

# Pacific Region ENSO UPDATE AND SEASONAL OUTLOOK

Nov 16 2015

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PREPARED BY THE PEAC CENTER

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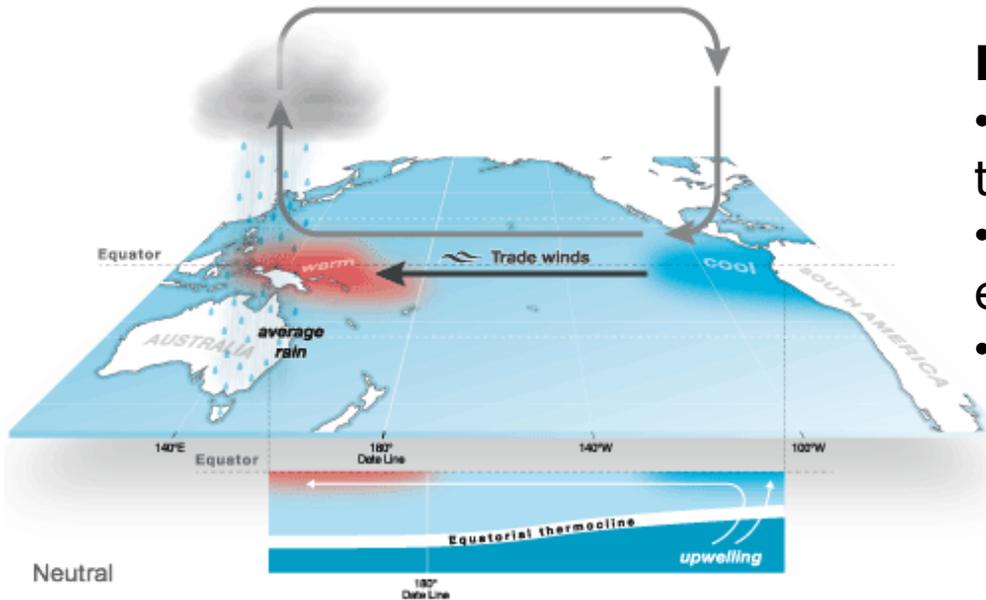


# What Is El Niño

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A general description of its global impacts

# El Niño in a nutshell

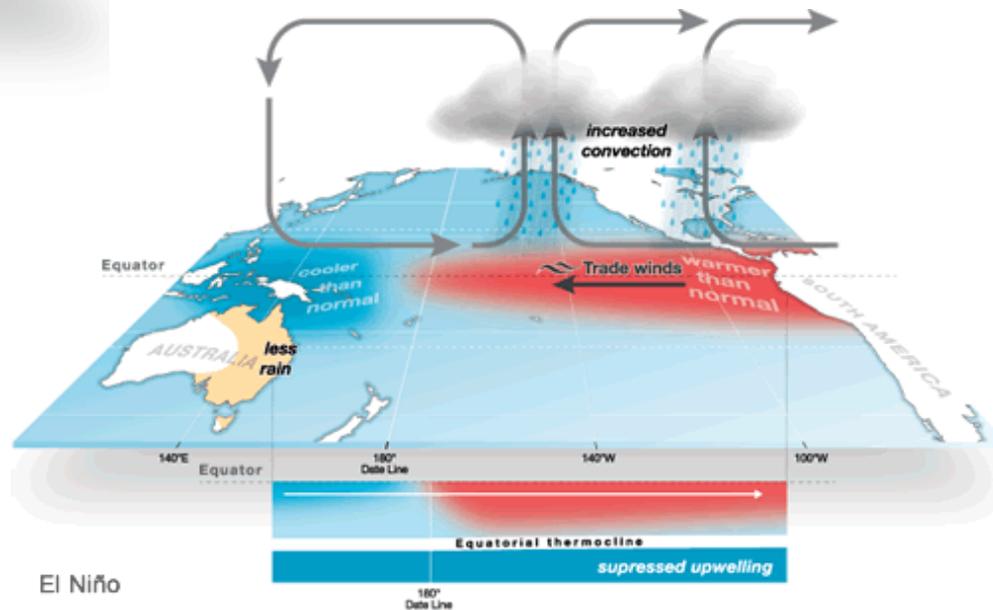


## Neutral Conditions:

- 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:

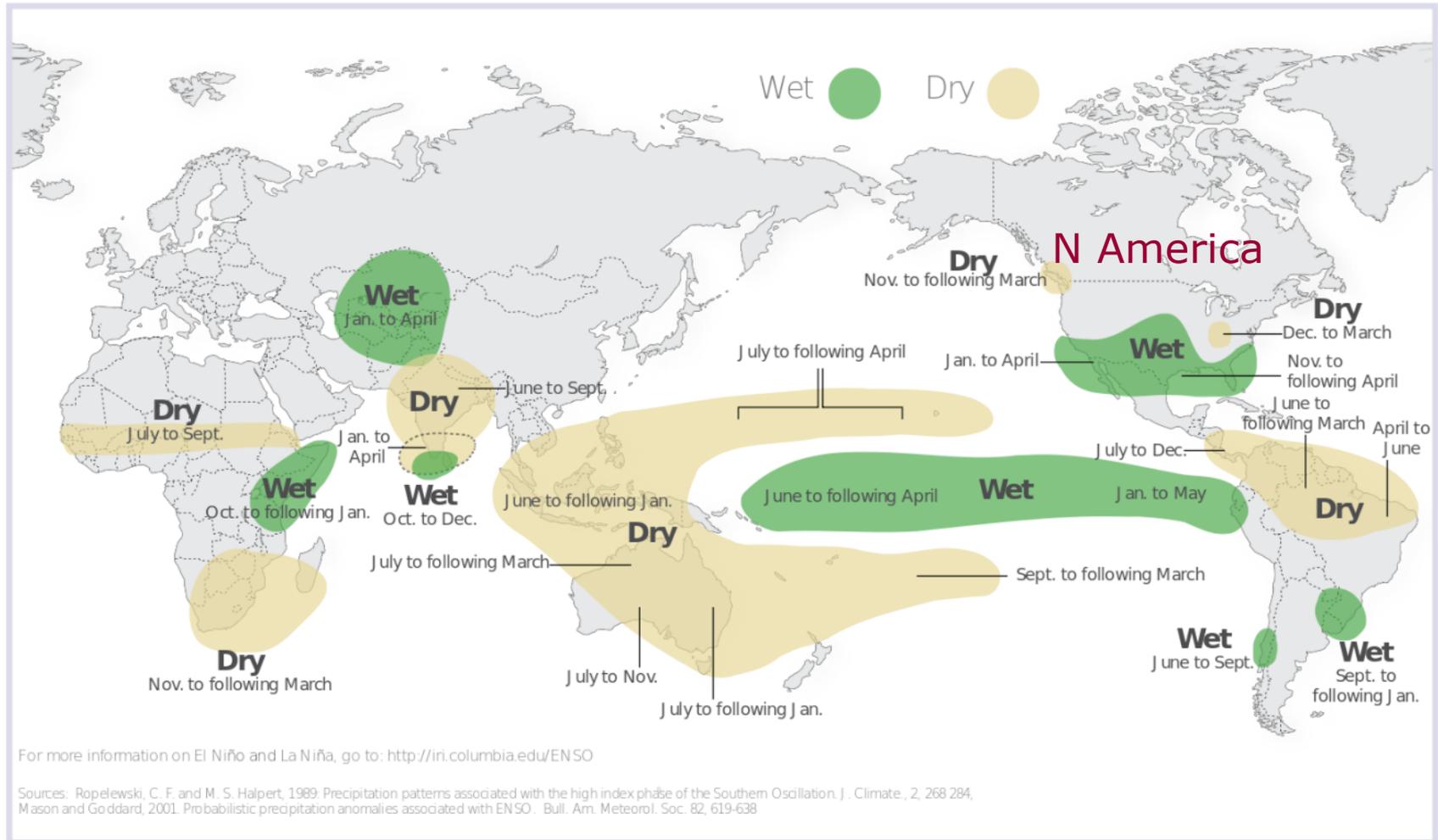
- Warm sea surface temperatures to the east and cold to the west
- Weakened trade winds, westerly winds over east Pacific
- Rainfall over the Central and East Pacific
- Lower than normal sea levels over the western Pacific



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

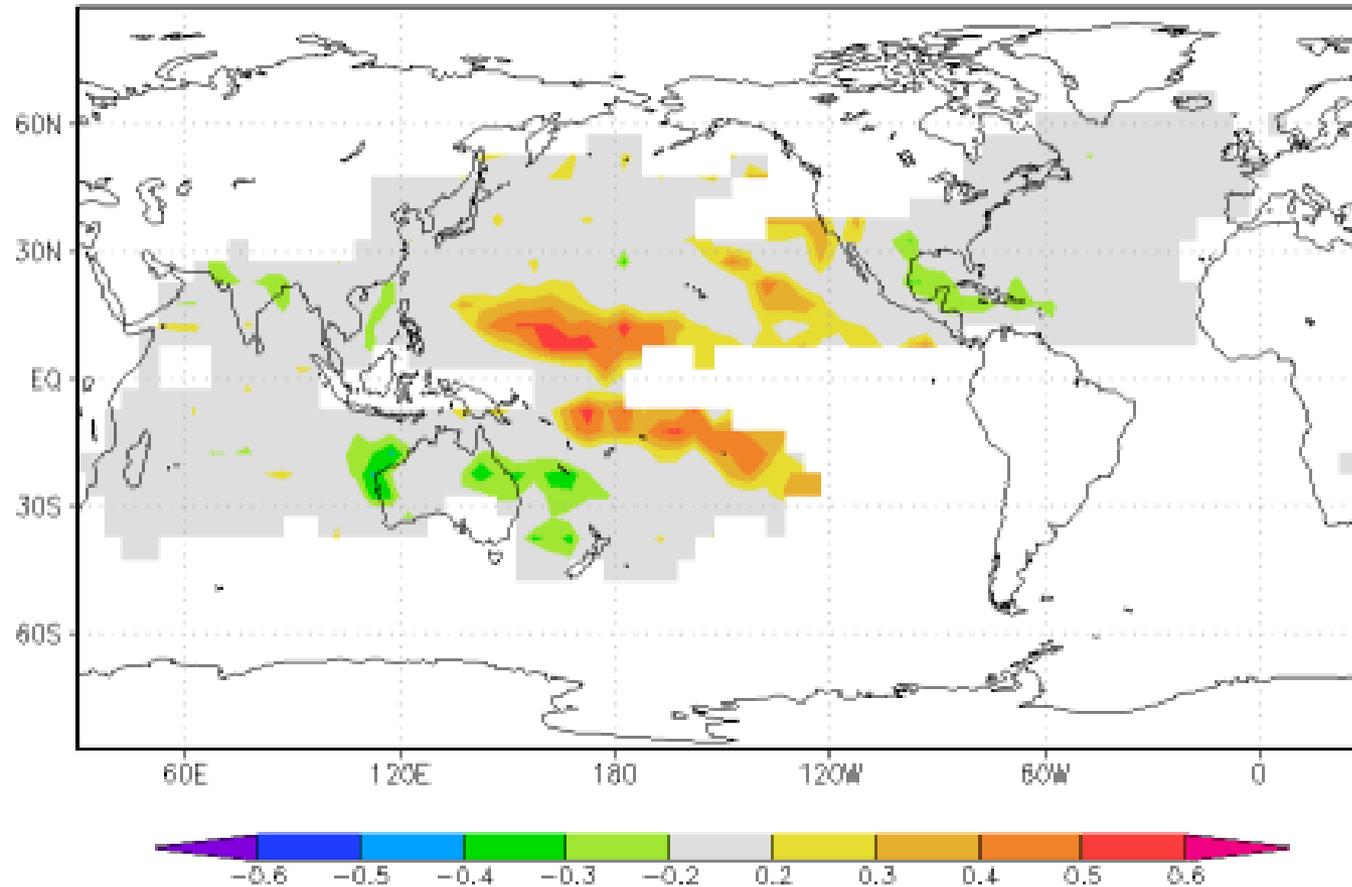
## El Niño and Rainfall

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.



# El Niño and Tropical Cyclones

corr Jul–Jun averaged NINO3.4 index  
with Jul–Jun averaged MIT #TS tracks 1856:2004



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

# GENERAL SYNOPSIS

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This section will give a quick overview of the coming topics

# Synopsis

## Current Conditions

- Current ENSO status is **El Niño**
- SST anomalies greater than 2.5C extend from the dateline to the South American Coast
- Large scale atmospheric patterns have shifted eastward as expected during El Niño
- Collectively, these atmospheric and oceanic anomalies reflect a strong and mature El Niño episode

## Observed Impacts

- Consistent with strong El Niño conditions
  - Wet conditions giving way to 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

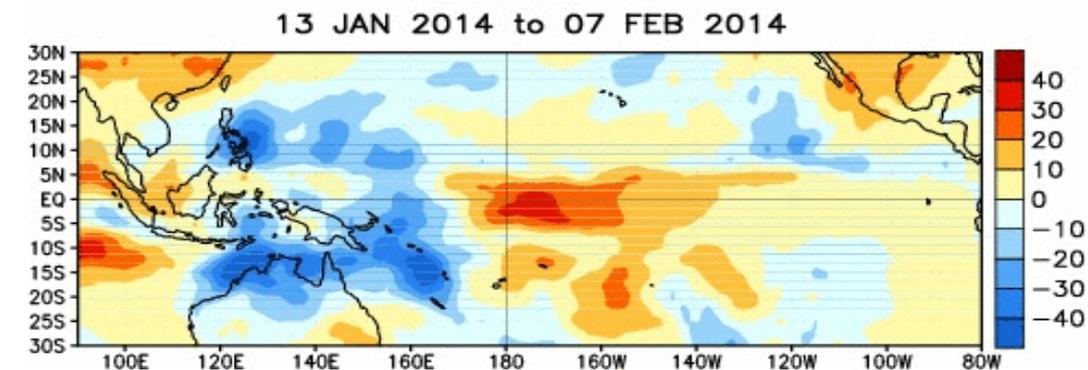
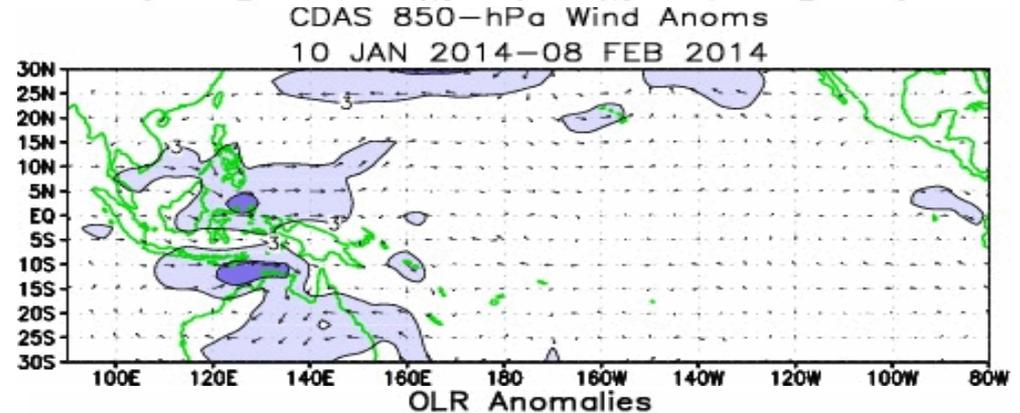
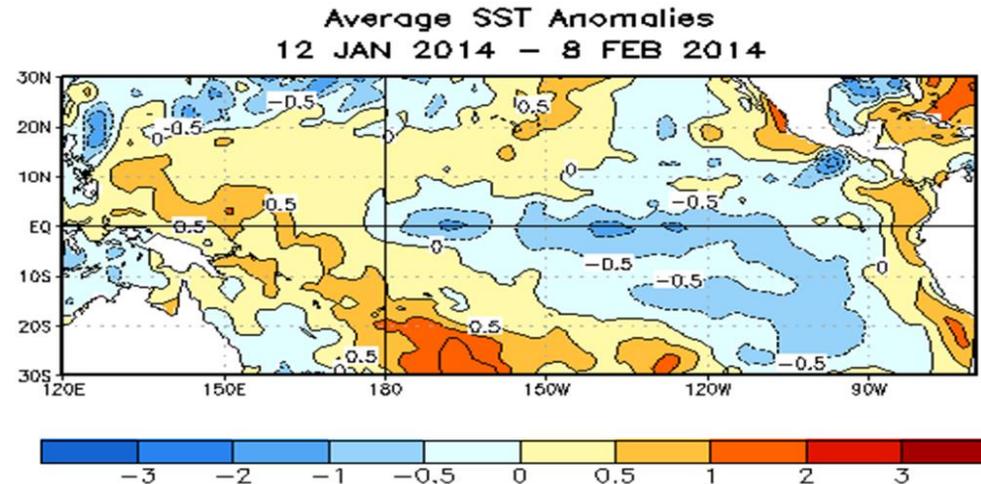
- Strong El Niño expected to continue through Northern Hemisphere spring 2016
- Transition to Neutral by late spring early summer

# THE DEVELOPING EL NINO 2014-2015-2016

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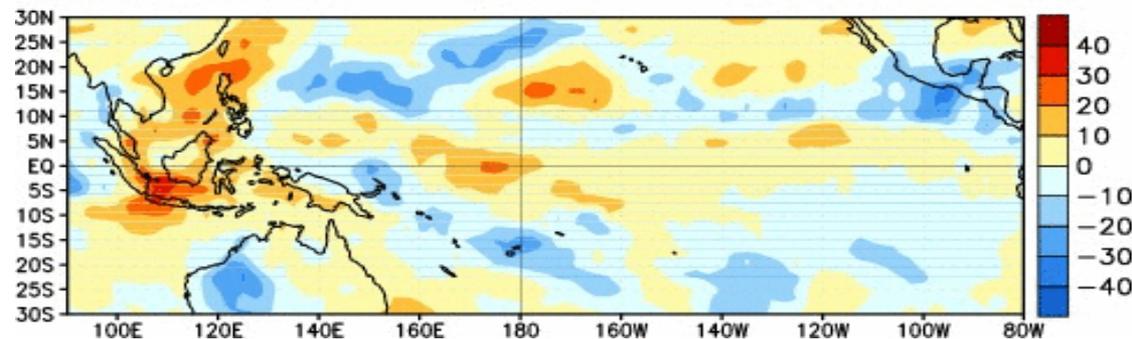
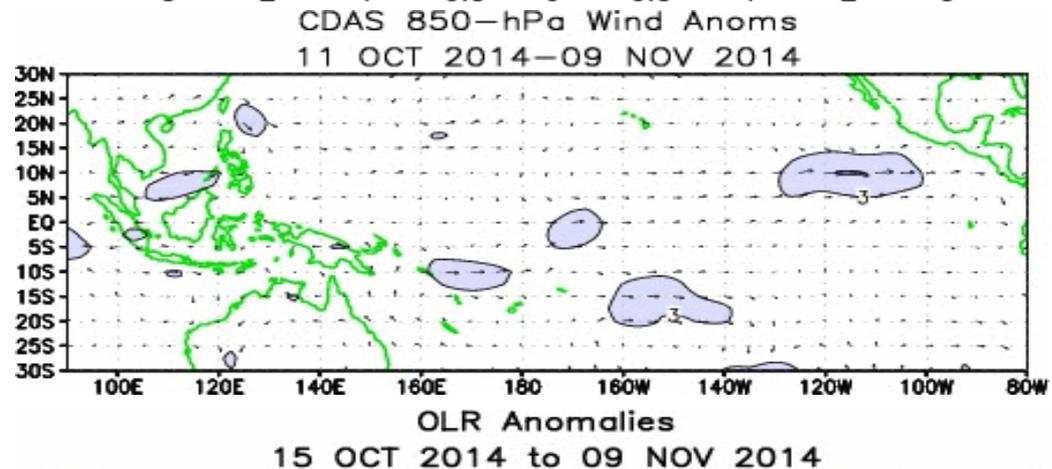
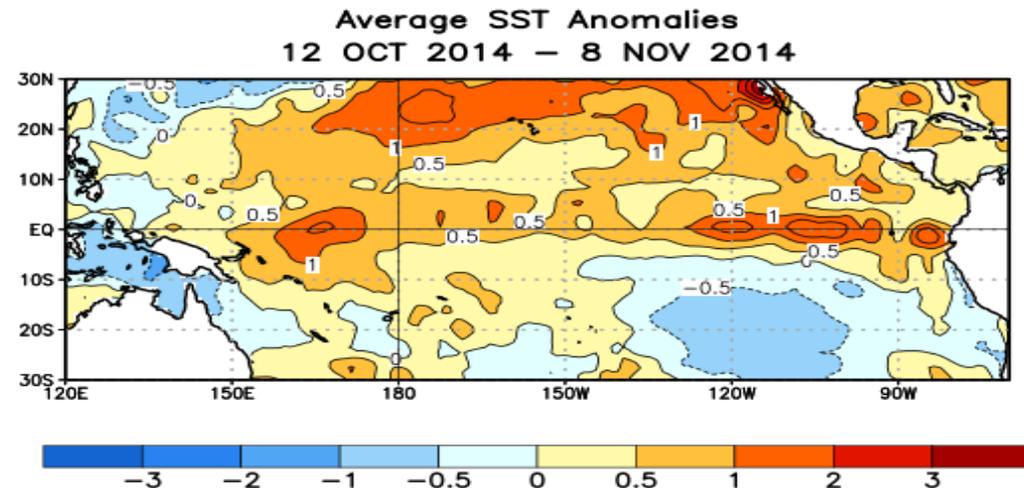
# What happened in early 2014

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



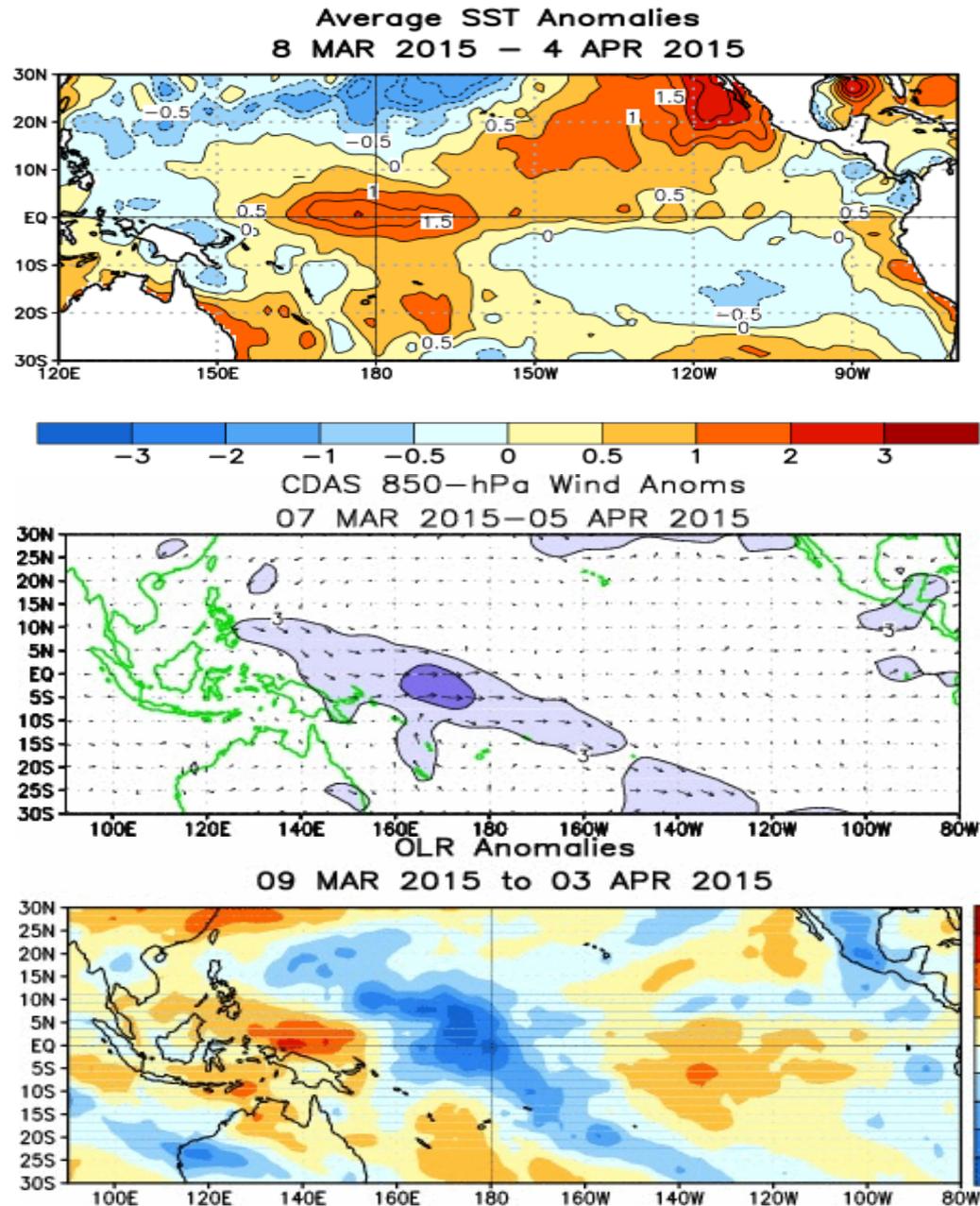
# By the end of 2014

- 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



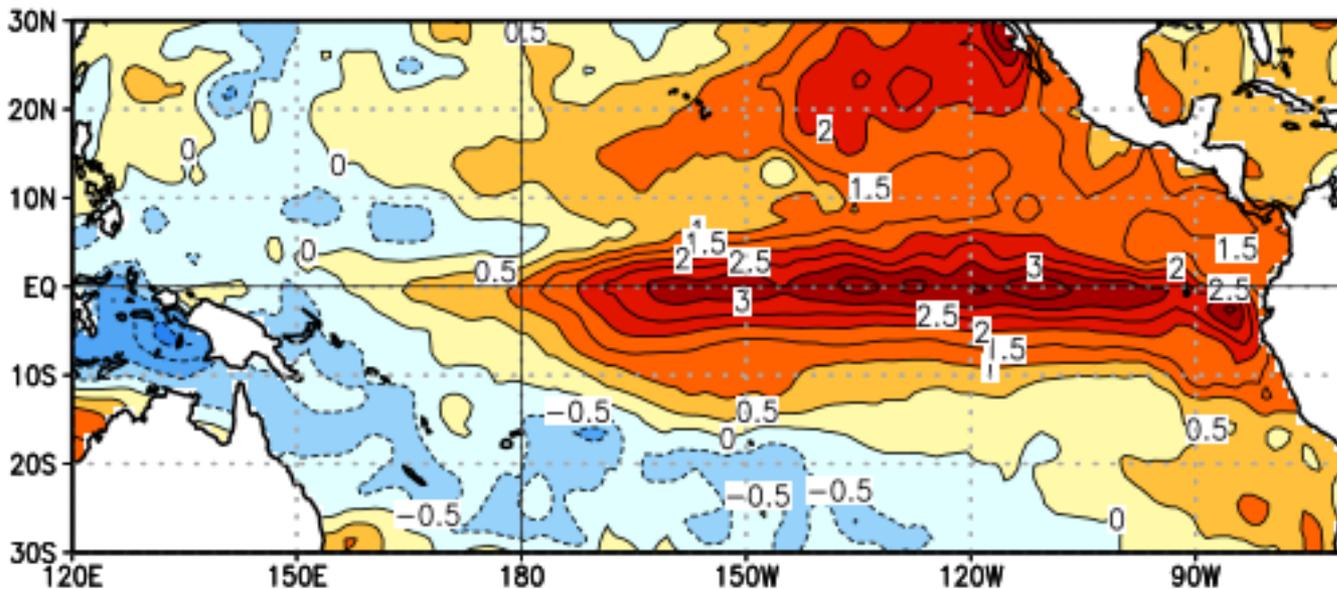
# Current Conditions

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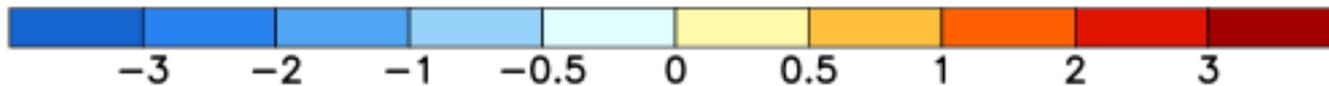
General State of the Ocean and Atmosphere

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

**Average SST Anomalies**  
11 OCT 2015 – 7 NOV 2015

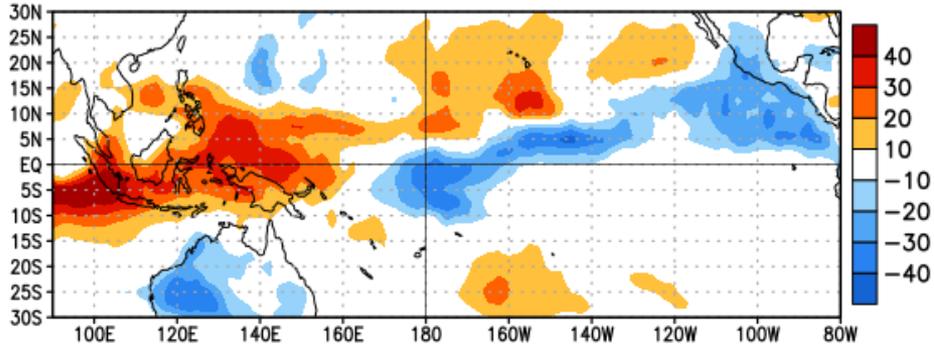


Average sea surface temperature (SST) anomalies ( $^{\circ}$  C). Over the past month, Warm SST anomalies were prevalent over the western central and eastern Pacific Ocean.



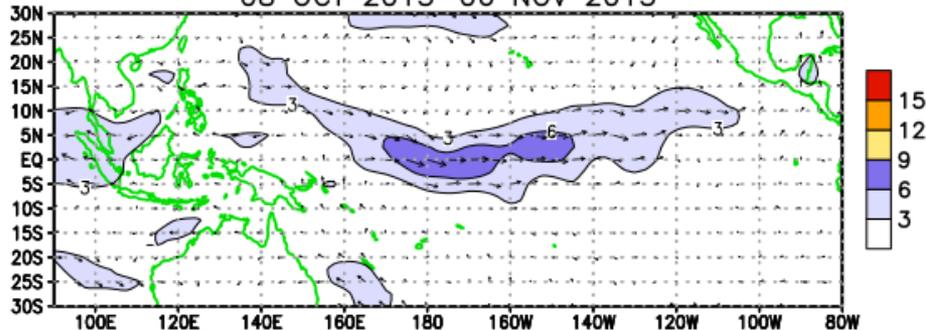
# OLR and Wind Anomalies for Past 30 Days

OLR Anomalies  
10 OCT 2015 to 04 NOV 2015



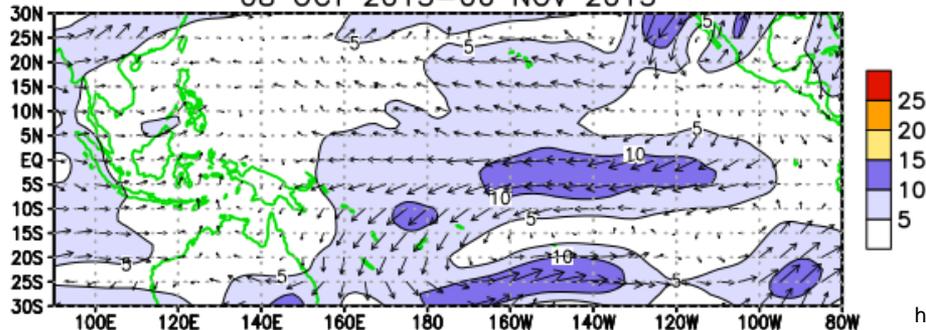
- Above average deep convection ( $-$  OLR anomalies)
- Over the dateline
- ITCZ
- Below average precipitation ( $+$  OLR anomalies)
- Western Pacific

CDAS 850-hPa Wind Anoms  
08 OCT 2015-06 NOV 2015



Low level westerlies over the Equatorial Central Pacific

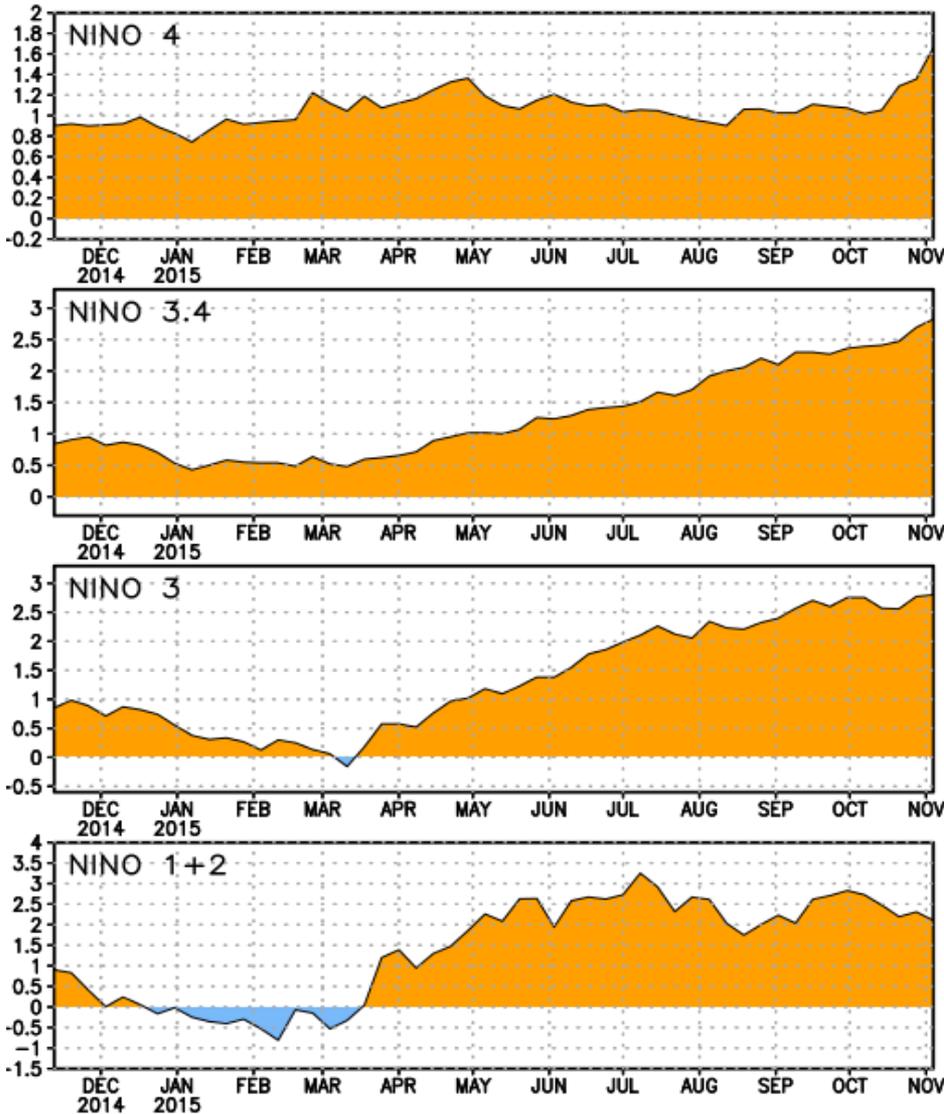
CDAS 200-hPa Wind Anoms  
08 OCT 2015-06 NOV 2015



Upper level winds show predominant easterly winds

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

SST Anomalies



The latest weekly SST departures are:

Niño 4      1.7°C

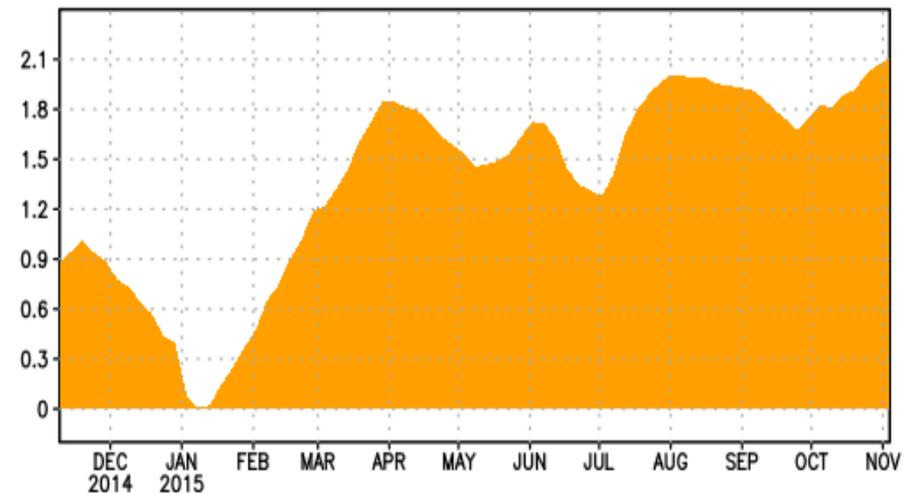
Niño 3.4    2.8°C

Niño 3      2.8°C

Niño 1+2    2.1°C

Central & Eastern Pacific Upper-Ocean (0-300 m)  
Weekly Heat Content Anomalies

EQ. Upper-Ocean Heat Anoms. (deg C) for 180–100W



# EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

## ENSO Alert System Status: **El Niño Advisory**

### Synopsis:

- A strong El Niño continued during October as indicated by well above-average sea surface temperatures (SSTs) across the central and eastern equatorial Pacific Ocean
- Most Niño indices increased during the month
- The subsurface temperature anomalies also increased in the central and eastern Pacific
- Low-level westerly wind anomalies and upper-level easterly wind anomalies continued over the western to east-central tropical Pacific
- These conditions are associated with enhanced convection over the central and eastern tropical Pacific and with suppressed convection over Indonesia
- Collectively, these atmospheric and oceanic anomalies reflect a strong and mature El Niño episode

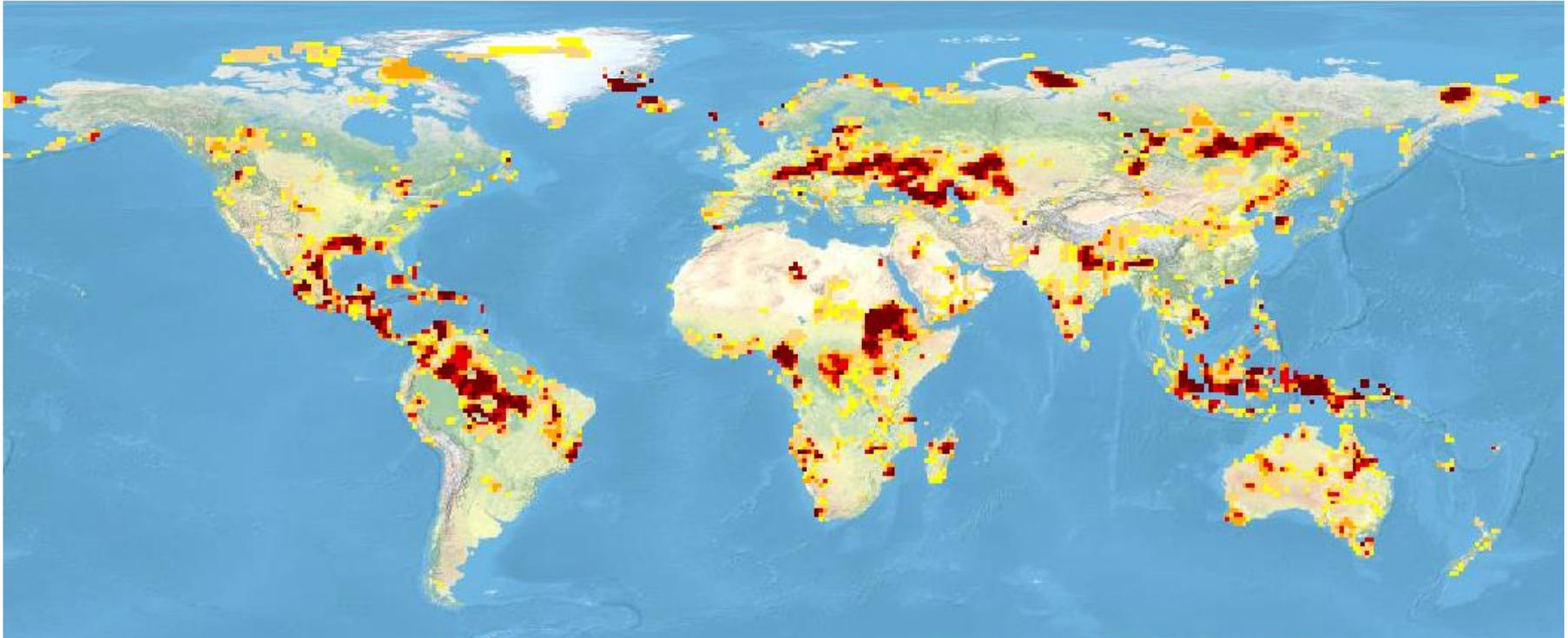
# Impacts

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Rainfall, Sea Level, Tropical Cyclones and  
Societal Impacts

# Rainfall impacts:

## Drought



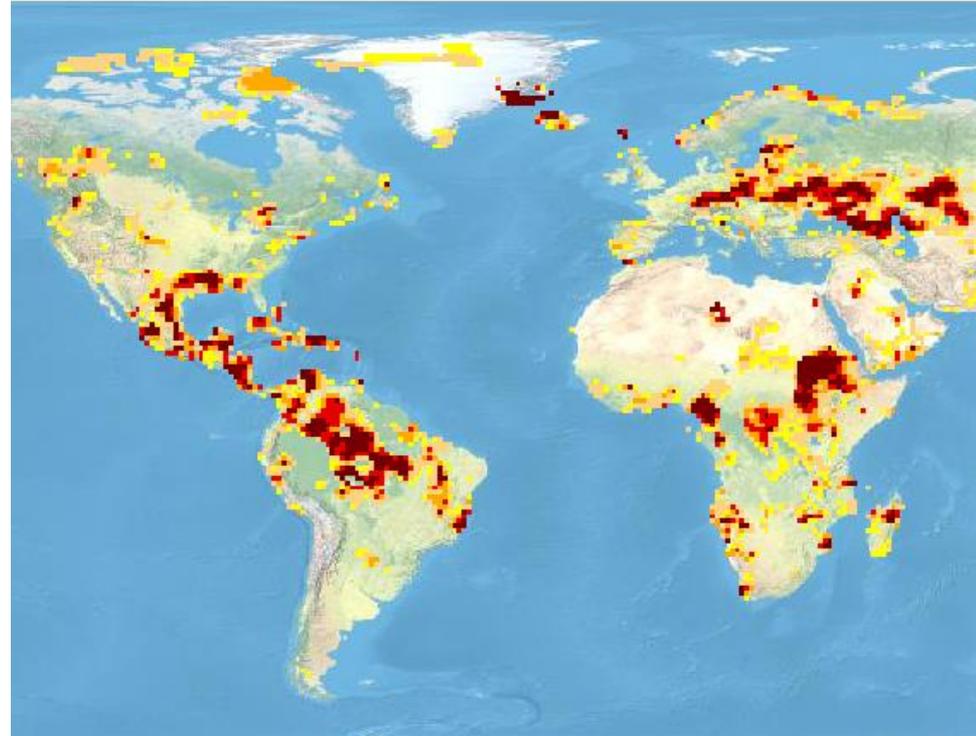
- Global Precipitation Climatology Center GPCP satellite derived Standardized Precipitation Index
- Represents the 3 month accumulated rainfall deficit
- Darker colors represent larger rainfall deficits

By the end of September 2015, drought conditions intensified in many locations

# Rainfall impacts:

## Drought

- In Europe, drought conditions continued to impact the majority of the continent
  - Some improvement was seen in the center of the continent while drought intensified in Eastern Europe.
- In Africa, drought remains across the equatorial region and through much of the South.
  - South Africa has declared a drought disaster for Free State and North West Provinces.
- In South America, drought remains in Brazil and has intensified through the central Amazon Basin
- Mexico and across the Caribbean remained dry.
  - The Dominican Republic and Jamaica have already experienced significant crop losses.

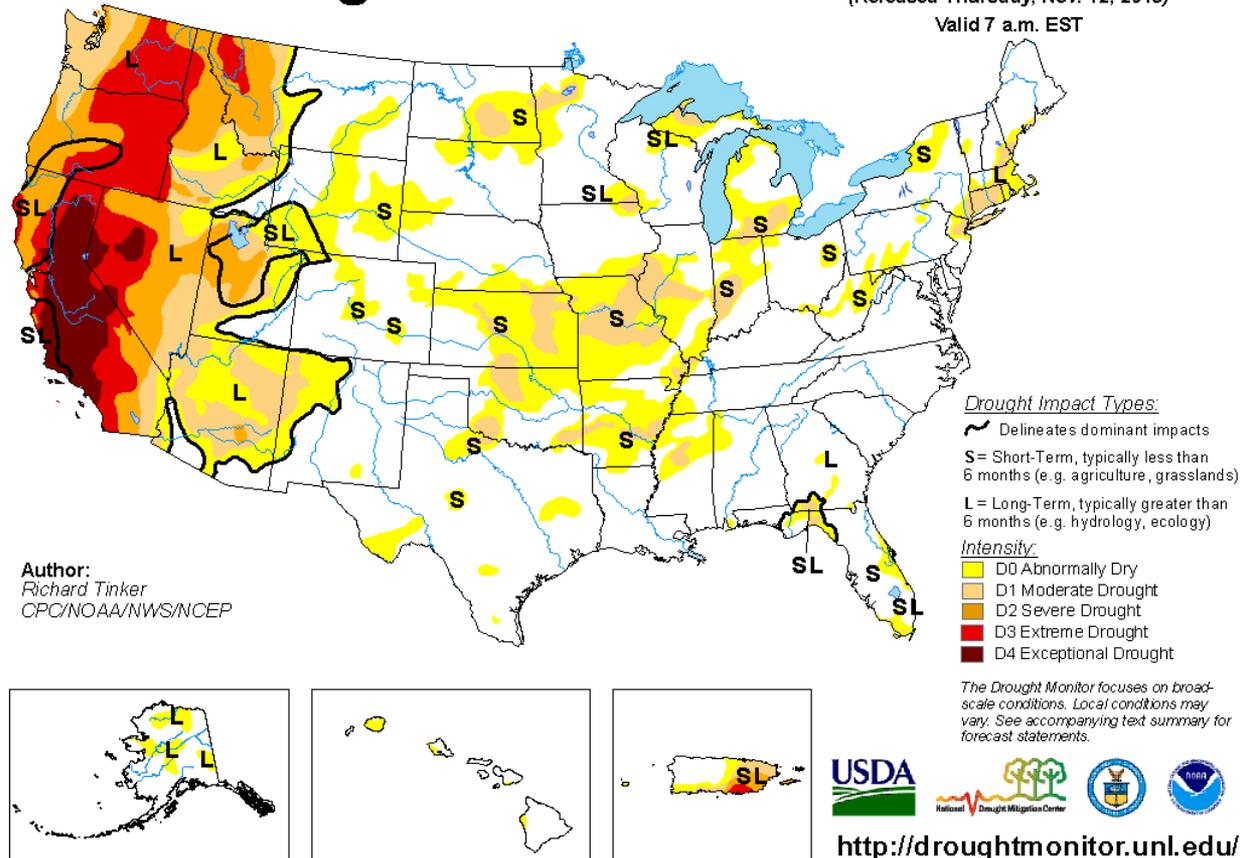


# Rainfall impacts: Drought

- The wet/snowy season is off to a rapid start in the Intermountain West and West Coast States
- Moderate to heavy precipitation
  - Sierra Nevada
  - northwestern California
  - western sections of Washington and Oregon
  - scattered areas from western Colorado to central Arizona, and a few other isolated spots
- Snowpack is well above normal for this time of year in the Sierra Nevada and parts of Nevada
- Given the long-term nature of the drought in much of the Far West, only scattered areas of improvement were noted
- Areas where drought was more entrenched will need abundant precipitation to continue much farther into the wet season before any notable improvement could evolve

## U.S. Drought Monitor

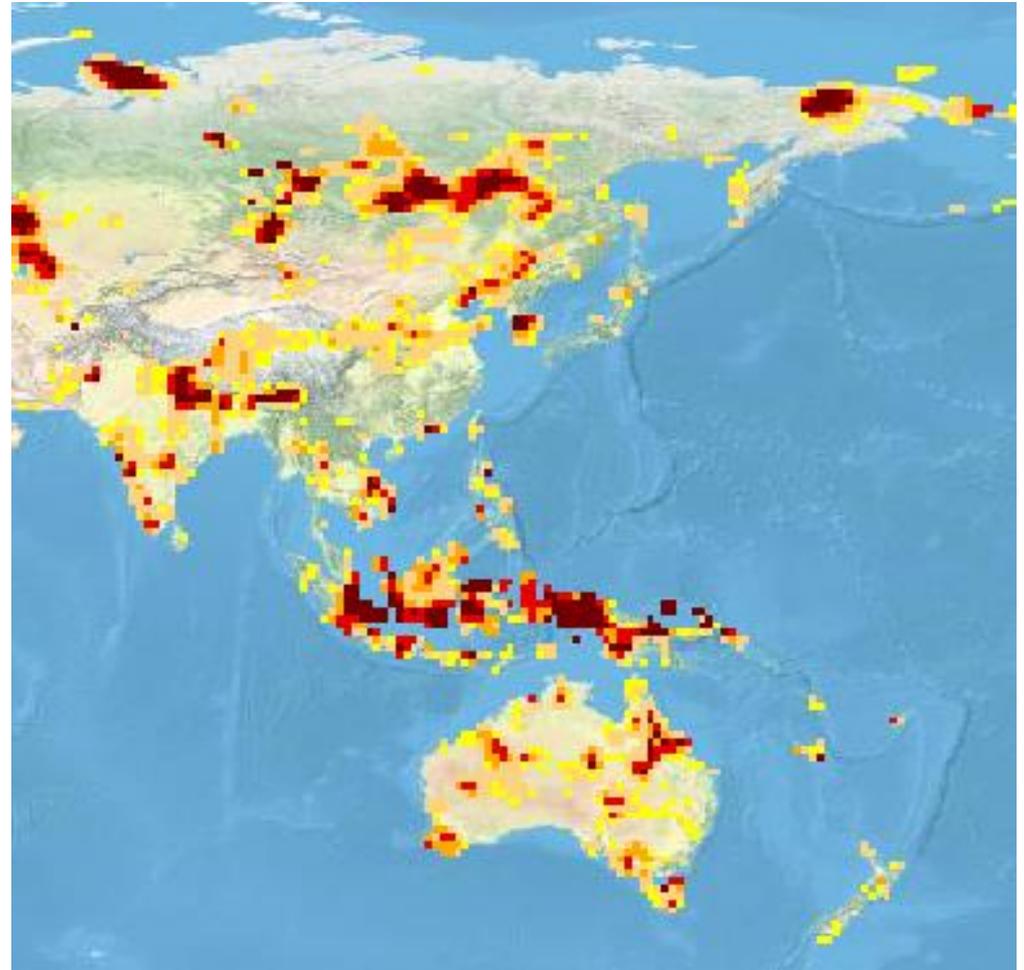
November 10, 2015  
(Released Thursday, Nov. 12, 2015)  
Valid 7 a.m. EST



# Rainfall impacts:

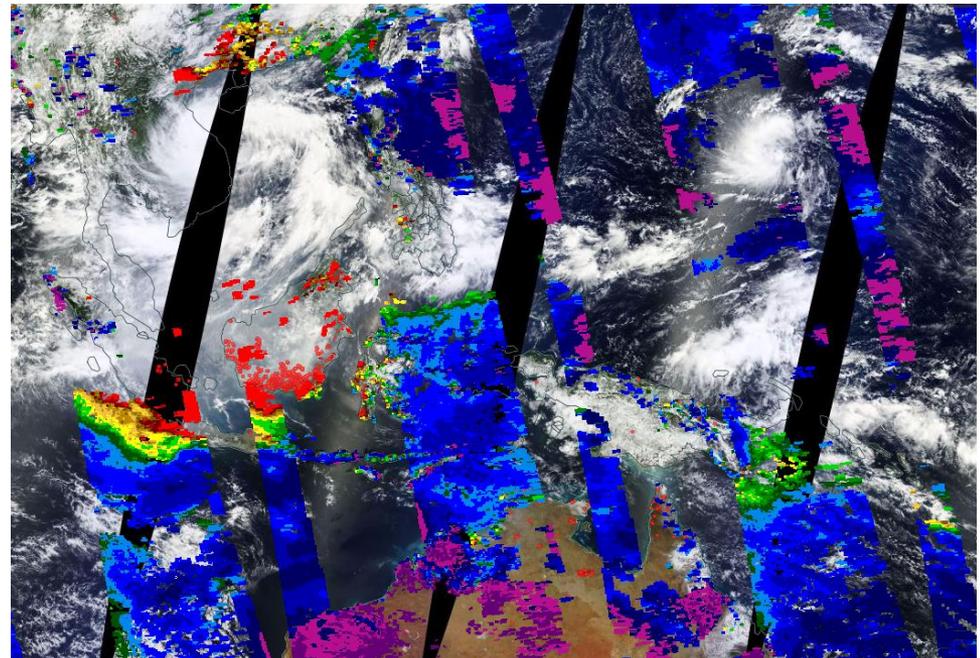
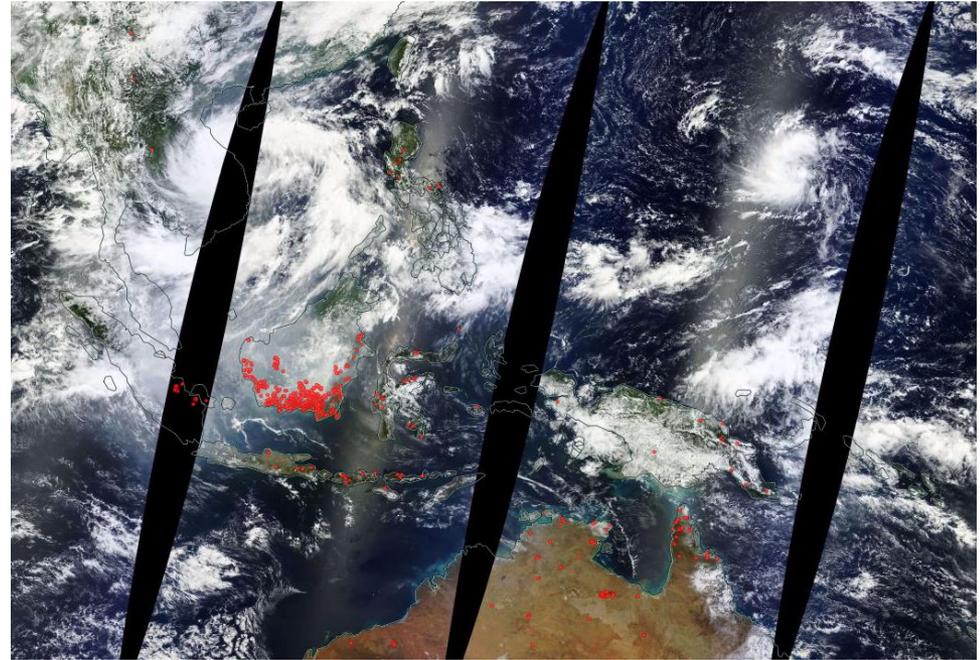
## Drought in Asia and the Pacific

- In Asia, drought is present from
  - Western Asia
  - Central and Eastern Russia
  - Southeast Asia
  - Indian sub-continent
- In Oceania
  - drought has intensified throughout north of Australia
  - drought conditions in Southern Australia have continued
- Papua New Guinea has released relief supplies for those most affected by the current drought.

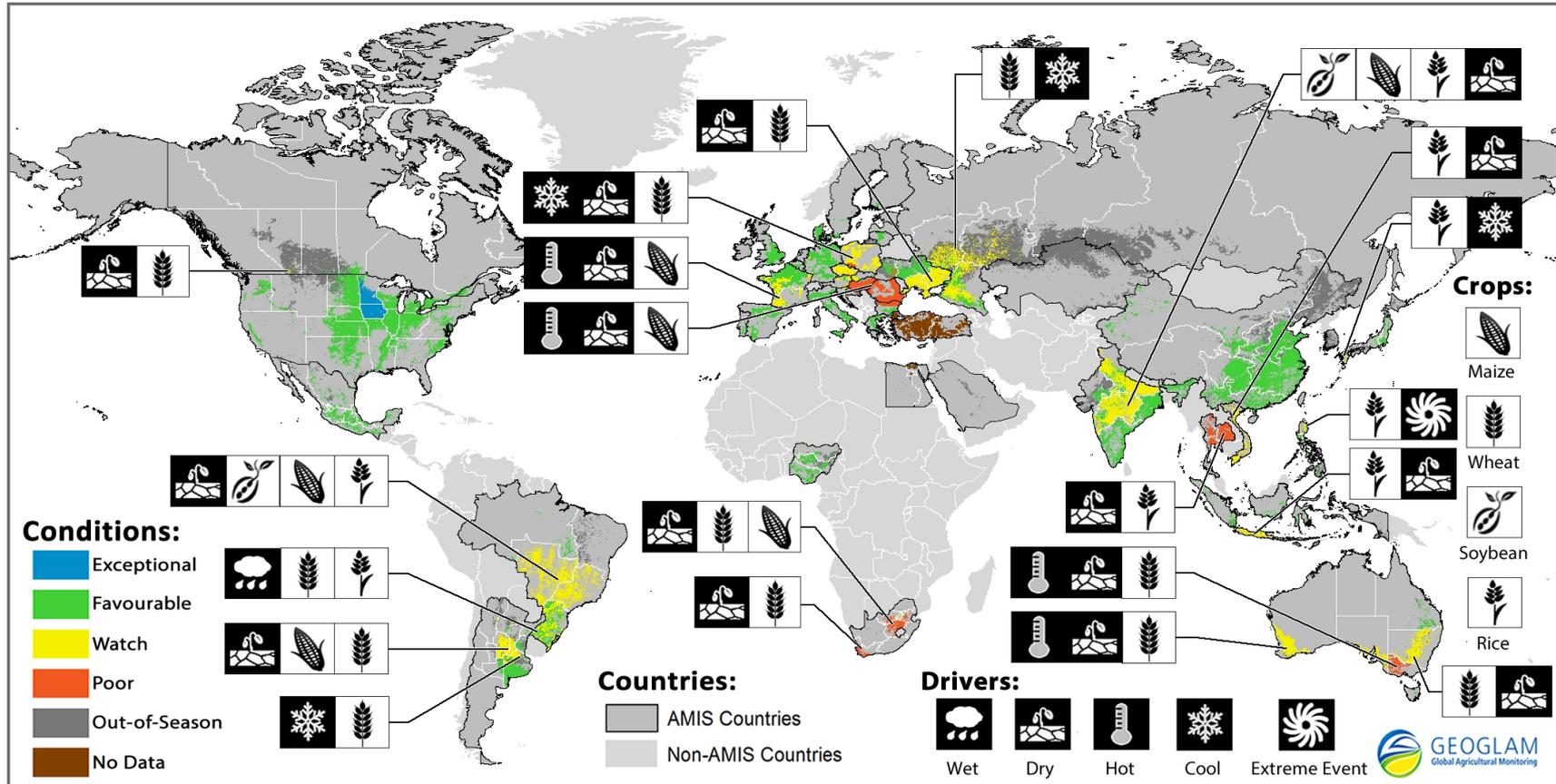


# Borneo fires

- 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



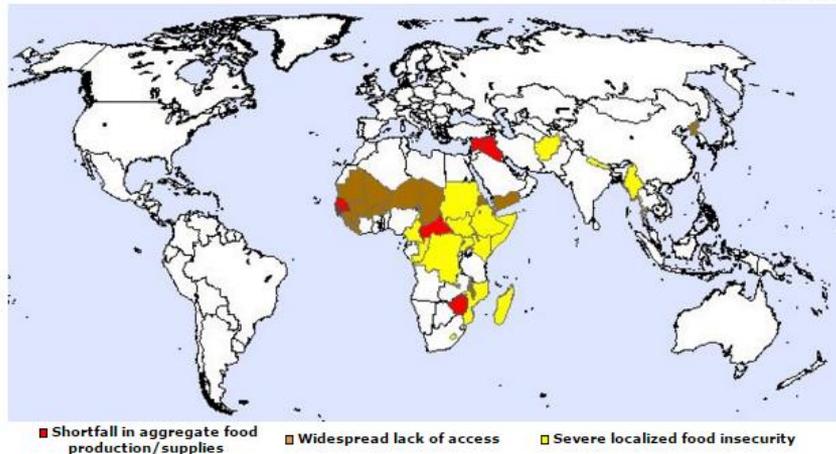
From GEOGLAM Crop Monitor <http://www.geoglam-crop-monitor.org/> Latest information up to Nov 9<sup>th</sup> 2015.

- El Niño brings a mix on conditions for global crop supplies
  - India is experiencing mixed growing conditions and depleted crops of rice and maize and soy are a concern
  - China will likely see favorable growing conditions during the next year
  - Brazil may experience irregular rainfall making for below normal rice, maize and soy crop yields
  - Australia has seen worsening conditions due to lack of rain

# UN Food and Agriculture Organization Global Information and Early Warning System

COUNTRIES REQUIRING EXTERNAL ASSISTANCE FOR FOOD  
(total: 35 countries)

Table View



COUNTRIES WITH UNFAVOURABLE PROSPECTS FOR CURRENT CROPS  
(total: 10 countries)

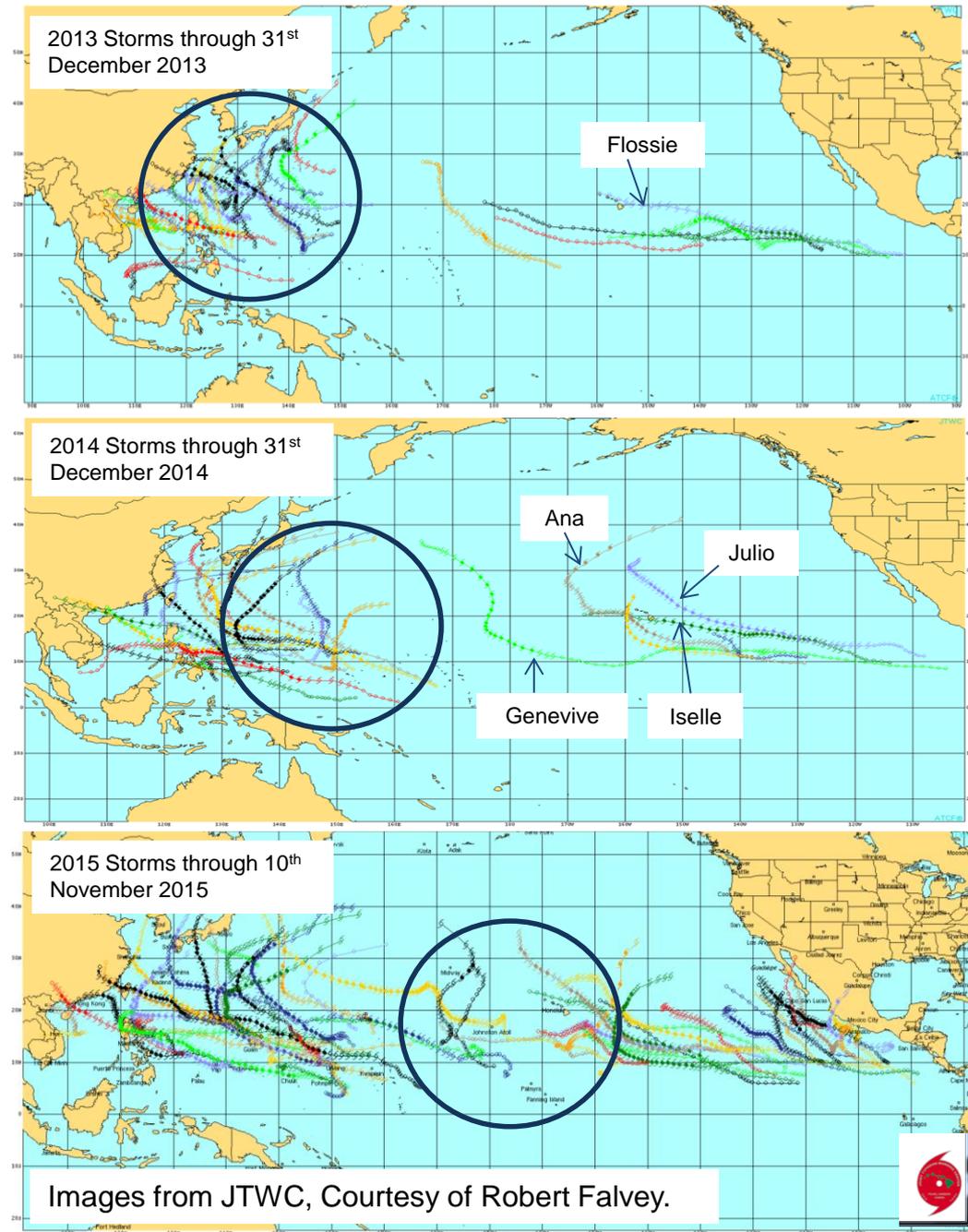
Table View



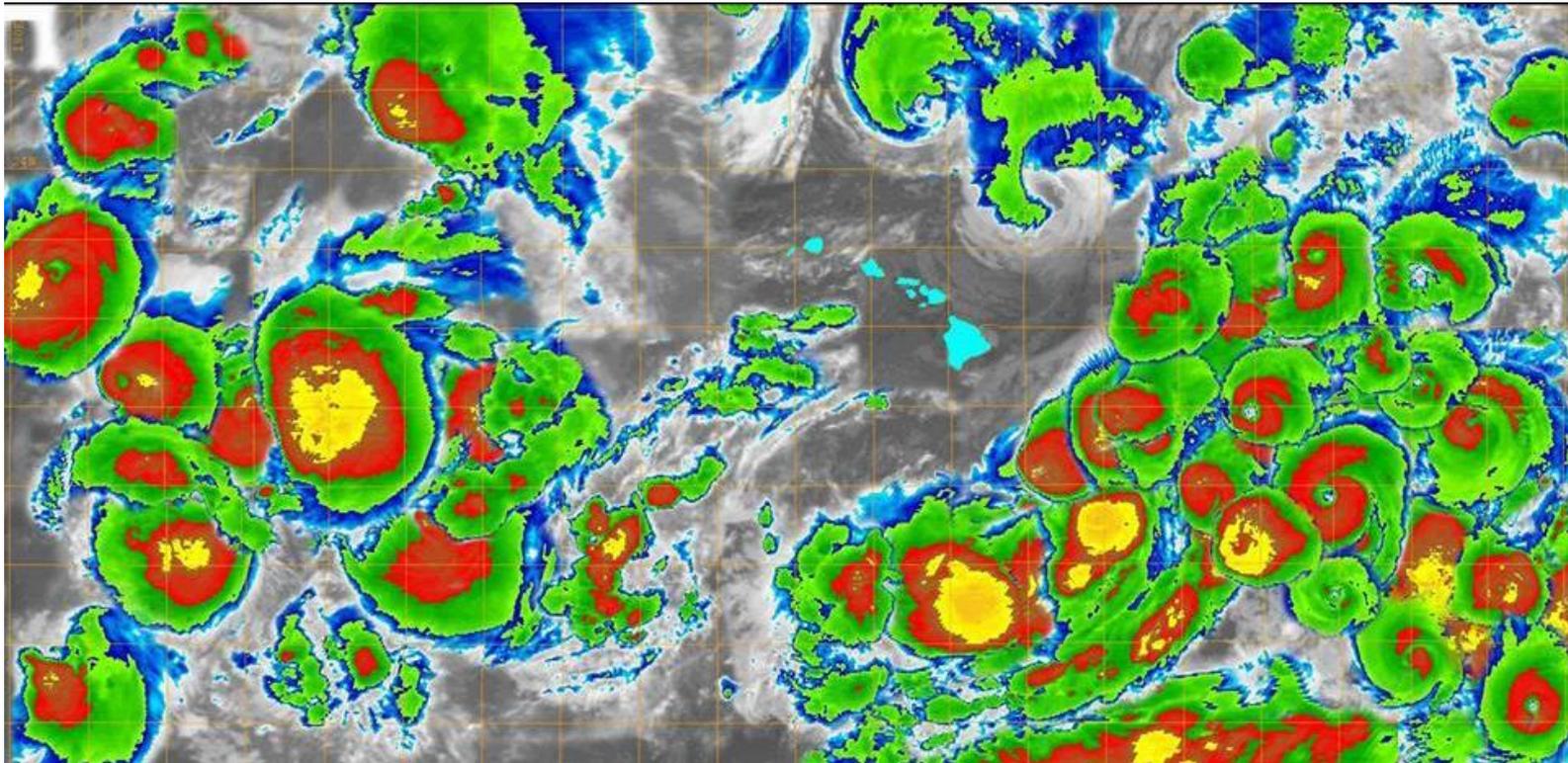
- International prices of maize and wheat generally increased in October
  - Maize prices were underpinned by further downward revisions of the 2015 production forecasts in key exporting countries
  - Concerns about inadequate precipitation for planting of the 2016 winter wheat crop in the Black Sea Region and in the United States of America supported wheat prices.
- The FAO Rice price Index remained under pressure driven by declines in Aromatic and Japonica rice segments
- In Southern Africa, prices of maize continued to increase in October, reflecting tight market supplies due to a sharp subregional production decline this year
  - FAO FPMA Bulletin 10 Nov 2015 <http://www.fao.org/3/a-bb170e.pdf>

# Tropical Cyclones

- West Pacific
  - 2013, 33 TCs, 5 Super Typhoons
  - 2014, 23 TCs, 8 Super Typhoons
  - 2015, 26 Cyclones, including 8 Super Typhoons
  - 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



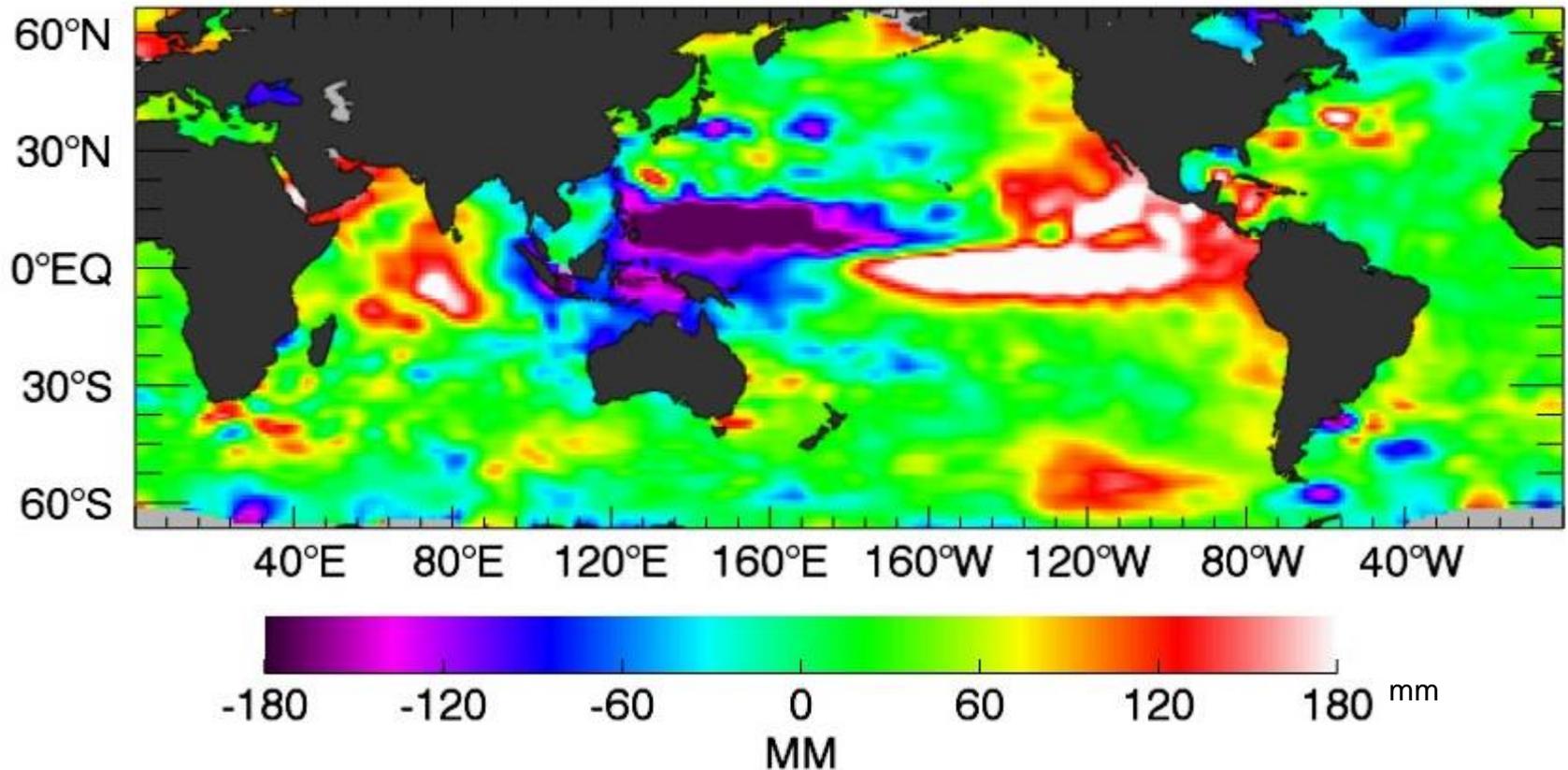
# Luck has been on our side!



- Courtesy of Kevin Kodama at NWS Honolulu Office

# Sea Level Observation

Jason-2 Sea Level Residuals OCT 31 2015



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 ASO 2015

Tide Gauge Station	Observed MEAN Anomaly				Observed MAX Anomaly			
	August 2015	September 2015	October 2015	Standard Deviation of the ASO mean	August 2015	September 2015	October 2015	Standard Deviation of the ASO max
Marianas, Guam	-5	-3	-6	3.5	-0.6	-3.9	-6.8	3.2
Malakal, Palau	-8.5	-7	-7	4.3	-5.5	-3.0	-5.7	4.3
Yap, FSM	-6.4	-8	-8	4.7	-4	-4.5	-7.6	4.7
Chuuk, FSM	*	*	*	*	*	*	*	*
Pohnpei, FSM	-2.8	-2.2	-4	3.8	-3.9	-4.3	-2.7	3.9
Majuro, RMI	-3.9	-4.1	-5	2.8	-2.3	-2.2	-5.9	3.5
Kwajalein, RMI	-5	-5	-6.5	3.2	-5.9	-5.8	-7.2	3.7
Pago Pago, American Samoa	+10	+9	+9	3.2	+9.7	+11.6	+8.2	3.4
Honolulu, Hawaii	0	+1	+1.5	1.8	-1.5	-1.1	+0.7	2.4
Hilo, Hawaii	0	+3	+4	1.8	+0.1	+1.7	+6.1	2.3
* Denotes where data is unavailable								

### Remarks:

- In October 2015, the monthly mean sea level recorded further fall in Guam, Pohnpei, Majuro, and Kwajalein.
- All NWP stations are below normal now.
- Pago Pago is stable which is expected.
- Honolulu and Hilo recorded slight rise.
- The monthly maximum values also displayed considerable fall in most of the stations.

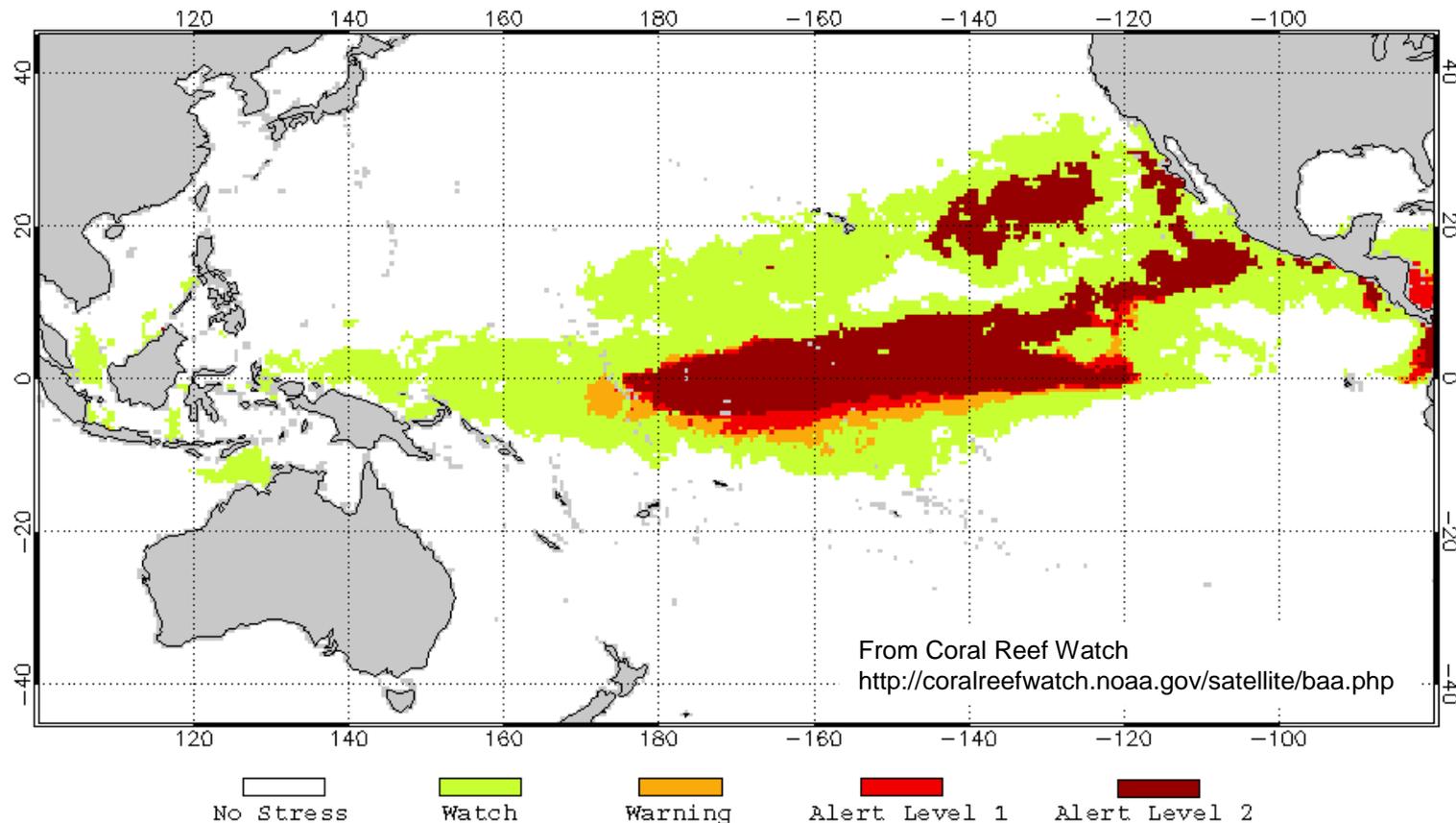
+/- indicate positive anomaly (rise) and negative anomaly (fall) respectively. Note that any changes between (0~ ±1) inch is considered to be negligible. Also note that changes within the range of (+/-) 2 inches are unlikely to cause any adverse climatic impact. \*\* Guesstimated values, \* Data currently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

# Coral Bleaching

## Alert Areas

NOAA/NESDIS Bleaching Alert Area, 11/12/2015



- Most of the Tropical Pacific Basin is under Watch status
- The Central and Eastern Pacific show large areas of Level 2 alert (mortality likely)
- Alert level areas collocated with warmest SST anomalies and low sea levels

# How ENSO effects global health

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

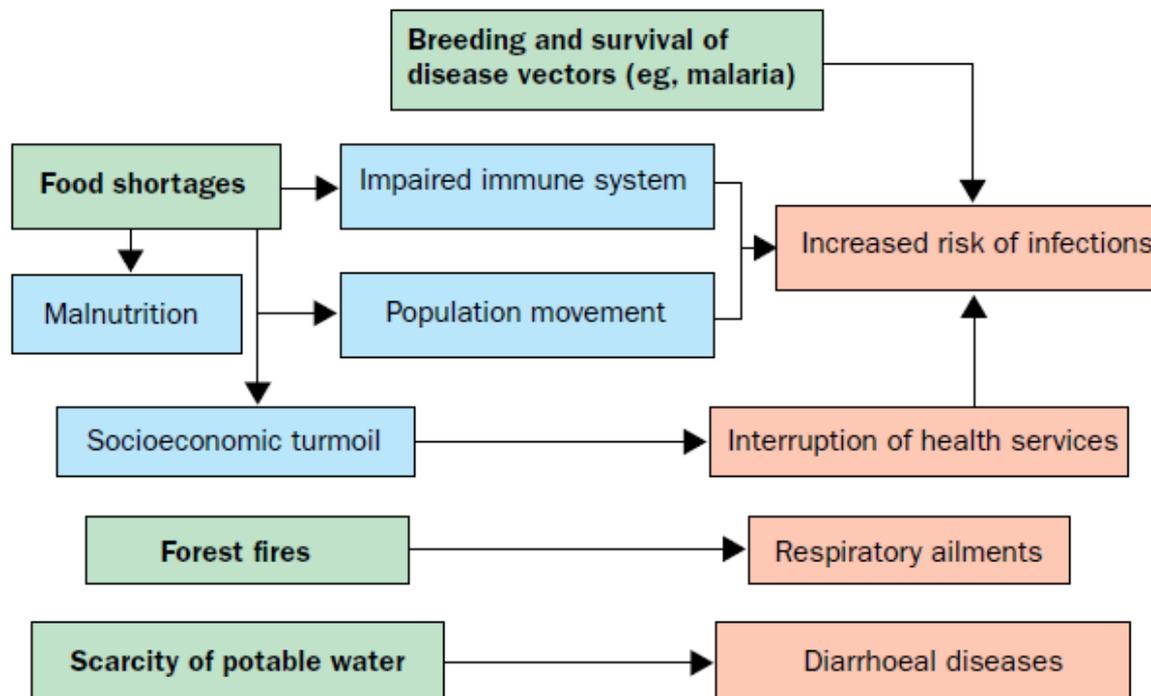
REVIEW

## Review

### El Niño and health

R Sari Kovats, M

El Niño Southern  
consequences of  
occurrence of El  
disasters increas  
South Asia and  
disease is provid  
on other mosqui  
to dealing with  
climate forecast

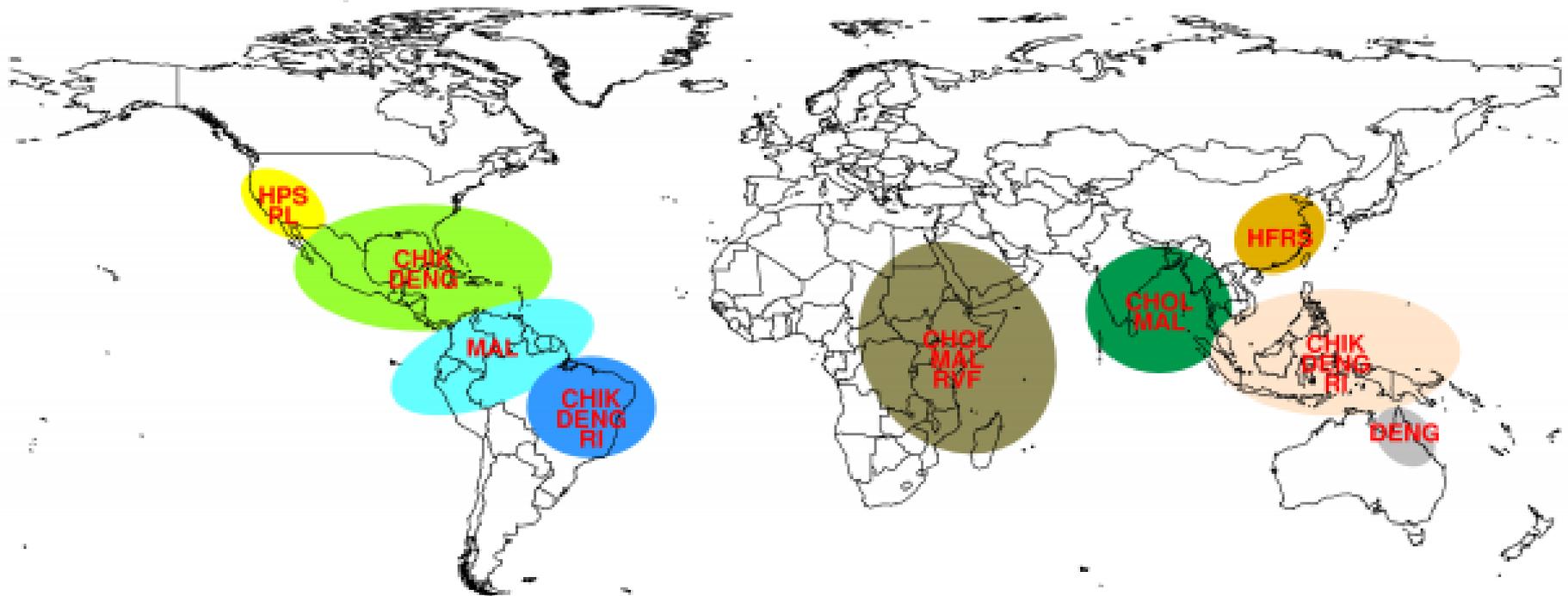


wide-ranging  
The irregular  
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en ENSO and  
NSO's effect  
ers are used  
and seasonal  
paredness.

Figure 2: Potential health effects of drought in developing countries

# ENSO and global health

Hotspots of Potential Elevated Risk for Disease Outbreaks: 2014-2015



CHIK Chikungunya  
CHOL Cholera  
DENG Dengue Fever

HFRS Hemorrhagic Fever with Renal Syndrome  
HPS Hantavirus Pulmonary Syndrome  
MAL Malaria

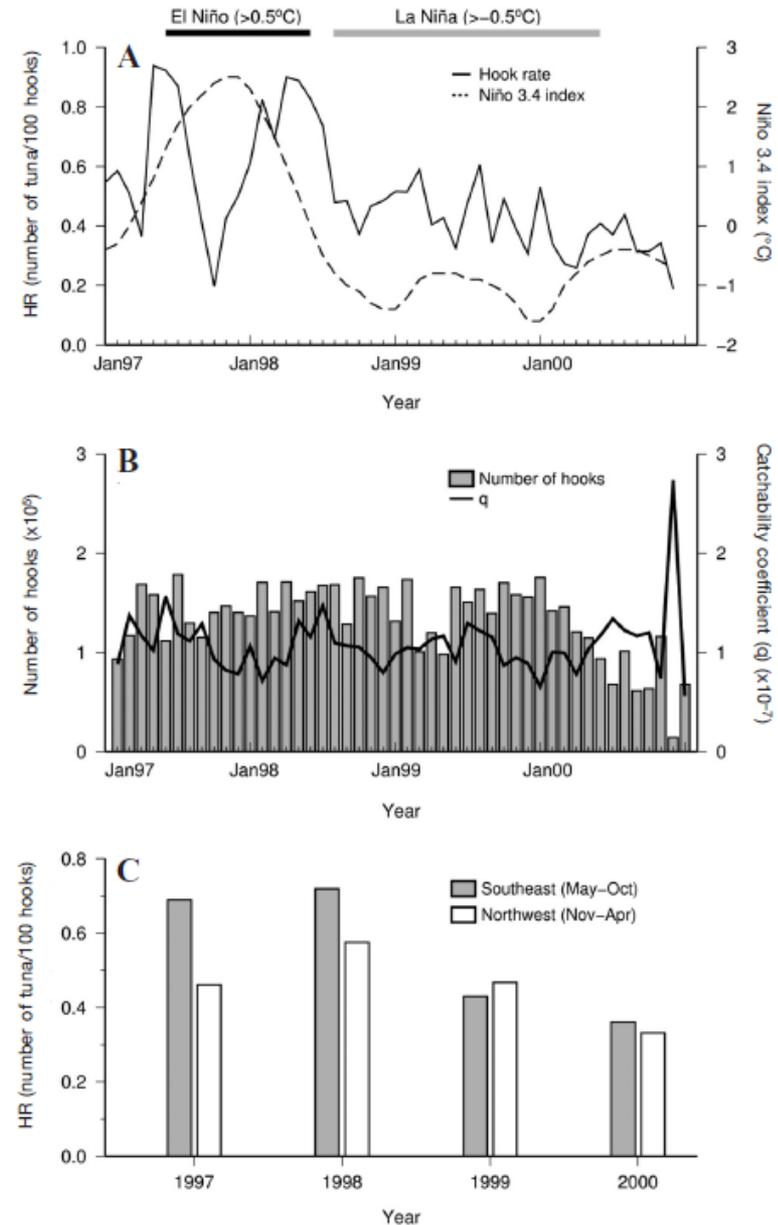
PL Plague  
RI Respiratory Illness  
RVF Rift Valley Fever

## ■ 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.

# El Niño 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 catchability 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).



# Forecast

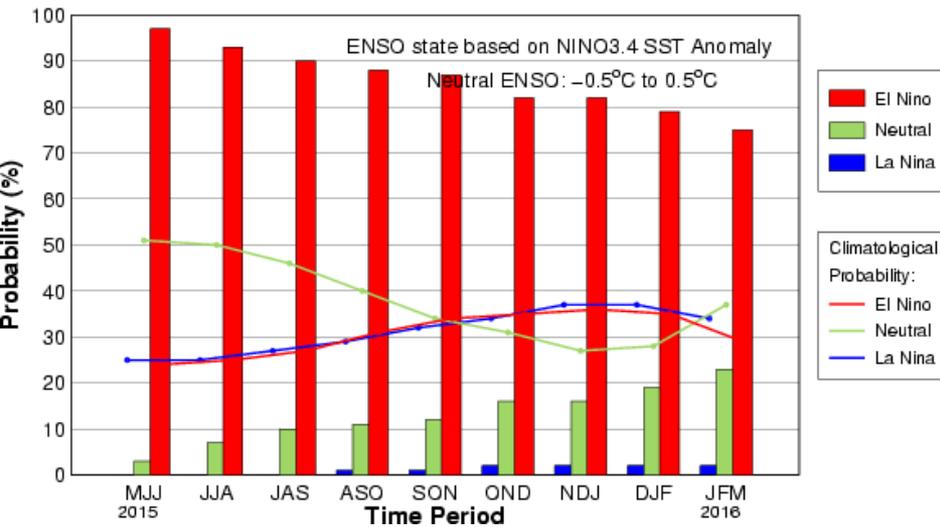
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ENSO forecasts

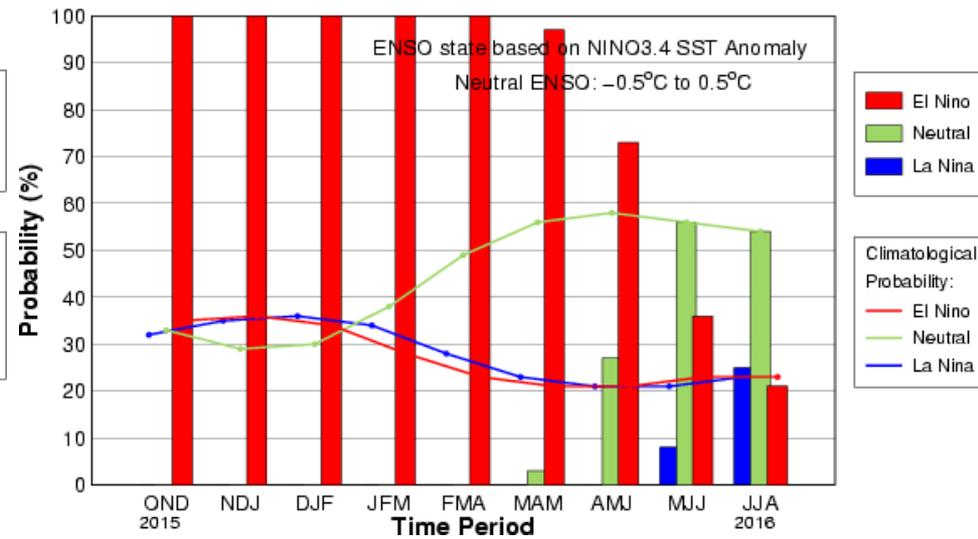
Rainfall, Sea level, Tropical Cyclones and  
Coral Bleaching

# CPC/IRI ENSO Forecast

Mid-May IRI/CPC Plume-Based Probabilistic ENSO Forecast



Mid-Oct IRI/CPC Plume-Based Probabilistic ENSO Forecast



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

### Expected Conditions

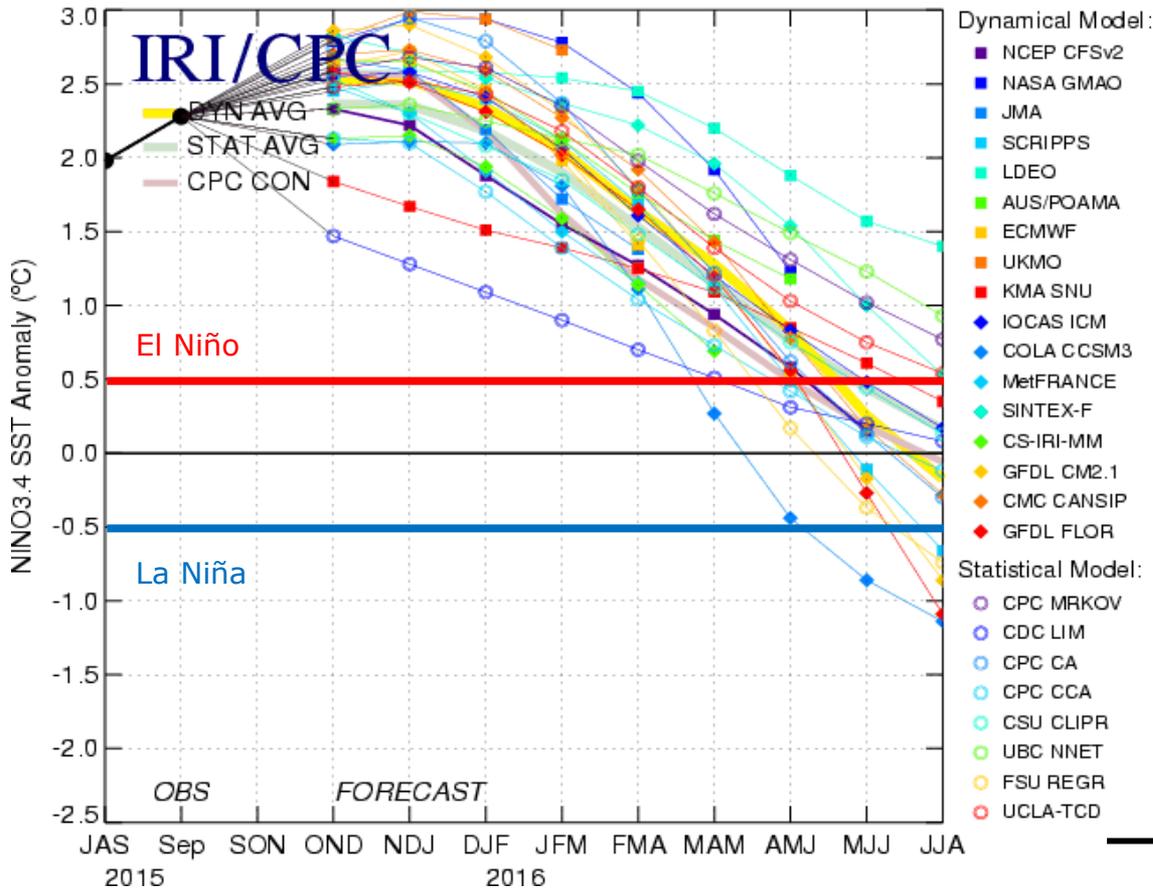
- Continuation of El Niño conditions appears at least 99% likely from the current Oct-Dec 2015 season through to the Feb-Apr 2015-16 season.
- El Niño probabilities remain over 90% into spring 2016, and fall rapidly to well under 50% by May-July 2016.

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

Season	La Niña	Neutral	El Niño
OND 2015	~0%	~0%	100%
NDJ 2015	~0%	~0%	100%
DJF 2015	~0%	~0%	100%
JFM 2016	~0%	~0%	100%
FMA 2016	~0%	~0%	100%
MAM 2016	~0%	3%	97%
AMJ 2016	~0%	27%	73%
MJJ 2016	8%	56%	36%
JJA 2016	25%	54%	21%

# CPC/IRI ENSO Forecast

Mid-Oct 2015 Plume of Model ENSO Predictions



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

### Expected Conditions

- Most models indicate that a strong El Niño will continue through the Northern Hemisphere winter 2015-16
- Weakening and a transition to ENSO-neutral during the late spring or early summer
- The average of all models predicts maintenance of strong El Niño levels (the level that has been attained since July), with very few predicting weakening from current levels

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

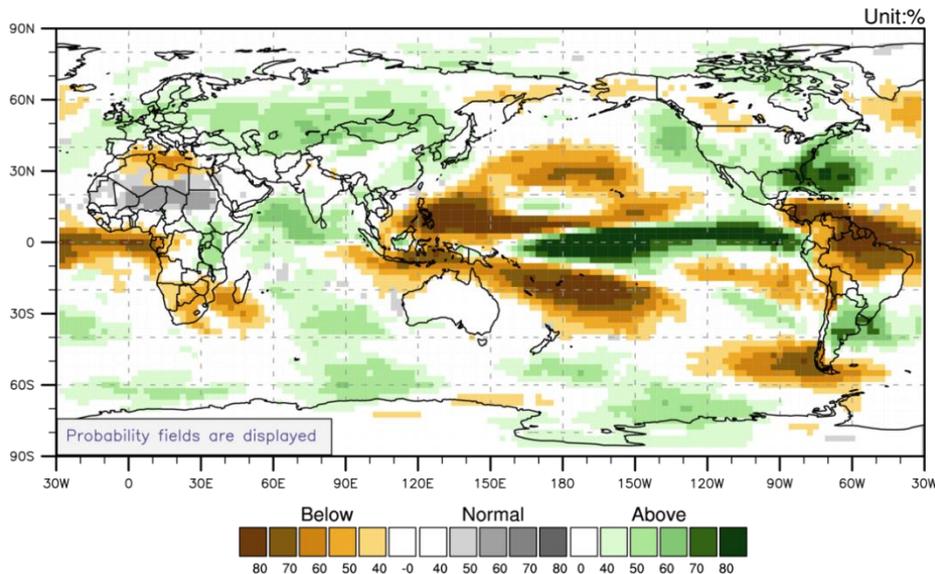
### Average Niño 3.4 SST Anomaly Forecast

	OND	NDJ	DJF
Dynamical	2.5	2.5	2.3
Statistical	2.4	2.4	2.2
All Models	2.5	2.5	2.3

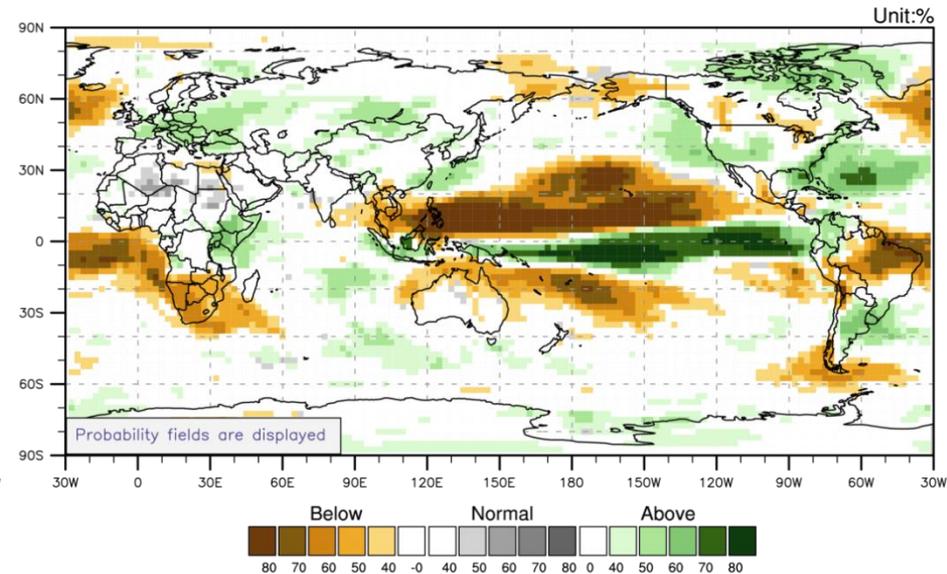
[http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso\\_tab=enso-cpc\\_update](http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)  
[http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso\\_tab=enso-sst\\_table](http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table)  
[http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso\\_tab=enso-iri\\_update](http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-iri_update)  
[http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso\\_tab=enso-sst\\_table](http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table)

# Tropical Rainfall Forecasts (Nov 2015-Apr 2016)

Precipitation for November 2015-January 2016



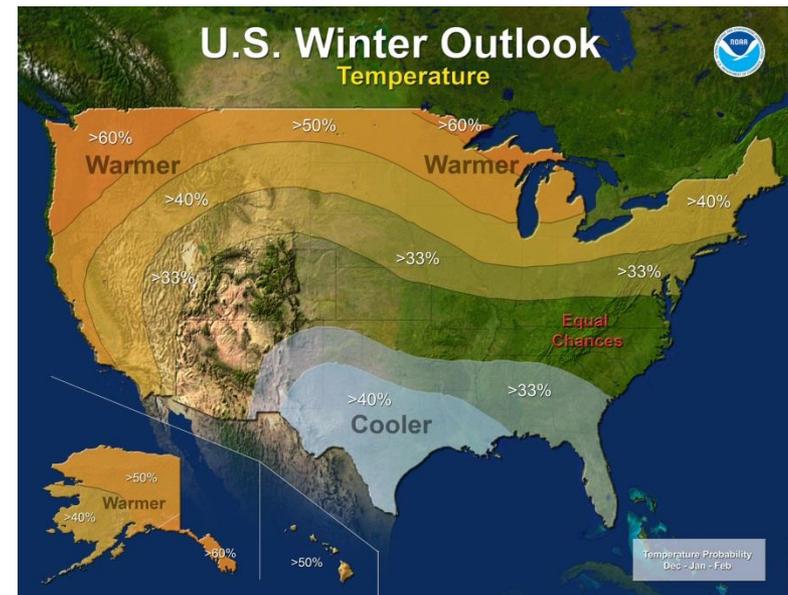
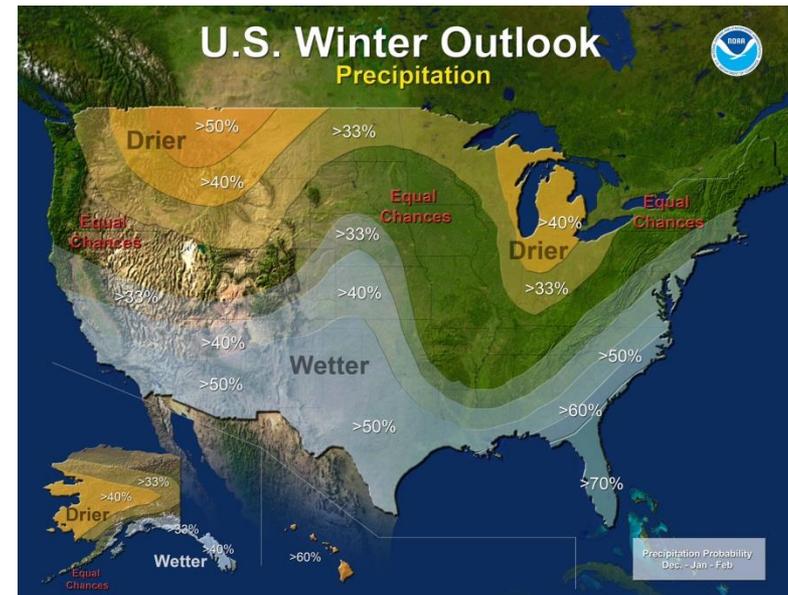
Precipitation for February-April 2016



- 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

# Continental US Forecast

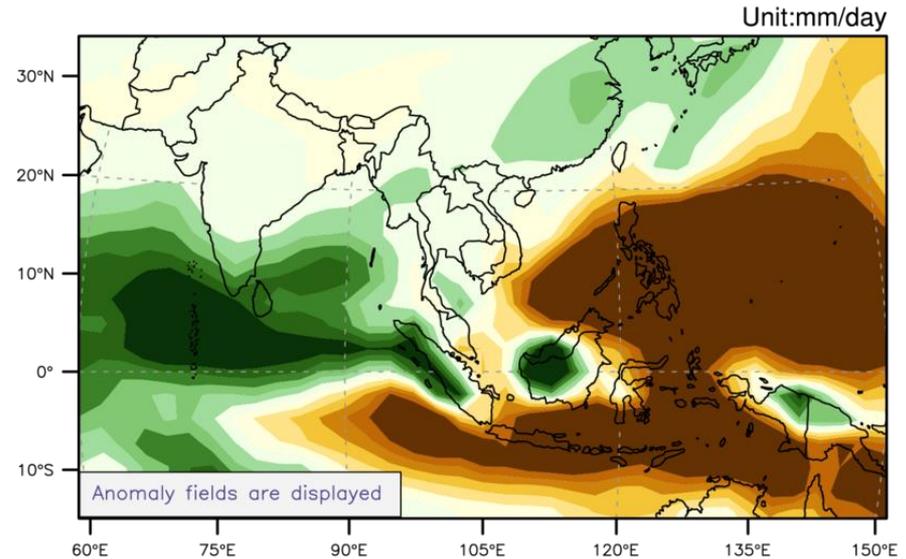
- During the next 3 months
  - Southern US likely wet and cool
  - Northern US dry and cold
  - The West coast warm and wetter than normal
- Given the long-term nature of the drought in much of the Far West, only scattered areas of improvement were noted
- Areas where drought was more entrenched will need abundant precipitation to continue much farther into the wet season before any notable improvement could evolve



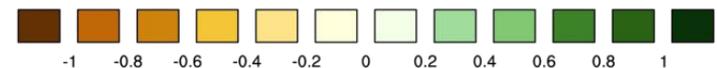
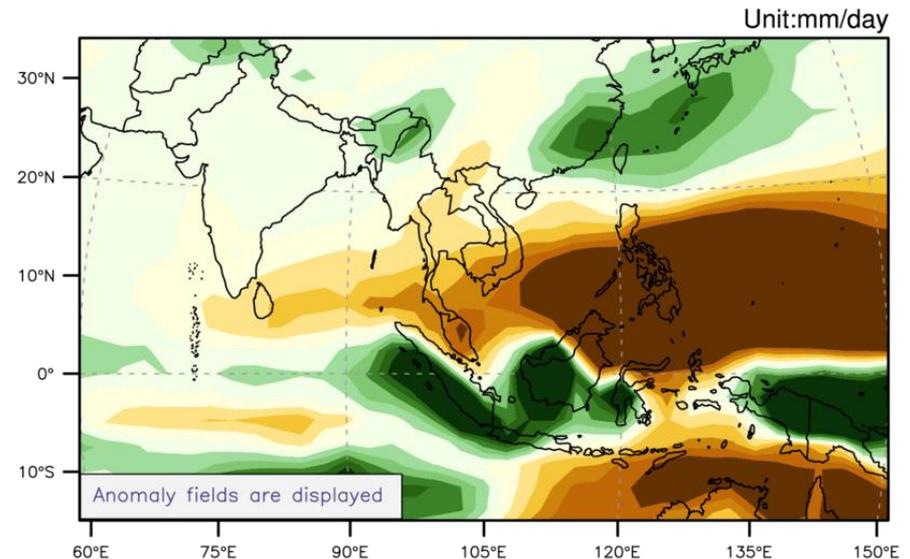
# Asia Pacific

- Dry conditions likely to continue over the tropical Western North Pacific
  - Western Pacific Islands will likely see severe drought
- China likely to receive above average rainfall for the next 6 months
- India
  - Above average rainfall in the Brahmaputra-Meghna area
  - Wet conditions to the south in the short term
- Philippines projected to receive well below average rainfall
- Mainland Southeast Asia likely to see worsening dry conditions over the next 6 months
- Maritime Southeast Asia may see some relief from severe drought

Precipitation for November 2015-January 2016



Precipitation for February-April 2016



# US Affiliated Pacific Islands Rainfall

November - December - January (NDJ) 2015

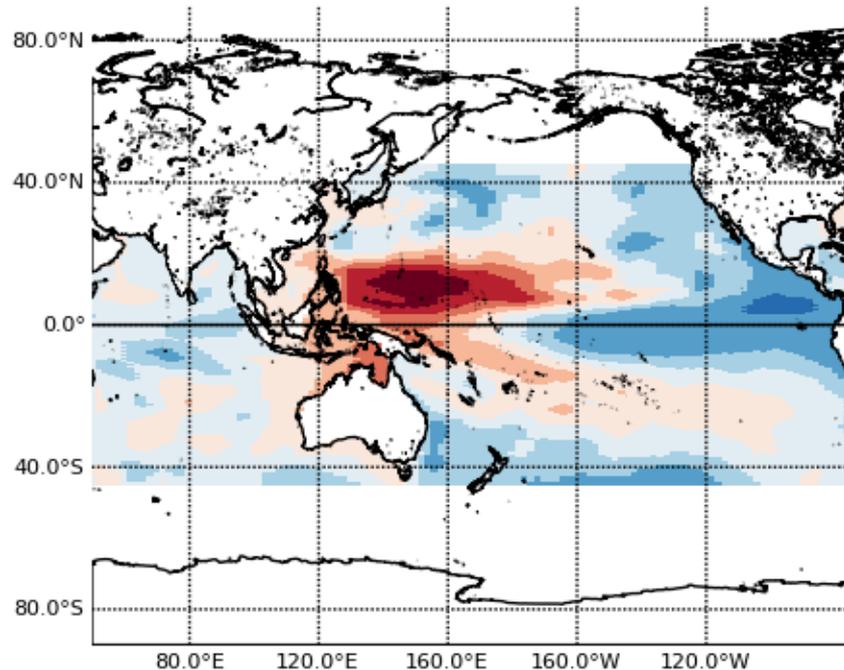
Model:	UKMO	ECMWF	NCEP CA	NASA GMAO	NCEP Coupled	IRI	APCC	PEAC CCA	Final Outlook	Final Probabilities	
Republic of Palau											
Koror	L 7° 22' N, λ 134° 32' E	Below	Below	Below	Below	Below	Below	Below	Avg-Below	Below	60:25:15
Federated States of Micronesia											
Yap	L 9° 29' N, λ 138° 05' E	Below	Below	Below	Below	Below	Below	Below	Below	Below	60:25:15
Chuuk	L 7° 28' N, λ 151° 51' E	Below	Below	Below	Below	Below	Below	Below	Below	Below	55:25:20
Pohnpei	L 6° 59' N, λ 158° 12' E	Below	Below	Below	Below	Below	Below	Below	Below	Below	55:25:20
Kosrae	L 5° 21' N, λ 162° 57' E	Below	Below	Avg	Avg-Below	Below	Below	Below	Below	Below	50:30:20
Republic of the Marshall Islands											
Kwajalein	L 8° 43' N, λ 167° 44' E	Avg-Above	Below	Avg	Below	Below	Below	Below	Below	Below	45:30:25
Majuro	L 7° 04' N, λ 171° 17' E	Below	Below	Above	Avg-Below	Below	Below	Below	Below	Below	45:30:25
Guam and CNMI											
Guam	L 13° 29' N, λ 144° 48' E	Below	Below	Below	Below	Below	Clim	Below	Clim	Below	50:30:20
Saipan	L 15° 06' N, λ 145° 48' E	Below	Below	Avg-Below	Below	Below	Clim	Below	Avg-Above	Below	50:30:20
American Samoa											
Pago Pago	L 14° 20' S, λ 170° 43' E	Below	Below	Below	Above	Below	Below	Below	Avg-Above	Below	45:30:25
State of Hawaii											
Lihue	L 21° 59' N, λ 159° 20' E	Below	Below	Below	Avg-Below	Avg	Below	Below	Avg-Below	Below	45:35:20
Honolulu	L 21° 19' N, λ 157° 56' W	Below	Below	Below	Avg-Below	Avg	Below	Below	Clim	Below	45:30:25
Kahului	L 20° 54' N, λ 156° 26' E	Below	Below	Below	Avg-Below	Avg	Below	Below	Clim	Below	45:30:25
Hilo	L 19° 43' N, λ 155° 03' E	Below	Below	Below	Avg-Below	Avg	Below	Below	Avg-Below	Below	45:35:20



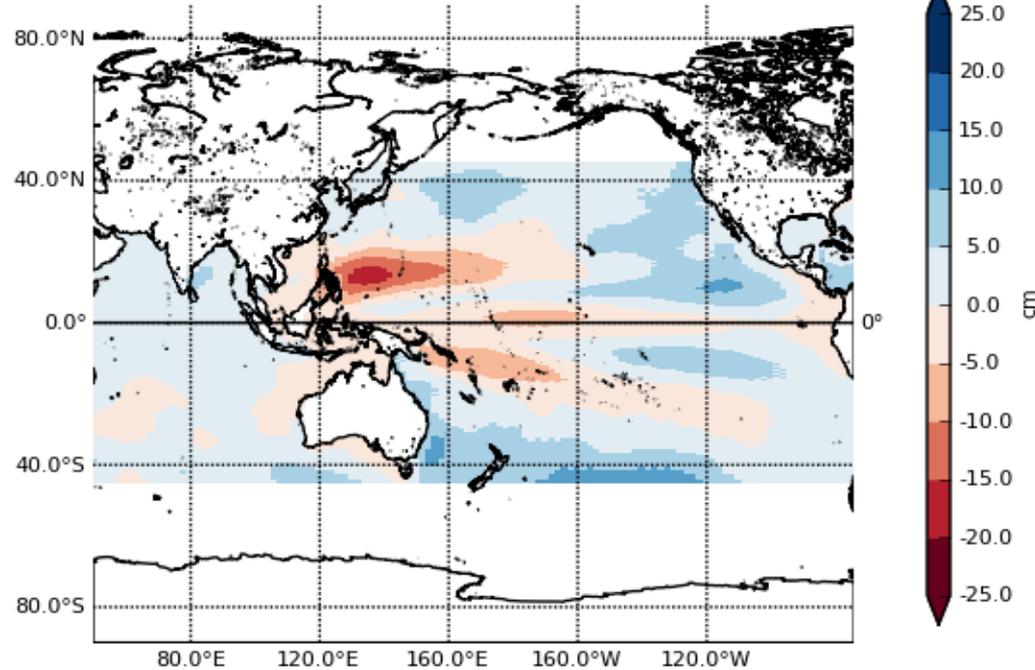
People line up for water in the Marshall Islands in early 1998 to receive a ration once every 14 days. (Photo courtesy of Federal Emergency Management Agency)

# Sea Level Forecasts

Forecast period: Dec - Feb, 2015 - 2016, Lead time: 1 month



Forecast period: May - Jul, 2016, Lead time: 6 months



- Sea Level across the Western Pacific Basin is expected to
  - Continue falling for the next few months
  - Stay well below normal through July 2016

# US Affiliated Pacific Islands

## Sea level forecast

Table 1 : Forecasts of MEAN and MAX sea level anomaly in inches for NDJ 2015

Tide Gauge Station	Forecast Anomaly for NDJ 2015 (in inches)			
	MEAN Deviation(1)	Standard Deviation NDJ season	MAX Deviation (2)	Standard Deviation of NDJ season
Marianas, Guam	-3	4.4	-1	3.8
Malakal, Palau	-6	4.8	-6	4.8
Yap, FSM	-5	4.9	-4	5.2
Chuuk, FSM**	-5	*	-4	*
Pohnpei, FSM	-7	4.8	-7	4.9
Kapingamarangi, FSM	*	*	*	*
Majuro, RMI	-5	3.7	-4	3.9
Kwajalein, RMI	-4	3.8	-4	4.1
Pago Pago, American Samoa	+1	3.0	+1	3.8
Honolulu, Hawaii	+2	1.6	+1	2.5
Hilo, Hawaii	+2	1.9	+1	2.4

(\*) 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.

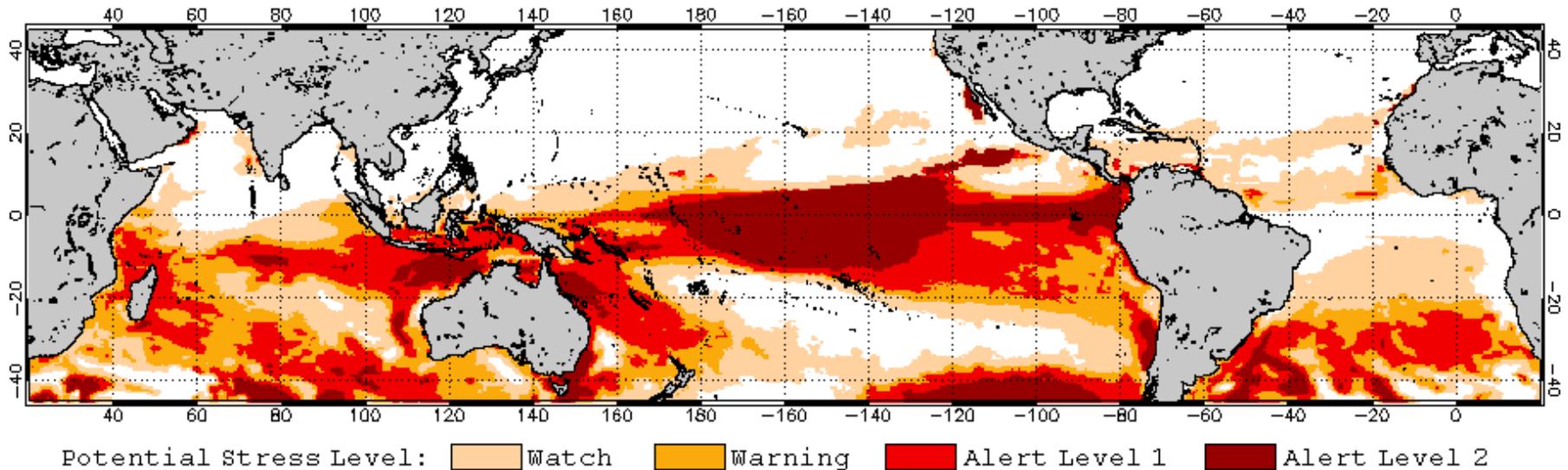
1: Difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value at each station (seasonal cycle removed); 2 : Difference between the maximum sea level for the given month and the 1983 through 2001 average maximum sea level value at each station (seasonal cycle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

# Tropical Cyclone Forecast

- **Western Pacific Basin** (Based on City University of Hong Kong Forecast)
  - Forecast from June 1 to November 30
  - Decreased TC formation and landfall predicted for the 2015 season
- **Central Pacific Basin** (Central Pacific Hurricane Center)
  - An above average season was expected
  - Our season is coming to an end but we're not out of the woods
  - Late season, even out of season TCs are still possible
- **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)
  - An average season, with around seven to nine cyclones forming
  - The equatorial region to the north of Mauritius could be significantly conducive for cyclone formation

# Coral Bleaching Outlook

2015 Nov 10 NOAA Coral Reef Watch 60% Probability Coral Bleaching Thermal Stress for Nov–Feb 2016  
Experimental, v3.0, CFSv2–based, 28–member Ensemble Forecast



- High probability of Coral Bleaching across the Tropical Pacific

# Synopsis

## Current Conditions

- Current ENSO status is **El Niño**
- SST anomalies greater than 2.5C 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
  - Wet conditions giving way to 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 to continue through Northern Hemisphere 2015-16
- Transition to Neutral by late spring early summer

# Forecast Summary

- Rainfall
  - Asia
    - Philippines projected to receive well below average rainfall
    - Mainland Southeast Asia likely to see worsening dry conditions over the next 6 months
    - Maritime Southeast Asia may see some relief from severe drought
  - Northern South America likely to experience dry conditions for the next 6 months
  - Southern Africa likely to see no relief to ongoing drought for the next 6 months
  - Continental US some relief for west coast drought possible
- Sea Level
  - Likely to remain well below average over the western Pacific until June 2016
- TCs
  - Central Pacific Basin
    - Late season, even out of season TCs are still possible
  - US Affiliated Pacific Islands
    - The risk of a damaging tropical cyclone likely to continue through January 2016
    - 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

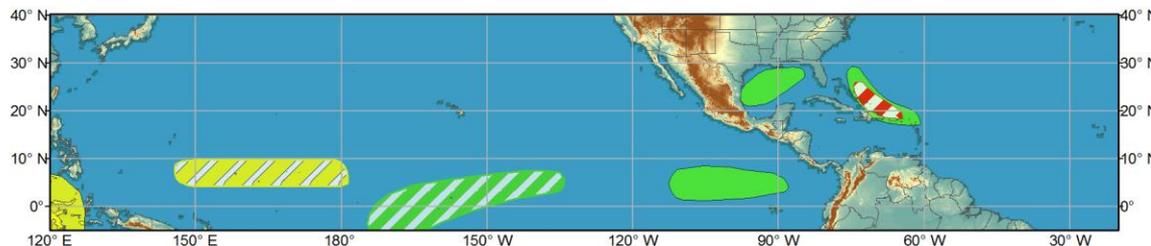
# Tropical Hazards and Benefits outlook



Global Tropics Hazards and Benefits Outlook - Climate Prediction Center



**Week 1 - Valid: Nov 07 2015 - Nov 10 2015**



**Week 2 - Valid: Nov 11 2015 - Nov 17 2015**



**Confidence**  
High Moderate

**Produced: 11/06/2015**  
**Forecaster: Pugh**

- |                                   |  |  |
|-----------------------------------|--|--|
| <b>Tropical Cyclone Formation</b> |  | Development of a tropical cyclone (tropical depression - TD, or greater strength). |
| <b>Prior TC Formation Outlook</b> |  | Tropical cyclone outlook from previous release.                                    |
| <b>Above-average rainfall</b>     |  | Weekly total rainfall in the upper third of the historical range.                  |
| <b>Below-average rainfall</b>     |  | Weekly total rainfall in the lower third of the historical range.                  |
| <b>Above-normal temperatures</b>  |  | 7-day mean temperatures in the upper third of the historical range.                |
| <b>Below-normal temperatures</b>  |  | 7-day mean temperatures in the lower third of the historical range.                |

**Product is updated once per week. The product targets broad scale conditions integrated over a 7-day period for US interests only. Consult your local responsible forecast agency.**



**UNIVERSITY AT ALBANY**  
State University of New York



# 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**

Weekly SST Anomalies (DEG C)

