Pacific Region
ENSO UPDATE AND SEASONAL OUTLOOK

Feb 5 2016

PREPARED BY THE PEAC CENTER

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NOAA

UOG/WERI

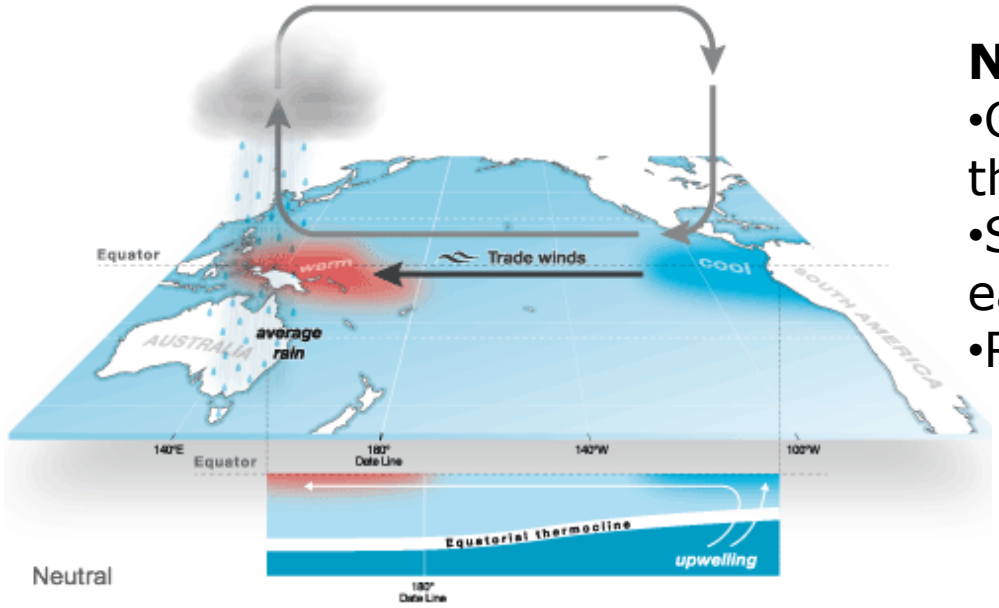
University of Hawai'i MĀNOA

UH/SOEST

What Is El Niño

A general description of its global impacts

El Niño in a nutshell

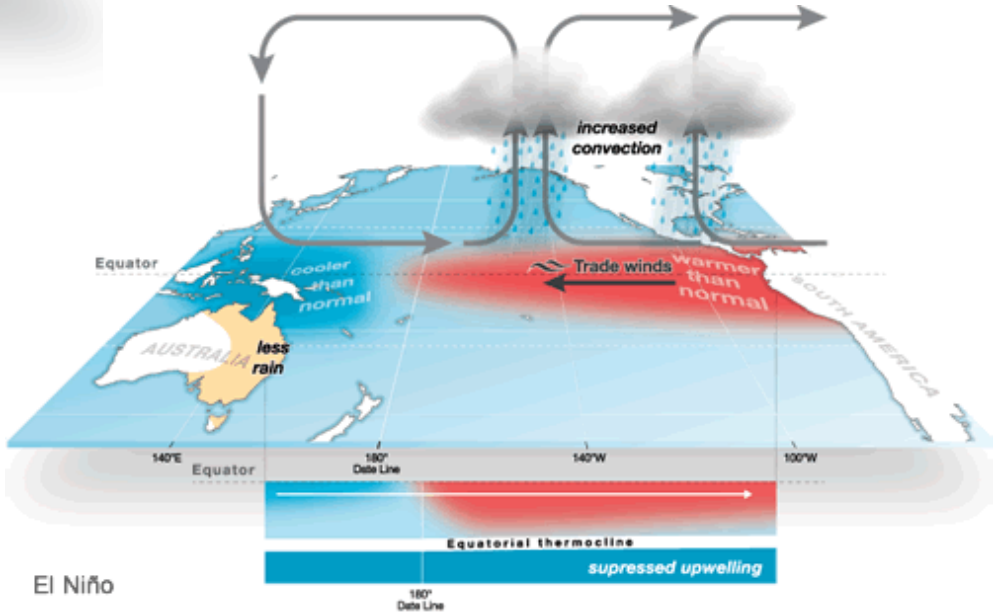


Neutral Conditions:

- Cold sea surface temperatures to the east and warm to the west
- Strong trade winds blowing from east to west
- Rainfall over the Western Pacific

El Niño Conditions:

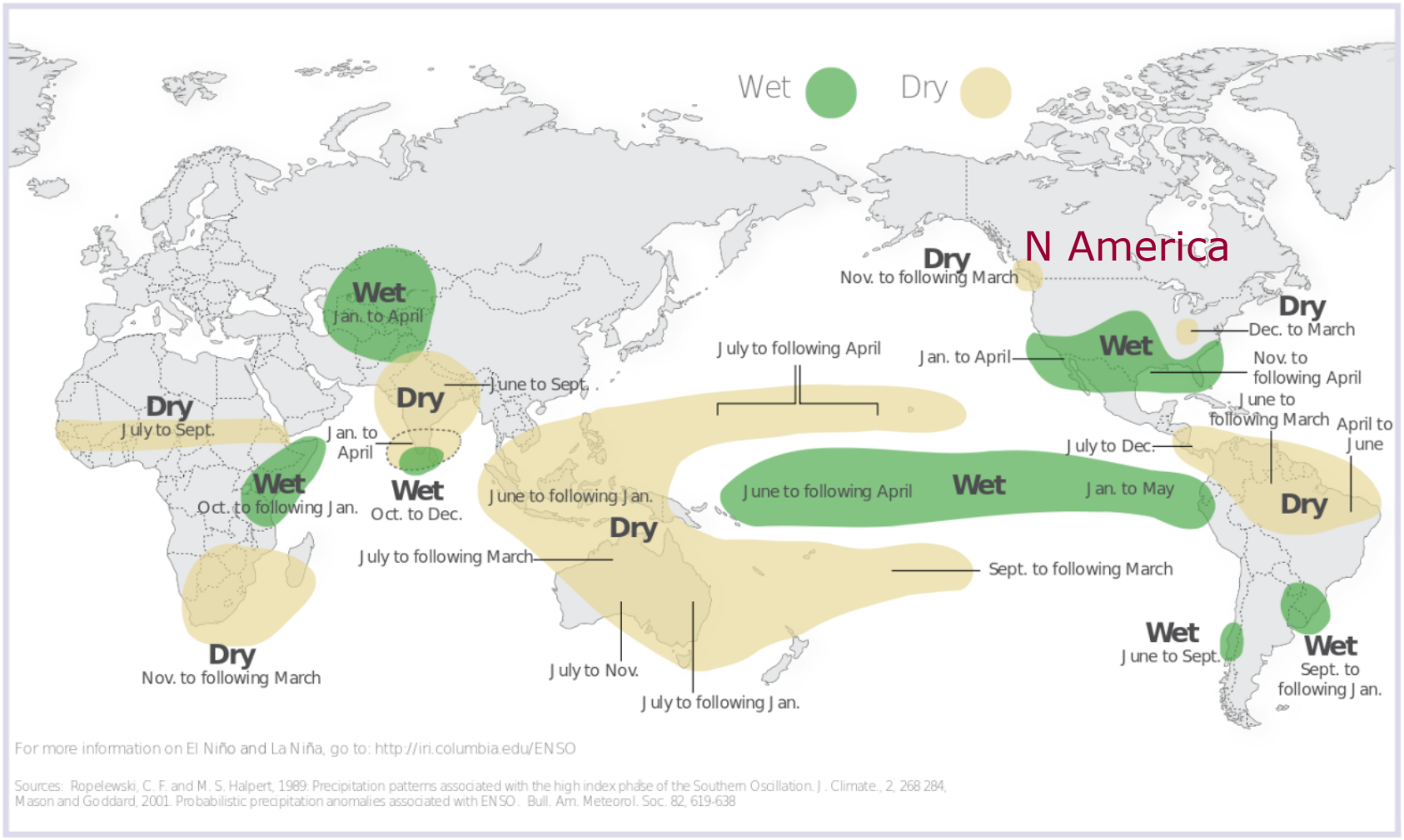
- Warm sea surface temperatures to the east and cold to the west
- Weakened trade winds, westerly winds over east Pacific
- Rainfall over the Central and East Pacific
- Lower than normal sea levels over the western Pacific



Figures from http://www.bom.gov.au/climate/enso/history/ln-2010-12/three-phases-of-ENSO.shtml

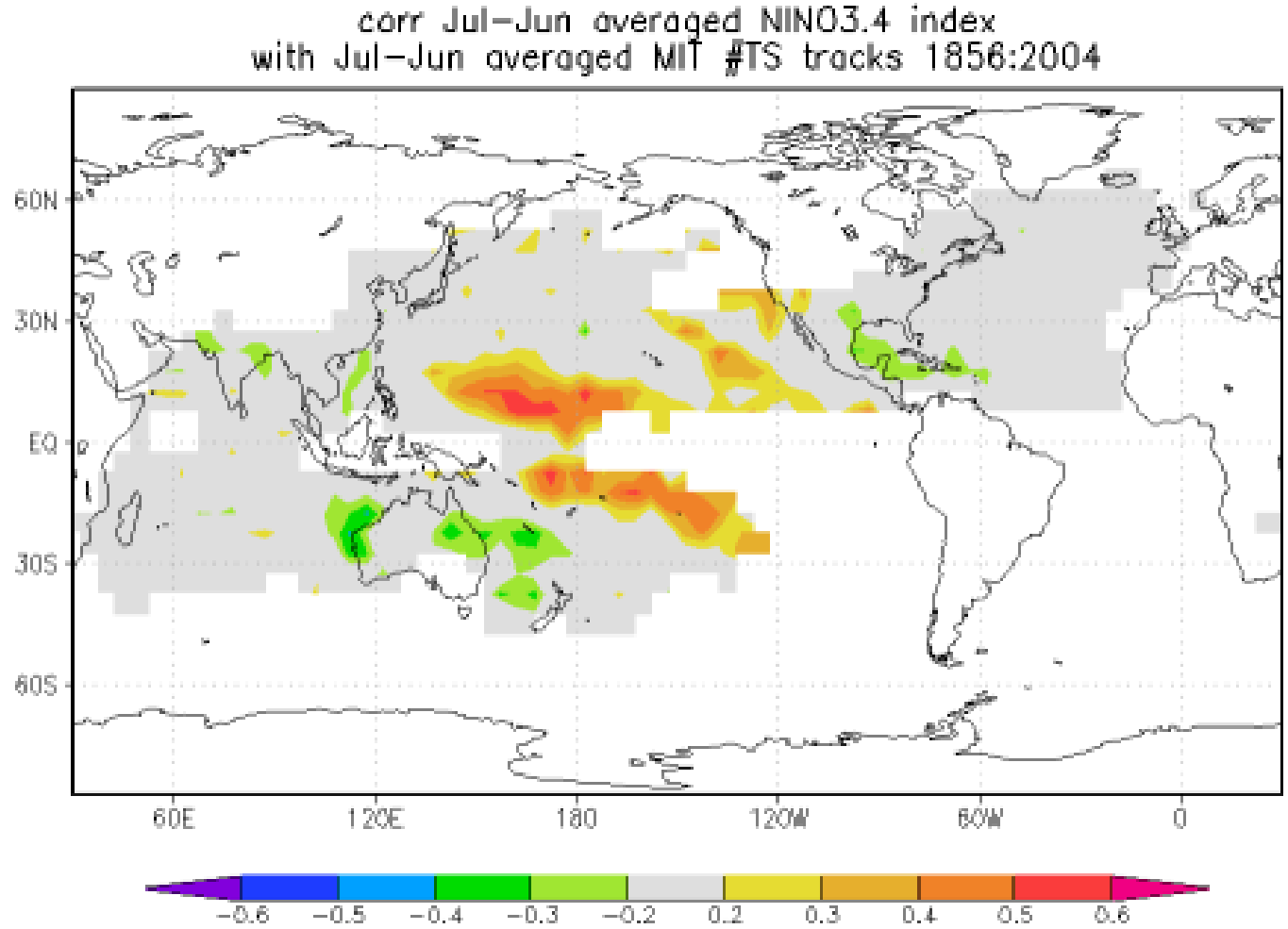
El Niño and Rainfall

El Niño conditions in the tropical Pacific are known to shift rainfall patterns in many different parts of the world. Although they vary somewhat from one El Niño to the next, the strongest shifts remain fairly consistent in the regions and seasons shown on the map below.



http://www.climate.gov/news-features/department/8443/all

El Niño and Tropical Cyclones



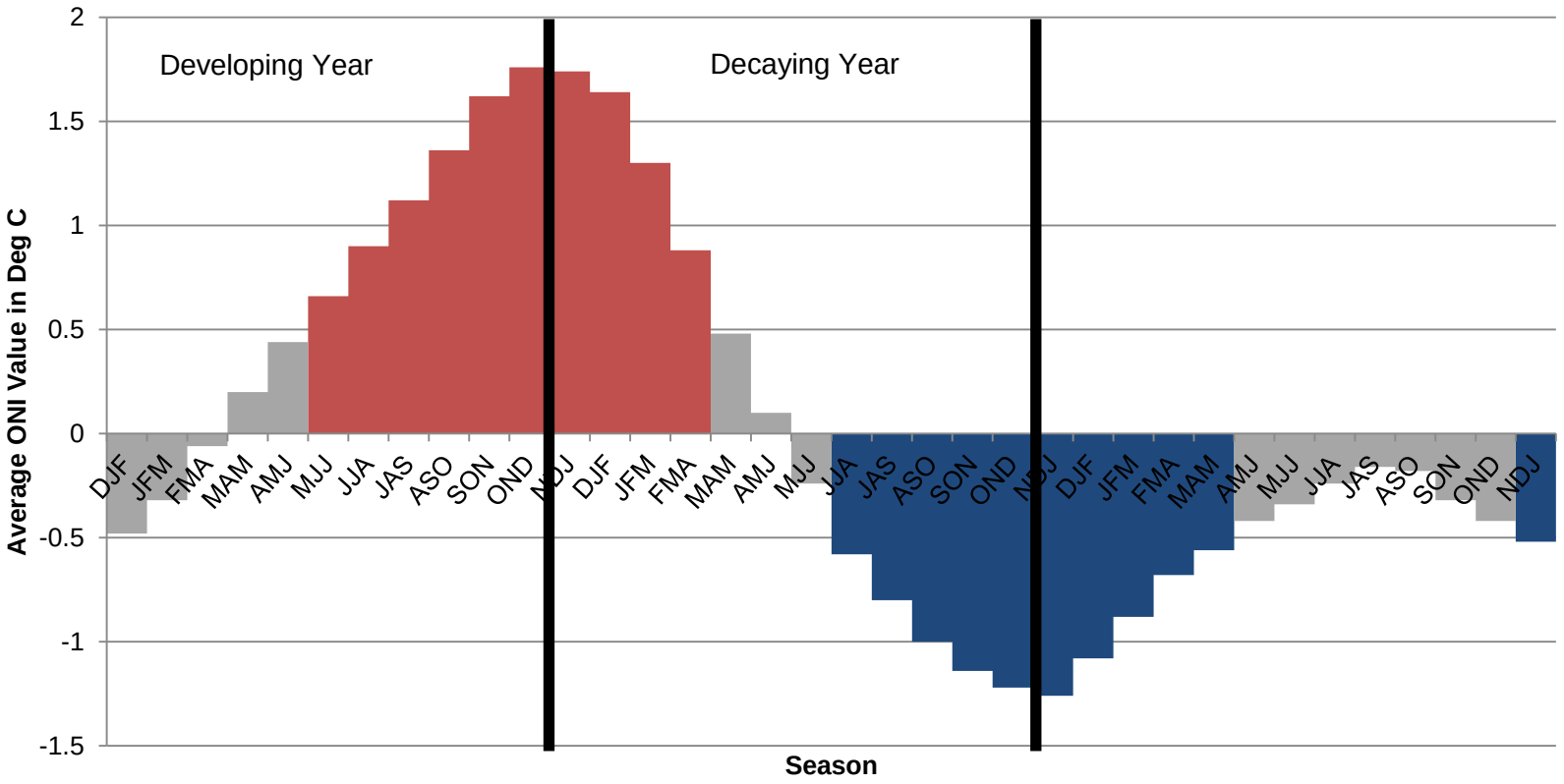
El Niño shifts TC genesis Eastward over the North and South Western Pacific

- Less TC activity
  - Australia
  - Philippines
- More TC activity
  - Tropical Pacific
  - Hawaii
  - American Samoa

From the Royal Netherlands Meteorological Institute
http://www.knmi.nl/research/global_climate/enso/effects/

El Niño development, peak and decay

- Oceanic Niño index averaged for 5 recent El Niño events
  - 1963/64, 1972/73, 1982/83, 1997/98, 2009/2010



GENERAL SYNOPSIS

This section will give a quick overview of the coming topics

Synopsis

Current Conditions

- Current ENSO status is **El Niño**
- Sea Surface Temperature warmer than normal over the eastern Pacific
- Atmospheric conditions consistent with mature El Niño

Observed Impacts

- Dry conditions over the Western Pacific
- Tropical cyclone activity shifted
- Below average sea levels over the Western Pacific

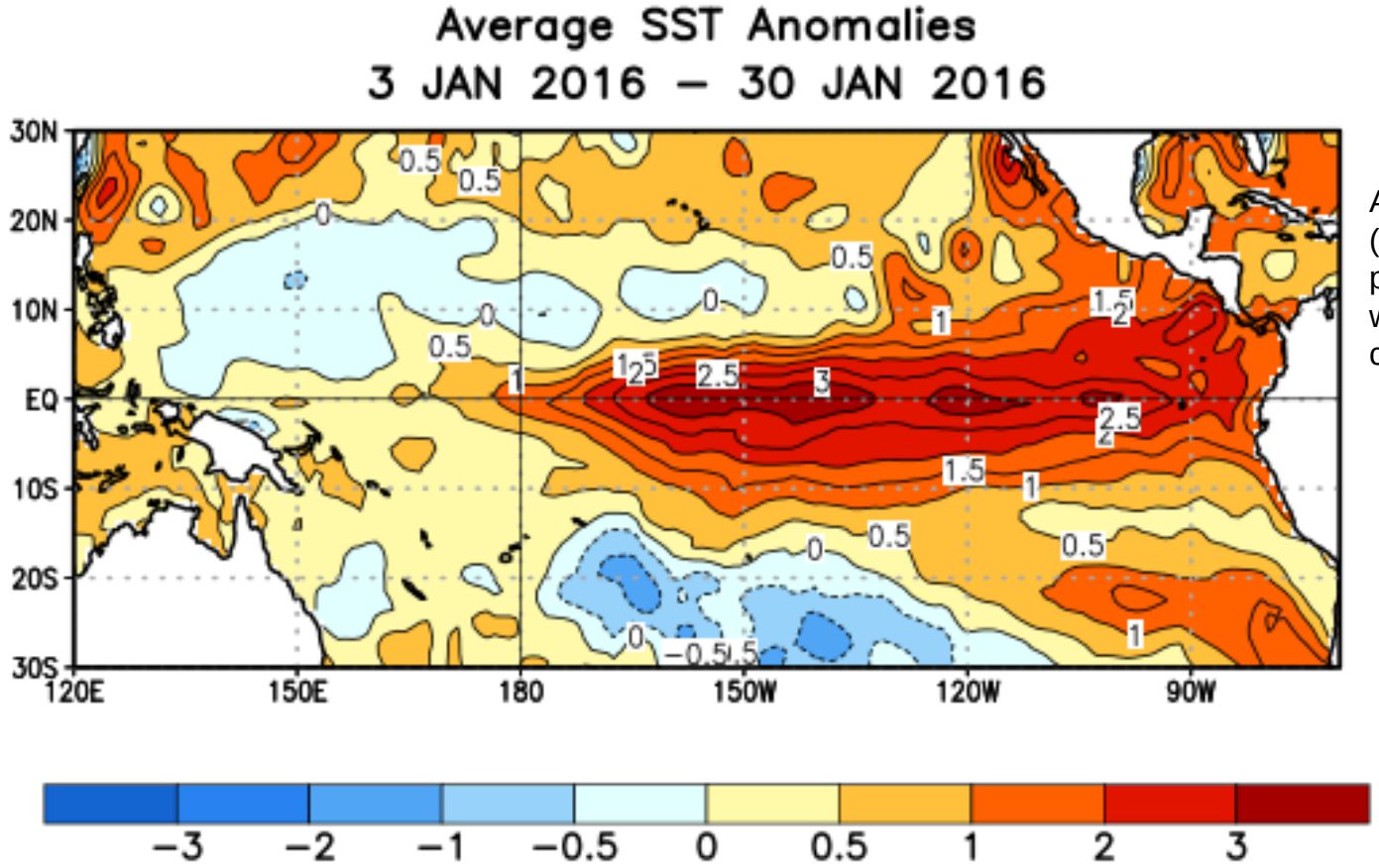
General El Nino Forecast

- El Niño expected to continue through Northern Hemisphere spring 2016
- Transition to Neutral by late spring early summer
- Possible development of **La Niña**

Current Conditions

General State of the Ocean and Atmosphere

During the last 4 months, equatorial SSTs were well above average across the Eastern Pacific Ocean

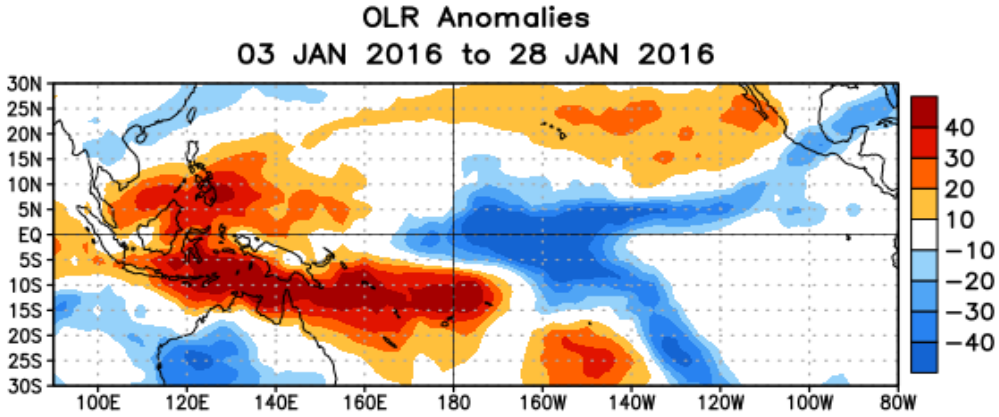


Average sea surface temperature (SST) anomalies (° C). Over the past month, Warm SST anomalies where prevalent over the western central and eastern Pacific Ocean.

170x159
(Slide 6)

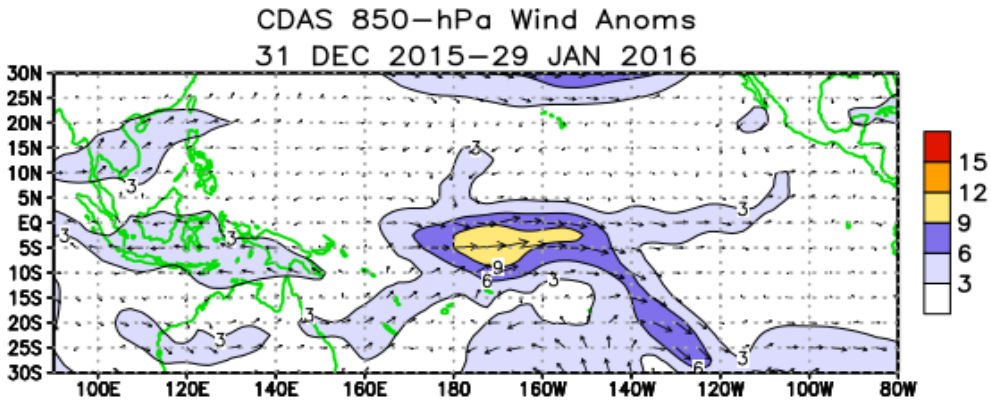
http://www.cpc.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt#356,6,SST Departures (oC) in the Tropical Pacific During the Last 4 Weeks

OLR and Wind Anomalies for Past 30 Days

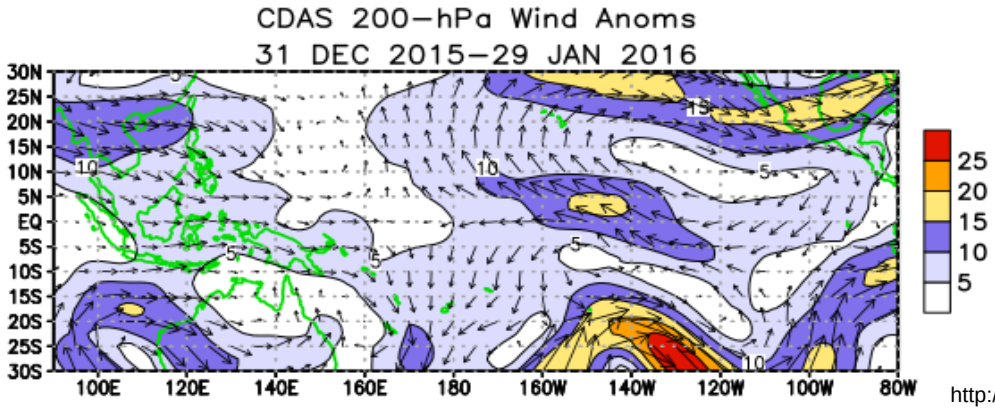


- Above average deep convection (- OLR anomalies)
- East of the dateline
- ITCZ

- Below average precipitation (+ OLR anomalies)
- Western Pacific



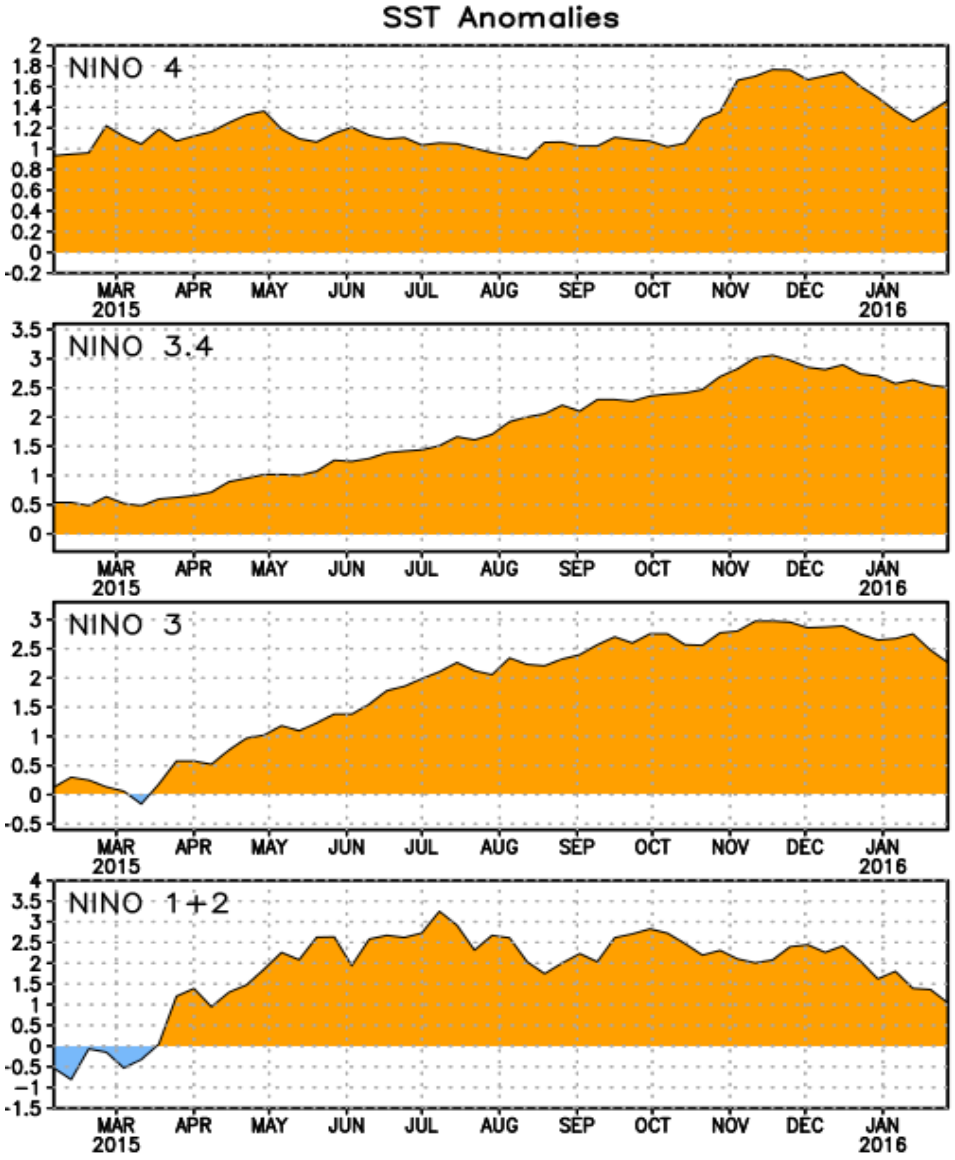
Low level westerlies over the Equatorial Central Pacific



Upper level winds show predominant easterly winds

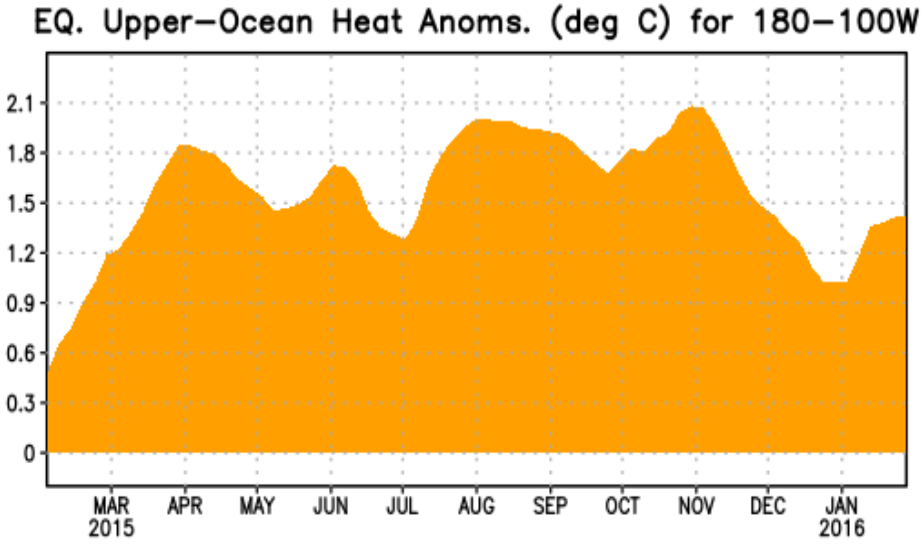
http://www.cpc.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt

SST DEPARTURES AND UPPER OCEAN (0 - 300m) HEAT CONTENT ANOMOLY



The latest weekly SST departures are:

Niño 4	**1.5ºC**
Niño 3.4	**2.5ºC**
Niño 3	**2.3ºC**
Niño 1+2	**2.1ºC**



http://www.cpc.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt#356,6,SST

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

ENSO Alert System Status: El Niño Advisory

Synopsis:

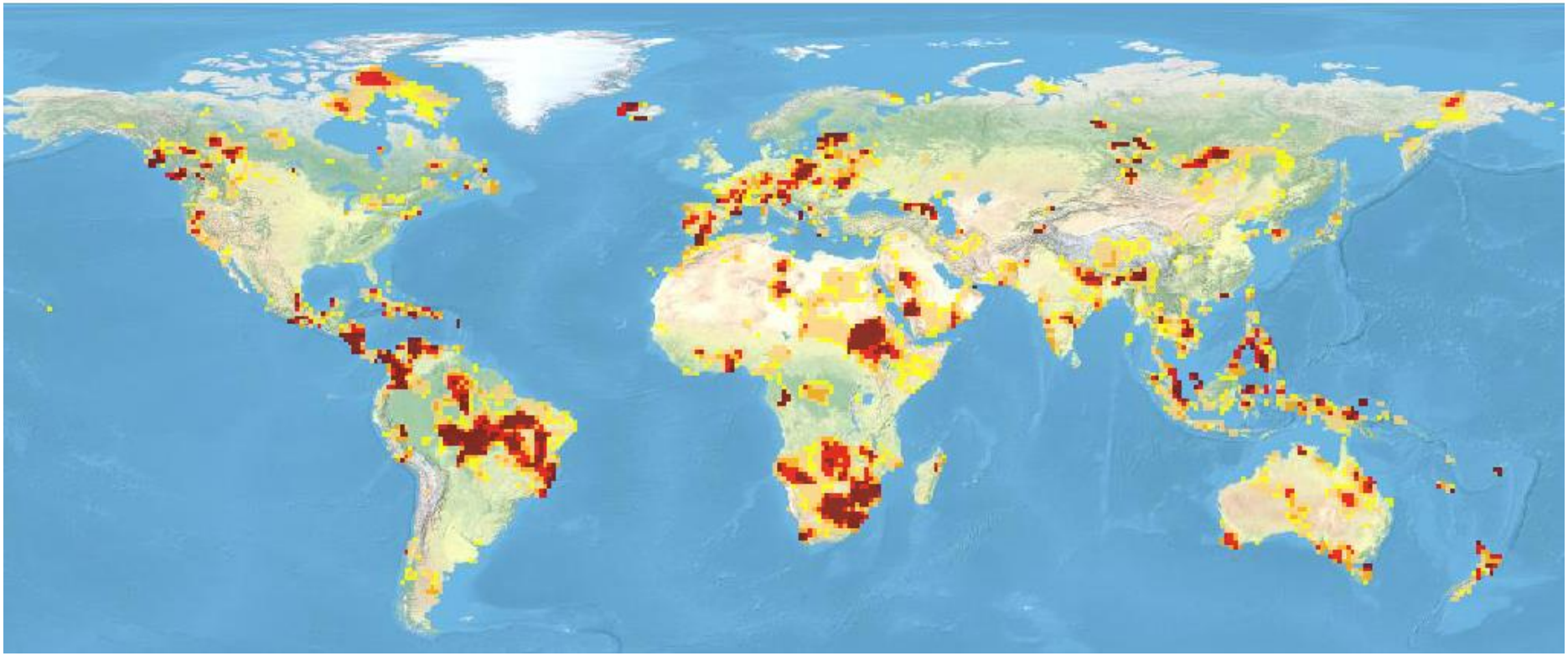
- A strong El Niño continued during December
- Well above-average sea surface temperatures across the central and eastern equatorial Pacific Ocean
- All weekly Niño indices decreased slightly from the previous month
- Significant low-level westerly wind anomalies and upper-level easterly wind anomalies continued over much of the tropical Pacific
- Southern Oscillation Index (SOI) values remained strongly negative
- Convection remained strong over the central and east-central tropical Pacific, and suppressed over Indonesia
- Collectively, these atmospheric and oceanic anomalies reflect the continuation of a strong El Niño episode.

Issued by
CLIMATE PREDICTION CENTER/NCEP/NWS
and the International Research Institute for Climate and Society
Diagnostic Discussion: 14 January 2016
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.doc

Impacts

Rainfall, Sea Level, Tropical Cyclones and Societal Impacts

Rainfall impacts:
Drought



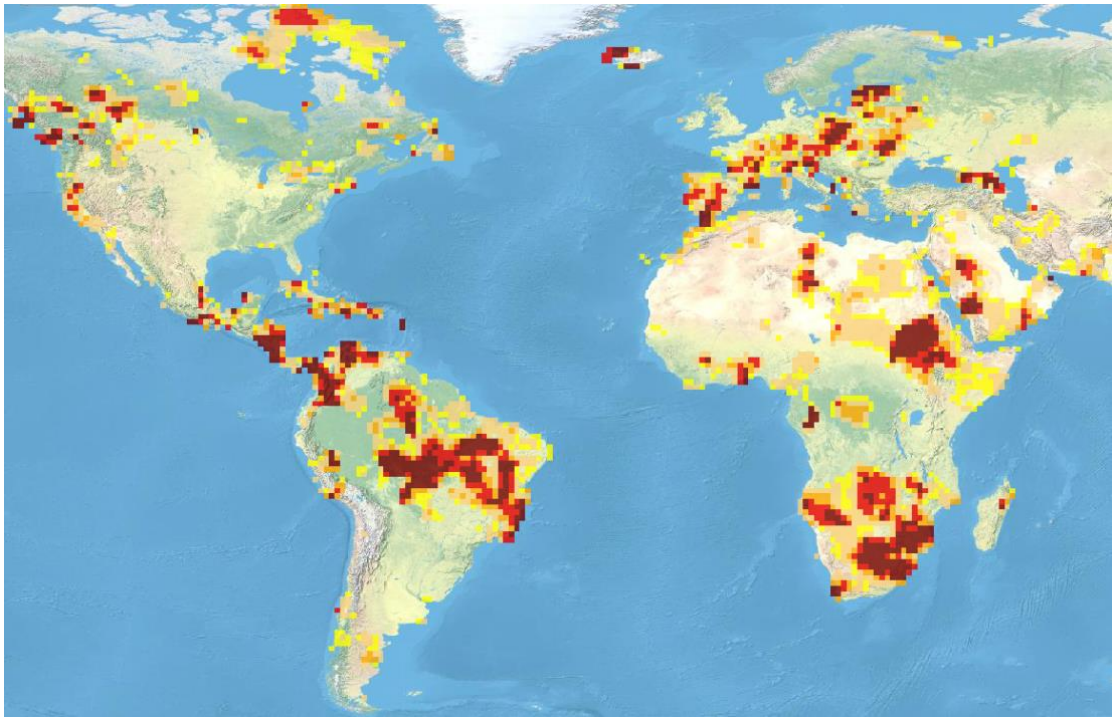
- Global Precipitation Climatology Center GPCC satellite derived Standardized Precipitation Index
- Represents the 3 month accumulated rainfall deficit
- Darker colors represent larger rainfall deficits

At the end of December 2015, El Nino continues to exert its influence

From the Global Drought Information System (http://www.drought.gov/gdm/content/welcome)

Rainfall impacts:
Drought

- In Europe, drought conditions:
  - Eased over the United Kingdom
  - Intensified around the Mediterranean Sea
- In Africa
  - drought intensified in the southern and northern portions of the continent
  - In Ethiopia, both harvests failed in parts of the country this year leaving one-tenth of the population in need of food aid.
- In South America
    - strong drought continues to impact the northern part of the continent

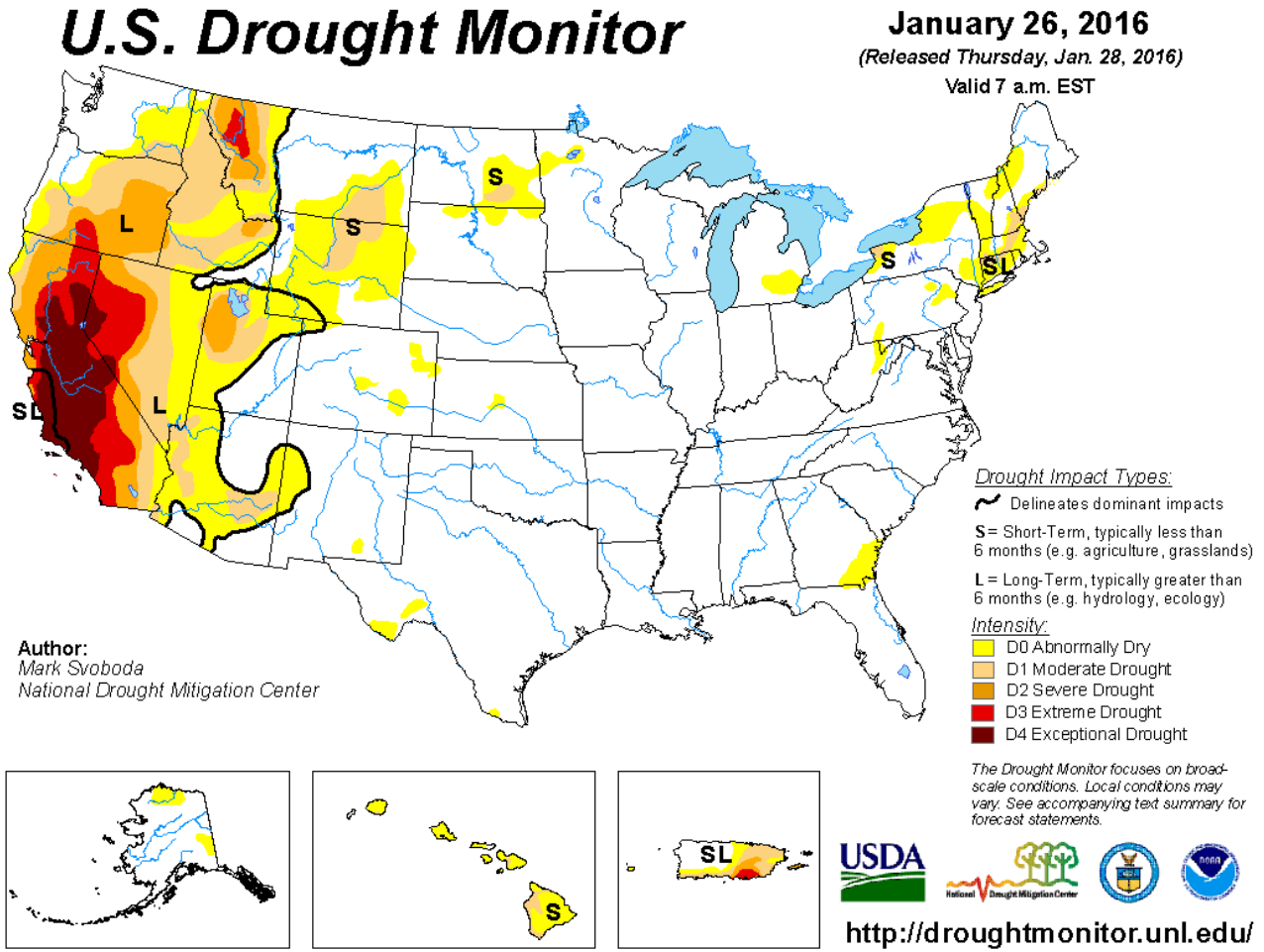


- Drought in Cuba is affecting over one million people and reducing the rice harvest during what is being characterized as their worst drought in 115 years

Rainfall impacts:

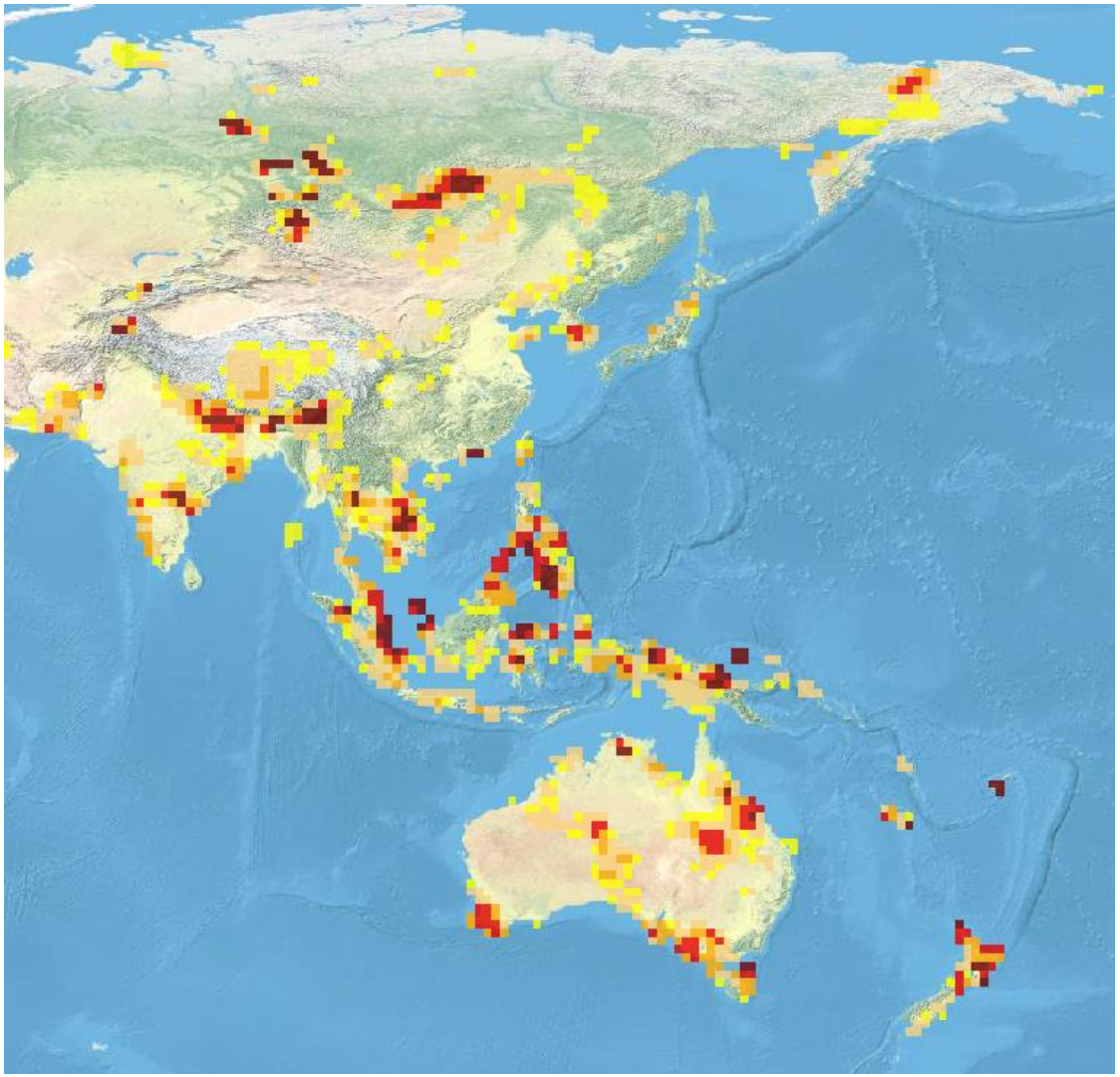
Drought

- California
  - Heavy rainfall in January
  - above-average snowpack
  - rising reservoirs in many areas
  - California State Water Resources Control Board recently approved an 8-month extension of existing drought-related emergency regulations
  - Drought situation in California remains very serious
- In Hawaii
  - Many areas received less than 20 percent of average rainfall for January
  - Though impacts are not that noticeable yet, they are expected to be in coming weeks
  - Especially if the outlooks for continuing dry weather verify



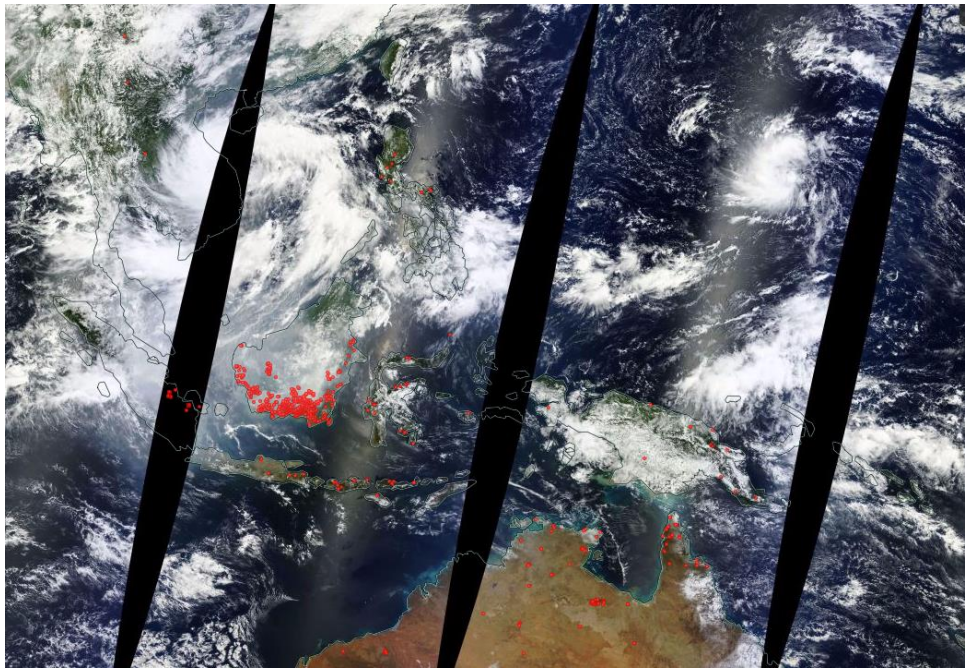
Rainfall impacts:
Drought in Asia and the Pacific

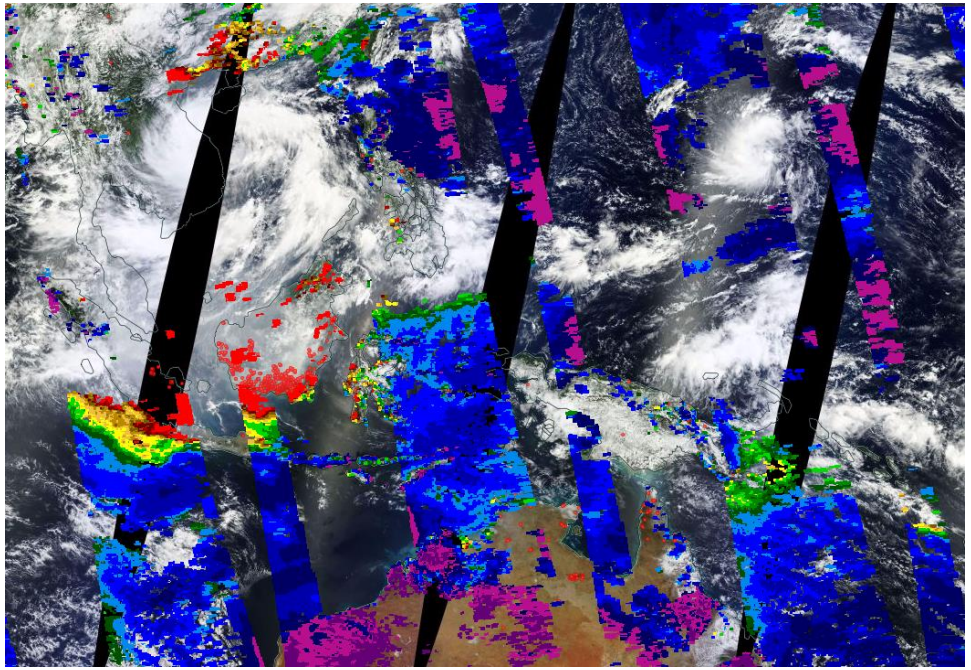
- In Asia
  - Drought remains entrenched in the Southeast and across the Indian sub-continent
  - Reduced water supplies and water-borne disease has led to the death of 16 children in the Thar district of Pakistan
- In Oceana
  - Drought improved slightly across Central Australia
  - Intensified over New Zealand



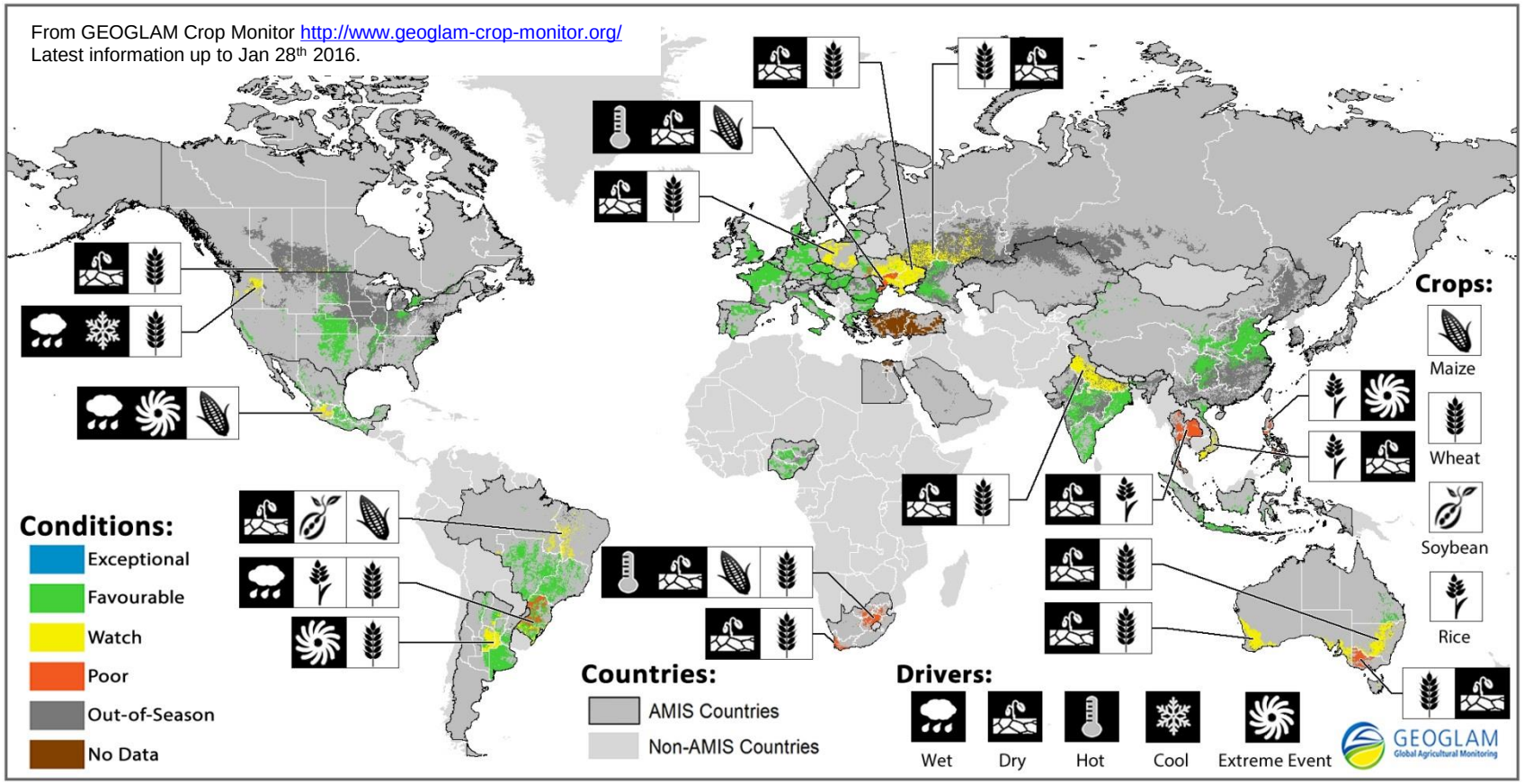
Borneo fires

- Sep 14 2015
- Top MODIS Terra true color and thermal anomalies
- Bottom MODIS Terra Aerosol Optical Depth
- This type of widespread fires was also seen during 1997



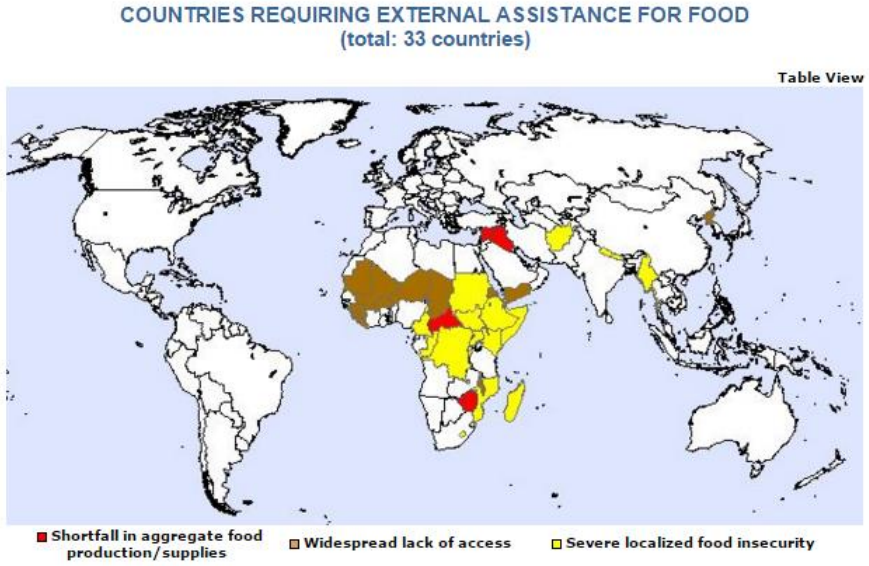


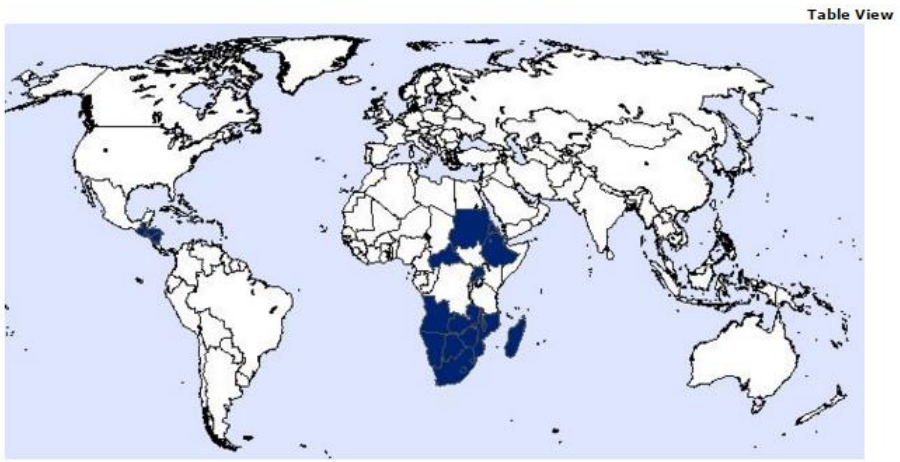
Global crops



- Northern hemisphere is largely out of season for most crops
  - Conditions largely favorable
  - Watch and Poor conditions in countries near the Black Sea
- Southern hemisphere is in season for most crops
  - Conditions are generally favorable
  - In South Africa, the growing season has been characterized by severe drought, with many crop growing areas having their driest early season since 1981

UN Food and Agriculture Organization Global Information and Early Warning System



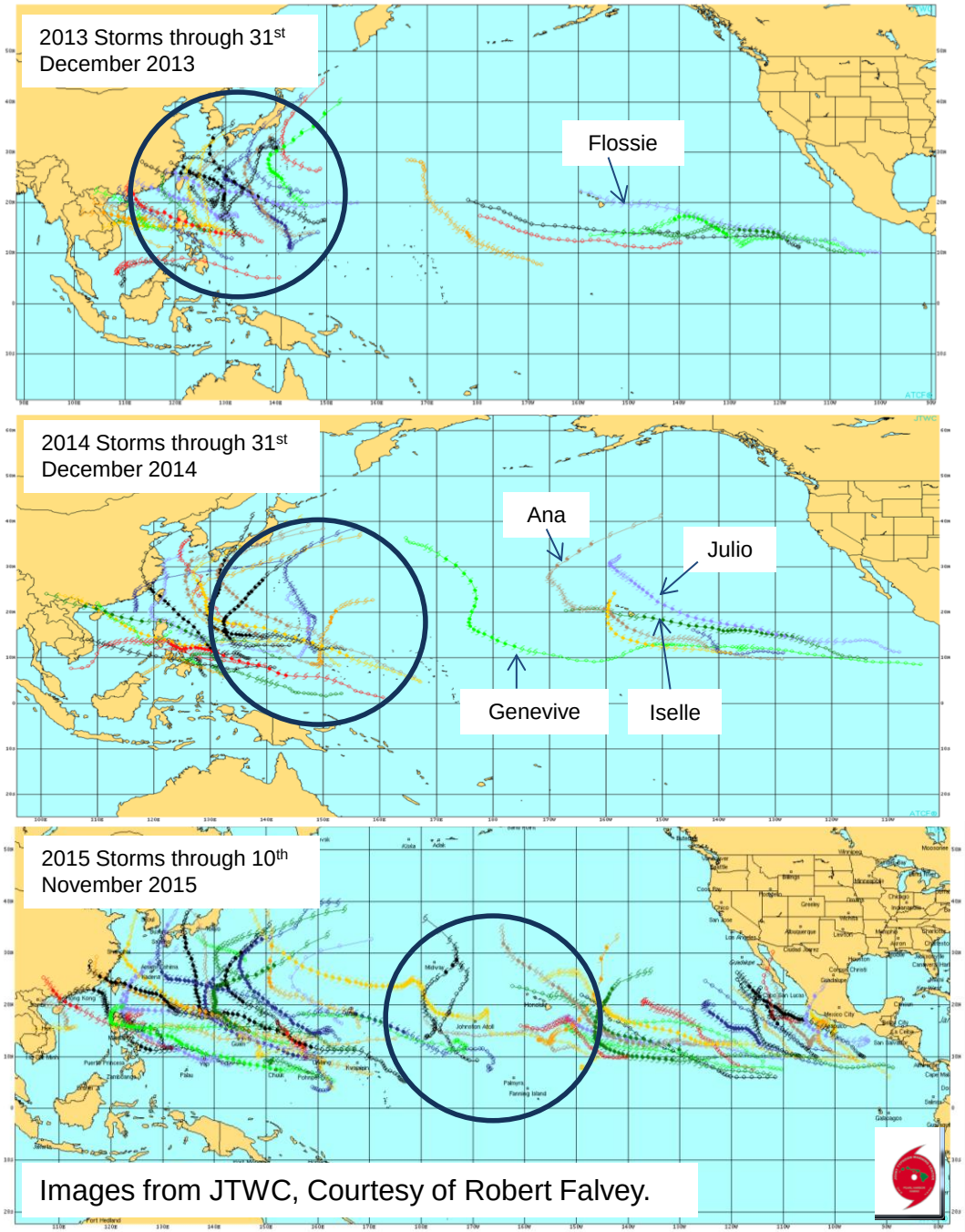


- In Southern Africa
  - Maize prices rose further in November
  - Sharp subregional production decline in 2015
  - Dry conditions affecting the start of the 2016 crop season added to upward pressure on prices
- In East Africa,
  - significant cereal price increases were observed in most countries of the subregion
  - Prices reached exceptionally high levels
    - South Sudan, due to the current economic downturn, as well as in
    - Uganda and the United Republic of Tanzania, as a result of sustained regional demand and reduced harvests this year

FAO FPMA Bulletin Dec 2015
http://www.fao.org/giews/English/hotspots/map.htm

Tropical Cyclones

- West Pacific
  - 2013, 33 TCs, 5 Super Typhoons
  - 2014, 23 TCs, 8 Super Typhoons
  - 2015, 27 Cyclones, including 8 Super Typhoons
    - (In-Fa, Melor and Onyok missing)
  - Tropical Cyclone genesis region has shifted eastward well to the east of Guam
- East/Central Pac.
  - 2013, 6 TCs form or move over the Central Pac, none of hurricane intensity
  - 2014, 6 TCs form or move over the Central Pac., 5 of which attain Hurricane intensity
  - 2015, 8 Cyclones form in the Central Pacific basin and 8 more moved into the basin from the east, 8 attained or maintained Hurricane intensity in the Central Pacific basin

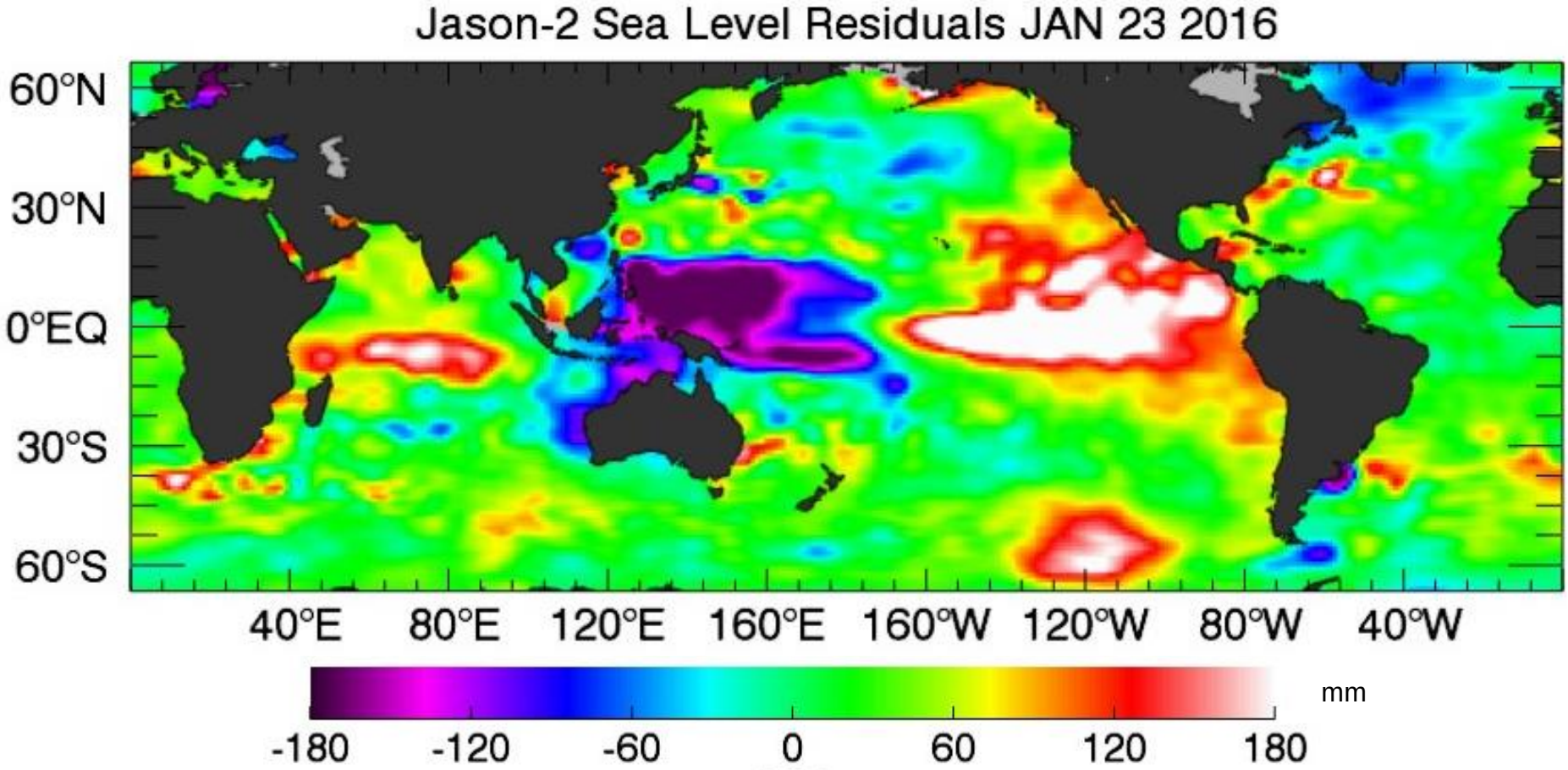


USAID
FROM THE AMERICAN PEOPLE

EL NIÑO-RELATED DISASTERS

How USAID's Office of U.S. Foreign Disaster Assistance is Preparing and Responding

Sea Level Observation



Sea Levels have been

- Below average over Western Pacific Basin
- Above average over the Central and Eastern Pacific

PEAC Sea Level Stations

US Affiliated Pacific Islands

Table 2 : Observed MEAN and MAX sea level anomaly in inches for OND 2015

Tide Gauge Station	Observed MEAN Anomaly				Observed MAX Anomaly			
	October 2015	November 2015	December 2015	Standard Deviation of the OND mean	October 2015	November 2015	December 2015	Standard Deviation of the OND max
Marianas, Guam	-6	-1.5	-4.5	4.1	-6.8	-1.4	-6.5	3.3
Malakal, Palau	-7	-7	-5	4.6	-5.7	-6.8	-8.2	4.2
Yap, FSM	-8	-4	-4	4.6	-7.6	-3.8	-4.8	4.9
Chuuk, FSM	*	*	*	*	*	*	*	*
Pohnpei, FSM	-4	-4	-4.5	4.7	-4.7	-6.8	-7.4	4.2
Majuro, RMI	-5	-5	-2	3.5	-5.9	-4.3	-4.1	3.7
Kwajalein, RMI	-6.5	-6.3	-3.5	3.6	-7.2	-6.8	-7.1	3.8
Pago Pago, American Samoa	+9	+9	+8	3.1	+2.0	+1.5	-1	3.2
Honolulu, Hawaii	+1.5	0	+1	1.7	+0.7	-0.2	+1.5	2.5
Hilo, Hawaii	+4	+2	-0.5	1.8	+6.1	+1	+1	2.4

*** Denotes where data is unavailable**

*+/- indicate positive anomaly (rise) and negative anomaly (fall) respectively. Note that any changes between (0~ ±1) inch is considered to be negligible. Also note that changes within the range of (+/-) 2 inches are unlikely to cause any adverse climatic impact. ** Guesstimated values, * Data currently unavailable; Figures in parenthesis are year-to-year seasonal anomaly.*

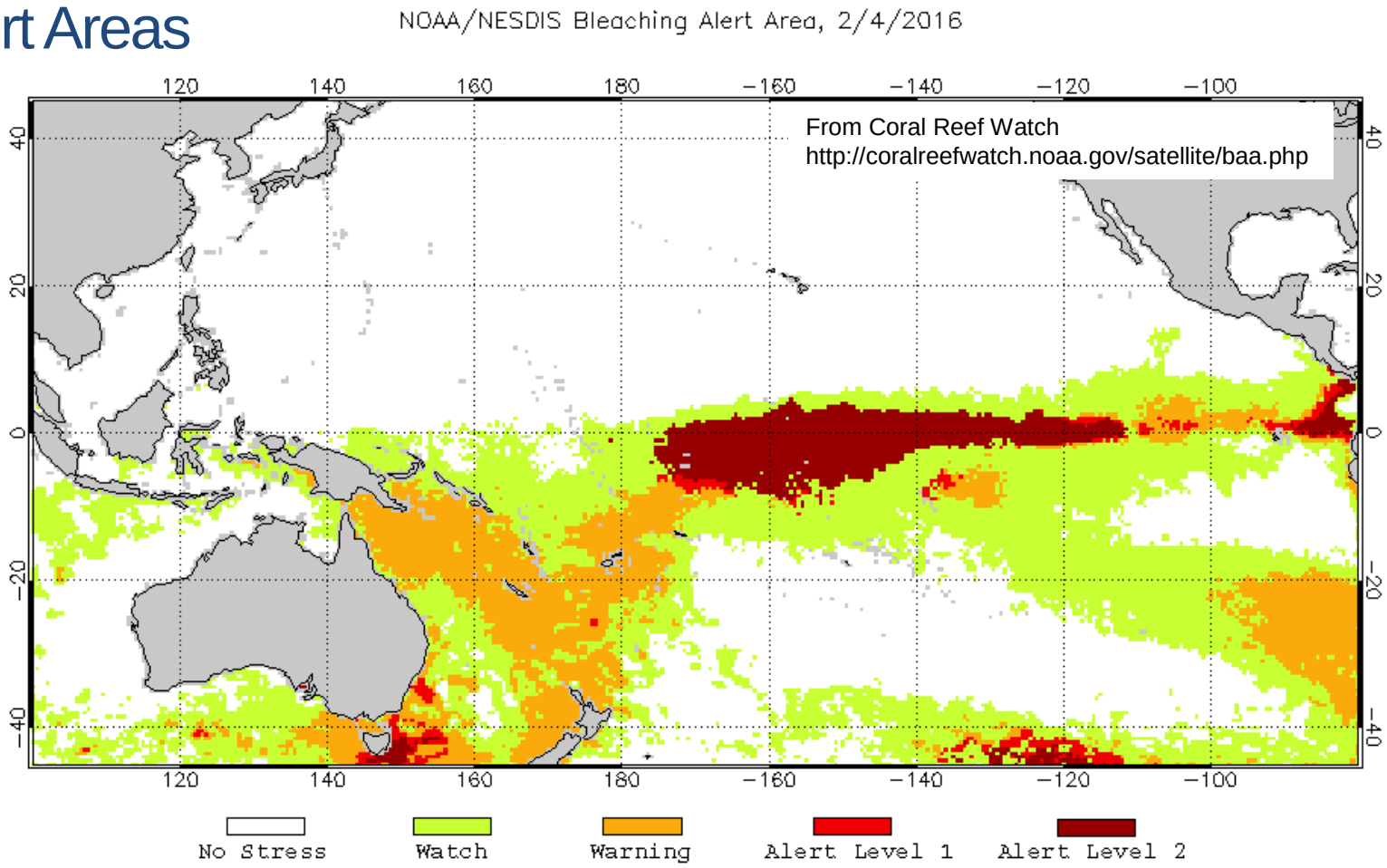
1: Difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value at each station (seasonal cycle removed); 2: Same as 1 except for maxima; SD stands for standard deviations.

Remarks:

- This current fall of sea level is significant compared to the values of DJF of 2014-15
- Current sea level still remains higher than the sea level minima observed during the historically strongest El Niño year 1997-98
- Some stations have already started displaying rise indicating a turning point for normal state
- The Pacific basin has not experienced the strongest impacts like that of 1982-83 and 1997-98
- In addition to ENSO, there are other factors (i.e., PDO, IOD etc.) equally important for causing sea level variability in the vicinity of USAPI

Coral Bleaching

Alert Areas



- Most of the Tropical South Pacific Basin is under Watch status
- The Central an Eastern Pacific show large areas of Level 2 alert (mortality likely)
- Alert level areas collocated with warmest SST anomalies
- Low sea levels may also be playing a role over the southwest Pacific

How ENSO effects global health

THE LANCET • Published online May 20, 2003 • http://image.thelancet.com/extras/02art5336web.pdf

Review

El Niño and health

R Sari Kovats, Me

El Niño Souther
consequences f
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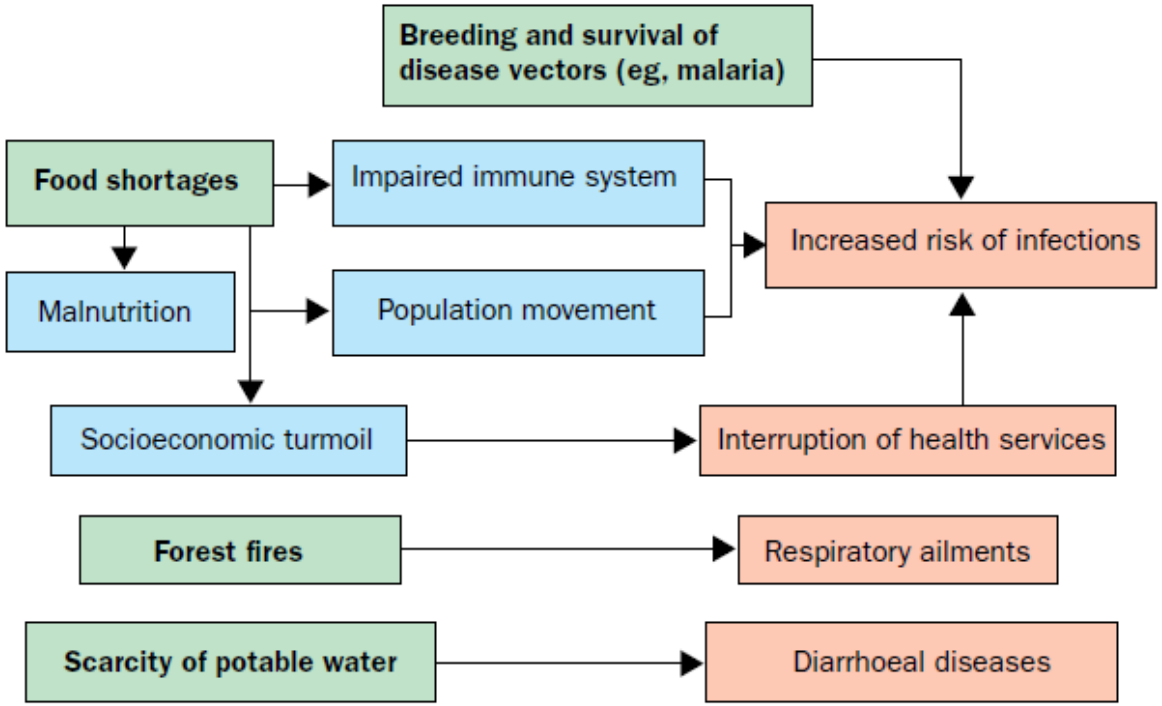
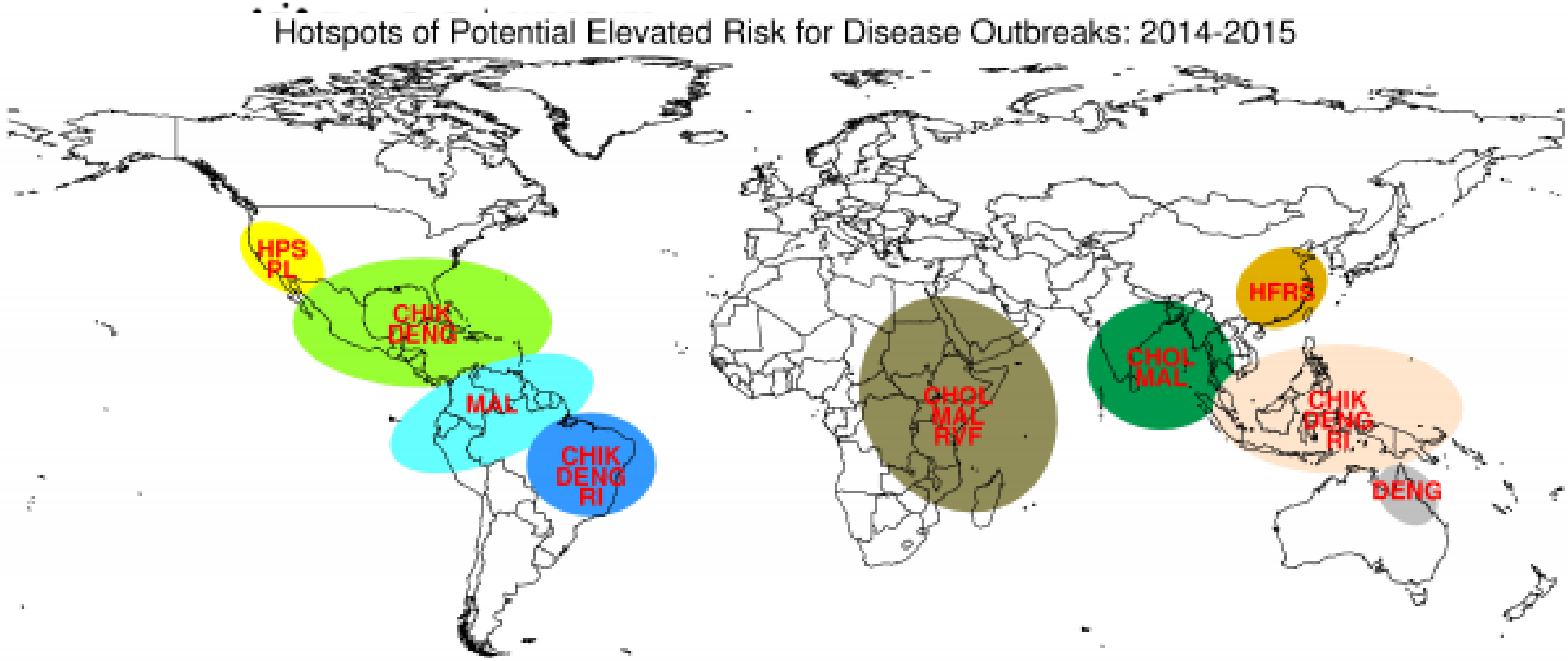


Figure 2: **Potential health effects of drought in developing countries**

ENSO and global health



CHIK Chikungunya
CHOL Cholera
DENG Dengue Fever
HFRS Hemorrhagic Fever with Renal Syndrome
HPS Hantavirus Pulmonary Syndrome
MAL Malaria
PL Plague
RI Respiratory Illness
RVF Rift Valley Fever

ABSTRACT

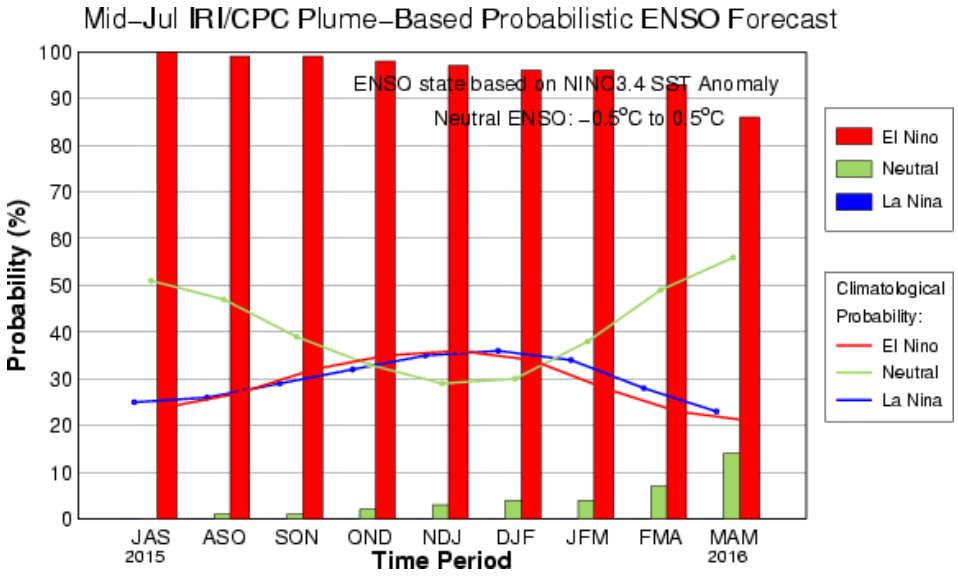
Background: The El Niño/Southern Oscillation (ENSO) is a global climate phenomenon that impacts human infectious disease risk worldwide through droughts, floods, and other climate extremes. Throughout summer and fall 2014 and winter 2015, El Niño Watch, issued by the US National Oceanic and Atmospheric Administration, assessed likely El Niño development during the Northern Hemisphere fall and winter, persisting into spring 2015.

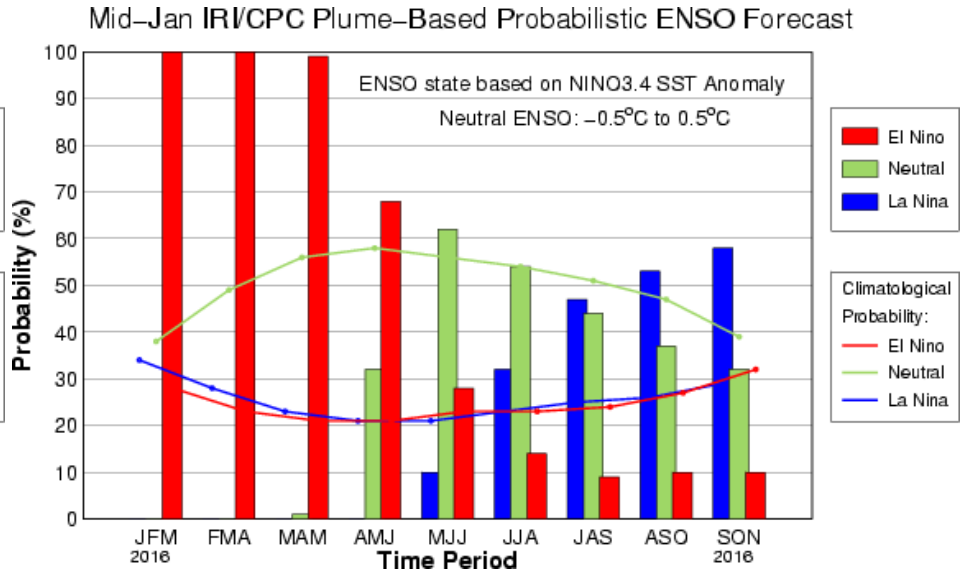
Forecast

ENSO forecasts

Rainfall, Sea level, Tropical Cyclones and Coral Bleaching

CPC/IRI ENSO Forecast





CPC/IRI EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

Expected Conditions

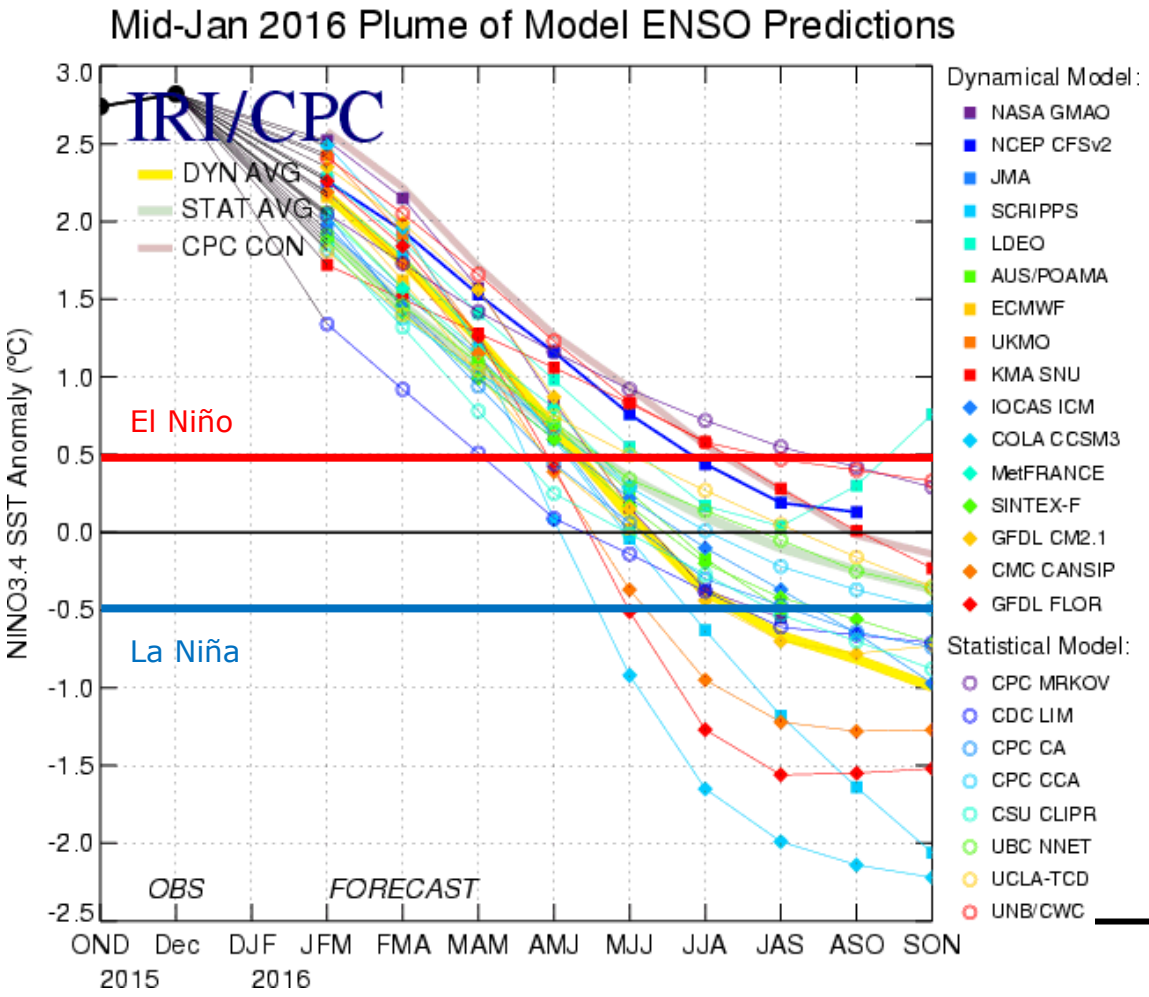
- The chance of El Niño gradually decreases into the spring and ENSO-neutral is favored by May-June-July (MJJ) 2016
- The chance of La Niña increases to 40% in August-September-October (ASO) 2016

Season	La Niña	Neutral	El Niño
JFM 2016	~0%	~0%	100%
FMA 2016	~0%	~0%	100%
MAM 2016	~0%	1%	99%
AMJ 2016	~0%	32%	68%
MJJ 2016	10%	62%	28%
JJA 2016	32%	54%	14%
JAS 2016	47%	44%	9%
ASO 2016	53%	37%	10%
SON 2016	58%	32%	10%

Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service
College Park, MD 20740

http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

CPC/IRI ENSO Forecast



http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table
http://iri.columbia.edu/ourexpertise/climate/forecasts/enso/current/?enso_tab=enso-iri_update
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table

CPC/IRI EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

Expected Conditions

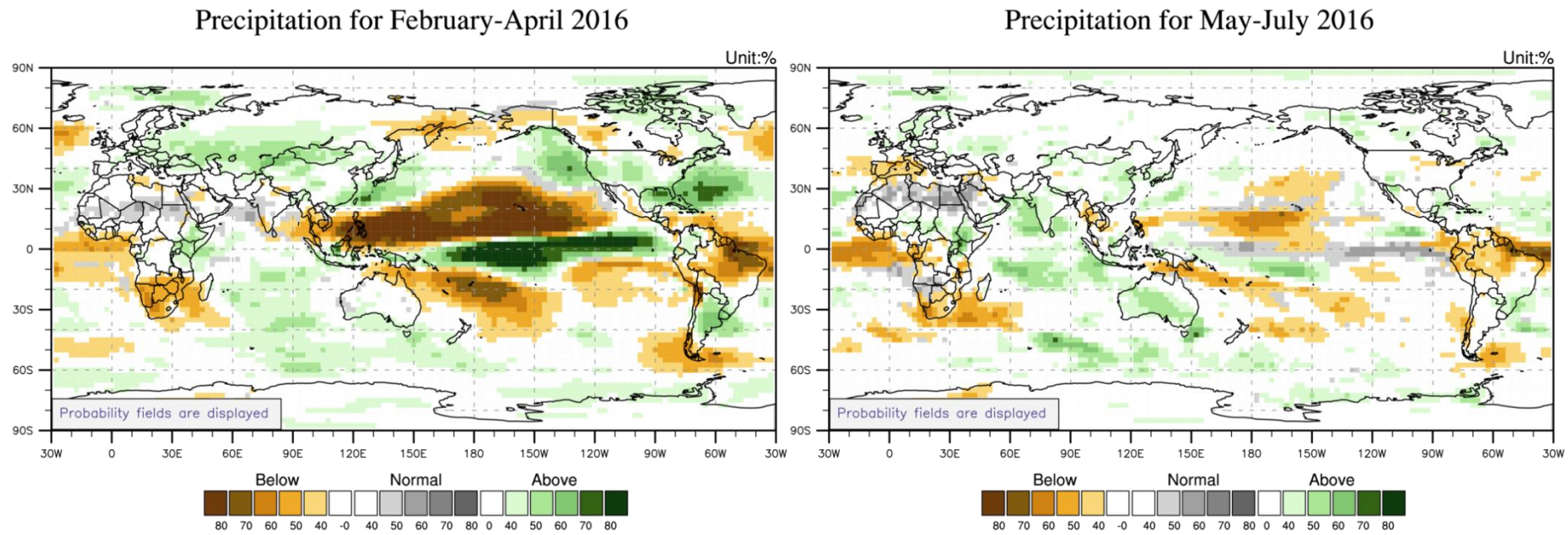
- Most models indicate that a strong El Niño will weaken with a transition to ENSO-neutral during the late spring or early summer
- The forecasters are in agreement with the model consensus, though the exact timing of the transition is difficult to predict.
- A strong El Niño is expected to gradually weaken through spring 2016, and to transition to ENSO-neutral during late spring or early summer

Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service
College Park, MD 20740

Average Niño 3.4 SST Anomaly Forecast

	JFM	FMA	MAM
Dynamical	*2.2*	*1.7*	*1.2*
Statistical	*1.9*	*1.5*	*1.1*
All Models	2.1	1.6	1.2

Tropical Rainfall Forecasts (Feb 2016-Jul 2016)

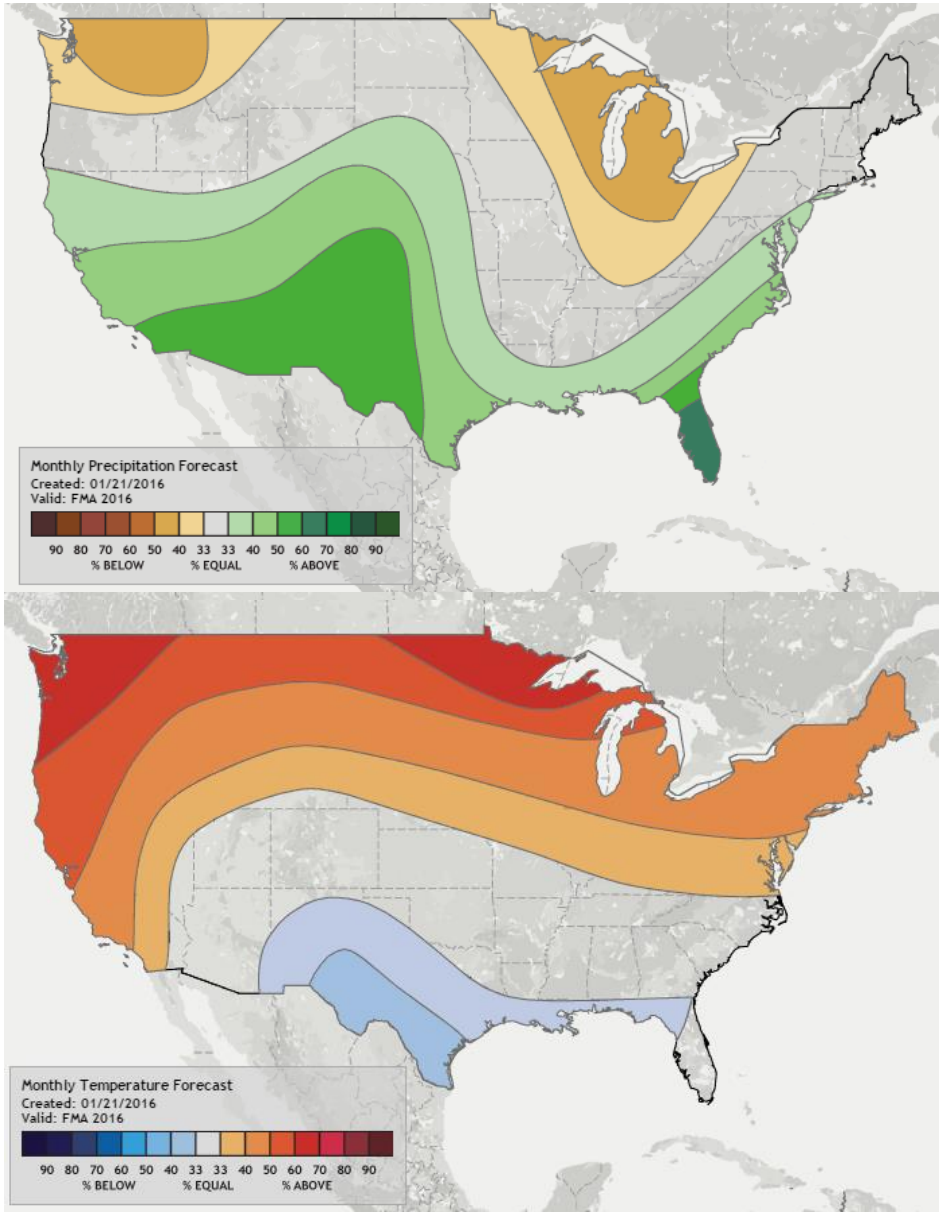


From: http://www.apcc21.org/ser/outlook.do?lang=en

- Model captures well the expected tropical El Niño rainfall anomaly pattern
  - “Horse shoe pattern”
  - Dry conditions over the Western Pacific
  - Wet over the Central and Eastern Pacific
  - Dry over South America
- Model transitions to weaker anomalies, closer to neutral conditions by MJJ

Continental US Forecast

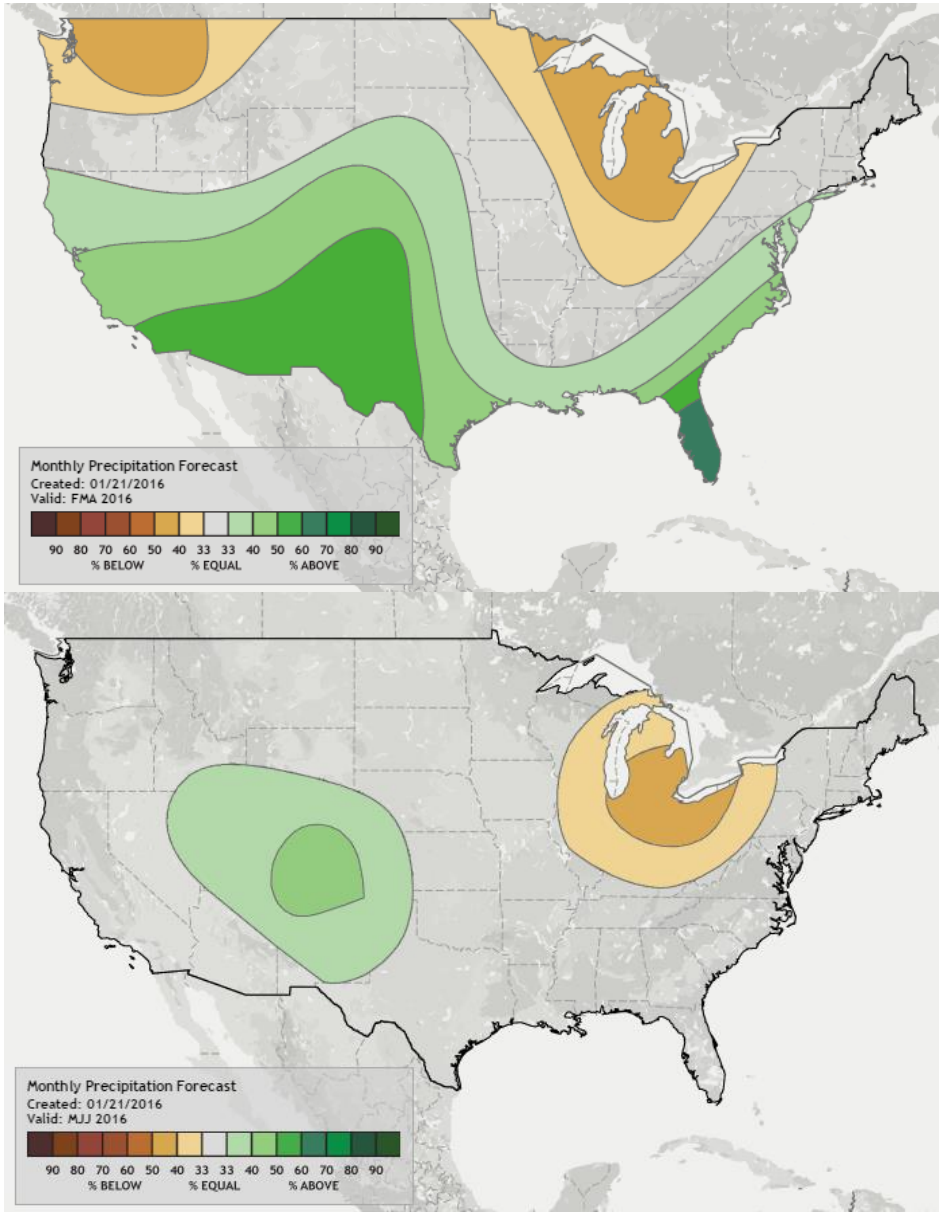
- During the next 3 months
  - Southern US likely wet and cool
  - Northern US dry and cold
  - The California likely to be warm and wetter than normal



From: http://www.cpcpara.ncep.noaa.gov/

Continental US Forecast (rainfall)

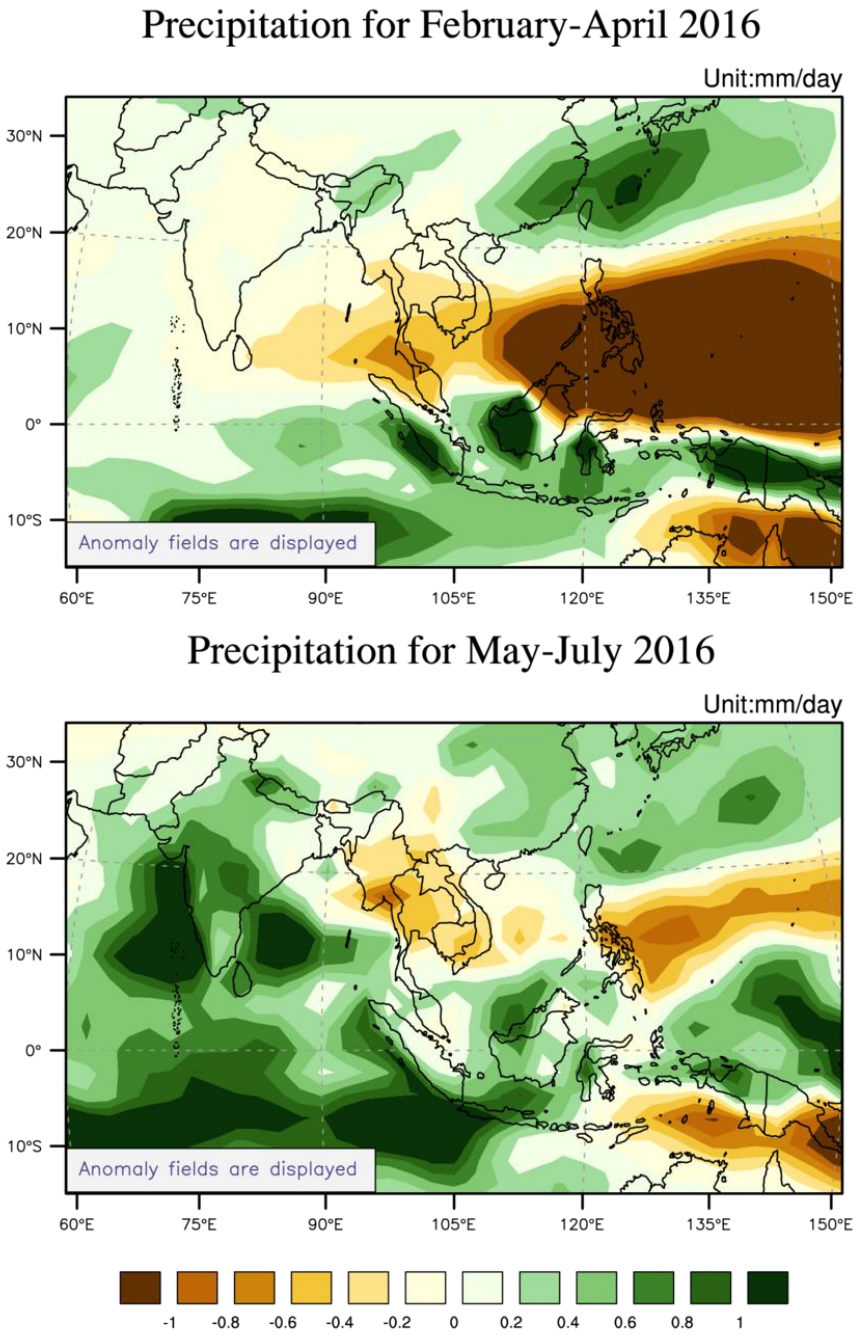
- Rainfall anomalies associated with El Niño are expected to last through April
- Quickly give way to near normal conditions by May
- Drought conditions in California have been present for a long time, and are likely to remain past this el Niño event



From: http://www.cpcpara.ncep.noaa.gov/

Asia Pacific

- Dry conditions likely to continue over the tropical Western North Pacific
  - Western Pacific Islands will likely see severe drought
- Eastern China likely to receive above average rainfall for the next 6 months
- India
  - Above average rainfall in the Brahmaputra-Meghna area
  - May-July wet conditions over the entire subcontinent
- Philippines projected to receive below average rainfall
- Mainland Southeast Asia likely to see dry conditions slightly improve over the next 6 months
- Maritime Southeast Asia will start getting more rain and relief from severe drought



From: http://www.apcc21.org/ser/outlook.do?lang=en

US Affiliated Pacific Islands

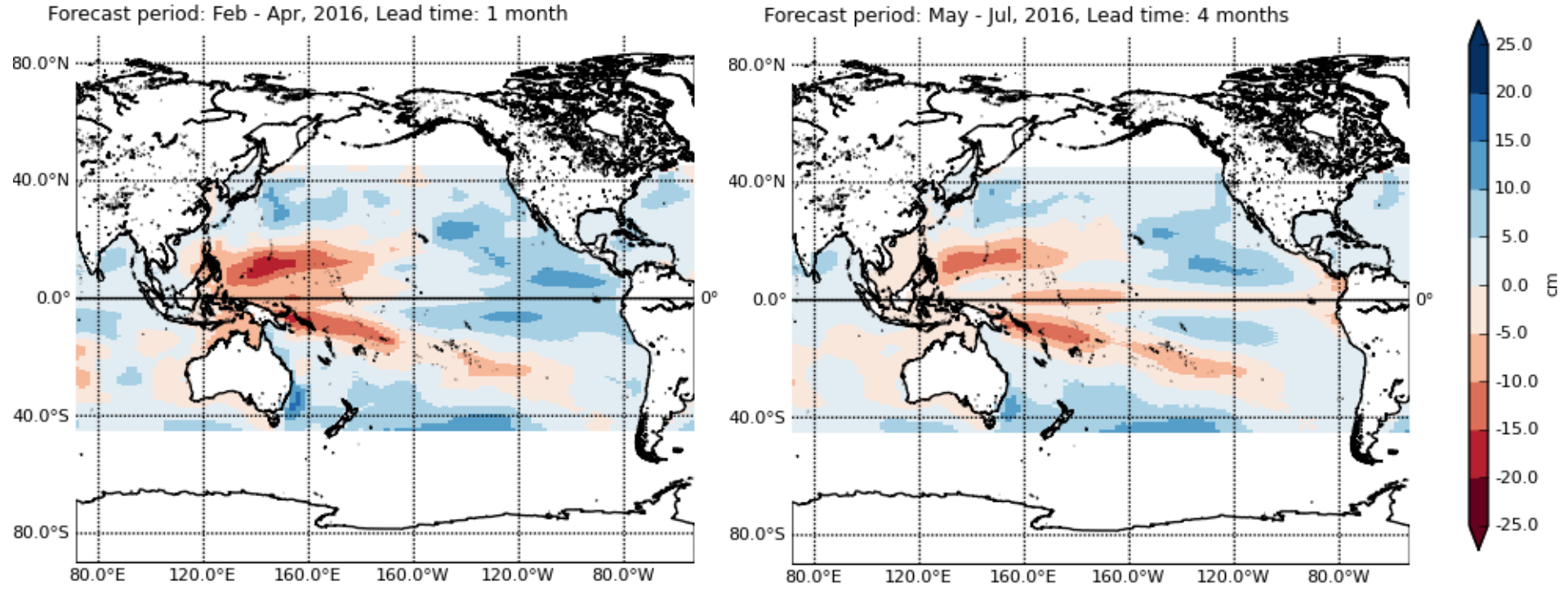
January - February - March (JFM) 2016

Model:		UKMO	ECMWF	NCEP CA	NASA GMAO	NCEP Coupled	IRI	APCC	PEAC CCA	Final Outlook	Final Probabilities
Republic of Palau											
Koror	L 7 ° 22' N, λ 134° 32' E	Below	Below	N/A	Below	Below	Below	Below	Below	Below	60:25:15
Federated States of Micronesia											
Yap	L 9° 29' N, λ 138° 05' E	Below	Below	N/A	Below	Below	Below	Below	Below	Below	60:25:15
Chuuk	L 7° 28' N, λ 151° 51' E	Below	Below	N/A	Below	Below	Below	Below	Below	Below	60:25:15
Pohnpei	L 6 ° 59' N, λ 158° 12' E	Below	Below	N/A	Below	Below	Below	Below	Below	Below	60:25:15
Kosrae	L 5 ° 21' N, λ 162° 57' E	Below	Below	N/A	Avg-Below	Below	Below	Below	Below	Below	55:25:20
Republic of the Marshall Islands											
Kwajalein	L 8 ° 43' N, λ 167° 44' E	Below	Below	N/A	Below	Below	Below	Below	Below	Below	55:25:20
Majuro	L 7° 04' N, λ 171° 17' E	Below	Below	N/A	Avg-Below	Below	Below	Below	Below	Below	50:25:25
Guam and CNMI											
Guam	L 13 ° 29' N, λ 144° 48' E	Below	Below	N/A	Below	Avg-Below	*Clim*	Below	Below	Below	60:25:15
Saipan	L 15 ° 06' N, λ 145° 48' E	Below	Below	N/A	Avg-Below	Avg-Below	*Clim*	Below	Below	Below	50:30:20
American Samoa											
Pago Pago	L 14 ° 20' S, λ 170° 43' E	Below	Below	N/A	Avg-Above	Below	Below	Below	*Clim*	Below	45:30:25
State of Hawaii											
Lihue	L 21 ° 59' N, λ 159 ° 20' E	Below	Below	N/A	Below	Avg-Below	Below	Below	Avg-Below	Below	50:30:20
Honolulu	L 21 ° 19' N, λ 157° 56' W	Below	Below	N/A	Below	Avg-Below	Below	Below	*Clim*	Below	50:30:20
Kahului	L 20 ° 54' N, λ 156° 26' E	Below	Below	N/A	Below	Avg-Below	Below	Below	*Clim*	Below	50:30:20
Hilo	L 19 ° 43' N, λ 155° 03' E	Below	Below	N/A	Below	Avg-Below	Below	Below	Avg-Below	Below	50:30:20

People line up for water in the Marshall Islands in early 1998 to receive a ration once every 14 days. (Photo courtesy of Federal Emergency Management Agency)

Forecasts for the JFM season issued on January 17 2016 available at http://www.weather.gov/peac/

Sea Level Forecasts



- Sea Level across the Western Pacific Basin has been well below average since early 2015 and is expected to
  - Start returning to normal over the next few months
  - Stay below normal through July 2016

http://poama.bom.gov.au/experimental/pasap/sla.shtml

US Affiliated Pacific Islands

Sea level forecast

Table 1 : Forecasts of MEAN and MAX sea level anomaly in inches for DJF 2015-2016

Tide Gauge Station	Forecast Anomaly for DJF 2015-2016 (in inches)			
	MEAN Deviation(1)	Standard Deviation DJF season	MAX Deviation (2)	Standard Deviation of DJF season
Marianas, Guam	-4	4.1	-1	4.4
Malakal, Palau	-7	5.2	-5	5.2
Yap, FSM	-5	4.9	-2	5.0
Chuuk, FSM**	-5	*	-2	*
Pohnpei, FSM	-5	4.4	-4	4.9
Kapingamarangi, FSM	*	*	*	*
Majuro, RMI	-5	3.2	-2	3.0
Kwajalein, RMI	-4	3.7	-3	3.8
Pago Pago, American Samoa	-2	3.3	0	3.8
Honolulu, Hawaii	+2	1.6	+2	2.3
Hilo, Hawaii	+3	1.9	+1	2.8

(*) Data Unavailable
Values for Chuuk (**) are guesstimated based on estimates from neighboring tide stations and observations from WSO Chuuk.
Deviations between 0~±1 inch are considered to be negligible and are denoted by ***(+/-).
Deviations withing the range of (+/-) 2 inches are unlikely to cause any adverse climatic impact.

1: *Difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value at each station (seasonal cycle removed);* 2 : *Difference between the maximum sea level for the given month and the 1983 through 2001 average maximum sea level value at each station (seasonal cycle removed)*

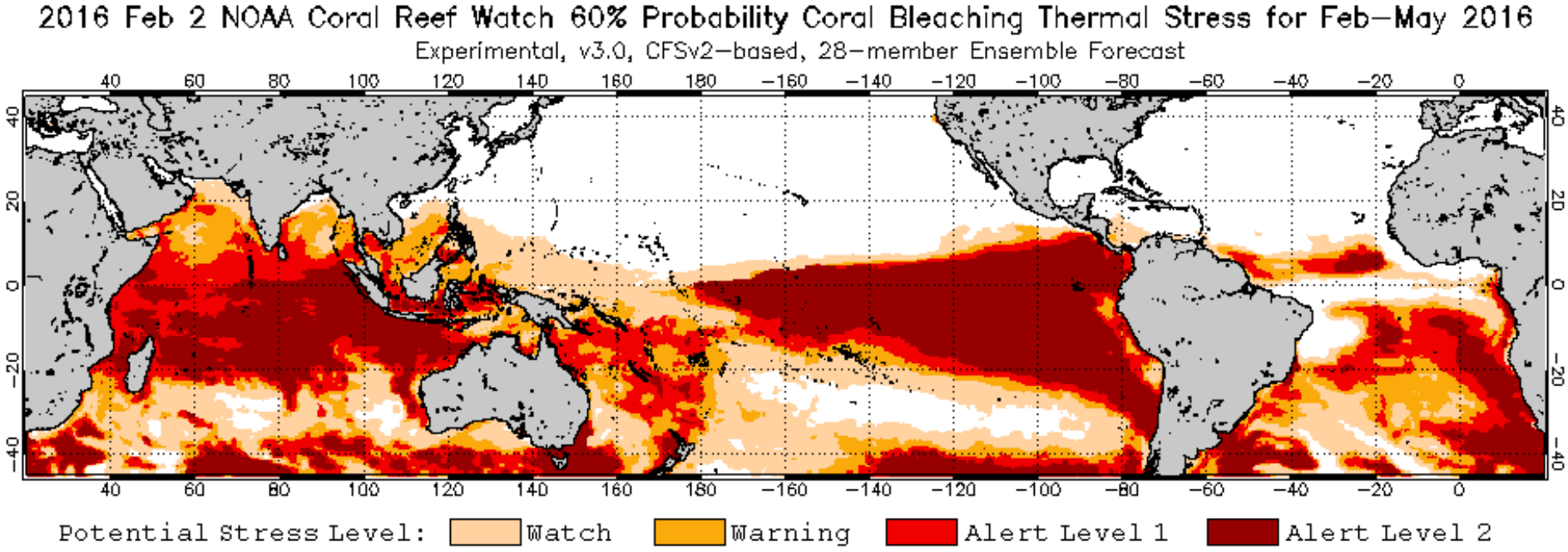
Forecasts for the DJF season issued on December 12 available at http://www.weather.gov/peac/

Tropical Cyclone Forecast

- Western Pacific Basin (Based on City University of Hong Kong Forecast)
  - Can have TCs year round, but has a minimum f activity in February and march
  - Forecast issued in April and July for June1 to November 30
  - Based on the forecasts for 2007/2008 & 2010/2011 la Nina suggest decreased TC activity
- Central Pacific Basin
  - TC season June 1 to November 30
  - Based on climatology, decreased activity
- US Affiliated Pacific Islands (Based on PEAC Center Forecast)
  - The risk of a damaging tropical cyclone in Micronesia is greatly enhanced by El Niño
  - This is likely to continue through 2015 and into January 2016 across Micronesia from Guam all the way eastward to the RMI
  - American Samoa may face a busy 2015-2016 cyclone season with highest risk from November to January and decreased risk from February to April
- Australia (Based on Australian BOM Forecast)
  - Below Average Cyclone season, Nov 1 – Apr 30
  - Usually later season cyclones
- Indian Ocean (Mauritius Meteorological service)
  - Season Nov 1 to May 15
  - An average season, with around seven to nine cyclones forming
  - The equatorial region to the north of Mauritius could be significantly conducive

Coral Bleaching

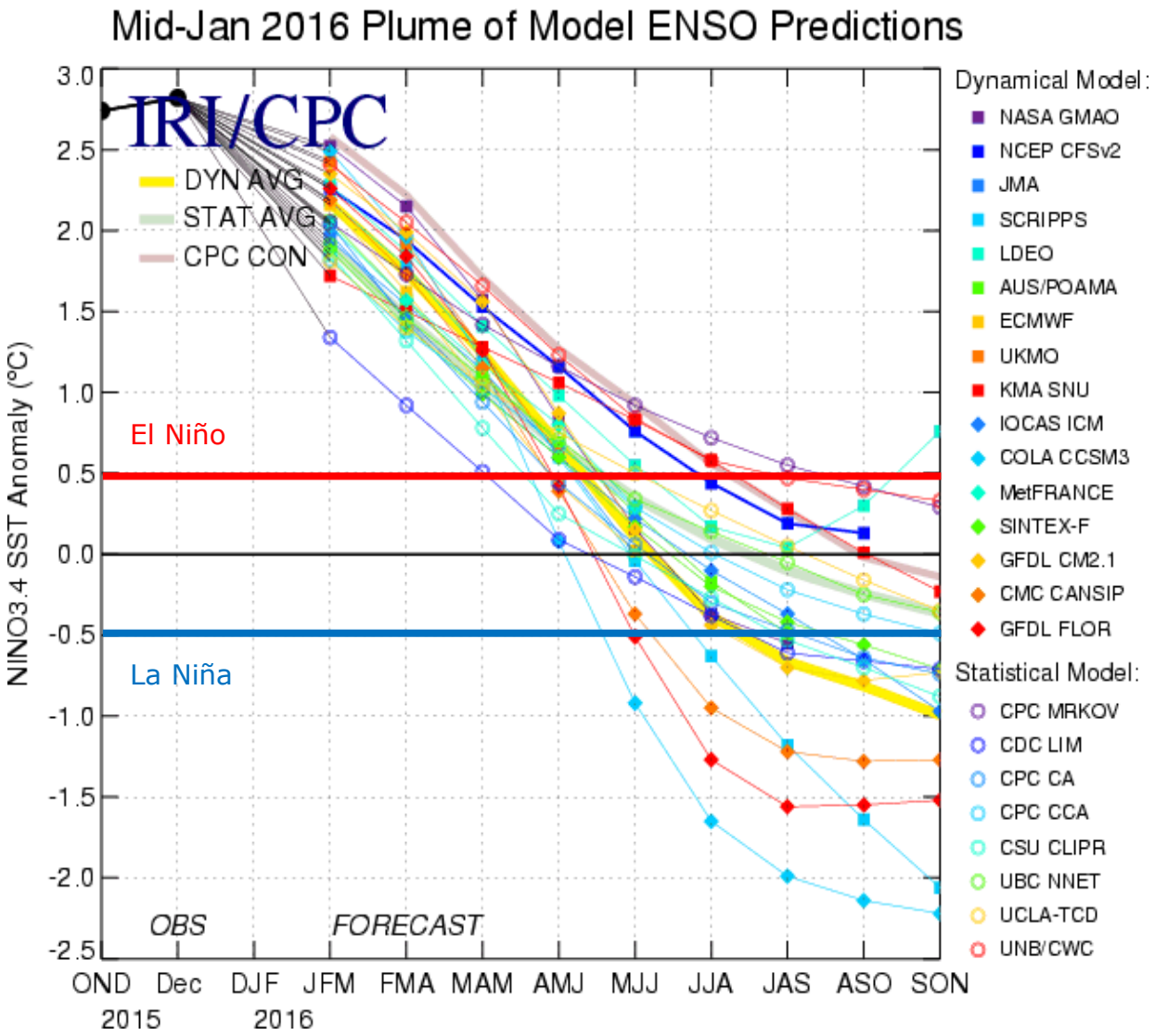
Outlook



- High probability of Coral Bleaching across the Southern Pacific
- Indian Ocean

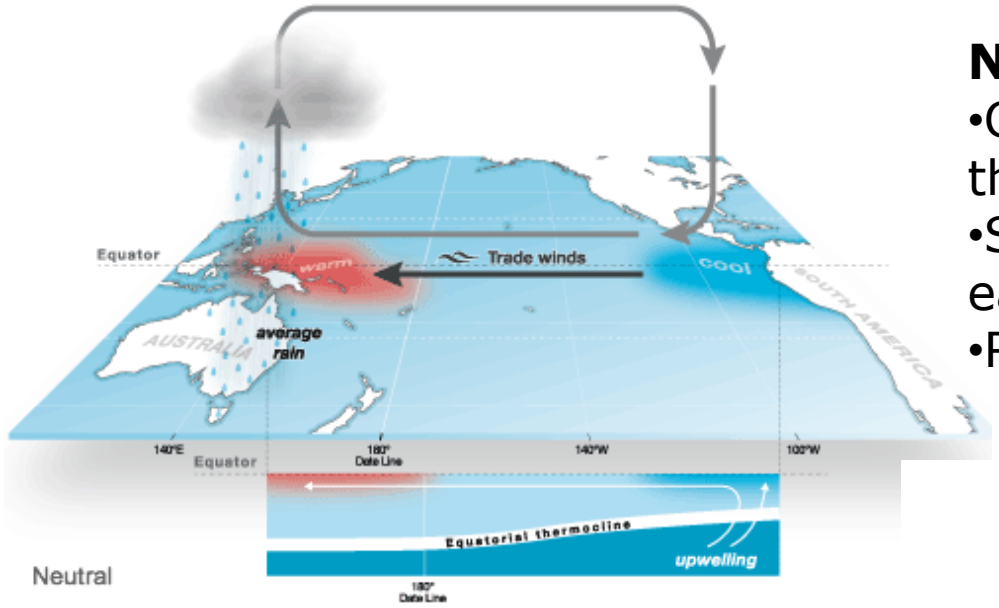
From Coral Reef Watch
http://coralreefwatch.noaa.gov/satellite/baa.php

The possibility of a La Niña



http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

La Niña in a nutshell

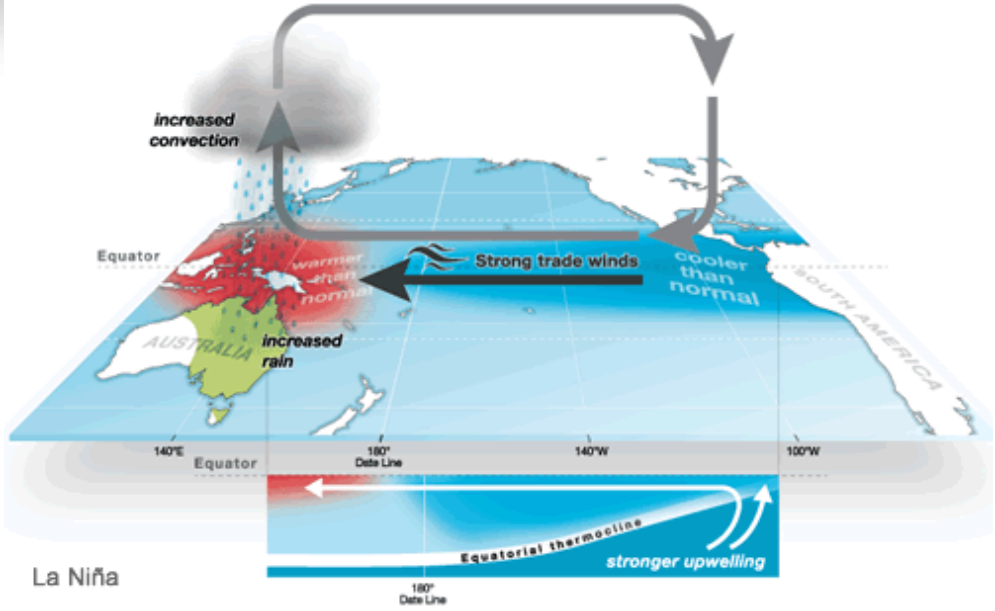


Neutral Conditions:

•Cold sea surface temperatures to the east and warm to the west

•Strong trade winds blowing from east to west

•Rainfall over the Western Pacific



La Niña Conditions:

•Colder than normal sea surface temperatures to the east and warmer than normal to the west

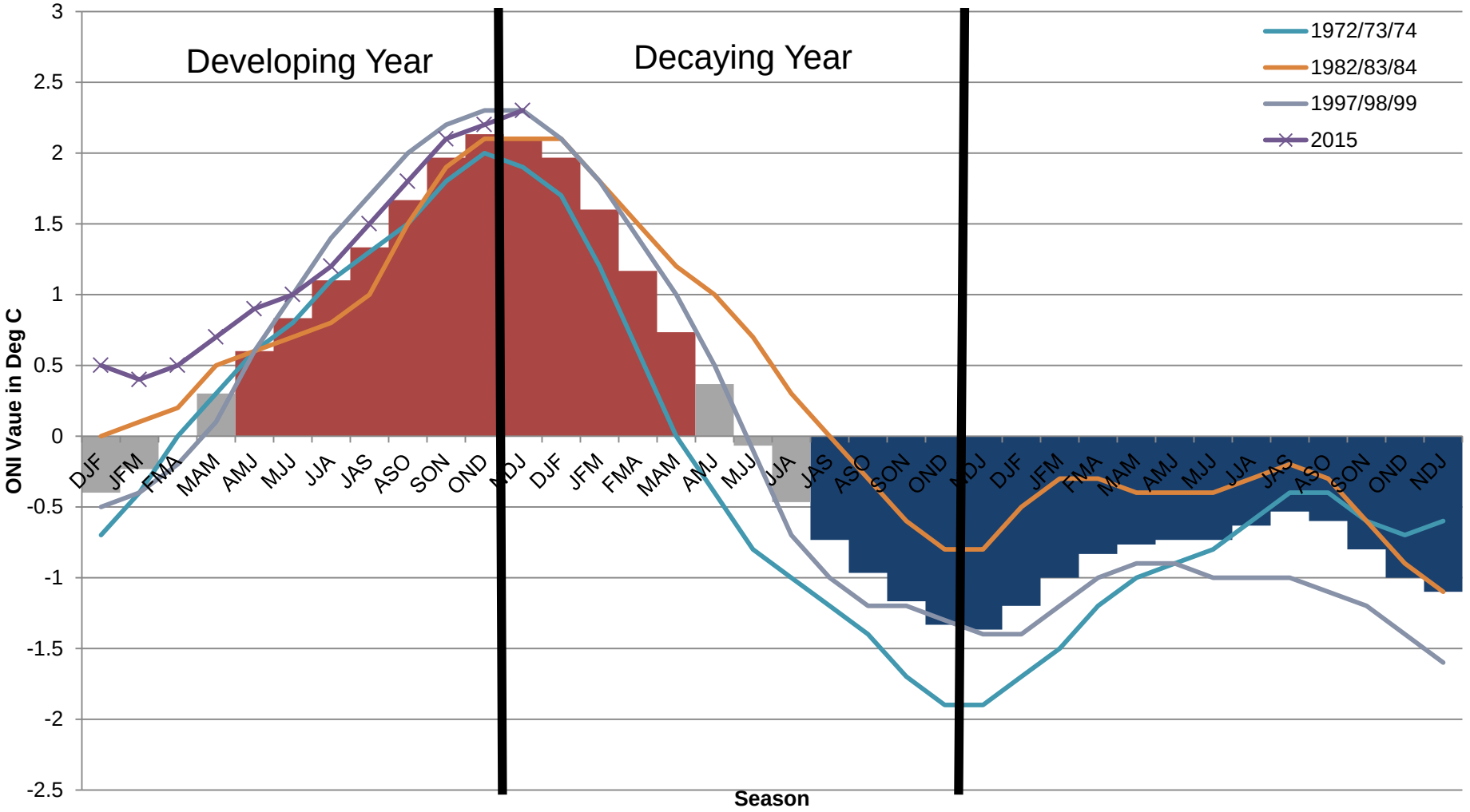
•Stronger trade winds

•Increased rainfall over the Western Pacific

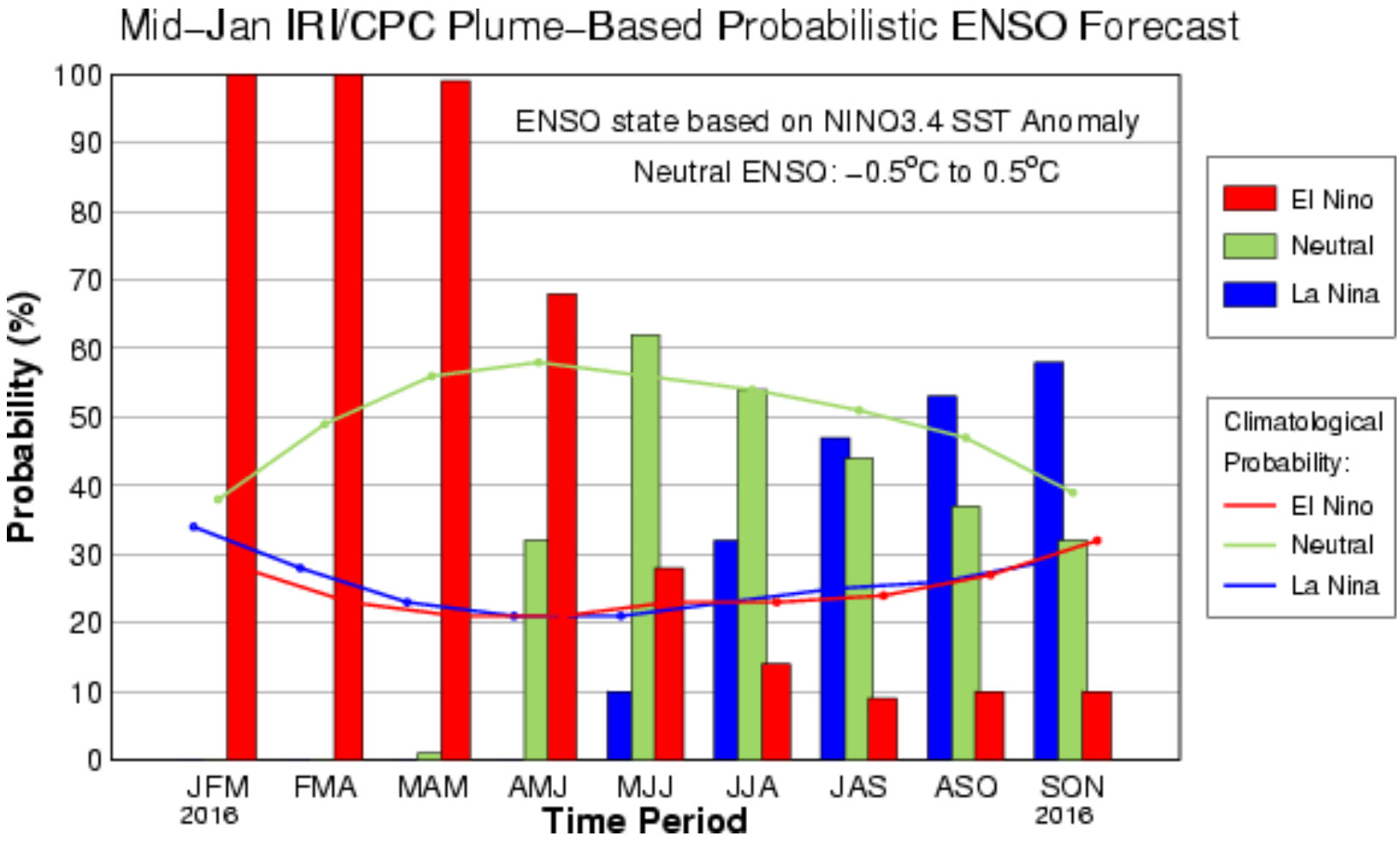
•Higher than normal sea levels over the western Pacific

Figures from http://www.bom.gov.au/climate/enso/history/ln-2010-12/three-phases-of-ENSO.shtml

Strong El Niño events and their transition into La Niña events



The possibility of a La Niña



http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Synopsis

Current Conditions

- Current ENSO status is **El Niño**
- SST anomalies greater than 1C extend from the dateline to the South American Coast
- Large scale atmospheric patterns are as expected during El Niño
  - Low level westerlies, upper level easterlies, eastward shift in tropical convection over the Pacific
- Collectively, these atmospheric and oceanic anomalies reflect a strong and mature El Niño episode

Observed Impacts

- Consistent with strong El Niño conditions
  - Dry conditions over the Western Pacific and maritime continent
  - Tropical cyclone activity shifted east over the Western Pacific and enhanced over the Central and Eastern Pacific Basin
  - Below average sea levels over the Western Pacific

General El Nino Forecast

- Strong El Niño expected transition to Neutral by late spring early summer
- Possibility of transition into **La Niña**

Forecast Summary

- Rainfall
  - Dry conditions likely to continue over the tropical Western North Pacific
    - Western Pacific Islands will likely see severe drought
  - Eastern China likely to receive above average rainfall for the next 6 months
  - India, increasingly wet conditions
  - Philippines projected to receive below average rainfall
  - Mainland Southeast Asia likely to see dry conditions slightly improve over the next 6 months
  - Maritime Southeast Asia will start getting more rain and relief from severe drought
  - Continental US little relief for west coast drought
- Sea Level
  - Likely to remain well below average over the western Pacific until June 2016
- TCs
  - Wester Pacific
    - Near normal possibly below
  - Central Pacific Basin
    - Near normal possibly below
  - US Affiliated Pacific Islands
    - American Samoa may face a busy 2015-2016 cyclone season Nov 2015-April 2016
  - Australia
    - Below Average Cyclone season, Nov 1 – Apr 30
  - Indian Ocean
    - An average season, with around seven to nine cyclones forming

The PEAC Center

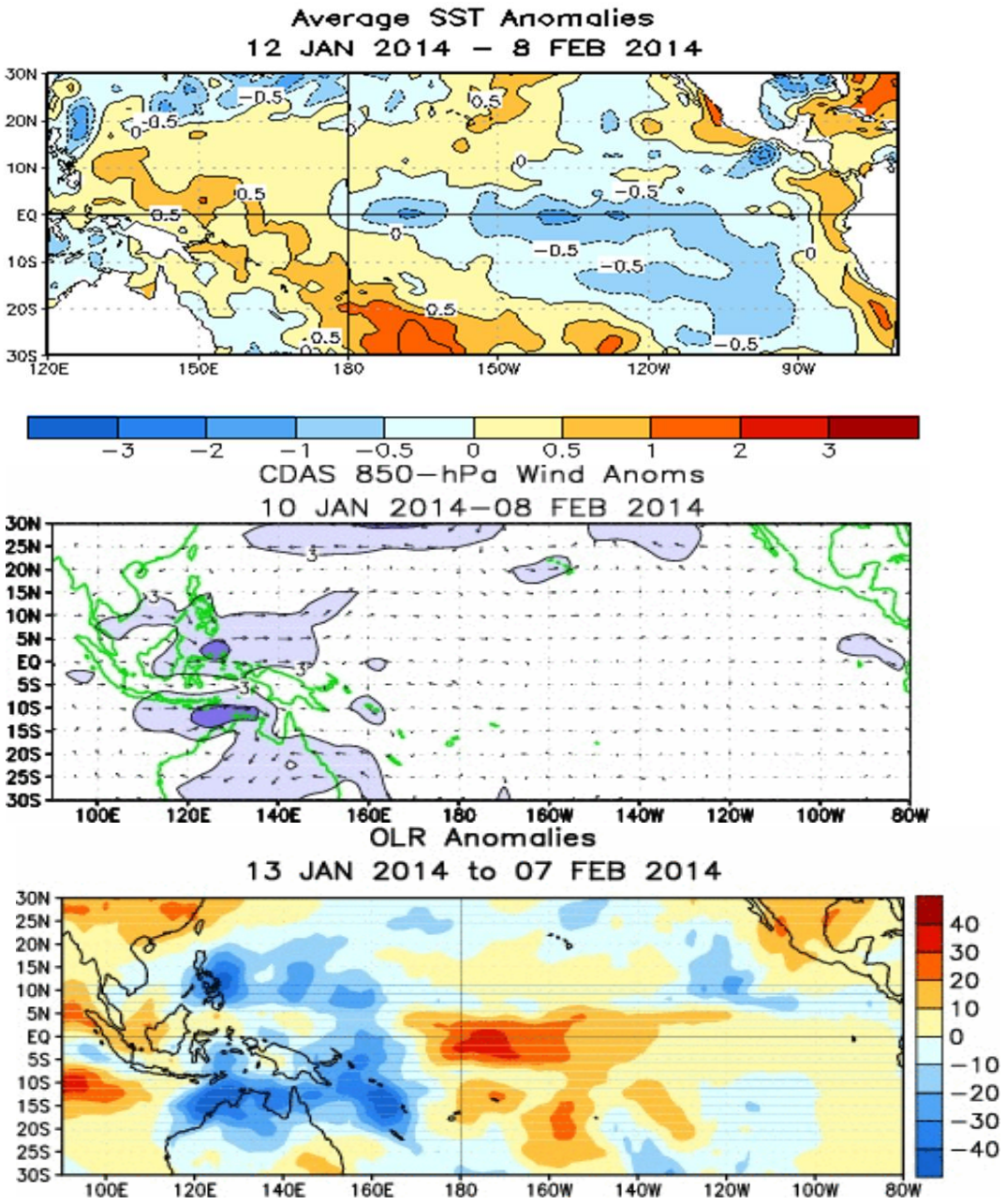
The Pacific ENSO Applications Climate Center

Photo courtesy of
Lt. Charlene Felkley

THE DEVELOPING EL NINO 2014-2015-2016

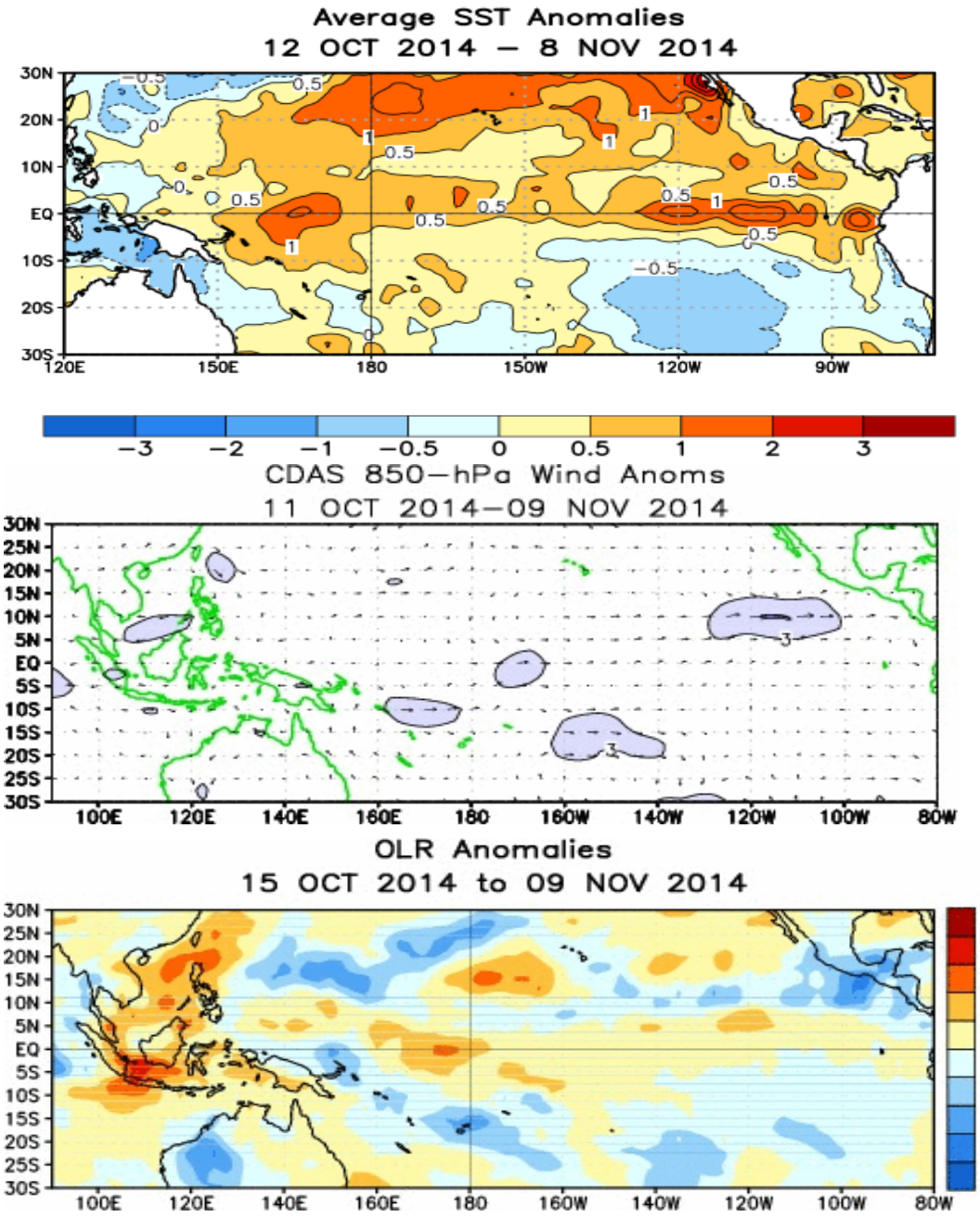
What happened in early 2014

- Pacific SSTs where close to normal
  - Slightly La Niña?
- Westerly winds over the Western Pacific play in important role in El Niño onset
- Tropical convection appeared to be playing along
  - Moved slightly towards the dateline



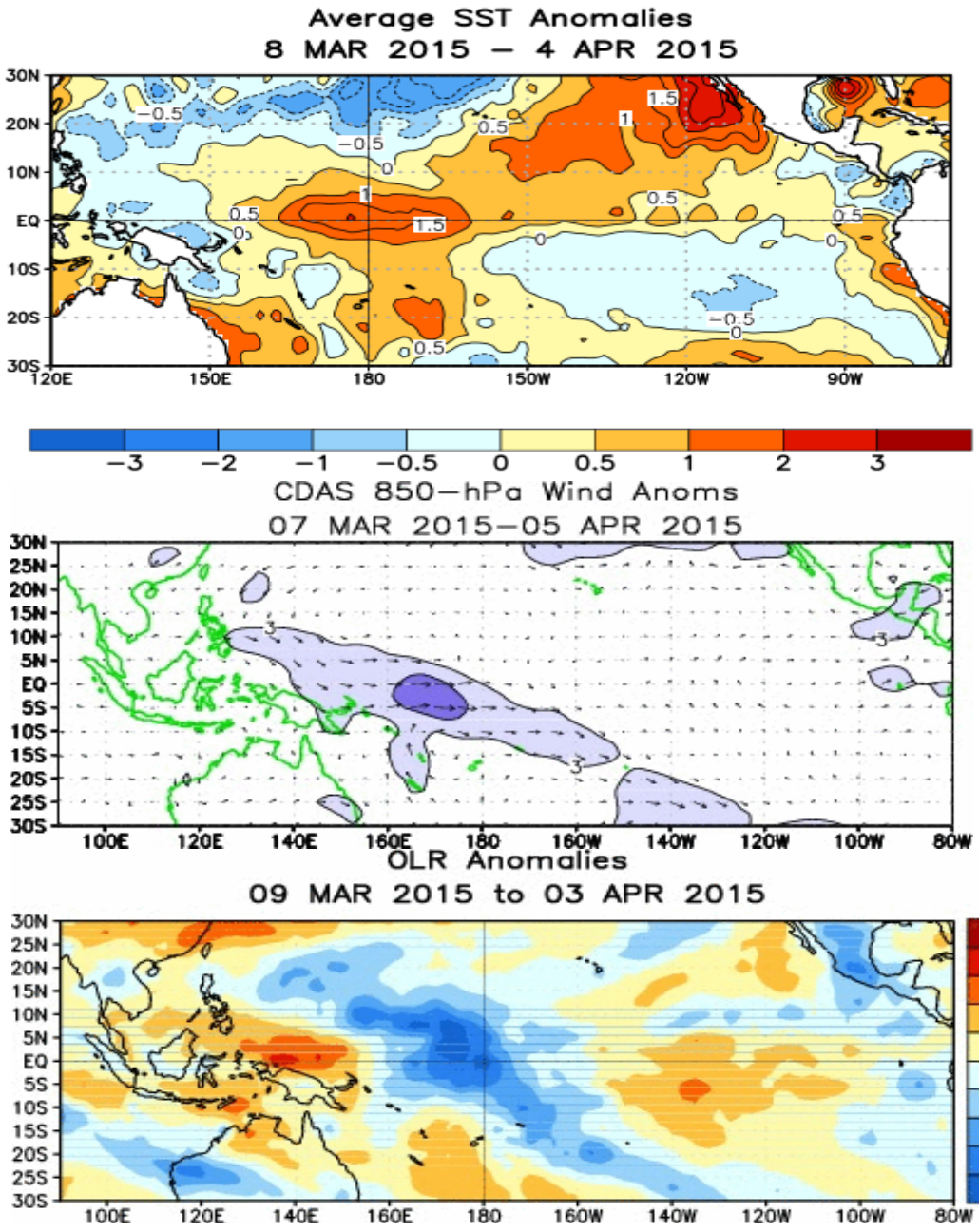
By the end of 2014

- SST over the Central and Eastern Pacific had warmed
  - But did not reach the El Niño threshold
- Atmospheric conditions did not continue to be conducive to El Niño development

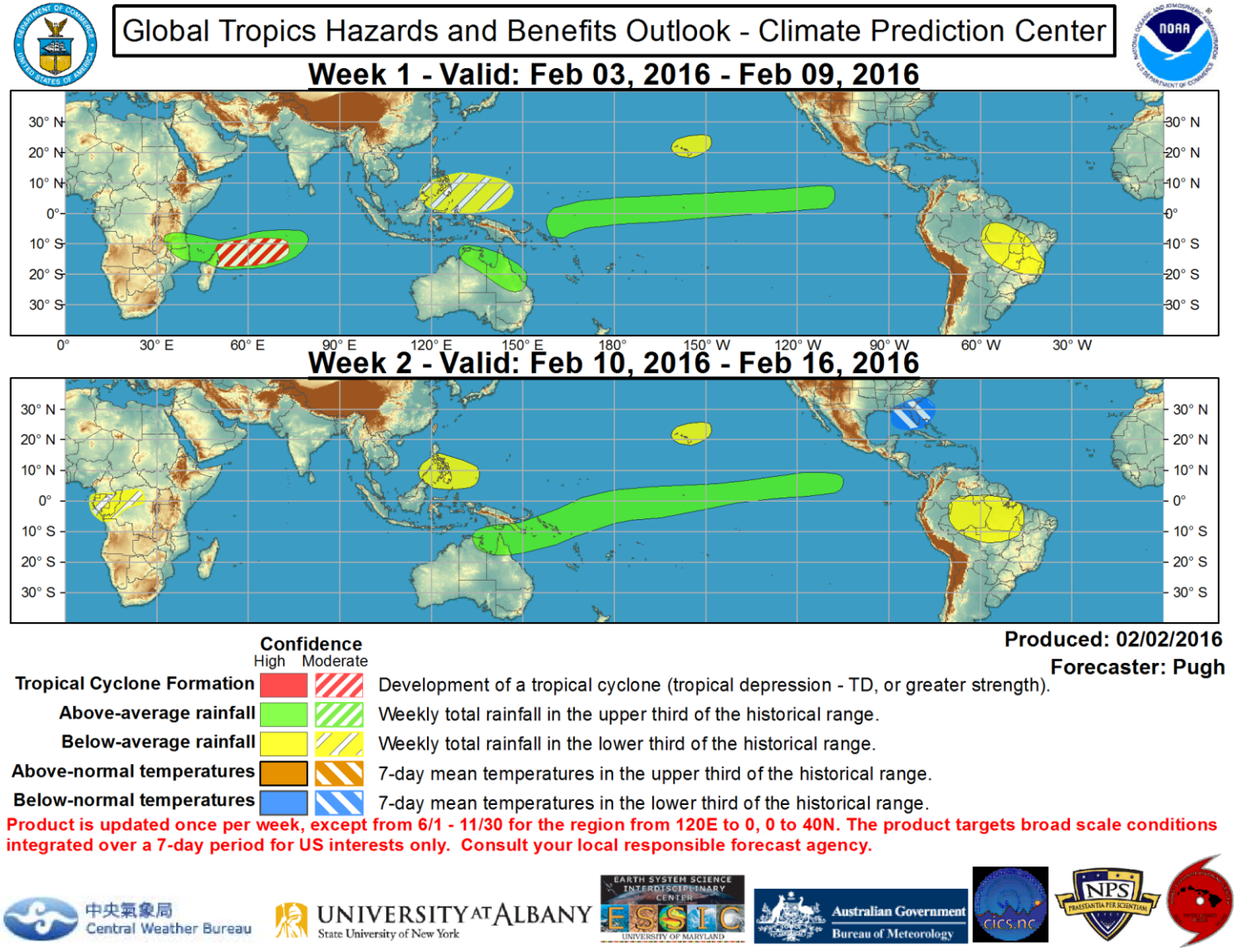


The Development into El Niño conditions resumed in 2015

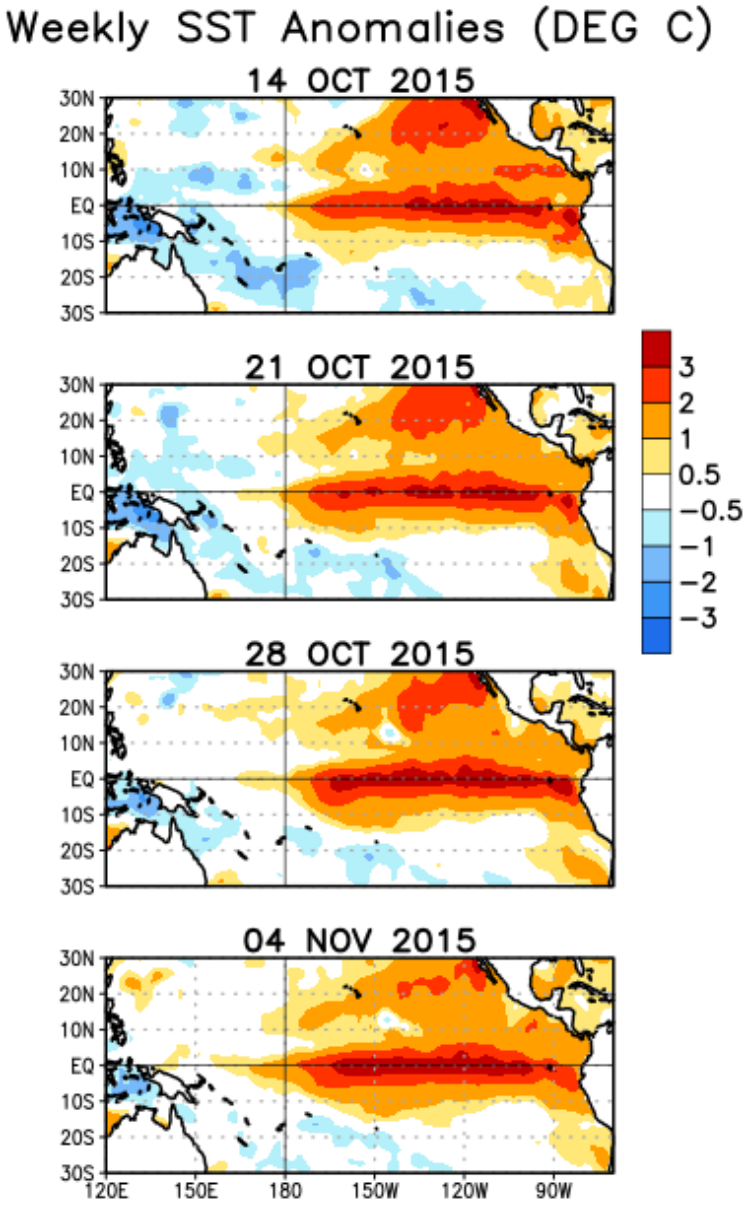
- SST over the Central and Eastern Pacific continued to warm
- Atmospheric conditions became strongly coupled to the ocean
  - Allowing for the development into a Strong El Niño



Tropical Hazards and Benefits outlook



Development of SST anomalies over the past 4 weeks.



During the last four weeks

- Positive SST anomalies strengthened across the Equatorial Pacific
- Positive SST anomalies off the Peruvian Coast strengthened

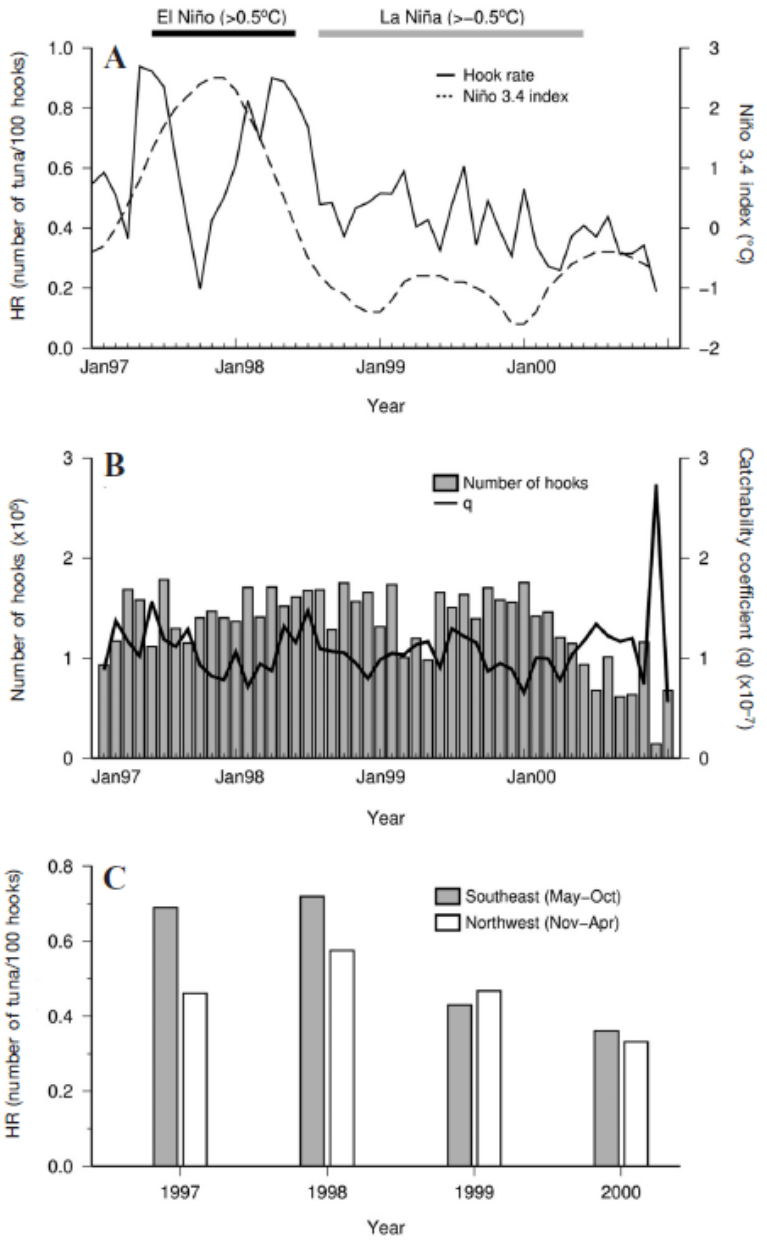
Sea Surface Temperature and Subsurface temperatures are all supportive of

Weak El Niño conditions

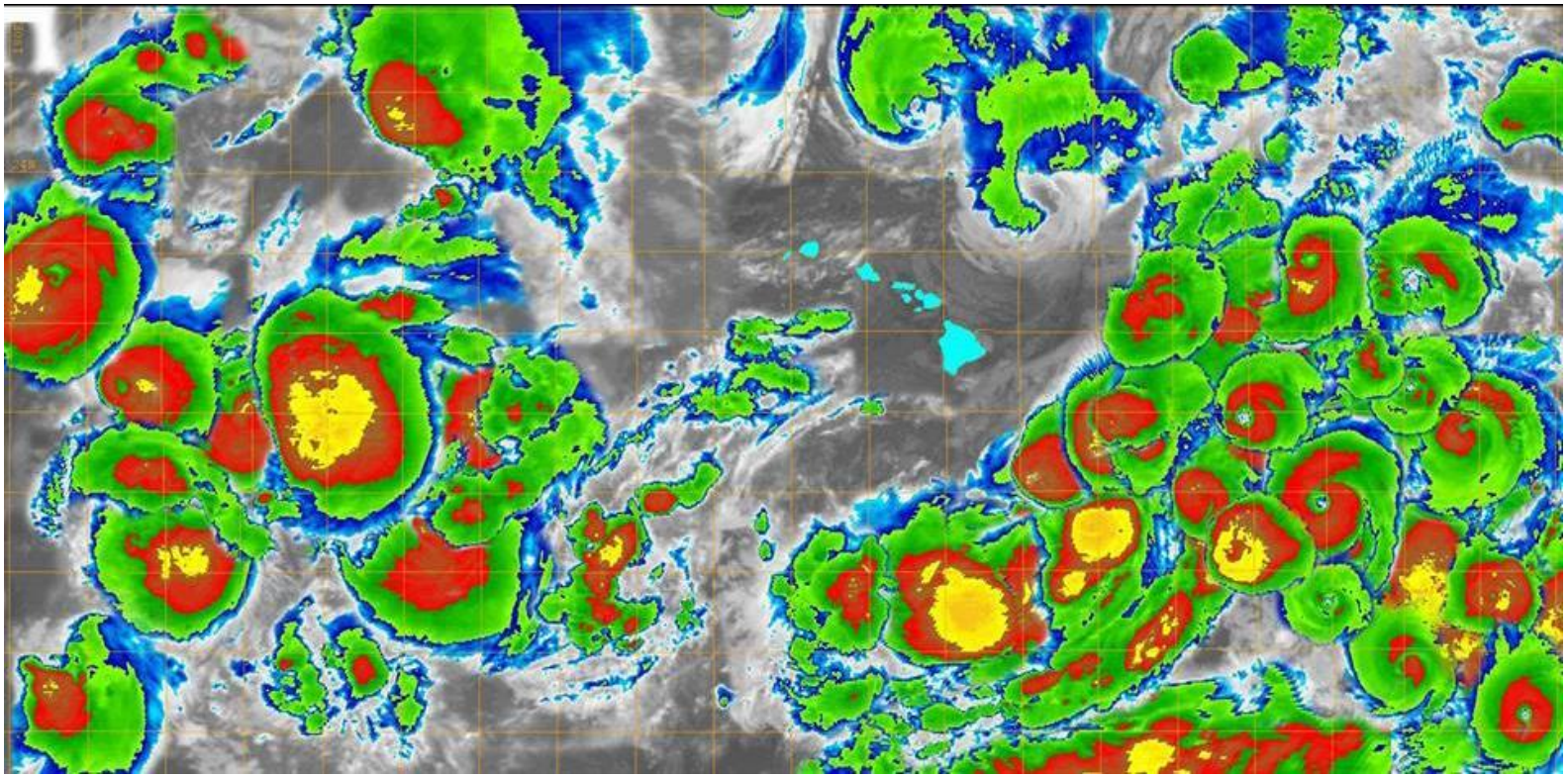
Figure From
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt

El Nino and fisheries

- (**A**) Variability in catch rates of Bigeye Tuna (*Thunnus obesus*) in the eastern Indian Ocean off Java by hook rate (HR) percentage (solid line) and SST anomalies from the Niño 3.4 index during 1997–2000 (dashed line).
- (**B**) The total number of hooks deployed (gray bars) and time series
- variation of the catchabillity coefficient (solid line) during 1997–2000.
- (**C**) Seasonal variations in Bigeye Tuna HR in 1997–2000. The gray bar represents the southeast monsoon (May–October), and the white bar represents the northwest monsoon (November–April).



Luck has been on our side!



- Courtesy of Kevin Kodama at NWS Honolulu Office