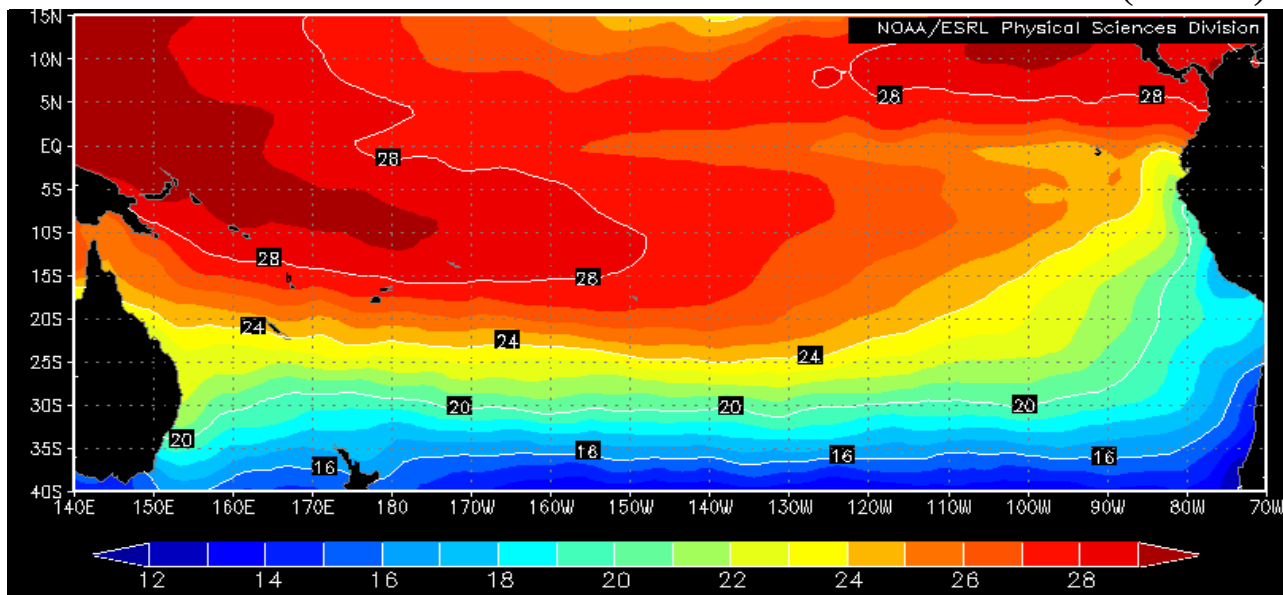


# COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



JUNE 2008

BAC N° 213

## *ERFEN*

(Estudio Regional del Fenómeno El Niño)

# BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



OMM



CPPS



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COLOMBIA  
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ECUADOR  
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PERÚ  
DHN

CHILE  
SHOA

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

During June Equatorial Pacific Ocean Sea Surface Temperature exhibited a strong tendency to reduction of negative anomalies, being negative values reduced to small and superficial sector of western center Equatorial Pacific. This sector is located between 160°E and 150°W. An increase of Sea Surface Temperature is observed in the last week of the month, causing positive anomalies to a large extent of Equatorial Pacific region (eastern-center, and coastal). The anomaly of Sea Surface Temperature during the last week of June in “El Niño” regions presented following values; in the region of the Western Pacific (“El Niño” Region 4) it was of -0.4°C; in the Central Pacific (“El Niño” Region 3. 4) the anomaly was of -0.1°C and; in the region of the Eastern Pacific (“El Niño” Region 1+2) the anomaly has stayed during the month in 0.4°C. At subsurface level thermal structure in the Central Equatorial Pacific continued reducing values of negative anomaly, being at the moment prisoner in a cell located in first 70m of depth in the area between 160°E and 150°W. To the 170 ms of depth one stays water cloak with positive anomaly, that practically moves throughout the thermocline by entire Equatorial Pacific. In the western side it observes a great nucleus with positive anomalies of until 4, 0°C. To the east of 110°W against coast of South America in the level of the 50 ms, it appears a nucleus of positive anomalies of 4°C, which reaches sea surface with a smaller magnitude.

The Mean Sea Level in the South Eastern Pacific during June one stayed on his normal patterns. Against the coasts of Ecuador level of the sea maintained positive anomalies reported previous month. In the same way Peruvian coast continued presenting positive anomalies, being observed fluctuations of +4.0 to +19.0 cm. Against Chile level of the sea was characterized to present one slight negative tendency, presenting anomalies that fluctuated between -2.5 to -7.7 cm.

Rains in Colombia generated emergency situations by events associated to sudden crescents, floods and slidings, especially in the middle and low basins of rivers San Jorge, Magdalena and Cauca, where totals of precipitation surpassed in more of 40% averages of this month. However rains in the coast of Ecuador continued deficit in 80%; in Peru’s north coast, during second and last week of the month, isolate drizzles appeared. In Chile precipitations appeared between their normal values and low normal for center, south and austral zones. As far as surface winds, in the region of the South Eastern Pacific they appeared predominantly of the south and south-east; as far as the speeds generally they appeared fluctuating slightly below the average value for month. Taking into account the present thermal behaviour from the Equatorial Pacific Ocean, as well as the exits of several models of simulation numerical it is anticipated that, during the next month the Sea Surface Temperature in the Eastern and Central sector of the Pacific Ocean will appear slightly on its normal value.

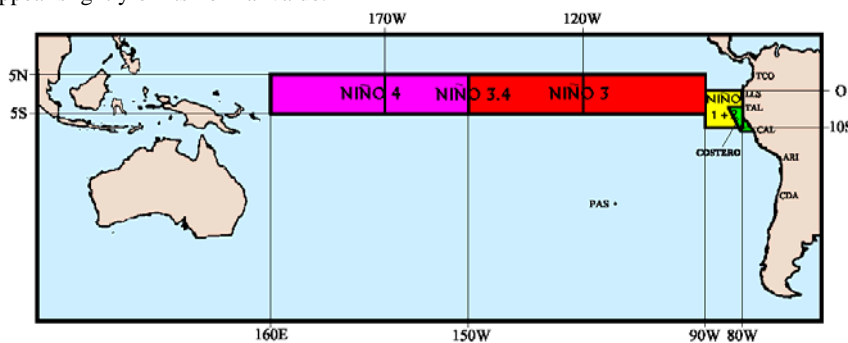


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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**CLIMATE ALERT BULLETIN**  
**BAC N° 213, JUNE 2008****I. GLOBAL AND REGIONAL IMAGE**

The Sea Surface Temperature (SST-TSM) in the Central Equatorial Pacific Ocean during June exhibited a strong reduction of negative anomalies. For June the monthly anomaly of the SST in the regions “El Niño” stayed negative slightly, with the exception of “El Niño” region 1+2 where values appear positives: In the Western Pacific region (“El Niño” Region 4) it happened of  $-0.8^{\circ}\text{C}$  to  $-0.6^{\circ}\text{C}$ , in the Central Pacific (“El Niño” Region 3,4) the anomaly happened of  $-0.6^{\circ}\text{C}$  to  $-0.3^{\circ}\text{C}$ ; in the Eastern Pacific region (“El Niño” Region 1+2) the anomalies were positive happening of  $0.1^{\circ}\text{C}$  to  $0.6^{\circ}\text{C}$ .

Subsurgently thermal structure of Central Equatorial Pacific shows a reduction of the water cell with negative anomaly of  $-1, 0^{\circ}\text{C}$ , being located, being reduced from the surface to the level of 70m and between  $160^{\circ}\text{E}$  and  $150^{\circ}\text{W}$  approximately. Below this layer to 170 ms of depth a water body stays with positive anomalies, of until  $4.0^{\circ}\text{C}$  this warm nucleus is located in the Central Equatorial Pacific.

In the Eastern edge of Equatorial Pacific, to the east of  $100^{\circ}\text{W}$  and near surface, appears also another warm nucleus with anomaly of  $4.0^{\circ}\text{C}$ . The Mean Sea Level (MSL-NMM) in the South Eastern Pacific during June stayed on its normal patterns. Against coasts of Ecuador sea Level continued presenting positive anomalies similar to previous month. In the same way throughout Peruvian coast continued presenting positive anomalies, being observed a variability of  $-4.0\text{cm}$  in the central and South zone, whereas in the north it has stayed constant, with respect to previous month. The anomalies of MSL fluctuated between  $+4.0\text{ cm}$  (San Juan and Matarani) and  $+19.0\text{ cm}$  (Chimbote); in front of Chile behaviour of the sea level was characterized to register one slight negative tendency, continued values under historical average throughout coast.

These registries of negative anomalies fluctuated between  $-2.5\text{ cm}$  (Caldera) to  $-7.7\text{ cm}$  (Talcahuano). In the case of this variable, second greater difference was registered in the stations of Antofagasta and Coquimbo, with a value of  $4.9\text{ cm}$  under historical average. The Index of Oscillation of South (IOS) after reporting negative values during previous month, happened again to its positive phase and in this occasion value was 0.3. The values of Tahiti and Darwin reached values of  $+0.8$  and  $+1.3$  respectively. The central axis of the Intertropical Convergence Zone (ITCZ) appeared in the Eastern sector of the Pacific. It was located between  $6$  and  $10^{\circ}\text{N}$  with quite significant convective activity, due to the interaction with tropical waves of the East, affecting to Colombia mainly.

Referring to rains, in Colombia when arriving the air masses from south east to Eastern mountains (“Cordillera Oriental”) generated cloudiness and rains of varied intensity especially in areas of “piedemontes Llanero” (reaching even some zones of “Sabana de Bogota”) and Amazonian. Rainy conditions continued generating situations of emergency by events associated to sudden crescents, floods and sliding, especially in the middle and low r basins of the rivers San Jorge, Magdalena and Cauca. In the Ecuador coast however rains continued deficit in 80%.

In the North coast of Peru during second and last week of the month, isolated drizzles appeared, registering precipitations in Talara and Paita of 2, 4 mm, in Chimbote and Lobos de Afuera, 0, 6 and 3, 3 mm respectively. In Chile precipitations appeared between their normal values for austral zone and center-north zone, and deficit for center-south zone and south zone. As far as surface winds, in the region of the South eastern Pacific they appeared predominantly of the south and south-east, with speeds that generally were slightly below the waited for average value for the month.

## II. NATIONAL IMAGE

### A. CONDITIONS IN THE COLOMBIAN COAST

From the first days of the month, the main synoptic system that exerted a greater influence in behaviour of the time on great part of the country was passage of tropical waves of the East, which interacted of continuous form with the Intertropical Convergence Zone, generating an instability atmospheric significant, especially in center of the national territory. A total of seven tropical waves (a quite significant amount) journeyed by the national territory; four of them had an important activity, increasing considerably volumes of precipitation, especially in areas of Antioquia, Eje Cafetero, Santander and Altiplano Cundiboyacense. The ITCZ presented some oscillations during this month and at general level it was located between 7 and 10 °N.

On the other hand, a “vaguada” in height that appeared almost constant on the center of the Caribbean Sea favoured so that convective processes in this zone stayed out, whereas the divergence to both sides of the “vaguada” was a determining factor in rains happened in the east, center and the west of the country. At the end of the month, the presence of a system of high pressure, originating of high latitudes, exerted atmospheric stability on the Amazonia and simultaneously it influenced the increase in the Trade wind speed of the south-east (anticyclonic circulation in surface).

This condition allowed the arrival of air masses from south west to the Eastern mountains (“Cordillera Oriental”), generating cloudiness and rains of varied intensity especially in areas of “piedmonts” Llanero (reaching even some zones of the Sabana de Bogota) and Amazonian. The rainy conditions continued generating situations of emergency by events associated to sudden crescents, floods and sliding, especially in the middle and low basins of the rivers San Jorge, Magdalena and Cauca, as well as in areas of “piedmonts” Llanero and Amazonian. One stands out in addition the registered amounts of rain in sectors to the Sabana de Bogota, Casanare, Antioquia, Eje Cafetero, Valle, Cauca and Nariño, where totals of precipitation surpassed in more of 40% averages of the month.

During June there is the official report of 12 earth sliding and 2 harmful torrential flows, which caused death to 17 people, 7 hurt and 6178 victims; of equal way, destruction of 13 houses, failures in 27 houses, damages in the road infrastructure with several emergencies that forced total and partial closing of several national and departmental routes, and damages in the infrastructure of domiciliary services with affectation of 1 aqueduct and a communitarian center. The movements in mass affected 8 departments, of which department of Antioquia with 6 events stands out. According to damages following events stand out: 1 torrential flow in Hacarí (Norte de Santander), that caused death to 10 people and hurt to other 3; 1 earth sliding in Riosucio (Caldas) that caused death to 5 people; and 1 earth sliding in Mocoa (Putumayo), which destroyed 10 houses and caused failures in other 10, leaving a high number of victims. (Source: DPAD, Gobernación de Antioch, Corponorte, INVIAS and IDEAM 2008).

During the monitoring of June of 2008, realised by the Area of Operational Oceanography 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, a sea surface temperature for the first and second fortnight of 27.6°C and 27.7 °C was registered respectively, with an average of 27.6°C.

A positive anomaly of 0,6°C at surface appears, with respect to the average historical monthly of period 1999 – 2008. The thermocline ascended in the first fortnight until the 50 meters, around 16 meters with respect to the last month, but soon in the second fortnight it descended again until the 65 meters. The isotherm of 15°C did not become visible for this month; the isotherm of 27°C ascended approximately until the 45 meters, presenting to this depth a positive anomaly of 0.13°C with respect to the monthly historical average.

As far as the behaviour of the salinity, a value of 31.84 and 31.58 ups was registered respectively at surface for the first and second fortnight, presenting a monthly average of 31.71ups. A positive anomaly of 0.31 appears at surface, with respect to the calculated monthly historical average between 1999 and 2008.

The maximum value of salinity of the month went approximately of 35.017 to a depth of 82 meters. The halocline, for the first fortnight was positioned on the 50 meters and for the second fortnight it descended approximately until the 65 meters. The isohaline of 34 and 35 appeared respectively to the 65 and 78 meters approximately.

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

The Oceanographic Institute of the Navy of Ecuador (INOCAR) reports that during June of 2008 temperature of the air throughout the Ecuadorian coast fluctuated between 26, 8°C and 24, 7°C what meant anomalies between 1, 2°C and 0, 5°C. As far as the sea surface temperature of the sea it presented values between 26, 6°C and 24, 7°C what corresponded to anomalies of 0, 5°C and -0, 4°C. The rain reduction experimented by the Ecuadorian Coast during June, generally meant a deficit between the 80 to the 100%. Seasonally this time is characterized by little precipitations in the region.

Considering present behaviour of ocean-atmospheric conditions in front of Ecuador, besides the own variability of the seasonal cycle of the region; it is anticipated that SST in the coastal profile will slightly present values around its average or below it; as far as precipitations, they will be weak, of short duration and in very precise places of the Ecuadorian coast, especially to the interior of the region. The sky predominance will be partially overcast during the month. As far as the temperature of the sea and the air next to Ecuadorian coast, esteem that values will stay slightly below normal awaited for July. As far as the temperature of the air, it is anticipated that during the day significant high thermal amplitude continue, high during day and low at night.

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

The Direction of Hydrography and Navigation of Peru (DHN) informs that in the Peruvian coast generally an ascent in the anomalies of the SST was registered, around 1, 0°C with respect to previous month; nevertheless, in spite of this increase anomalies of stations of the south, San Juan, Mollendo and Ilo were negative. The maximum anomaly appeared in the northern station of Talara (+1, 7°C), whereas the minimum anomaly was registered in Mollendo (- 0, 6°C).

The Mean Sea Level (MSL-NMM) throughout Peruvian coast continued presenting positive anomalies, being observed a variability of +/- 4 cm in the Central and South zone, whereas in the north one has stayed constant with respect to previous month. The anomalies of the MSL fluctuated between +4 cm (San Juan and Matarani) and +19 cm (Chimbote). Throughout Peruvian coast, temperature of the air has registered an ascent around 1, 0°C, with respect to previous month; negative anomalies prevailing. Air Temperature anomalies fluctuated between +0, 3°C (Chimbote and Lobos de Afuera) and -1, 4°C (Mollendo).

In the north coast, during the second and last week of the month, isolated drizzles appeared, registering precipitations in Talara and Paita of 2, 4 mm, 0, 6 mm in Chimbote and 3, 3 mm in Lobos de Afuera. Whereas, in the south during second week of the month drizzles appeared, registering precipitations in Mollendo and Ilo of 0, 4 mm and in El Callao registered only plans. Throughout Peruvian coast winds of south direction predominated; nevertheless, also they presented components of the south-east in the stations of Talara, San Juan and Mollendo. In relation to the wind speed, negative anomalies predominated, that fluctuated between -0, 3 to -1, 6 m/s; with the exception of San Juan and Mollendo that presented anomalies of +1, 6 and +0, 9 m/s, respectively; whereas Chimbote presented behaviour similar to its normal one.

## **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 monitoring a series of oceanic and atmospheric variables. A description of the Sea Surface Temperature (SST) and sea level (SL-NM) between Arica (18°29'S) and Talcahuano (36°41'S) for the month of June of 2008 is:

In the north zone of the country, SST registered one slight tendency to increase that did not imply positive values of anomalies, since it continued observed cold condition during last months.

In this sector, values oscillated between  $-0.9^{\circ}\text{C}$  (Arica) and  $-1.5^{\circ}\text{C}$  (Caldera). Whereas, in the north-center zone presented values between  $-0.7^{\circ}\text{C}$  in Valparaíso and  $-0.8^{\circ}\text{C}$  in Coquimbo. It is possible to emphasize the anomaly of  $-0.1^{\circ}\text{C}$  that was presented in the station of Talcahuano, since it is a value near a considered condition normal.

The sea level behaviour was characterized to register one slight negative tendency, continued values under historical average throughout Chilean coast. These negative anomalies registries fluctuated between  $-2.5$  cm (Caldera) to  $-7.7$  cm (Talcahuano). In the case of this variable, second greater difference was registered in the stations of Antofagasta and Coquimbo, with a value of 4.9 cm under historical average.

The Meteorological Direction of Chile (DMCh) shows that during June, the average temperature of the air registered a condition between normal to cold in the zone center-north and center, between Arica and Chillán. Contrary, zone center-south, south and austral, between Concepción and Punta Arenas, behaved slightly warm, with maximums in Balmaceda ( $+0.9^{\circ}\text{C}$ ) and Osorno ( $+0.7^{\circ}\text{C}$ ). The maximum temperature of the air appeared by third month under conditions of cooling, affecting north and central zone, between Arica and Valparaíso, with negative anomalies majors that  $1.0^{\circ}\text{C}$  in Arica, Iquique and La Serena. The south and austral zone maintained slight anomalies positive, occurring maximum heating in Balmaceda, with  $+1.7^{\circ}\text{C}$ . The minimum temperature of the air, associated to weak heating (positive anomalies  $<1^{\circ}\text{C}$ ) were present in regions of north zone, south and austral, being Arica whose caught up bigger heating with  $+1.4^{\circ}\text{C}$ . The Chile central zone between La Serena and Concepción presented between normal and cold.

The atmospheric circulation in the South Pacific, characterized by the predominance of anticyclonic circulation in the zone band ( $30-55^{\circ}\text{S}$ ) and cyclonal circulation to the south of  $60^{\circ}\text{S}$ . The fields of anomalies of the pressure at sea level, in middle latitudes of the south-eastern Pacific reached positive values of  $+4$  hPa and negatives to the south of this region, with  $-12$  hPa. This condition favoured low activity of frontal systems and reduction of the precipitation. The precipitations appeared between their normal values for center-north zone and austral, and deficit in the center-south zone and south, between Chillán and Puerto Montt, with reduction of their normal values of the month in more than 120 mm in Chillán, Concepción and Valdivia.

### 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, esteem that during next month to a large extent of the Equatorial Pacific will appear slight positive anomalies of SST, although nevertheless still will be observed small areas with negative anomalies, those that will reduce gradually.

#### B. REGIONAL

In agreement with the pursuit of the ocean-atmospheric conditions in the South Eastern Pacific Ocean, executed by Program ERFEN (integrated by National Committees ERFEN of Chile, Colombia, Ecuador and Peru), and coordinated by the CPPS, is anticipated that during next month SST in the Eastern Equatorial Pacific appears slightly on their average value; whereas in the coastal sector, next to South America, the SST will be oscillating around their average value; with respect to air temperature a similar behaviour is expected.

**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
APR 08	6.0	9.5	5.4	27.4	26.8	27.2	25.9	23.0	13.1	9.9	0.6
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	***	14.9	13.1	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	
APR 08	28.3	25.8	16.3	17.2	16.5	15.3	15.5	12.9	
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	

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	
APR 08	***	2645	1130	1603	686	1270	922	671	
MAY 08	***	2797	1160	1611	699	1242	896	722	
JUN 08	***	***	1170	1555	661	1215	871	693	

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)

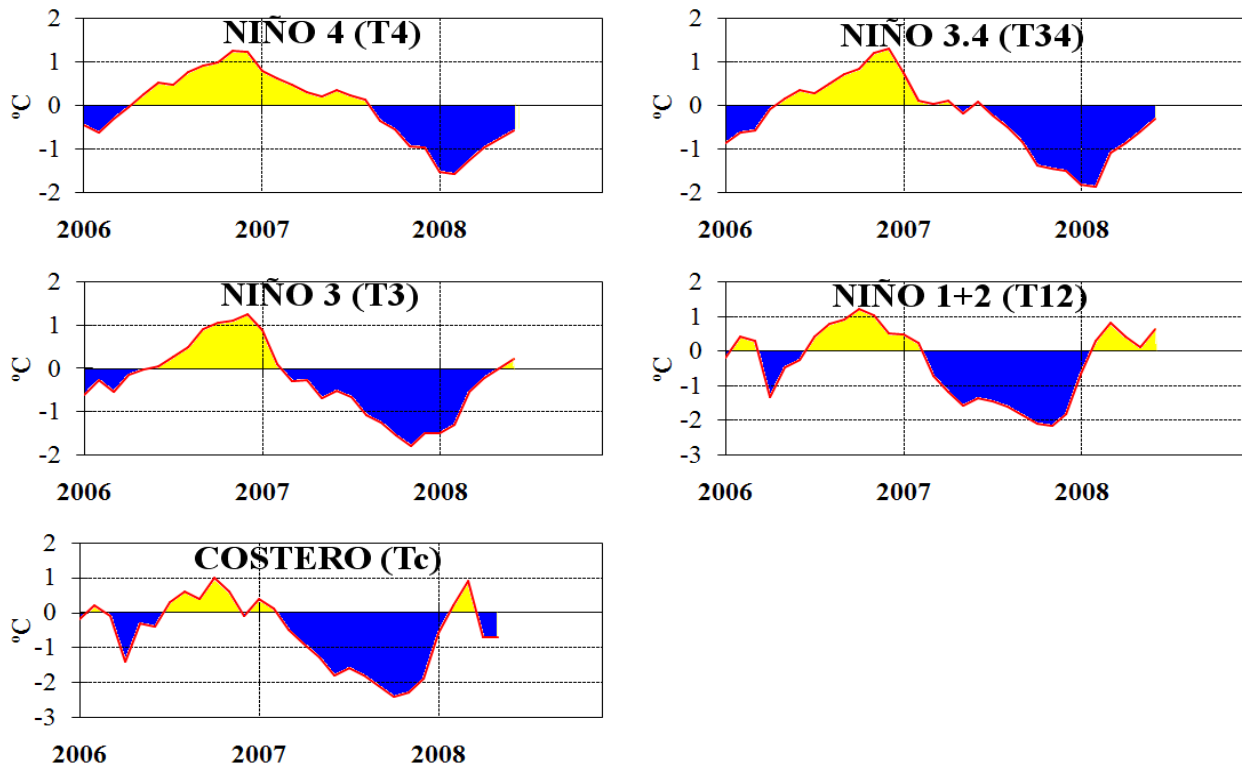
PENTADS	Sea Surface Temperature (SST)			Mean Sea Level (MSL)		
	BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO
MAY 03	***	20.6	16.5	***	2774	1169
08	***	19.4	16.0	***	2844	1153
13	***	19.9	16.4	***	2755	1157
18	***	19.9	15.8	***	2772	1121
23	***	20.4	15.7	***	2800	1131
28	***	20.4	16.1	***	2824	1154
JUN 02	***	21.2	16.0	***	***	1188
07	***	20.8	16.4	***	***	1227
12	***	20.8	17.0	***	***	1151
17	***	20.7	17.0	***	***	1136
22	***	20.2	17.1	***	***	1188
27	***	20.0	17.1	***	***	1194

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

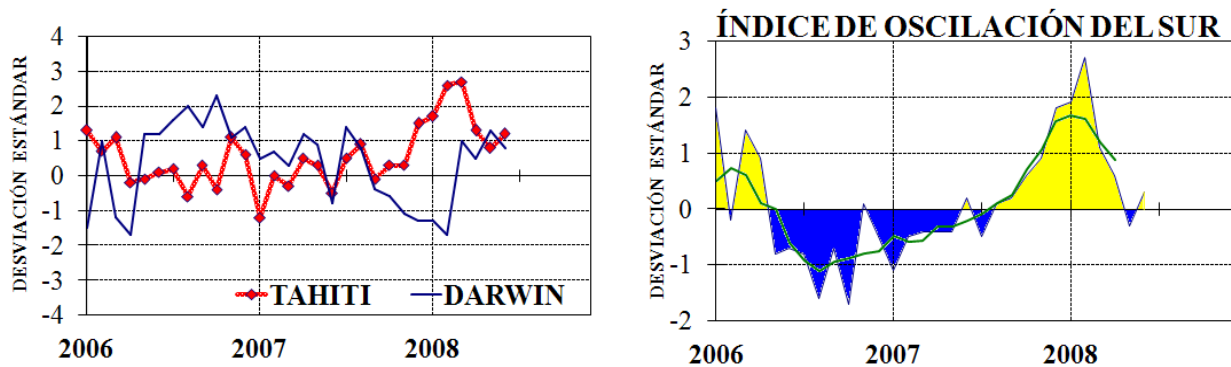
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\* Values revised

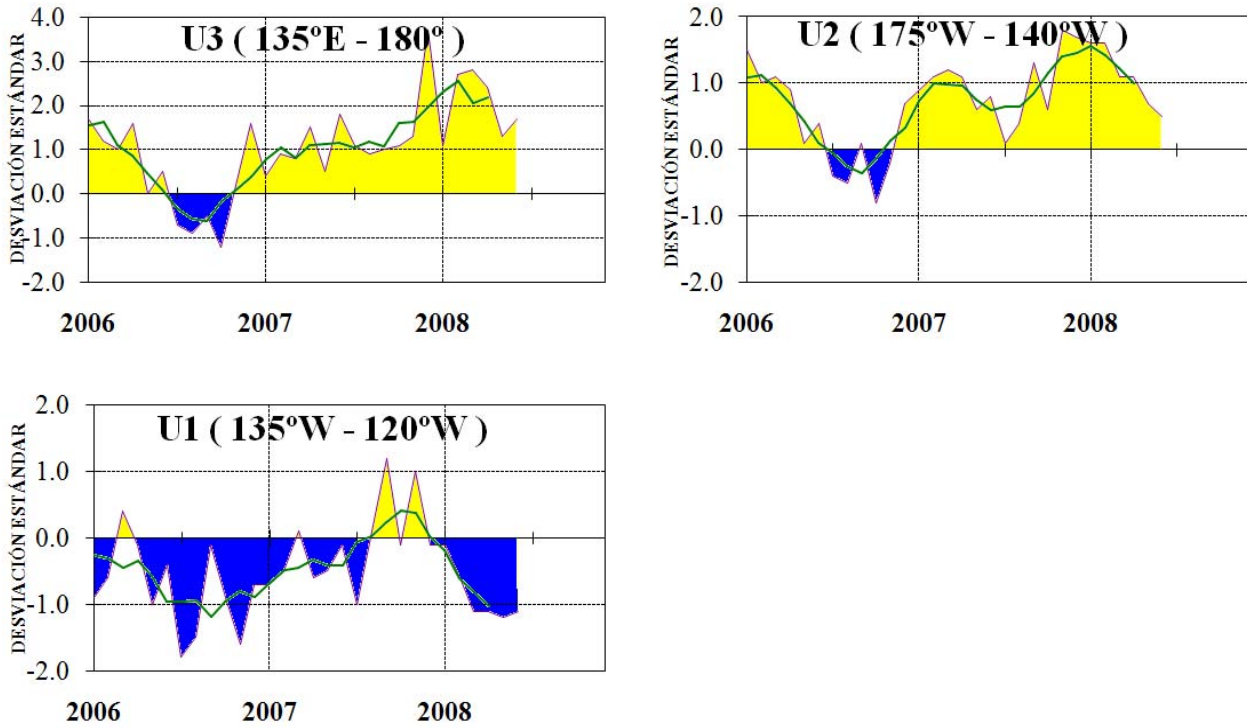
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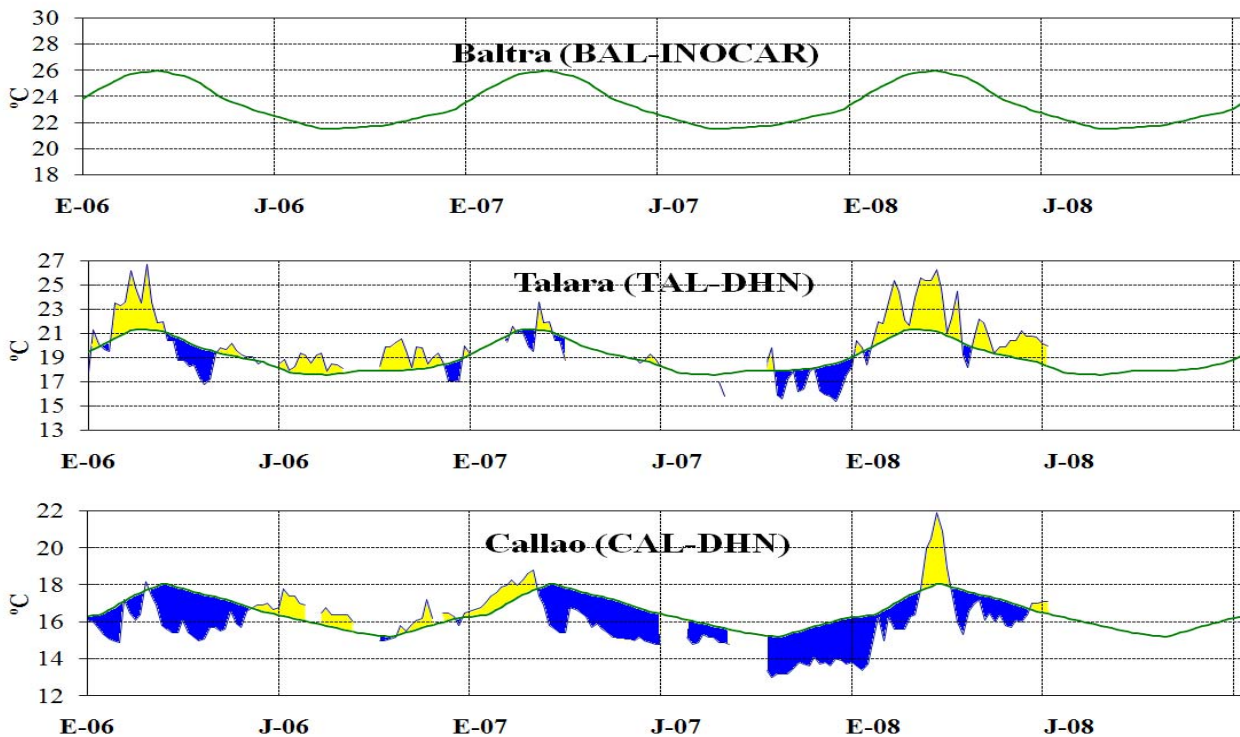
**Figure 3.-** Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).



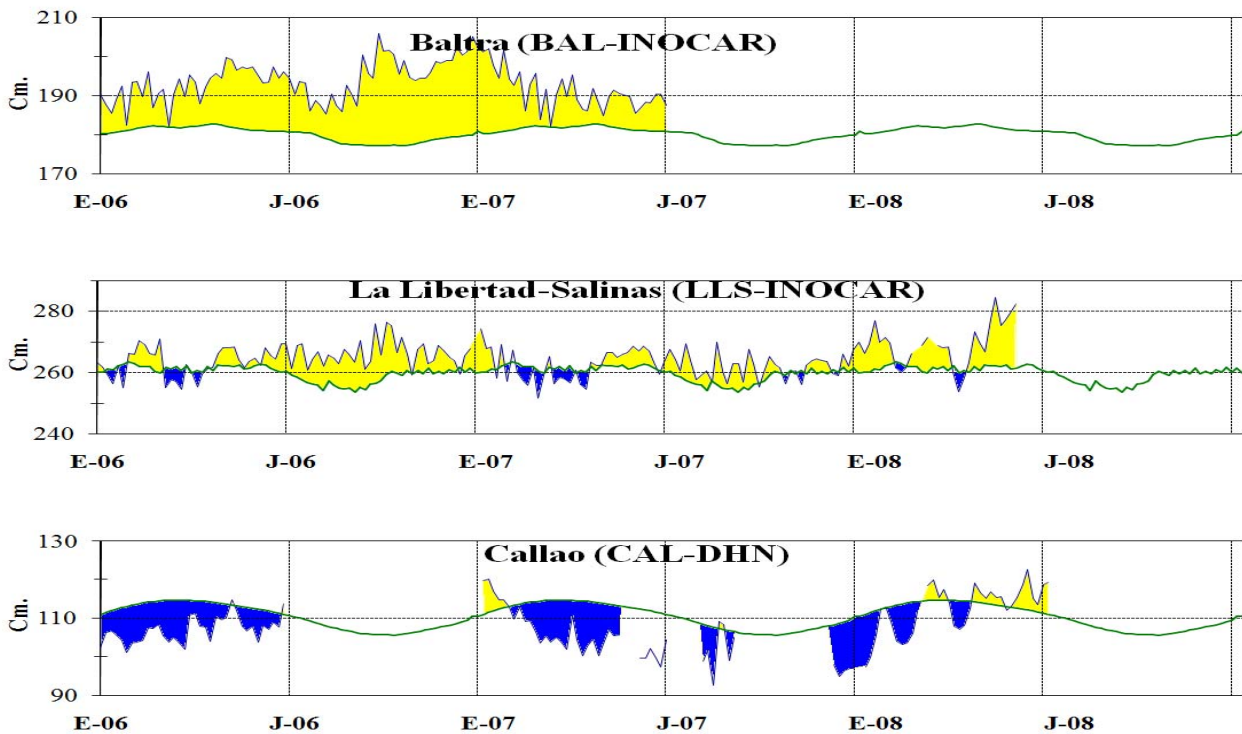
**Figure 4.-** Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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



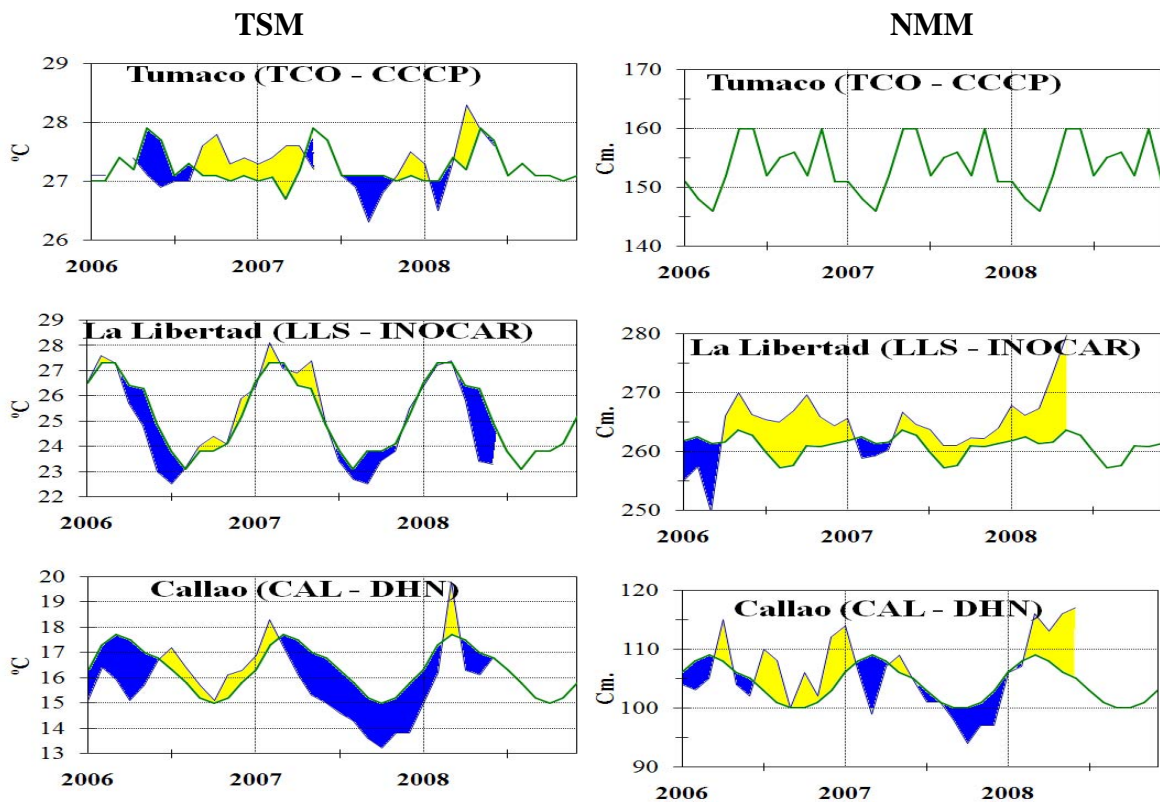
**Figure 5.-** Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).



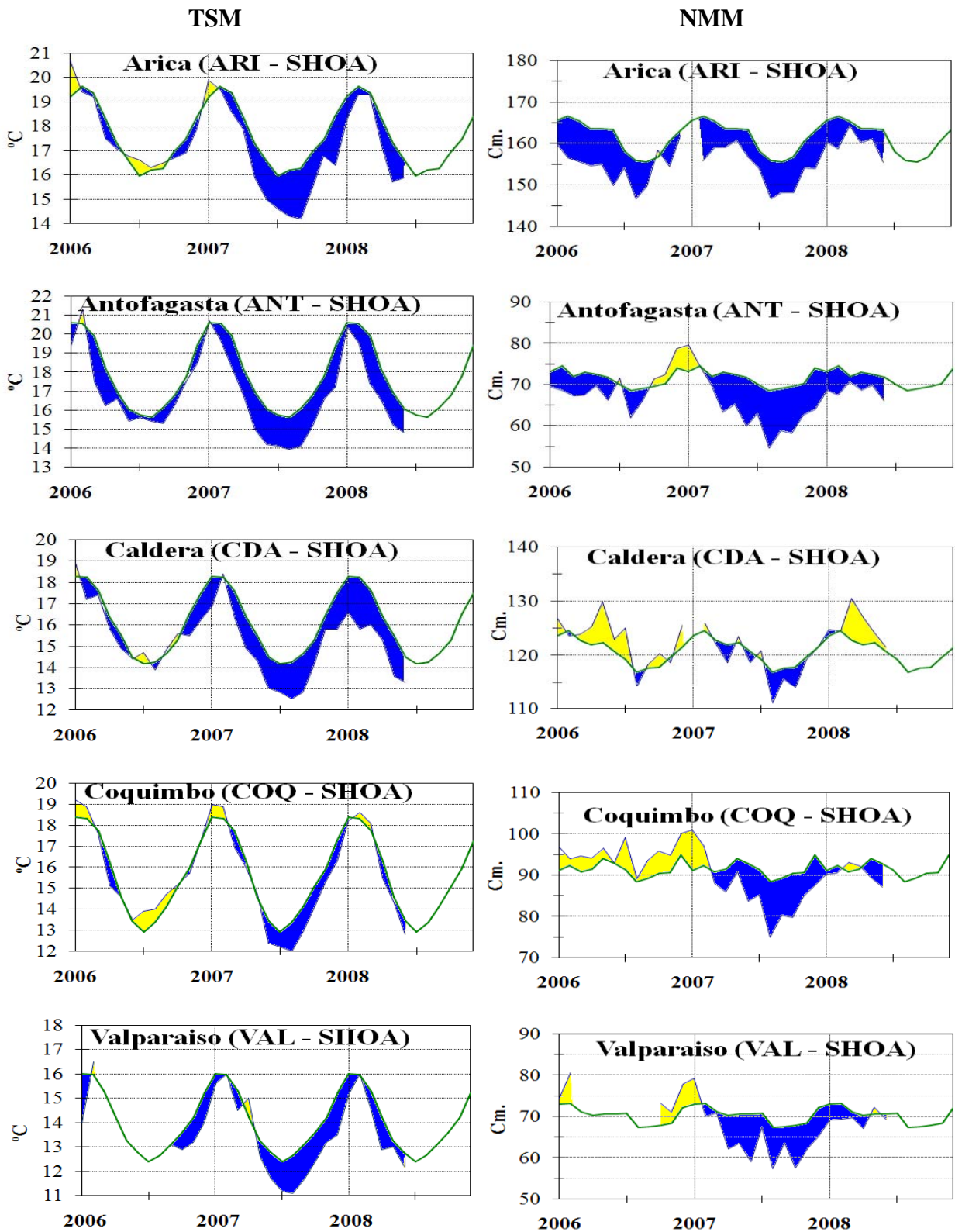
**Figure 6.-** Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)



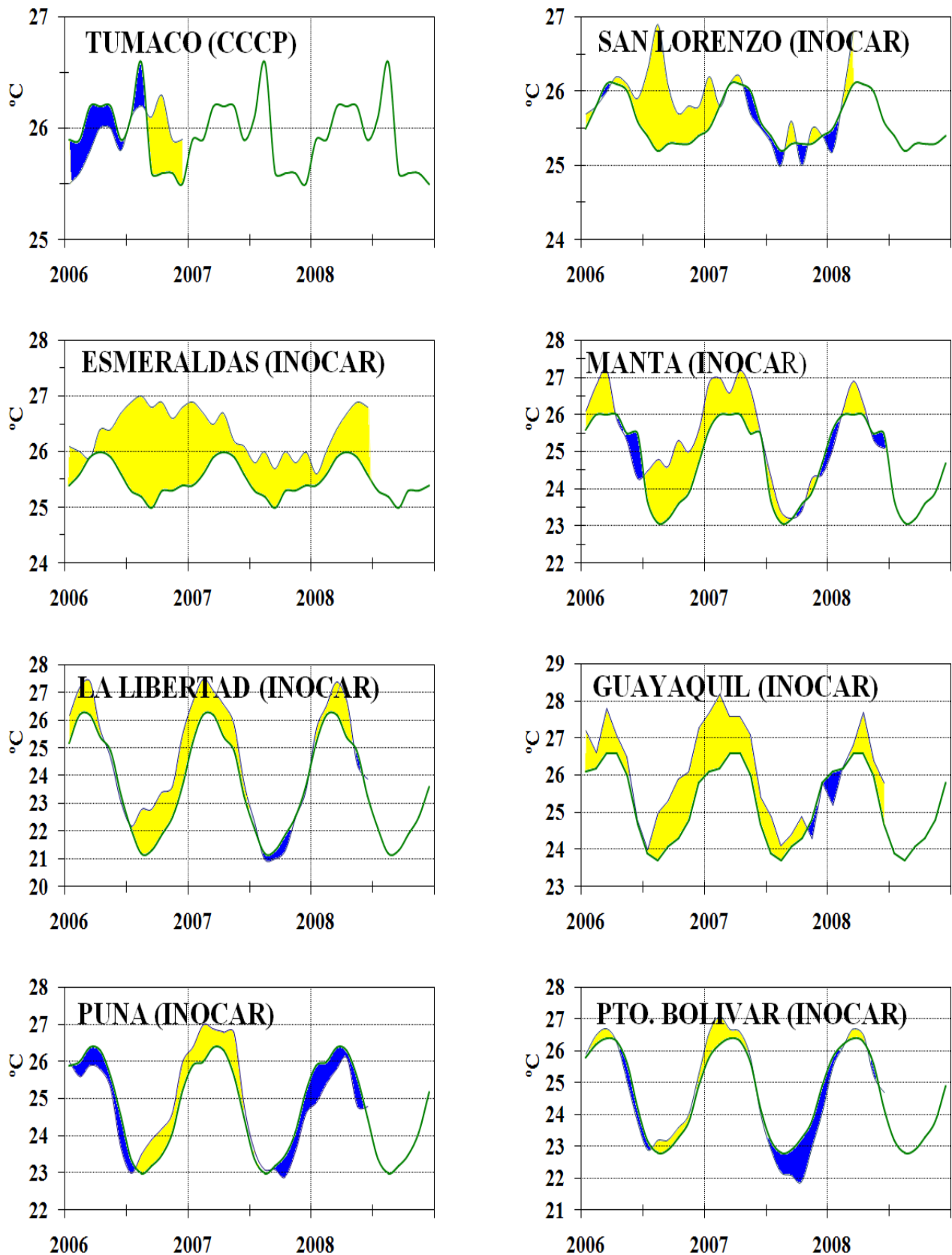
**Figure 7.-** Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).



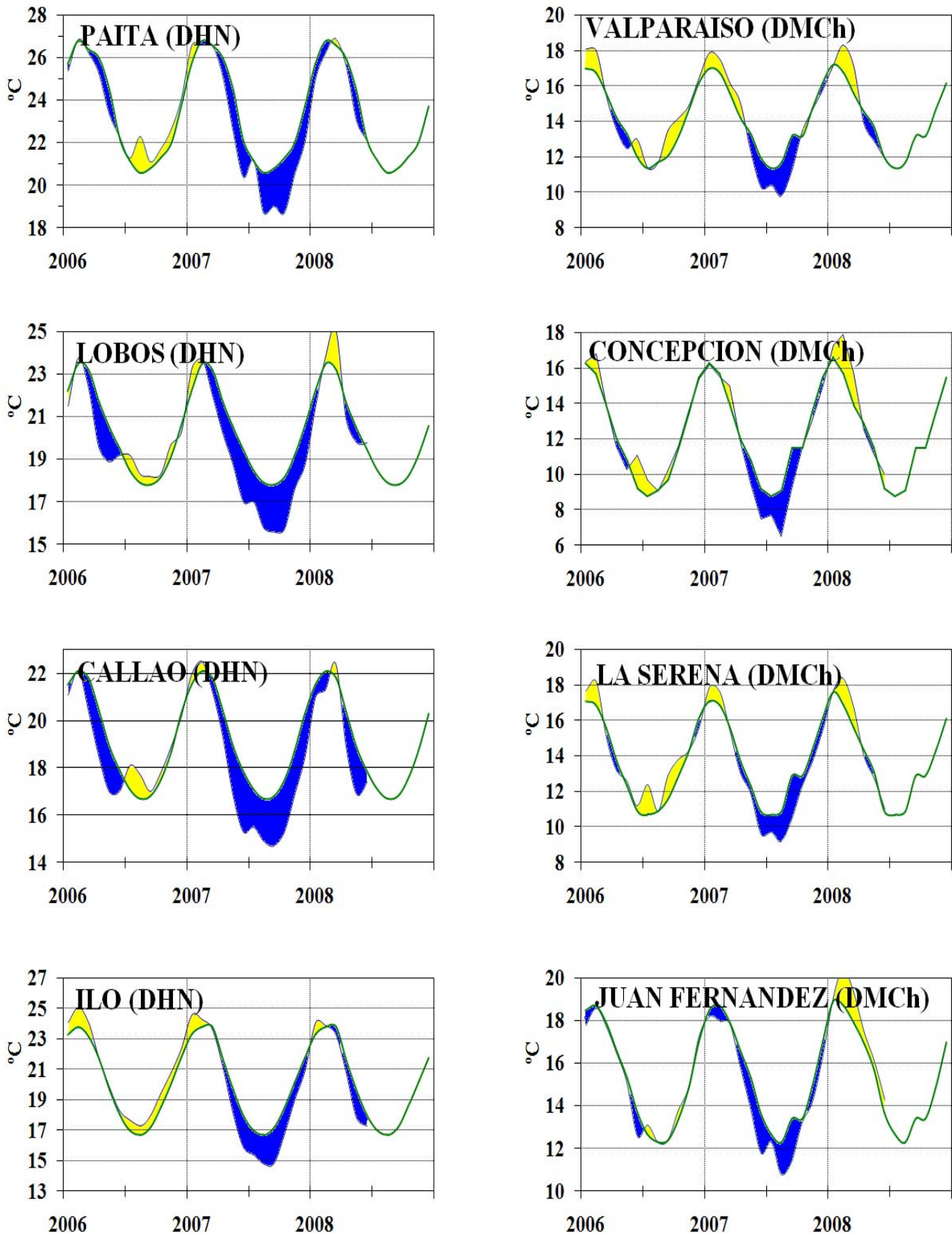
**Figure 8a.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).



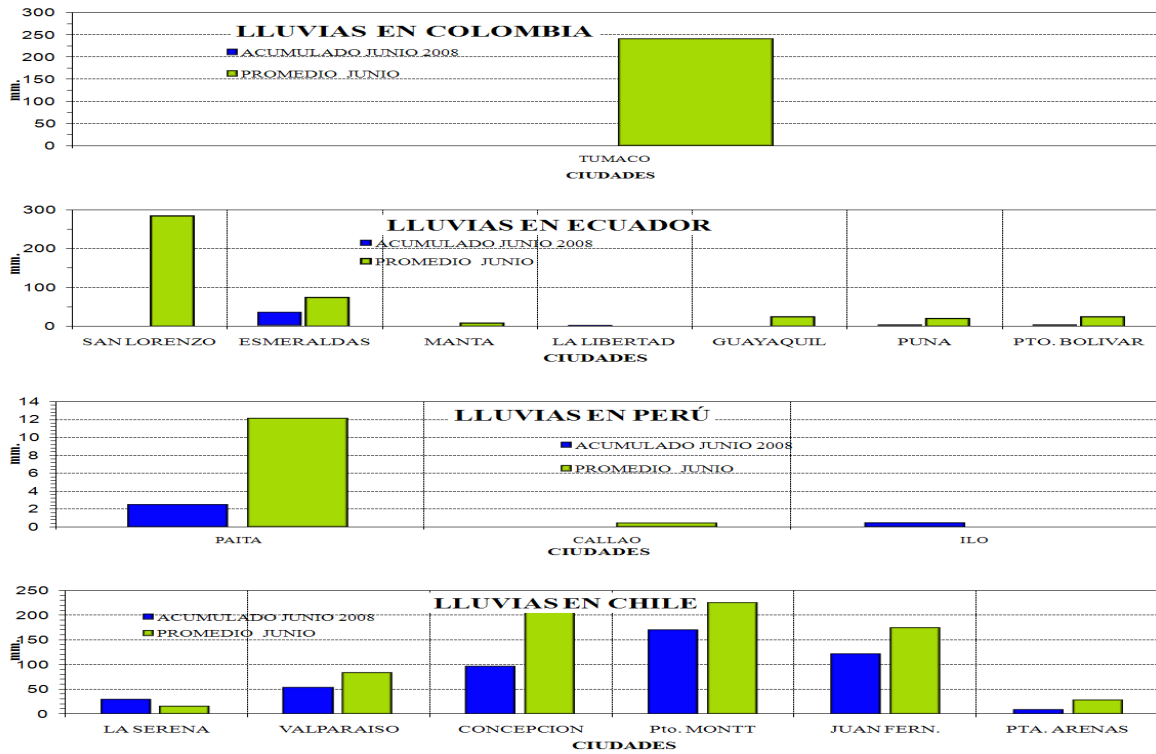
**Figure 8b.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).



**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).

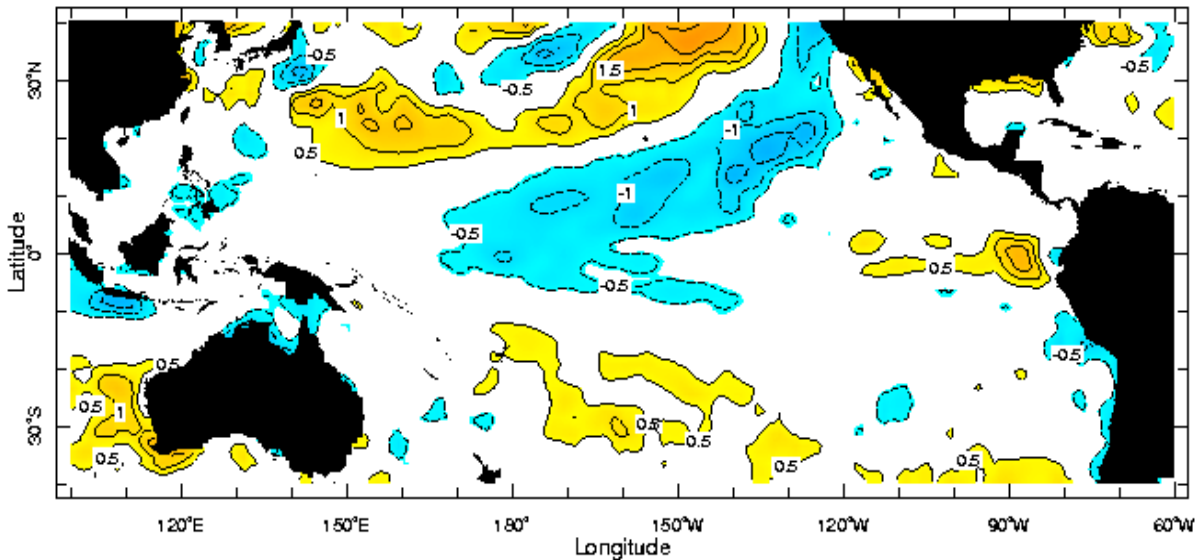


**Figure 9b.-** Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).



**Figure 10.-** Rains during June 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) Junio 2008



Jun 2008

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

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