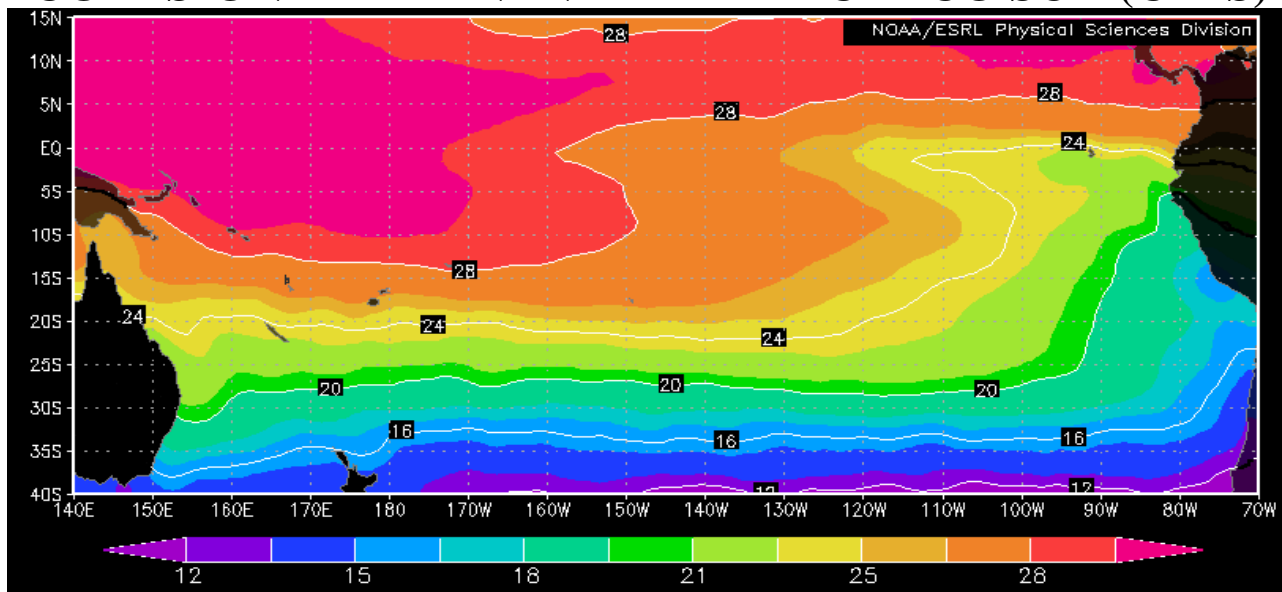


COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



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

AUGUST 2009

BAC N° 227

ERFEN

(Estudio Regional del Fenómeno El Niño)

BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



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COMISIÓN PERMANENTE DEL PACÍFICO SUR
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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

During August the Pacific Ocean continued the process of development of an event El Niño, in spite of being observed a slight reduction of the Sea Surface Temperature in the area of the Central Pacific, exhibiting positive anomalies between 1 and 1.5°C; on the other hand in the sector of the South East Pacific, next to the coast, values next to the normal one were observed, even with presence of negative anomalies next to the North and Central coast of Chile. The anomaly of the Sea Surface Temperature in the El Niño regions during the last week of August presented the following values: in the region of the Western Pacific (El Niño Region 4) it was of 0.8°C; in the Central Pacific (El Niño Region 3.4) the anomaly stayed in 0.9°C and; in the region of the Eastern Pacific (El Niño Region 1+2) it was increased to 0.7°C. At subsurface level between 80 and 200 ms of depth, the positive anomalies of the Sea Temperature continued present (until 3°C), that approximately from 120°W towards the east, they have reached the surface of the sea. In this occasion it is possible to observe, in the Eastern edge of the Pacific, between 50 and 100m of depth, a slight reduction of the temperature with negative anomalies of -0.5°C. The Mean Sea Level in the South East Pacific during the month, presented tendency towards values by above of its normal patterns. The anomalies in the North and Central zones of the Peruvian coast were superiors to the 10 cm; and inferiors to this value in the South zone. In the case of Chile, the level of the sea presented slight positive anomalies between 0.5 and 3.1 cm. The Index of Oscillation of the South during the month passed to the negative phase with a value of -0.7. The Intertropical Convergence Zone stayed during 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 appeared of the South and South-east; as far as the wind speed it was oscillating around the normal values of the month. Taking into account the present thermal behavior from the Equatorial Pacific Ocean, as well as the more excellent models of numerical simulation, are anticipated that during the next month the increase of temperature of waters of the Tropical Pacific Ocean stays; whereas in the Eastern edge of the Pacific Ocean, the tendency will be to present values around the normal ones. The results of the majority of the models of numerical simulation continue indicating to the development of conditions El Niño in the sector of the Central Pacific, that could reach its maximum development during the first trimester of the 2010; at the moment, the intensity of the event cannot be established, nor which would be their effects on the region of the South East Pacific.

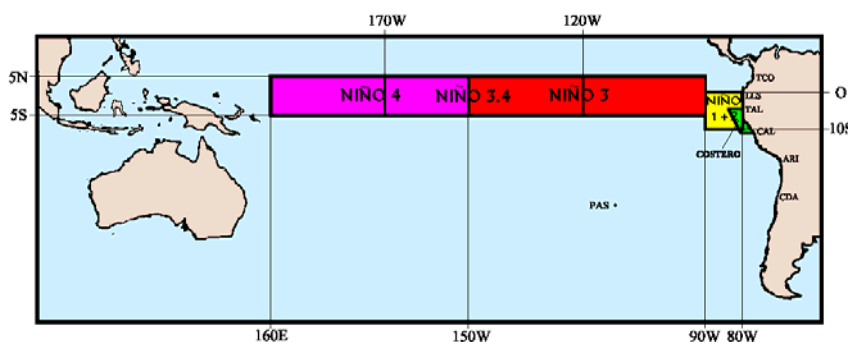


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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CLIMATE ALERT BULLETIN
BAC N° 227, AUGUST 2009**I. GLOBAL AND REGIONAL IMAGE**

In August the increase of the Sea Surface Temperature (SST) in the Tropical Pacific Ocean stayed, with anomalies between 1 and 2°C. The monthly anomaly of the SST in the regions El Niño during August continued on its climatologic values, being greater in the Eastern region of the Pacific. The registered variations were the following: in the region of the Western Pacific (El Niño Region 4) passed from 0.6 to 0.7°C, in the region of the Central Pacific (El Niño Region 3.4) a slight reduction appeared, passing from 0.9 to 0.8°C; in the region of the Eastern Pacific (El Niño Region 1+2) the anomalies passed from 0.8 to 0.9°C.

At subsurface level in the Equatorial Pacific in 160°W, a warm nucleus of until 3.0°C located between 100 and 150 ms of depth is observed. In this occasion in the Eastern edge, between 50 and 100m a small cold nucleus with anomalies of -0.5°C was observed, probably as a result of the entrance of cold waters of the south towards the region.

The Mean Sea Level (MSL) in the Southeastern Pacific continued with the tendency previously observed when presenting values on its normal values. In Peru the anomalies of the MSL (NMM) in the zone between Talara and Chimbote were superiors to the 10.0 cm, the minimum anomaly appeared in the stations of Callao, San Juan and Mollendo with 8.0 cm and the maximum anomaly occurred in the stations of Paíta, Lobos de Afuera and Chimbote with 13.0 cm. In Chile the Sea Level was characterized to present one slight tendency to the increase, with positive anomalies in the stations of Arica with 3.1 cm, Caldera with 0.5 cm and Talcahuano with 2.1 cm.; nevertheless the stations of Antofagasta, Coquimbo and Valparaiso still maintain negative anomalies with values near -4.0 cm.

In this occasion the South Oscillation Index (SOI) passed to a value of standardized anomaly significant of -0.7.

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 south-east, with speeds that fluctuated around their climatologic average.

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

The Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) informs that in Colombia, in opposition to the anticipated thing, in August it increased to the activity and frequency of the tropical waves of the East, which in interaction with the Intertropical Convergence Zone (ITCZ), were decisive factors in the behavior of rains, especially of the center and north of the country; a greater presence of positive anomalies of the Sea Surface Temperature in a great part of the Atlantic Ocean, including the marine area of the Colombian Caribbean, was the preponderant factor for the convective activity registered in sectors of the south of the Caribbean region and north of the Andean, added to the slight weakening in the development of the present phenomenon of El Niño, product of the diminution

of the Surface Temperature and Subsurface in the tropical Pacific Ocean, especially observed between the end of July and the third week of August.

The passage of nine tropical waves by the Colombian territory was registered, of which, four appeared during the first fortnight. It is possible to emphasize, that in second half of the month, some of the waves that journeyed by the Atlantic they turned into tropical revolving storms (Ana, Bill, Claudette and Danny), although the trajectory of them was predominantly to the Northwest, but generally without affecting the patterns atmospherics of the country. However, the associated atmospheric circulation to Bill, which becomes until the moment the hurricane of greater category (two), generated increases in the cloudiness and the amounts of precipitation in some zones of the north of the country.

Besides the previous thing, it is important to emphasize the presence of centers of low pressure, in particular on the north of the Pacific region, which contributed so that precipitations over the normal thing were registered in Choco. On the contrary, in the south of the Andean region amounts of rain below the historical values were registered; the location of the ITCZ a little more to the north of the normal thing for the time, influenced so that deficit amounts in these zones of the country predominated.

It is possible to indicate, that during the first five days of August, the dry conditions in ample sectors of the regions Andean and the Caribbean were accentuated, which affected so that the maximum temperatures of the air, were increased considerably. The previous thing favored the probability of fire occurrence of the vegetal cover, for which alert and warnings were emitted, especially in the south of the Andean region.

The Pollution Control Center for the Pacific (CCCP) declares that during the monitoring of August of 2009, realized by the Area of Operational Oceanography of the CCCP, 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 Sea Surface Temperature for August was of 27.5 and 27.6°C during the first and second fortnight respectively. A positive anomaly at Surface Level of 0.5°C with respect to the historical average appeared.

The thermocline during August presented a reduction of 7 ms, with respect to the last registry of July, being located to 50 ms of depth. During the second fortnight the thermocline descended 2 ms, being located to 48 ms of depth.

The superficial value of salinity for the first fortnight of August was of 32.23 UPS, while in the second fortnight it was of 31.71 UPS. A negative anomaly of -0.05 UPS 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) reports that during August continued the warm anomalies of the Sea Surface Temperature of the sea throughout the Equatorial Pacific Ocean, with values that oscillated between 0.5 and 1.0°C, whereas at subsurface level the values of the anomalies varied between 0.5 and 3.0°C. The highest anomalies were registered in the Northeastern Pacific.

In the Ecuadorian coasts as much the Air Temperature (AT) as the SST has increased their value with respect to the normal averages for August. The AT presents increases between 1.0 and 2.0°C degrees whereas the SST does between 0.5 and 1.0°C.

The winds registered during the month have a South-Southeast direction, with speeds within the waited for normal rank for the date.

The warm conditions that are appearing in the Central Pacific, associated with the starting phase of an El Niño event, not yet exert influence on the coast of Ecuador, following the force and permanence of winds of the south.

C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) shows that, generally, throughout the Peruvian coast registered a variation around the $\pm 0.4^{\circ}\text{C}$ in the anomalies of the SST with respect to the previous month. The positive anomalies with the exception of the station of San Juan predominated; this station presented a negative anomaly of -0.4°C . The positive anomalies of the SST fluctuated between 0.1°C (Chimbote and Callao) and 0.7°C (Paita).

The Mean Sea Level throughout the Peruvian coast presented positive anomalies of consideration, registering a variation average of ± 2.0 cm, with respect to the previous month. The anomalies in the zone between Talara and Chimbote are superiors to the 10.0 cm; whereas, in the Callao and the South zone, they are homogenous and inferiors to this value. The minimum anomaly appeared in the stations of Callao, San Juan and Mollendo with 8.0 cm and the maximum anomaly in the stations of Paita, Lobos de Afuera and Chimbote of 13.0 cm.

Throughout the Peruvian coast, the Air Temperature has registered a variation average of $\pm 0.4^{\circ}\text{C}$, with respect to the previous month. The negative anomalies prevailed; with the exception of the northern stations of Paita, Lobos de Afuera and Chimbote, that presented anomalies of 0.3 and 0.5°C , respectively. The negative anomalies of the AT fluctuated between -0.1 and -0.7°C .

Light intermittent drizzles in some coastal zones appeared, mainly during the second and fourth week of the month, with accumulated values of 1.5 mm in Chimbote and 0.1 mm in Mollendo and Ilo; whereas, in the zone of the Callao appeared plans Only.

Throughout the Peruvian coast winds of South and South-east direction appeared. In relation to the wind speed, the anomalies were variable, fluctuating between $+0.9$ m/s (Ilo) and -3.8 m/s (Paita).

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 Sea Level to monitor a series of oceanic and atmospheric variables. Next a description of the Sea Surface Temperature and the Sea Level between Arica ($18^{\circ}29'S$) and Talcahuano ($36^{\circ}41'S$) appears, for August of 2009.

During this month the majors negative anomalies of SST were concentrated in the North zone of the country, specifically in the stations of Arica and Antofagasta, with values of -0.8 and -0.6°C , respectively. On the other hand, the Center-South zone located between Caldera and Talcahuano registered values near the historical average that fluctuated between the -0.2 and -0.4°C .

The Sea Level was characterized to present one slight tendency to the increase, with positive anomalies in the stations of Arica (3.1 cm); Caldera (0.5 cm) and Talcahuano (2.1 cm). Despite previous, the stations of Antofagasta, Coquimbo and Valparaiso still they maintain negative anomalies with values near to normal that they fluctuate around the -4.0 cm.

It is possible to emphasize that, the data of SST and Sea Level described previously for the North zone and the 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 the present event El Niño/South Oscillation (ENSO).

The Meteorological Direction of Chile (DMC) declares that the average temperature of the air during August was characterized by the presence of positive anomalies that affected the Central and South zone, between Valparaiso and Balmaceda, with anomalies between 0.6 and 1.7°C, being the warmest region between Temuco and Puerto Montt. On the contrary, only the North end presented slight negative anomalies, with a value in Arica of -0.4°C.

In relation to the average maximum temperature of August, the North end of Chile presented negative anomalies of -0.8°C and a less intense cooling was observed in the zone South Center of the country, represented by Chillán with -0.5°C. Other localities of the Central zone, between Valparaiso and Curicó, presented the majors heating with positive anomalies between 0.4 y 1.3°C. In the rest of the country were observed maximum temperatures around the normal with anomalies of +/- 0.3°C.

The minimum temperature to a large extent of the country presented significant positive anomalies, being the Central and South region between Valparaiso and Puerto Montt the warmest, with values between 1.1 and 3.4°C. Only Arica and Coyahique presented slight negative anomalies of -0.1°C.

The atmospheric circulation on the South Pacific was dominated by negative anomalies associate to the fall of the pressure at Sea Level and geopotencial height in the average and high troposphere, as a result of a high frequency of extratropical disturbances and “vaguadas” of synoptic scale that affected the Central and South zone of Chile. Negative anomalies of the pressure at Sea Level were observed in island stations of Juan Fernandez (-2.4 hPa) and Island of Pascua (-1.8 hPa), and continental regions like Concepcion (-1.7 hPa), Puerto Montt (-4.1 hPa) and Punta Arenas (-5.2 hPa). This condition favored the frontal high activity and the wellknown increase of precipitations in the country.

During August, the precipitation was characterized to present normal conditions to a large extent of the country, being the South zone between Concepcion and Puerto Montt the rainiest surpassing in more than 80 mm its climatologic values.

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 esteemed that during the next month in the Central Pacific will continue the development of an event El Niño. Consequently, the positive anomalies of the SST (TSM) will be present, equal way at Subsurface Level will persist the heating that at the moment covers all the Equatorial Pacific region.

B. REGIONAL

In agreement with the pursuit of the ocean-atmospheric conditions in the Southeast Pacific Ocean executed by Program ERFEN (integrated by National Committees ERFEN of Colombia, Chile, Ecuador and Peru) and coordinated by the CPPS; it is anticipated for September of 2009 that as much the values of Sea Surface Temperature as those of Air Temperature will stay fluctuating around the normal thing or slightly on the normal thing. Despite previous, it is esteemed that the present heating of waters of the Tropical Pacific Ocean not yet will exert a significant influence on the region of the South East Pacific, taking in to account that the event El Niño is in its phase of beginning and could reach its maximum development during the first trimester of the next year, reason why is recommendable to maintain a careful pursuit of the evolution of the event, as well as of its future repercussions on the climate of the region of the South East Pacific.

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
JUN 09	3.2	6.6	6.0	29.2	28.1	27.1	23.7	21.6	13.6	12.7	-0.3
JUL 09	2.8	9.3	8.7	29.2	28.0	26.6	22.7	20.2	14.3	13.1	0.1
AUG 09	3.0	7.0	7.3	29.2	27.5	25.9	21.7	19.2	13.8	12.9	-0.7

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	
JUN 09	27.4	23.9	17.0	16.1	14.9	14.2	13.3	12.4	
JUL 09	28.0	23.8	17.6	16.0	15.1	13.5	12.8	***	
AUG 09	27.5	23.6	15.9	15.6	14.9	13.9	13.3	12.2	

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	
JUN 09	***	2774	1180	***	***	1231	815	704	
JUL 09	***	***	1130	***	***	1224	804	***	
AUG 09	***	2736	1090	1571	622	1215	861	651	

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
JULY 02	***	18.4	18.4	***	271.4	116.0
07	***	18.3	18.5	***	274.8	114.7
12	***	18.3	17.9	***	275.7	112.1
17	***	18.2	17.5	***	271.1	112.0
22	***	18.3	16.8	***	270.8	114.2
27	***	18.0	16.7	***	274.1	112.6
AUGUST 01	***	18.2	16.5	***	269.6	108.0
06	***	17.8	16.6	***	271.9	111.1
11	***	17.5	16.0	***	278.9	108.4
16	***	18.3	15.7	***	269.8	108.4
21	***	18.6	15.5	***	276.6	112.0
26	***	18.0	15.5	***	274.7	105.9
31	***	18.3	15.6	***	271.2	104.8

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

Note.

* Values revised

***. Information not received

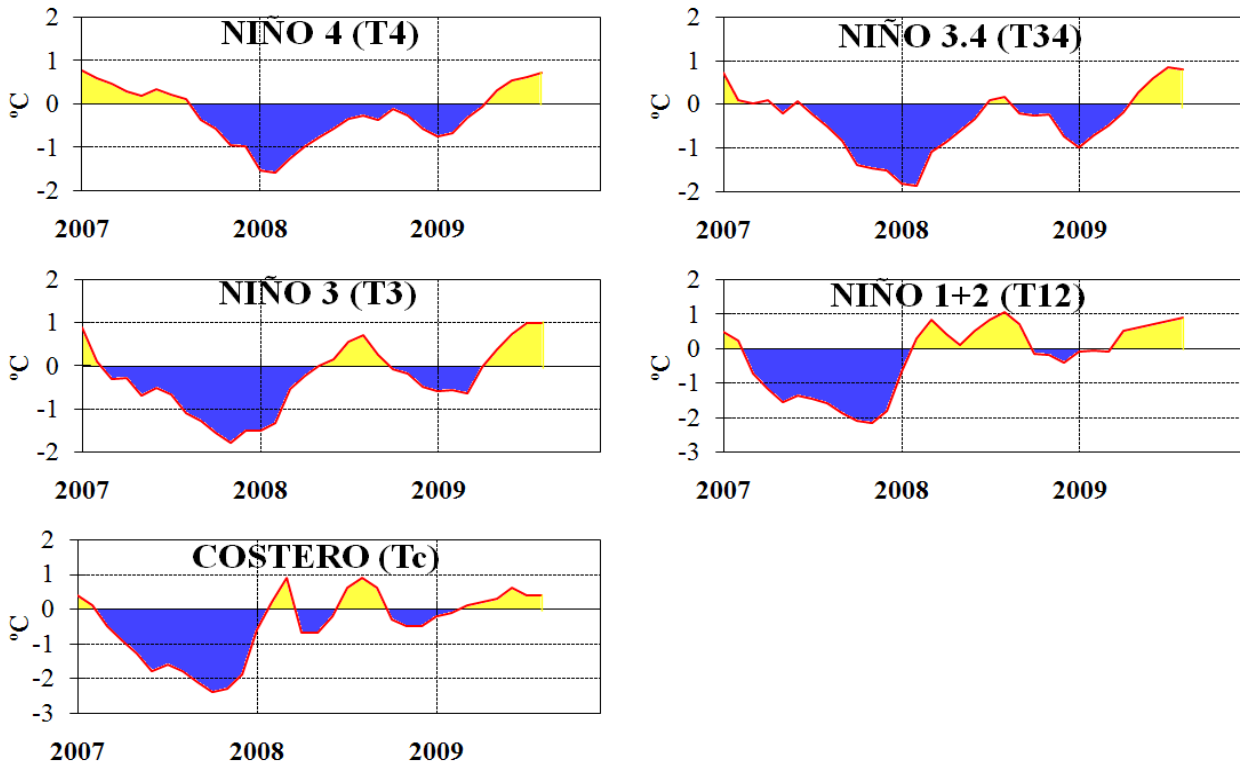


Figure 3.- Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).

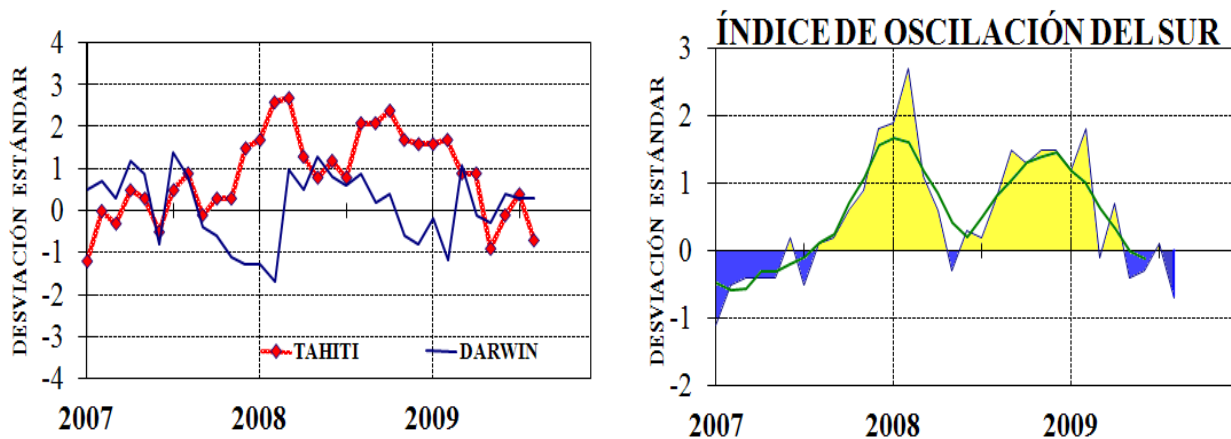


Figure 4.- Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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

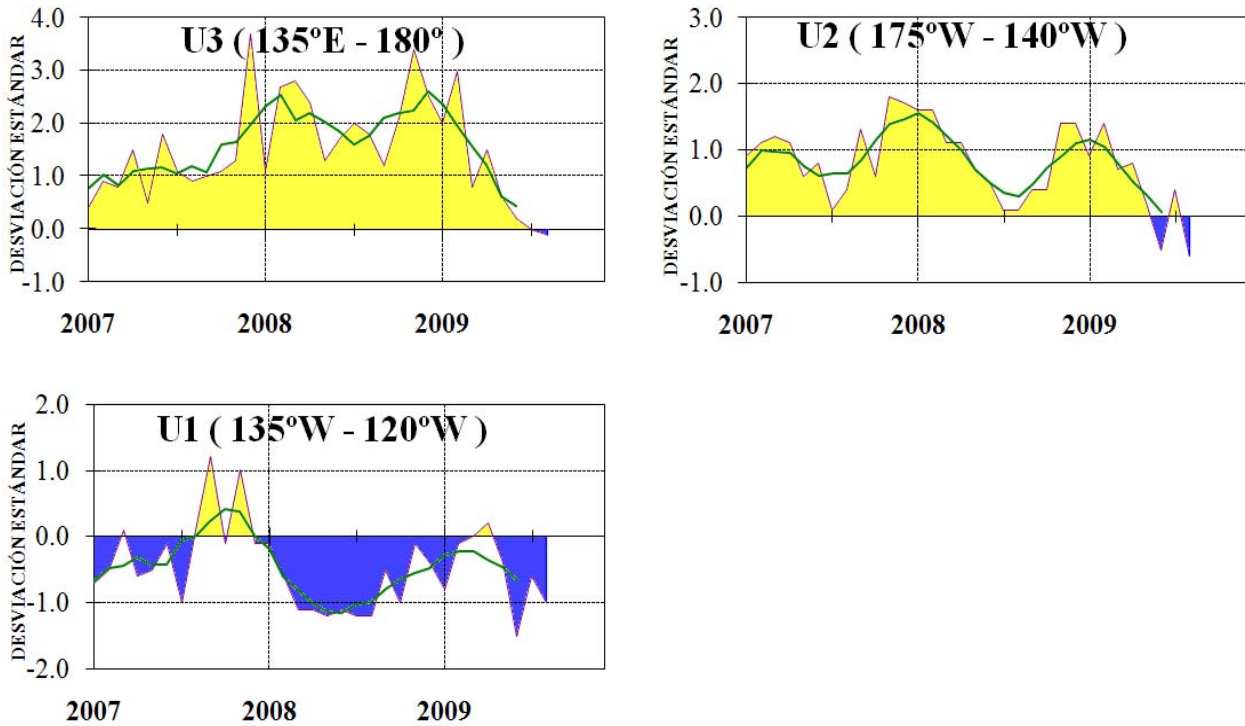


Figure 5.- Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).

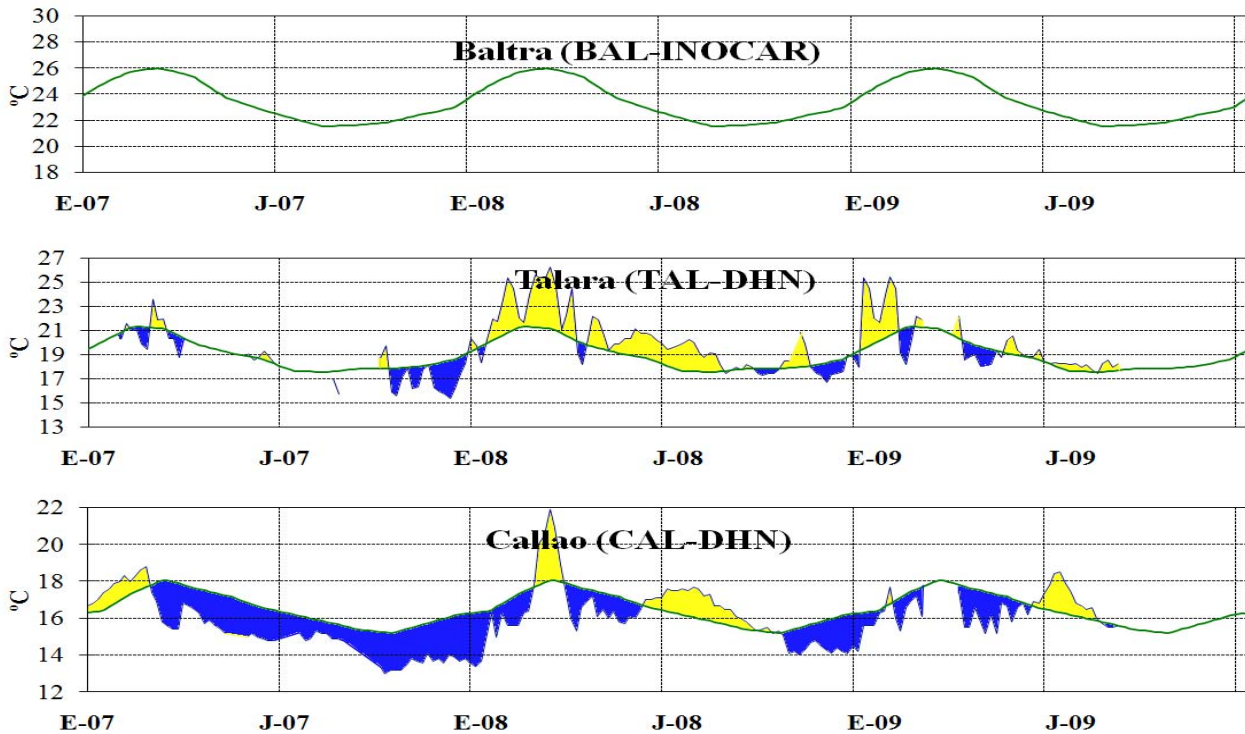


Figure 6.- Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)

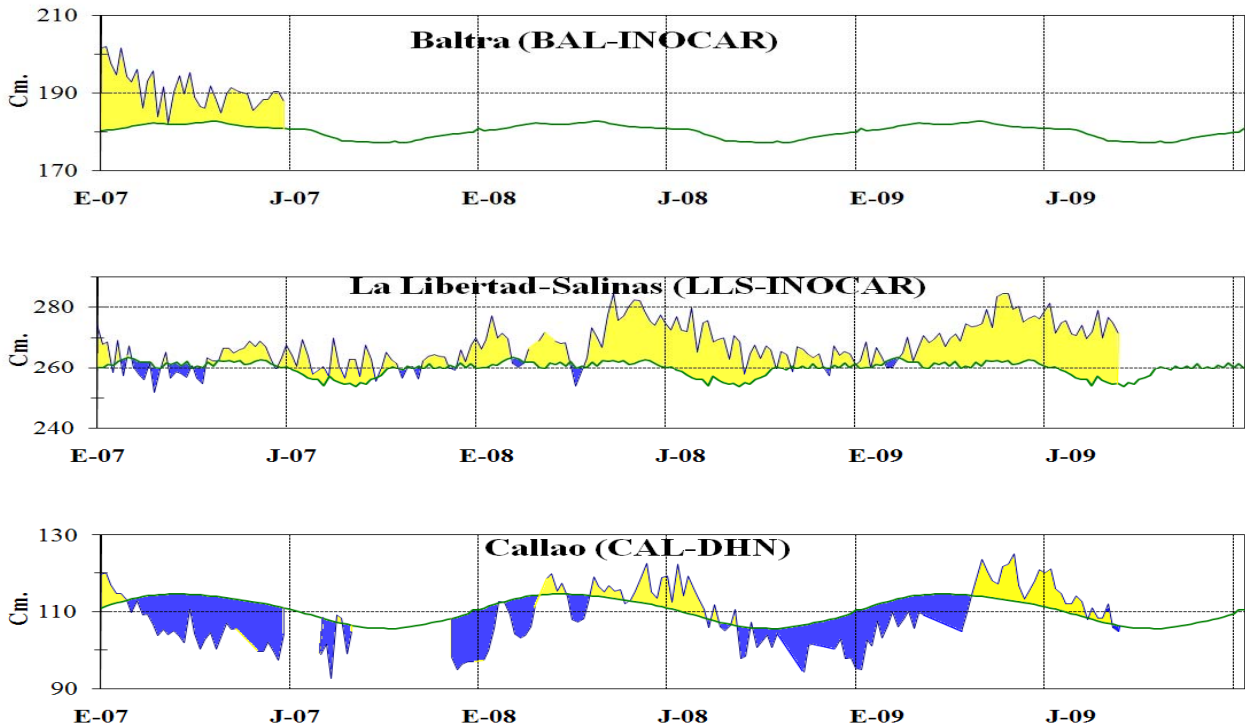


Figure 7.- Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).

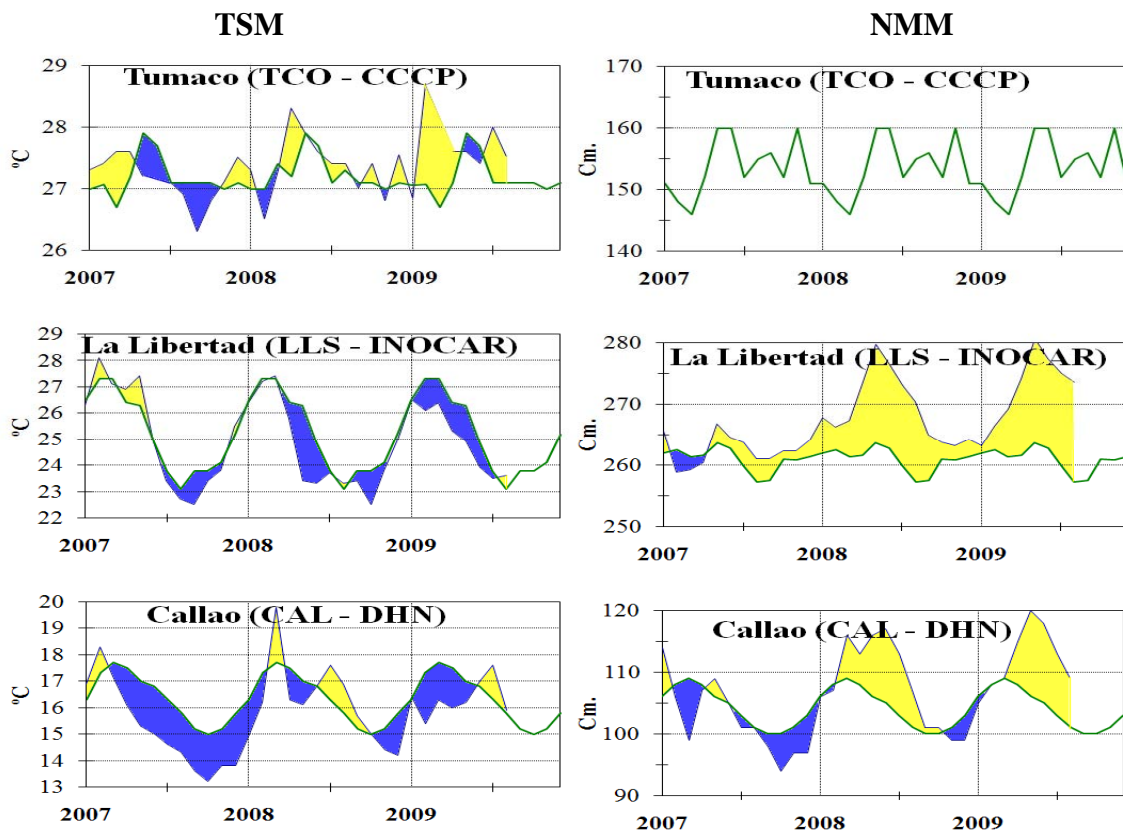


Figure 8a.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).

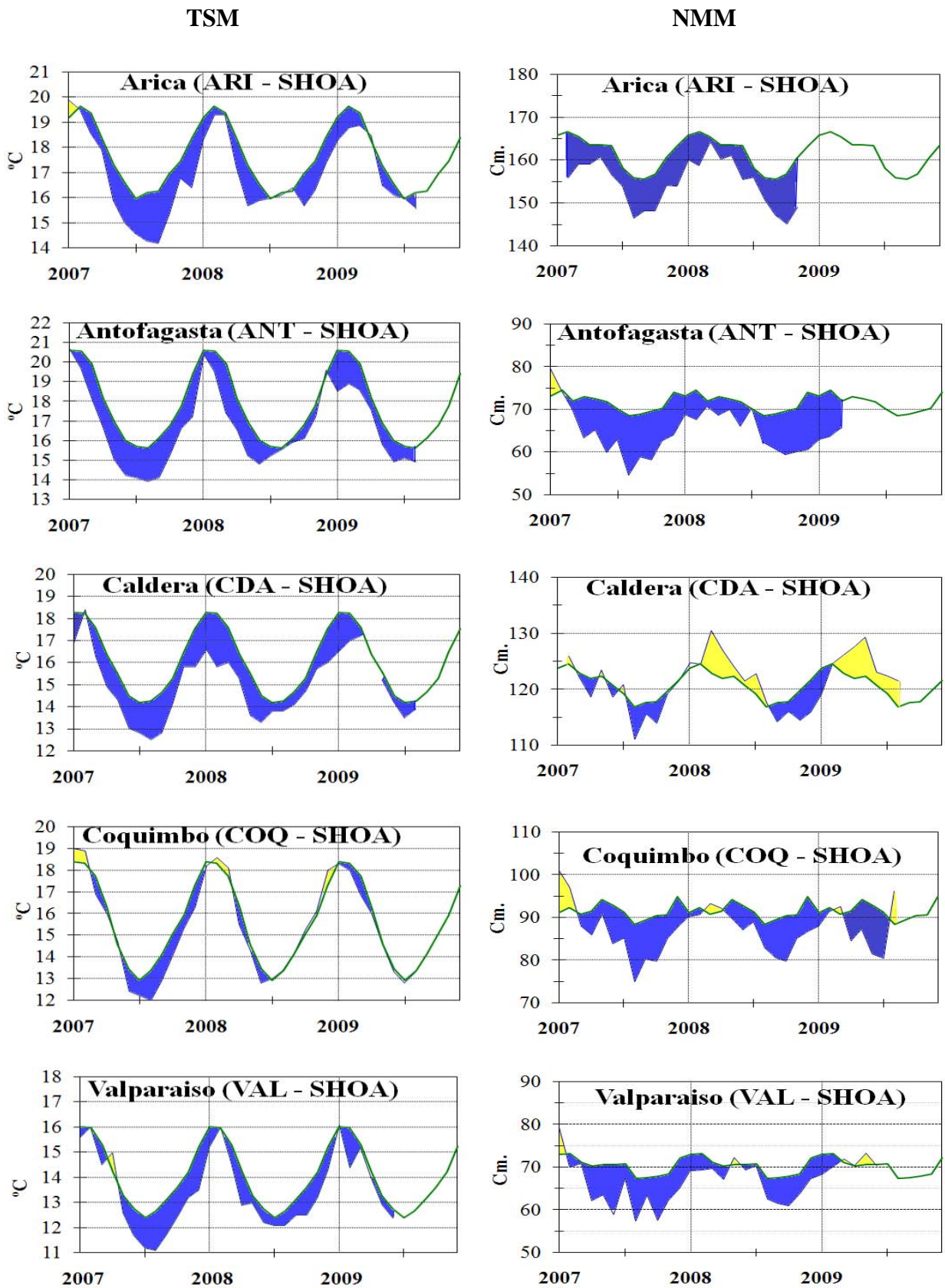


Figure 8b.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).

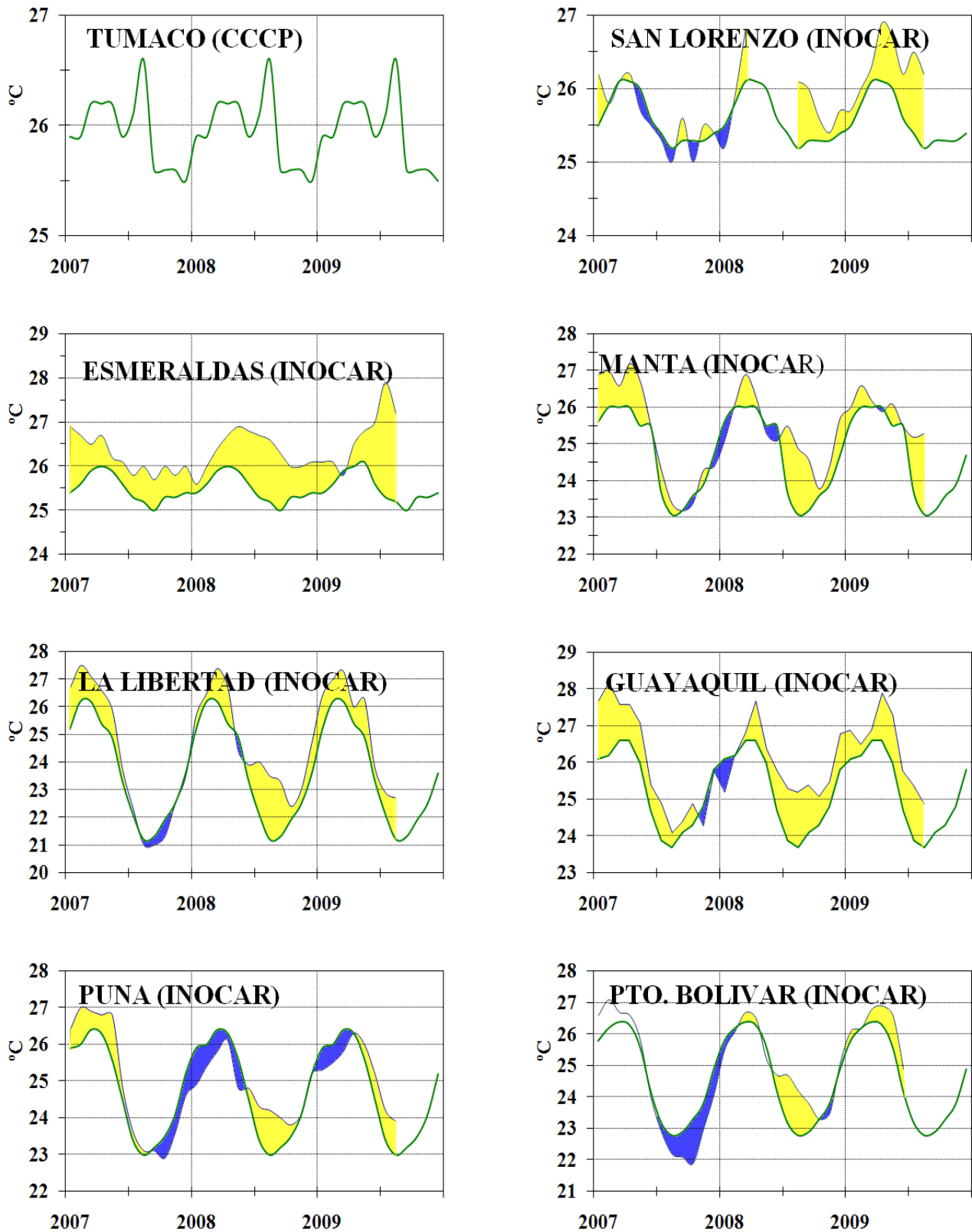


Figure 9a.- Monthly means of the air temperature (°C) in 8 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP & INOCAR).

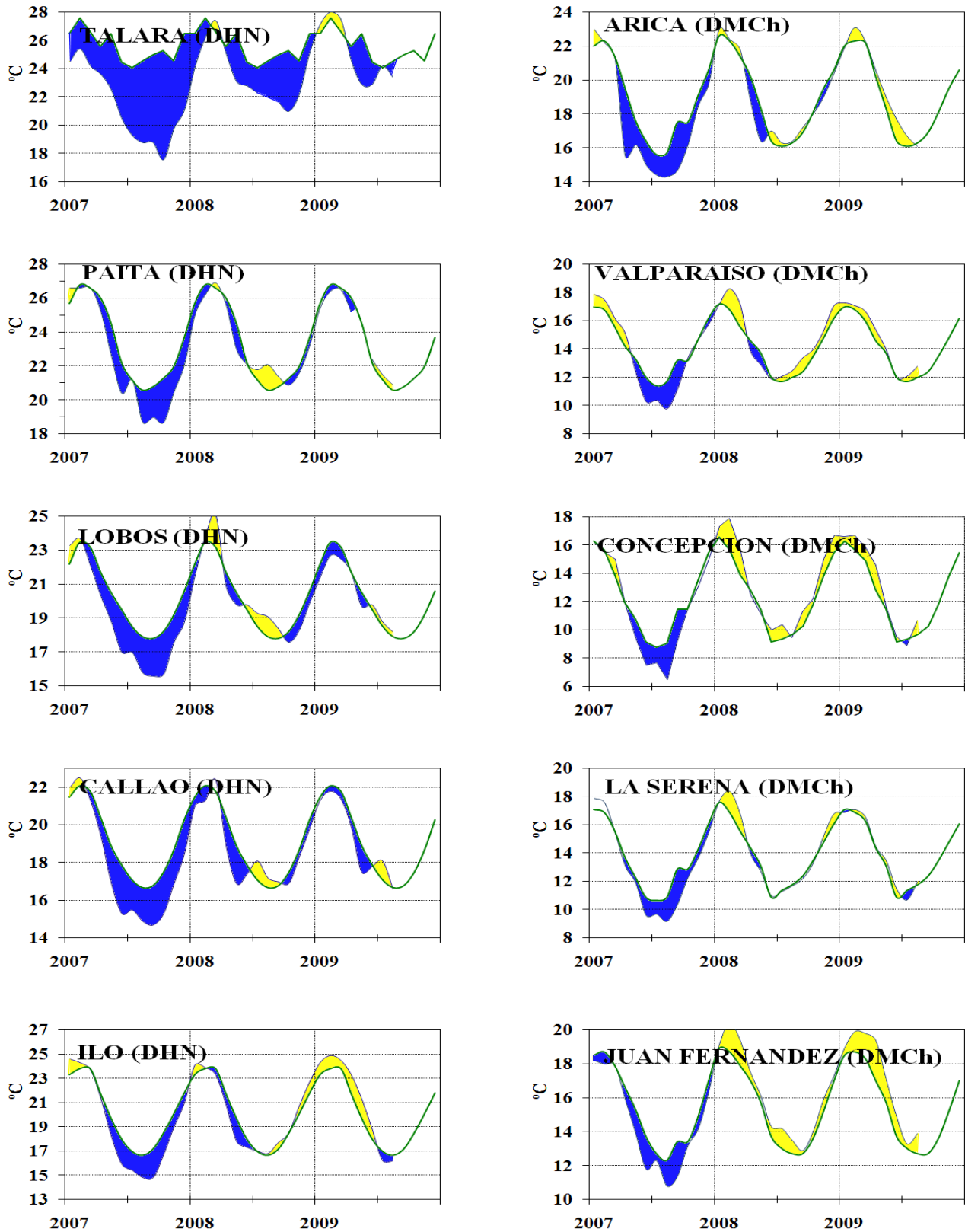


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).

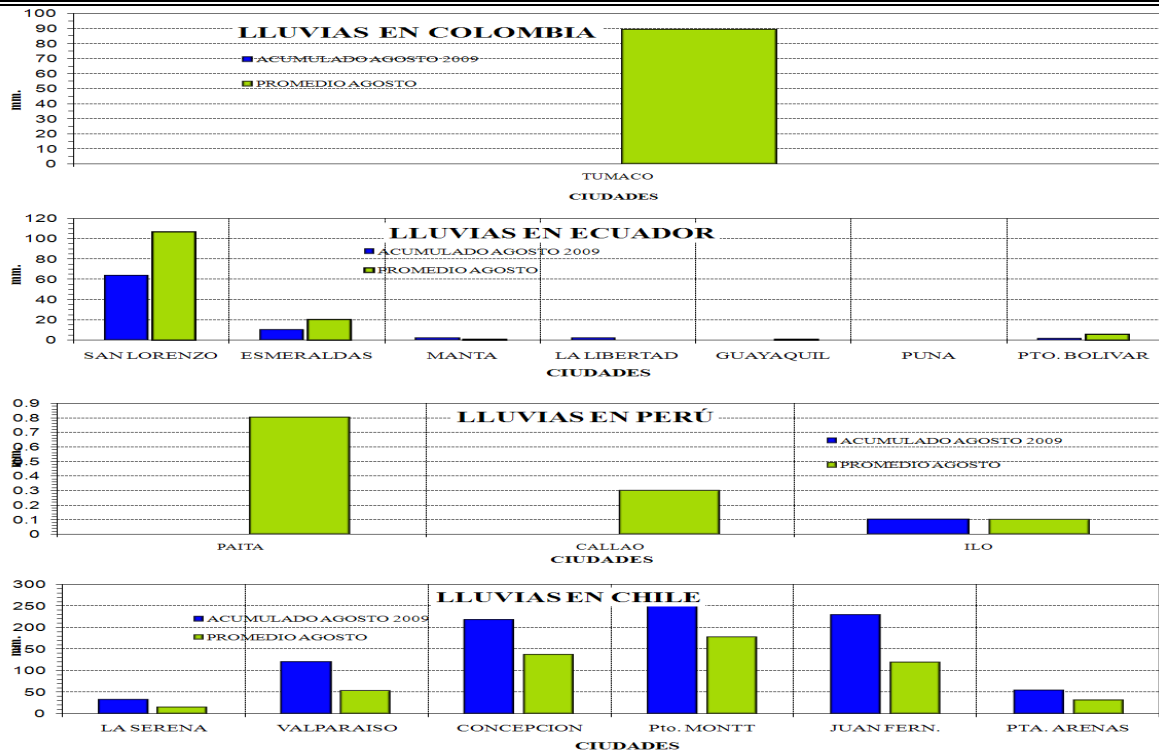
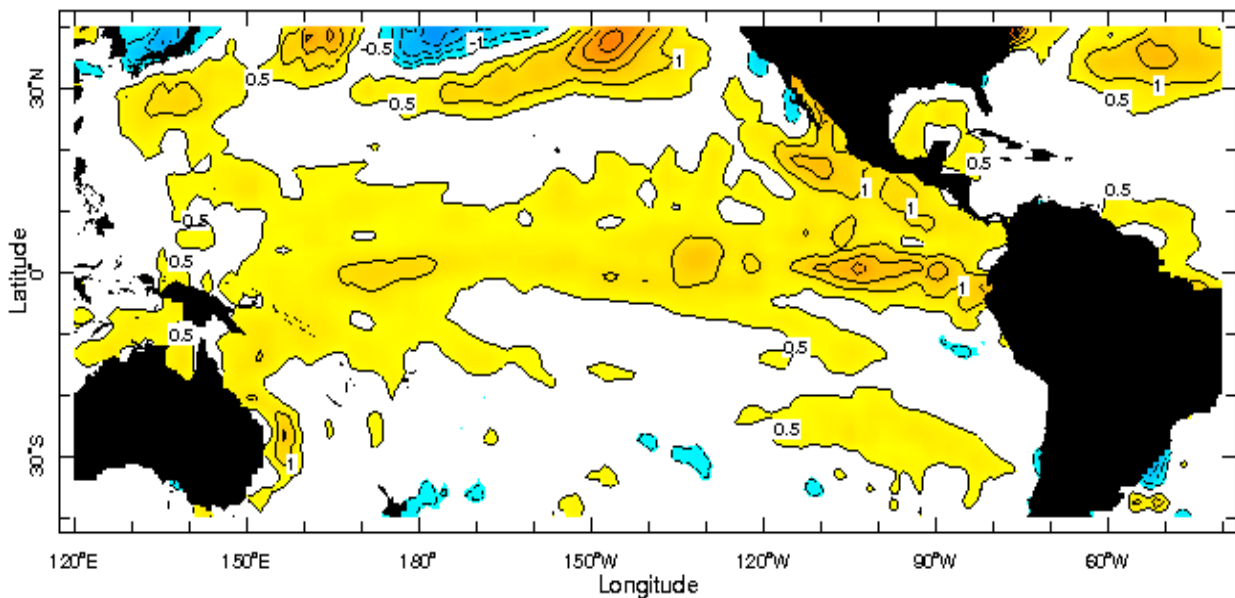


Figure 10.- Rains during August in the coastal stations of Colombia, Ecuador, Peru and Chile. Location of the stations appears in Figure 1. (Sources: CCCP, INOCAR, DHN & DMCh).

Anomalia de la Temperatura Superficial del Mar (°C) Agosto 2009



Aug 2009

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

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