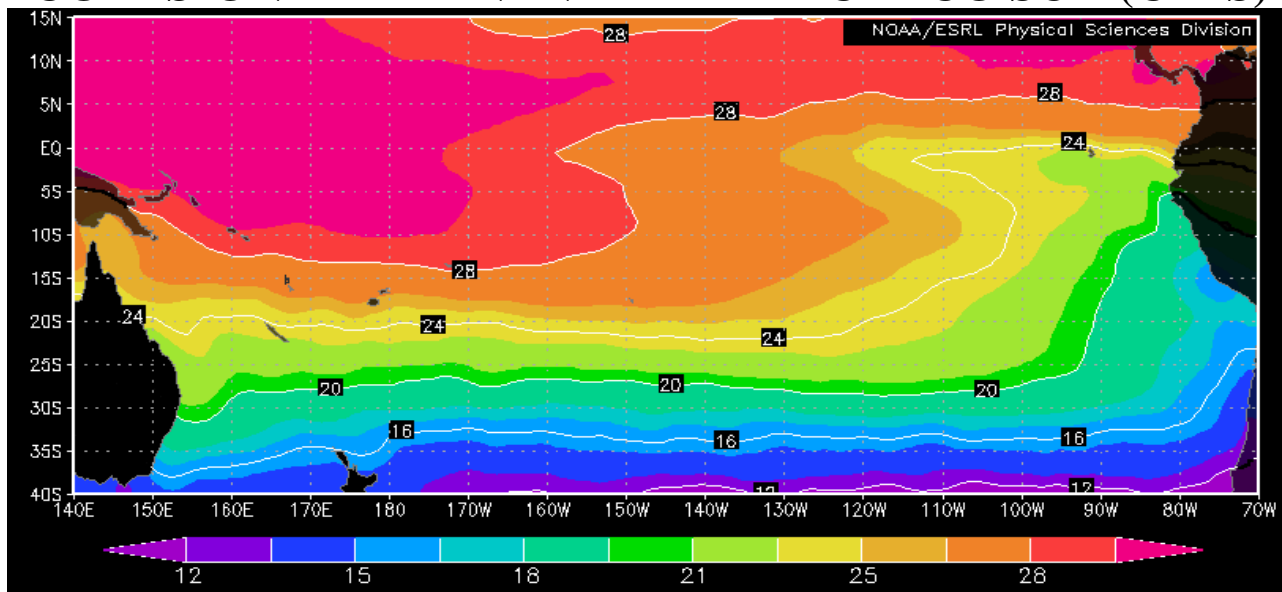


COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



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

SEPTEMBER 2009

BAC No 228

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 September great part of the Central Equatorial Pacific maintained the increase of the Sea Temperature observed from April, with anomalies of to 1, 0°C; nevertheless it is necessary to mention that next to the coast of Southamerica an evident reduction of the Sea Temperature at surface as much as subsurface level appeared, especially during the second fortnight of the month. This tendency to reduce the Sea Temperature next to the coast of Southamerica had noticed from the previous month, with presence even of slight negative anomalies. The anomaly of the Sea Surface Temperature in the “El Niño” regions during the last week of September presented the following values; in the Western Pacific (“El Niño” Region 4) stayed in 0.8°C; in the Central Pacific (“El Niño” Region 3.4) the anomaly was reduced to 0.7°C; in the Eastern Pacific (“El Niño” Region 3), it was of 0.6°C; and in the coastal Pacific (“El Niño” Region 1+2) by second consecutive week a negative anomaly was observed with -0.3°C. At Subsurface level between 50 and 150 ms of depth, in the Central Pacific the positive anomalies of the Sea Temperature continued present (until 3.0°C). Like in the previous month it was possible to observe in the Eastern edge of the Pacific, from the surface to 100m of depth, the presence of negative anomalies of -0.5°C; in addition the existence of a nucleus with negative anomalies of until -1.0°C located below 100m of depth in 140°W was noticed. The Value of the South Oscillation Index for the month passed to the positive phase with 0.3. The Intertropical Convergence Zone stayed during most part of the month around 7°N, exerting greater influence on the zone of Centralamerica. In the region of the Southeastern Pacific the surface winds appeared of the South and the South-east; as far as the speed the tendency was observed to present positive anomalies between 0.3 and 1.0 m/s. Taking into account the present thermal behavior from the Equatorial Pacific Ocean, as well as the more excellent models of numerical simulation it is anticipated during the next month that stays the increase of temperature of waters of the Tropical Pacific Ocean; whereas in the Eastern edge of the Pacific Ocean, it continues the tendency to present values around the normal. The results of the majority of the models of numerical simulation remain indicating to development of El Niño conditions in the sector of the Central Pacific that could reach its maximum development during the period December 2009 - February 2010. Nevertheless, analyzing the present state of the oceanographic conditions in the Eastern Pacific, except Colombia that indicates that the effects of the present El Niño phenomenon have become well-known in the behaviour of the air temperature and in the totals of rain registered in most of the country presenting clear skies and warm time, still in the rest of the coastal Region of the South East Pacific are not observed majors signals of the warm event and apparently this one would not have significant consequences for the region.

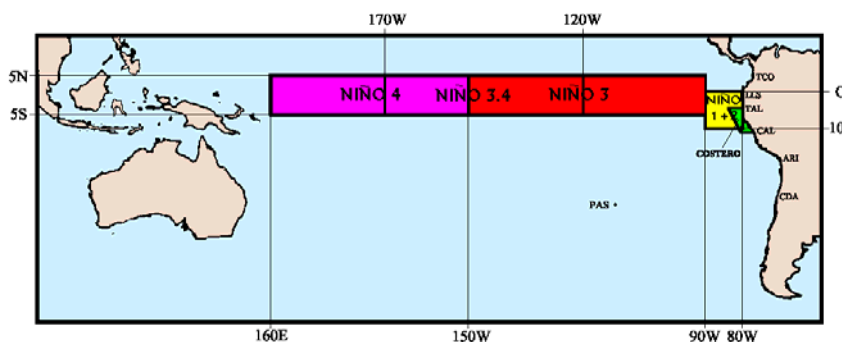


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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**CLIMATE ALERT BULLETIN
BAC N° 228, SEPTEMBER 2009****I. GLOBAL AND REGIONAL IMAGE**

During September, the anomalies of the Sea Surface Temperature (SST) in the Tropical Pacific Ocean stayed between 0.3 and 0.8°C. The monthly anomaly of the SST in the El Niño regions varied very little with respect to the previous month, continuing on its climatologic values thus; in the region of the Western Pacific (El Niño Region 4) and in the region of the Central and Eastern Pacific (El Niño Regions 3.4 and El Niño 3) the SST anomaly stayed like the previous month around 0.8°C; however in the region of the coastal Pacific (El Niño Region 1+2) the anomalies were reduced of 0.8°C to 0.3°C; it is important to indicate that this last region is the region that presents greater fluctuation in the temperatures of the sea, due to its proximity to the continent which generates continuous processes of interaction between land and sea.

The Mean Sea Level in the South East Pacific during the month presented tendency towards values by above of its normal patterns in front of the coasts of Ecuador and Peru and below its normal in the coast of Chile. In the coasts of Peru the positive anomalies continued present registering a variation average of +/- 2.0 cm, with respect to the previous month. The minimum anomaly appeared in the station of San Juan (5.0 cm) and the maximum anomaly in the station of Lobos de Afuera (13.0 cm). In the coast of Chile the level of the sea returns to present negative anomalies, in particular the stations of the North zone (Antofagasta and Caldera) registering negative anomalies of the order of -5.0 cm, whereas the Center – South zone located between Coquimbo and Talcahuano with negative anomalies of the order of -10.0 cm.

In September, the South Oscillation Index (SOI) again passed to positive values reached in this occasion the value of 0.3, as results from the negative value of the anomaly of pressure present in Darwin (- 0.6) and in Tahiti without presence of significant anomaly (0.0).

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 fluctuated slightly on their climatologic average between 0.3 and 1.5 m/s.

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

The Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) reports that from beginnings of September was observed a notorious diminution of precipitations, associated to one position more to the north of the Intertropical Convergence Zone (ITCZ) and to a diminution of the passage of tropical waves of the East, which did not favor the appearance of rains. Another aspect that affected in this situation was the little cyclonal activity in the Atlantic, despite being historically the month of greater recurrence.

In the middle of the month, the atmospheric conditions tended to change slightly with a tropical wave of the East that journeyed by the Caribbean, interacted with a “vaguada” (low pressure system in height) induced by a cold front of the North hemisphere and with the ITCZ, which increased the cloudiness and precipitations to a large extent of the country. Nevertheless, this situation lasted few days, returning progressively dry conditions to a large extent of the country, product of the diminution of the passage of tropical waves and of the low activity of the ITCZ, which only appeared activates in the West of the country influencing the registered volumes of rain in the month.

The effects of the present phenomenon of “El Niño” have become notorious in the behavior of the temperatures and in the registered totals of rain in most of the country. Clear skies and warm time appeared especially in Caribbean and Andean regions, in particular in the inter Andean valleys of the rivers Cauca and Magdalena. The temperatures maximum presented high values in relation to the averages of maximum during the month, and including in some zones of the north and the south of the country, it exceeded during some days the historical maximums of September. This situation favored that happened forest fire; where near 20000 hectares registered fires of their vegetal cover in 19 of the 32 departments of the country. The departments that reported emergencies associated with these events were: Antioquia, Araucan, Atlántico, Bolivar, Boyacá, Caldas, Caquetá, Casanare, Cauca, Córdoba, Cundinamarca, Guajira, Guaviare, Huila, Magdalena, Meta, Nariño, Norte de Santander, Quindío, Santander, Tolima, Valle del Cauca and Vichada. Another important aspect is associated with the first problems of water supply, especially in some zones of the south of the country, where some rivers and little streams of water registered the lowest levels of last 10 years and are already registered water rations in some municipalities. The totals of rain have presented considerable deficits in most of the national territory, being outstanding this situation in some sectors of the Caribbean (Bolivar and Atlantic) and Andean (Santander, Norte de Santander, Antioquia, Quindío, Tolima, Bogota, Huila and Nariño) regions where it only rained a 30% than it rains normally in September.

The Pollution Control Center for the Pacific (CCCP) declares that during the monitoring of September of 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 78.5° W and 2° N, could be observed that the registry of the SST for September was of 27.6°C during the first fortnight presenting an anomaly of 0.63°C with respect to the climatology.

The surface value of salinity for the first fortnight of September was of 31.92. With a negative anomaly of -0.09 at surface level in relation to the historical average.

B. CONDITIONS IN THE ECUADORIAN COAST

The Oceanographic Institute of the Navy of Ecuador (INOCAR) reports that during September continued the positive anomalies of the Sea Surface Temperature 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 of 3.0°C in the Central Pacific to negative values of -0.5°C in the Eastern edge of the Pacific.

In the Ecuadorian coasts as much the temperature of the air (AT) as the SST present clearly two sceneries thus; to the north of 1°S (Manta) the values of AT and SST present anomalies of 1.4°C and 1.5°C respectively; whereas to the south of this position the anomalies of AT and SST are of 0.8° and -0.7° C.

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

The present warm conditions in the Central Pacific associated to the development of an event “El Niño”, not yet exert significant influence on the coast of Ecuador.

C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) declares that throughout the Peruvian coast registered a variation around the +/- 0.3°C in the anomalies of the SST with respect to the previous month. The positive anomalies predominated with the exception of the stations of Mollendo and Ilo, that presented negative anomalies of -0.2° and -0.3°C respectively; whereas, Chimbote presented a behavior similar to its normal one. The positive anomalies of the SST fluctuated between 0.1°C (Lobos de Afuera) and 0.7°C (Talara).

The Mean Sea Level throughout the Peruvian coast continuous presenting positive anomalies, registering a variation average of +/- 2.0 cm with respect to the previous month. The minimum anomaly appeared in the station of San Juan (5.0 cm) and the maximum anomaly in the station of Lobos de Afuera (13.0 cm).

Throughout the Peruvian coast, the temperature of the air has registered a reduction average of 0.3°C with respect to the previous month. The negative anomalies prevailed with the exception of the station of Paita, that presented an anomaly of 0.1°C; whereas, Lobos de Afuera and Chimbote presented behavior similar to their normal patterns of the month. The negative anomalies of the AT fluctuated between -0.2° and -0.8°C.

During the first fortnight of the month, light drizzles in Central and South zones appeared, with accumulated values of 3,0 mm in Chimbote and 0,5 mm in Mollendo and Ilo; whereas, during the last fortnight drizzles in the North zone were registered, with 0,2 mm of accumulated precipitation in Talara and Paita. Also, in the zone of El Callao and Lobos de Afuera only appeared trace.

Throughout the Peruvian coast winds of South direction predominated; nevertheless, the station of Ilo presented South-east component. In relation to the wind speed, the positive anomalies predominated, that fluctuated between 0.3 to 0.9 m/s; with the exception of Paita and Lobos de Afuera that presented anomalies of -1.9 and -0.5 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 SHOA presents a description of the Sea Surface Temperature and the Sea Level (SL) between Arica (18°29'S) and Talcahuano (36°41'S) for September 2009.

In relation to variable SST, unlike the observed thing in August, where slight negative anomalies appeared, in September it recovers a condition colder than the normal throughout the coast of Chile, which is reflected in negative anomalies of the order of -1.0°C between Arica and Valparaiso.

The Sea Level is concordant with the SST and returns to present negative anomalies. In particular, the stations of the North zone (Antofagasta and Caldera) registered negative anomalies of the order of -5.0 cm, whereas the center-south zone located between Coquimbo and Talcahuano presented majors differences with respect to the historical average, with negative anomalies of the order of -10,0cm.

It is possible to emphasize that the data of SST and SL described previously for North and Center-South zone 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 September was characterized by the presence of negative anomalies in the north, center and south, being the majors cooling observed in the Central and South region, between Santiago and Puerto Montt with anomalies surroundings to -1.0°C. Only the Austral region reached a heating whose positive anomaly was of +1.3°C in Punta Arenas.

The average maximum temperature of September characterized by the presence of cooling in the North coast and central region of the country with negative anomalies majors that 1.0°C, especially in Santiago (-1.5°C) and Curicó (-1.6°C). In the Austral region, between Coyhaique and Punta Arenas appeared a heating with anomalies that surpassed 1.0°C the climatologic value.

The minimum temperature appeared with a cooling to a large extent of the country, being the central region, between La Serena and Puerto Montt, coldest. The maximum cooling concentrated between Concepcion and Puerto Montt with $-1,6^{\circ}\text{C}$. Contrary, the extreme regions of the north and the south of Chile indicated slight heating with positive anomalies between $+0.4$ and $+1.3^{\circ}\text{C}$.

The atmospheric circulation on the South Pacific was dominated by positive anomalies associated to an intensification of the Subtropical Anticyclone of the South Pacific. Such condition was reflected by the increase of the average values of pressure concerning the sea during September in the majority of the stations of continental Chile. The regions with maximum anomalies of the pressure were Santiago ($+2.2$ hPa), Juan Fernandez ($+3.4$ hPa) and Puerto Montt ($+4.1$ hPa). Under this scenery of atmospheric circulation, a smaller frontal activity was observed between the center-south and austral regions of the country, giving as result one more reduced precipitation.

During September, the precipitation appeared with values below normal between Chillán and Punta Arenas, being the region with greater pluviometric deficit between Puerto Montt and Coyhaique with negative anomalies between 50 and 60 mm. Only the Central region, between Santiago and Curicó, appeared with precipitation slightly by on the normal thing, associated to frontal activity and presence of “bajas segregadas”.

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 is predicted that will continue the oceanographic and atmospheric conditions in the Tropical Pacific, own of the development of an “El Niño” event in the region of the Eastern Equatorial Pacific ocean between weak and moderate magnitude which could reach its maximum development during the first trimester (quarter) of 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; reason why it is recommendable to maintain a careful pursuit of the evolution as well as its future repercussions on the climate of the region of the Southeast Pacific.

B. REGIONAL

According with the pursuit of the ocean-atmospheric conditions in the Southeast Pacific Ocean, preformed by the Program ERFEN (integrated by National Committees ERFEN of Colombia, Chile, Ecuador and Peru) and coordinated by the CPPS, for October it is anticipated that in the sector of the South East Pacific the values as much of the Sea Surface Temperature as the Air stay fluctuating around the normal and that the present heating of waters presents in the Central Pacific, does not exert major influences on the region of the Southeast Pacific. At the moment, in the Region of the Southeast Pacific conditions 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. These scarce influences of the warm event on the Region could be subject to action of trade winds over the Region as a result of the ongoing escalation of the South Pacific anticyclone.

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
JUL 09	2.8	9.3	8.7	29.2	28.0	26.6	22.6	20.2	14.3	13.1	0.1
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

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	
JUL 09	28.0	23.8	17.6	16.0	15.1	13.5	12.8	***	
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	

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	
JUL 09	***	2728	1130	***	***	1224	804	***	
AGO 09	***	2736	1090	1571	622	1215	861	651	
SEP 09	***	2719	1080	***	632	1163	80.2	***	

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
AGO 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
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

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

Note.

* Values revised

***. Information not received

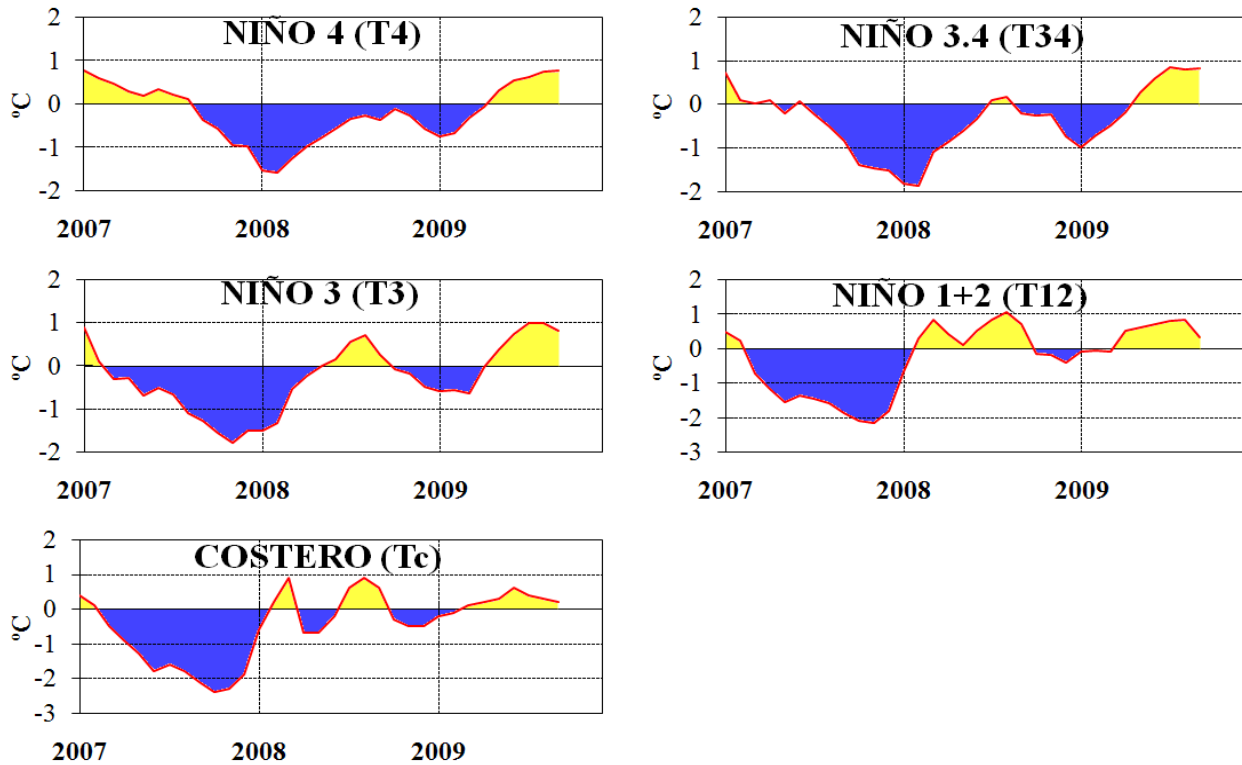


Figure 3.- Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).

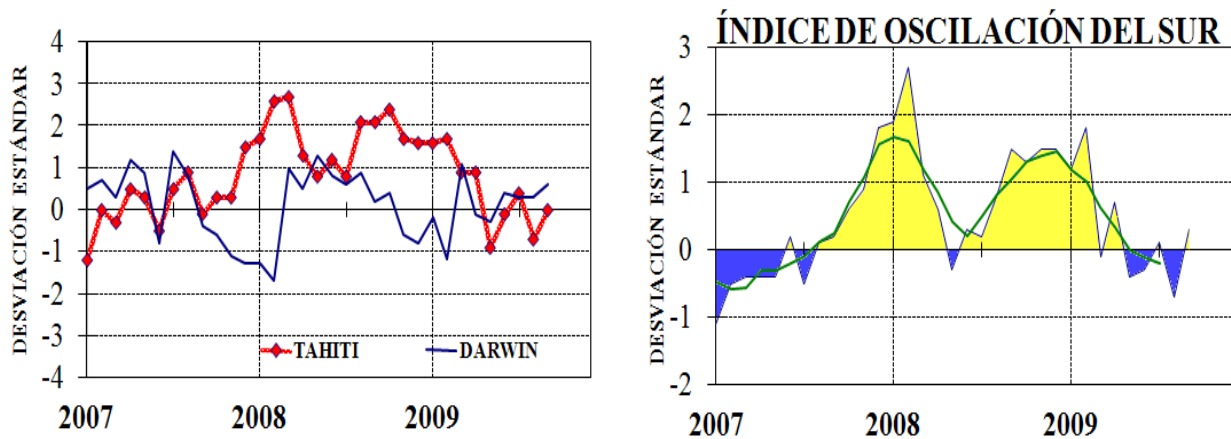


Figure 4.- Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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

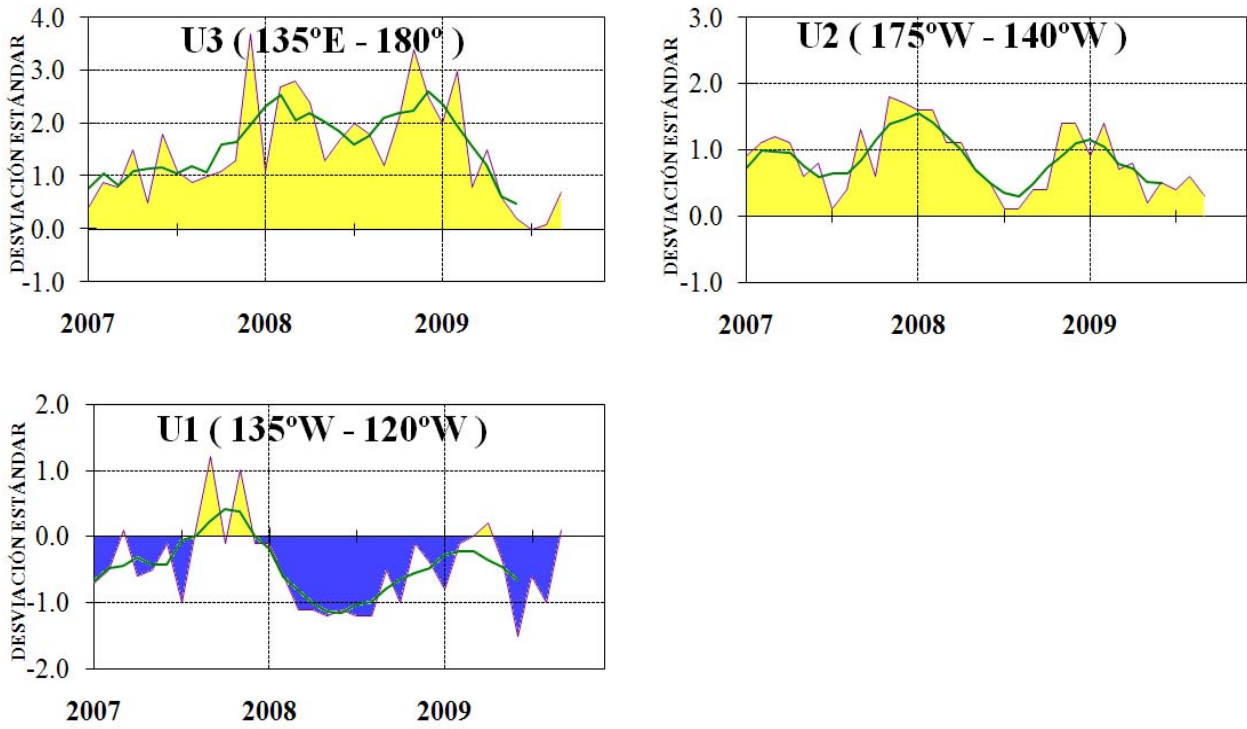


Figure 5.- Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).

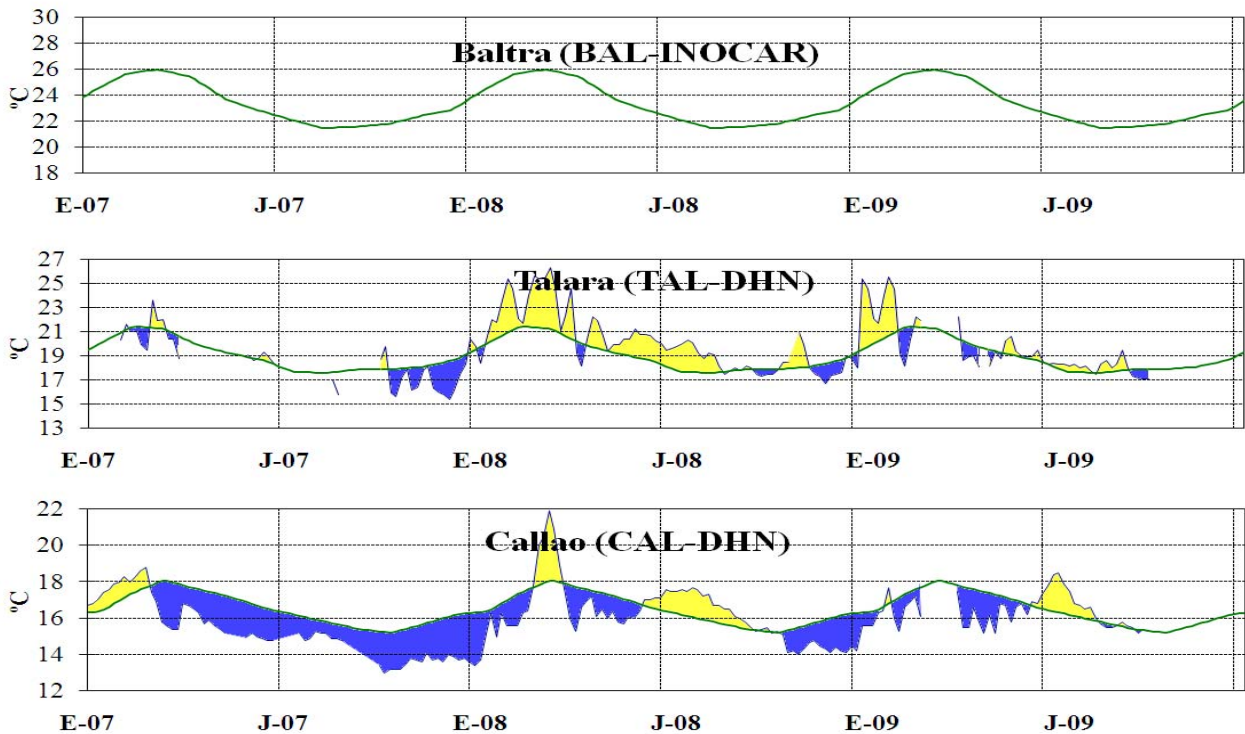


Figure 6.- Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)

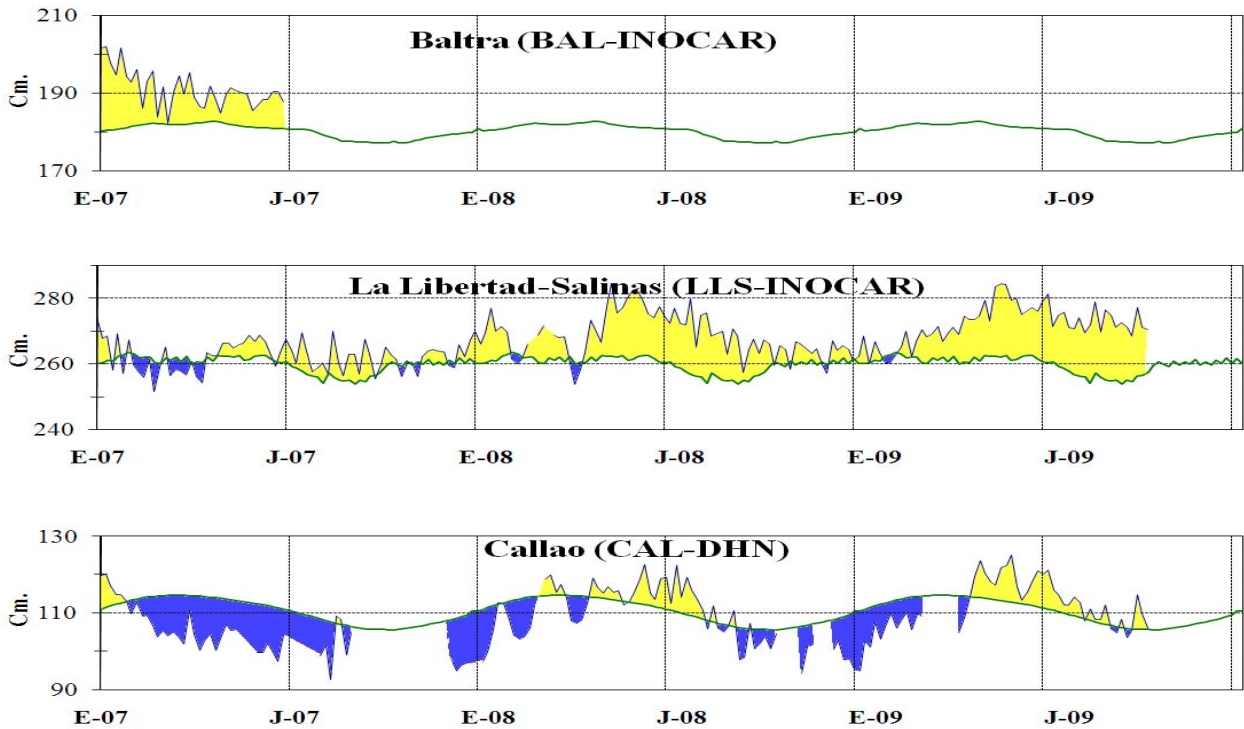


Figure 7.- Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).

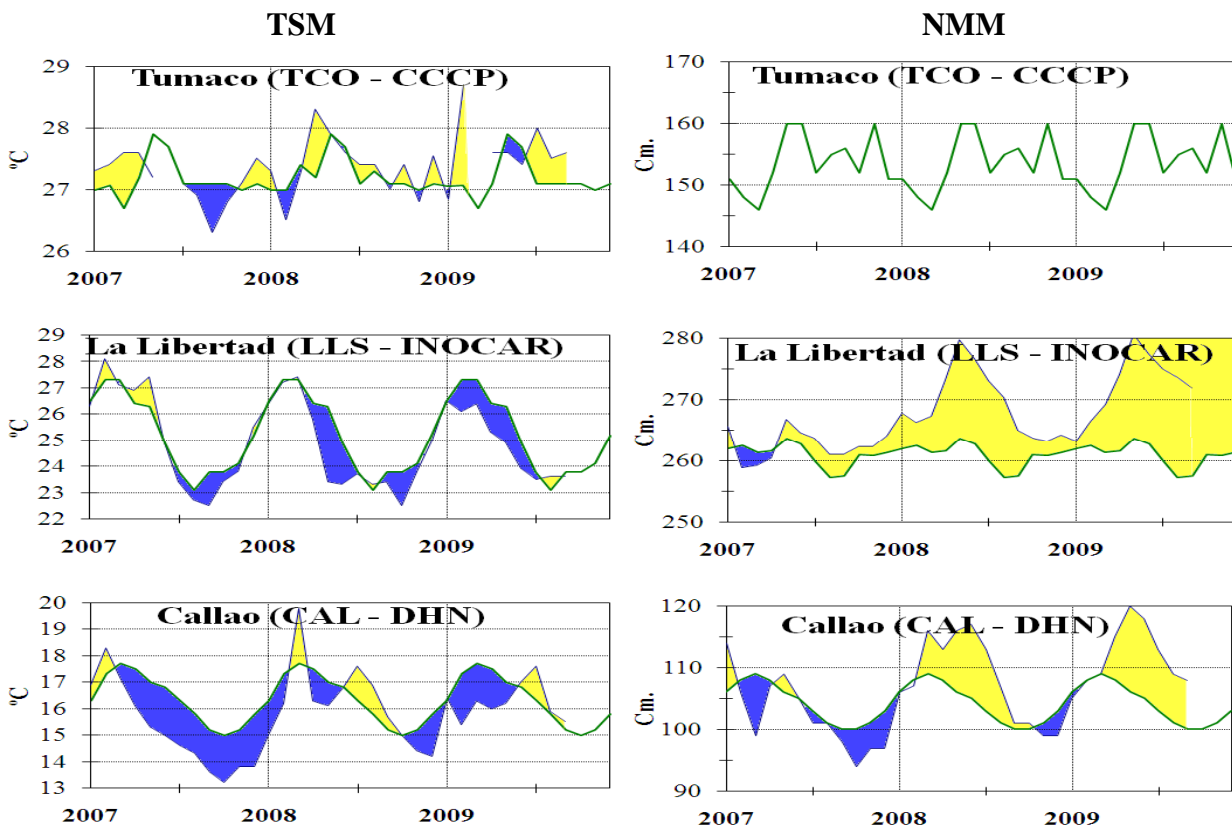


Figure 8a.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).

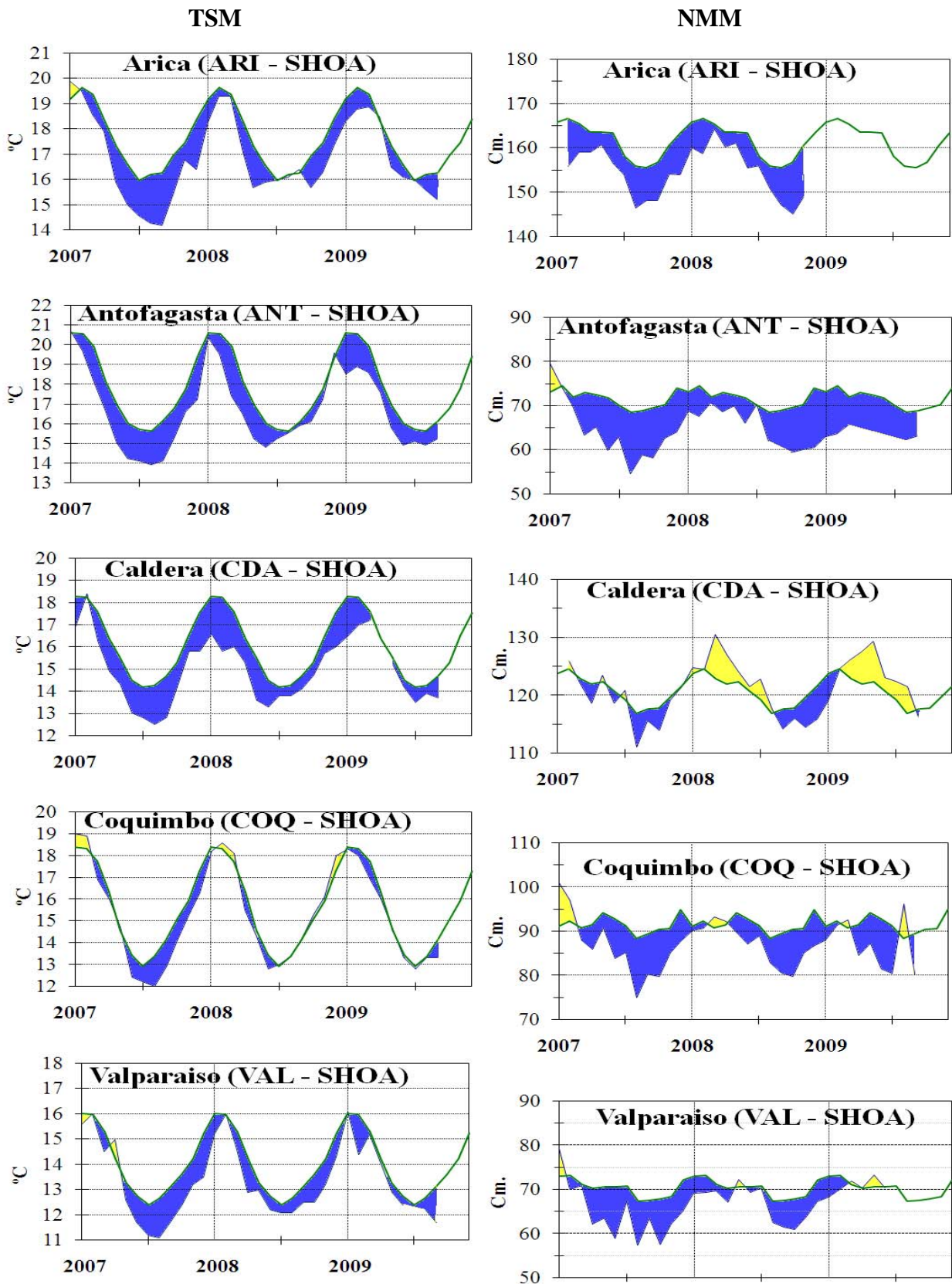


Figure 8b.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).

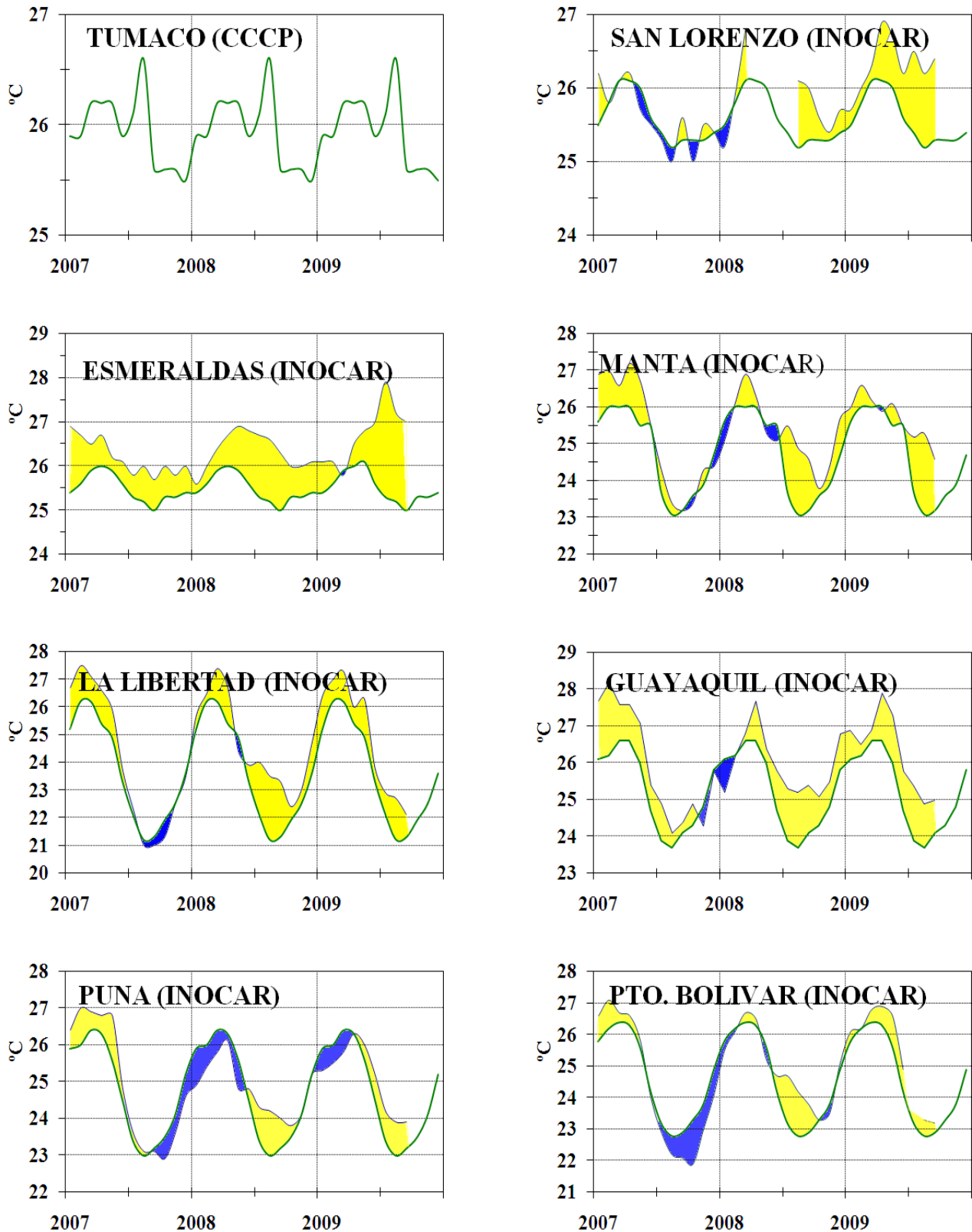


Figure 9a.- Monthly means of the air temperature (°C) in 8 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP & INOCAR).

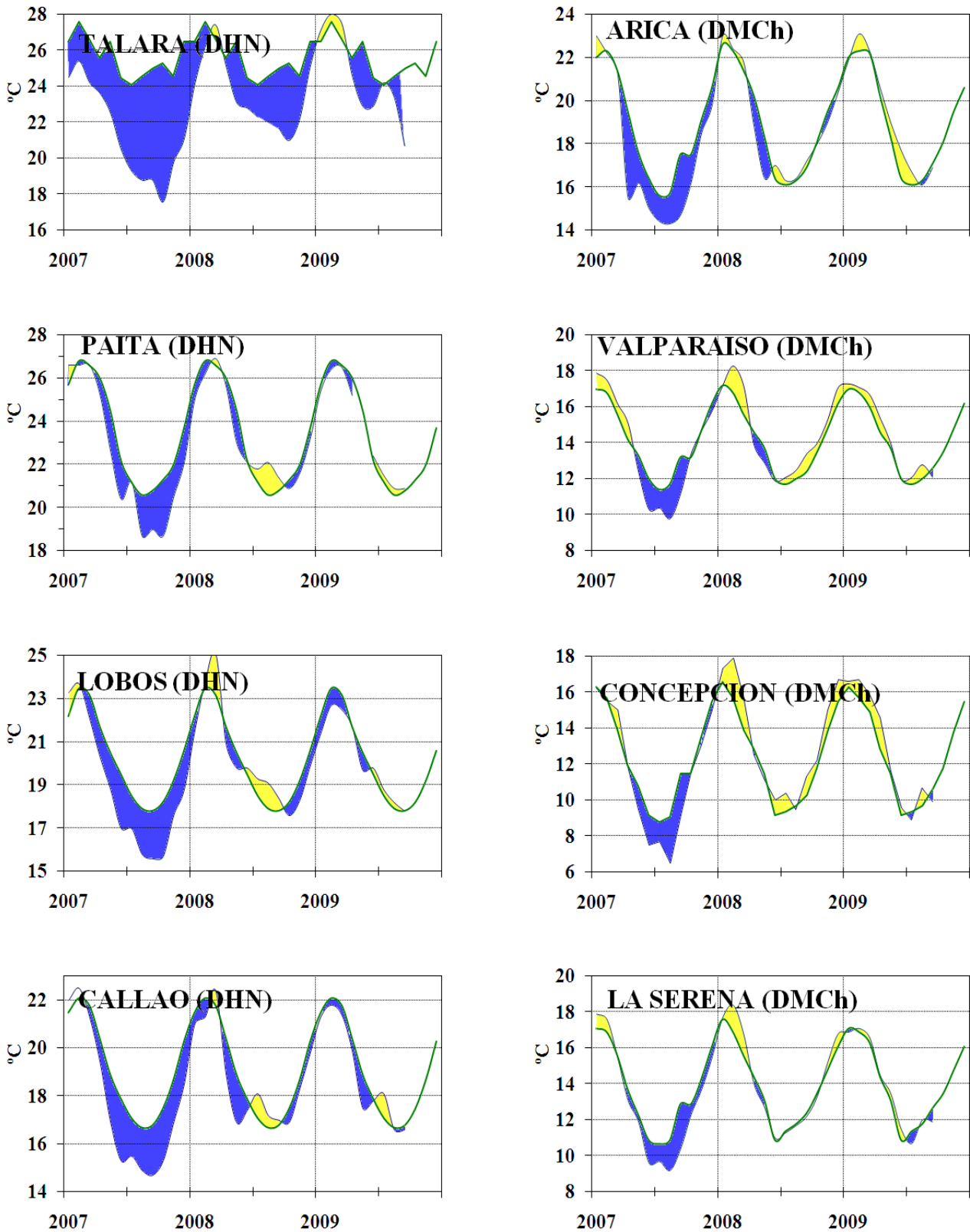


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).

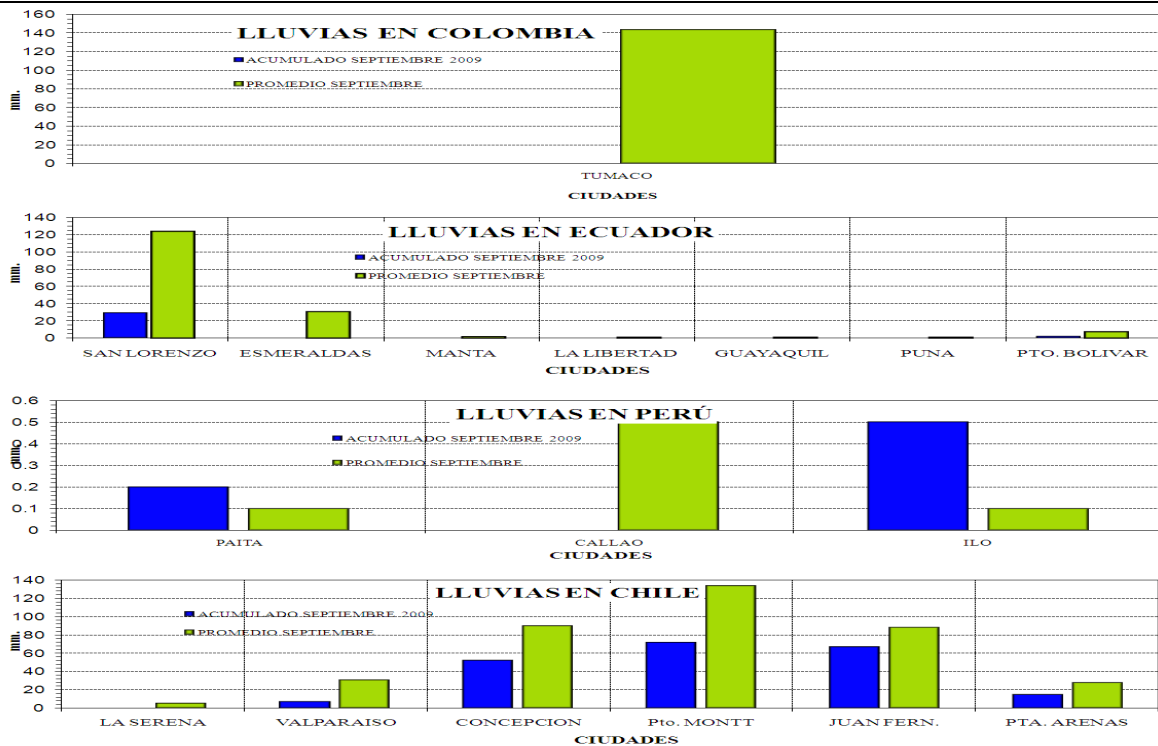
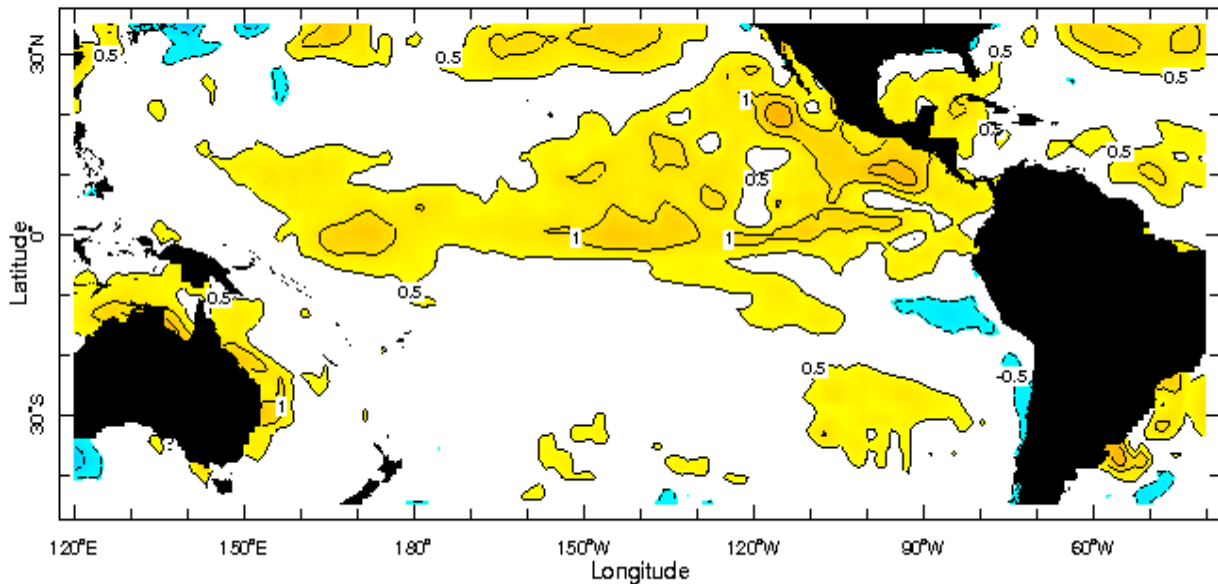


Figure 10.- Rains during September in the coastal stations of Colombia, Ecuador, Peru and Chile. Location of the stations appears in Figure 1. (Sources: CCCP, INOCAR, DHN & DMCh).

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



Sep 2009

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

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