



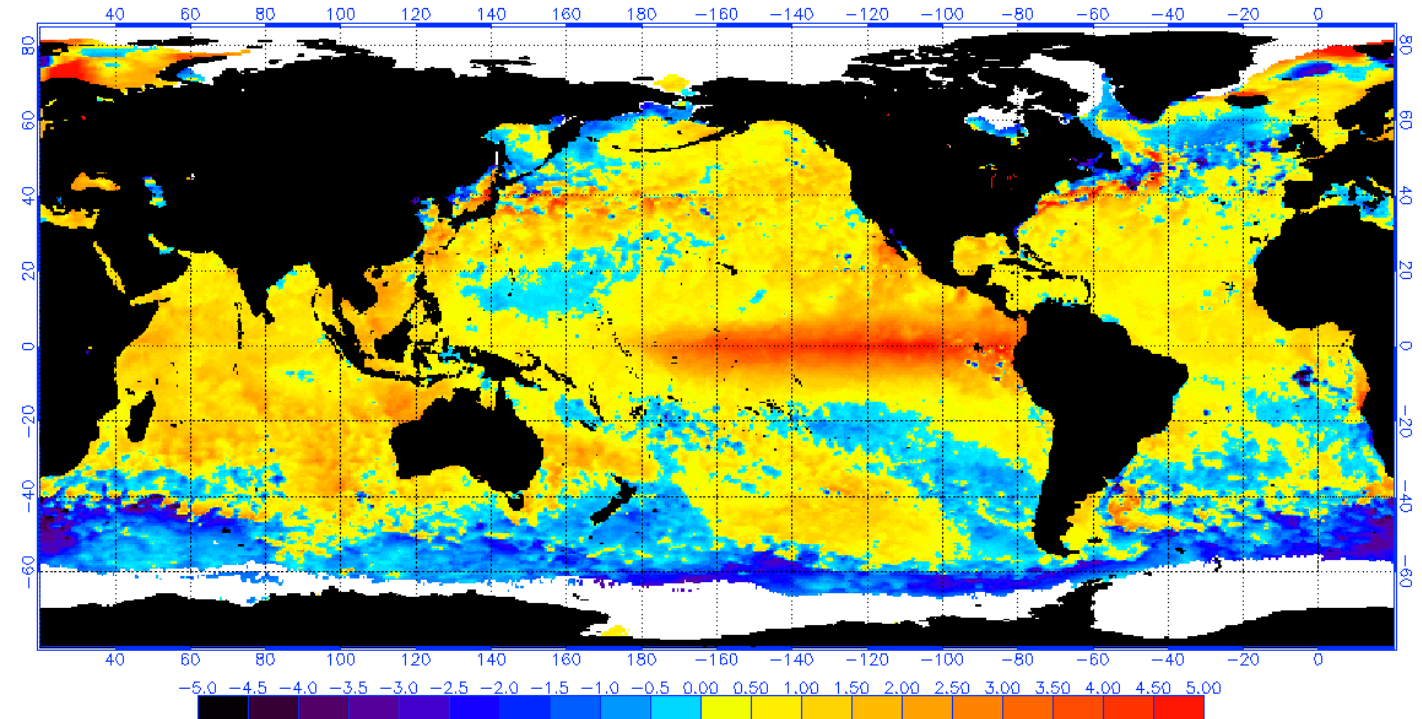
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**Extreme Events
Institute**

FLORIDA INTERNATIONAL UNIVERSITY

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/30/2015
(white regions indicate sea-ice)



El Niño Southern Oscillation (ENSO) 2015–16

Latin American and Caribbean Region

Disaster Risk Reduction Program
Extreme Events Institute
Florida International University
FIU-DRR Report no. 1 (December 2015)

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INTRODUCTION

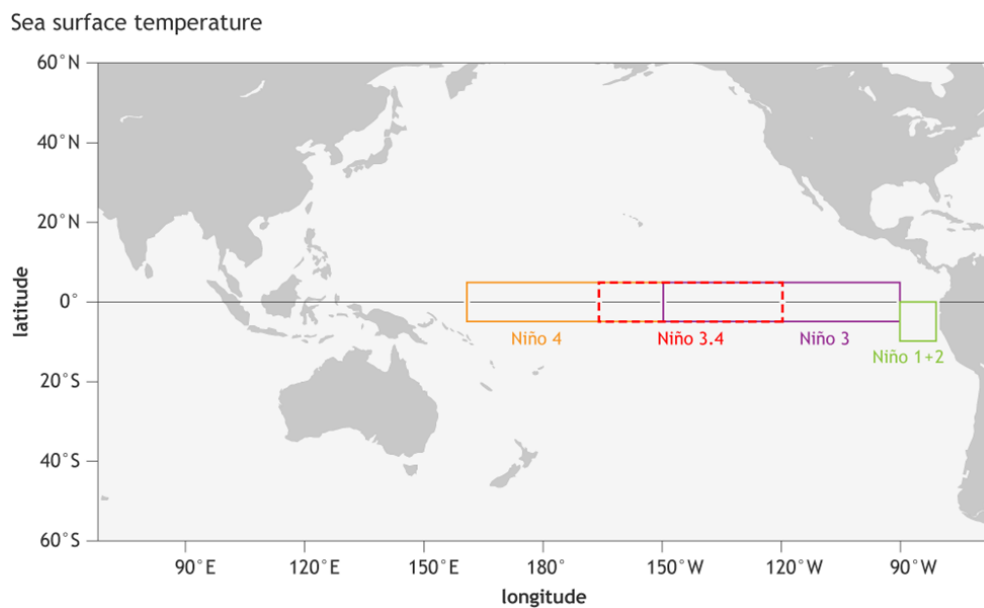
The El Niño-Southern Oscillation is a naturally occurring phenomenon resulting from the interaction between the ocean and atmosphere in the Tropical Pacific that has important consequences for weather and climate across the globe. Although its frequency is quite irregular, El Niño occurs every two to seven years, typically lasting nine to 12 months. A recent update from the World Meteorological Organization (November 16, 2015) reports that El Niño will likely peak in the Northern hemisphere winter of 2015–16. Peak three-month average sea surface temperatures (SST) will exceed 2 degrees Celsius above normal in the east-central tropical Pacific Ocean, making this year's event among the three strongest since 1950.

El Niño significantly affects a number of South American countries. In the 1997-98 El Niño event, central Ecuador and Peru suffered 10 times the normal rainfall which caused flooding, extensive erosion and mudslides with loss of lives destruction of homes and infrastructure, damage to food supplies. In Peru about 10% of the health facilities were damaged. National meteorological services throughout the region have been very active in advising governments on preparedness measures to try to limit damages from this year's El Niño.

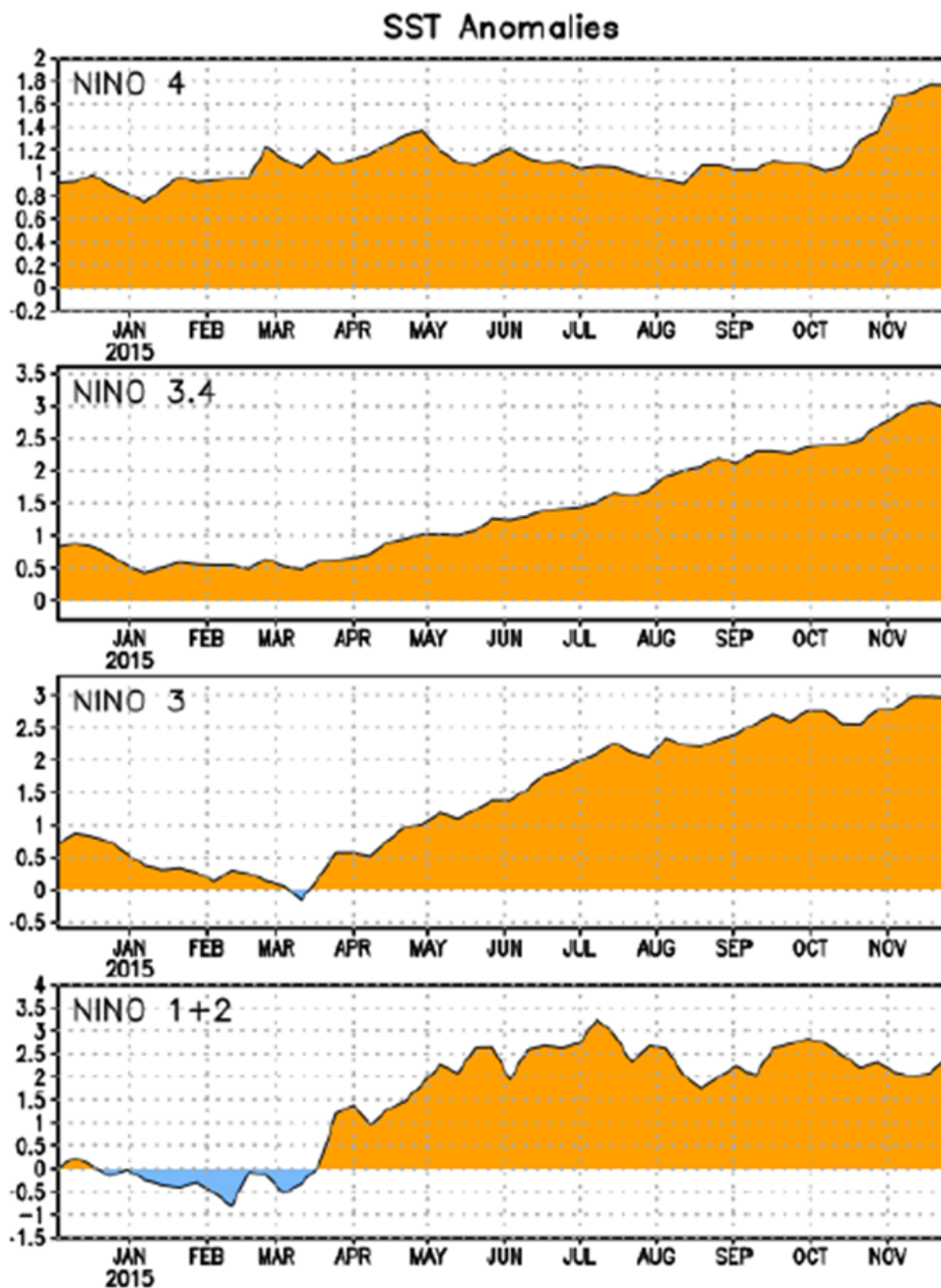
Consistent with typical El Niño impacts, large areas of Central America and the Caribbean recorded below average rainfall this year. Brazil, which started the year in drought in southern and eastern areas, saw the focus of the drought shift north with scant rainfall during the dry season over the Amazon. Peru was affected by heavy rain and flooding, as was Argentina (WMO, Press Release 13, November 25, 2015).

EL NIÑO INDICATORS

Sea surface temperatures (SST) are used to measure the El Niño events. The SSTs in a specific region of the equatorial Pacific are compared to the long-term average of that region. The difference between the current measure and the long-term average is the anomaly. The average anomaly



in the Niño3.4 region (a specific region in the Pacific) is used as the primary index for El Niño. Peak El Niño refers to the highest index in this region. During the 1997-98 El Niño, the Niño3.4 Index peaked at 2.33°C in November. (Picture above is courtesy NOAA)



SST Anomalies from January to November 2015
(Climate Prediction Center/NCEP, 30 November, 2015)

Recent El Niño Indicators

The average anomaly in the Niño3.4 region during August–October of this year was 1.7°C, second to the same period in 1997. Tropical SSTs were above average across most of the Pacific in November 2015.

The latest SST departures are:

	23 November 2015	30 November 2015
Niño 4	1.8°C	1.8°C
Niño 3.4	3.1°C	3.0°C
Niño 3	3.0°C	3.0°C
Niño 1+2	2.1°C	2.4°C

References

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html

<http://oceanservice.noaa.gov/facts/ninonina.html>

<https://www.wmo.int/media/content/el-ni%C3%B1o-expected-strengthen-further-high-impacts-unprecedented-preparation>

<https://www.wmo.int/media/content/wmo-2015-likely-be-warmest-record-2011-2015-warmest-five-year-period>

<https://www.climate.gov/news-features/blogs/enso/november-el-ni%C3%B1o-update-it%E2%80%99s-small-world>

REGIONAL AND NATIONAL INFORMATION

The oceanic and atmospheric anomalies observed in the Pacific, reflect a strong El Niño event that continues to evolve. The consensus in global predictive models suggests that El Niño could reach maximum intensity between November 2015 and January 2016, to gradually decline during the first semester of 2016. Global and regional predictions estimate for November 2015-January 2016 greater precipitation probabilities over average levels in Mexico, coast of Ecuador, north and north-west of Peru, central region and east of Paraguay, south-east of Brazil, Uruguay, and north of Argentina. Greater precipitation under average in Central America, Venezuela, north of Colombia, north-east and east of Brazil, eastern lowlands of Bolivia and north of Chile. **EXTRACTED FROM REGIONAL OUTLOOK – CIIFEN** (Centro Internacional para la Investigación del Fenómeno de El Niño), available at http://www.ciifen.org/index.php?option=com_content&view=article&id=1304&catid=78&Itemid=95&lang=en (accessed 12/1/2015)

A strong El Niño continues in the tropical Pacific Ocean. The majority of international climate outlook models indicate that el Niño 2015-2016 will strengthen slightly before the end of the year. Models and expert opinion suggest that peak 3-month average surface water temperatures in the east-central tropical Pacific Ocean will exceed 2 degrees Celsius above average, placing this El Niño event among the three strongest previous events since 1950 (1972-73, 1982-83, 1997-98). During October, east-central tropical Pacific Ocean surface temperature have ranged between +1.9 and +2.5 degree Celsius above average, exceeding El Niño thresholds by around 1.5 degrees Celsius and signifying a strong event. Typically El Niño peaks late in the calendar year.

During the last several months, temperatures below the surface of the tropical Pacific to the east of the international dateline have been substantially above average in response to persistent episodes of significant weakening of the trade winds. The far above average sea surface temperatures in the central and eastern tropical Pacific are associated with the upper portion of this subsurface heat, as well as the weakened trade winds. The current excess subsurface heat is expected to support the maintenance or a further slight increase of these well above average sea surface temperatures during the remainder of 2015. A recent period of particularly marked weakening of the trade winds in the central tropical Pacific Ocean is supporting further increases in the temperatures below the surface, and a possible consequent increase in sea surface temperature in the far eastern tropical Pacific Ocean in late November or December.

Currently, more than three-quarters of the dynamical prediction models surveyed predict 3-month average sea surface temperatures in the east-central tropical Pacific to remain near or exceed +2.0 degrees Celsius above average during November and December. Statistical models are predicting somewhat more conservative peak El Niño strength, with temperatures ranging between 1.7° and 2.2° Celsius above average. Taking into account both types of models and their known performance characteristics, there is a high likelihood that the current above-average ocean temperatures in the east-central tropical Pacific will continue and likely slightly increase during November or December. The expected likely peak 3-month average strength would place this El Niño event among the three strongest previous events since 1950, and may rank among the two strongest, along with 1982-83 and 1997-98. A careful watch will be maintained on the oceanic and atmospheric conditions over the tropical Pacific in the coming months to better assess the evolution of the strength of the event.

In summary:

- As of October 2015, both the ocean and atmosphere over the tropical Pacific indicate the presence of a strong El Niño;
- A majority of the models surveyed and expert opinion suggest the 2015-16 El Niño will either remain steady or strengthen slightly further during November or December 2015;
- The peak 3-month average strength of this El Niño, expected sometime during October-December 2015 to December-February 2016, would place it among the three strongest previous El Niño events since 1950, and may rank among the two strongest.
- Impacts from this El Niño are already evident in some regions and are expected to be felt in some of these as well as other regions in the next 2-6 months;

El Niño events typically decline and then dissipate during the first and second quarters of the year following their formation. Note that impacts in some regions are still expected during the dissipation phase.

Extracted from WMO (World Meteorological Organization), available at http://www.wmo.int/pages/prog/wcp/wcasp/enso_update_latest.html (accessed 12/1/2015)

BOLIVIA – LAST REPORT 10-2015

SENAMHI - <http://www.senamhi.gob.bo/>

The conditions of “El Niño” continue to be present. The superficial temperature of the ocean presents positive anomalies in most of the Pacific Ocean. There is a probability over 95% that El Niño will continue until the 2015-2016 summer in the Southern Hemisphere, and later weaken in autumn 2016.

Almost all dynamic and statistical models show El Niño event with anomalies in regions 3 and 4. It is estimated that it will continue to be over 0.5 C until autumn 2016. All model averages indicate that el Niño 3.4 is estimated over + 1.5C (strong Niño) by the end of 2015 and early 2016 (January and February).

COLOMBIA – IDEAM - <http://www.ideam.gov.co/>

According to the last report on El Niño, data shows that the event has increased to a strong intensity. During the month of October, the superficial temperature of the ocean maintained the warming in the basin of the tropical Pacific Ocean (central-east) presenting major anomalies in the center of the región.

The index ONI for the aug-sept-oct trimester, for region Niño 3.4, had a value of 1.8 C (over the neutral threshold) with a moderate increase with respect to the trimester july-aug-sept, with ocean-atmospheric conditions of a strong El Niño.

It is estimated that warm conditions in the tropical pacific basin will continue for the trimester nov-dec-january. It is also projected warm conditions with anomalies superior to 1.5 C in el Niño region 3.4 during the first trimester of 2016.

Climate Prediction Dec2015-Jan2016: dry season of the end of 2015 and early 2016, will coincide with El Niño in its maximum intensity, therefore, the dry season will be more critical than average.

Climate Prediction Feb-Mar-Apr2016: it is expected that levels of precipitation will not be sufficient due to the influence of El Niño, and it is estimated to last during the first trimester of 2016. Precipitation levels will be moderately under average in the Caribbean, Pacific, and Andean regions.

PERU- SENAMHI- OCTOBER 2015 - <http://www.senamhi.gob.pe/>

El Niño 2015 mantiene el acoplamiento océano – atmósfera en el Pacífico Tropical para el trimestre Agosto-October, pero en menor amplitud que el año 1997; dado que, la actividad convectiva, por estacionalidad, se ha confinado ligeramente sobre la línea ecuatorial (0°- 5° N) y hasta el momento se mantienen flujos de alisios del sureste sobre lo normal a lo largo de la costa sudamericana; a diferencia de los años 1982 y 1997. En efecto, el APS persiste moderadamente intenso hacia el sur del continente, permitiendo episódicamente la disminución gradual de los valores de TSM cerca al Pacífico ecuatorial oriental.

De romperse este patrón en superficie, se mantendría un escenario cálido para toda la cuenca del Pacífico para los siguientes meses.

October was the sixth month after El Niño established in the Pacific, and as of now, it has been following a normal cycle with high peaks of superficial temperature of the ocean by the end of Spring. It is expected that strong El Niño will last at least until the end of the year with anomalies that could exceed the 2 C in Niño region 3.4, to later gradually decrease by the end of Autumn 2016.

During the month of October, oceanic indicators in the tropical Pacific continue showing the development of an ENSO event. In the Peruvian coast, a progressive increment of positive anomalies of TSM was observed, with an average value of 3C in the north sector. It is expected that Kevin warm wave –formed between the second half of September and the month of October–will continue into the Oriental Pacific and will reach Peruvian coast from the second half of November, event which will contribute to maintain warming and could even increment it, with a possibility to reach temperature observed by December of 1982.

Currently, oceanic-atmospheric conditions in Niño region 3.4 for the trimester sept-oct-nov have surpassed the threshold of 0.5 C in the central Pacific. For the trimester oct-nov-dec, models estimate a strong ENSO for this region. The Peruvian coast, especially north and central regions, show evidence of warm conditions. The multi-sectoral committee on El Niño ENFEN maintains the alert.

<http://www.senamhi.gob.pe/load/file/02204SENA-49.pdf>

PANAMA ETESA - HIDROMET

http://www.hidromet.com.pa/documentos/el_nio_2015_08_15.pdf

In Panama, el Niño produces in average, a decrease in precipitation in regions located along the Pacific and an increase in regions located in the Caribbean. It is worth noting local variations both spatial and temporal. A very strong relation observed between the occurrence of the event (El Niño) and an increase of anomalies in temperature, the anomalies of precipitation show deficit during the years of El Niño. Data shows that this decrease is more accentuated during the first year of the event rather than the second one. This is due to the fact that El Niño ends by mid-second year and during the following months there is an increase in precipitation which compensates deficit during the first months of the event.

A report by International Research Institute (IRI) estimates positive anomalies of about 2.5 C for the nov-dec-jan trimester and later weakening by Spring in the North Hemisphere. With this scenario, Niño conditions could persist during dry season in Panama for 2016.

COSTA RICA - INFORME 181 (octubre, 2015) RESUMEN - <https://www.imn.ac.cr/43>

The magnitude of El Niño in October had the highest levels since El Niño 1997 and is now among the three most intense event since 1950. In the meantime, the Atlantic tropical ocean and the Caribbean sea, during the second semester, have met high levels of warming, even higher than last year. In the Pacific watershed, precipitation levels in October increased with regard to September, particularly in the Central Valley and North Pacific, the region most affected by meteorological drought. On the contrary, they decreased significantly in the North Zone and North Caribbean. These changes can be intrinsically related with a strong warming registered in the Caribbean sea during the month of October. The estimates of the evolution of El Niño, indicate by January/February a decrease in intensity, and disappearing by may 2016. The increase in ocean temperature in the Atlantic ocean will continue at least the following six months. In summary, the most likely scenario for the trimester nov-dec-jan is: in the Pacific, El Niño with strong intensity, while in the Caribbean sea and the tropical Atlantic, conditions will be warmer than average. This scenario will continue to create extreme climatic anomalies in the country's precipitation pattern.