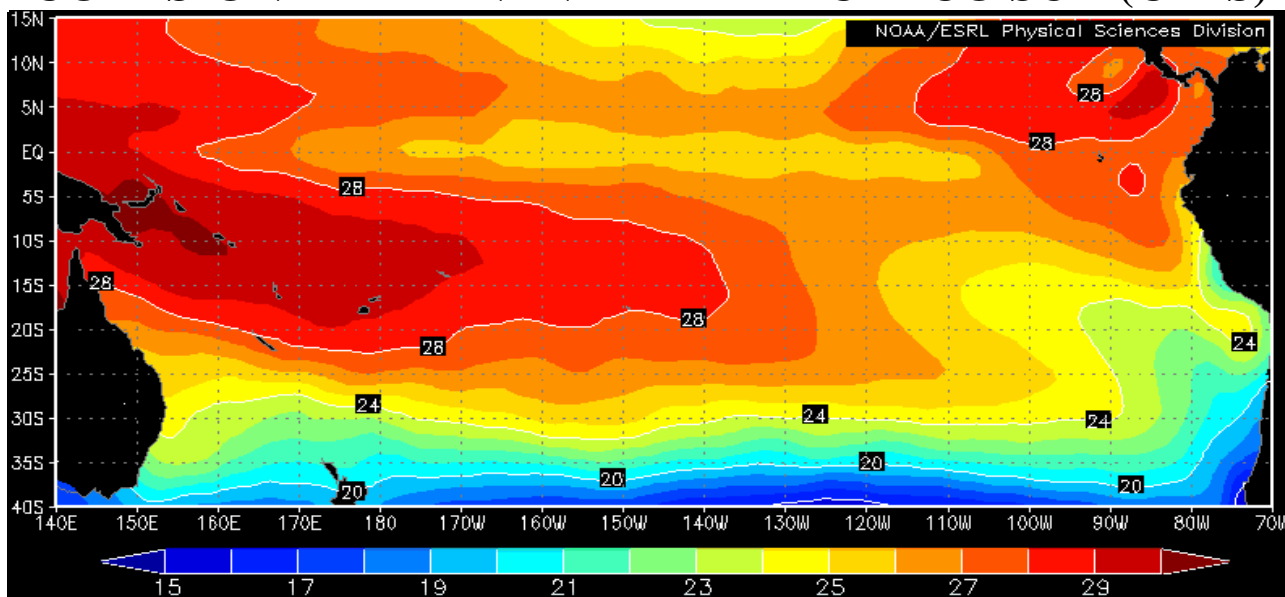


# COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



Sea Surface Temperature, March 2008, NOAA-CIRES/Climate Diagnostic Center

MARCH 2008

BAC N° 210

## *ERFEN*

(Estudio Regional del Fenómeno El Niño)

# BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



OMM



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COI

COLOMBIA  
CCCP

ECUADOR  
INOCAR

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

The increase of the Sea Surface Temperature (SST), observed during February next to the coast of South America continued in March with greater intensity than the observed in the previous month, with which continuous the process of weakening of the cold event of "La Niña" in the Southeastern Pacific waters; reaching during the month positive anomalies of 1.5°C. Nevertheless in the Region of the Central Equatorial Pacific Ocean the negative anomalies of the temperature of the sea in -1.0°C stay approximately, being evident the reduction of the area of negative anomalies in comparison with the previous month. During the last week of march the temperature of the sea presented anomalies of -1.1°C in the Western Pacific, -1.0°C for the Central Pacific and 1.1°C in the Eastern Pacific, continuing in this month the tendency to reduce the negative anomalies in the Equatorial Pacific, process that gradually was occurring from the previous month and that in march apparently increased its speed. As far as surface winds in the region of the Southeastern Pacific, like the previous month variables with predominance of the south and southeastern appeared with wind occurrences of the north for some of the stations of Ecuador; the speeds in general were within the normal rank for the date. The Index of Oscillation of the South by eighth consecutive month presents positive values being in this occasion the greater one of 1.1.

In March the Mean Sea Level in the Southeastern Pacific fluctuated thus near its normal patterns: as opposed to the coasts of Ecuador it was 5.0 cm on media.; in the north and central zones of the Peruvian coast appeared positive anomalies, whereas, in the south, it prevailed the negative anomalies; the anomalies fluctuated between 7.0 cm (Talara and Callao) and -3.0 cm (San Juan). In front of Chile the Level of the Sea was characterized to present tendency to the increase, that implied values of positive anomalies in the stations of Arica (1.4 cm) and Caldera (3.5 cm), nevertheless, the negative anomalies stay fluctuating between -0.8 cm (Coquimbo) and -4.3 cm (Talcahuano). Taking into account the present thermal behaviour from the Equatorial Pacific Ocean, as well as the exits of several models of numerical simulation, are anticipated that during the next month in the Eastern sector of the Pacific the Sea Surface Temperature will remain on the normal; whereas in the Central Pacific the negative anomalies stay, with the same tendency to reduce the negative anomalies.

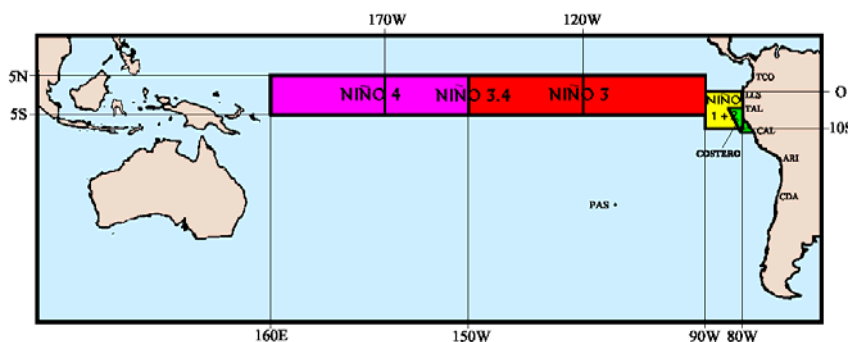


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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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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**CLIMATE ALERT BULLETIN**  
**BAC Nº 210, MARCH 2008****I. GLOBAL AND REGIONAL IMAGE**

In March the Central Equatorial Pacific Ocean continued presenting Sea Surface Temperature (SST) below its climatologic value; nevertheless the monthly anomaly in the region of the Southeastern Pacific, like the previous month, was positive of 0.9°C. In the “El Niño” regions the monthly anomaly of the SST for March tended to reduce its values thus; in the region of the Western Pacific (“El Niño” Region 4) it happened of -1.6°C to -1.3°C, in the Central Pacific (“El Niño” Region 3.4) the anomaly happened of -1.9°C to -1.1°C, whereas in the region of the Eastern Pacific (“El Niño” Region 1+2) continuous with the increase of the positive anomalies, happening of 0.3°C to 0.8°C.

The behaviour of the subsurface thermal structure in the Eastern Equatorial Pacific maintains the presence of negative anomalies whose nucleus presents values of -3.0°C that is located around 90°W in the level of the 60 ms; in addition at surface level in the first 100 ms a water cloak with anomalies of -1.0°C extends from 120°W to 160°E: below this surface layer in the level of the 200 ms a warm nucleus with positive anomalies of until 4.0°C is located, that projects towards the Eastern edge of the Equatorial Pacific, reaching 140°W.

A remarkable structure that it arose from the second fortnight of the previous month, is the presence at surface level (the first 50 ms) of a thin water cloak with anomalies of 2.0°C in the Eastern edge of the Equatorial Pacific.

In March the Mean Sea Level in the Southeastern Pacific fluctuated near its normal patterns: As opposed to the coasts of Ecuador was 5.0 cm on the average; to the Peruvian coast, in the north and central zones, positive anomalies appeared, whereas, in the south it prevailed the negative anomalies. The anomalies fluctuated between 7.0 cm (Talara and Callao) and -3.0 cm (San Juan). In front of Chile the Level of the Sea was characterized to present tendency to the increase, that implied values of positive anomalies in the stations of Arica (1.4 cm) and Caldera (3.5 cm), nevertheless, the negative anomalies stay fluctuating between -0.8 cm (Coquimbo) and -4.3 cm (Talcahuano).

The Index of Oscillation of the South by eighth consecutive month presents positive values being in this occasion of 1.1.

The Intertropical Convergence Zone (ITCZ) in the Eastern sector of the Pacific appeared branched off and with regulating convective activity, being located to the North branch in 5°N and the South branch on 3°S.

As soon as rains in the coasts of Ecuador, like in the previous month they appeared with surplus reaching in average an excess of the 120% on the climatologic value of the month. In the north coast of Peru during the first fortnight of the month, drizzles appeared registering themselves accumulated precipitations of 16 mm in Talara, whereas, in the Callao only rains were registered during the last days of the month. In Chile the atmospheric pattern associated to anticyclonal circulation and high pressures, originated precipitations of low intensity and a smaller number of days with rain, specially the south and austral zone.

As far as surface winds in the region of the Southeastern Pacific, winds variables with predominance of the south and Southeastern appeared, with wind occurrences of the north for some of the stations of Ecuador; the speeds were within the normal rank for the date.

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## II. NATIONAL IMAGE

### A. CONDITIONS IN THE COLOMBIAN COAST

The Center for the Pollution Control of the Pacific (CCCP) and the Hydrology, Meteorology and Environmental Studies Institute (IDEAM) inform that during March low volumes of precipitation in ample sectors of the country appeared, especially in the north and east of the Colombian territory. The predominance of the anticyclone of the Atlantic, amplified on good part of the Caribbean region was an influential factor so that in this zone the precipitations were little; nevertheless, some occasional rains associated to the passage of cold fronts influenced so that the historical values were surpassed. On the other hand, the activity of the ITCZ, especially between the 9 and the 14 of March, generated dense cloudiness and abundant precipitations in most of the Pacific region, as well as in the centre and the south of the Andean region; for the two regions in mention, in ample sectors the averages in a high percentage were surpassed. The ITCZ was located during great part of the month between 4 and 8 degrees of north latitude. For the Amazonia, like an own condition of the month, the humidity entrance from Brazilian earth, it caused persistent and abundant precipitations during most of the days of the month, with amounts superior to the usual during March. It is important also to emphasize the agreement of the passage of intraseasonal waves to the behaviour of rains in Colombia; the predominance of divergent phases during the month, supported of some forms the inhibition of precipitations in the country.

During the monitored of March of 2008, made by the Area of Operational Oceanography of the CCCP to the fixed station coastal N° 5 located to 10 miles of the bay of Tumaco between the coordinates 78. 51° W and 2° N, could be observed that the registry of SST for March, were of 27.9 and 26.7°C for the first and second fortnight respectively, throwing a monthly average of 27.3°C. A positive anomaly at surface level of 0.6°C appears, with respect to the historical average (March 2000 - March 2007) which is of 26.7°C.

In March the termocline for the first fortnight promoted 5 meters with respect to the last registry of February, positioning itself on the 28 meters, and for the second fortnight it positioned approximately on the 12 meters. The isotherm of 15°C becomes visible for this month to a depth of 55 meters, the isotherm of 27°C descended until the 5 meters.

As far as the behaviour of the salinity, it respectively registered at superficial level value of 30.52 and 29.18 ups for the first and second fortnight of March, throwing a monthly average of 29.85 ups. A negative anomaly of -1.72 appears at surface level with respect to the historical average that is of 31.58 ups.

The maximum value of salinity appeared in the first fortnight of the month, throwing a value of 34.96 ups to a depth of 143 meters approximately. The halocline was positioned respectively for the first and second fortnight on the 28 and 15 meters.

### B. CONDITIONS IN THE ECUADORIAN COAST

The Oceanographic Institute of the Navy of Ecuador (INOCAR) reports that during march of 2008 originating winds of the south appeared and of the north appeared occasionally. The temperature of the air throughout the Ecuadorian coast fluctuated between 26.4 and 27.5°C giving anomalies between 0.3 and 0.7°C. As far as the Sea Surface Temperature in average it presented value of 26.9°C what meant anomaly of 0.8°C.

In March, the Ecuadorian Coast continued supporting to a strong weather, characterized in intense rains during most of the month, appearing daily accumulated rain of up to 75 mm and a monthly accumulated of 460 mm that produced an accumulated excess on the normal for the month of 85%.

Considering the present behaviour of the conditions ocean-atmospheric and that in april begins the decrease of the rainy time of the Ecuadorian coast, one hopes that in the Ecuadorian coast the amount and intensity of rains diminish, staying the probabilities of surpassing the average values of accumulated precipitation for April.

As far as the temperature of the sea and the air in the Ecuadorian coast they will maintain the tendency to present values by on the normal of the month.

### C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) informs that in general in the Peruvian coast registered values of the SST over the monthly average, being observed increasing around 1°C, with respect to the previous month, with the exception of the South zone where the negative anomalies have prevailed. The anomalies of the SST fluctuated between 3,2°C (Lobos de Afuera) and -1.7°C (San Juan).

The Mean Sea Level (MSL) throughout the Peruvian coast has increased its values around 7.0 cm with respect to the previous month. In the north and central zones the positive anomalies have appeared; whereas, in the south the negative anomalies have prevailed. The anomalies of the MSL fluctuated between 7.0 cm (Talara and Callao) and -3.0 cm (San Juan).

In the zone between Talara and San Juan the temperature of the air (AT) has been increased around 1°C, with respect to the previous month, prevailing the positive anomalies; whereas, in the south it has diminished slightly below the monthly average. The Maxima anomaly of the AT appeared in Chimbote, north zone of the coast (3.8°C); whereas, the minim appeared in Mollendo, south zone of the coast (-1.2°C).

In the North coast during the first fortnight of the month, drizzles appeared registering accumulated precipitations of 16 mm in Talara, 4 mm in Paita, 6 mm in Lobos de Afuera and 5 mm in Chimbote, respectively; whereas, in the Callao only plans were registered during the last days of the month.

Throughout the Peruvian coast winds of south direction predominated; nevertheless, also they presented components of the southwest and southeastern in the stations of Paita, Chimbote and Lobos de Afuera, respectively. In relation to the wind speed the positive anomalies predominated, that fluctuated between 0.5 to 4.2 m/s; with the exception of Paita and Callao, that presented anomalies of -0.1 m/s.

### 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 monitoreo a series of oceanic and atmospheric variables. A description of the Sea Surface Temperature and the level of the sea between Arica (18°29'S) and Talcahuano (36°41'S) for March of 2008 is:

During this month, the SST continued showing a condition more colder than the normal thing especially in the north zone of the country between Arica and Caldera. This sector demonstrated negative anomalies that oscillated between -0.9 and -2.5°C. On the other hand, the zone north-centre presented values near the historical average, with anomalies of 0.4°C in the station of Coquimbo and -0.6°C in Valparaiso

Finally, like the observed thing in February 2008 the station of Talcahuano registered a value of positive anomaly of the order of 1.0°C by on the historical average.

The level of the sea was characterized to present a tendency to the increase that implied positive values of anomalies in the stations of Arica (1.4 cm) and Caldera (3.5 cm), nevertheless, still stay the negative anomalies characteristic of the cold event "La Niña" developed in the equatorial Pacific Ocean and south American coast, these anomalies fluctuated between -0.8 cm (Coquimbo) and -4.3 cm (Talcahuano).

The Meteorological Direction of Chile (DMCh) declares that during March the average temperature of the air was characterized by the presence of positive anomalies by on 1.0°C to a large extent of the country, being the central, south and austral zone, where were presented the greater heatings like Curicó (2.3°C), Temuco (1.9°C) and Punta Arenas (1.9°C).

The Maxima temperature of the air presented by third consecutive month a heating that affected a big part of the country, but of smaller magnitude than the previous months, arriving at anomalies by on 3.0°C between Temuco and Coyhaique. The region of the north coast maintained slight negative anomalies with values of -0.9°C in Arica and -0.6°C in Antofagasta.

The minimum temperature of the air presented positive anomalies in the central and south zone of the country, with the greater heating observed inside the central zone, like for example Curicó with 2.7°C. The austral and north zone registered negative anomalies, located in Antofagasta (-0.2°C), Puerto Montt (-0.2 °C) and Balmaceda (-2.3°C).

The anticyclonal circulation in the middle and low troposphere was characterized by the presence of positive anomalies, especially in the south and austral zone of Chile. The high frequency of days with anticyclonal flow, ridges of long wave and high pressures in surface, caused reduction of the precipitation with respect to a normal condition for the time.

The atmospheric pattern associated to anticyclonal circulation and high pressures originated precipitations of low intensity and a smaller number of days with rain, specially the south and austral zone. The unusual irruption of a low segregated in the central zone during day 7 produced precipitations in the central zone (Santiago - Curicó) with values between 8 and 12 mm.

### **III. PERSPECTIVE**

#### **A. GLOBAL**

Taking into account the present predictions from several numerical models, as well as the behaviour of the main oceanic and atmospheric indicators, is considered that during the next month the Central Equatorial Pacific will continue exhibiting negative anomalies of the SST, although the tendency is to continue the reduction of the same.

#### **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 the CPPS, it is anticipated that during the next month it continues appearing warm values of the SST in the Eastern Equatorial Pacific and coastal, as far as the temperature of the air will present values around its normal, particularly from the north coasts from Chile to the south of Ecuador.

Esteem that the MSL stays fluctuating around their average value without greater alterations; with respect to rains, the tendency for the coast of Ecuador and north of Peru are to continue presenting a surplus; whereas for the rest of the region the tendency of precipitations is to stay below the normal thing, in special the centre-south coast of Chile.

**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
JAN 08	2.8	12.5	10.6	26.6	24.7	24.1	23.8	23.1	12.5	4.9	1.9
FEB 08	6.5	12.2	8.9	26.4	24.8	25.0	26.2	25.1	13.8	4.7	2.7
MAR 08	6.8	10.3	6.3	26.8	26.0	26.5	27.3	25.9	14.3	8.4	1.1

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	
JAN 08	27.3	26.4	15.0	18.3	20.4	16.6	18.2	15.2	
FEB 08	26.5	27.3	16.2	19.3	19.5	15.8	18.6	16.0	
MAR 08	27.3	27.4	19.8	19.3	17.4	16.0	18.1	14.6	

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	
JAN 08	***	2705	1060	1602	687	1248	902	691	
FEB 08	***	2630	1070	1587	675	1245	906	693	
MAR 08	***	2669	1160	1644	706	1305	932	697	

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)

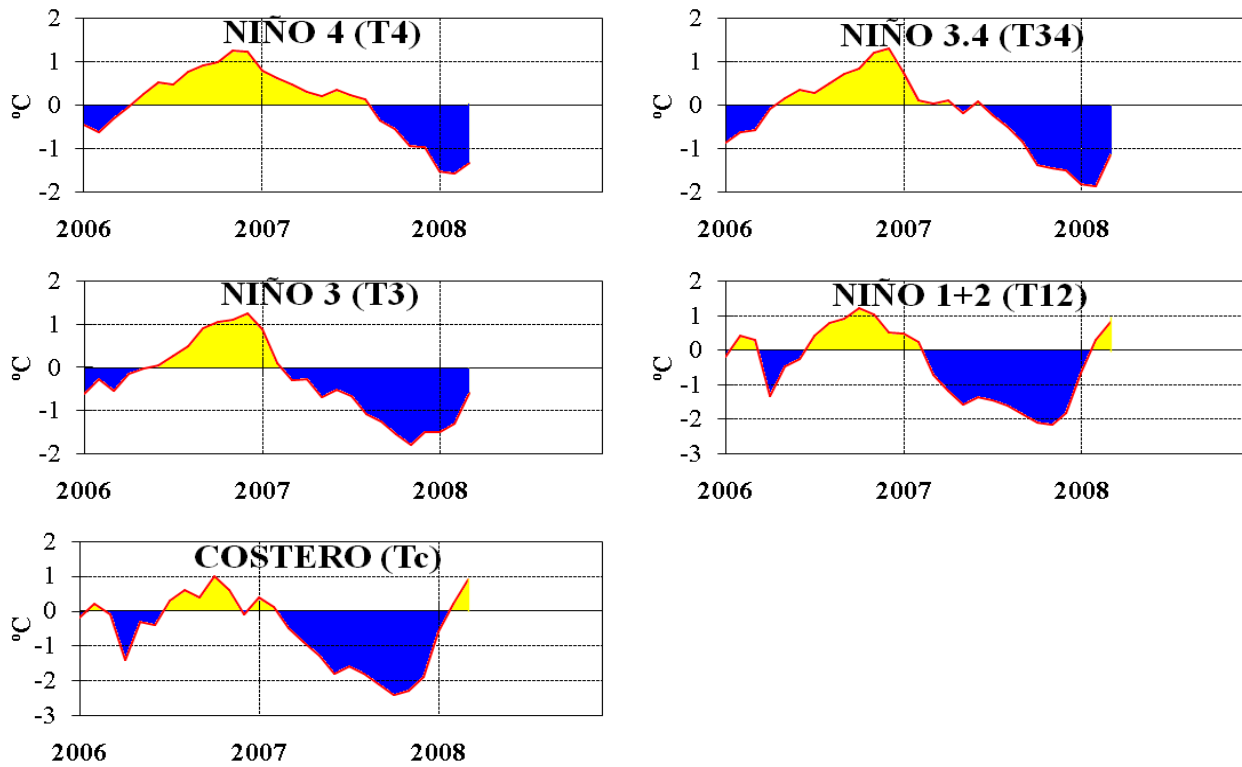
PENTADS	Sea Surface Temperature (SST)			Mean Sea Level (MSL)			
	BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO	
FEB	02	***	25.4	15.6	***	261.7	104.1
	07	***	24.5	15.6	***	260.2	103.2
	12	***	22.1	15.6	***	261.6	103.7
	17	***	21.7	16.3	***	266.2	106.0
	22	***	24.0	16.4	***	***	111.8
MAR	27	***	25.6	17.8	***	268.8	***
	04	***	25.4	20.0	***	271.6	118.60
	09	***	25.4	20.5	***	***	119.90
	14	***	26.3	21.9	***	268.8	115.40
	19	***	24.7	20.9	***	268.1	117.50
	24	***	21.1	18.9	***	268.3	114.00
	29	***	22.3	17.3	***	260.3	108.00

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

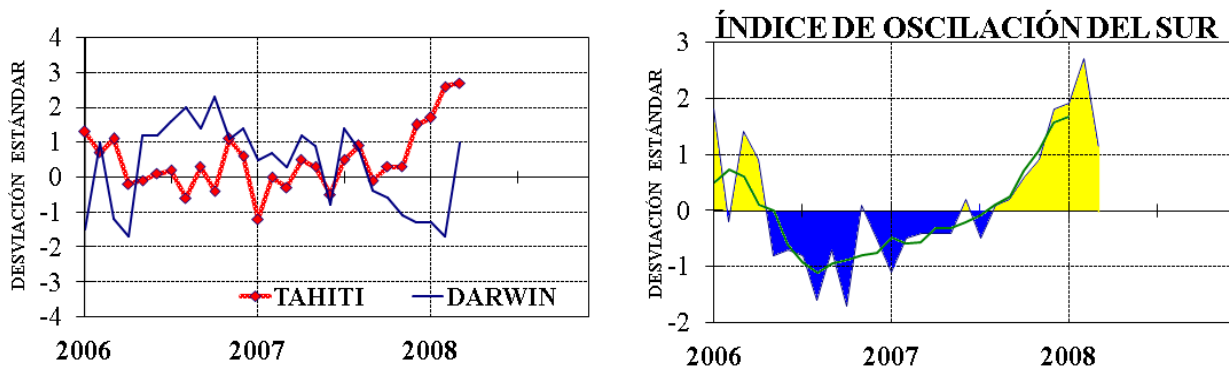
Note.

\* Values revised

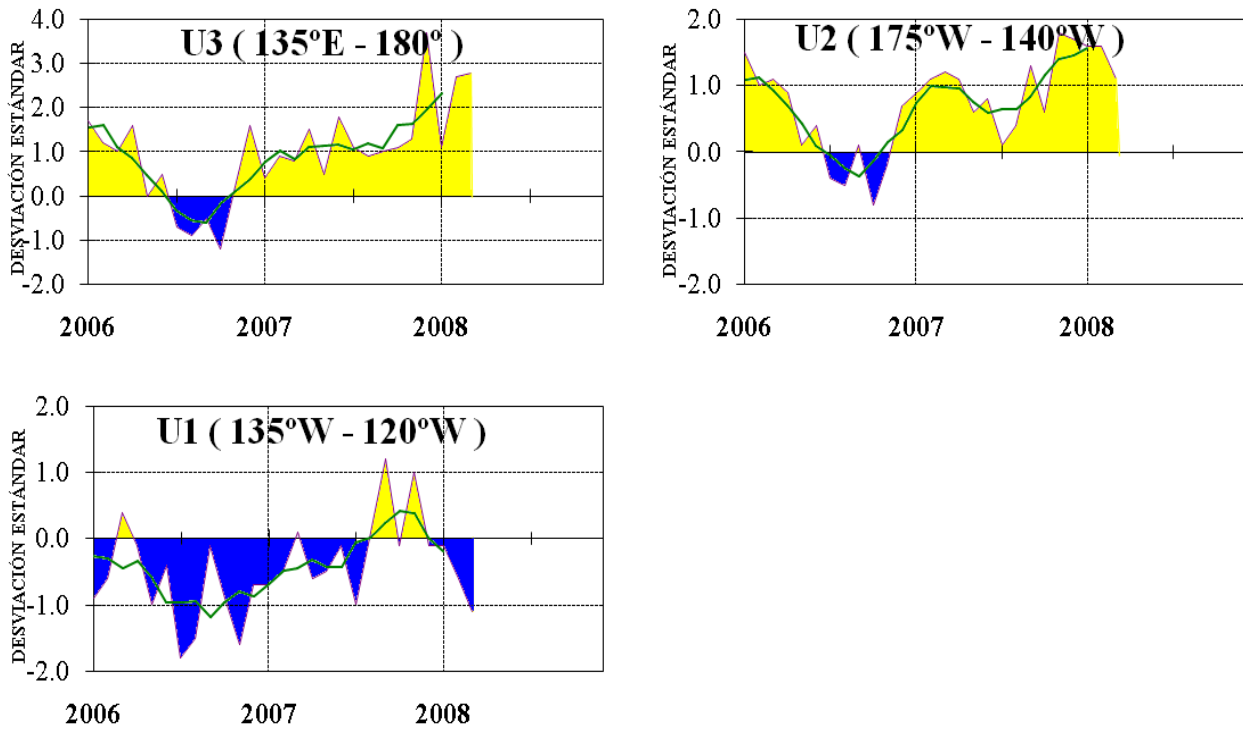
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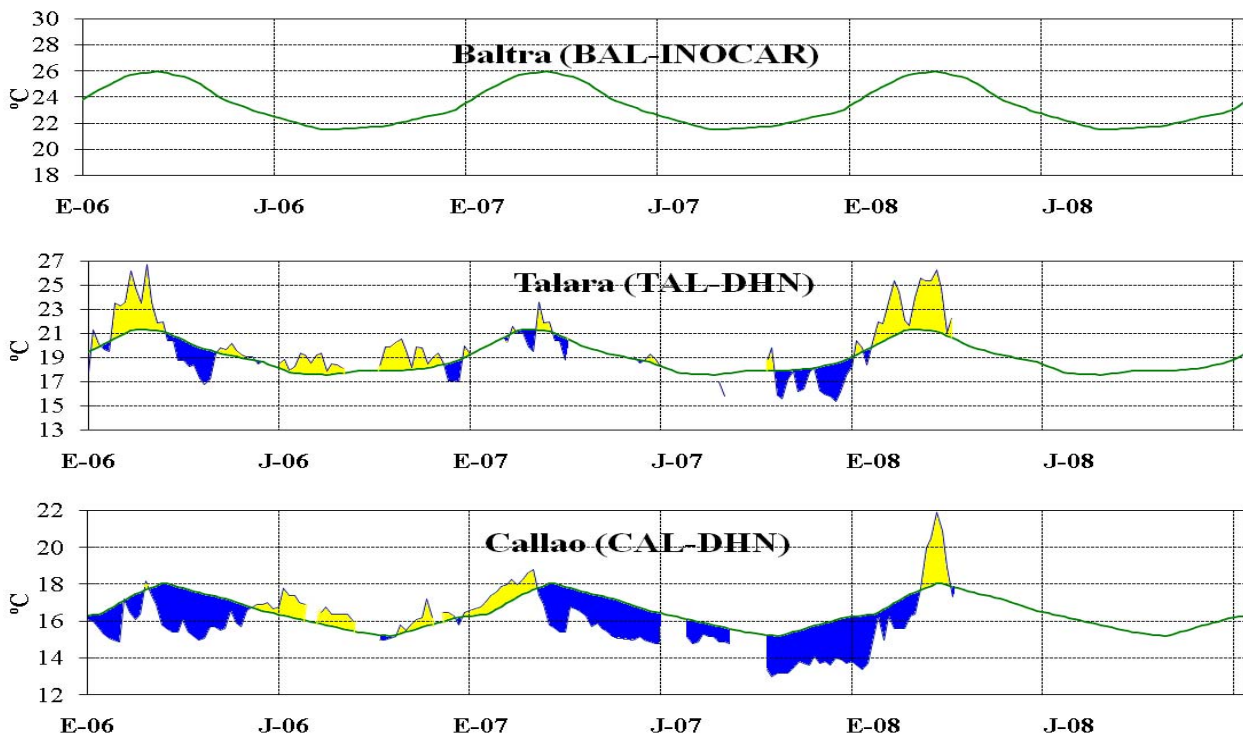
**Figure 3.-** Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).



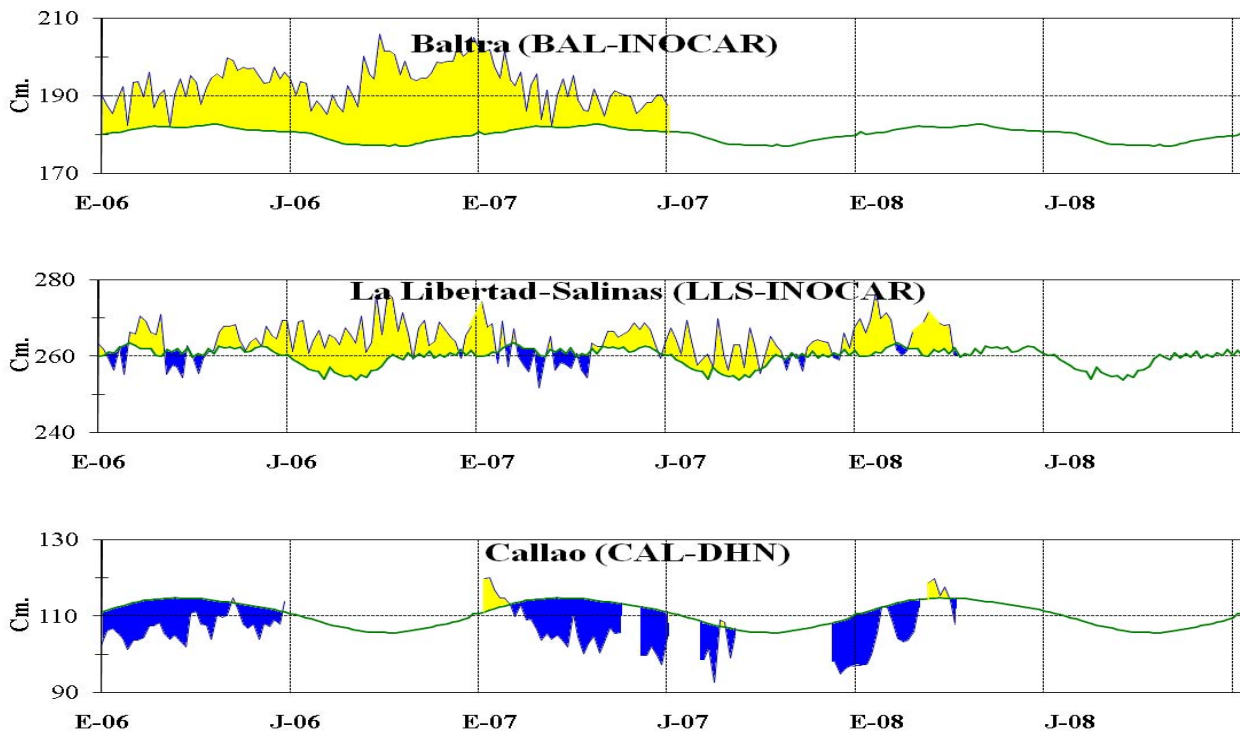
**Figure 4.-** Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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



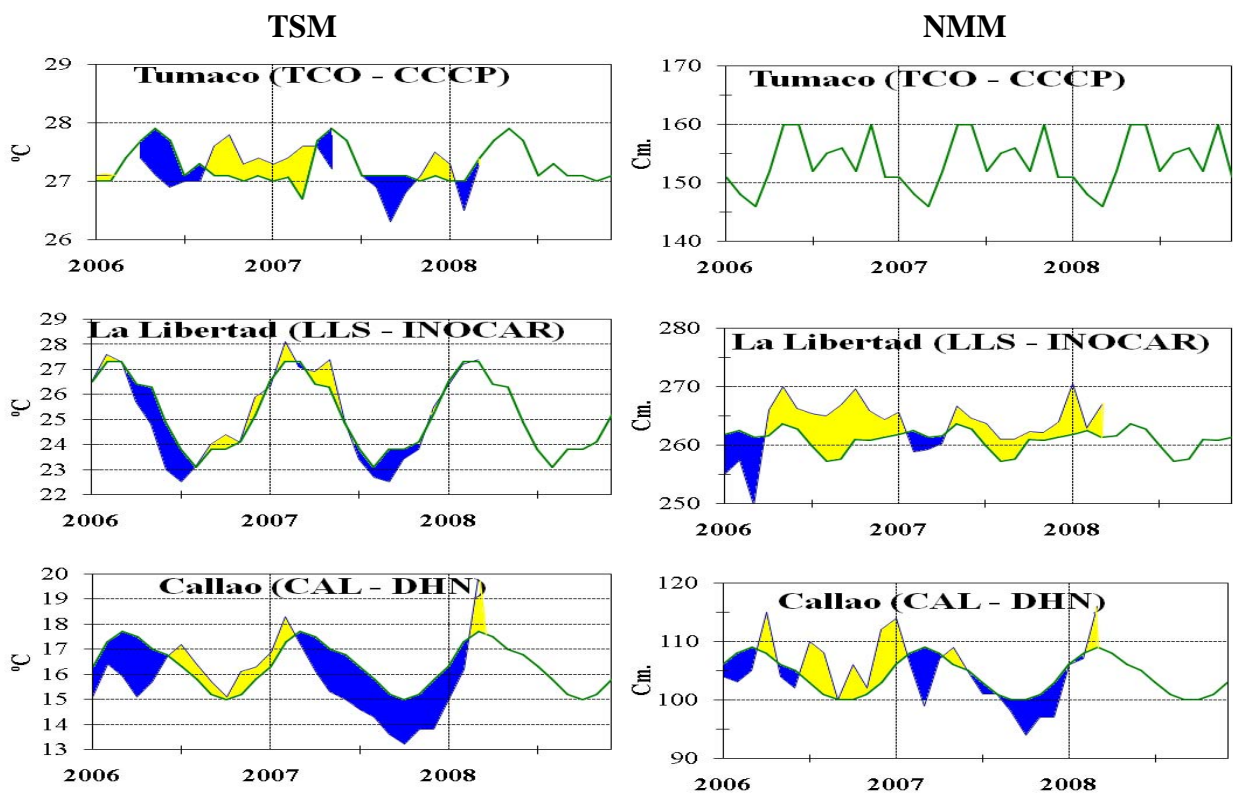
**Figure 5.-** Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).



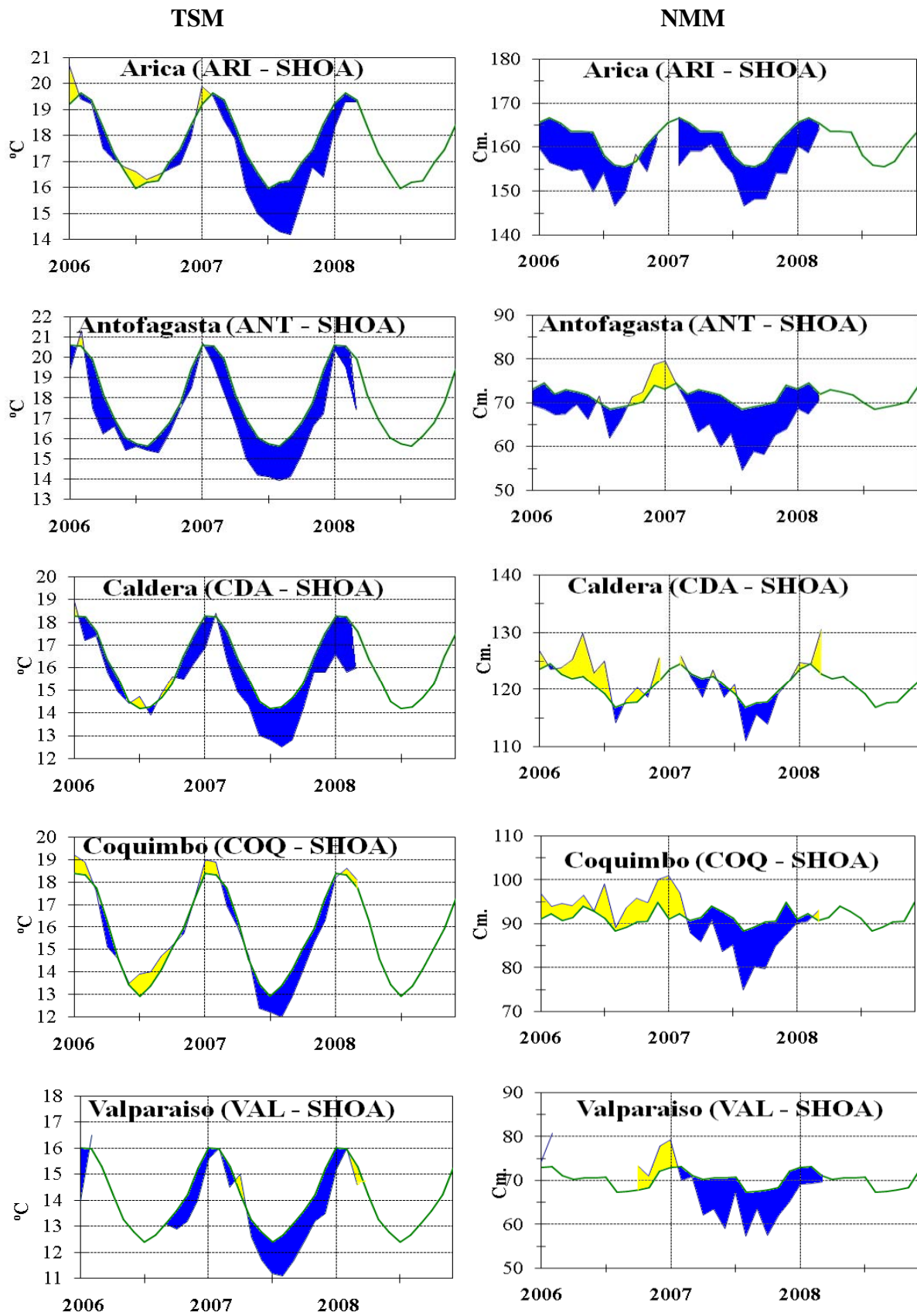
**Figure 6.-** Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)



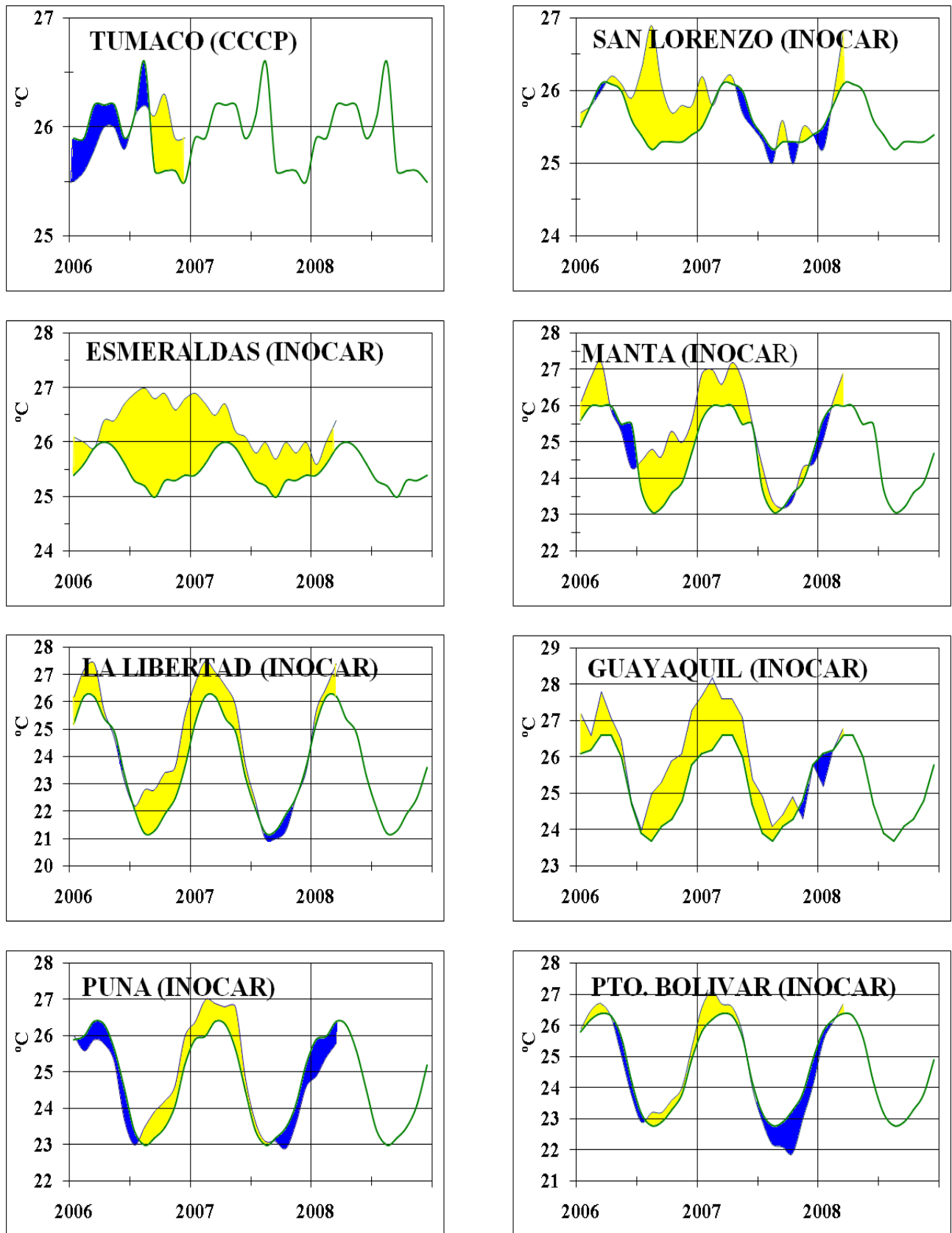
**Figure 7.-** Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).



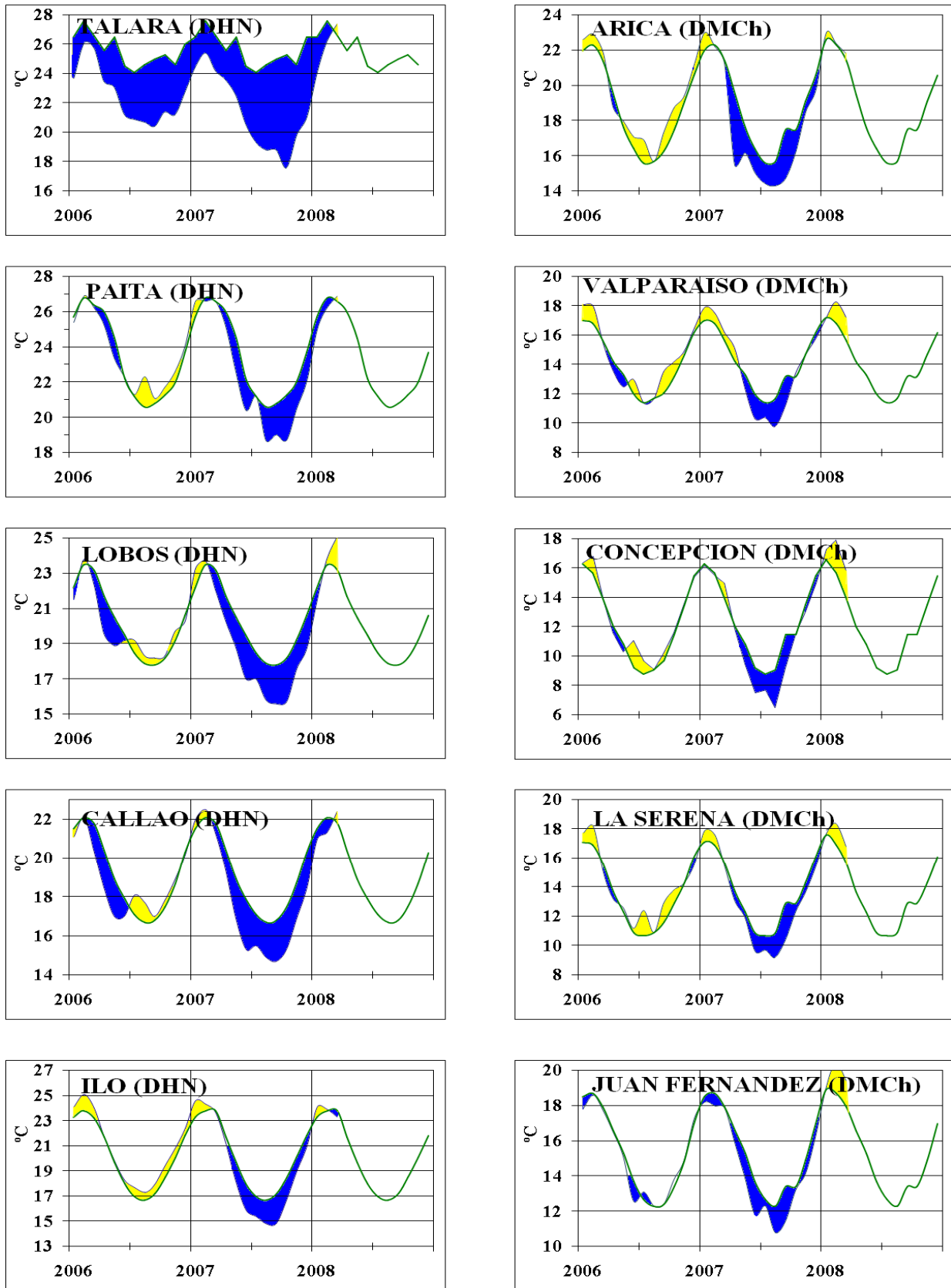
**Figure 8a.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).



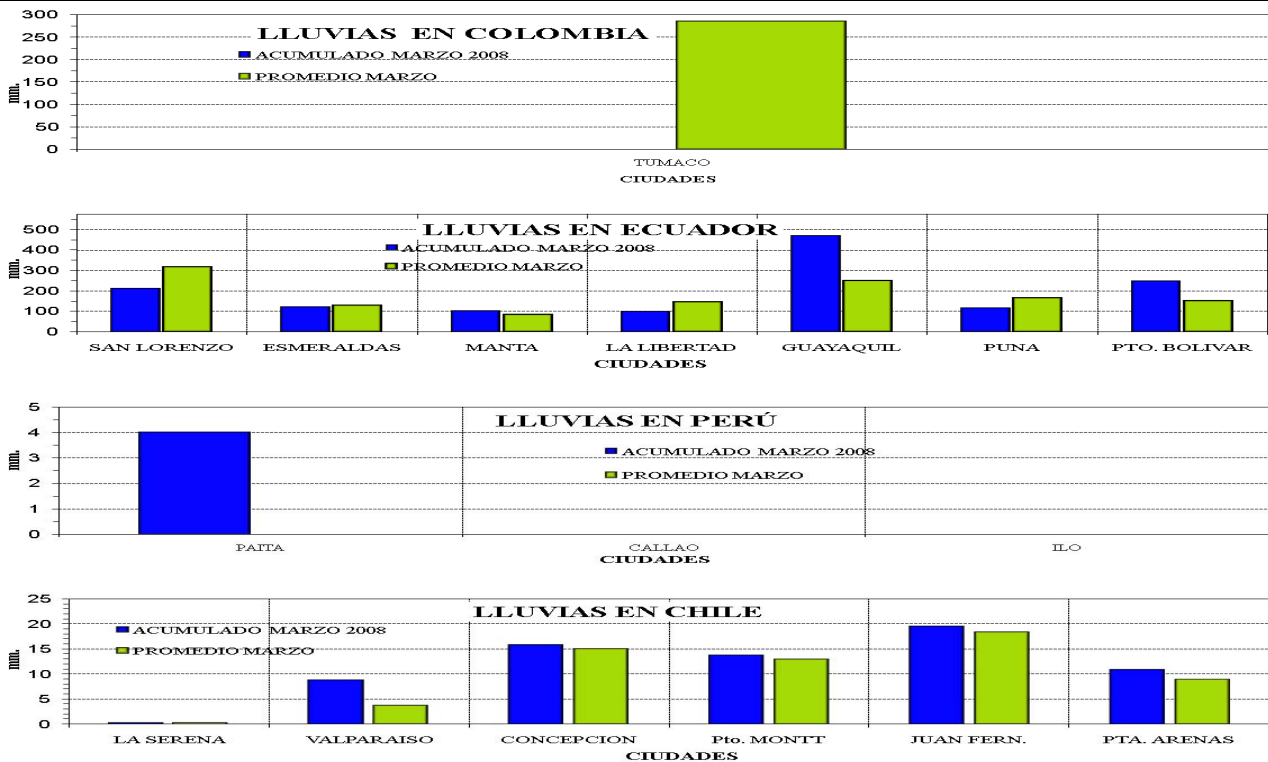
**Figure 8b.-** Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).



**Figure 9a.-** Monthly means of the AT (°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).

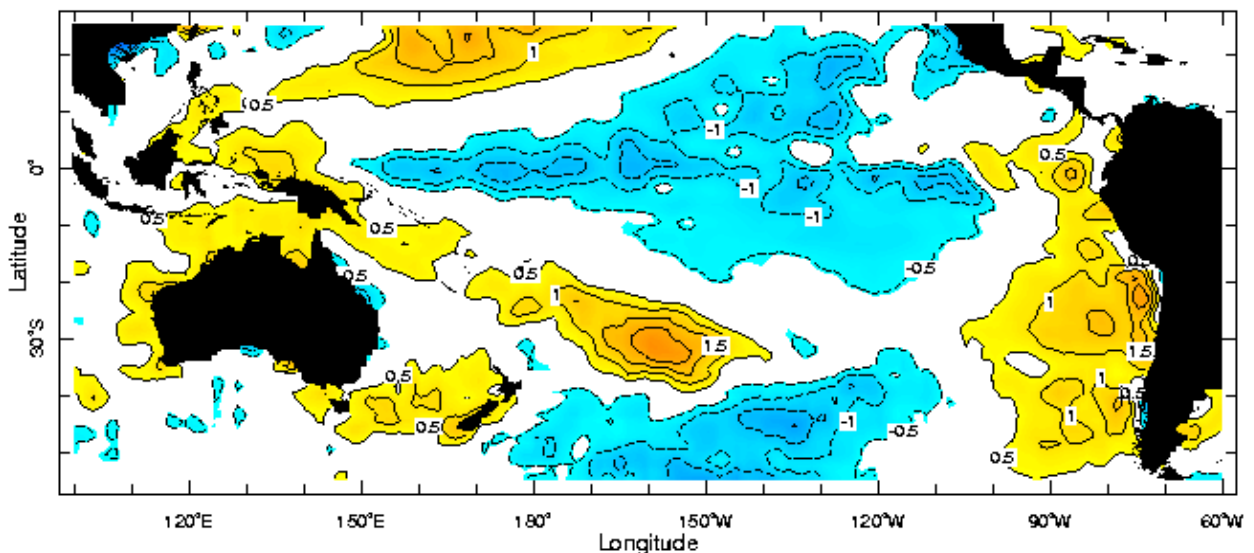


**Figure 9b.-** Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).



**Figure 10.-** Rains during March 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) Marzo de 2008



23-29 Mar 2008

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

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