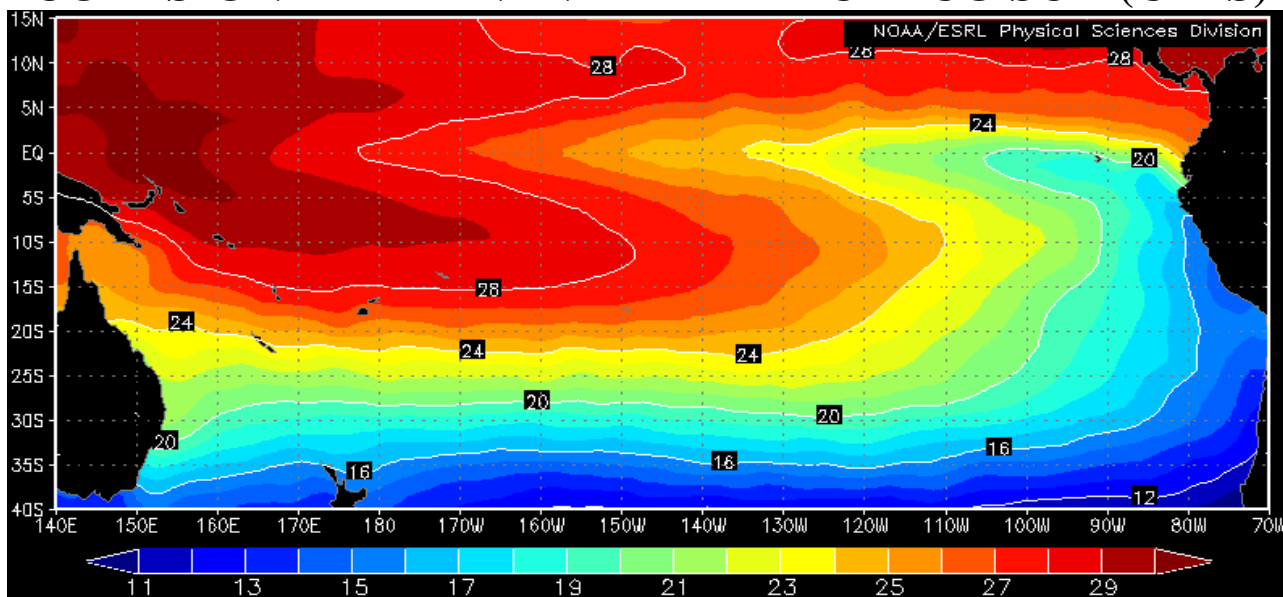


# COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



SEPTEMBER 2007

BAC N° 204

## *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

In September continued the cooling of the Equatorial Pacific Ocean, observed in all “El Niño” regions; being more intense in the Eastern edge, decreasing the negative thermal anomalies towards the western sector of the Pacific.

The temperature of the sea during the last week of September exhibited anomalies about -0,5°C in the Western Pacific, -1,7°C for the Central Pacific and -2,4°C in the Eastern Pacific, staying could conditions for the Equatorial Pacific.

As far as surface winds, stayed in the region of the Southeastern Pacific the predominance of winds from south and Southeastern, with speeds fluctuating around the normal range for the date.

The Southern Oscillation Index, as in the previous month, presented slightly positive values again, being in this occasion of 0.2.

During this month, the mean sea level in the Southeastern Pacific, was characterized to fluctuate closely in the coasts of Ecuador and Peru around its normal patterns for the month; in Chile the negative anomalies stayed, with fluctuations between -6,4 cm (Caldera and Valparaiso) to -9,1 cm (Antofagasta). Taking into account the present thermal behaviour of the Equatorial Pacific Ocean, as well as results of several numerical models, are anticipated that, during the next month in the Eastern and Central sector of the Pacific, temperature of the sea would stay below its normal value, showing the presence of an event La Niña.

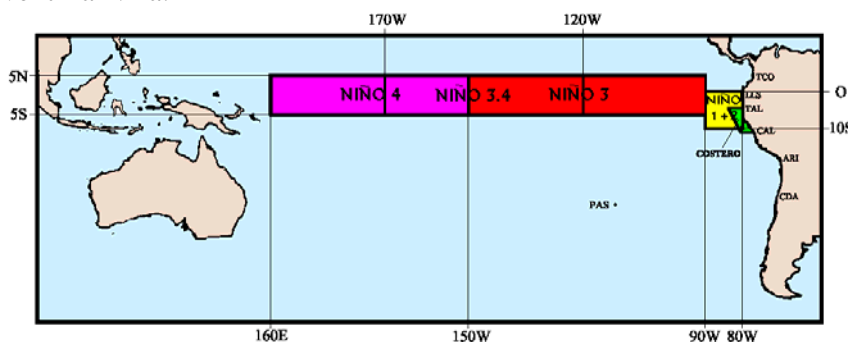


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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**CLIMATE ALERT BULLETIN**  
**BAC Nº 204, SEPTEMBER 2007****I. GLOBAL AND REGIONAL IMAGE**

The Equatorial Pacific Ocean during September was characterized by the maintenance and, at some moments, fortification of the process of cooling of the Sea Surface Temperature (SST), particularly in the Eastern sector of the Equatorial Pacific, reaching the SST values of anomaly about  $-2,1^{\circ}\text{C}$  in the Southeastern Pacific region. The monthly anomaly of the SST in "El Niño" regions presented generalized cooling, whose values for September with respect to previous month in the Pacific Western region ("El Niño" Region 4) was from  $0,1$  to  $-0,3^{\circ}\text{C}$ , in the Central Pacific ("El Niño" Region 3.4) the anomaly was from  $-0,5$  to  $-0,8^{\circ}\text{C}$  and in Eastern Pacific ("El Niño" Region), was from  $-1,6$  to  $-1,9^{\circ}\text{C}$ .

At subsurface level, the behaviour of the thermal structure during September in the Eastern Equatorial Pacific was enough similar to that in the previous month, presenting negative anomalies until  $-3,0^{\circ}\text{C}$  that reached the level of the 150 m. as far as  $170^{\circ}\text{W}$ , disappearing the small warm water cell observed by the end of the previous month in the Eastern edge. On the other hand, the body water with positive anomalies ( $1,0^{\circ}\text{C}$ ) present in the Western margin of the Pacific, stayed at the level of 200 m, moving towards the East, near the date line in the Pacific.

The Mean Sea Level (MSL) in the Southeastern Pacific during September, fluctuated near its normal patterns for the month: in the coasts of Ecuador it was 4.0 cm of the average, in Peru the anomalies fluctuated between 1.0 cm (Talara) and  $-3,0$  cm (Matarani) and in Chile the negative anomalies persist, with fluctuations between  $-2,8$  cm (Arica) and  $-16,3$  cm (Talcahuano).

The Southern Oscillation Index (SOI) continuous in the positive phase, with a value of 0,2. With respect to the atmospheric pressure anomalies of Tahiti and Darwin reached values of  $-0,1$  and  $-0,4$  respectively.

The Intertropical Convergence Zone (ITCZ-ZCIT), in the Eastern Pacific Ocean, appeared like a cloudy band, with its central axis located around  $8^{\circ}\text{N}$ , with presence of active convective cells that exerted his greater influence on the Central America Region, North of Colombia and the Caribbean.

With respect to rains, during September in Colombia they were deficit quite distant of which it was anticipated; changes in the associated patterns of atmospheric circulation to an intensification of the system of high pressure in the northeast Pacific, were the main factor so that the behaviour of rains during the month was deficit in some zones of Colombia; in Ecuador also rains were deficit, with the occurrence of sporadic episodes of rains in the North region, that did not exceed the normal value for the month; in Peru, only in Mollendo light drizzles were registered, with 1.0 mm of accumulated precipitation; in Chile it continued during September the rain deficit, reaching anomalies up to 33.0 mm under the normal in Chillán. In as much, from  $39^{\circ}\text{S}$  towards the south a surplus was registered that reached positive anomalies up to 40.0 mm being of greater intensity in the centre-south zone of the country.

With respect to surface winds, they predominated from South and Southeastern; with speeds that fluctuated on the normal value of the month in approximately 1.0 m/s.

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

The Center for Pollution Control of the Pacific (CCCP) and the Hydrology, Meteorology and Environmental Studies Institute (IDEAM), inform that during September the atmospheric conditions mainly were modulated by the activity of the Intertropical Convergence Zone - ITCZ that stayed located between  $8$  and  $10^{\circ}$  of North latitude, causing rains especially in the north and centre of the country. By the other hand, the Colombian

Caribbean Sea presented conditions fresher than the registered in the previous month, situation that repelled in a remarkable diminution in the step and activity of the tropical waves of the East, in the national territory.

In the marine area of Colombia, four tropical waves distributed thus were only registered: two in the first fifteen days, third initiating the second fortnight and the fourth at the end of the month. Some of the waves that formed in the Atlantic, became tropical storms before entering the Caribbean and they dissipated quickly, with exception of the tropical storm Felix, which formed during the first days of the month to the northwest of the Guyanas, becoming quickly Hurricane, with a displacement west-northwest in direction of the Colombian Caribbean Sea, where it happened in the night of Monday 3 of September about 118 kilometres to the north of the island of Providence, without important effects; the winds reached bursts of 60 kilometres per hour and the spiral bands of Felix produced important heavy rains in the departments of the Caribbean region.

Finally, it is worth to emphasize that the conditions of rain were deficit and were quite distant of which was anticipated, in agreement with the development of the phenomenon "La Niña" of the tropical Pacific. Changes in the associated patterns of atmospheric circulation due to intensification of the high pressure system in the northeast Pacific were the main factor so that the behaviour of rains during the month was deficit in some zones of Colombia.

During the monitoring made by the Area of Operational Oceanography of the CCCP in September 2007, in the coastal station number five (05), located 10 miles from the bay of Tumaco between the coordinates 01°55'41.94"N and 78°51'40.9"W, respectively obtained a registry of sea surface temperature for the first and second fortnight of 26.97 and 25.64°C, with a monthly average of 26.30°C and a positive anomaly at surface level of 0,24°C, with respect to the historical average (July 1999 - August 2007), which is of 27.12°C.

During September, the thermocline for the first fortnight approximately descended 4.3 m with respect to the last registry from August, being located on 32 m approximately, and for the second fortnight it was positioned approximately on 47 m, descending 15 m with respect to the first fortnight.

The salinity at superficial level registered respectively values of 28.33 and 29.04 ups for the first and second fortnight of September, throwing a monthly average of 28.68 ups, presenting a -2.19 ups anomaly at superficial level with respect to the historical average that is 30.88 ups. The halocline oscillated between 31 and 41m for the first and second fortnight, respectively.

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

The Oceanographic Institute of the Navy of Ecuador (INOCAR), reports that, in September 2007, the continuous presence of wind from the south affected the central and South zone of the Coast, transporting to the region cold air masses, demonstrated in the reduction of the air temperature (21,9°C) in the South coast, whereas in the north the air temperature was a little but warmer (25,8°C), with presence of slight and brief precipitation as drizzles.

The dry season of the Ecuadorian coast, characterizes by the presence of minimum rains and the reduction of sea and air temperature, particularly between August and September. In September 2007 were important the presence of wind from the west and the cold air transport over the region, especially on the south and central zone; and trade winds from the Southeastern that moderately influence the Galápagos Islands.

The presence of cloudiness in low levels has caused occasional fogs and drizzles in the coastal zone, as well as weak rains in the North inner zone, in any case with accumulated amount under the normal for the period.

The variation of the air temperature in the Coast was irregular, oscillating between values slightly over the average to the north (+0.6°C in Esmeraldas 1°N) and under the normal in the centre and the south (-0.5°C in Guayaquil), which is considered normal within the range of fluctuation of the dry season.

The sea surface temperature continues in general terms with values slightly superior to the normal in the north coast of Ecuador (1°N), below normal in approximately -0.9°C in the Insular-Galapagos region and -2.0°C in the south coast of the Ecuadorian coast.

The air temperature during this month presented values below the normal (-2.0°C) in the south coast and above the normal (0.4°C) in the north coast.

Considering the present behaviour of the ocean-atmospheric conditions, it would be expected for October 2007 that in the Ecuadorian coast, the precipitations (rains and drizzles) are minimum, according to the typical of the dry season, with accumulated values underneath to its normal. In the Galápagos Islands precipitations would continue deficit.

It will stay the situation of stability for most of the Coastal Region and Galápagos Islands; this is cold air, cloudiness in low levels that dissipate in the course of the day, occasional drizzles and fogs in sectors of the coastal zone and even weak rains in the interior especially in the north coast.

### C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) informs that in all Peruvian coast the registries of the SST continued below the monthly average, being observed in general a slight reduction of its values towards conditions more cold. The anomalies of the SST fluctuated between -1.0°C (Talara) and -2.2°C (San Juan).

The Mean Sea Level throughout the Peruvian coast presented in general light anomalies, with values very near its normal patterns of the month. The values of the anomalies fluctuated between 1.0 cm (Talara) and -3.0 cm (Matarani).

The temperature of the air also stayed below the monthly average, being appraised in the coast, colder conditions, diminishing around 0,4°C, with respect to the previous month. The maximum negative anomaly appeared in the station of Ilo (-2.4°C); whereas, the minimum anomaly appeared in Chimbote (-1.1°C).

In the south coast, specifically in the locality of Mollendo appeared a light drizzle registering 1.0 mm of accumulated precipitation. Whereas in Callao were only registered intermittent drizzles, during the second fortnight of the month.

Throughout the Peruvian coast winds from the South direction predominated; with the exception of the stations Lobos de Afuera and Mollendo, in which winds from the Southeastern appeared. Respect with the wind speed, negative anomalies in the zone between Paita and Callao predominated, with values from -0.2 to -1.6 m/s; with the exception of Chimbote that presented an anomaly of 1.1 m/s, whereas towards the south the anomalies which predominated were positive, fluctuating between 0.7 to 1.0 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 sea level to supervise a series of oceanic and atmospheric variables. Next, its presented a description of the sea surface temperature and the sea level between Arica (18°29'S) and Talcahuano (36°41'S) for September 2007.

With respect to the SST, it is observed that from June of the present year has stayed a cold condition with negative anomalies in the entire north coast and the centre-south of the country. These anomalies during September 2007 fluctuated between the -0,9 and -2,4°C, appearing the greater differences in the North region (Arica and Antofagasta) with values of temperature about 2,0°C below the historical average.

The behaviour of the sea level, was characterized for presenting a slight positive tendency, nevertheless, this increase did not imply positive anomalies values, since as happens in the case of the SST stay the negative

anomalies of this variable in all monitoring stations, with fluctuations between -6.4 (Caldera and Valparaiso) to -9.1 cm (Antofagasta).

The data of sea surface temperature and sea level described previously for the north zone and the centre-south of Chile are coherent to the cold conditions developed in the tropical Pacific.

The Meteorological Direction of Chile (DMCh) expresses that during September, predominated average air temperatures below the normal to a large extent of the country, associated to maximum and minimum temperatures below the average.

The North zone of the country registered maximum temperatures below the normal, reaching a reduction until  $-4.3^{\circ}\text{C}$  in Arica ( $18^{\circ}\text{S}$ ). On the other hand, the minimum temperatures presented negative anomalies that reached values about  $-1.9^{\circ}\text{C}$  in Antofagasta.

The central zone of the country continued to registering a cooling as much in the maximum temperatures as minimum, reached anomalies about  $-3,5^{\circ}\text{C}$  in Chillán in the maximum and  $-2,9^{\circ}\text{C}$  in the minimum, respectively.

The south and austral zones also registered a cooling like the rest of the country. The maximum temperatures presented anomalies until  $-2.4^{\circ}\text{C}$  in Coyhaique and the minimum temperatures registered a cooling until  $-2.0^{\circ}\text{C}$  below the average in Balmaceda.

With respect to the atmospheric pressure at Mean Sea Level, during September presented a greater persistence of pressures above the normal, especially on the south and austral zones of the country, favouring the passage of the frontal systems towards the central zone of the country, increasing the precipitation deficit that already was observed during the last months. The monitoring stations registered positive anomalies up to 3 hPa in the central zone, and the austral zone registered an increase of pressure up to 5.8 hPa (Balmaceda).

As far as the precipitation deficit observed during the last months, especially in the central zone it continued during September, reaching anomalies up to 33.0 mm under the normal in Chillán. In as much, from  $39^{\circ}\text{S}$  towards the south a surplus was registered that reached positive anomalies up to 40,0 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 the Equatorial Pacific during the next weeks would continue presenting cold conditions, particularly in the region of the Eastern and coastal Equatorial Pacific.

#### 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 will continue the cooling of the SST in the Eastern and coastal Equatorial Pacific, showing the presence of an event La Niña, in the same way the air temperature, will present values below its normal, particularly from the coasts of Chile to the south of Ecuador.

With respect to the MSL it would also continue fluctuating around its average value, with certain tendency to maintain the negative anomalies, particularly in front of Chile. With respect to rains, they will slightly present a deficit distribution for the time, in the pacific coast of Colombia and north coast of Ecuador; whereas for the rest of the region the tendency of precipitations is to stay below the normal, especially in the central and 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
<b>JUL 07</b>	4.9	8.5	7.9	28.8	26.9	24.9	20.4	18.3	14.4	14.2	-0.5
<b>AUG 07</b>	4.9	9.5	9.4	28.6	26.2	23.9	19.2	17.1	15.4	13.4	0.1
<b>SEP 07</b>	4.7	11.2	10.0	28.1	25.8	23.6	18.6	16.4	14.2	11.5	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	
<b>JUL 07</b>	27.1	23.4	14.7	14.6	14.1	12.8	12.2	11.2	
<b>AUG 07</b>	26.9	22.7	14.3	14.3	13.9	12.5	12.0	11.1	
<b>SEP 07</b>	26.3	22.5	13.6	14.2	14.1	12.8	12.9	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	
<b>JUL 07</b>	***	2637	1010	1590	629	1209	852	674	
<b>AUG 07</b>	***	2610	1010	1512	546	1111	750	574	
<b>SEP 07</b>	***	2610	980	14.2	14.1	12.8	12.9	11.7	

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)

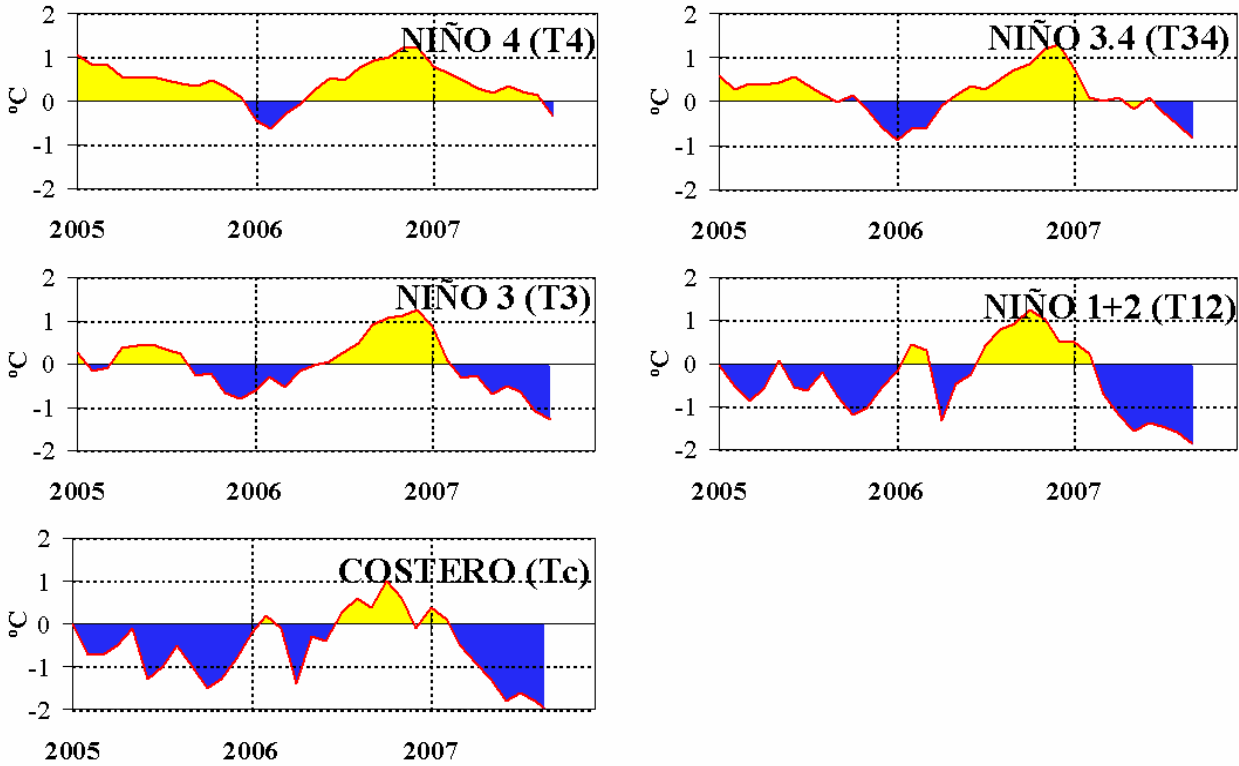
PENTADS	Sea Surface Temperature (SST)				Mean Sea Level (MSL)		
	BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO	
<b>AUG</b>	01	***	16.90	14.90	***	259.0	98.9
	06	***	***	15.30	***	260.5	101.8
	11	***	***	15.20	***	257.0	92.6
	16	***	***	15.20	***	270.0	109.1
	21	***	17.00	14.90	***	260.5	108.4
<b>SEP</b>	26	***	15.80	14.90	***	256.5	99.1
	31	***	***	14.80	***	263.0	105.1
	05	***	***	***	***	263.0	***
	10	***	***	***	***	257.0	***
	15	***	***	***	***	267.5	***
	20	***	***	***	***	263.0	***
	25	***	***	***	***	255.5	***
30	***	***	***	***	260.0	***	

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

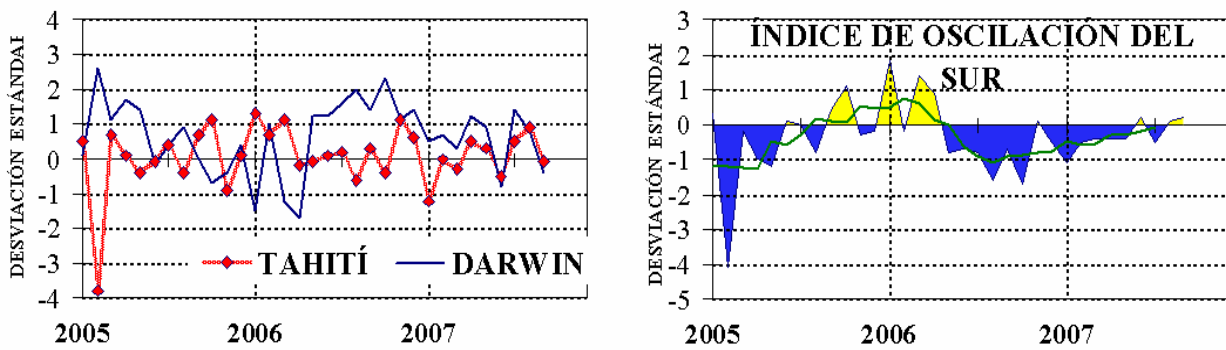
Note.

\* Values revised

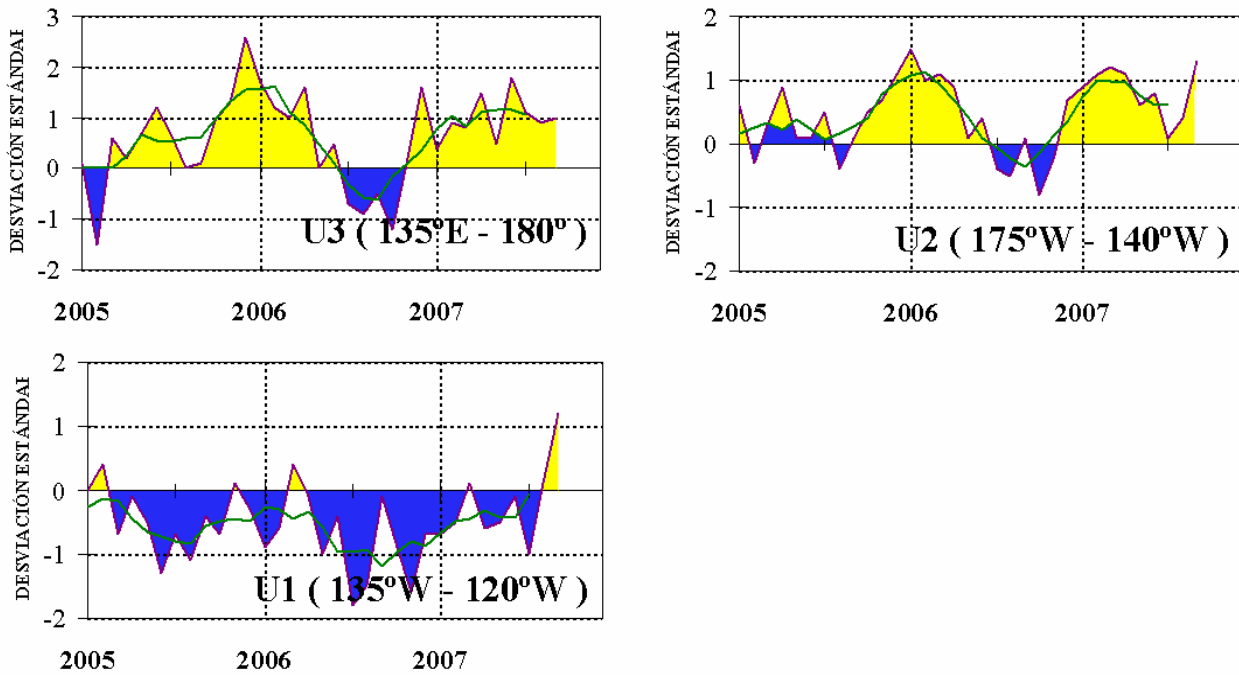
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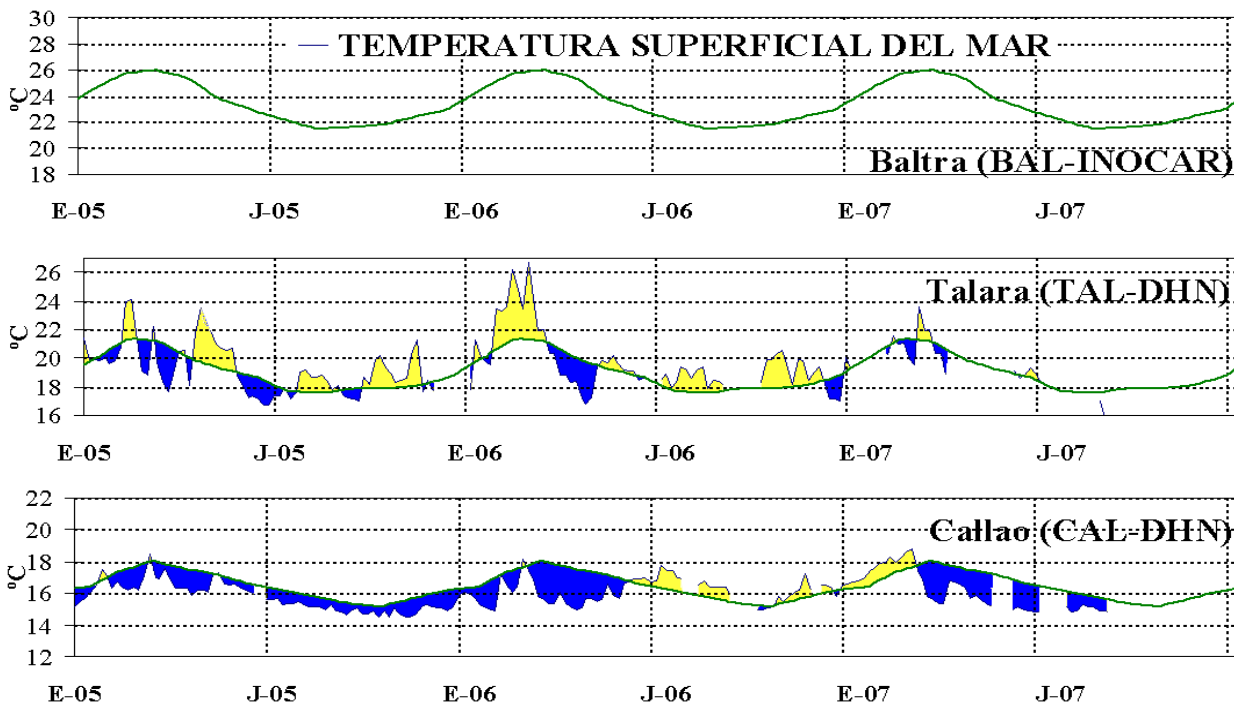
**Figure 3.-** Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).



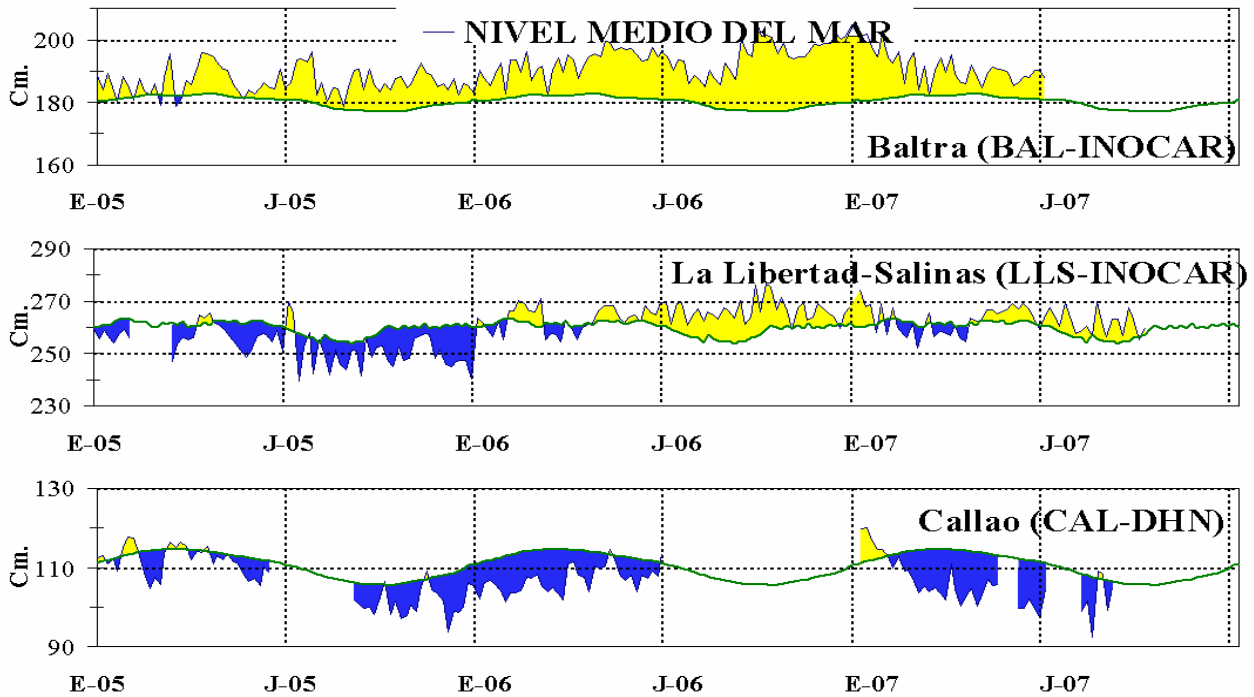
**Figure 4.-** Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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



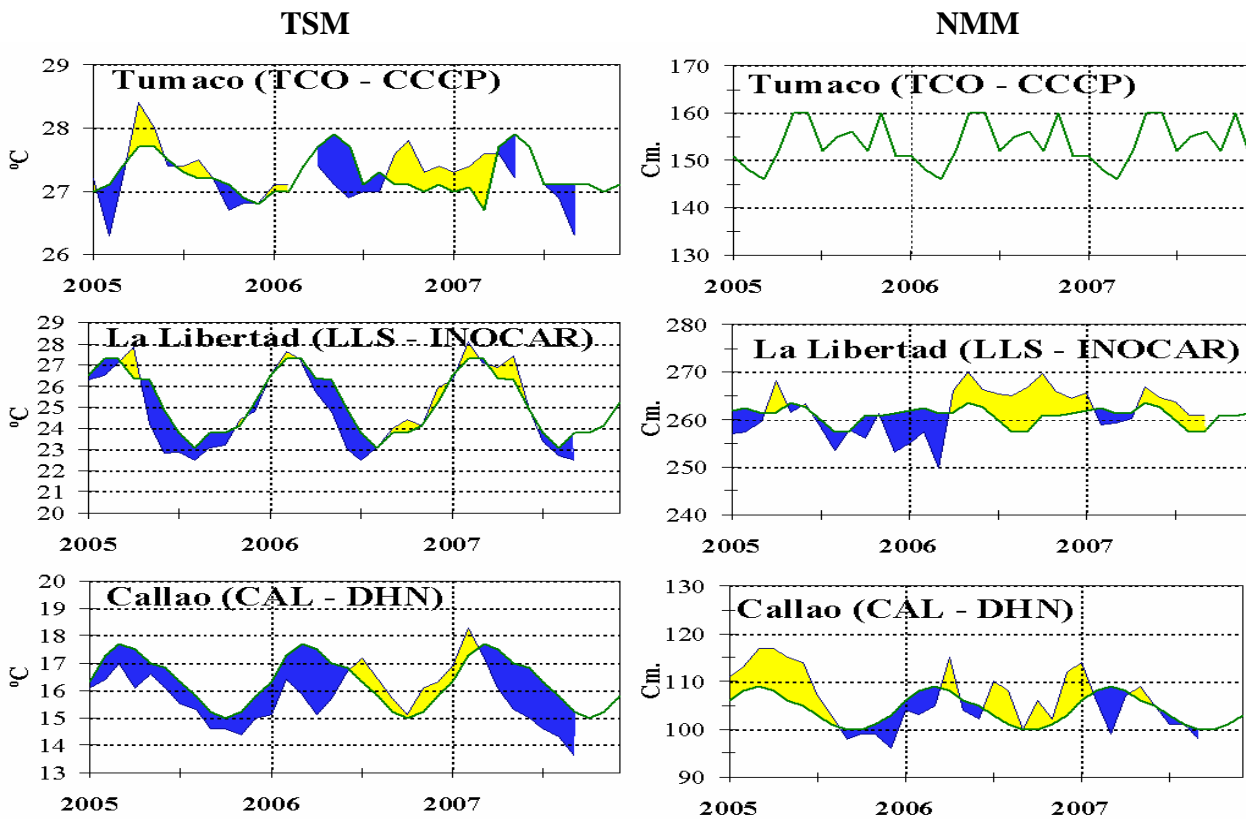
**Figure 5.-** Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).



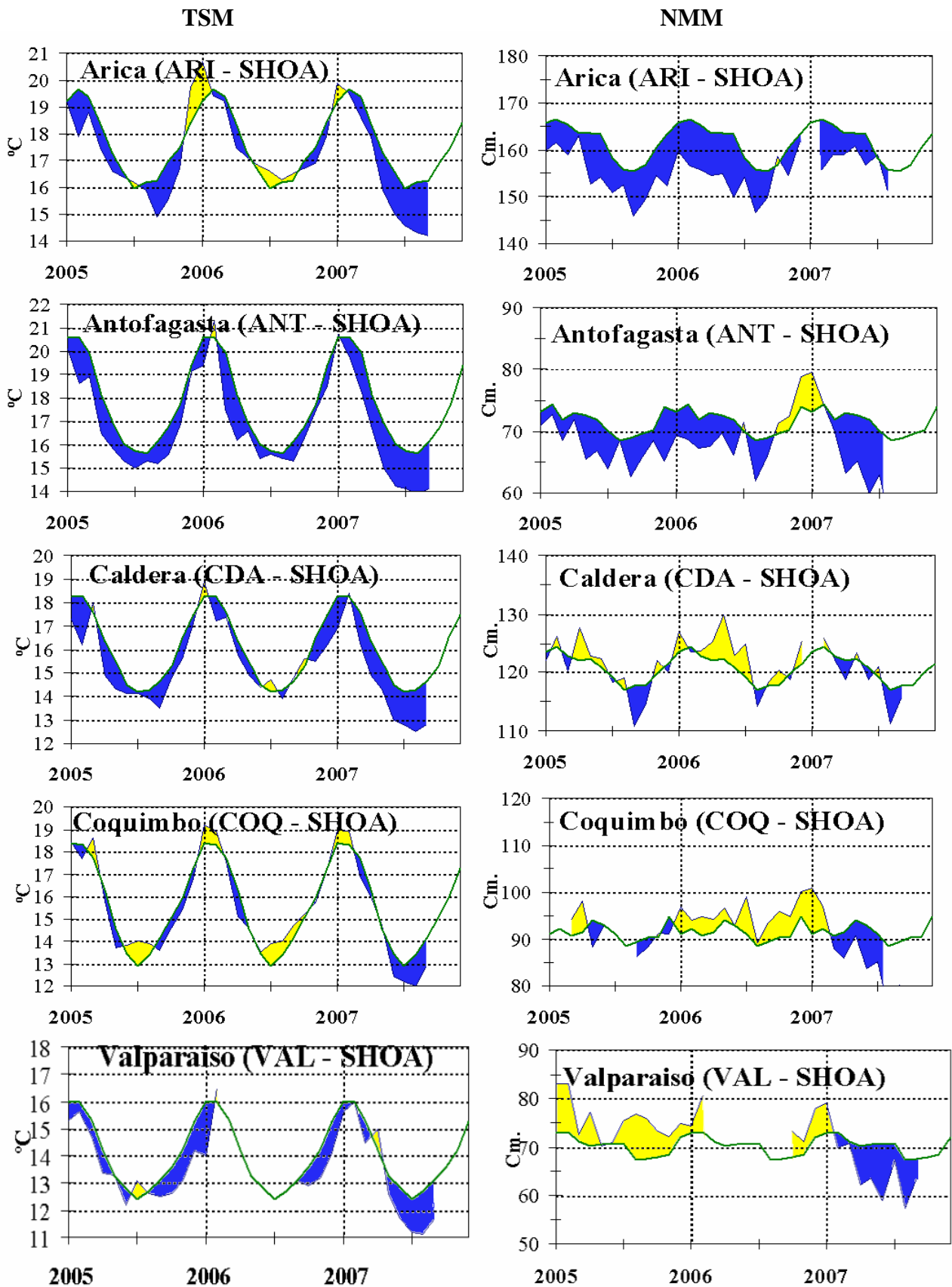
**Figure 6.-** Five day averages (pentads) of SST (°C) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)



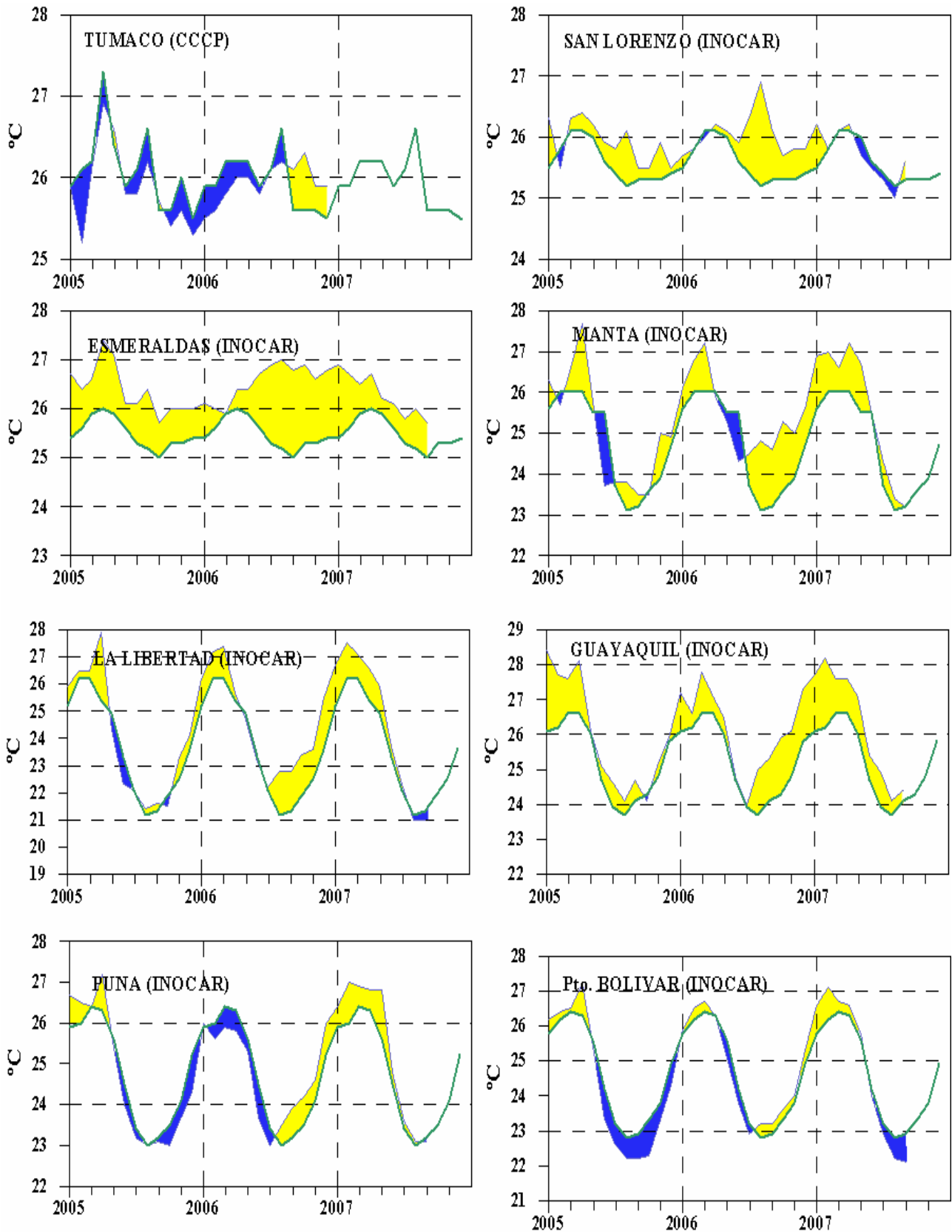
**Figure 7.-** Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1.  
 (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).



**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).

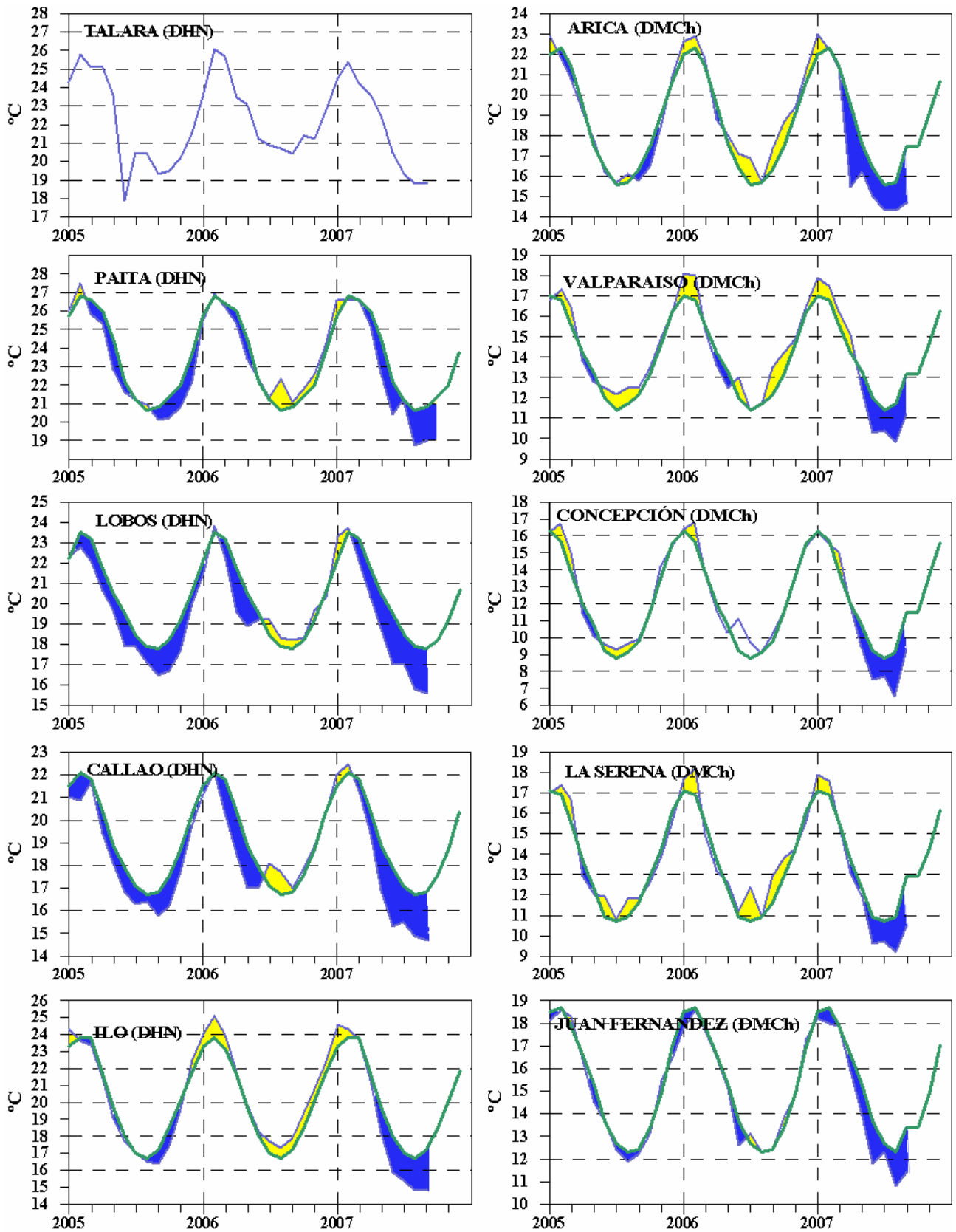
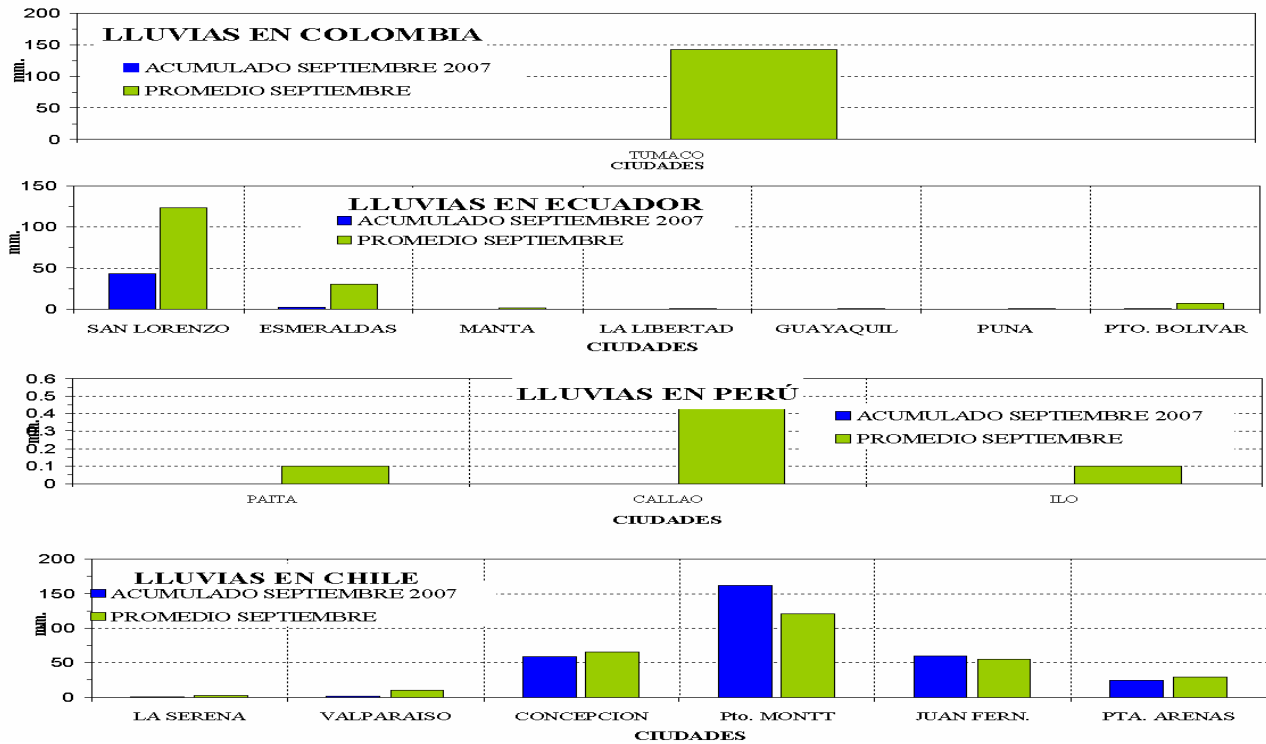
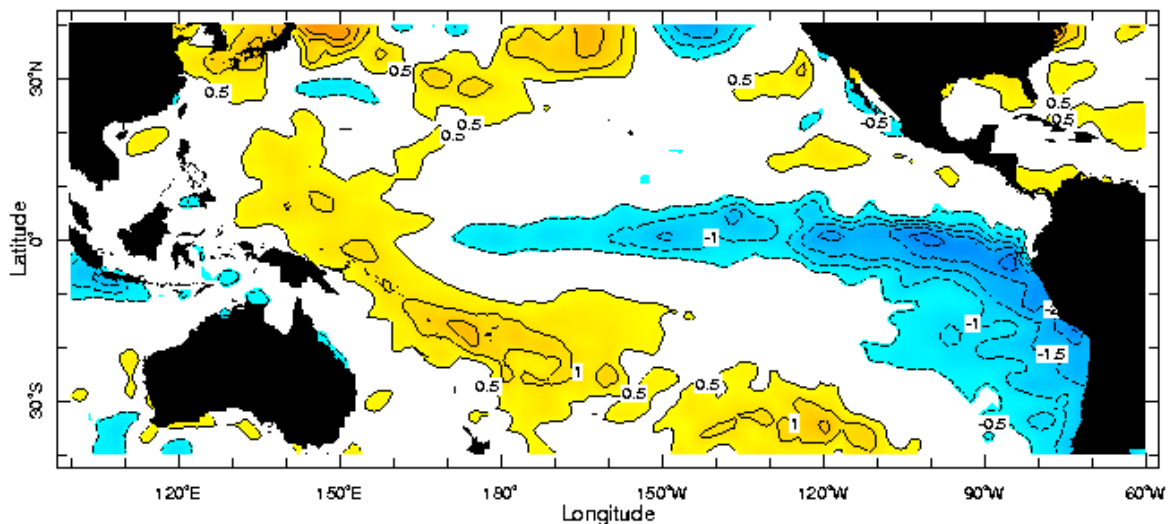


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).



**Figure 10.-** Rains during September 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) Septiembre 2007



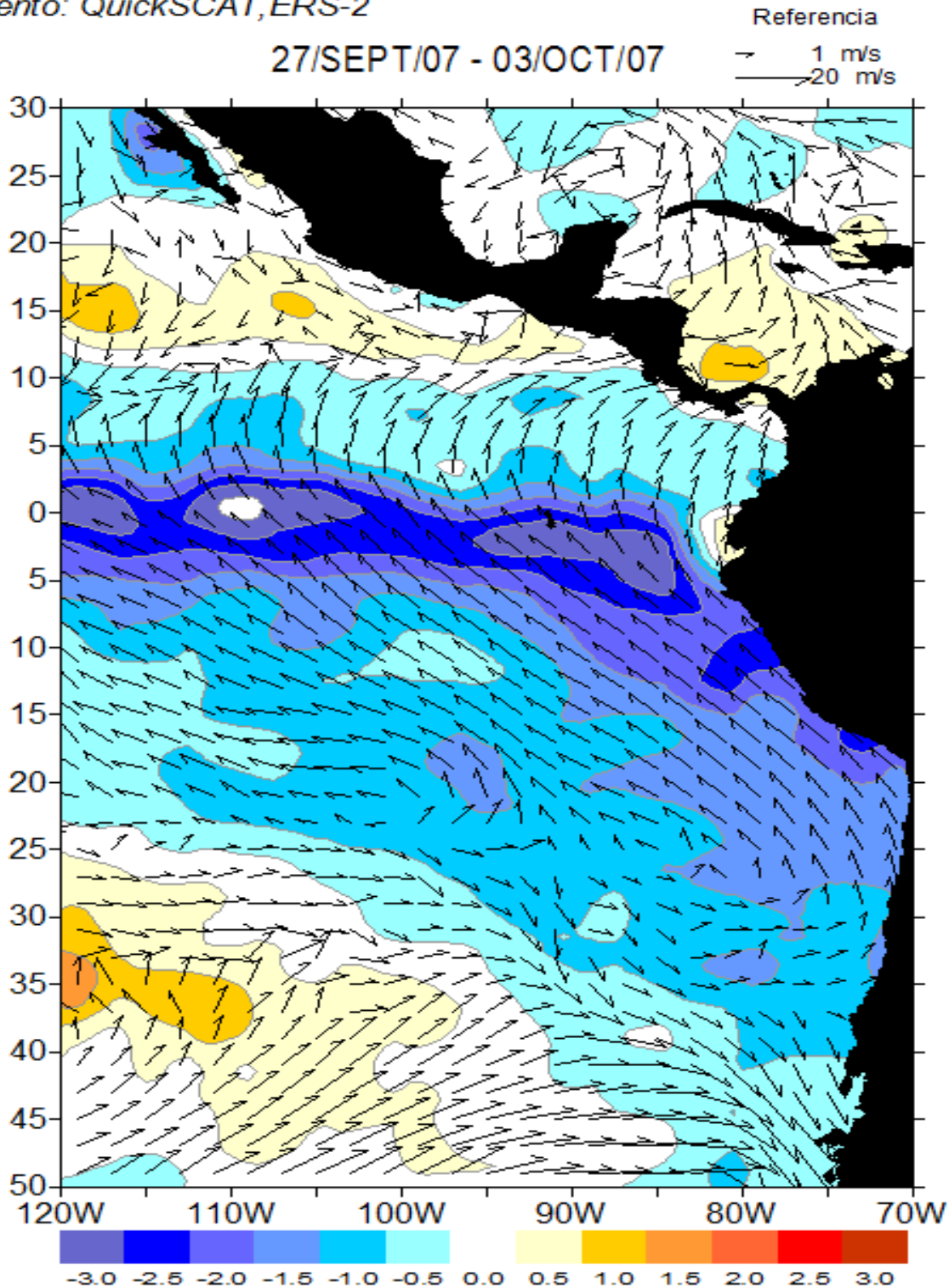
Sep 2007

**Figure 11.-** Sea Surface Temperature Anomalies (°C) September 2007. (Source: International Research Institute for Climate and Society)

### Anomalia de Temperatura Superficial del Mar y Viento Superficial

Climatología: Reynolds OI (AVHRR / TSM In-Situ) Resolución: 0.5°

Viento: QuickSCAT,ERS-2



Fuente: NCEP/NOAA - CoastWatch.  
Procesamiento: INOCAR - CIIFEN, 2007

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