

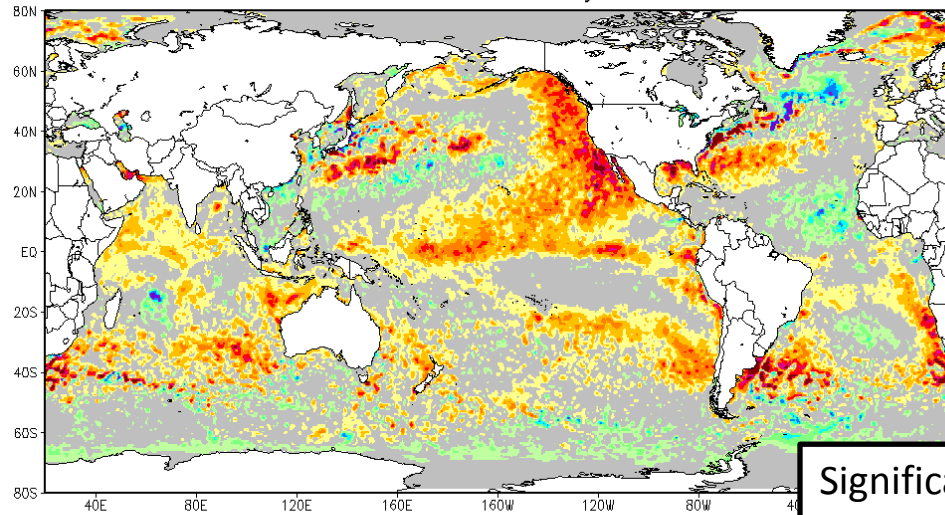
# TCI 2015 ENSO update

05/26/2015

Slides prepared by Will Komaromi

Daily OISST Anomaly Intv2: 12APR2015

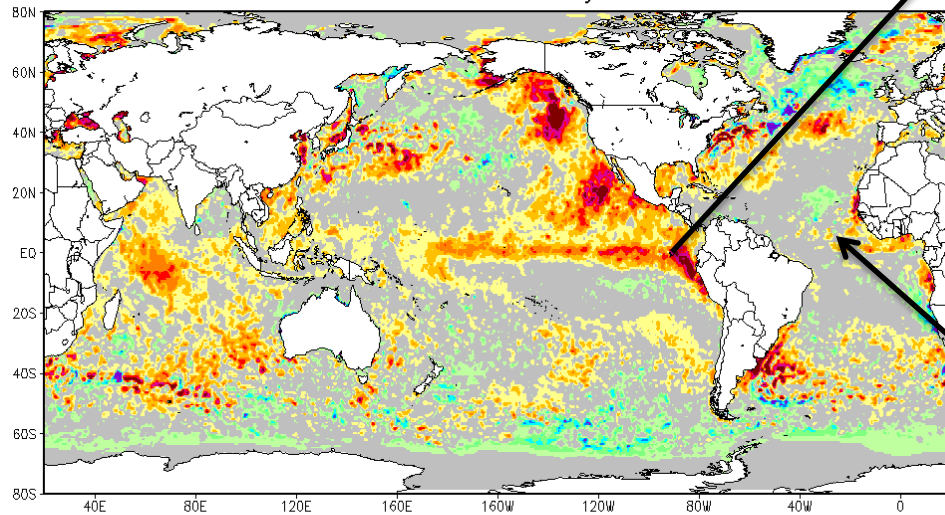
AVHRR – only



Significant recent warming in Nino 1+2

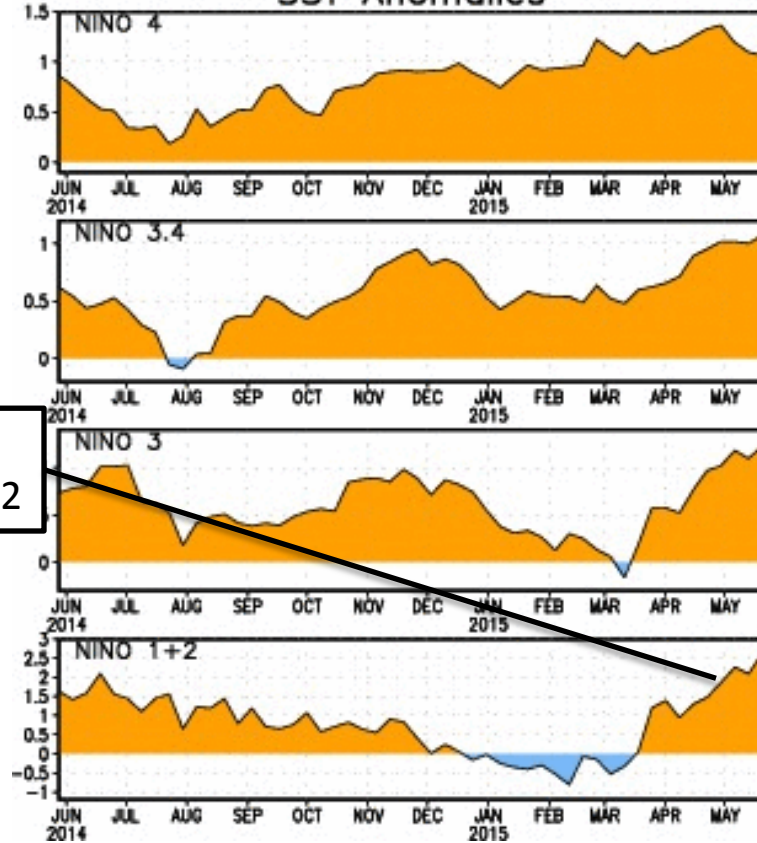
Daily OISST Anomaly Intv2: 25MAY2015

AVHRR – only



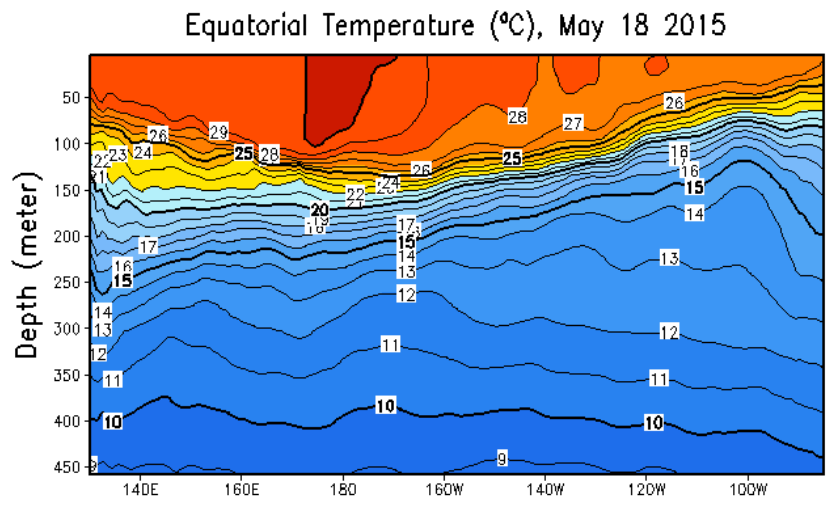
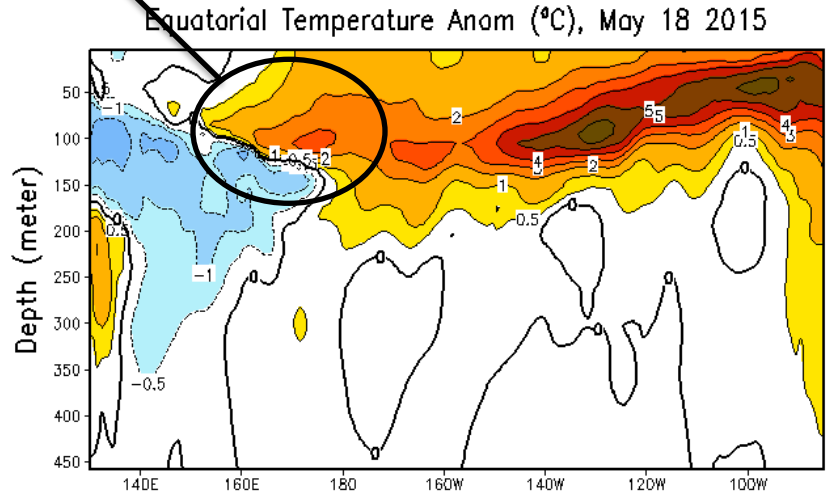
Also note average to below average temperatures in Atlantic MDR

SST Anomalies



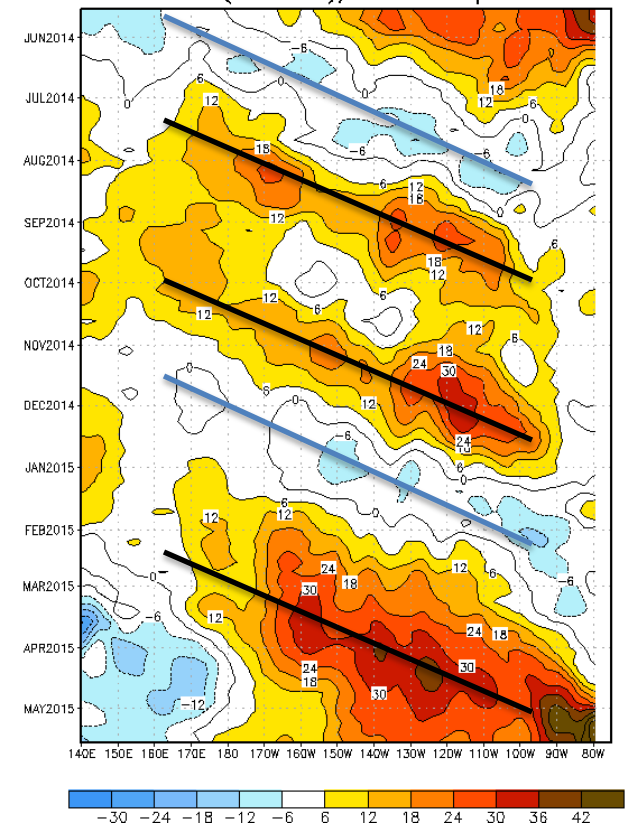
Early signs of development of reinforcing downwelling oceanic Kelvin wave?

Extremely large / deep warm pool in equatorial East Pacific



Downwelling Kelvin waves  
Upwelling Kelvin waves

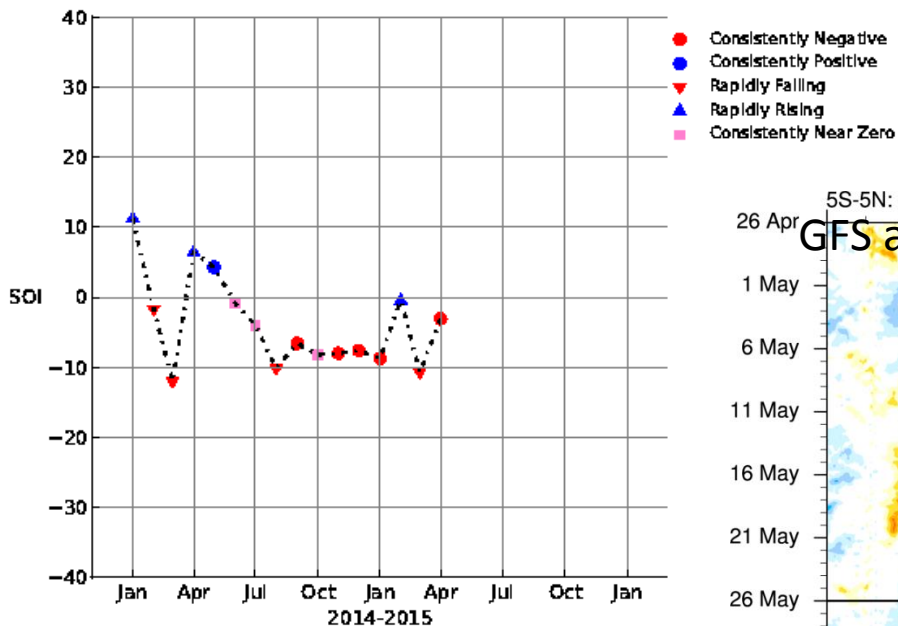
Depth 20°C Anom., ending May 20 2015 (2°S-2°N), 4 times 3pts



Very strong downwelling oceanic Kelvin wave has crossed entire equatorial Pacific. Recent sustained (non-propagating) cooling in West Pacific also generally associated with mod/strong El Nino development. Note how weak previous upwelling waves have been by comparison.

# -SOI and continued westerly wind bursts (WWBs)

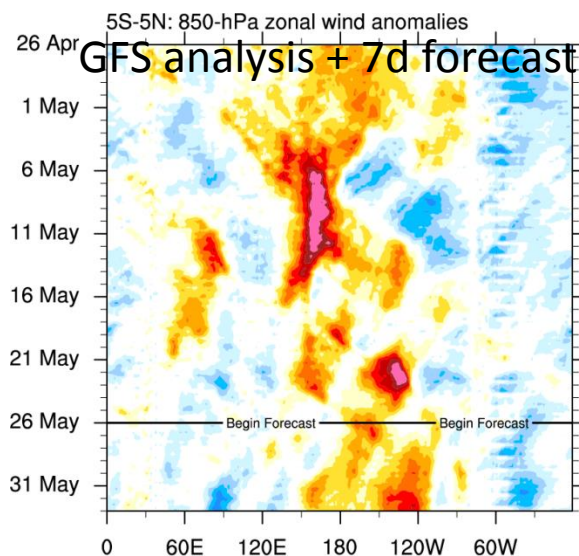
Southern Oscillation Index & 'SOI Phase'



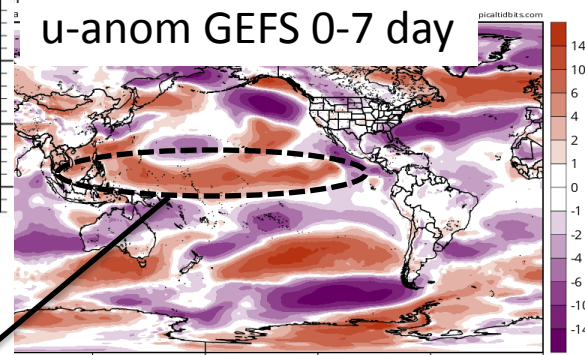
SOI has been varying between 0 and -20. We expect a sustained period below -10 (occasionally well-below) in mod/strong El Ninos. Whether or not this drop in SOI is sustained or transient remains to be seen.

Past and upcoming westerly wind anomalies along equator should continue to support warming in the east/central Pacific

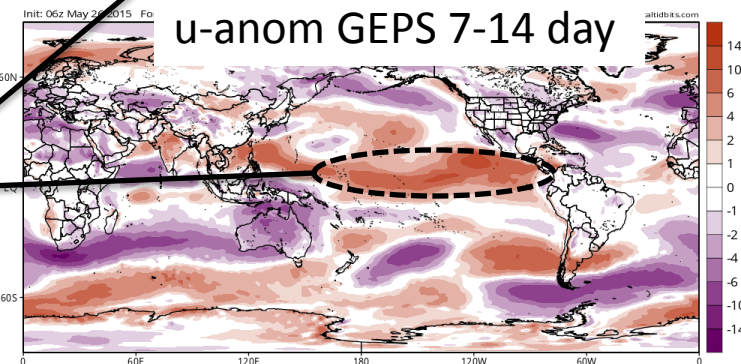
5S-5N: 850-hPa zonal wind anomalies  
GFS analysis + 7d forecast



u-anom GEFS 0-7 day

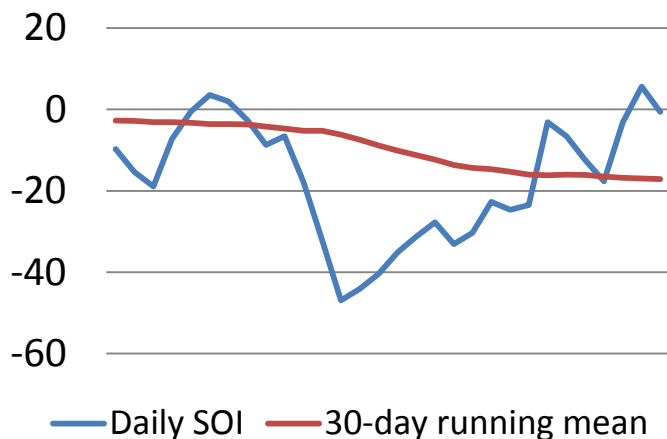


u-anom GEFS 7-14 day



Anomalous westerlies

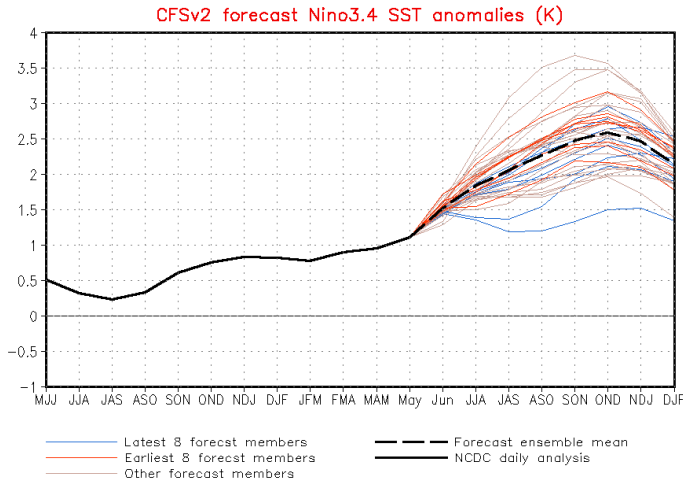
SOI most recent 30 days



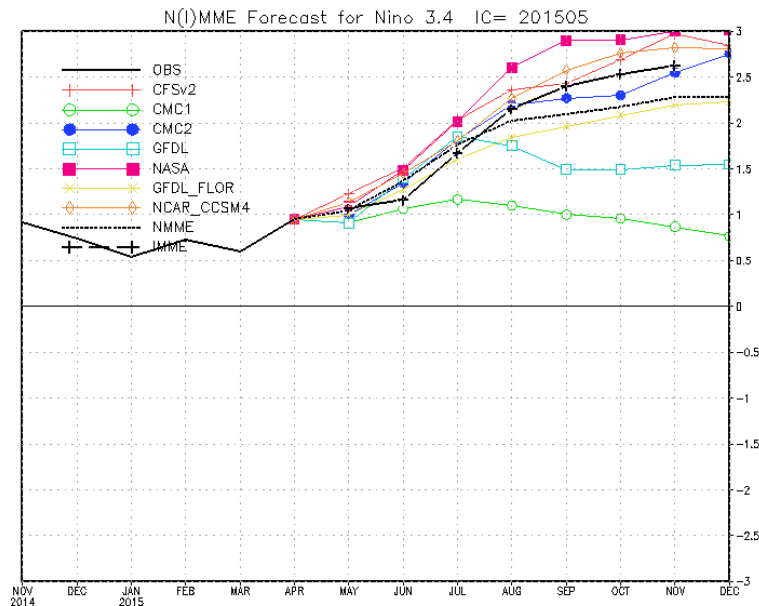
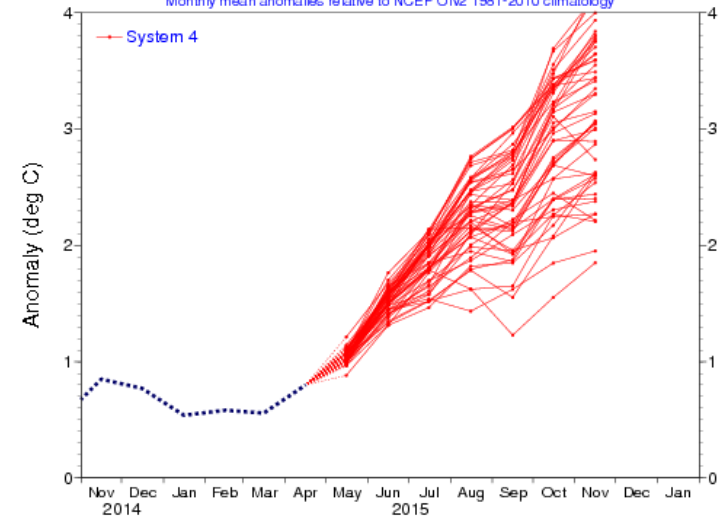
# Dynamical models all agree on mod/strong El Nino by August-October (ASO), statistical models more indicative of weak to moderate El Nino



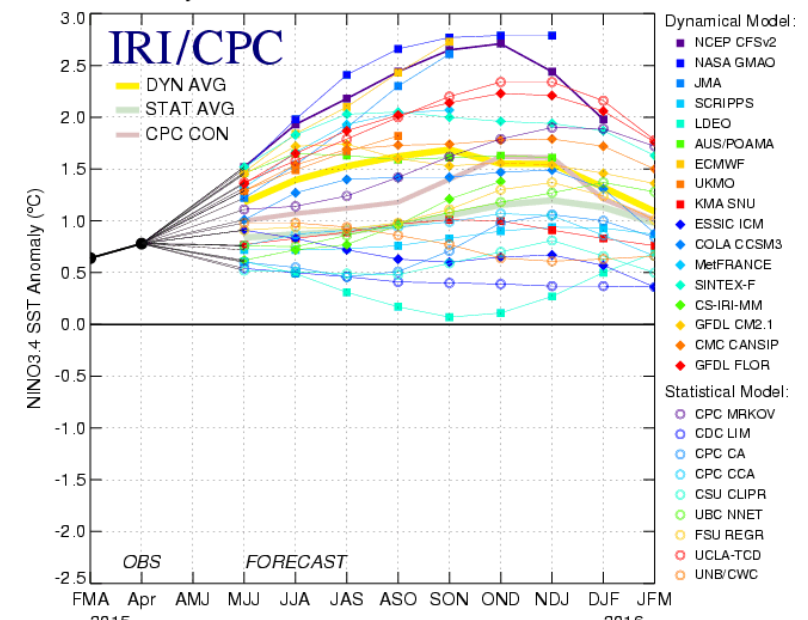
Last update: Tue May 26 2015  
Initial conditions: 15May2015-24May2015



NINO3.4 SST anomaly plume  
ECMWF forecast from 1 May 2015  
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology



Mid-May 2015 Plume of Model ENSO Predictions



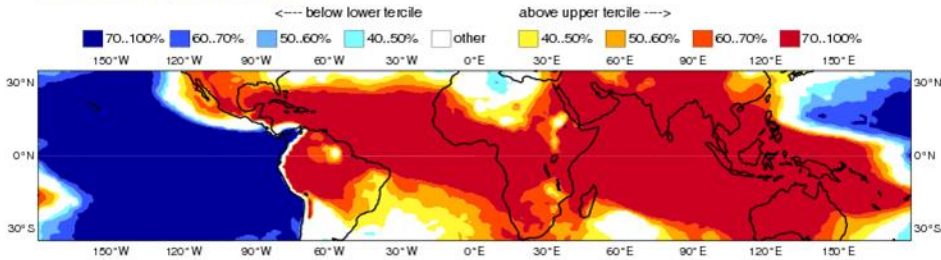


ECMWF Seasonal Forecast  
 Prob(most likely category of MSLP)  
 Forecast start reference is 01/05/15  
 Ensemble size = 51, climate size = 450

System 4  
 ASO 2015

ECMWF seasonal forecast calls for much higher than average probabilities of above average MSLP in the Atlantic, above average probabilities of below-average MSLP in the E Pac

Overall better agreement than any of 4 prior years

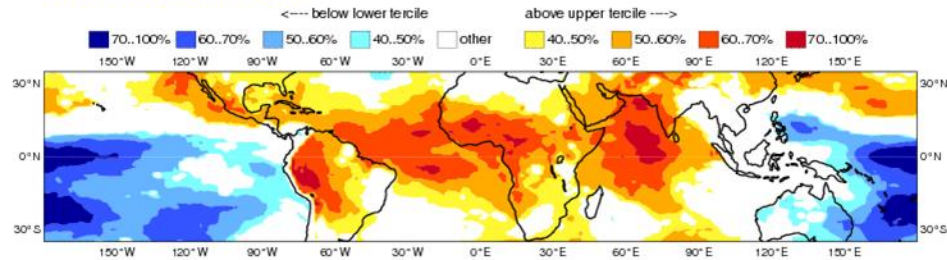
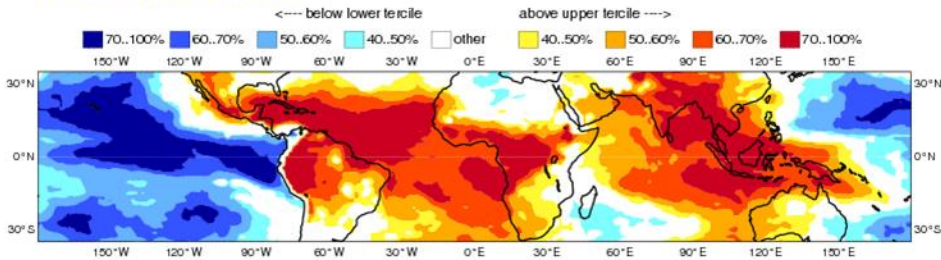


ECMWF Seasonal Forecast  
 Prob(most likely category of MSLP)  
 Forecast start reference is 01/05/14  
 Ensemble size = 51, climate size = 450

System 4  
 ASO 2014

ECMWF Seasonal Forecast  
 Prob(most likely category of MSLP)  
 Forecast start reference is 01/05/12  
 Ensemble size = 51, climate size = 450

System 4  
 ASO 2012

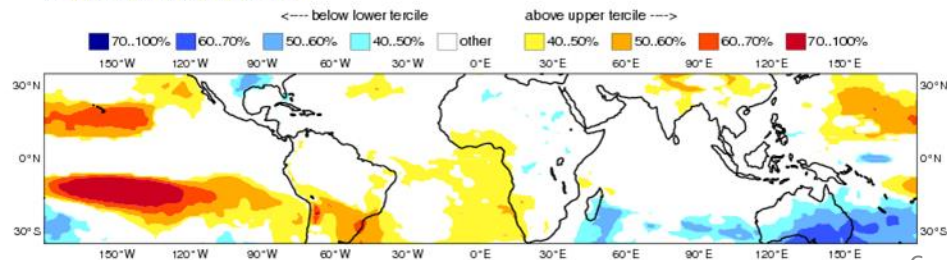
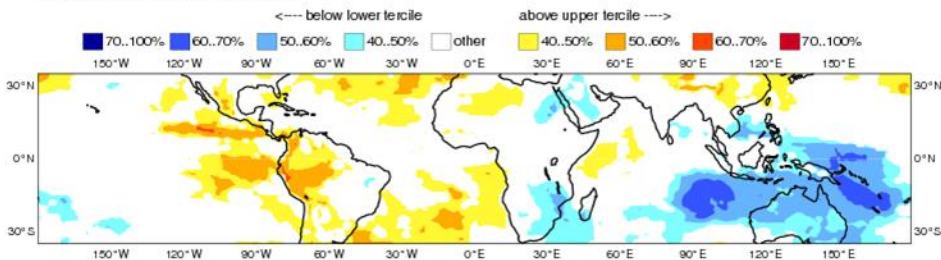


ECMWF Seasonal Forecast  
 Prob(most likely category of MSLP)  
 Forecast start reference is 01/05/13  
 Ensemble size = 51, climate size = 450

System 4  
 ASO 2013

ECMWF Seasonal Forecast  
 Prob(most likely category of MSLP)  
 Forecast start reference is 01/05/11  
 Ensemble size = 51, climate size = 450

System 4  
 ASO 2011



# 10 strongest El Nino years (in terms of ASO Nino 3.4) since 1950

Year	ASO Nino 3.4	Trop Storms	Hurricanes	ACE
1997	2.1	8	3	40
1965	1.7	6	4	84
1972	1.6	7	3	28
1987	1.6	7	3	34
1982	1.5	6	2	29
1957	1.2	8	3	84
1963	1.2	9	7	118
1951	1.1	12	8	137
2002	0.9	12	4	67
2009*	0.8	9	3	53
Mean:		<b>8.4</b>	<b>4.0</b>	<b>67.4</b>

\*since 1953, 1969, 2004 and 2009 are all tied for 10<sup>th</sup> place in terms of Nino 3.4, used Aug/Sep MEI as the tie-breaker

# 10 weaker El Nino years (in terms of ASO Nino 3.4) since 1950

Year	ASO Nino 3.4	Trop Storms	Hurricanes	ACE
1969	0.8	18	12	158
2004	0.8	15	9	225
1953	0.8	14	6	104
1986	0.7	6	4	36
1991	0.7	8	4	34
1976	0.6	10	6	81
1968	0.5	8	4	35
1977	0.5	6	5	25
1994	0.5	7	3	32
2006	0.5	10	5	79
Mean:		<b>10.2</b>	<b>5.8</b>	<b>80.9</b>



# 10 ENSO neutral-positive years (in terms of ASO Nino 3.4) since 1950

Year	ASO Nino 3.4	Trop Storms	Hurricanes	ACE
2012	0.5*	19	10	133
1990	0.4	14	8	91
2003	0.4	16	7	175
1958	0.3	10	7	121
1979	0.3	9	5	91
1952	0.2	7	6	87
1960	0.2	7	4	88
1993	0.2	8	4	39
2005	0.0	28	15	250
1966	0.0	11	7	145
Mean:		<b>12.9</b>	<b>7.3</b>	<b>122</b>

\*less than 5 consecutive tri-monthly mean Nino 3.4 values above +0.5C, so not considered an official El Nino

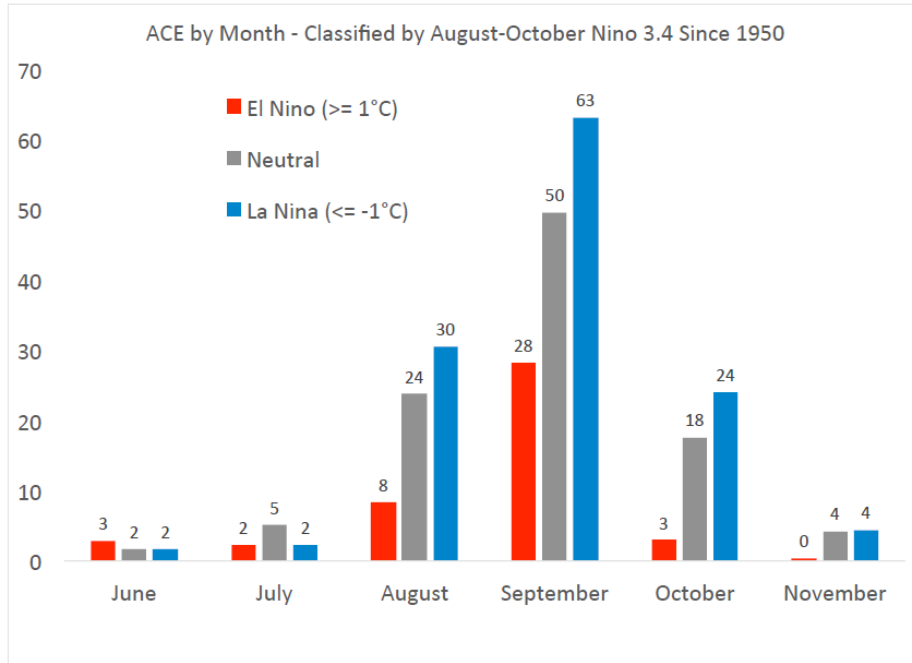
	<b>Trop Storms</b>	<b>Hurricanes</b>	<b>ACE</b>
10 strongest El Nino years	<b>8.4</b>	<b>4.0</b>	<b>67.4</b>
10 weaker El Nino years	<b>10.2</b>	<b>5.8</b>	<b>80.9</b>
10 neutral+ ENSO years	<b>12.9</b>	<b>7.3</b>	<b>122</b>

Clearly, on average, the warmer the ENSO 3.4 region, the lower the expected number of tropical storms, hurricanes and seasonal ACE (but with significant year-to-year variability within each sample)

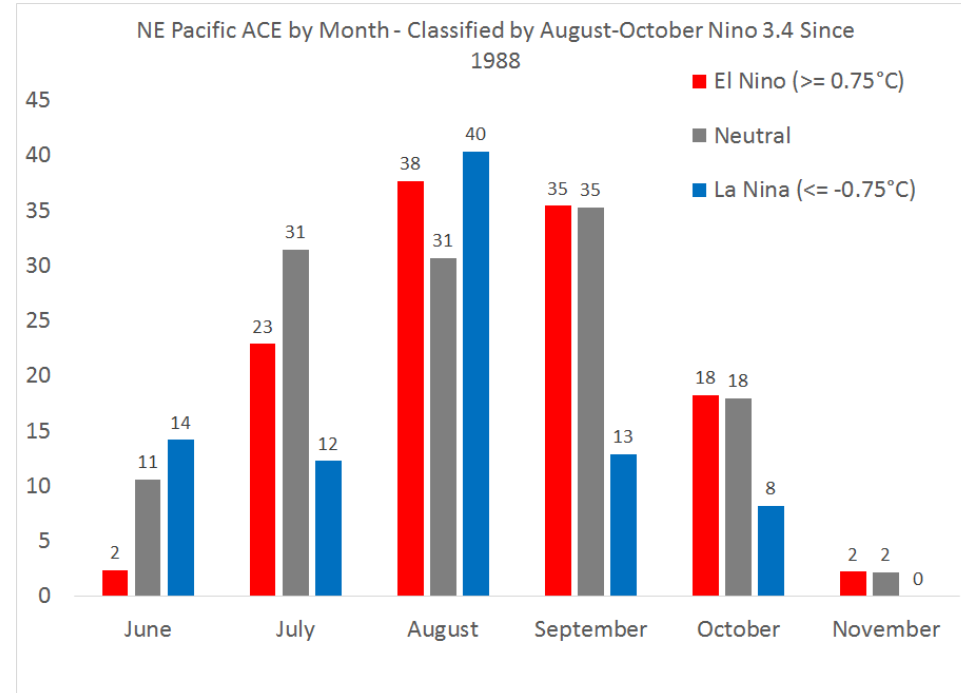
Note: neutral+ years still have higher numbers in all 3 columns even if you remove 2005 from the sample

# ACE by month

## Atlantic



## East Pacific



Plots produced by Philip Klotzbach, shared by Jason Dunion

# Early Season: Jun-Jul

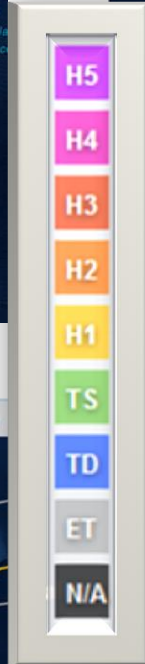
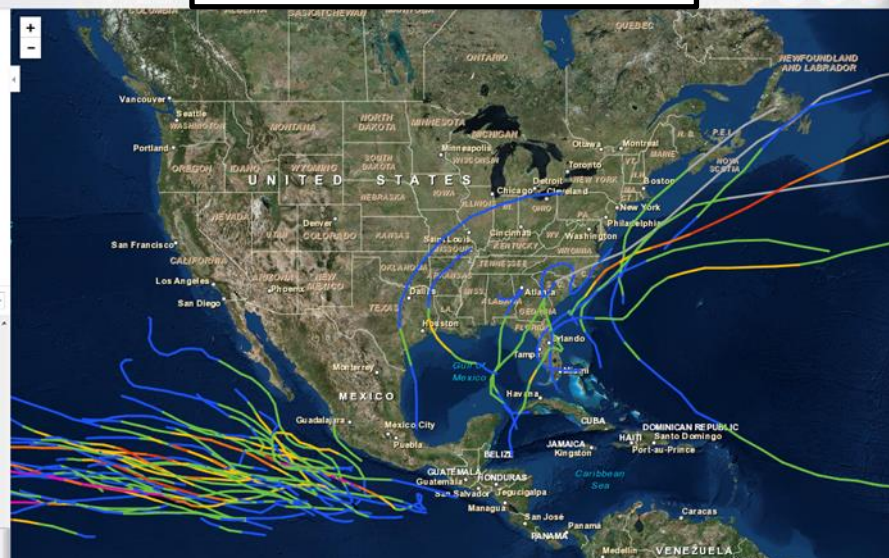
Mod/Strong El Nino (10 years)



Neutral/slightly + (10 years)



Weak El Nino (10 years)



Early season can be very hit-or-miss

Overall likelihood of an early season Gulf threat perhaps slightly lower in El Niño seasons

Odds of an East Coast threat about equal

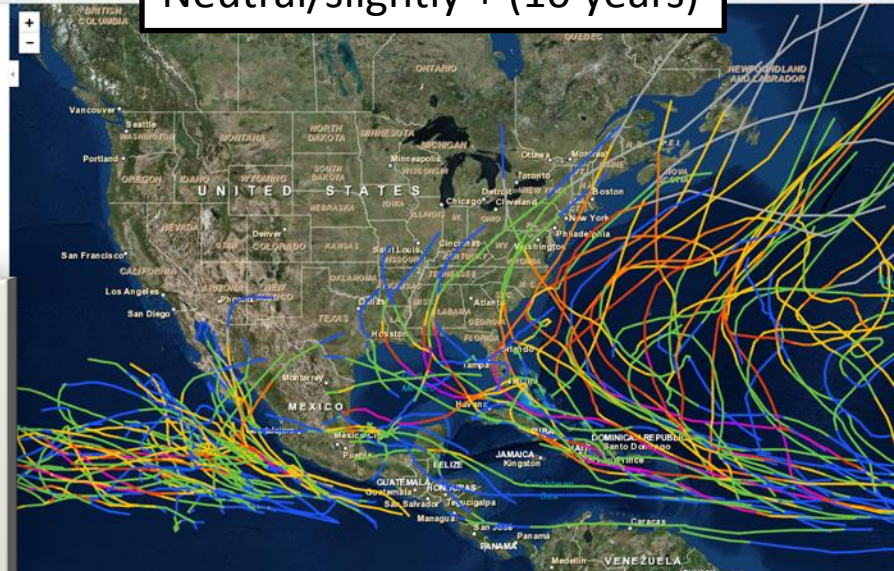


## Peak Season: Aug-Sep

Mod/Strong El Nino (10 years)



Neutral/slightly + (10 years)



Weak El Nino (10 years)



If anything, the number of Gulf threats actually increases during El Nino years. However most increase due to short-lived TSs not hurricanes

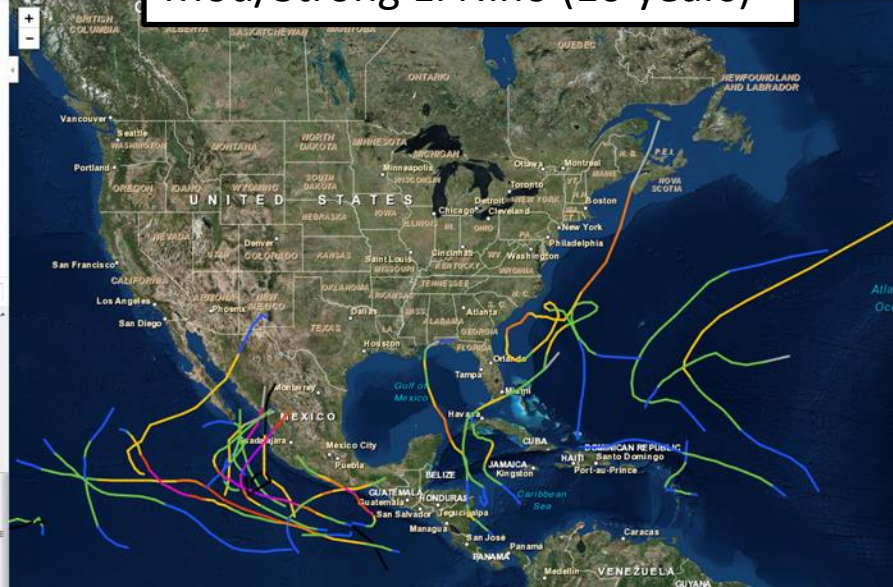
East Coast threats still numerous in weak El Nino seasons. Mod/strong El Ninos comparatively quiet along East Coast

While activity is reduced in mod/strong El Ninos, it certainly does not guarantee a shutout



## Late Season: Oct-Nov

Mod/Strong El Nino (10 years)



Neutral/slightly + (10 years)



Weak El Nino (10 years)



While total number of late season TCs is reduced in mod/strong El Ninos, several targets “close to home” still exist

In the East Pac: late-season recurving TCs into Mexico increases slightly in El Nino conditions, could be potential “last resort”

# Flight opportunities in 4 strongest El Nino events since 1950

## ATLANTIC- GH Sep Wk 2 and before

Year	#Storms	#Hurricanes	Location	Month	#WB OPS	#GHOP
1972	7, 3SS	3H, 1 Jun	E Coast	Sep wk1-2,	1H, 2T	1H, 2T
1882	6, 1SS	1H, 1MH, 1Jun	Ctrl ATL	Sep wk2-3	0	1H
1987	7	2H, 1 MH	E Carib, ctrl ATL; W Carib, S FL	Sep wk4 Oct wk2	1H	2H 1T
1997	8	2H, 1MH, 2Jun	E Coast-30N	Jul wk2,3 Sep wk2	1T	2H

## E. PACIFIC- GH Sep Wk3 onward

1972	12	8H	SW Baja	Aug wk4, Sep wk1 Oct wk1	1H, 1T 1H	1H
1982	19	11H	S Baja	Sep wk3-4	1H, 2T	2H
1987	18	9H	15-20N, 100-120W  SW Baja	Jul wk4, Aug wk1 Sep wk2, Oct wk2	0	1H
1997	17	9H	15N, 120-135W S Baja	Jul wk2-4 Sep wk2-4	1H	1H