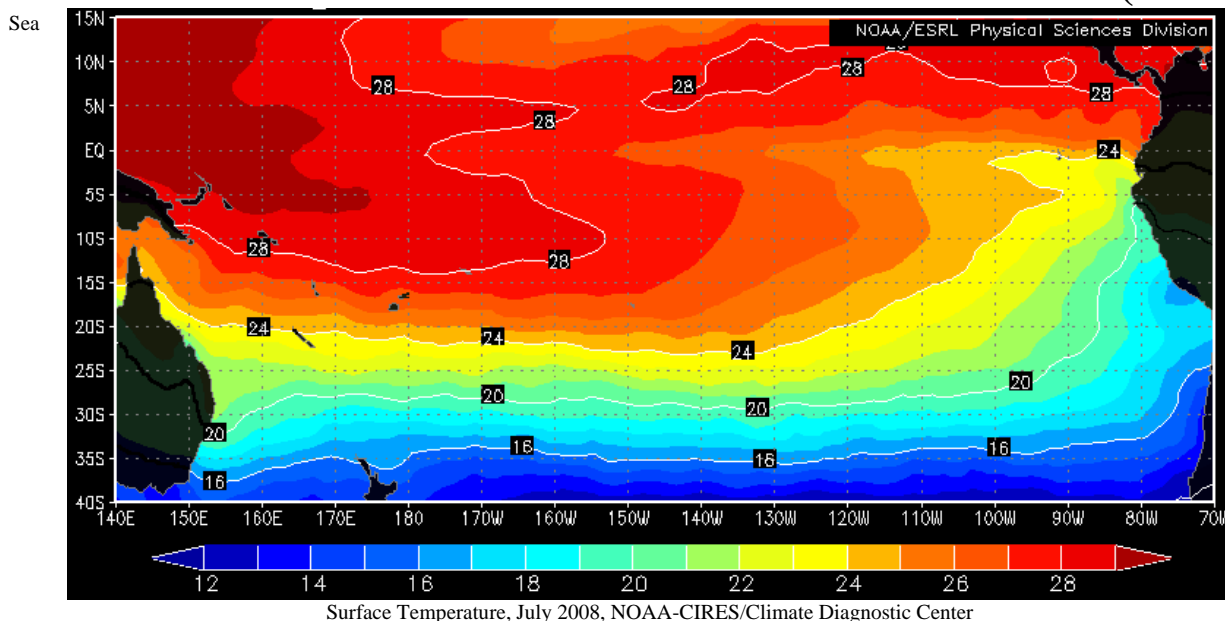


# COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



JULY 2008

BAC N° 214

## *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](mailto:dircient@cpps-int.org); [nino@inocar.mil.ec](mailto: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

The Equatorial Pacific Ocean during July continued showing a strong tendency to reduce negative anomalies of the Sea Surface Temperature, similar to the observed thing during past month, being in this occasion reduced to the sector Western Center of the Equatorial Pacific between 170°E and 160°W, with anomalies of -0, 3°C (“El Niño” Region 4). On the other hand, in other sectors anomaly of the Sea Surface Temperature during last week of July was positive with following values: In the Central Pacific (“El Niño” Region 3,4) it was of 0, 2°C, in the Pacific Eastern Center (“El Niño” Region 3) with 0, 6°C and in the region of the Eastern Pacific (“El Niño” Region 1+2) it reached the greater intensity with 0, 9°C. At Subsurface level thermal structure in the Central Equatorial Pacific showed a weakening of heating, especially in the regions of the Pacific western Center, to west of 170°W and a depth of 150 ms and in the Eastern Pacific surroundings to 90°W and about 50 ms below sea surface. The other change observed during July was the increase of negative anomalies about 150 ms of depth that has extended at levels near surface (50 ms) in the Central Pacific between 170° and 180°W. Towards east of 110° W against the coast of South America, in the level of 50 ms, the nucleus of positive anomalies continuous present, although in this occasion its value has been reduced of 4°C to 2°C, that like the previous month when arriving around the Galápagos Islands reaches sea surface reducing the value of positive anomaly.

Positive thermal anomalies at subsurface level during month have presented a slight reduction with respect to reported previous month, unlike the observed thing in surface that has shown some areas with slight positive anomalies of SST. During July mean sea level in the Southeastern Pacific continued on its normal Patterns. In front of the coasts of Ecuador sea level continued presenting positive anomalies similar to previous month, of equal way the Peruvian coast continued presenting positive anomalies that fluctuated between +4, 0 and +12, 0 cm. In front of Chile sea level were characterized to present a tendency to the increase, with anomalies between 0, 1 and 1, 3 cm, nevertheless also registered negative values that fluctuated between -0, 2 and -2, 6 cm.

The Index of Oscillation of the South stayed in its positive phase and in this occasion its value was 0, 2. The central axis of the Intertropical Convergence Zone in the Eastern sector of the Pacific was located between 7° and 10° North latitude with significant convective activity. In Colombia precipitations were in volumes over averages of the month; in the coastal region of Ecuador rains continued deficit, especially in center and south coast, like in the coastal region of Peru; in Chile precipitations were pronounced by on the normal thing in the South region and around the normal thing in the Central and Austral zone. As far as surface winds, in the region of the Southeastern Pacific, they appeared predominantly of the south and south-east with speeds that generally fluctuated around average value for the month. Taking into account present thermal behaviour from Equatorial Pacific Ocean, as well as information of several models of numerical simulation are anticipated that during next month SST in the Eastern and Central sector of Equatorial Pacific Ocean will continue slightly by on their normal value.

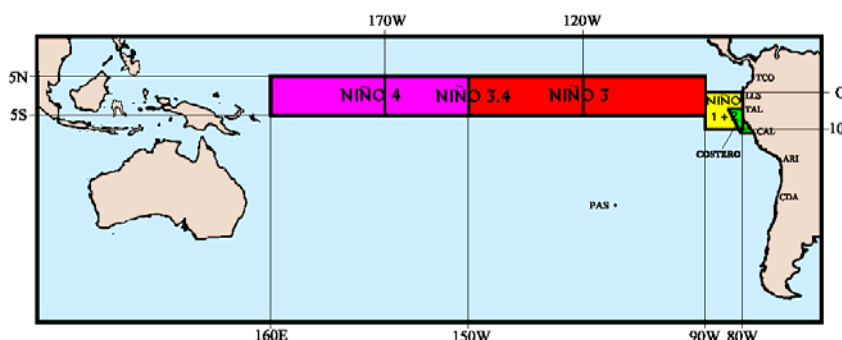


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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CCCP - Centro Control de Contaminación del Pacífico (Colombia);	<a href="mailto:cccp@cccp.org.co">cccp@cccp.org.co</a>
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INAMHI - Instituto Nacional de Meteorología e Hidrología (Ecuador)	<a href="mailto:dptclima@inamhi.gov.ec">dptclima@inamhi.gov.ec</a>
DHN - Dirección de Hidrografía y Navegación (Perú);	<a href="mailto:oceanografia@dhn.mil.pe">oceanografia@dhn.mil.pe</a>
SHOA - Servicio Hidrográfico y Oceanográfico de la Armada (Chile)	<a href="mailto:shoa@shoa.cl">shoa@shoa.cl</a>
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**CLIMATE ALERT BULLETIN**  
**BAC N° 214, JULY 2008****I. GLOBAL AND REGIONAL IMAGE**

The Sea Surface Temperature (SST) in the Central Equatorial Pacific Ocean during July continued with the process of negative anomalies reduction. For July monthly anomaly of SST in the “El Niño” regions happened to positive values, with the exception of “El Niño” region 4 where still slightly negative values stay. The Western Pacific region (“El Niño” Region 4) happened of  $-0.6^{\circ}\text{C}$  to  $-0.3^{\circ}\text{C}$ ; in the Central Pacific (“El Niño” Region 3.4) the anomaly happened of  $-0.3^{\circ}\text{C}$  to  $0.1^{\circ}\text{C}$ ; in the Eastern Pacific region (“El Niño” Region 1+2) the anomaly happened of  $0.5^{\circ}\text{C}$  to  $0.8^{\circ}\text{C}$ .

The subsurface thermal structure of the Central Equatorial Pacific maintains reduction of the water cell with negative anomaly of  $-1.0^{\circ}\text{C}$  from surface to the depth of 70m and between  $170^{\circ}\text{E}$  and  $160^{\circ}\text{W}$ , approximately. In the Central Equatorial Pacific sector, to 170 ms of depth approximately, the body of water continues with positive anomalies of  $2.0^{\circ}\text{C}$ . In the Eastern edge of the Equatorial Pacific, to the east of  $100^{\circ}\text{W}$  and near surface another nucleus warm continue present with anomaly of  $2.0^{\circ}\text{C}$ , but reduced with respect to previous month. In both cases a reduction of positive anomalies with respect to previous month is observed. In addition, it has begun an increase of cooling in surfaces levels below 150 ms in the region between  $170^{\circ}$ - $130^{\circ}\text{W}$ . The negative anomalies of  $-1^{\circ}\text{C}$  have been increased to  $-2^{\circ}\text{C}$  covering a greater extension and approaching surfaces levels to 50 ms of depth.

The Mean Sea Level (MSL) in the Southeastern Pacific during July continued on its normal patterns. Against the coasts of Ecuador MSL presented positive anomalies similar to previous month, of equal way throughout the Peruvian coast continued presenting positive anomalies, being observed generally a variability of  $\pm 2.0$  cm, the anomalies of MSL fluctuated between  $+4.0$  cm (San Juan) and  $+12.0$  cm (Chimbote); in front of Chile MSL also presented a tendency to increase, with positive anomalies of  $0.1$  cm in Arica and  $1.3$  cm in Antofagasta; on the other hand between Caldera and Talcahuano registered negative values that fluctuated between  $-0.2$  cm (Caldera) and  $-2.6$  cm (Valparaiso).

The Index of South Oscillation (IOS), like in the previous month, continued in its positive phase and in this occasion value was  $0.2$ , being values of Tahiti and Darwin  $+0.8$  and  $+0.6$  respectively.

The central axis of the Intertropical Convergence Zone (ITCZ) appeared in the Eastern sector of the Pacific between  $7^{\circ}$  and  $10^{\circ}\text{N}$  with significant convective activity, interacting with tropical waves of the East, with affectation to Central America and Colombia.

As far as rains, good part of Colombia presented volumes of precipitation over month averages and some slight deficits in precise zones of the east of the country, as well as on the Southeastern area of the Caribbean region. Again and as it were anticipated, passage of tropical waves of the East on waters of the Caribbean Sea was determining factor in the humidity contributions; for this reason, although with respect to June a reduction in the amounts of precipitation (own of the season) in the Andean zone appeared especially, due to the strong activity of the ITCZ, associated to the passage of the mentioned waves, fell some heavy showers that caused that averages of a big part of the country were surpassed, and in a high percentage (plus than 50%, in almost all the Andean region).

The surface winds, in the region of the Southeastern Pacific they appeared predominantly of the south and south-east, with speeds that were fluctuating around average value waited for the month in  $\pm 1, 0$  m/s.

## II. NATIONAL IMAGE

### A. CONDITIONS IN THE COLOMBIAN COAST

The Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) informs that during July at general level, a big part of the country appeared volumes of precipitation over averages of the month and some slight deficits in precise zones of the Eastern region, as well as on the Southwestern area of the Caribbean region. Again and as it were anticipated, the passage of tropical waves of the East on waters of the Caribbean Sea, was a determining factor in the humidity contributions; for this reason, although with respect to June a reduction in the amounts of precipitation appeared (own of the season), especially in the Andean zone, strong activity of the Intertropical Convergence Zone, associated to the passage of the mentioned waves, caused the occurrence of some heavy showers that caused that averages in a big part of the country were surpassed and in a high percentage (plus than 50% in almost all the Andean region). Considering these excesses and registered amounts of rain in the Orinoquía (next to the historical values for the time), during the month continued presenting emergencies associated to sudden crescents and slidings (although with smaller frequency), especially in areas of “piedemonte Llanero” and some Andean departments; similarly, high levels in low parts of both main rivers of the country (Magdalena and the Cauca), and in certain important currents of the Colombian east, which brought problems by floods in its coastal zones. The observed climatic situation during July for Colombia prevented wild fire occurrence generally.

A total of seven tropical waves of the East, journeyed by the Colombian Caribbean sea with diverse degree of convective intensity; initially with little activity, whereas during second decade of the month they presented a dynamic major, interacting continuously with the ITCZ and low pressure of the Northeastern of South America that brought with itself a high instability in the atmosphere and excesses of rain already mentioned.

The ITCZ stayed oscillating between  $7^{\circ}$  and  $10^{\circ}$  N; in height the flow stayed divergent due to anticyclonic circulations that predominated to the north of the continent, condition that favoured convective activity in levels near the surface.

Three tropical revolving storms appeared in waters of the Atlantic Ocean; “Bertha” reached hurricane category in the central part, “Cristóbal” stayed during several days as tropical storm and “Dolly” got to be hurricane of category 1 by hours, but quickly lost force when entering continental areas. The trade winds, especially in the second fortnight of the month, registered moderate speeds; in some zones of the center and north of the country gales were registered.

The Center for the Pollution Control of the Pacific (CCCP) declares that during monitoring of July 2008, realised by the area of Operational Oceanography of the CCCP to fixed station coastal N° 5 located to 10 miles of the bay of Tumaco between coordinates  $78, 51^{\circ}$  W and  $2^{\circ}$  N, can be observed that the registry of SST for July was of  $27.29$  and  $27.48^{\circ}$ C for the first and second fortnight, respectively, presenting a monthly average of  $27.39^{\circ}$ C. A positive anomaly at surface level of  $0.24^{\circ}$ C appears with respect to the historical average (July 1999 - July 2008), which is of  $27.14^{\circ}$ C.

In July, thermocline for the first fortnight descended 7 meters with respect to last registry from June of 2008, positioning itself on the 72 meters, and for the second fortnight it was positioned approximately on the 42 meters. The isotherm of the  $15^{\circ}$ C did not become visible during this month.

As far as behaviour of the salinity, it registered at surface a value of 31, 16 and 30, 08 for the first and second fortnight of March, respectively, presenting a monthly average of 30, 62. A negative anomaly of 1, 37 appears at surface with respect to the historical average that is of 31, 99.

The maximum value of salinity appeared in the second fortnight of the month, presenting a value of 35.026 to a depth of 66 meters approximately. The halocline was positioned respectively for the first and second fortnight on the 73 and 44 meters.

## **B. CONDITIONS IN THE ECUADORIAN COAST**

July temperature of the air throughout the Ecuadorian coast fluctuated between 24 and 26.7 °C, so it means anomalies between 1.0 and 1.9°C. As far as the Sea Surface Temperature presented values between 23.7 and 26.8°C giving anomalies of -0.1 and 0.9°C.

Seasonally in July rains in the Ecuadorian coast are characterized for being minimum, between 5 and 37 mm. During this month appeared below these values.

Considering the present behaviour of the conditions ocean-atmospheric in front of Ecuador, it is anticipated that the volume of precipitations stays minimum. As far as temperature of the sea and the air in the Ecuadorian coast esteem that will appear values slightly on the normal one hoped for August.

## **C. CONDITIONS IN THE PERUVIAN COAST**

The Direction of Hydrography and Navigation of Peru (DHN) shows that generally in the Peruvian coast an ascent in the anomalies of the SST was registered around 1°C with respect to the previous month, predominating positive anomalies. The maximum anomaly appeared in the northern station of Talara (+1.8°C), whereas the minimum anomaly was registered in Mollendo (+0.3°C).

The Mean Sea Level (MSL) throughout the Peruvian coast continued presenting positive anomalies, being observed generally a variability of +/- 2 cm, a reduction in the North and Central zones; whereas in the south a slight increase with respect to the previous month. The anomalies of MSL fluctuated between +4 cm (San Juan) and +12 cm (Chimbote).

Throughout the Peruvian coast Air Temperature has registered an ascent around 1, 0°C with respect to previous month, maintaining positive anomalies. Between +1, 2°C (Chimbote) and -0, 7 °C (San Juan) Air Temperature anomalies fluctuated. ILO presented behaviour similar to its normal one.

In Paita, station of the North coast, and Mollendo, station of the South coast, registered precipitations type drizzles during day 12 with accumulated of 0.1 mm and day 31 with 0.8 mm, respectively.

Throughout the Peruvian coast winds of South direction predominated; nevertheless, also components of the South-east in the stations of Talara and Mollendo appeared. In relation to wind speed, positive anomalies predominated, that fluctuated between 0.2 to 1.6 m/s; with exception of Paita and ILO that presented anomalies of -1.6 and -0.2 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 sea level to monitor a series of oceanic and atmospheric variables. A description of the Sea Surface Temperature and sea level between Arica (18°29'S) and Talcahuano (36°41'S) for July of 2008 is:

Variable SST was characterized to present a noticeable tendency to increase, which was reflected in the diminution of negative values of anomaly, in all the stations of monitoring of the coast of Chile. It is possible to emphasize, that North zone between Arica and Caldera still maintains anomalies negative, nevertheless, these are near normal thing (- 0.4°C).

Similar to observed thing with SST, the sea level also presented a tendency to the increase, with positive anomalies of 0.1 cm in Arica and 1.3 cm in Antofagasta. On the other hand, between Caldera and

Talcahuano negative values of sea level were registered, that fluctuated between -0.2 cm (Caldera) and -2.6 cm (Valparaiso), these values are considered within the normal ranks.

The data of SST and Mean Level (ML) described previously for North zone and center-south of Chile are coherent with developed neutral conditions in the tropical Pacific in the month of July 2008.

The Meteorological Direction of Chile (DMCh) shows that during July air average temperature presented condition around normal thing, between Arica and Valparaiso, to slightly warmer between Santiago and Punta Arenas, reaching majors heatings between Curicó and Temuco, with anomalies that fluctuated between 1.0 and 1.5°C.

The maximum temperature continued presenting slight cooling between Arica and La Serena, with anomalies near -0.5°C. However, Central, South and Austral zone were between normal conditions and slightly warm, with exception of Chillán, that registered a smooth cooling represented by a negative anomaly of -0.4°C.

The minimum temperature was characterized by presence of heating generalized in all the country, being Central and South region most extreme, with anomalies that surpassed 2°C between Curicó and Temuco. Another significant characteristic was absence of days with frosts in the central zone, between La Serena and Concepcion, considering that July, in climatologic terms, represents the coldest month of the year.

The atmospheric circulation that affected the country was characterized by a noticeable frontal activity in the South region, between Concepcion and Puerto Montt, having originated the major surplus in the cities of Valdivia and Osorno, with 195 and 120 mm by on its climatologic values respectively. The most significant negative anomalies of atmospheric pressure in surface appeared in the station of Juan Fernandez with -3, 1 hPa, Temuco with -2.8 hPa and Puerto Montt with -1.2 hPa. The average pattern of circulation concerning 500 hPa was represented by a "vaguada" around 90°W on the Pacific Ocean, having favoured a greater transport of cyclonal disturbances and many number of days with rain (greater than 50% of days of the month) in the South region, between Concepcion and Puerto Montt.

The precipitations were pronounced around normal thing to slightly deficit in Central zone, between La Serena and Chillán, and also in Austral part of the country, between Coyhaique and Punta Arenas. Only South region, between Concepcion and Puerto Montt, was surplus of fallen water with positive anomalies that surpassed climatologic averages between 40 and 195 mm.

### **III. PERSPECTIVE**

#### **A. GLOBAL**

Taking into account present predictions from several numerical models, as well as the behaviour of the main oceanic and atmospheric indicators is anticipated that during next month to a large extent of the Equatorial Pacific positive anomalies of SST will continue present, although it hopes that they remain small areas with negative anomalies.

#### **B. REGIONAL**

In agreement with the pursuit of the ocean-atmospheric conditions in the Southeastern Pacific Ocean executed by Program ERFEN (integrated by National Committees ERFEN of Chile, Colombia, Ecuador and Peru), and coordinated by CPPS, it is anticipated that during next month, as much the temperature of the air as the SST in the Eastern Equatorial Pacific appears on their average value of the month, with tendency to reduce values of positive anomaly.

**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
MAY 08	5.1	8.9	5.7	27.9	27.2	27.1	24.4	21.6	13.3	12.2	-0.3
JUN 08	6.2	9.1	6.8	28.1	27.2	26.6	23.7	20.9	14.9	13.1	0.3
JUL 08	6.6	8.6	7.6	28.2	27.2	26.1	22.6	20.4	14.7	13.4	0.2

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	
MAY 08	27.9	23.4	16.1	15.7	15.2	13.6	14.3	13.0	
JUN 08	27.6	23.3	16.8	15.9	14.8	13.3	12.8	12.2	
JUL 08	27.4	23.7	17.6	16.0	15.2	13.8	13.0	12.1	

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	
MAY 08	***	2797	1160	1611	699	1242	896	722	
JUN 08	***	2767	1170	1555	661	1215	871	693	
JUL 08	***	***	1130	1561	703	1228	889	704	

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)

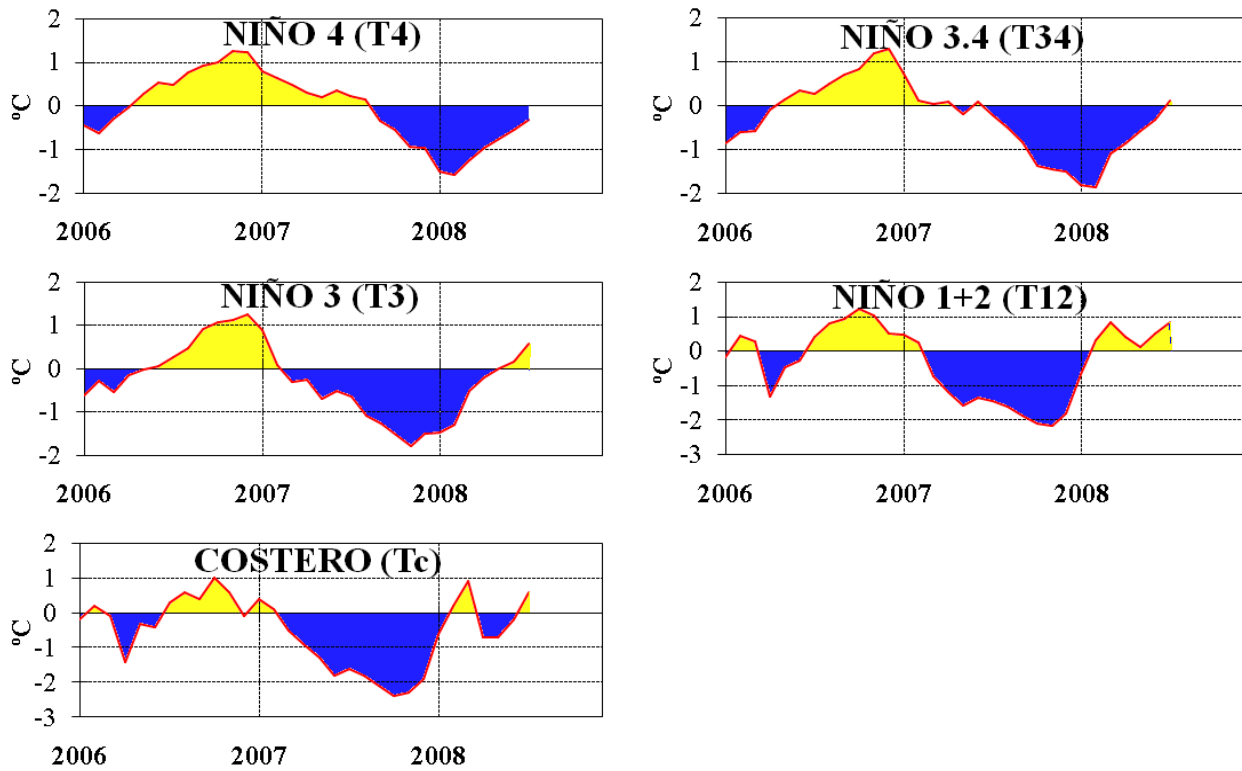
PENTADS	Sea Surface Temperature (SST)			Mean Sea Level (MSL)			
	BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO	
JUN	02	***	21.2	16.0	***	282.2	118.8
	07	***	20.8	16.4	***	278.8	122.7
	12	***	20.8	17.0	***	275.4	115.1
	17	***	20.7	17.0	***	274.0	113.6
	22	***	20.2	17.1	***	277.4	118.8
27	***	20.0	17.1	***	274.8	119.4	
JUL	02	***	***	***	***	***	***
	07	***	***	***	***	***	***
	12	***	***	***	***	***	***
	17	***	***	***	***	***	***
	22	***	***	***	***	***	***
27	***	***	***	***	***	***	

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

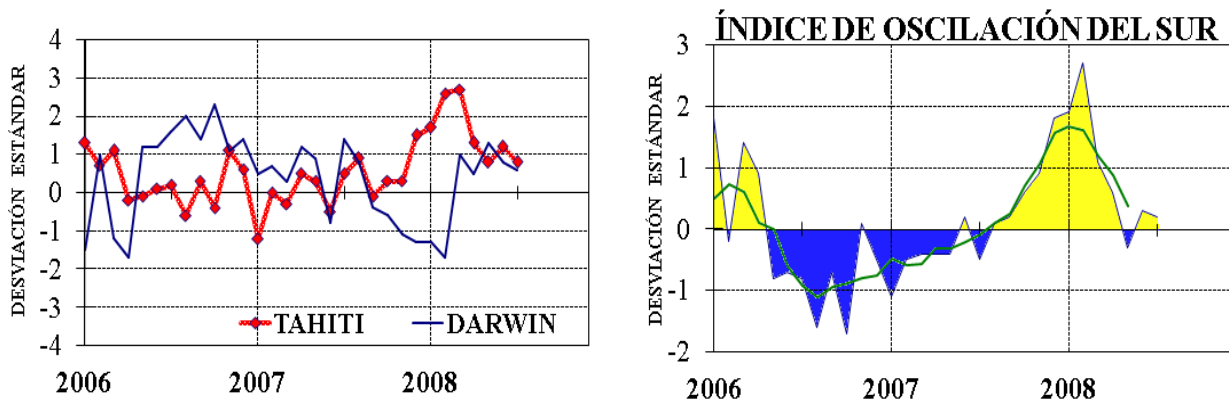
Note.

\* Values revised

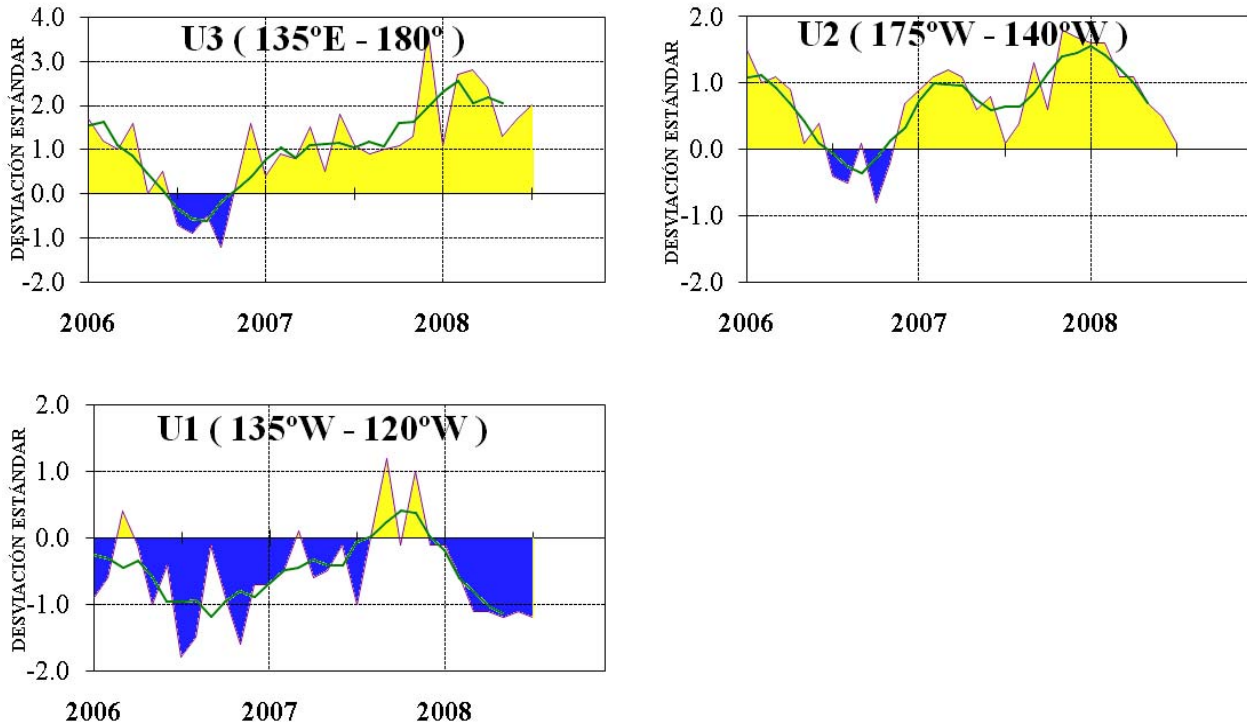
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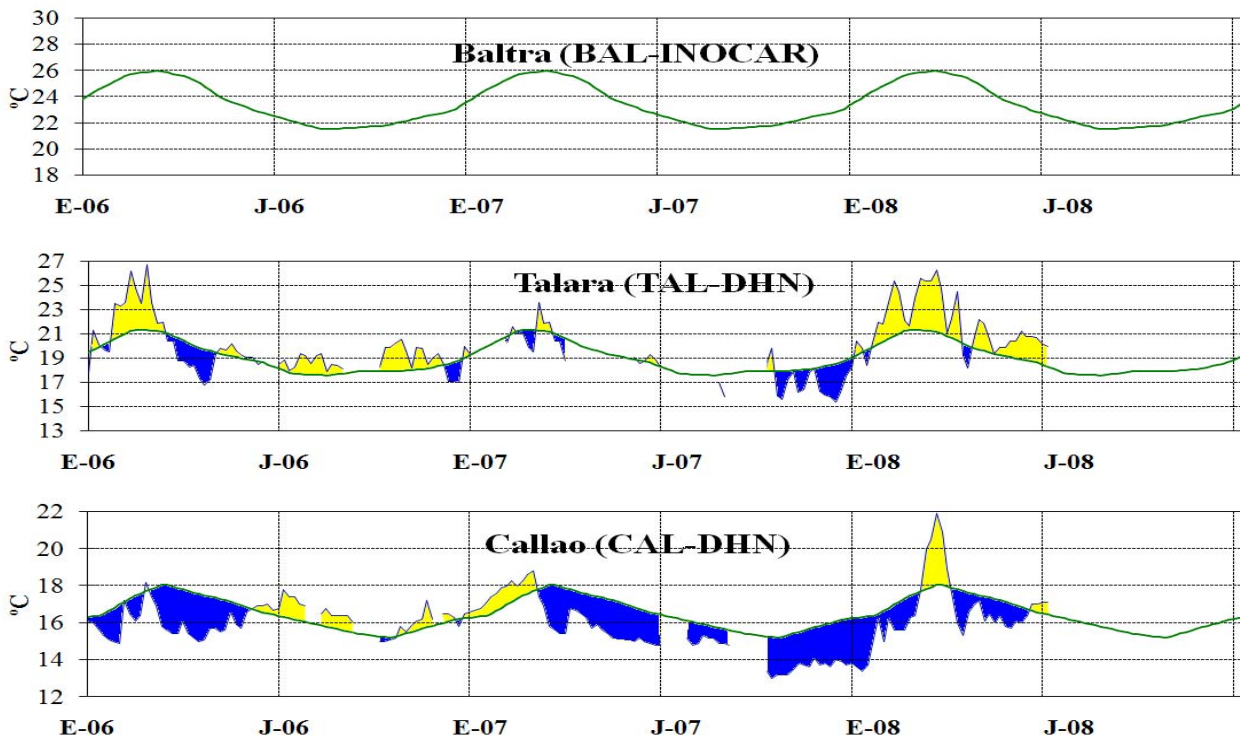
**Figure 3.-** Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).



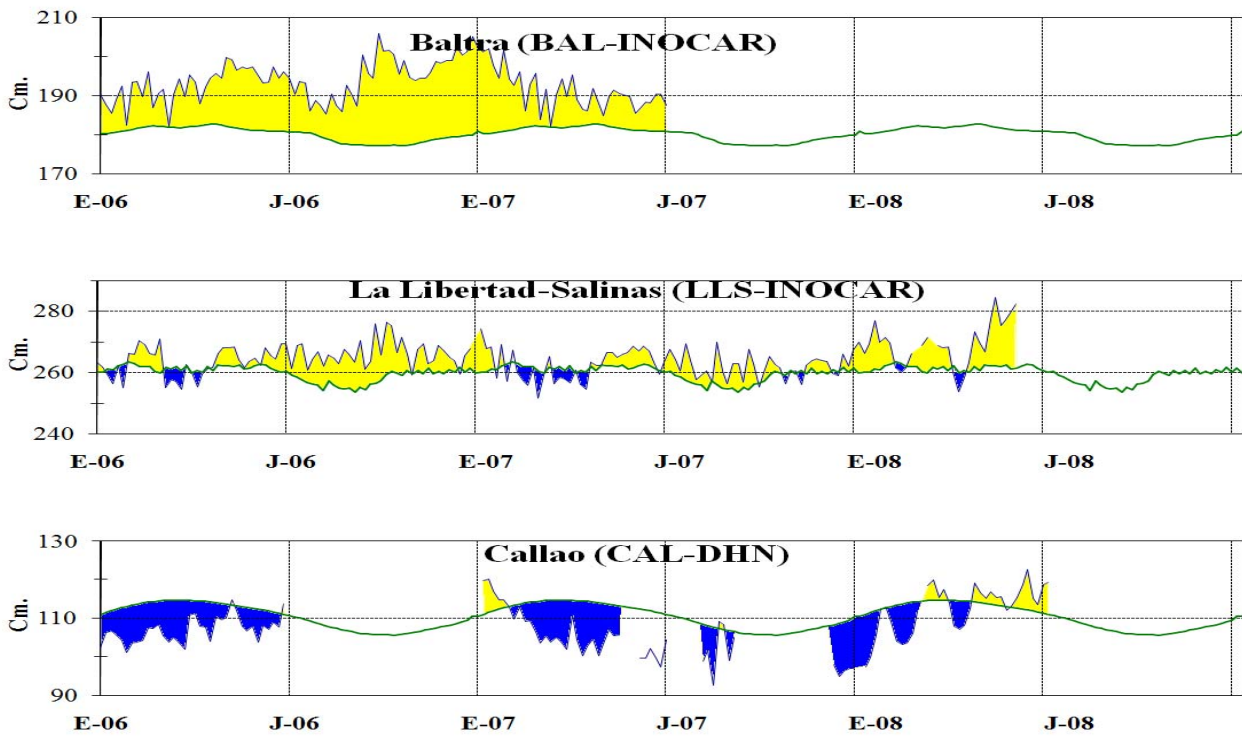
**Figure 4.-** Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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



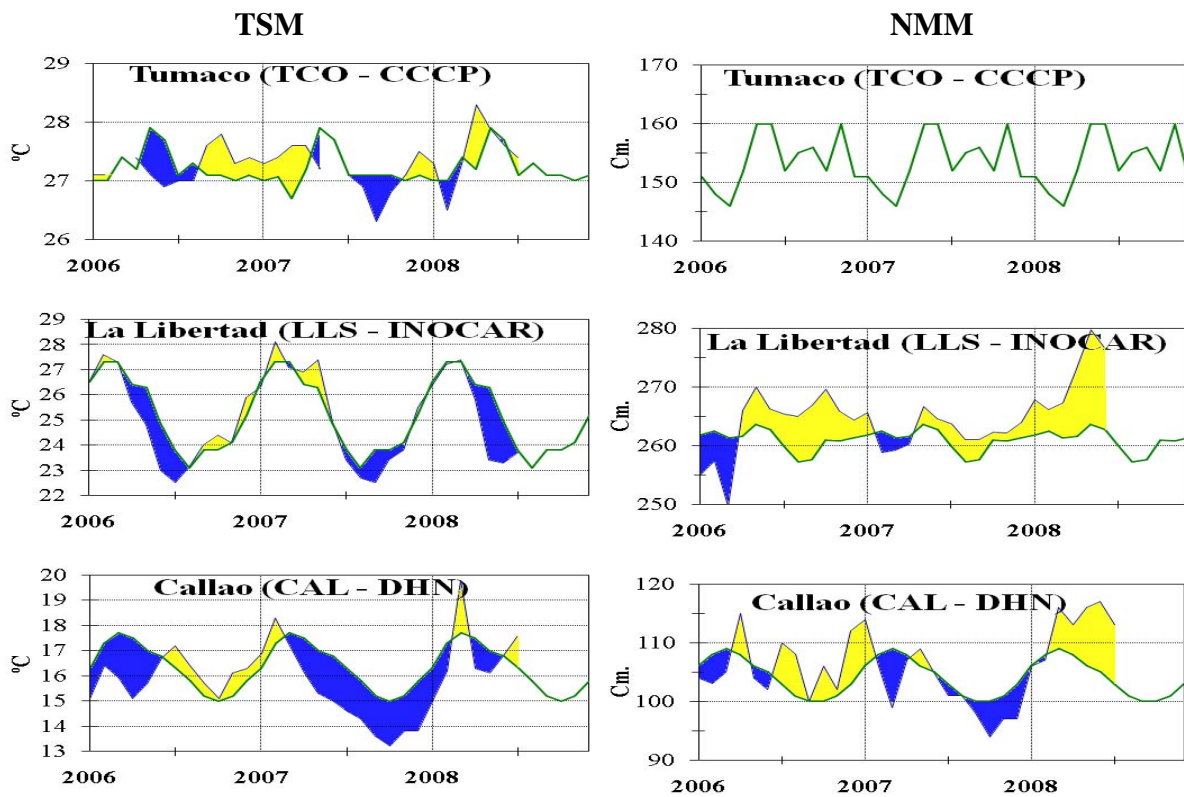
**Figure 5.-** Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).



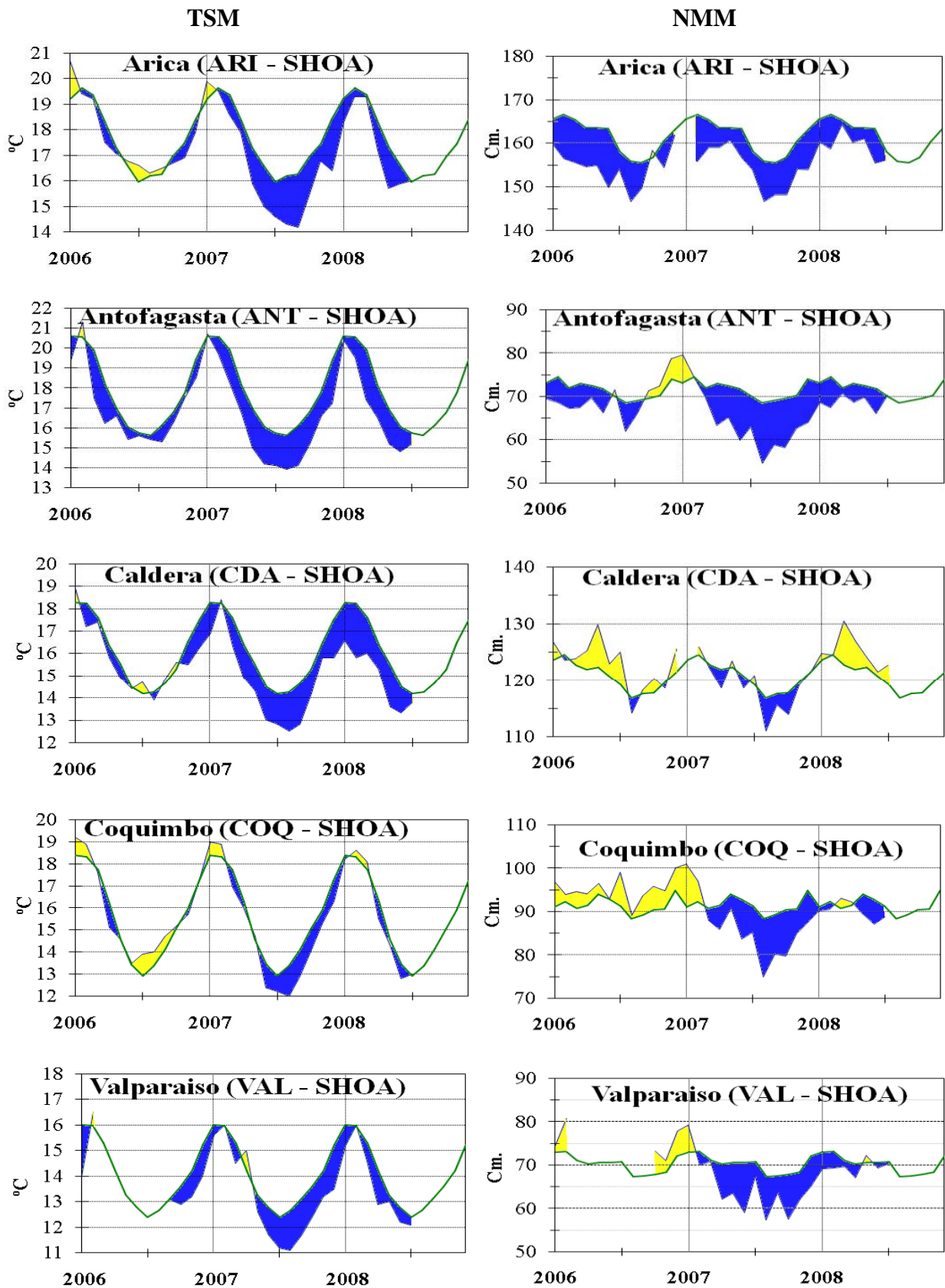
**Figure 6.-** Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)



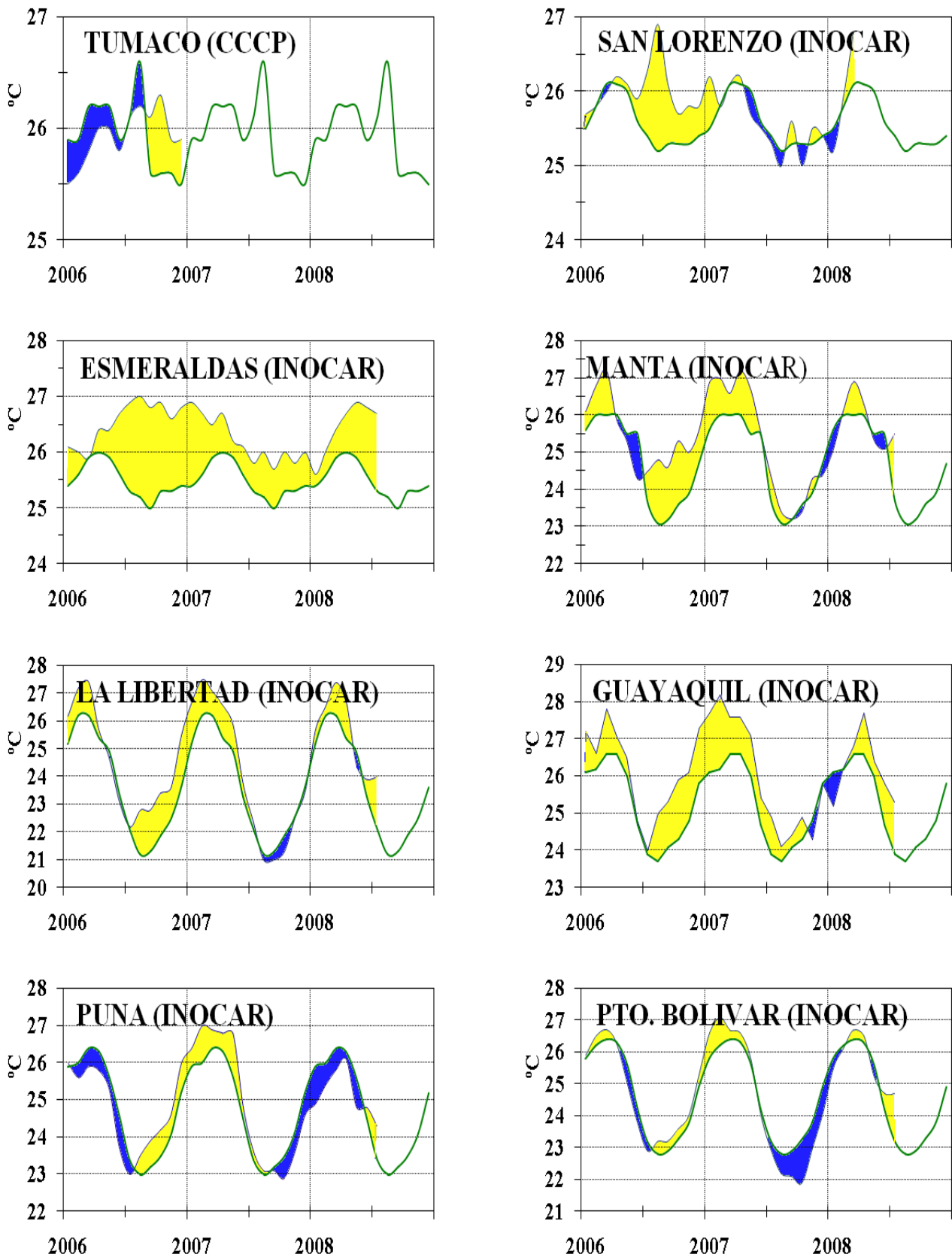
**Figure 7.-** Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).



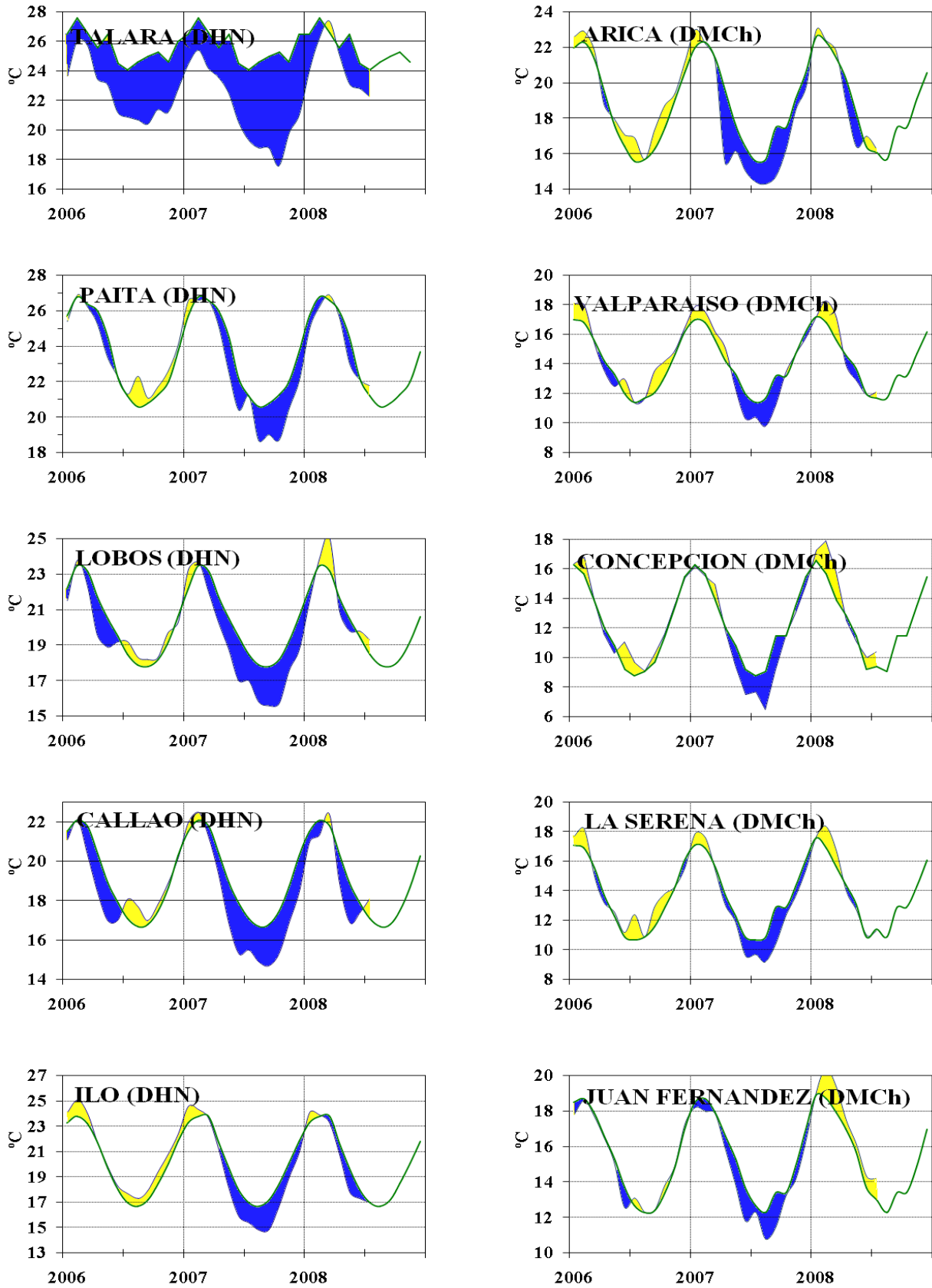
**Figure 8a.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).



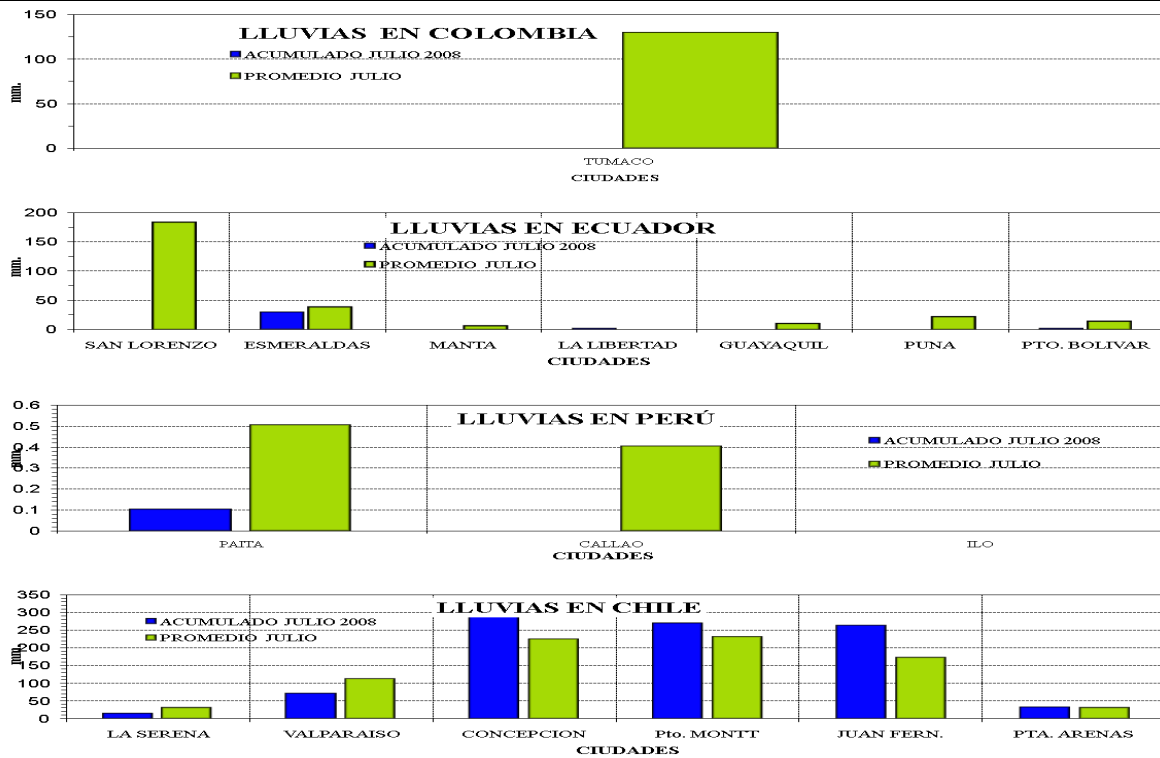
**Figure 8b.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).



**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).

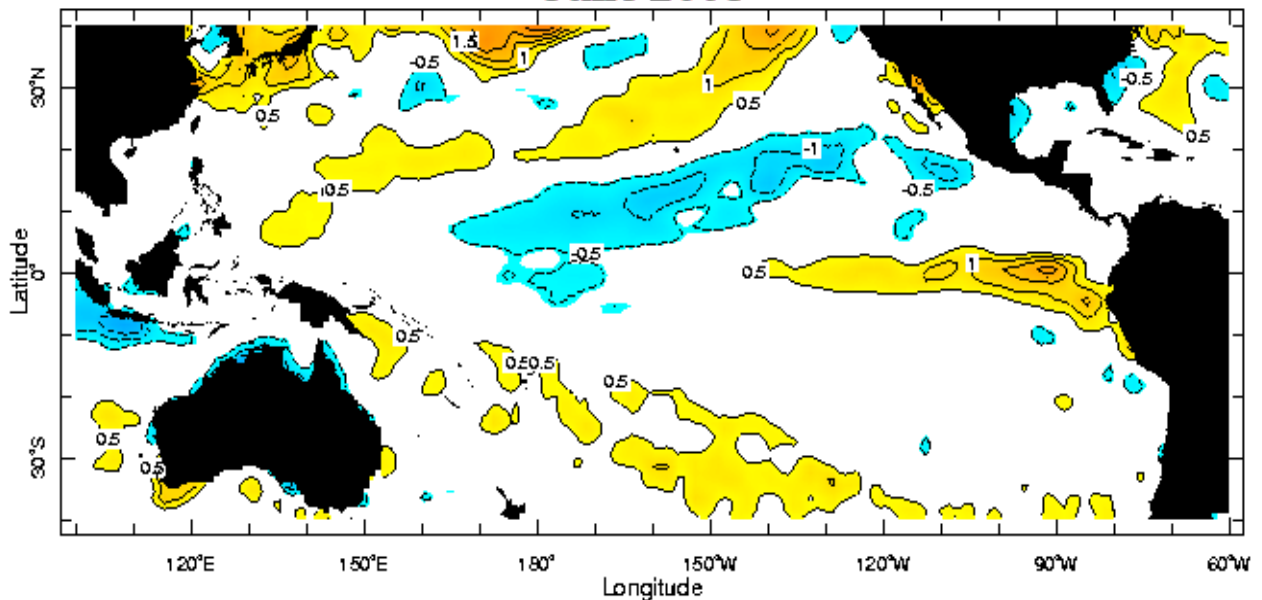


**Figure 9b.-** Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).



**Figure 10.-** Rains during July 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) Julio 2008



Jul 2008

**Figure 11.-** Sea Surface Temperature Anomalies (°C) July 2008. (Source: International Research Institute for Climate and Society)

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