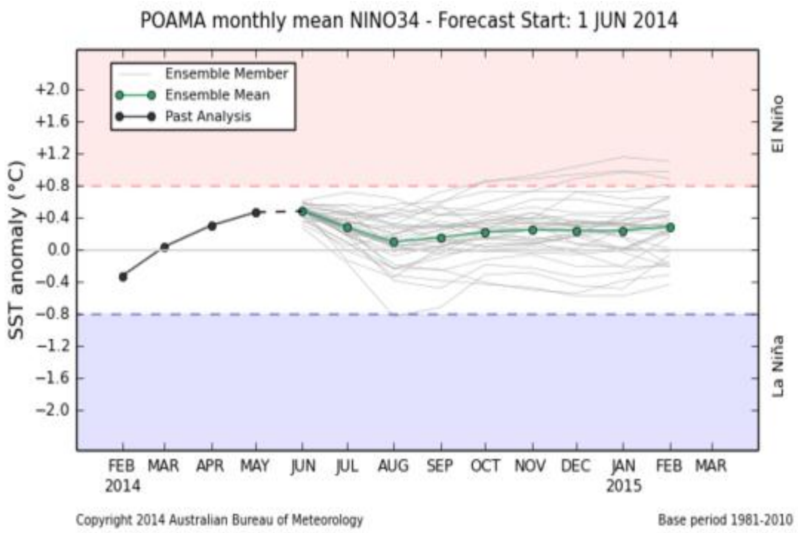
Individual Model Forecasts: Predict an El Nino/neutral in 2014

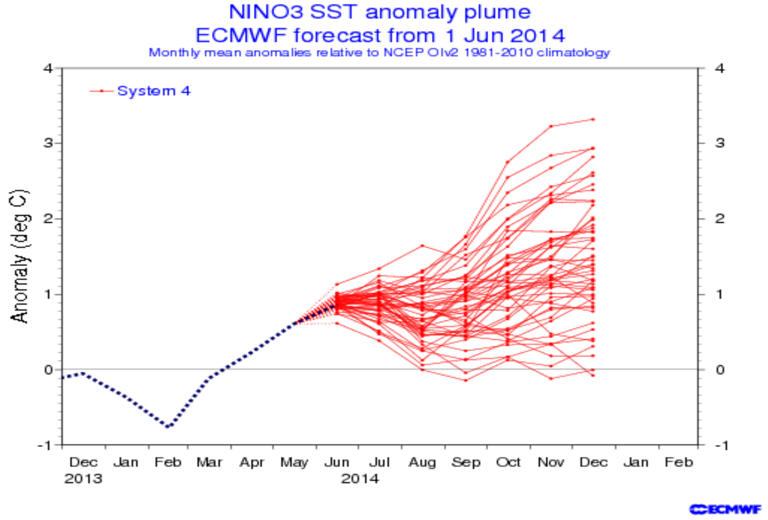
NCEP: NINO34 IC=June 2014



JMA: Nino3, IC=June2014

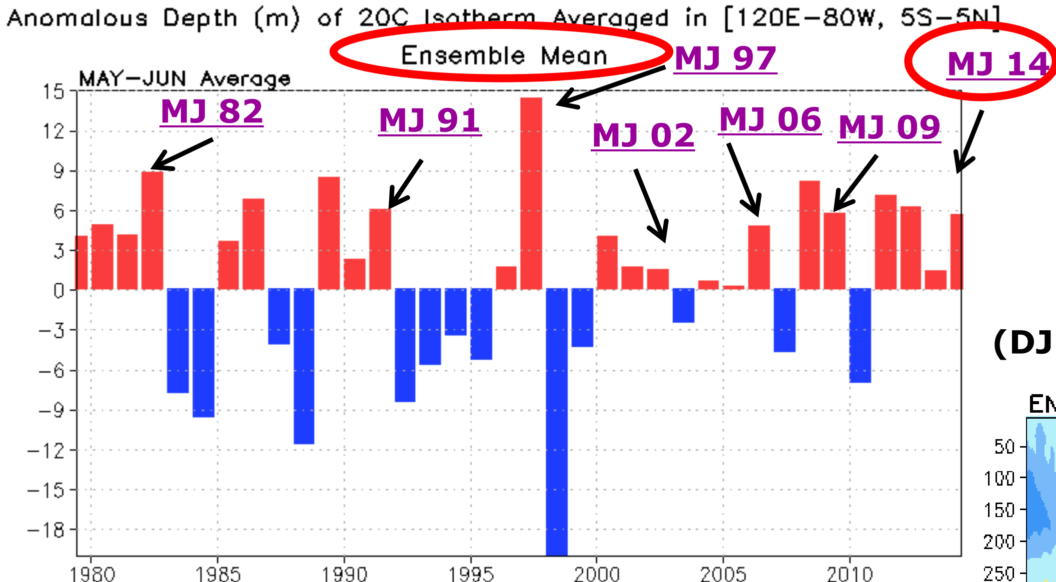




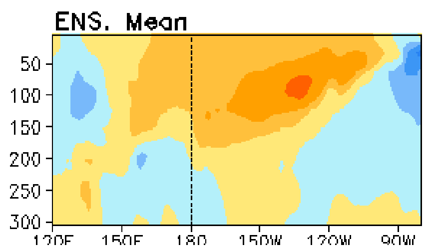


- Differences in model forecasts might be partially related with differences in ocean initializations provided by ocean reanalyses.

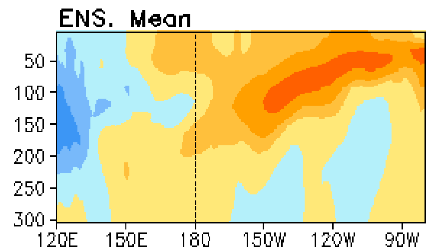
Warm Water Volume Index Derived From Ensemble Mean of Ocean Reanalyses



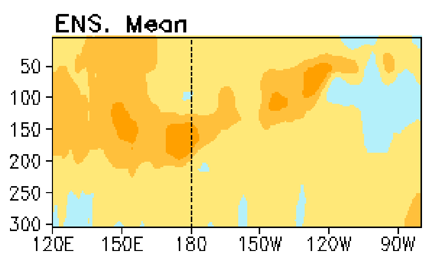
Jun 2002 (DJF NINO3.4=+1.1)



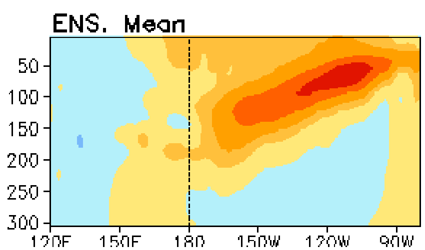
Jun 1991 (DJF NINO3.4=+1.6)



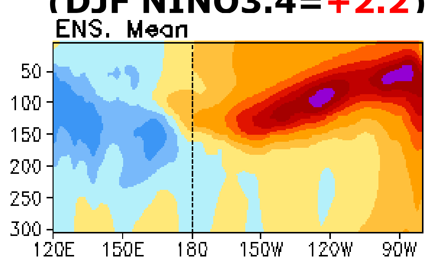
Jun 2006 (DJF NINO3.4=+0.7)



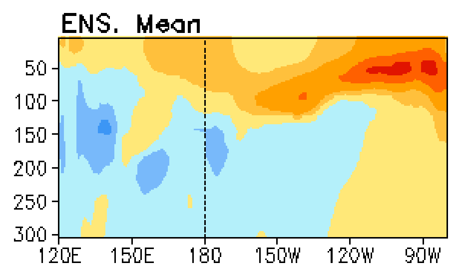
Jun 1982 (DJF NINO3.4=+2.2)



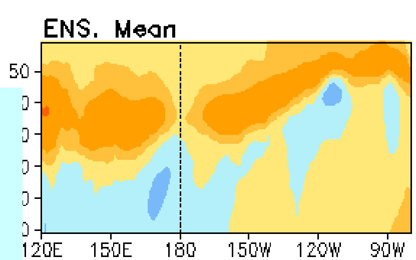
Jun 1997 (DJF NINO3.4=+2.2)



Jun 2014

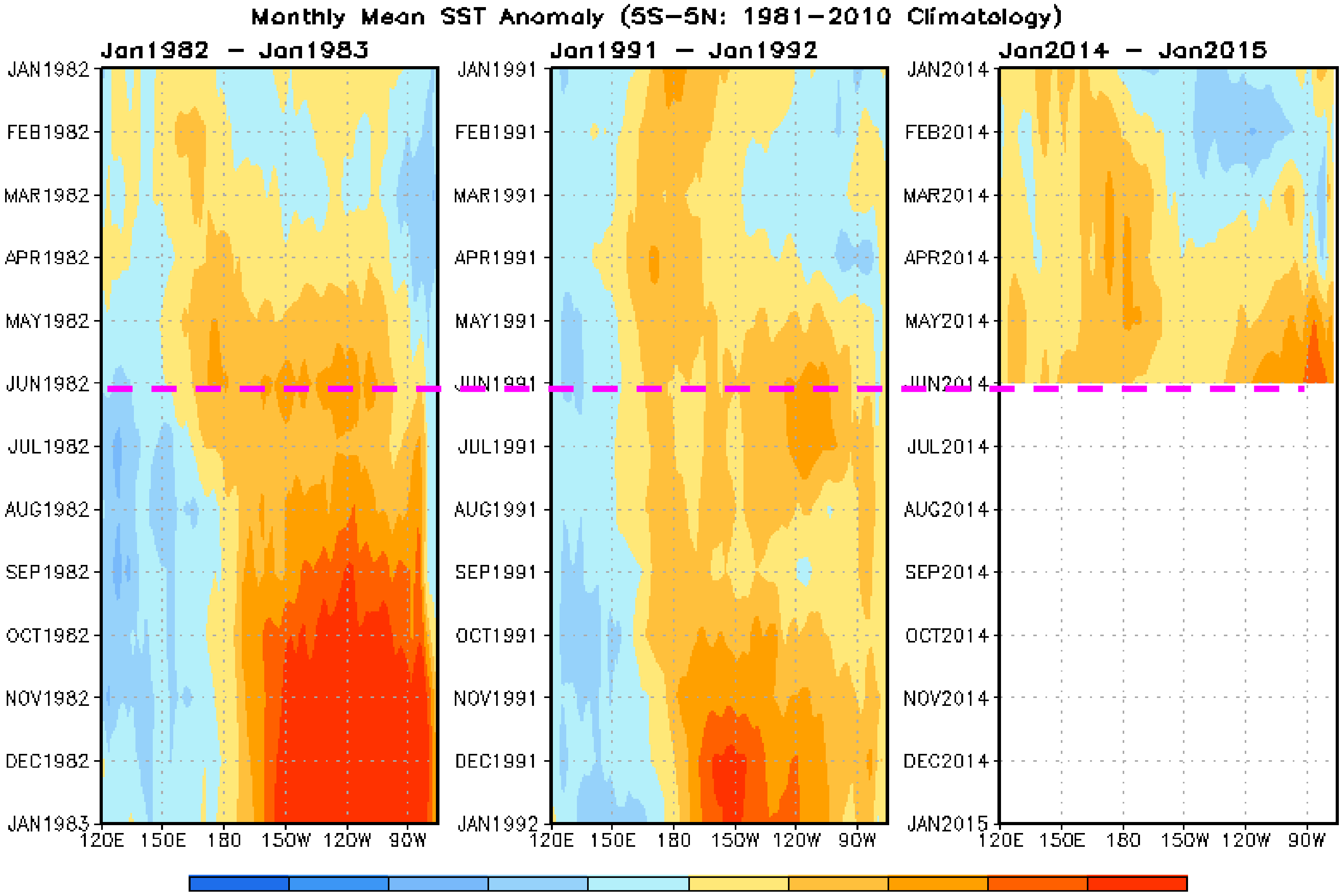


Jun 2009 (DJF NINO3.4=+1.6)

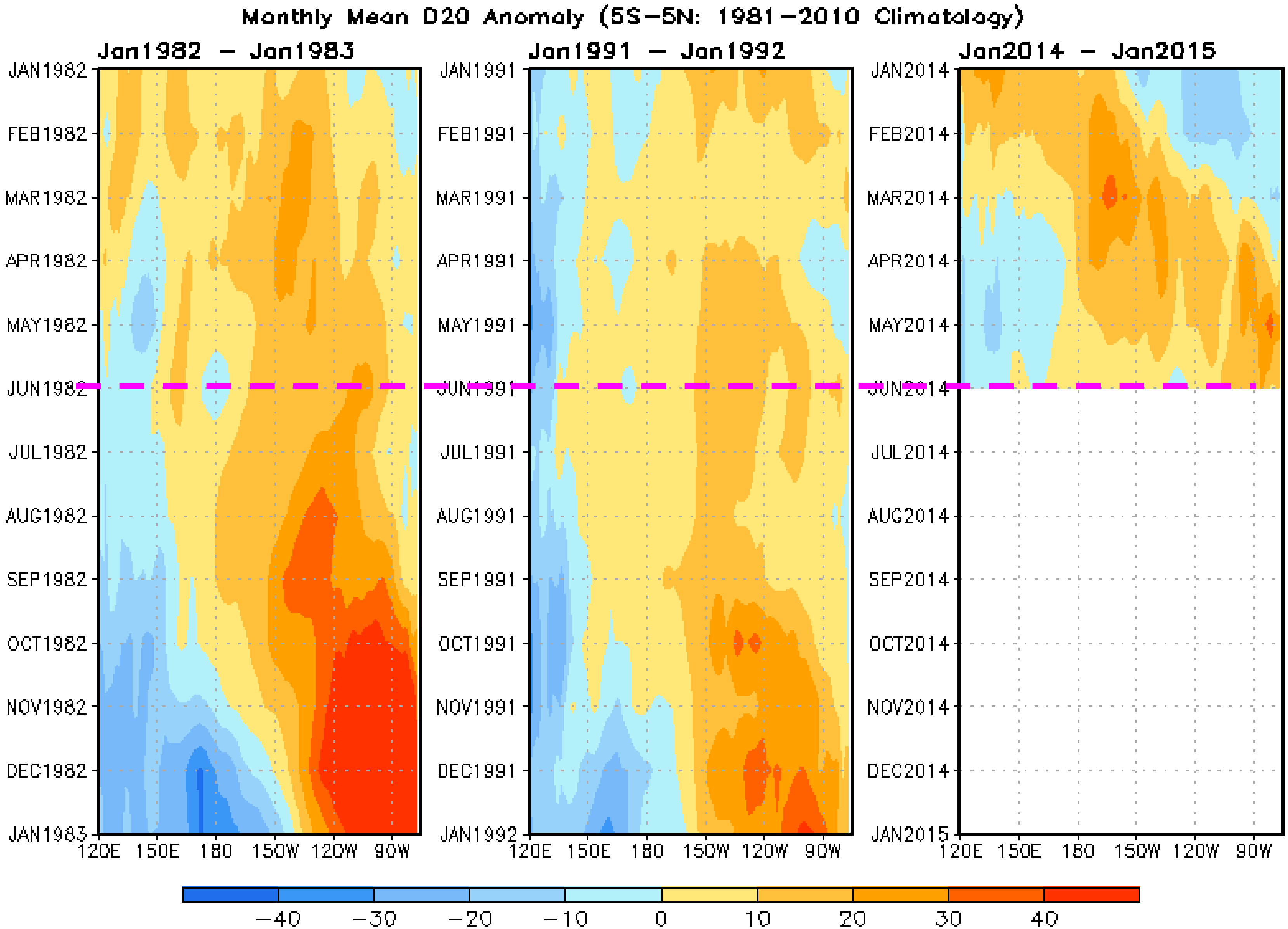


- Warm Water Volume averaged in May-June 2014 is similar to that in May-June of 2009, 2006 and 1991. However, the pattern of subsurface temperature anomaly averaged in 5S-5N in Jun 2014 is mostly similar to Jun 1991.

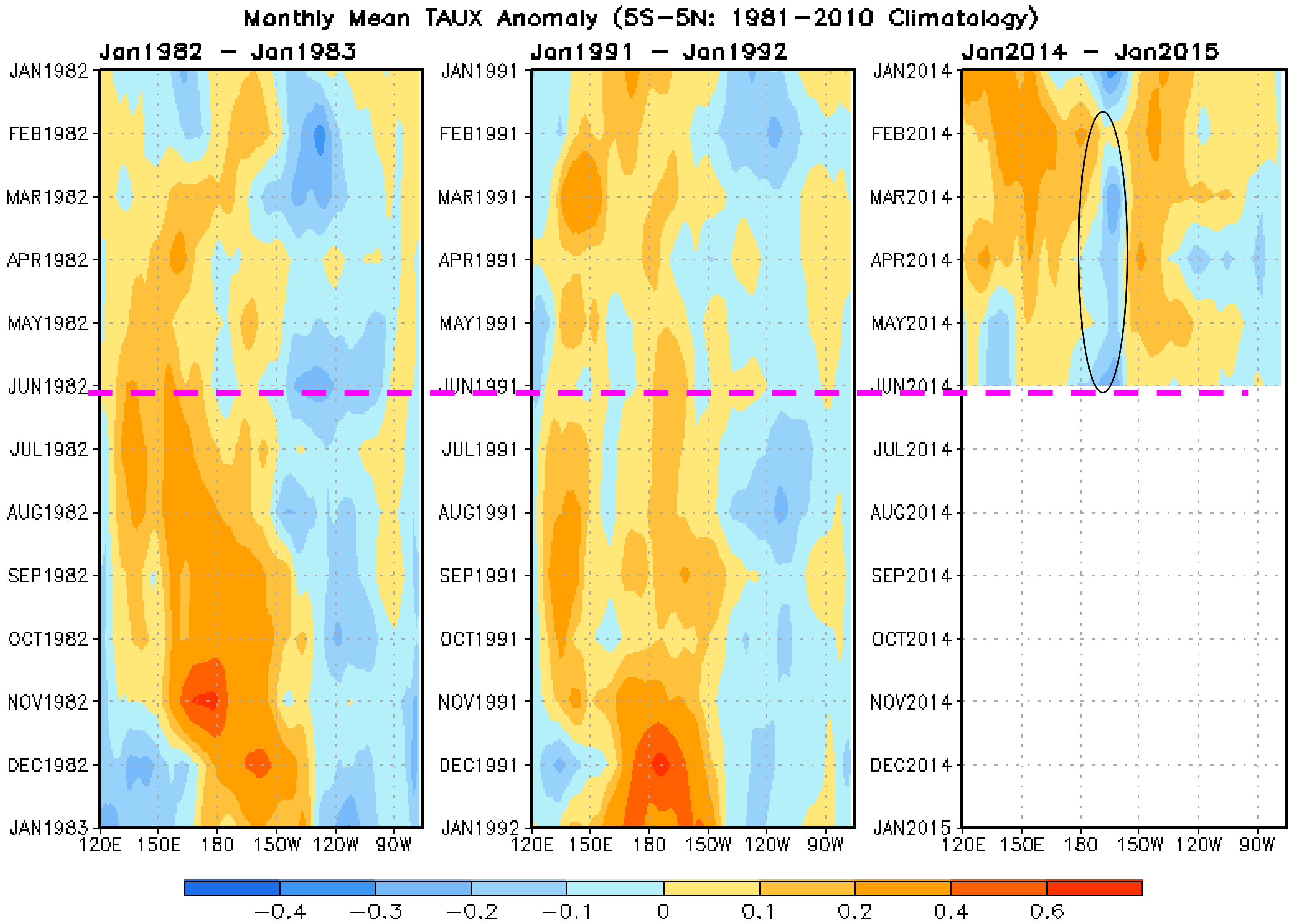
SSTA evolution in 1982-83, 1991-92, 2014



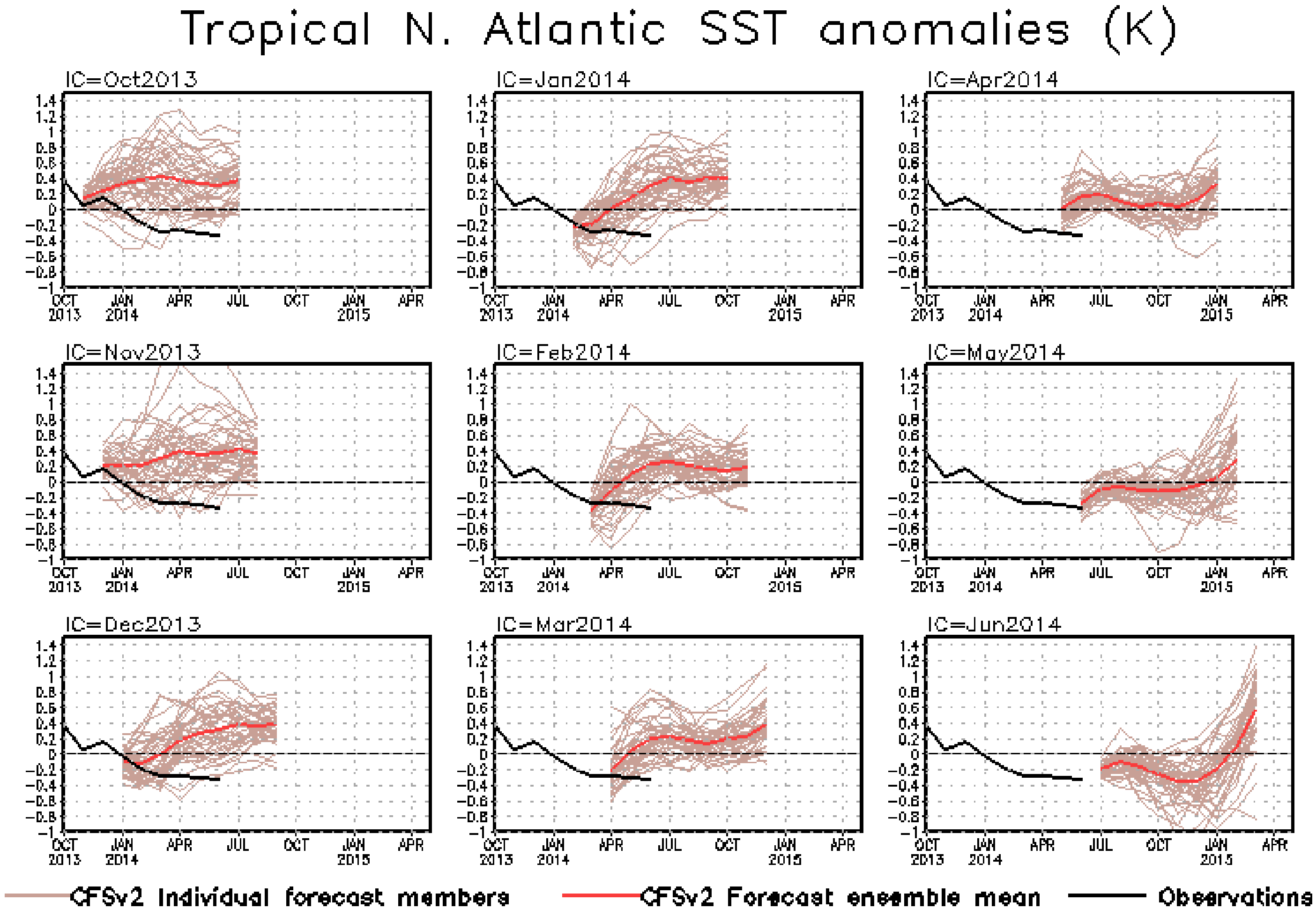
D20 evolution in 1982-83, 1991-92, 2014



TAUA evolution in 1982-83, 1991-92, 2014



CFSv2 Tropical North Atlantic (TNA) SST Predictions from Different Initial Months



- Forecast from June 2014 IC calls for below-normal SST in the tropical North Atlantic in the coming north Hemisphere summer-fall.

TNA is the SST anomaly averaged in the region of [60°W-30°W, 5°N-20°N].

Fig. M3. CFS Tropical North Atlantic (TNA) SST predictions from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labelled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). Anomalies were computed with respect to the 1981-2010 base period means.

Backup Slides

Tropical Pacific: SST Anom., SST Anom. Tend., OLR, Sfc Rad, Sfc Flx, 925-mb & 200-mb Winds

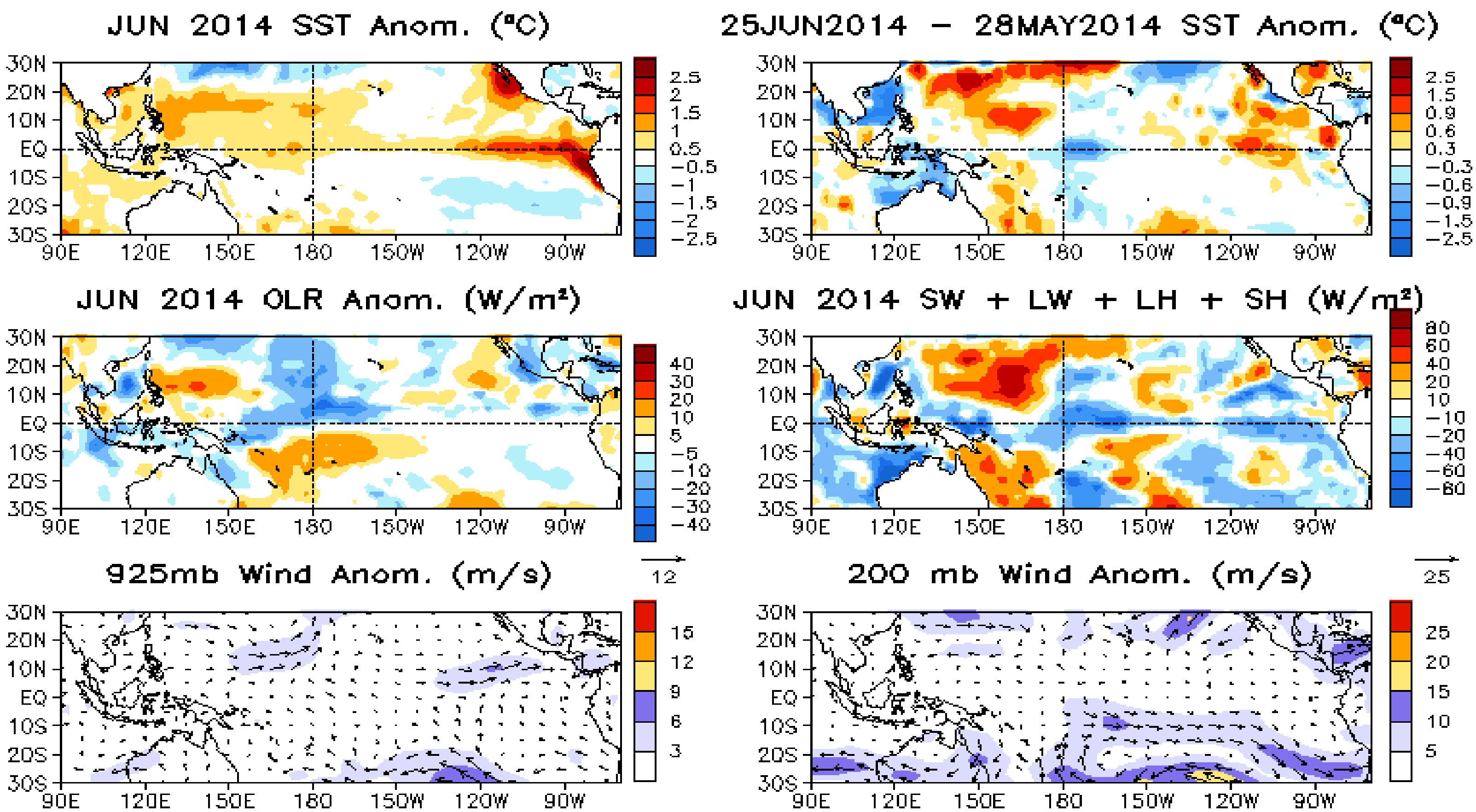
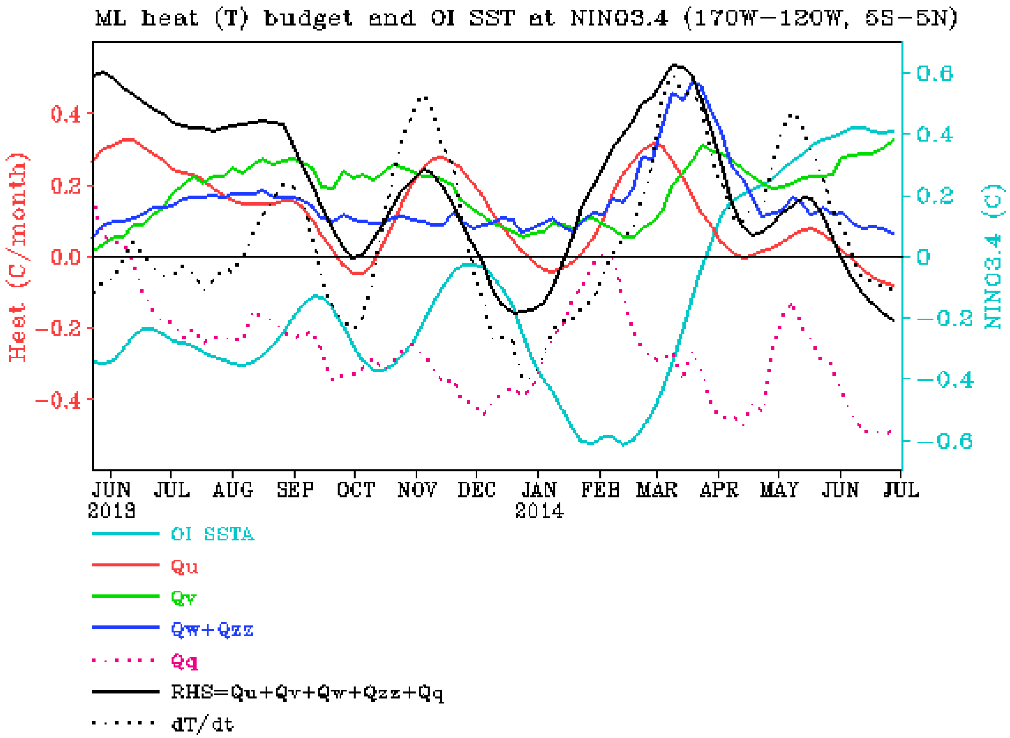


Fig. P2. Sea surface temperature (SST) anomalies (top-left), anomaly tendency (top-right), Outgoing Long-wave Radiation (OLR) anomalies (middle-left), sum of net surface short- and long-wave radiation, latent and sensible heat flux anomalies (middle-right), 925-mb wind anomaly vector and its amplitude (bottom-left), 200-mb wind anomaly vector and its amplitude (bottom-right). SST are derived from the NCEP OI SST analysis, OLR from the NOAA 18 AVHRR IR window channel measurements by NESDIS, winds and surface radiation and heat fluxes from the NCEP CDAS. Anomalies are departures from the 1981-2010 base period means.

NINO3.4 Heat Budget



- **SSTA tendency (dT/dt) in NINO3.4 (dotted line) was negative in June 2014**

-Qv and Qw+Qzz were positive in last a few months.

- **Qu switched to negative in June 2014.**

Huang, B., Y. Xue, X. Zhang, A. Kumar, and M. J. McPhaden, 2010 : The NCEP GODAS ocean analysis of the tropical Pacific mixed layer heat budget on seasonal to interannual time scales, J. Climate., 23, 4901-4925.

Qu: Zonal advection; Qv: Meridional advection;

Qw: Vertical entrainment; Qzz: Vertical diffusion

Qq: (Qnet - Qpen + Qcorr)/ρcph; Qnet = SW + LW + LH +SH;

Qpen: SW penetration; Qcorr: Flux correction due to relaxation to OI SST

Warm Water Volume (WWV) and NINO3.4 Anomalies

- **WWV is defined as average of depth of 20°C in [120°E-80°W, 5°S-5°N].** **Statistically, peak correlation of Nino3 with WWV occurs at 7 month lag** **(Meinen and McPhaden, 2000).**

- **Since WWV is intimately linked to ENSO variability (Wyrtki 1985; Jin 1997), it is useful to monitor ENSO in a phase space of WWV and NINO3.4 (Kessler 2002).**

- **Increase (decrease) of WWV indicates recharge (discharge) of the equatorial oceanic heat content.**

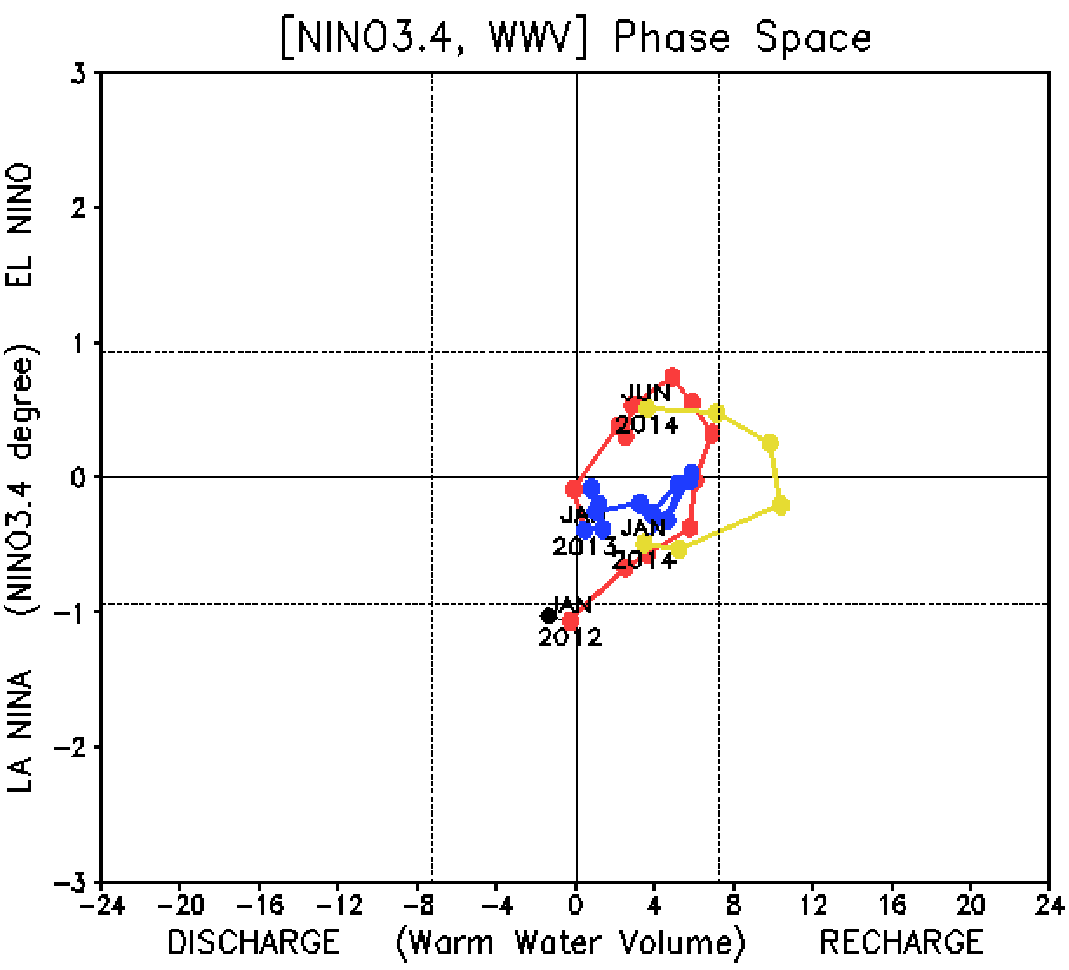


Fig. P3. Phase diagram of Warm Water Volume (WWV) and NINO 3.4 SST anomalies. WWV is the average of depth of 20°C in [120°E-80°W, 5°S-5°N] calculated with the NCEP's global ocean data assimilation system. Anomalies are departures from the 1981-2010 base period means.

North Pacific & Arctic Ocean: SST Anom., SST Anom. Tend., OLR, SLP, Sfc Rad, Sfc Flx

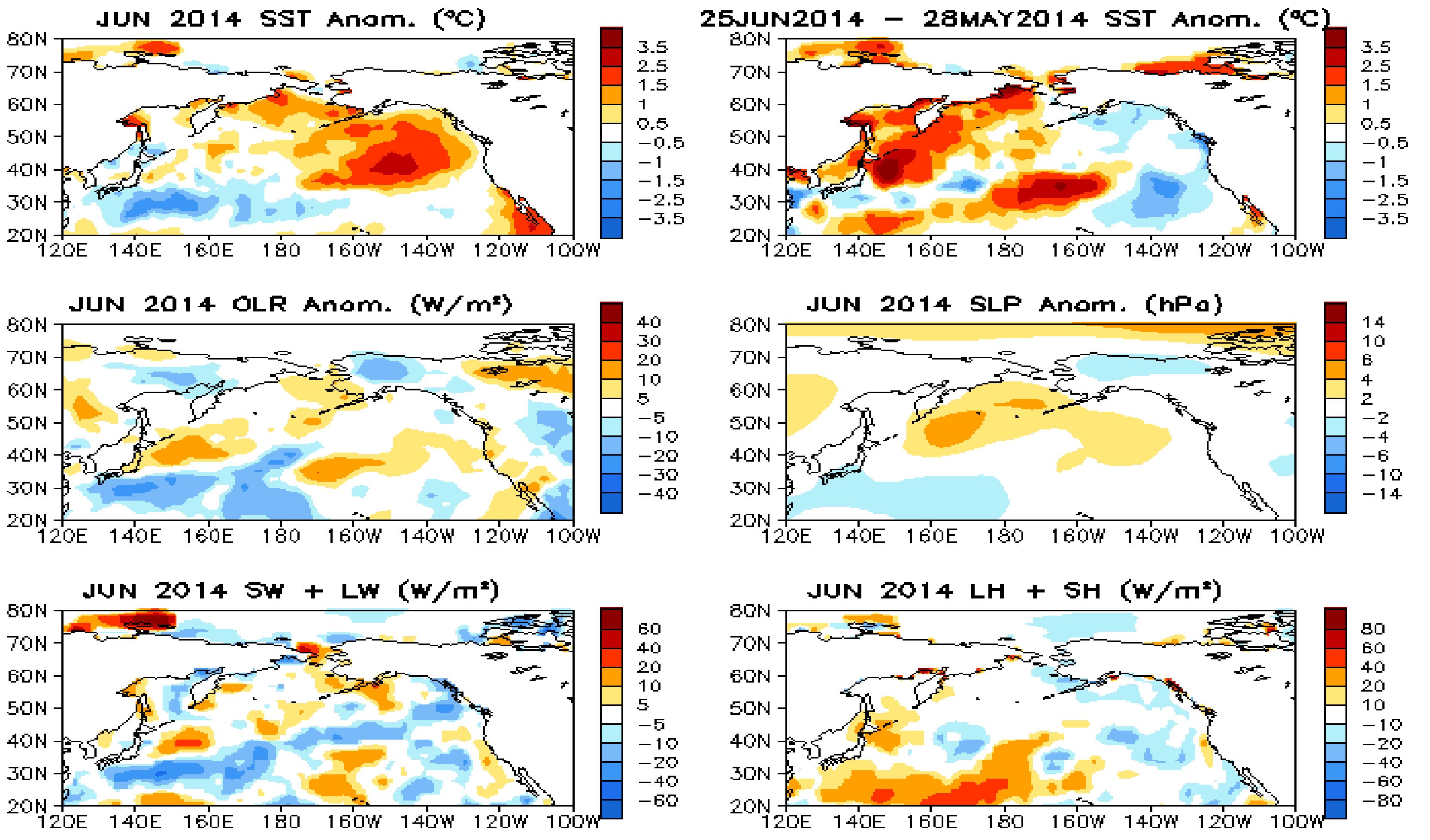
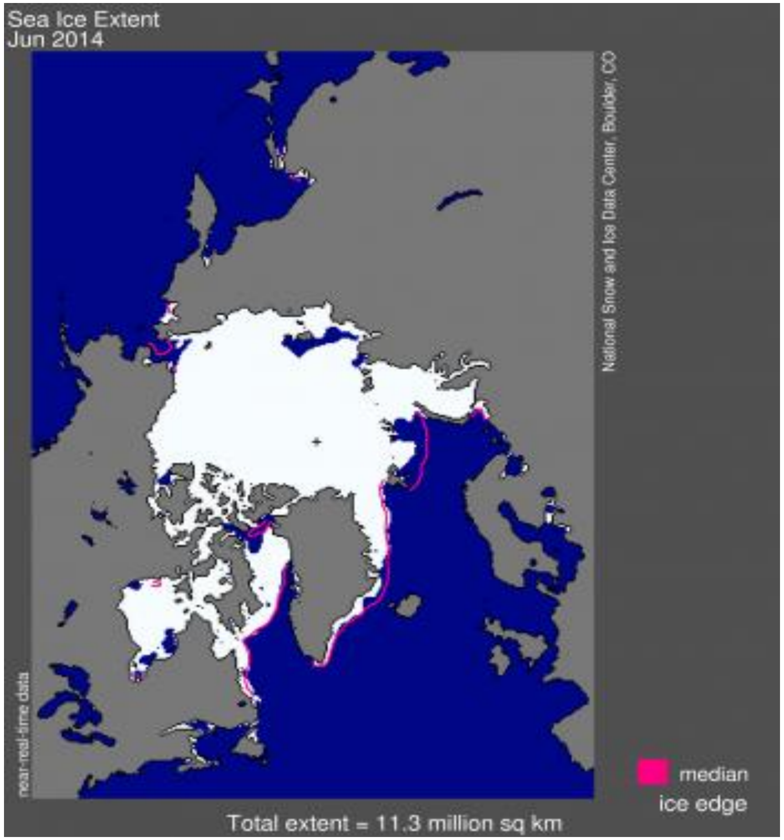


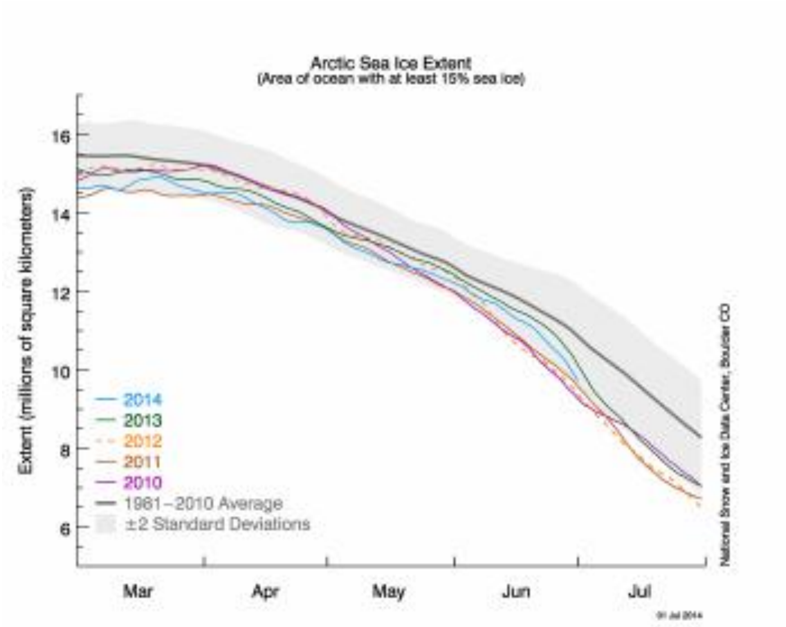
Fig. NP1. Sea surface temperature (SST) anomalies (top-left), anomaly tendency (top-right), Outgoing Long-wave Radiation (OLR) anomalies (middle-left), sea surface pressure anomalies (middle-right), sum of net surface short- and long-wave radiation anomalies (bottom-left), sum of latent and sensible heat flux anomalies (bottom-right). SST are derived from the NCEP OI SST analysis, OLR from the NOAA 18 AVHRR IR window channel measurements by NESDIS, sea surface pressure and surface radiation and heat fluxes from the NCEP CDAS. Anomalies are departures from the 1981-2010 base period means.

Arctic Sea Ice

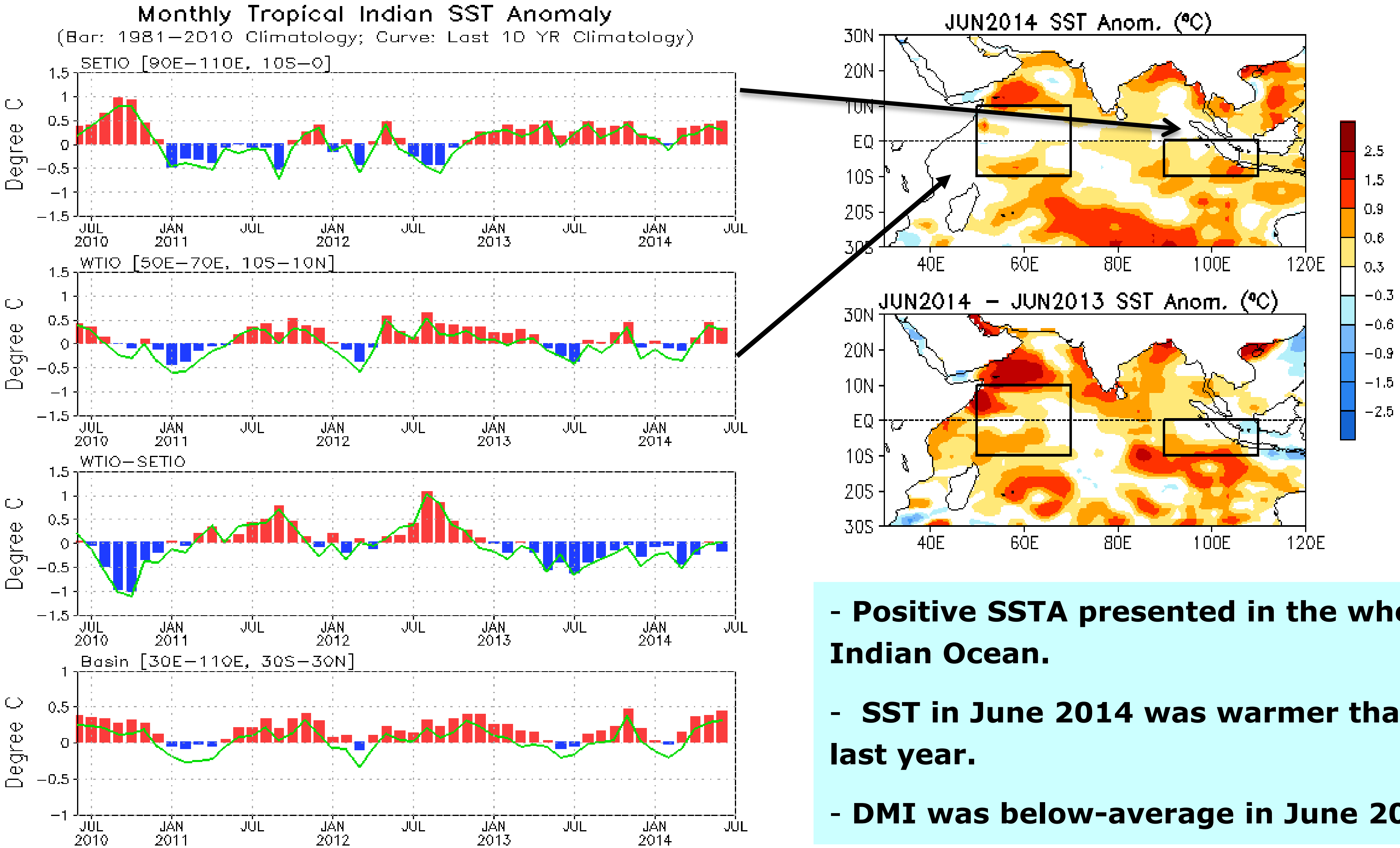
National Snow and Ice Data Center

http://nsidc.org/arcticseaicenews/index.html





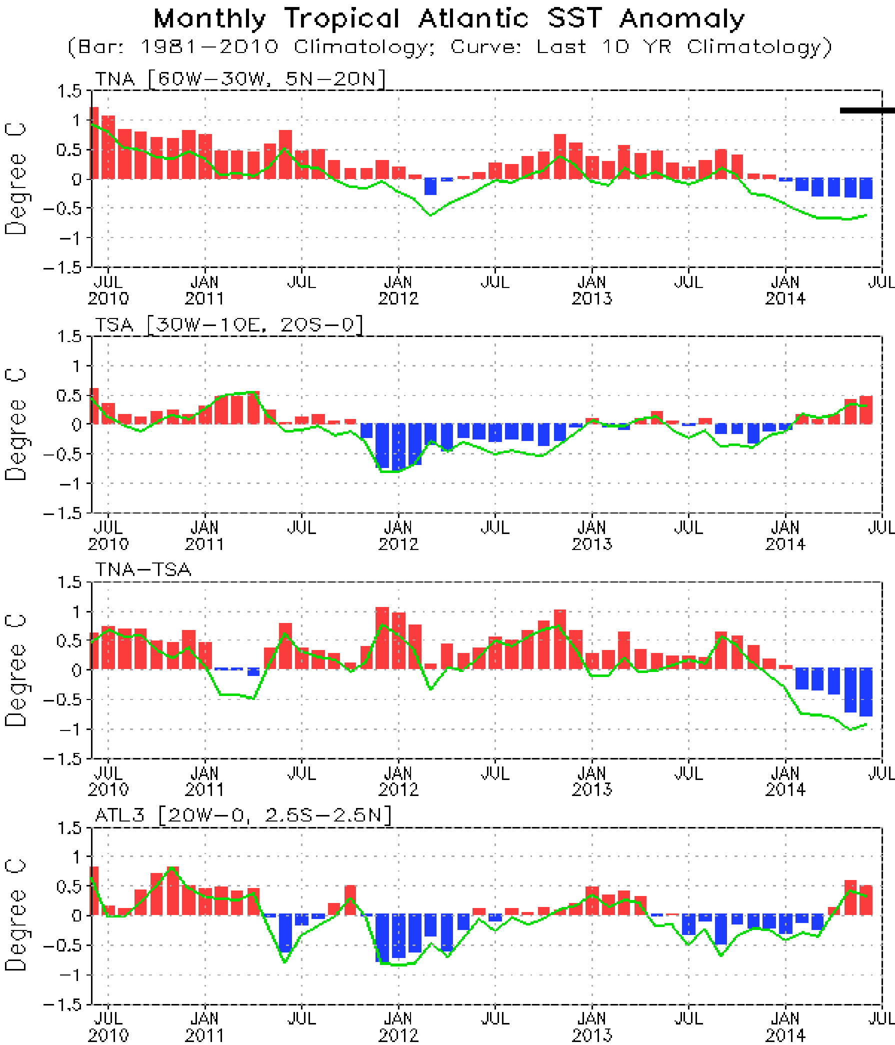
Evolution of Indian Ocean SST Indices

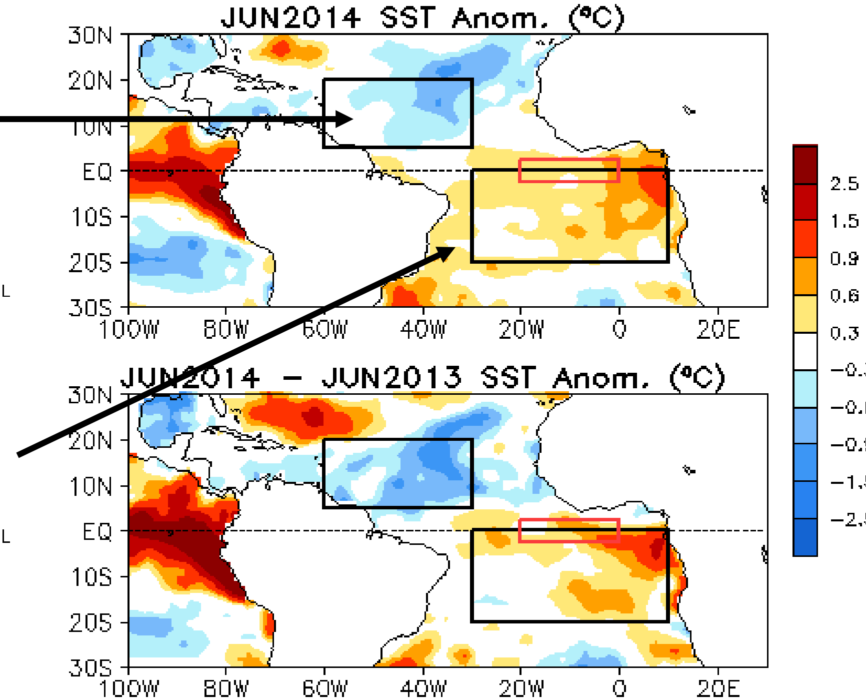


- **Positive SSTA presented in the whole Indian Ocean.**
- **SST in June 2014 was warmer than last year.**
- **DMI was below-average in June 2014.**

Fig. I1a. Indian Ocean Dipole region indices, calculated as the area-averaged monthly mean sea surface temperature anomalies (°C) for the SETIO [90°E-110°E, 10°S-0] and WTIO [50°E-70°E, 10°S-10°N] regions, and Dipole Mode Index, defined as differences between WTIO and SETIO. Data are derived from the NCEP OI SST analysis, and anomalies are departures from the 1981-2010 base period means.

Evolution of Tropical Atlantic SST Indices





- **Tropical North Atlantic (TNA) index was negative since Jan 2014 and gradually strengthened.**
- **Tropical South Atlantic (TSA) index was above-normal.**
- **Meridional Gradient Mode (TNA-TSA) has switched to negative phase in Feb 2014 and gradually strengthened.**
- **Positive ATL3 SSTA persisted in June 2014.**

Fig. A1a. Tropical Atlantic Variability region indices, calculated as the area-averaged monthly mean sea surface temperature anomalies (°C) for the TNA [60°W-30°W, 5°N-20°N], TSA [30°W-10°E, 20°S-0] and ATL3 [20°W-0, 2.5°S-2.5°N] regions, and Meridional Gradient Index, defined as differences between TNA and TSA. Data are derived from the NCEP OI SST analysis, and anomalies are departures from the 1981-2010 base period means.

North Atlantic: SST Anom., SST Anom. Tend., OLR, SLP, Sfc Rad, Sfc Flx

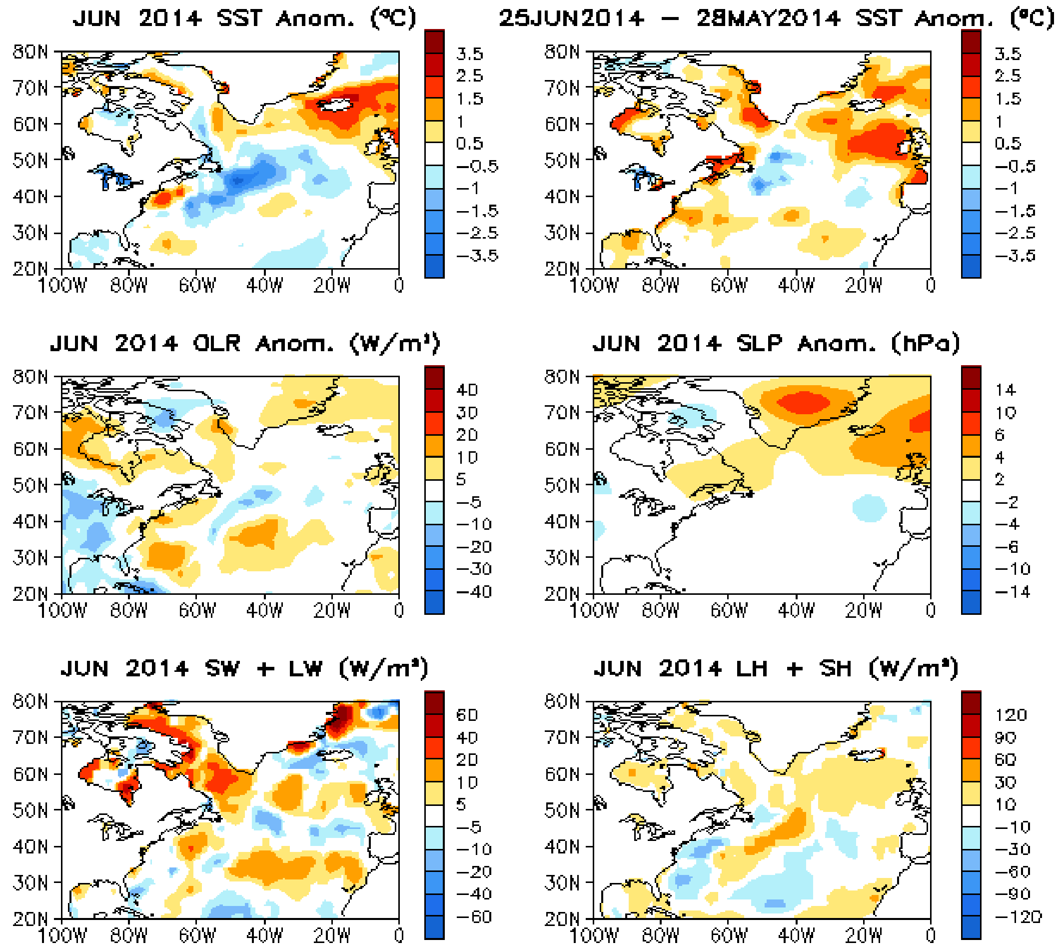
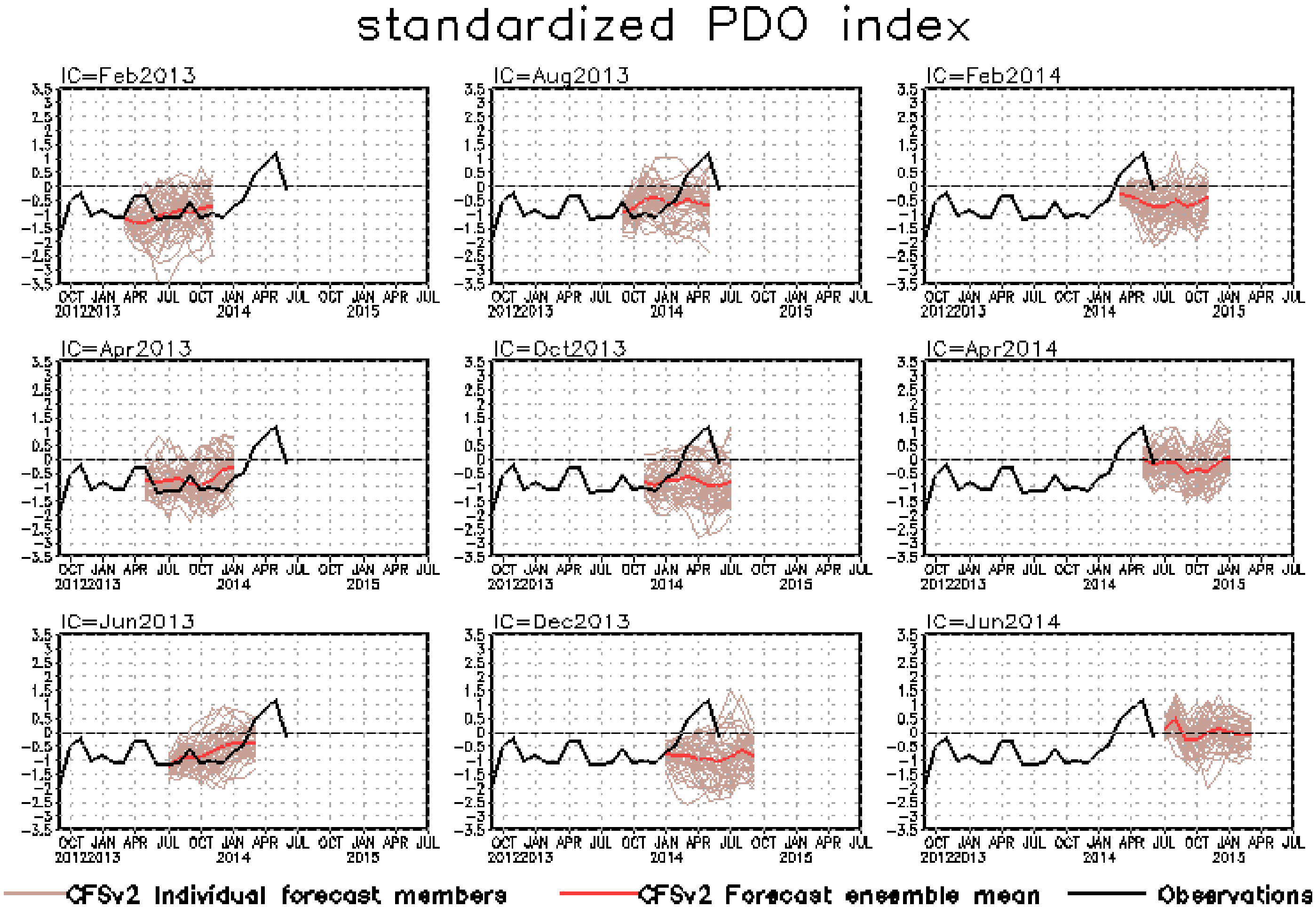


Fig. NA1. Sea surface temperature (SST) anomalies (top-left), anomaly tendency (top-right), Outgoing Long-wave Radiation (OLR) anomalies (middle-left), sea surface pressure anomalies (middle-right), sum of net surface short- and long-wave radiation anomalies (bottom-left), sum of latent and sensible heat flux anomalies (bottom-right). SST are derived from the NCEP OI SST analysis, OLR from the NOAA 18 AVHRR IR window channel measurements by NESDIS, sea surface pressure and surface radiation and heat fluxes from the NCEP CDAS. Anomalies are departures from the 1981-2010 base period means.

CFS Pacific Decadal Oscillation (PDO) Index Predictions from Different Initial Months



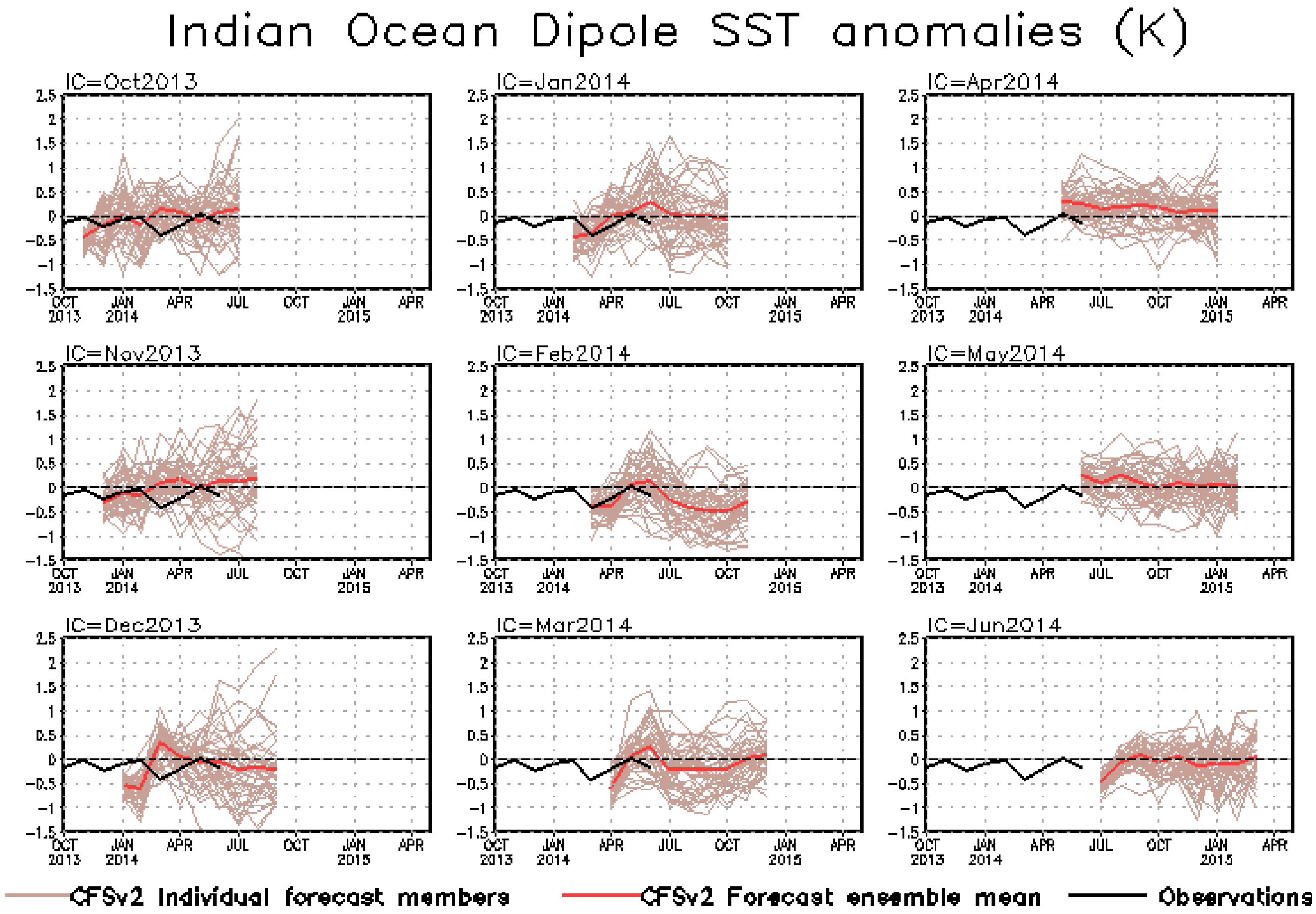
- Forecast in June 2014 IC calls for near-normal PDO in next 9 months.

PDO is the first EOF of monthly ERSSTv3b anomaly in the region of [110ºE-100ºW, 20ºN-60ºN].

CFS PDO index is the standardized projection of CFS SST forecast anomalies onto the PDO EOF pattern.

Fig. M4. CFS Pacific Decadal Oscillation (PDO) index predictions from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labelled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). Anomalies were computed with respect to the 1981-2010 base period means.

NCEP CFS DMI SST Predictions from Different Initial Months

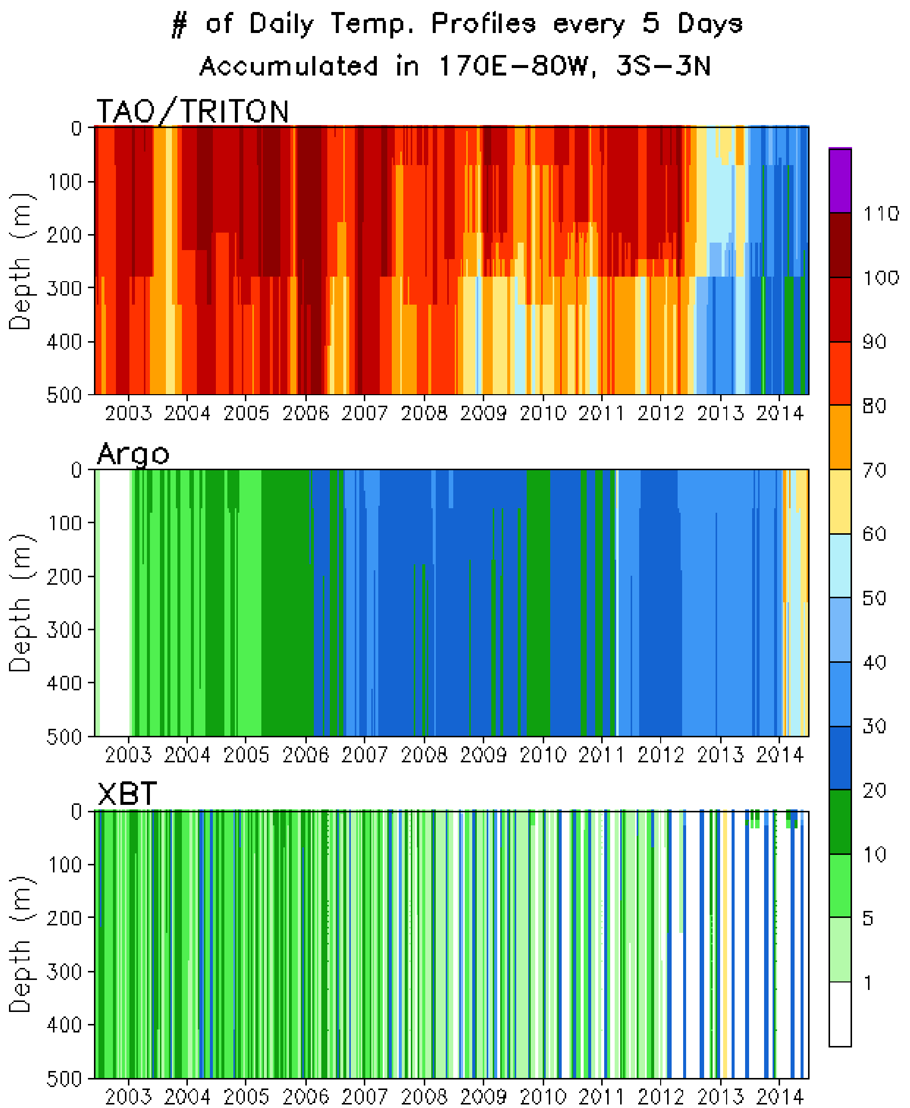


DMI = WTIO- SETIO

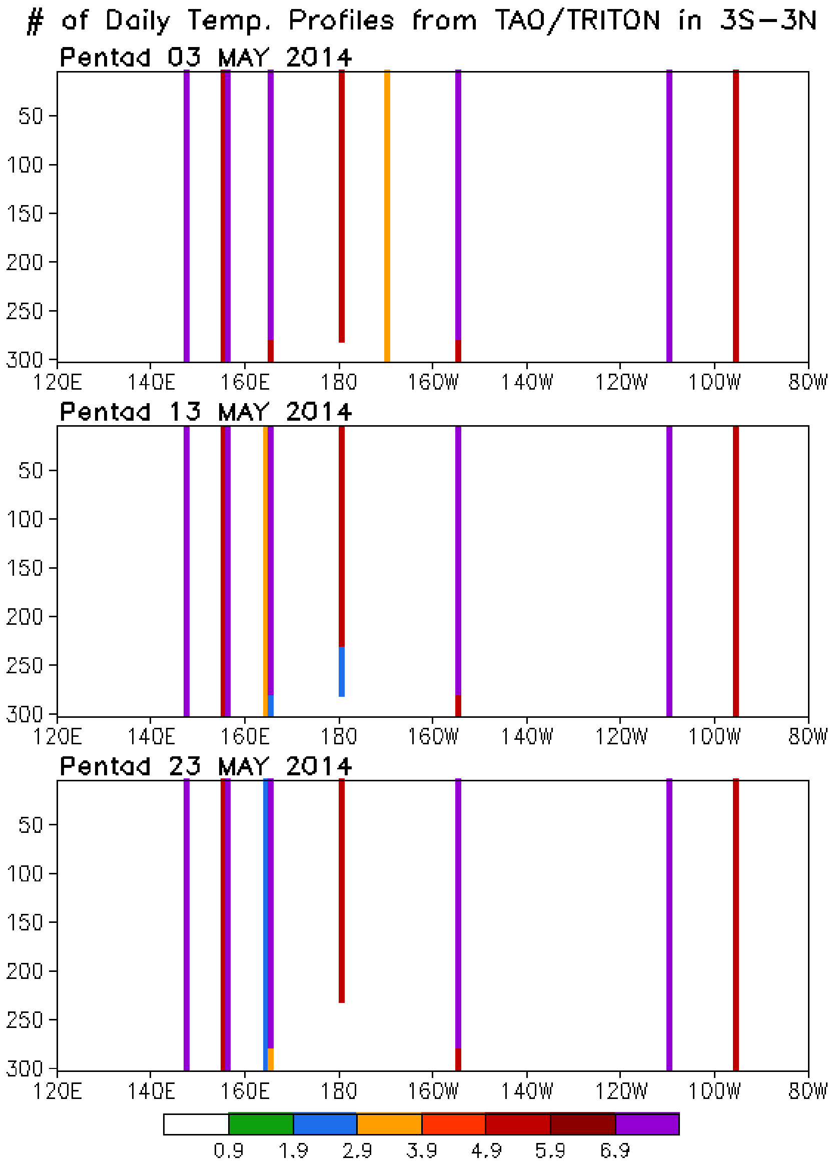
SETIO = SST anomaly in [90ºE-110ºE, 10ºS-0]

WTIO = SST anomaly in [50ºE-70ºE, 10ºS-10ºN]

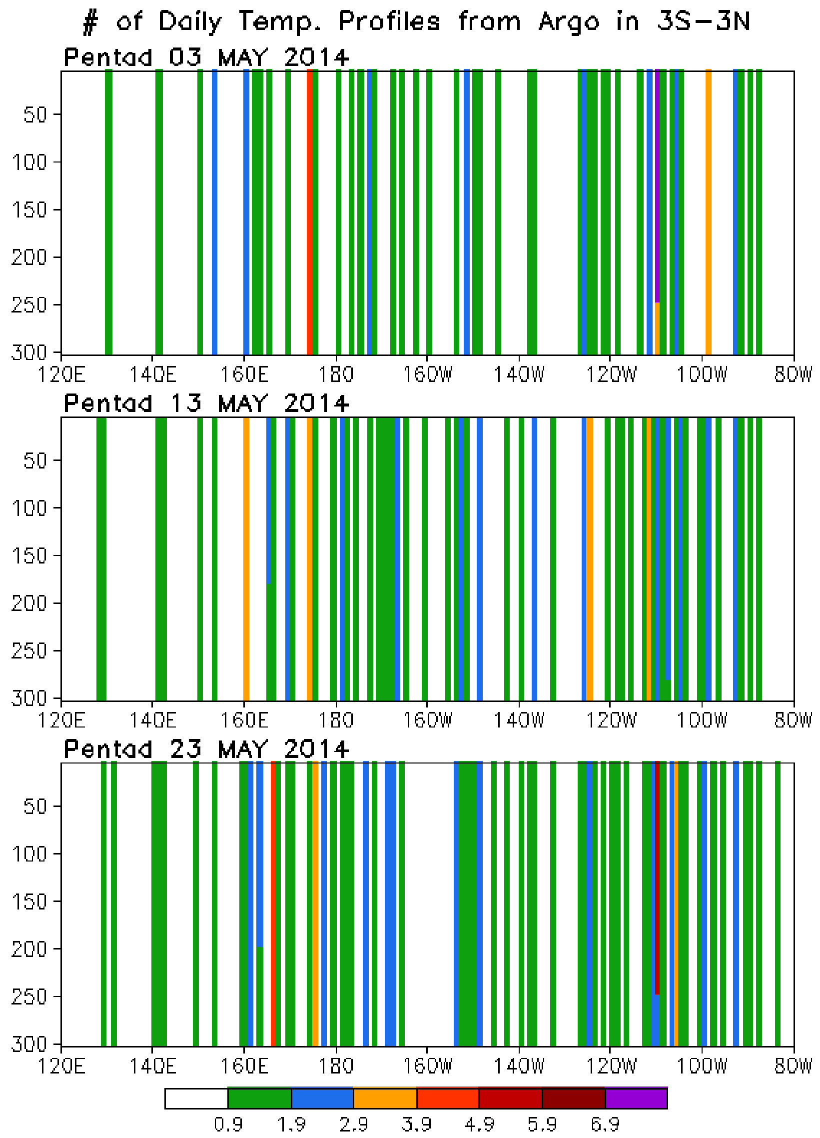
Fig. M2. CFS Dipole Model Index (DMI) SST predictions from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labelled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). The hindcast climatology for 1981-2006 was removed, and replaced by corresponding observation climatology for the same period. Anomalies were computed with respect to the 1981-2010 base period means.



# of Daily Temp. Profiles every 5 Days
Accumulated in 170E-80W, 3S-3N
TAO/TRITON
Argo
XBT
Depth (m)
0
100
200
300
400
500
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
110
100
90
80
70
60
50
40
30
20
10
5
1

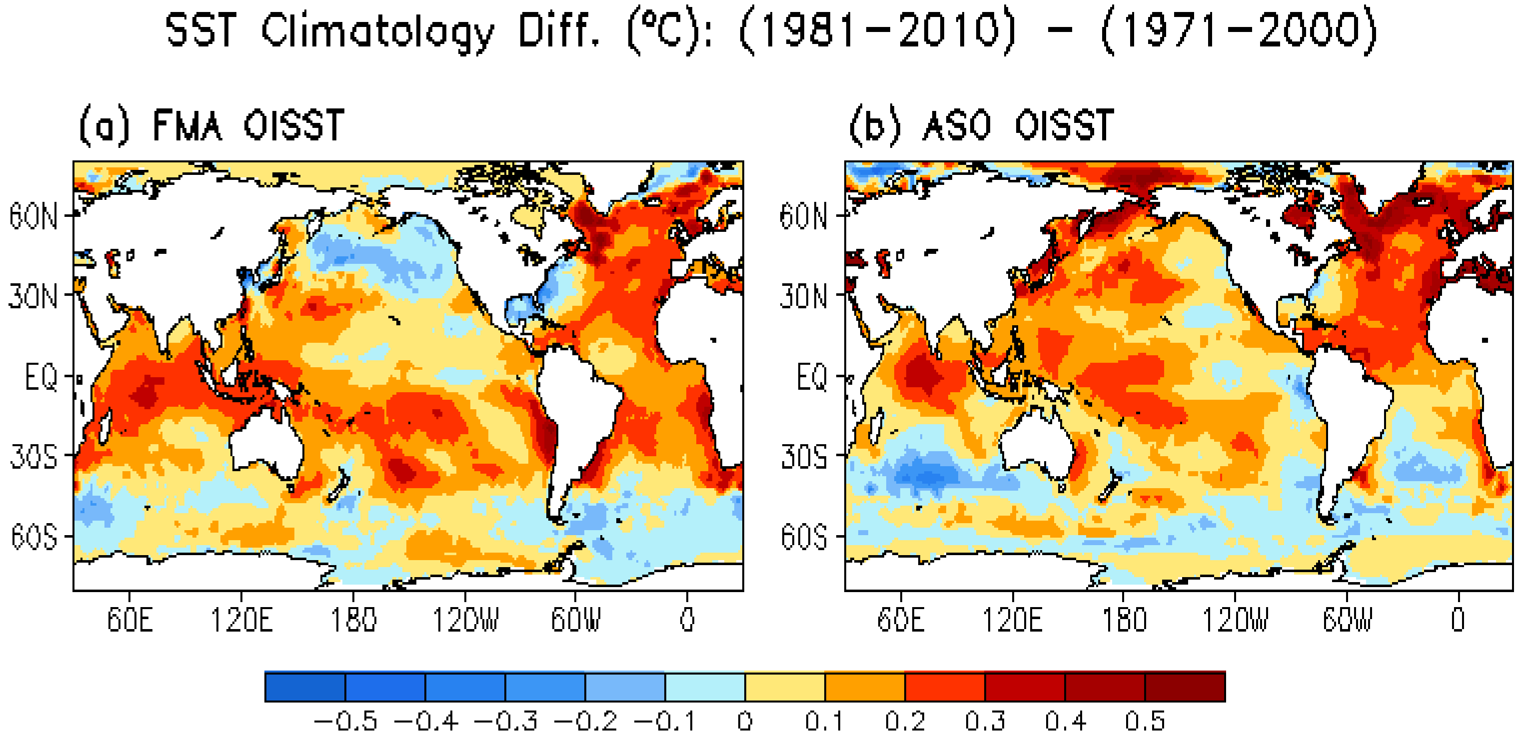


# of Daily Temp. Profiles from TAO/TRITON in 3S–3N
Pentad 03 MAY 2014
Pentad 13 MAY 2014
Pentad 23 MAY 2014
50
100
150
200
250
300
120E
140E
160E
180
160W
140W
120W
100W
80W
0.9
1.9
2.9
3.9
4.9
5.9
6.9



# of Daily Temp. Profiles from Argo in 3S–3N
Pentad 03 MAY 2014
Pentad 13 MAY 2014
Pentad 23 MAY 2014
50
100
150
200
250
300
120E
140E
160E
180
160W
140W
120W
100W
80W
0.9
1.9
2.9
3.9
4.9
5.9
6.9

Be aware that new climatology (1981-2010) was applied since Jan 2011



1971-2000 SST Climatology (Xue et al. 2003): http://www.cpc.ncep.noaa.gov/products/predictions/30day/SSTs/sst_clim.htm

1981-2010 SST Climatology: http://origin.cpc.ncep.noaa.gov/products/people/yxue/sstclim/

- **The seasonal mean SST in February-April (FMA) increased by more than 0.2°C over much of the Tropical Oceans and N. Atlantic, but decreased by more than 0.2°C in high-latitude N. Pacific, Gulf of Mexico and along the east coast of U.S.**
- **Compared to FMA, the seasonal mean SST in August-October (ASO) has a stronger warming in the tropical N. Atlantic, N. Pacific and Arctic Ocean, and a weaker cooling in Gulf of Mexico and along the east coast of U.S.**

Switch to 1981-2010 Climatology

- **SST from 1971-2000 to 1981-2010**
  - **Weekly OISST.v2, monthly ERSST.3b**
- **Atmospheric fields from 1979-1995 to 1981-2010**
  - **NCEP CDAS winds, sea level pressure, 200mb velocity potential, surface shortwave and longwave radiation, surface latent and sensible fluxes, relative humidity**
  - **Outgoing Long-wave Radiation**
- **Oceanic fields from 1982-2004 to 1981-2010**
  - **GODAS temperature, heat content, depth of 20^{o}C, sea surface height, mixed layer depth, tropical cyclone heat potential, surface currents, upwelling**
- **Satellite data climatology 1993-2005 unchanged**
  - **Aviso Altimetry Sea Surface Height**
  - **Ocean Surface Current Analyses – Realtime (OSCAR)**

Data Sources and References

- **Optimal Interpolation SST (OI SST) version 2 (Reynolds et al. 2002)**
- **NCEP CDAS winds, surface radiation and heat fluxes**
- **NESDIS Outgoing Long-wave Radiation**
- **NDBC TAO data (http://tao.noaa.gov)**
- **PMEL TAO equatorial temperature analysis**
- **NCEP's Global Ocean Data Assimilation System temperature, heat content, currents (Behringer and Xue 2004)**
- **Aviso Altimetry Sea Surface Height**
- **Ocean Surface Current Analyses – Realtime (OSCAR)**

Please send your comments and suggestions to Yan.Xue@noaa.gov. Thanks!

CPC Home > GODAS Home > CPC Monthly Ocean Briefing > Real Time Ocean Reanalysis Intercomprison

Real Time Multiple Ocean Reanalysis Intercomparison

(with contributions from NCEP, ECMWF , JMA , GFDL , NASA , BOM based on 1981-2010 Climatology)

(Background Information)

Tropical Pacific Ocean

- **Climate Indices**
  - Depth of 20C isotherm anomaly in NINO3: last 4 years last 15 years 1979-present
  - Depth of 20C isotherm anomaly in NINO4: last 4 years last 15 years 1979-present
  - Upper 300m heat content anomaly in NINO3: last 4 years last 15 years 1979-present
  - Upper 300m heat content anomaly in NINO4: last 4 years last 15 years 1979-present
  - Warm Water Volume: last 4 years last 15 years 1979-present
  - Warm Water Volume average in last two months ending in:
    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
- **Spatial Maps**
  - Equatorial temperature anomaly: last month month before last month 1979-present
  - Depth of 20C isotherm anomaly: last month month before last month 1979-present
  - Upper 300m heat content anomaly: last month month before last month 1979-present

Global Ocean

- **Spatial Maps**
  - Equatorial temperature anomaly: last month month before last month 1979-present
  - Depth of 20C isotherm anomaly: last month month before last month 1979-present
  - Upper 300m heat content anomaly: last month month before last month 1979-present

http://www.cpc.ncep.noaa.gov/products/GODAS/multiora_body.html