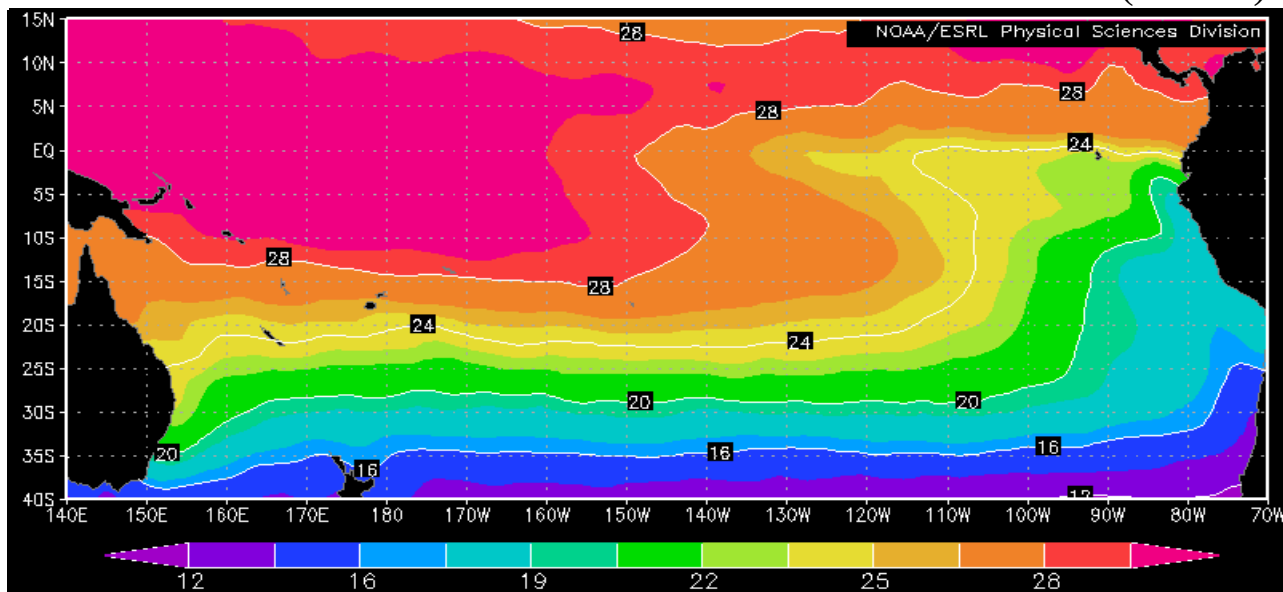


COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



Sea Surface Temperature, October 2009, NOAA-CIRES/Climate Diagnostic Center

OCTOBER 2009

BAC No 229

ERFEN

(Estudio Regional del Fenómeno El Niño)

BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



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COMISIÓN PERMANENTE DEL PACÍFICO SUR
SECRETARÍA GENERAL
GUAYAQUIL, ECUADOR



The Boletín de Alerta Climático (BAC) is a monthly publication of the CPPS in which the oceanic and atmospheric conditions of the region of the Southeastern Pacific within the Regional Study of El Niño (ERFEN) are analyzed. The digital version of the BAC is available from the 15 of every month in the pages Web of the CPPS: <http://www.cpps-int.org> and of the INOCAR: <http://www.inocar.mil.ec>

The suggestions, commentaries or scientific information will be welcome to the electronic mails: dircient@cpps-int.org; nino@inocar.mil.ec, (Group BAC ECUADOR), or by means of written communication directed to the seat of the Permanent Commission for the South Pacific, General Secretariat, Complex Albán Borja, Building CLASSIC, 2nd floor, Guayaquil-Ecuador, FAX: (593)4-2221201.

Figure 1.- Shore stations locations in the Southeast Pacific region.

EXECUTIVE SUMMARY

In October like in the previous month, the Sea Surface Temperature in the Equatorial Pacific continued showing positive anomalies around 1, 0°C. On the other hand, the temperature of the sea next to the coast of South America, maintained negative the anomalies previously reported; nevertheless one is due to mention, that as of the second fortnight of October, at coastal level, as much begins a slow increase of the temperature of the sea at surface as subsurface. Therefore, the tendency to the reduction of the temperature of the sea, observed from August to half-full of October approximately, seems to have entered its final stage, preparing the oceanographic conditions for the seasonal change that would occur as of December. The anomaly of the Sea Surface Temperature in the “El Niño” regions during the last week of October was increased, presenting the following values; in the region of the Western Pacific (El Niño Region 4) it was of 1.6°C; in the Central Pacific (El Niño Region 3. 4) 1.5°C and, in the region of the Eastern Pacific (El Niño Region 1+2), it returned to positive values of 0.4°C.

At subsurface level, the positive anomalies of the sea temperature continued present, being located a great warm nucleus in the sector of the Central – Eastern Pacific with positive values until 4.0°C, located between 100 and 200 m of depth. In the Eastern edge of the Pacific it is possible to see, from the surface to 100m of depth approximately, the presence of negative anomalies of -0.5°C, in a more reduced area in relation to the previous month.

The Mean Sea Level in the South East Pacific during the month maintained the tendency observed in previous months to present values by above of its normal patterns against the coasts of Ecuador (around 10.0cm) and Peru (between 3.0 cm 8.0 cm).

The Intertropical convergence zone stayed during most of the month around 7°N, exerting greater influence on the zone of Central America. In the region of the South East Pacific the surface winds had a South and South-East direction; as far as the speed the positive anomalies predominated, that fluctuated between 0.2 to 1.2 m/s.

Taking into account the present thermal behavior from the Equatorial Pacific, as well as the results of the most excellent numerical simulation models, are anticipated that for the next month the present heating of the Tropical Pacific Ocean stays; whereas in the Eastern edge of the Pacific Ocean, normal values or slightly superiors appear. In addition, the majority of the models of numerical simulation continue indicating the development of an event El Niño of moderate intensity, in the sector of the Equatorial Pacific that would reach its maximum development during the period December 2009 - February 2010. In relation to the ocean-oceanographic conditions of the region of the South east Pacific, with the exception of Colombia that shows that the effects of the present phenomenon of El Niño have become well-known in the behavior of the temperature of the air and in the registered totals of rain in most of the country; another region affected by El Niño has been the South zone of Chile, whose precipitations under the normal value have been the most important signal until the moment. The rest of the coastal region of the South East Pacific does not show significant signals of the present warm event.

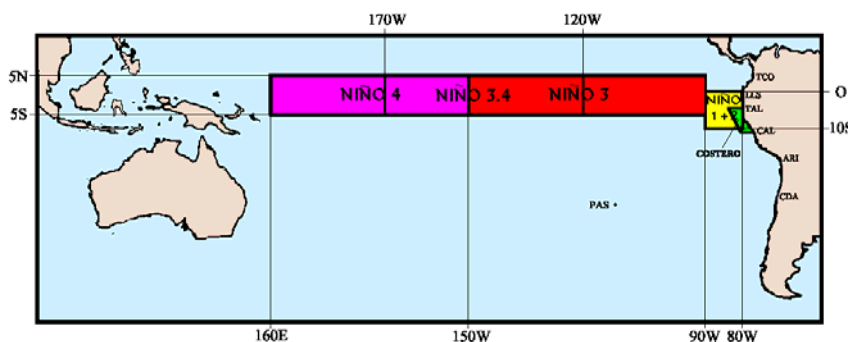


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

INSTITUCIÓN	Dirección electrónica
CCCP - Centro Control de Contaminación del Pacífico (Colombia);	cccpc@cccpc.org.co
IDEAM - Instituto de Estudios Ambientales (Colombia);	meteorologia@ideam.gov.co
INOCAR - Instituto Oceanográfico de la Armada (Ecuador);	nino@inocar.mil.ec
DHN - Dirección de Hidrografía y Navegación (Perú);	oceanografia@dhn.mil.pe
SHOA - Servicio Hidrográfico y Oceanográfico de la Armada (Chile)	shoa@shoa.cl
DMCh - Dirección de Meteorología (Chile)	metapli@meteochile.cl
NOAA - AOML Miami (USA)	JHARRIS@aoml.noaa.gov

**CLIMATE ALERT BULLETIN
BAC N° 229, OCTOBER 2009****I. GLOBAL AND REGIONAL IMAGE**

During October, the anomalies of the Sea Surface Temperature (SST) in the Tropical Pacific Ocean stayed between 0.8 and 1.2°C. The monthly anomaly of the SST in the El Niño regions varied very little with respect to the previous month, continuing on their climatologic values; in the region of the Western Pacific (El Niño Region 4) it was of 1.2°C and in the region of the Central Pacific (El Niño Region 3.4) it was increased to 1.0°C; whereas in the region of the Eastern Pacific (El Niño Region 1+2) the anomalies continued with the tendency to reduction, reaching in this occasion a value of 0.0°C.

At subsurface level, the positive anomalies of the temperature of the sea continued present, being located an intense warm nucleus in the sector of the Central – Western Pacific (170°W-130°W), with positive values of until 4, 0°C, located between 100 and 200 m of depth. Of way similar to the previous month, it was possible to observe in the Eastern edge of the Pacific, from the surface to 100m depth approximately, the presence of negative anomalies of -0, 5°C; although in this occasion the reduction of the area occupied by the mentioned anomalies is noticed.

The Mean Sea Level in the South east Pacific during the month, it continues showing tendency towards values by of its normal patterns of 8.0 cm against the coasts of Ecuador, whereas the coasts of Peru generally registered a reduction of its values around 3, 0 cm, with respect to the previous month and in spite of it, it continued presenting positive anomalies between 3.0 and 8.0 cm.

From October 2006, the Index of Oscillation of South (IOS) was not reaching a as low value as the one of this month, with -1.7. The central axis of the Intertropical Convergence Zone (ITCZ) in the Eastern sector of the Pacific stayed between 6° and 8°N with moderate convective activity on Central America.

During the month the surface winds, in the region of the South east Pacific predominated of the South and the South-east, with speeds that slightly surpassed the climatologic average in 1.0 m/s.

II. NATIONAL IMAGE**A. CONDITIONS IN THE COLOMBIAN COAST**

The Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) reports that the second season of rains began delayed at the beginning of the second decade of October. The own atmospheric circulation of this season generated a wave tropical which interacted with a cold front of the North hemisphere and the systems of low pressure of the north of Brazil, this rainy situation only appeared during 7 days.

From there, the tropical waves have not been continuous, generating a situation in which have alternated droughts days with rainy days. Nevertheless, in the Archipelago of San Andres and Providence a tropical wave that entered the West of the Caribbean Sea day 17 interacted with a low pressure and caused strong rains in San Andres, this system stayed stationary until day 22, had to a large extent to the blockade that generated a cold front of the North Atlantic.

During the last days of the month, the Intertropical Convergence Zone moved more to the north of the normal position, returning to very dry conditions to the south of the country, nevertheless 30 and 31 days a

tropical wave and the activity of the ITCZ generated an abrupt change in the meteorological conditions bringing an increase of rains in the Andean region.

However, to be October an historically rainy month to a large extent of the country, the effects of the present "El Niño" phenomenon, have been made well-known in the registered totals of rain in the past month.

Like a typical behavior of the event, deficit volumes of precipitation in the regions biggest part of Andean, Pacifica and Caribbean appeared, prevailing deficits between 10 and 40%, and in precise zones between the 40 and 70%. With respect to the extreme temperatures, one stands out that in the beginning of the month high values were registered, especially in the north of the country, where 38° C were surpassed in the shade; after the first decade of the month, in this zone a tendency appeared to fall, presenting a behavior next to the averages of the time, whereas in some cities of the center and the south of the country, they were continued surpassing the average values significantly, without reaching the historical maximums.

It is possible to indicate, that the beginning of the second rainy season of the year, appeared of delayed form, as of the second decade of the month, bringing with itself an increase of the cloudiness and the patterns of rain, as well as a diminution in the intensity of the maximum temperatures in relation to the past month. The previous thing, was determining to reduce the probability of fire of the vegetal cover.

The Pollution Control Center for the Pacific (CCCP) declares that during the monitoring of October 2009, realized by the Area of Operational Oceanography of the CCCP to the fixed station coastal N° 5 located to 10 miles of the bay of Tumaco between the coordinates 78. 51° W and 2° N, can be observed, that the registry of SST for the month, was of 27.7 °C and 27.9°C during the first and second fortnight respectively. A positive anomaly at surface level of 0.7°C with respect to the historical average appeared.

The thermocline during October presented an ascent of 11 meters, with respect to the last registry of September, being located to 38 meters of depth. During the second fortnight the thermocline descended 6 meters, being located to 44 meters.

The surface value of salinity for the first fortnight of October was of 31.19, while in the second fortnight it was of 29.92. A negative anomaly of 0.13 at surface level in relation to the historical average appeared.

B. CONDITIONS IN THE ECUADORIAN COAST

The Oceanographic Institute of the Navy of Ecuador (INOCAR) informs that from the analysis of the data obtained by the research vessel "Orion", during the XII Regional Oceanographic Cruise carried out from 7 to 21 October, and that one originating from the coastal stations to 10 nautical miles coast outside, located against La Libertad (2°S) and Manta (1°S) it was obtained that:

The analysis allowed demonstrating the magnitude of the outcrops nourished by the Cromwel current to the west on Galápagos and its significant contribution on nutrients to the ecosystem of these islands, being responsible of the biological wealth of the marine reserve of the archipelago. As far as the other oceanographic and atmospheric parameters monitored during the cruise, it was possible to be stated that they are within the rank of seasonal variability that has been observed for this time, discarding significant abnormal values, which would imply that the own conditions of a "El Niño" at the moment developing in the Central sector of the Pacific, not yet are pronounced in our coasts. Nevertheless, one is due to be pending of the evolution of the oceanographic conditions during the next months, when the seasonal weakening of the Anticyclone of the South takes place and consequently the winds and the currents of the South diminish obviously their actions against the coasts of Ecuador, allowing this way the entrance of originating warm waters of the Central Pacific.

In the coastal sector, the evolution of the oceanographic conditions is complemented with the biweekly monitoring from two fixed stations to 10 nautical miles coast outside the Freedom (1°S) and Manta (2°S), where the thermal structure in the coastal sector of Ecuador presented cold waters originating of the south, during the months of September and October, which derived in negative anomalies from until -1, 0°C. This reduction of the temperature of the sea occurred as a result of the fortification of winds of the south and the

consequent drag cold waters of the south towards national waters. At the moment the stations coast outside report normal conditions for the time.

This explains because during the last days of October and first of November, a weakening of winds is observed as well as a recovery of the values of the temperature of the sea, which could mean that the cooling reported in previous weeks is finalized, initiating the preparations for the seasonal change towards the humid time of the Ecuadorian coast. Of equal way at present the entrance of originating warm and humid air masses of the Amazonian region is observed that reaches the coastal region, which in contact with the cold air of the south cause cloudy skies accompanied in certain places of slight precipitations.

As perspective at regional level at the moment, it has in development an "El Niño" event in the Central Pacific of moderate intensity and that would become present in national waters during the next trimester.

C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) shows that generally, throughout the Peruvian coast registered a reduction average in the anomalies of the SST, 0.4°C with respect to the previous month. The negative anomalies predominated, with the exception of the stations Talara, Callao and Mollendo that presented anomalies of +0.1°C; whereas Paita presented a behavior similar to its normal one. The negative anomalies of the SST fluctuated between -0.2°C (Chimbote) and -0.8°C (Lobos de Afuera), nevertheless during last 10 days of the month was observed a significant increase of the SST, throughout the Peruvian coast.

The Mean Sea Level throughout the Peruvian coast, generally registered a reduction of its values around 3.0 cm, with respect to the previous month but in spite of it, it continued presenting positive anomalies. The minimum anomaly appeared in the southern stations of San Juan and Matarani (3.0 cm) and the maximum anomaly in the stations of Paita and Chimbote (8.0 cm).

Throughout the Peruvian coast, the temperature of the air registered a reduction average of 0.6°C, with respect to the previous month, prevailing the negative anomalies. The anomalies of the AT fluctuated between -0.4°C (Paita) and -1.8° C (San Juan).

During days 18 and 26 of the month, light drizzles only in the zones of Lobos de Afuera and Chimbote appeared, with accumulated values of 0.6 and 0.1 mm respectively.

The winds throughout the Peruvian coast appeared with South direction. In relation to the wind speed, the positive anomalies predominated that fluctuated between 0.2 to 1.2 m/s; with the exception of Paita, Lobos de Afuera and San Juan that presented negative anomalies of -2.3, -0.1 and -0.3 m/s respectively.

D. CONDITIONS IN THE CHILEAN COAST

The Hydrographic and Oceanographic Service of the Navy of Chile (SHOA) maintains throughout the coast a network of stations of level of the sea to monitor a series of oceanic and atmospheric variables. Next a description of the Sea Surface Temperature (SST) and the level of the sea (SL) between Arica (18°29'S) and Talcahuano (36°41'S) for the month of October of 2009 appears.

During this month one slight tendency could be observed to the increase in the values of SST, which did not imply positive values of anomalies in any of the stations of monitoring of the coast of Chile. Specifically in Caldera and Coquimbo normal SST for the time were registered, with anomalies of -0.1°C and 0°C respectively. The stations that presented the biggest negative anomalies were Arica (-0.9°C) and Valparaiso (-1.0°C).

It is possible to emphasize that the data of SST described previously for the North zone and Center-South of Chile still reflect conditions of neutrality, not being observed until the moment no type of heating of the surface of the sea related to event ENSO.

The Meteorological Direction of Chile (DMC) declares that the average temperature of the air during October presented generally negative anomalies that dominated the North, South and Austral regions of the country, being the maximum cooling observed in Iquique (- 1.0°C), Coyahique (- 1.7°C) and Balmaceda (- 1.3°C). On the contrary, only the Central region of Chile, between Valparaíso and Curicó, appeared with positive anomalies, with values that fluctuated between +0.7 and +1.1°C.

The average maximum temperature of October, characterized by the presence of cooling in the North coast (Arica-Iquique) and South region of the country (Temuco-Coyahique), with negative anomalies that fluctuated between -1 and -2°C. The Central zone of Chile had a heating, whose anomalies with respect to the monthly value, surpassed in more of 1°C and affected Valparaíso and Santiago mainly.

The average minimum temperature of October, appeared in the North, Central and South regions with positive and negative anomalies of low intensity and inferior to 1°C, and only the Austral region, between Coyahique and Punta Arenas, showed a cooling of moderate intensity, whose negative anomalies oscillated between -0.9 and -1.4°C.

The atmospheric circulation on the South Pacific was dominated by negative anomalies that affected the South and Austral regions of Chile, with a nucleus of -10 hPa centered in the Drake Step. One second band of negative anomalies of the pressure at sea level, of smaller intensity, extended by the subtropical region of the Pacific between the Australian Continent (“Oceania”) and the coasts of the south of Chile, reaching a nucleus of -3hPa centered in the neighborhoods of “Island of Pascua”. Contrary, the high frequency of presence of ridges of the average troposphere that moved in the Eastern South Pacific, between latitudes 40 and 55°S, and length 130-90°W, originated positive anomalies of pressure at sea level of +12 hPa and geopotential height +120 meters at level of 500 hPa.

During October, the high frequency of days with precipitation observed in the South region of Chile, associated to a greater frontal activity, it originated a surplus of precipitation between Temuco and Coyahique, with positive anomalies between 48 and 110 mm by on the average value of the month.

III. PERSPECTIVE

A. GLOBAL

Taking into account the predictions from several numerical models, as well as the behavior of the main oceanic and atmospheric indicators, it is anticipated that the oceanographic conditions continue in the Tropical Pacific, own of the development of an event “El Niño”, which could reach its maximum development during the first trimester of the next year. Consequently the positive anomalies of the SST will be present and of equal way at subsurface level the heating of the sea will persist, mainly in the region of the Central Equatorial Pacific; being highly recommendable to maintain a careful pursuit of the evolution as well as its future repercussions on the climate of the region of the South East Pacific.

B. REGIONAL

In agreement with the pursuit of the ocean-atmospheric conditions in the South East Pacific Ocean executed by Program ERFEN (integrated by National Committees ERFEN of Colombia, Chile, Ecuador and Peru), and coordinated by the CPPS for November it is anticipated that in the sector of the South East Pacific the values as much of the Sea Surface Temperature as the one of the air, they stay fluctuating around the normal with slight tendency to the increase and that the present heating of waters in the Central Pacific will not exert major influences on the region of the South East Pacific. At the moment, conditions still considered like neutral exist; with the exception of Colombia that has reported an increase of the temperature of the air as well as a noticeable rain deficit and Chile with an increase by on the normal thing in precipitations of the South zone.

TABLE 1

LARGE SCALE DATA: From left to right, monthly median for the last three months of the zonal wind component at lower levels (U3, U2, U1 in the Equatorial Pacific central western, central and central eastern, respectively in m/s with positive values from East to West). SST (T4,T3.4,T3,T1+2,Tc corresponding to the Equatorial Pacific central western, central and central eastern, close to the coast and the coastal area, Talara-Callao, respectively: in °C), atmospheric pressures in Tahiti (Tht) and Darwin (Dwn), expressed in an excess over 1000 Hpa and South Oscillation Index (SOI).

MONTH	ZONAL WIND			NIÑO REGION SST					ATMOSPHERIC PRESSURE		
	WEST.	CENT.	EAST.	T4	T3.4	T3	T1+2	Tc	Tht	Dwn	IOS
AGO 09	3.0	7.0	7.3	29.2	27.5	25.9	21.6*	19.2	13.8	12.9	-0.7
SEP 09	1.5	8.7	8.1	29.3	27.5	25.7	20.8	18.3	14.3	11.3	0.3
OCT 09	-0.3	4.3	5.2	29.6	27.6	25.7	20.9	18.2	11.9	11.4	-1.7

Source: NCEP/NWS/NOAA/USA.

TABLE 2

COASTAL OCEAN DATA OF THE ERFEN REGION: Monthly medians of the last three Months for Sea Surface Temperatures (SST) in degrees °C. Stations: Tumaco (TCO), La Libertad-Salinas (LLS), Callao (CAL), Arica (ARI), Antofagasta (ANT), Caldera (CDA), Coquimbo (COQ) and Valparaíso (VAL).

Sea Surface Temperature (SST)									
MONTH	TCO	LLS	CAL	ARI	ANT	CDA	COQ	VAL	
AGO 09	27.5	23.6	15.9	15.6	14.9	13.9	13.3	12.2	
SEP 09	27.6	23.6	15.5	15.2	15.2	13.7	13.3	11.7	
OCT 09	27.8	23.5	15.1	16.2	16.0	15.0	15.0	12.8	

Source: CCCP (Colombia), INOCAR (Ecuador), DHN (Perú), SHOA (Chile).

TABLE 3

COASTAL OCEAN DATA OF THE ERFEN REGION: Monthly medians of the last three Months for the Mean Sea Level (MSL) in mm. Stations: Tumaco (TCO), La Libertad-Salinas (LLS), Callao (CAL), Arica (ARI), Caldera (CDA), Coquimbo (COQ) and Valparaíso (VAL).

Mean Sea Level (MSL)									
MONTH	TCO	LLS	CAL	ARI	ANT	CDA	COQ	VAL	
AGO 09	***	2736	1090	1571	622	1215	861	651	
SEP 09	***	2719	1080	***	632	1163	80.2	***	
OCT 09	***	2715	1060	***	***	***	***	***	

Source: CCCP (Colombia), INOCAR (Ecuador), DHN (Perú), SHOA (Chile).

TABLE 4

COAST OCEANIC DATA OF THE ERFEN REGION: Five-day averages (Pentads) of SST (°C) and MSL (mm)

PENTADS	Sea Surface Temperature (SST)			Mean Sea Level (MSL)		
	BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO
SEP 05	***	19.5	15.8	***	272.7	108.4
10	***	17.9	15.6	***	271.3	103.5
15	***	17.3	15.5	***	268.6	105.4
20	***	17.2	15.2	***	277.1	114.8
25	***	17.1	15.4	***	271.2	109.7
30	***	17.1	15.3	***	270.6	106.1
OCT 05	***	17.1	15.4	***	275.1	108.5
10	***	18.2	15.1	***	267.7	101.5
15	***	16.8	15.1	***	269.1	107.0
20	***	17.0	15.1	***	274.7	103.9
25	***	19.5	15.0	***	272.6	***
30	***	19.8	***	***	270.4	***

Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.

Note.

* Values revised

***. Information not received

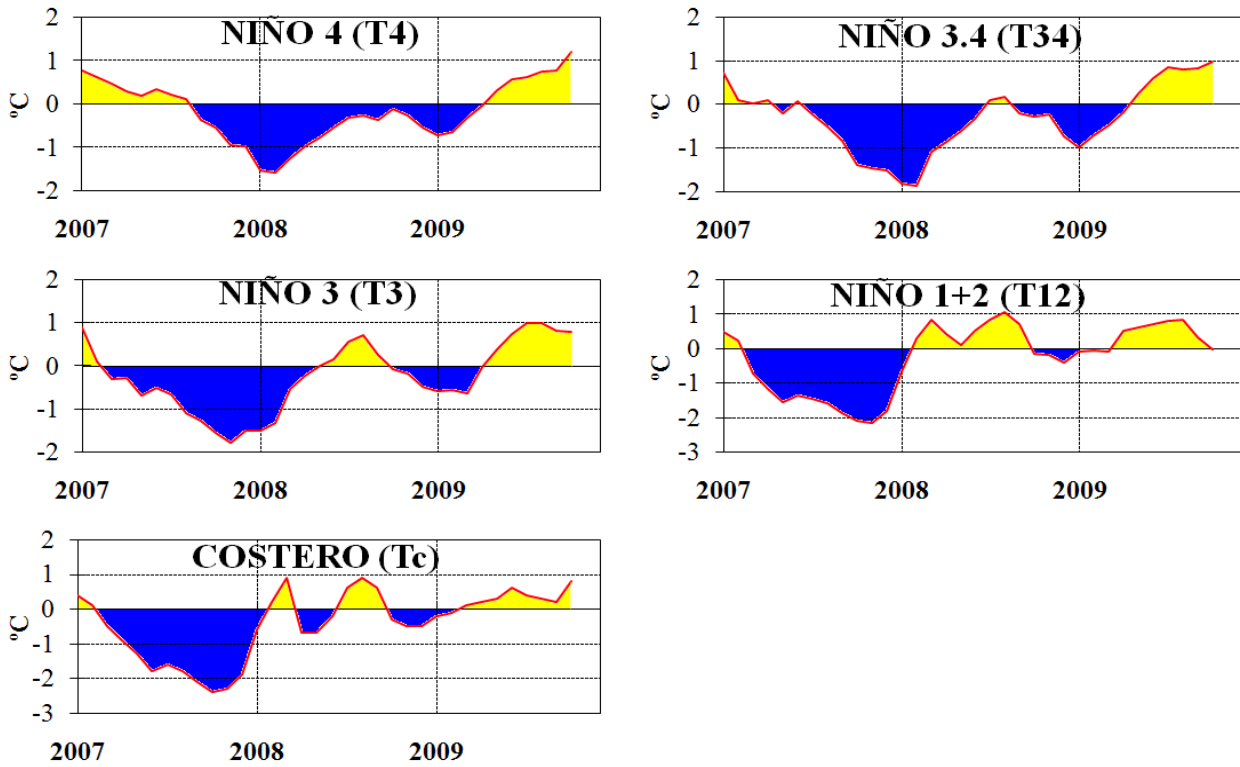


Figure 3.- Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).

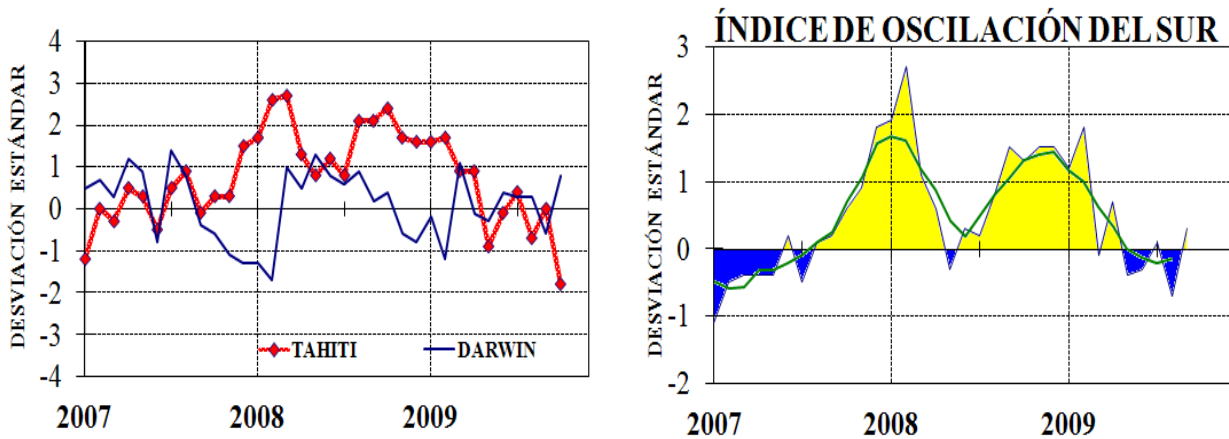


Figure 4.- Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: Tahiti minus Darwin. The differences are also standardized for standard deviation of yearly values. (Source: NCEP/NWS/NOAA/USA).

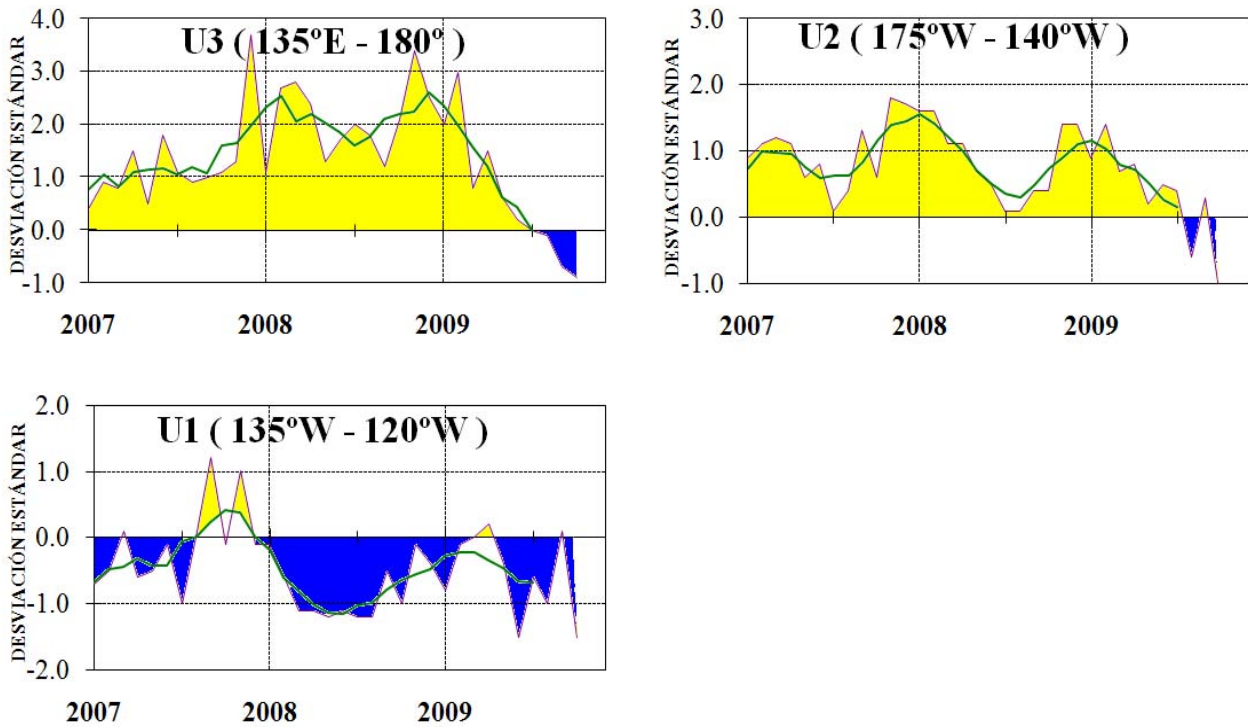


Figure 5.- Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).

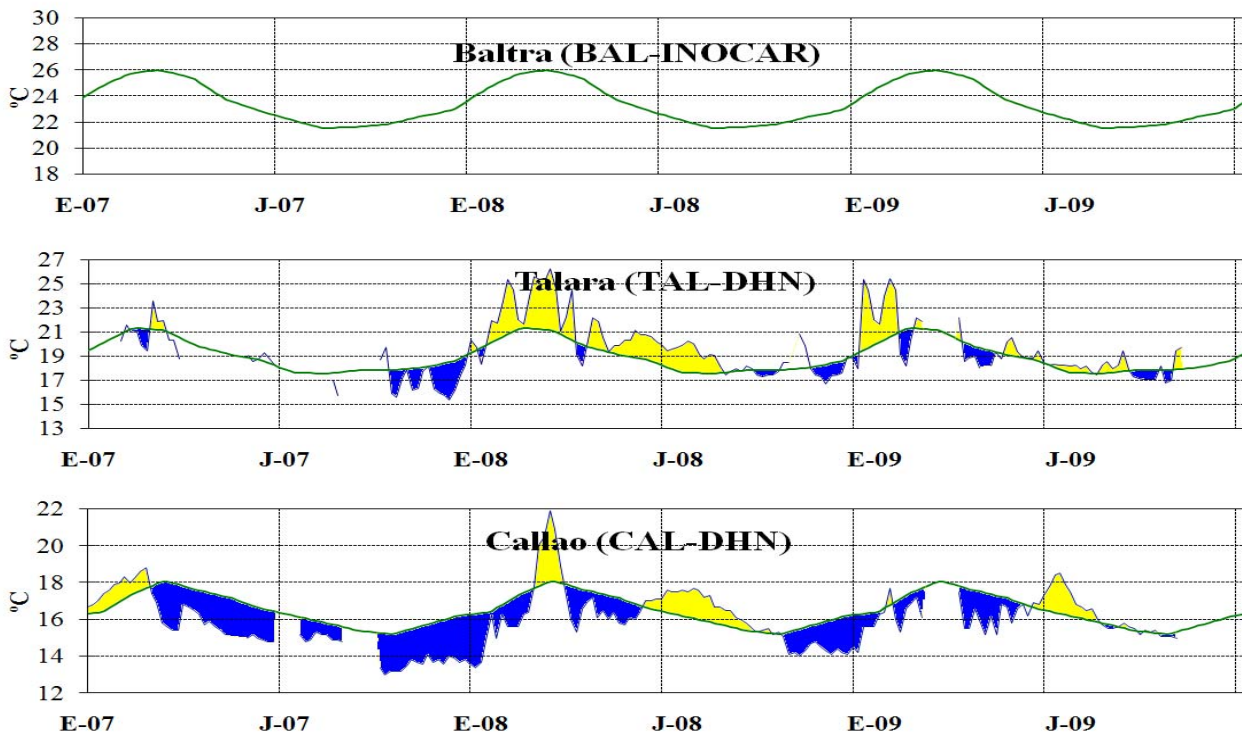


Figure 6.- Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)

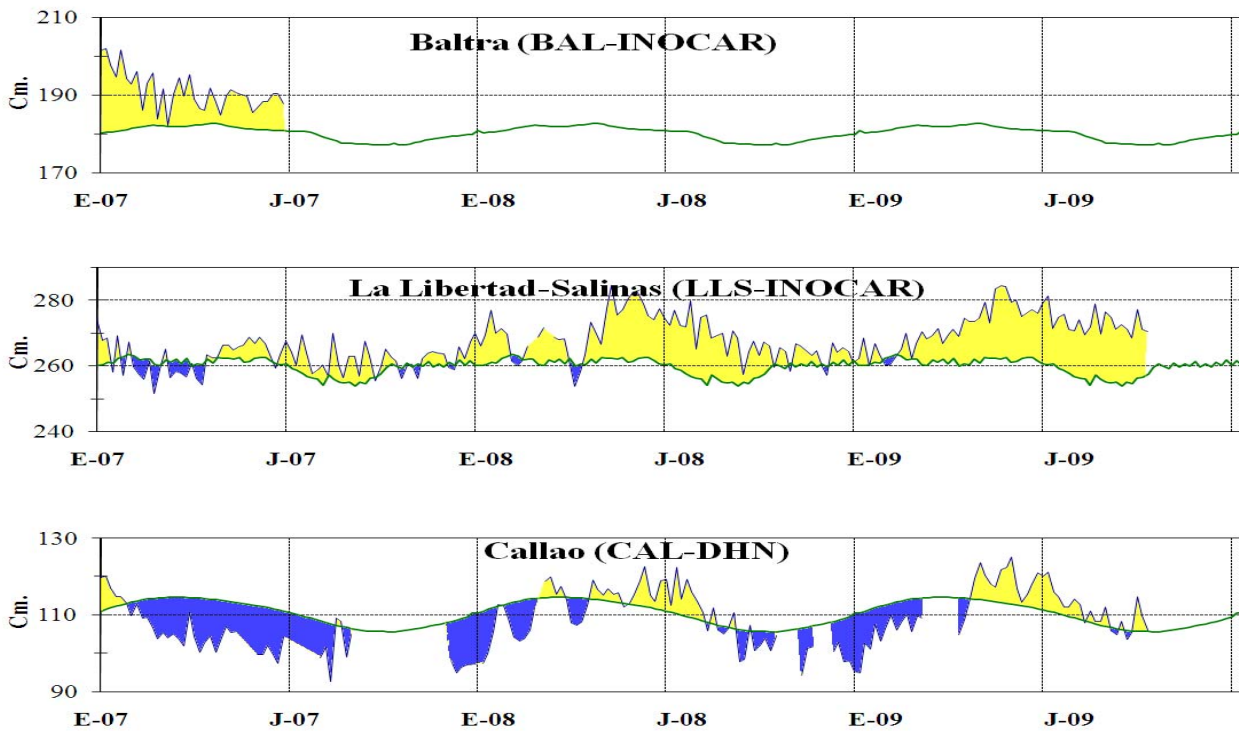


Figure 7.- Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).

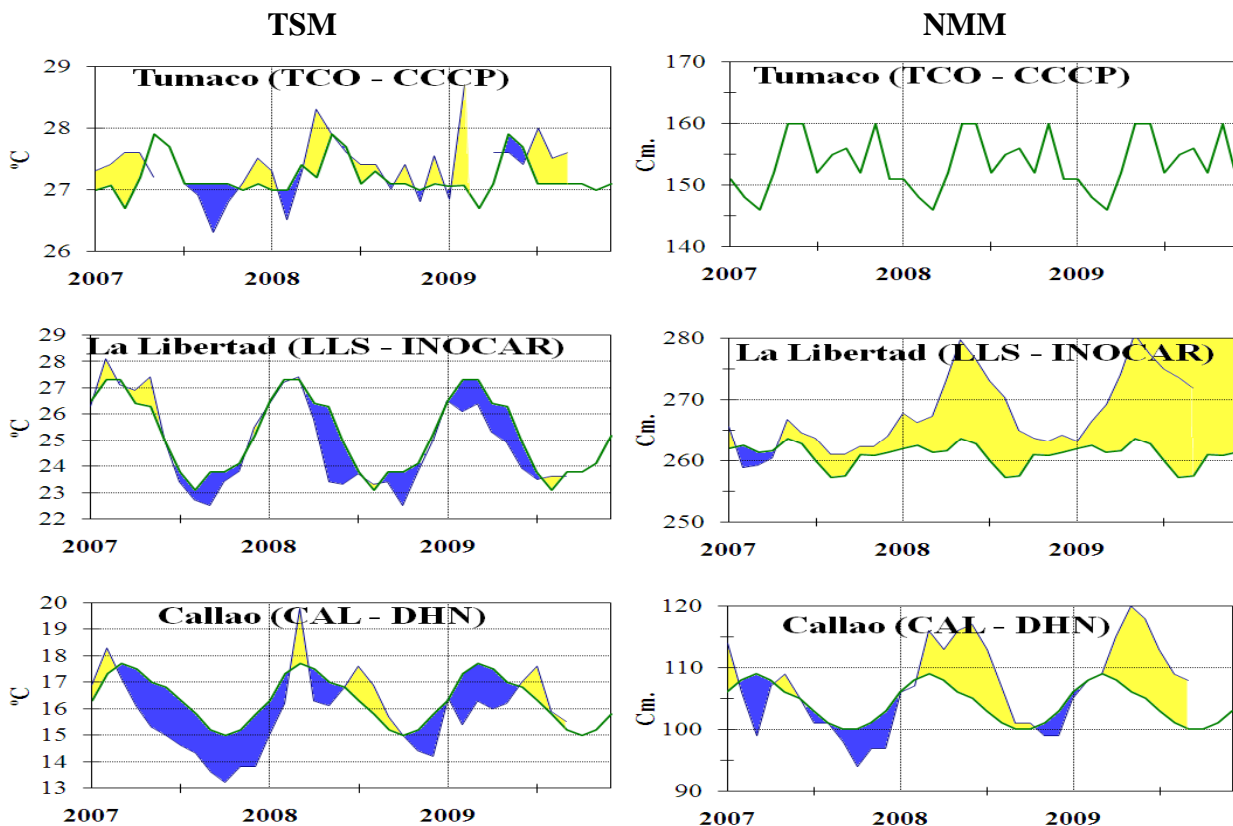


Figure 8a.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).

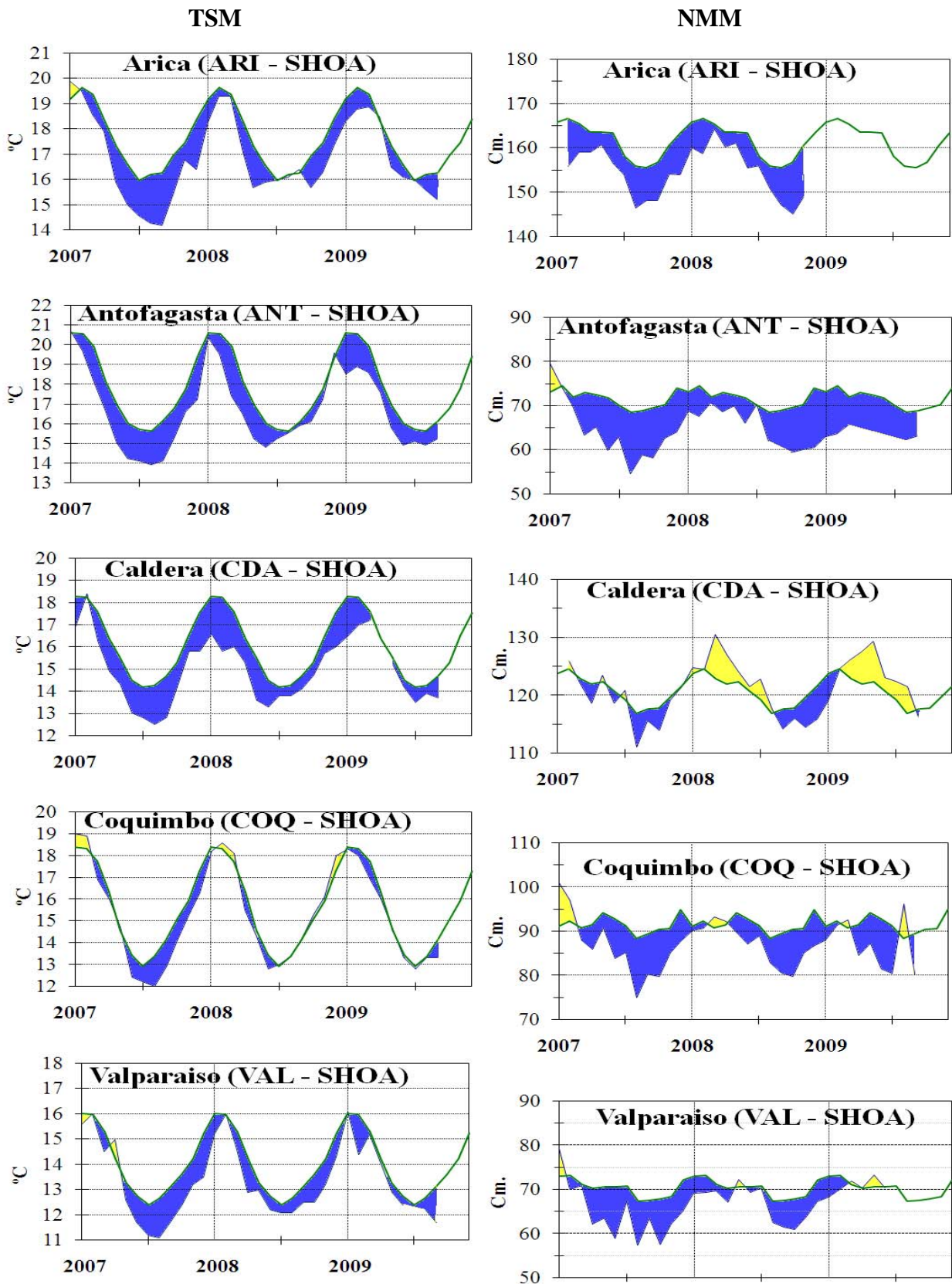


Figure 8b.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).

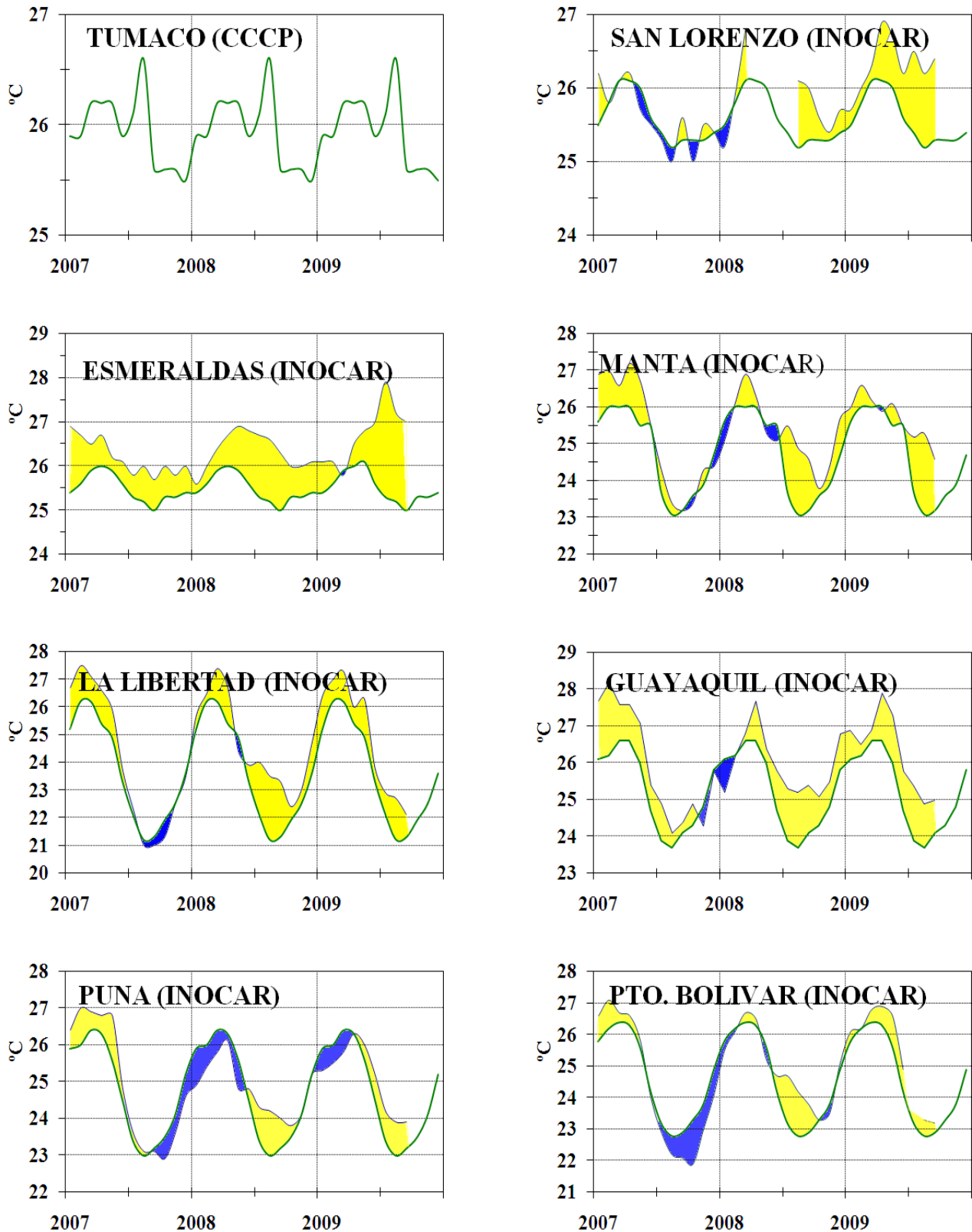


Figure 9a.- Monthly means of the air temperature (°C) in 8 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP & INOCAR).

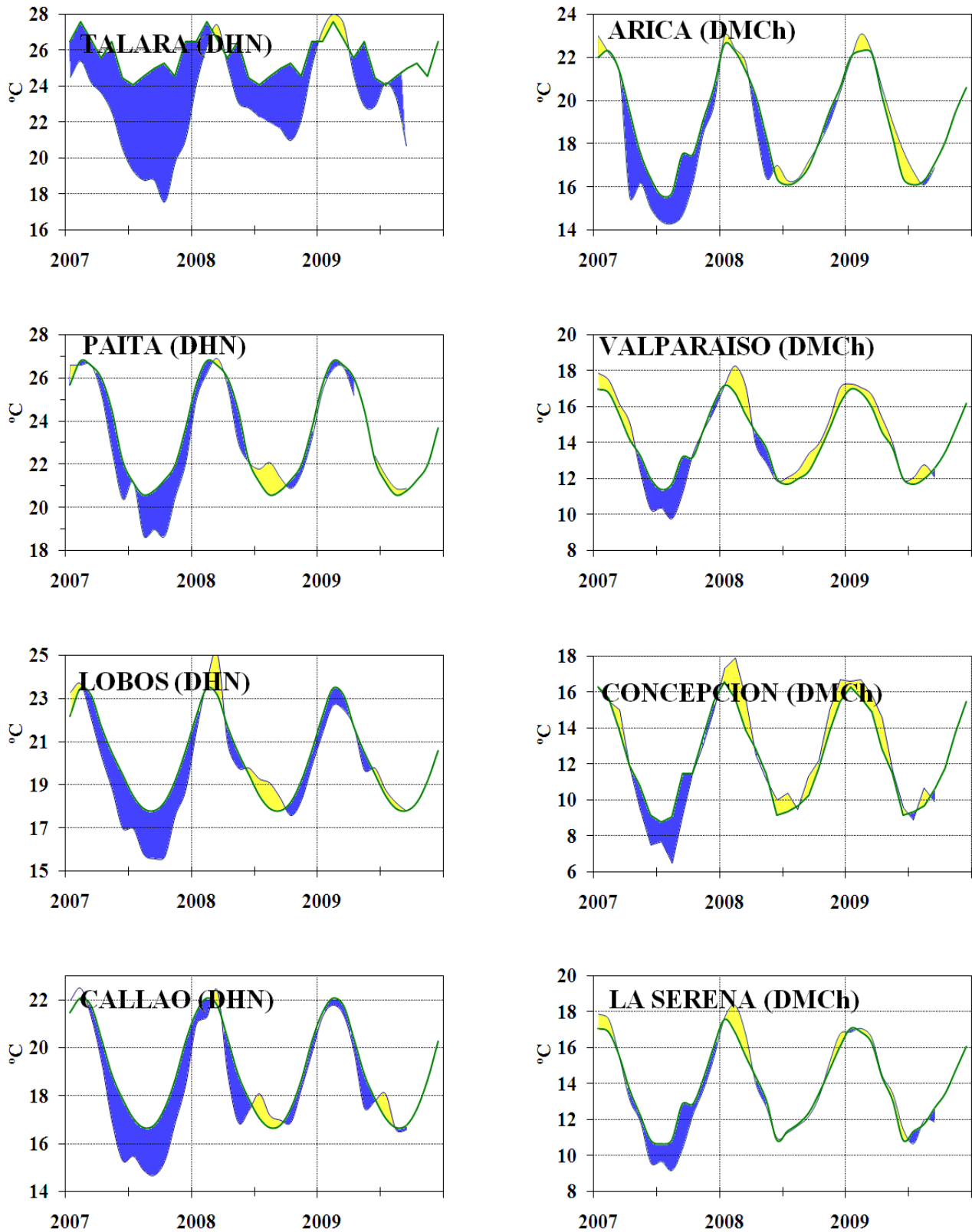


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).

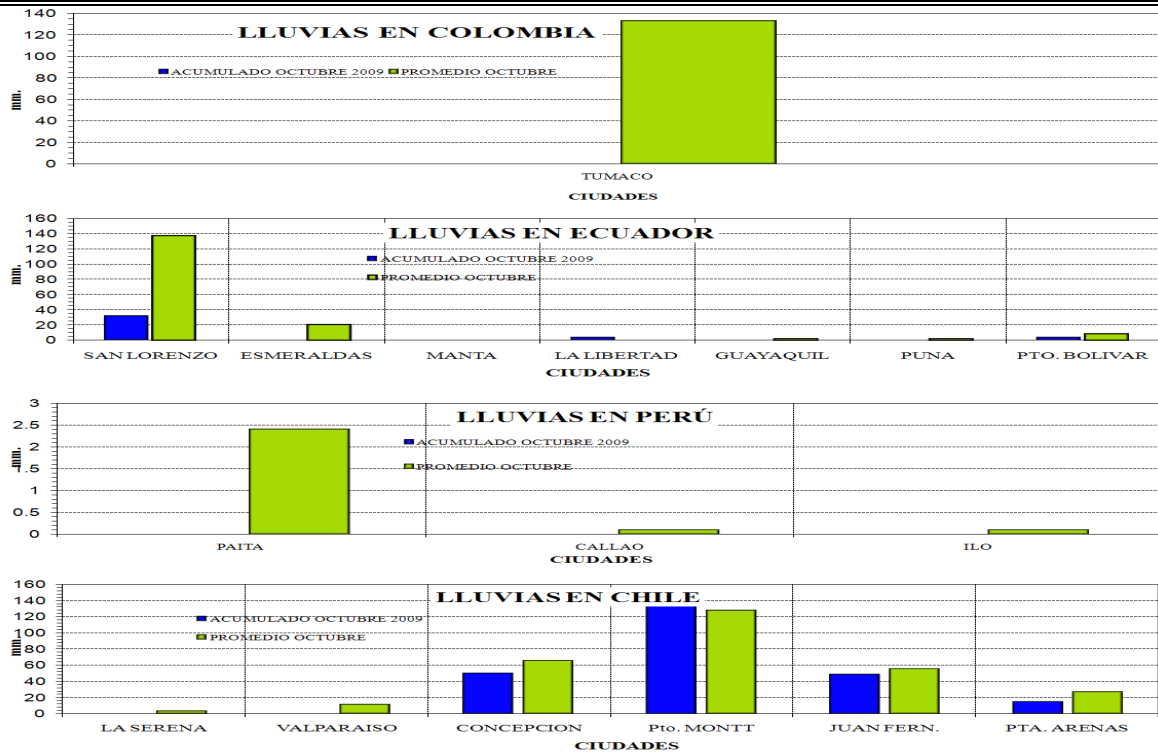
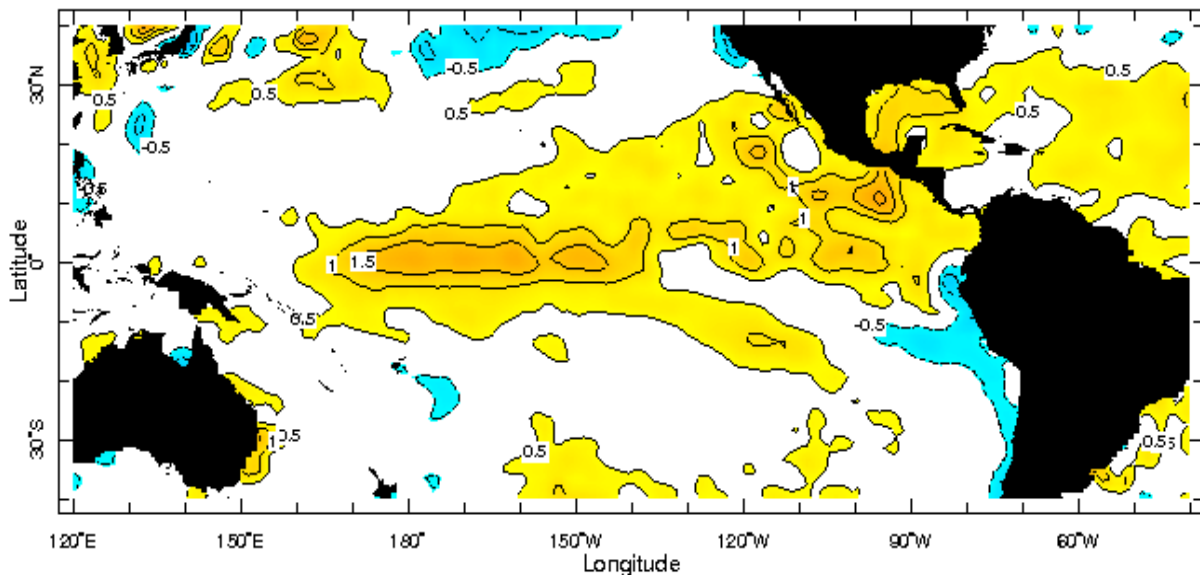


Figure 10.- Rains during October in the coastal stations of Colombia, Ecuador, Peru and Chile. Location of the stations appears in Figure 1. (Sources: CCCP, INOCAR, DHN & DMCh).

Anomalía de la Temperatura Superficial del Mar (°C) Octubre 2009



Oct 2009
Figure 11.- Sea Surface Temperature Anomalies (°C) October 2009. (Source: International Research Institute for Climate and Society)

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OCEANOGRAPHIC INSTITUTE OF THE NAVY OF ECUADOR
Av. 25 de julio. Base Naval Sur. Guayaquil, Ecuador.
P.O. Box 5940. Fax (593)4-2485166. Tel: (593)4-2481300.

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