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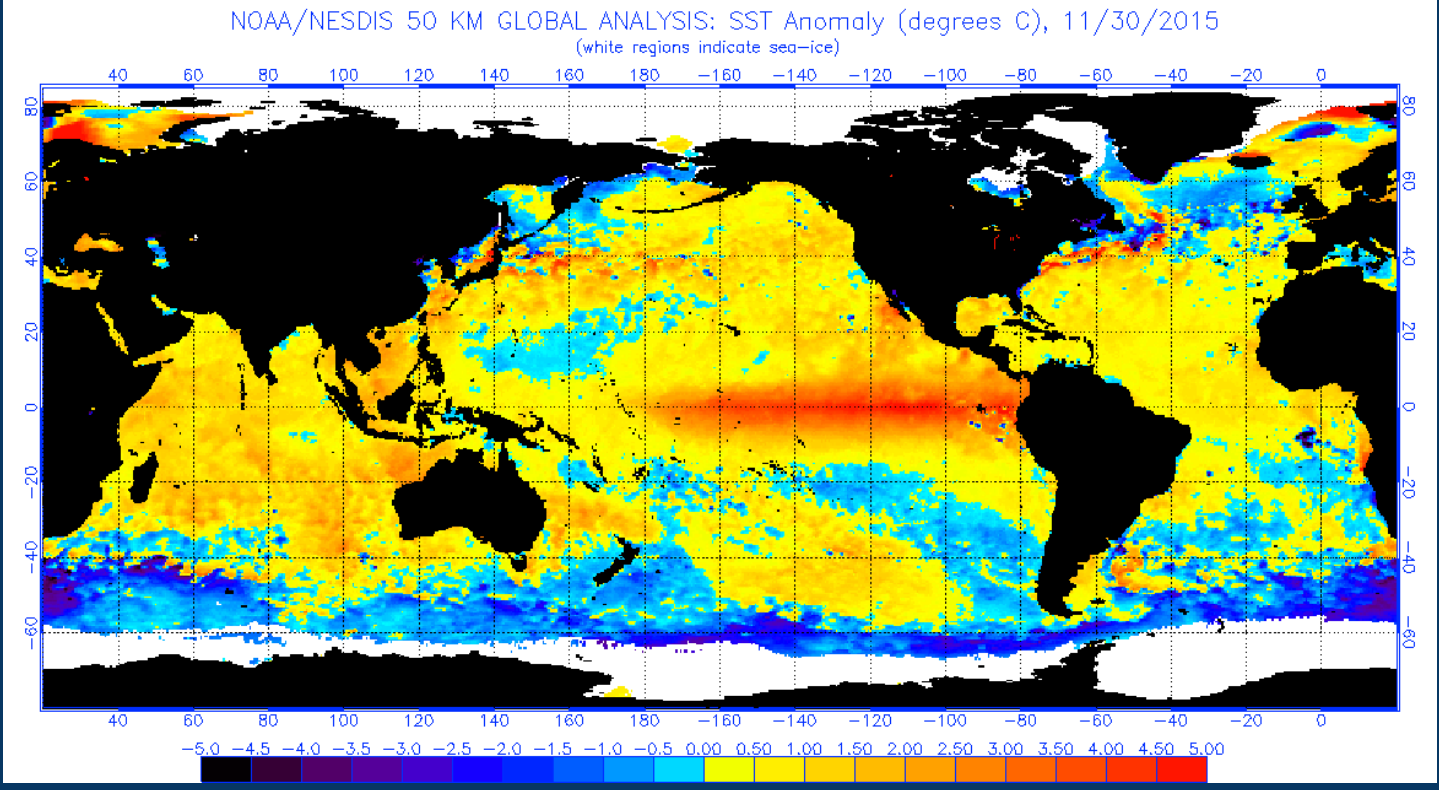

El Niño Southern Oscillation (ENSO) 2015–16

Latin American and Caribbean Region

Disaster Risk Reduction Program

Extreme Events Institute

Florida International University

FIU-DRR Report no. 2 (December 2015)

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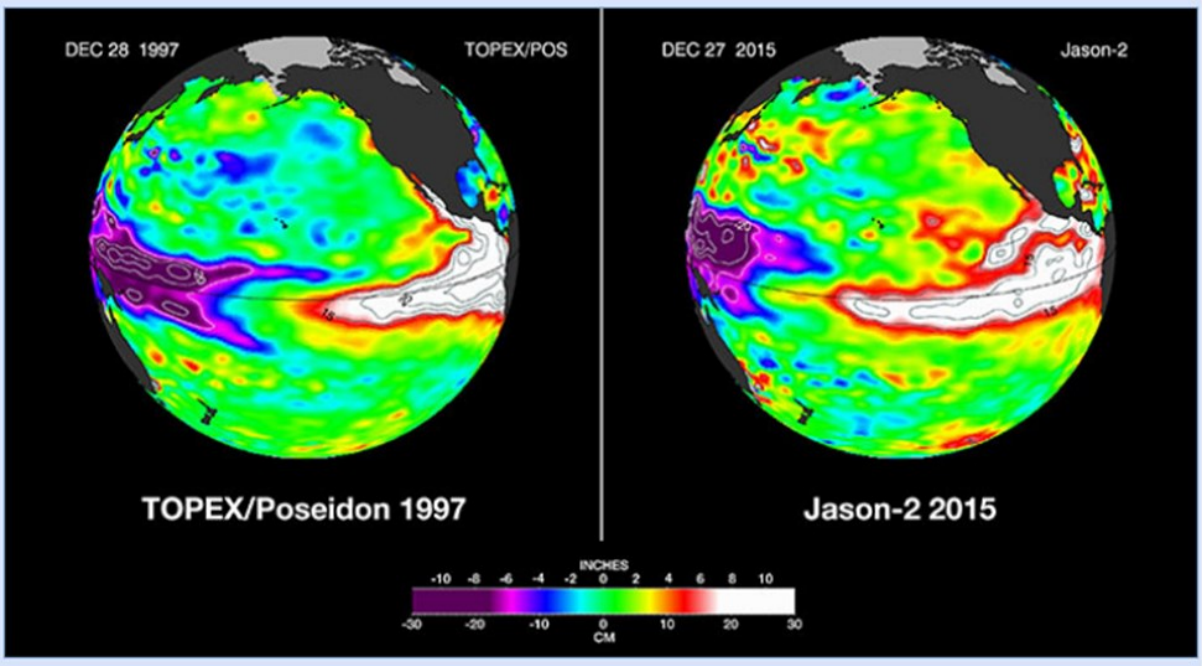
The December 27, 2015 Pacific sea surface heights image from the satellite Jason-2 (right in the picture below) is strikingly similar to the one from December 1997 (left in the picture below). Both reflect a pattern of a fully developed El Niño, with no signs of waning for the 2015-16 event. The identical, unusually high sea surface heights as seen in the satellite images around the equator in the central and eastern Pacific clearly indicate a big and powerful El Niño. The high sea surface heights means that a thick layer of warm water is present in this region [1, 2]



The latest satellite image of Pacific sea surface heights from Jason-2 (right) differs slightly from one 18 years ago from Topex/Poseidon (left). In Dec. 1997, sea surface height was more intense and peaked in November. In 2015 the area of high sea levels is less intense but considerably broader. Credit: NASA/JPL-Caltech

The 2015-16 El Niño is being declared as one of the strongest since 1950 and is responsible for making 2015 the warmest year on record. The main impacts season will be December 2015–March 2016 while temperatures will continue to be affected well into 2016. The 2015 El Niño has been linked to several floods in some areas and droughts in others along with unusually warm conditions in the northern hemisphere [1, 2, 3]. The WMO predicts that the peak three month average water surface temperatures in tropical Pacific will exceed 2C above normal [3].

Drought and erratic rains have already affected 2 million people in Guatemala, Honduras, El Salvador, and Nicaragua, with more floods expected in January. In Haiti the effects of drought and crop failure are being felt [3].

The 2015 El Niño has clearly been linked to the worst floods seen in the last 50 years in several countries of South America—Paraguay, Argentina, Uruguay and Brazil. These floods have forced more than 150,000 people from their homes, more than 100,000 from the Paraguayan capital Asunción alone [2].

In terms of losses incurred from the natural disasters experienced in 2015, Munich Re reports that 94% of loss-relevant natural catastrophes in 2015 were weather-related events. The strong El Niño of 2015 restricted the number of tropical cyclones in the North Atlantic to 11, below the average of 14.8 for the warm phase since 1995. Only four of the 11 cyclones reached hurricane strength, with overall and insured losses just a fraction of the average of previous years [4].

On the other hand, El Niño wrought an opposite effect in the northeastern Pacific, where it promoted the development of intense tropical cyclones, partly due to the higher water temperatures that it brings. A total of 26 cyclones (long-term average 15.6) developed there, 16 of which reached hurricane strength and 11 (4.1) grew to severe hurricanes. In 2015, Hurricane Patricia became one of the strongest storms ever recorded anywhere and the most powerful in the northeastern Pacific ever to

make landfall. Patricia made landfall close to Cuixmala in the Mexican state of Jalisco on 23 October 2015, quite late in the hurricane season with peak wind speeds up to 340 km/hr. A number of buildings were destroyed in the areas hit by the storm. Overall losses came to more than US$ 0.5 billion, with only a small portion of this insured [4]. However, the presence of the sparsely populated Chamela-Cuixmala Biosphere in the region of the landfall fortunately minimized the damage [4].

In South America, Africa and Southeast Asia, the 2015 El Niño phase brought droughts and heatwaves, the worldwide losses from which came to US$ 12 billion, of which US$ 880m was insured [4].

FORECAST

The Caribbean Outlook Forum consensus predicts “drier than usual end of wet season form Leewards southward, wetter in extreme northwest; drier wet season in Guyanas; mild”. Predicted positive impacts include limited water-related pests, epidemics, and flood potential. Negative impacts predicted are long-term drought will remain in many islands [5].

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 [6].

To characterize the phenomena of El Niño, the SST anomaly for the Niño3.4 region is used as the primary index, also called the Oceanic Niño Index (ONI). El Niño occurs when a five consecutive 3-month running mean of SST anomalies in the Niño3.4 region is above the threshold of +0.5°C. This positive departure of SST indicates the presence of El Niño while a departure of -0.5°C indicates La Niña. The Niño3.4 region encompasses the western half of the equatorial cold tongue regions and provides a good measure of important changes in SST and SST gradients that result in changes in the pattern of deep tropical convection and atmospheric circulation. The criteria, that is often used to classify El Niño episodes, is that five consecutive 3-month running mean SST anomalies exceed the threshold [7].

Warm and cold phases are defined as a minimum of five consecutive 3-month running mean of SST anomalies (ERSST.v4, 1971-2000 base period) in the Niño 3.4 region surpassing a threshold of +/- 0.5°C [7].

Last 12 3-Month Running Means in Niño 3.4 Region

JAS	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND
0.6°C	0.5°C	0.4°C	0.5°C	0.7°C	0.9°C	1.0°C	1.2°C	1.5°C	1.8°C	2.0°C	2.3°C

From: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst.php

Sea Surface Temperature (SST) anomalies/departures (in °C) for the year 2015

Month	Niño 4	Niño 3.4	Niño 3	Niño 1+2
January 2015	0.86	0.53	0.36	-0.39
February 2015	1.02	0.56	0.18	-0.55
March 2015	1.13	0.58	0.15	0.06
April 2015	1.23	0.78	0.67	1.35
May 2015	1.09	1.03	1.19	2.43
June 2015	1.09	1.32	1.66	2.54
July 2015	1.00	1.60	2.17	2.87
August 2015	0.98	2.07	2.34	2.24
September2015	1.04	2.28	2.63	2.57
October 2015	1.12	2.46	2.66	2.52
November 2015	1.67	2.95	2.93	2.24
December 2015	1.63	2.82	2.85	2.19

From: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst.php

References

[1] http://climate.nasa.gov/news/2382/

[2] http://eepurl.com/bLonzX

[3] http://www.bbc.com/news/science-environment-35159826

[4] http://www.preventionweb.net/news/view/47212?&a=email&utm_source=pw_email

[5] http://stormcarib.com/reports/current/pdfLAGKq4ihsg.pdf

[6] http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

[7] https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst.php

Regional Outlook by Country

Introduction

The International Center for the Research on el Niño Phenomenon (CIIFEN), located in Guayaquil (Ecuador), in its West-South, South America Forecast December 2015-February 2016, indicates that according to statistical analyses of 422 stations of Meteorological Services of Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela during the period of December 2015-February 2016, there will be "greater probabilities of precipitation over normal averages in the insular region and north coast of Ecuador; the coastal north region of Peru; the regions of Beni, Pando, and north of La Paz in Bolivia; most of the territory in Paraguay and Uruguay. Greater probabilities of precipitations under normal averages in most part of Venezuela, Colombia; in the Andean region of Ecuador, south of Peru; south lowlands in Bolivia, the Bolivian Chaco region and the south Chile."[1] In addition, there will be a "greater probability of maximum temperatures over normal averages in Colombia; Andean region of Ecuador; coast and Andean center and south region of Peru; the valley region in Bolivia, in Paraguay and the north-center of Chile from Arica to Curico."[2]
It is worth noting that the European Commission in December 2, 2015, has decided to provide support of 5 million dollars (U$S) to countries affected by the El Niño phenomenon in Central America and South America (Guatemala, Honduras, and Colombia). It is estimated that in this countries, 3 million people are being affected by this phenomenon.[3]

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[1]CIIFEN, "Pronóstico Estacional Oeste y Sur de Sudamérica Diciembre 2015-Febrero 2016, http://www.ciifen.org/images/stories/pronostico_est/Pronstico_Estacional_Oeste_y_Sur_de_Sudamerica_DEF_2015-16.pdf

2Ibid. It is worth noting the CIIFEN utilizes this forecast as a reference that uses statistical data from about 420 meteorological stations in 8 countries of the region to estimate greater probabilities for precipitations over or under historical averages in the three months of the forecast, i.e. the most probable conditions throughout these three months. CIIFEN indicates that this constitutes a long-term reference, explaining that specific short duration extreme events that could occur in different countries are not considered in this analysis. This information is provided by the National Meteorological Services.

[3]European Commission, "EU mobilizes €125 million for countries affected by 'El Niño'," Press Release, December 2, 2015, http://www.redhum.org/documento_detail/comision-europea-nota-de-prensa-ue-moviliza-eur125-millones-para-los-paises-afectados-por-el-nino-ingles

Bolivia – SENAMHI - http://www.senamhi.gob.bo/

The reports by the Meteorological and Hydrological National Service (SENAMHI) indicate that flooding and droughts due to the consequences of El Niño phenomenon (ENSO) will occur in March 2016, even though there are reported emergencies in Beni and Pando for possible flooding and overflowing of rivers.[4] One of SENAMHI's forecaster, Danilo Pomier, estimates that the intensity of the El Niño phenomenon will decrease its intensity between the months of April and May, even though the consequences of affected temperatures and precipitations will be seen by the months of February-March, 2016.[5]

However, there are areas reporting emergencies, as noted by website Telesur, such as the Cobija and Guayaramerín regions in Beni, which are experiencing overflow of rivers and persistent precipitations. It was indicated from SENAMHI that the other face of the El Niño phenomenon are the droughts produced in Poopó lake, as well as the plateau regions of La Paz, Oruro and Potosí.

It is worth noting that the Bolivian government has approved in early December, a decree to activate the Immediate Action Plan for the El Niño phenomenon 2015-2016, which will have a budget of 21,5 million dollars.[6]

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

The last bulletin of IDEAM indicates the El Niño phenomenon (ENSO) has been increasing to a strong intensity. The bulletin of December 15, 2015, indicates that it is likely that the event effects on precipitations and temperatures in Colombia will be very strong, particularly in the subsequent two months. There are significantly high precipitations in the Pacific and South east Amazonian regions.

[4]Red de Información Humanitaria para Latinoamérica y el Caribe, "Los efectos del fenómeno de El Niño se manifestarán en Marzo", 28 de diciembre de 2015, http://www.redhum.org/noticia_detail/los-efectos-del-fenomeno-de-el-nino-se-manifestaran-en-marzo-54580
[5]Ibid
[6]Ibid

On the other hand, the Andean region -which concentrates close to 80% of the population, expects that precipitation will be well below the historic averages with a probability of 64% for most of the region, with the exception of the Nariño department where precipitations of over normal averages with probabilities of 52% (27% normal) are expected. The anomalies of TSM for the first week of December continued increasing oscillating between 2,5 and 3,0 C, over median values in great parts of the tropical Pacific Ocean. The forecast from the Climate Prediction Center of the United States and the Research Institute for Society and the Environment (IIRI) estimates there is a probability of 99% that El Niño will continue until March 2016, after which it will weaken for the second trimester of 2016.[7]

PERU-SENAMHI-OCTUBRE 2015 - http://www.senamhi.gob.pe/

The last official report by the Multisectoral Committee in charge of the National Study of El Niño phenomenon (ENFEN) maintains the alert status. The scenario estimated as the most probable is that coastal El Niño 2015-2016 will be moderate.[8] It is expected during the month of January, that weakened precipitations will continue in Tumbes and Piura, even though strong precipitations are not ruled out. The report indicates that for the Andean region, precipitations associated to El Niño phenomenon will continue in the Pacific. The perspective of this Committee in regard to coastal El Niño for the period December 2015-March 2016 is moderate, with an estimation of 65%.

PANAMA – HIDROMET - http://www.hidromet.com.pa/index.php

According to the Report of December 10, 2015 of the Climate Forecast Center/NCEP/NWS and the International Institute of Research for Climate and Society, El Niño will continue with a strong intensity during the winter 2015-16 of the North Hemisphere, anticipating a transition to a neutral ENSO late during the spring or early during the summer of 2016.

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[7]Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM), http://www.pronosticosyalertas.gov.co
[8]Instituto Nacional de Defensa Civil (INDECI), "Comunicado Oficial ENFEN N-01-2016, Estado del Sistema de Alerta: Alerta de El Niño Costero", 7 de Enero de 2016, http://www.indeci.gob.pe/boletines-diarios.php?item=MTQwOQ==

This report indicates the forecast of precipitations under normal averages in the country during this trimester of dry season and few precipitation levels in the Pacific, with a similar situation expected in the Caribbean watershed.[9]

ECUADOR – ERFEN - http://www.inocar.mil.ec/erfen/

The national committee ERFEN-Ecuador estimates precipitation probabilities over normal levels, particularly in the north and center regions, Guayaquil Gulf, coastal areas and center of Manabí. For the rest of the region, normal levels of precipitation are expected. The insular region estimates precipitations over normal levels. This report indicates that according to dynamic and statistical models of December 26, 2015 and January 4, 2016, for Niño regions 3 and 3.4 "warm conditions will continue until April 2016 with anomalies over 2°C, featuring a strong El Niño. In El Niño region 1.2 the anomalies for the first trimester of 2016 are estimated to be close to 0.5°C.[10]

[9]Hidromet, Pronóstico Trimestral de Lluvia para Panamá Ene-Feb-Mar 2016, 23 de diciembre 2015, http://www.hidromet.com.pa/documentos/.pronostico_precip_panama_enero_a_marzo2016.pdf

[10]Comité Nacional ERFEN Ecuador, 7 de enero, http://www.inocar.mil.ec/erfen/index.php?option=com_content&view=article&id=97:reunion-erfen-7-enero-2016&catid=35:reuniones-comite&Itemid=54