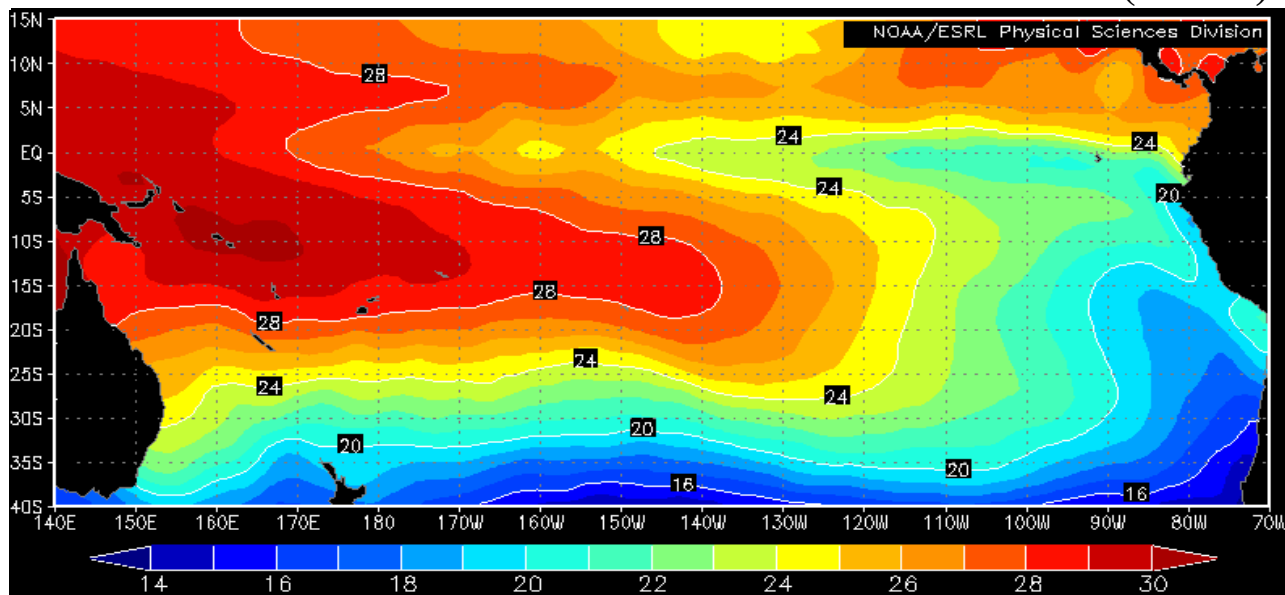


# COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



DECEMBER 2007

BAC N° 207

## *ERFEN*

(Estudio Regional del Fenómeno El Niño)

# BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



OMM



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COLOMBIA  
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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 November, the event La Niña persists throughout the equatorial Pacific, being more intense in the Eastern edge; the main characteristics of the present event are cold surface temperatures and subsurface of the sea, tradewinds more forts than the average and reduced cloudiness; the index of South Oscillation also has been increased to more typical values of La Niña.

The temperature of the sea during the last week of November exhibited anomalies of -0.9°C in the Western Pacific, of -1.8°C for the Central Pacific and of -2.3°C in the Eastern Pacific, lasting the could conditions that characterizing to the present event La Niña.

As far as surface winds, one stayed in the region of the Southeastern Pacific the predominance of winds of the south and Southeastern with speeds slightly superior to the normal rank for the date. The Index of Oscillation of the South, by fourth consecutive month presents positive values being in this occasion of 0.9.

During November the Mean Sea Level in the Southeastern Pacific fluctuated thus near its normal patterns, as opposed to the coasts of Ecuador was 1.4 cm on the average, in Peru fluctuated between 1.0 cm (Talara) and -4.0cm (Callao) and in Chile the observed behaviour stayed previously, with anomalies that fluctuated between the -2.9 cm (Arica) to -9.9 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 and Central sector of the Pacific the temperature of the sea would continue below its normal value.

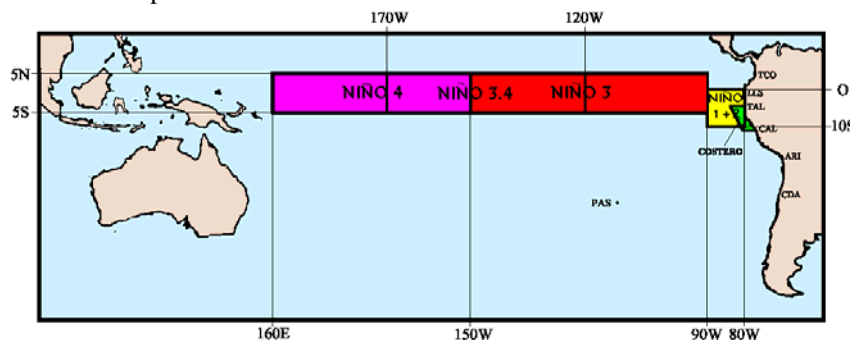


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

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**CLIMATE ALERT BULLETIN**  
**BAC N° 207, DECEMBER 2007****I. GLOBAL AND REGIONAL IMAGE**

During November the Equatorial Pacific Ocean was characterized by the support of the process of cooling of the Sea Surface Temperature (SST), particularly in the Eastern and Central sector of the Equatorial Pacific, reaching the SST values of anomaly of to  $-2.4^{\circ}\text{C}$  in the region of the Southeastern Pacific. The monthly anomaly of the SST in the El NIÑO regions continued showing a generalized cooling, whose values for November with respect to the month previous in the region of the Western Pacific (El Niño Region 4) happened of  $-0.5$  to  $-0.9^{\circ}\text{C}$ , in the Central Pacific (EL Niño Region 3,4) the anomaly happened of  $-1.38$  to  $-1.45^{\circ}\text{C}$  and in Eastern Pacific (EL Niño Region 1+2), it happened of  $-2.1$  to  $-2.2^{\circ}\text{C}$ .

At subsurface 1 level, the behaviour of the thermal structure during November in the Eastern Equatorial Pacific was similar to the reported thing for the previous month, presenting in this occasion negative anomalies of  $-3.0^{\circ}\text{C}$  that were located from the surface to the level of the 150 ms of depth between  $90^{\circ}\text{W}$  and the date line. Towards the west of the date line, and to a depth of 150m a Kelvin wave is observed that presents an ample nucleus with positive anomalies of until  $3.0^{\circ}\text{C}$ , forming a clear subsurface thermal dipole in the region of the equatorial Pacific.

The Mean Sea Level (MSL) in the Southeastern Pacific during November fluctuated around its normal patterns for the month, as opposed to the coasts of Ecuador was 1.4 cm on the average, in Peru fluctuated between 1.0 cm (Talara) and  $-4.0\text{cm}$  (Callao) and in Chile the observed behaviour stayed previously, with anomalies that fluctuated between the  $-2.9$  cm (Arica) to  $-9.9$  cm (Talcahuano). The Index of Oscillation of South (IOS), continued by fourth consecutive month in the positive phase, with a value of 0.9. With respect to the atmospheric anomalies of pressure, Tahiti and the Darwin reached values of 0.3 and  $-1.1$  respectively.

The Intertropical Convergence Zone (ITCZ) in the Eastern sector of the Pacific appeared around  $10^{\circ}\text{N}$ , towards the last days of the month the location of the ITCZ moved slightly towards the south being located around  $8^{\circ}\text{N}$ . With respect to rains, during the first fifteen days of November it continued defined the rainy season in ample sectors of the Colombian territory, decaying considerably during the second fortnight of the month; in Ecuador rains were deficit, stayed the presence of cloudiness in low levels. Weak and occasional rains in the north coastal zone were registered ( $1^{\circ}\text{N}$ ); in the coastal centre and the south of Peru, plans by intermittent drizzles were only registered during the month; in Chile it continued during November the low frequency of days with rain in the regions central, south and austral, causing a generalized precipitation deficit for the month between Curicó and Punta Arenas.

With respect to surface winds, they predominated of the South and the Southeastern; with speeds that fluctuated on the normal value of the month in approximately 0.5 m/s.

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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 (IDEAM), inform that in November continued the rainy season good defined during the first fifteen days in ample sectors of the Colombian territory; the Intertropical Convergence Zone (ITCZ) appeared around 10°N influenced by the drag that exerted a cold front that advanced from the coast of the United States towards the Caribbean Sea. This situation along with an important activity of tropical waves during the first fifteen days of the month favoured rains to a large extent of the country. From half of the second decade, the displacement of a system of High pressure from the United States towards the Atlantic, affected so that the cold fronts were located more North on guard, with which the influence of these systems decayed well-known. At the same time, in high levels of the atmosphere it begins to predominate one ridge on the Caribbean Sea, being appeared the jet stream to the east of this region, which generates an intensification of winds in all the layers of the atmosphere; this situation changes of radical way the atmospheric circulation, generating in the north and center of the country high values of atmospheric stability and therefore, a remarkable diminution of rains, first in the Caribbean region during the second decade and soon gradually in the north of the Andean region as of day 17.

During the last days of the month the conditions were variable, the greater influence was exerted by the location of the ITCZ, which moved slightly towards the south being located around 8°N. During the monitoreo of November of 2007, made by the Area of Operational Oceanography of the CCCP, the fixed station coastal N° 5 located to 10 miles of the bay of Tumaco between the coordinates 78,51°W and 2°N, it is possible to be observed, that the registry of the SST for November was of 27,13°C. A positive anomaly at surface level of 0,01 °C appeared, with respect to the historical average (July 1999 - November 2007), which is of 27.12 °C. In November, the termocline promoted 6 meters with respect to the last registry of October, positioning itself on the 37 meters. The isotherm of 15°C becomes visible for this month from the 42 m to the 86 m of depth.

As far as the behaviour of the salinity registered at surface level a value of 31,12 ups. A positive anomaly of 0. 64 ups appeared at surface level with respect to the historical average that is of 30, 47 ups. The maximum value of salinity of the month was of 34, 98 ups and it were registered approximately to a depth of 83 meters. The halocline was positioned to the 37 meters. The isohaline of 34 ups was located from the 38 ms, descending 28 ms with respect to the month from October.

### B. CONDITIONS IN THE ECUADORIAN COAST

The Oceanographic Institute of the Navy of Ecuador (INOCAR) reports that during November of 2007 the originating wind presence of the south stayed that had greater incidence in the south and central zone of the Coast, transporting to the region cold air masses, that was demonstrated in the reduction of the temperature of the air in the region (22.5°C), whereas towards the north the temperature of the air was something warmer (25.5°C), With slight rainfall and brief type drizzles. November is considered like the month of transition towards the humid station of the Ecuadorian coast, characterized by the minimal rain presence and the gradual increase of the temperature of the sea and the air. In this occasion November had the presence of temperature of the sea and the air below normal of the month and by winds of the south and the southwest transporting cold air on the coastal region of Ecuador; exerting greater influence on the South coast, central coast and on the Galápagos Islands.

The presence of cloudiness in low levels has caused light fogs and drizzles in the coastal zone; as well as occasional weak rains in the north inner zone whose accumulated amount was below the normal thing for the period. The variation of the temperature of the air in the coast was irregular, oscillating between values slightly over the average to the north ( $0.1^{\circ}\text{C}$  in Emeralds  $1^{\circ}\text{N}$ ) and under normal in the center and the south ( $-1.8^{\circ}\text{C}$  in La Libertad  $2^{\circ}\text{S}$ ). The surface temperature of the sea also continued, in general terms, with values slightly superior to the normal one in the north coast of Ecuador ( $0.3^{\circ}\text{C}$  in Emeralds  $1^{\circ}\text{N}$ ) and below the normal thing in  $-0.4^{\circ}\text{C}$  in the south coast ( $3^{\circ}\text{S}$ ); in the Galapagos insular region it was of approximately  $-2.1^{\circ}\text{C}$ . Considering the present behaviour of the ocean-atmospheric conditions, it would underneath be expected for December of 2007 that in the Ecuadorian coast and the Galápagos Islands, the precipitations (rains and drizzles) continue deficient, with accumulated values below his normal ones. One 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 especially in the north coast.

### C. CONDITIONS IN THE PERUVIAN COAST

The Direction of Hydrography and Navigation of Peru (DHN) informs that in the Peruvian coast values of the SST below the monthly average were registered, nevertheless, with respect to the previous month, these underwent a diminution average of  $0.6^{\circ}\text{C}$ . The anomalies of the SST fluctuated between  $-0.3^{\circ}\text{C}$  (Mollendo) and  $-2.1^{\circ}\text{C}$  (San Juan). The Mean sea level throughout the Peruvian coast, presented in general negative anomalies, except the station of Talara where a slight positive anomaly of 1.0 cm was registered; also, it was possible to be observed that these values were increased in average 3.0 cm, with respect to the previous month. The values of the anomalies fluctuated between 0.0 cm (Paita and Chimbote) and  $-4.0$  cm (Callao). The temperature of the air also stayed below the monthly average, being appraised in the coast a diminution average of the anomaly of  $0.6^{\circ}\text{C}$ , with respect to the previous month. The Maxima negative anomaly appeared in the station of El Callao ( $-1.8^{\circ}\text{C}$ ); whereas, the minimum anomaly appeared in Ilo ( $-1.1^{\circ}\text{C}$ ).

In the coastal center and the south, plans by intermittent drizzles were only registered during the month. Throughout the Peruvian coast winds of South direction predominated; with the exception of the stations of Lobos de Afuera and Mollendo, in which winds of the Southeastern appeared. In relation to the wind speed the anomalies were positive, fluctuating between 0.3 to 2.8 m/s; with the exception of Paita and Callao, that presented negative anomalies of  $-1.2$  and  $-0.1$  m/s, respectively.

### D. CONDITIONS IN THE CHILEAN COAST

The Hydrographic and Oceanographic Service of the Navy of Chile (SHOA) maintains throughout the coast a network of stations of level of the sea to monitor a series of oceanic and atmospheric variables. Next, a description of the Sea Surface Temperature and the level of the sea between Arica ( $18^{\circ}29'\text{S}$ ) and Talcahuano ( $36^{\circ}41'\text{S}$ ) for November of 2007 appears. With respect to the SST, like the happened thing in October, was characterized to register a diminution of its cooling. It is thus as the stations of the north zone of the country (Arica and Antofagasta) were those that presented the greater negative anomalies with values near  $-1.0^{\circ}\text{C}$ . The behaviour of the level of the sea, was characterized to present a slight positive tendency, nevertheless, to the equal one as it happens in the case of the SST stayed the negative anomalies in all the stations of monitoreo, with fluctuations of between  $-2.9$  cm (Arica) and  $-9.9$  cm (Talcahuano). The greater differences were registered in the stations of Coquimbo and Talcahuano, with values of  $-7.0$  cm and  $-9.9$  cm, respectively. The Meteorological Direction of Chile (DMCh) declares that during November, the average temperature of the air, was characterized by the presence of negative anomalies to a large extent of Chile, being the North and South zones those that presented the greater cooling, with

anomalies between  $-0.5$  and  $-1.0^{\circ}\text{C}$ . Contrary, the inner valleys of the central zone, between Santiago and Chillán, presented heating, whose positive anomalies were between  $0.5$  and  $1.5^{\circ}\text{C}$ .

The Maxima temperature average reached its greater cooling in the north coast of Chile, between Arica and La Serena, with negative anomalies between  $-1.0$  and  $-1.7^{\circ}\text{C}$ . The other less cold region was located in the South part between Temuco and Montt Port, with anomalies between  $-0.5$  and  $-1.0^{\circ}\text{C}$ . Anomalous heating were observed in the central zone, between Santiago and Chillán, with anomalies between  $0.6$  and  $2.1^{\circ}\text{C}$ .

The minimum temperature average, showed for the north and central zone slight negative anomalies ( $<-0.5^{\circ}\text{C}$ ), whereas in the south and austral region between Concepcion and Punta Arenas they dominated negative anomalies between  $-0.9$  and  $-1.5$ , Exceptionally Arica and Curicó showed positive anomalies of  $0.6$  and  $1.3^{\circ}\text{C}$  respectively.

The pattern of atmospheric circulation in the Eastern South Pacific, characterized itself by the presence of anticyclonal circulation in the average troposphere and at mean sea level, associated to an intensification of the subtropical anticyclone extended more to the south of climatologic average position. This condition, was represented by a nucleus of anomalies of  $10$  hPa located the south of  $45^{\circ}\text{S}$  and around the length  $100^{\circ}\text{W}$ . The stations of Island of Pascua, as well as the located ones in the continent, to the south of  $40^{\circ}\text{S}$  (between Puerto Montt and Punta Arenas), presented positive anomalies between  $1.0$  and  $2.0$  hPa. The north zone, on the contrary, presented negative anomalies, between  $-0.5$  and  $-1.0$  hPa. The low frequency of days with rain in central, south and austral regions of the country, originated a generalized precipitation deficit for the month between Curicó and Punta Arenas. The regions with greater deficit were Chillán, Valdivia and Puerto Montt, with  $40$ ,  $42$  and  $60$  mm below the normal one monthly respectively.

### 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, it is considered that during the next month the Equatorial Pacific would continue presenting cold conditions own of the event La Niña, 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, like the temperature of the air, that will present values below its normal one, particularly from the coasts from Chile to the south of Ecuador. As far as 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 present a slightly deficit distribution for the time, for the coast of the Pacific of Colombia and north coast of Ecuador; whereas for the rest of the region the tendency of precipitations is to stay below the normal thing, in special the central and south coast of Chile. On the contrary, the “altiplánica” region is favourable to present precipitations by over the normal value.

**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>OCT 07</b>	3.7	8.7	7.9	27.8	25.2	23.4	18.6	16.4	14.0	10.0	0.6
<b>NOV 07</b>	1.9	11.2	10.7	27.4	25.1	23.2	19.4	17.7	12.2	7.6	0.9
<b>DIC 07</b>	6.1	11.6	10.2	27.4	25.0	23.5	20.8	19.6	12.5	6.0	1.8

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>OCT 07</b>	26.8	23.4	13.2	15.4	15.2	14.2	14.1	12.4	
<b>NOV 07</b>	27.1	23.8	13.8	16.8	16.6	15.8	15.3	13.2	
<b>DIC 07</b>	27.5	25.5	13.8	16.4	17.2	15.8	16.3	13.5	

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>OCT 07</b>	***	2623	940	1482	581	1139	798	575	
<b>NOV 07</b>	***	2622	970	1541	626	1192	850	621	
<b>DIC 07</b>	***	2640	970	1540	640	1215	877	651	

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)

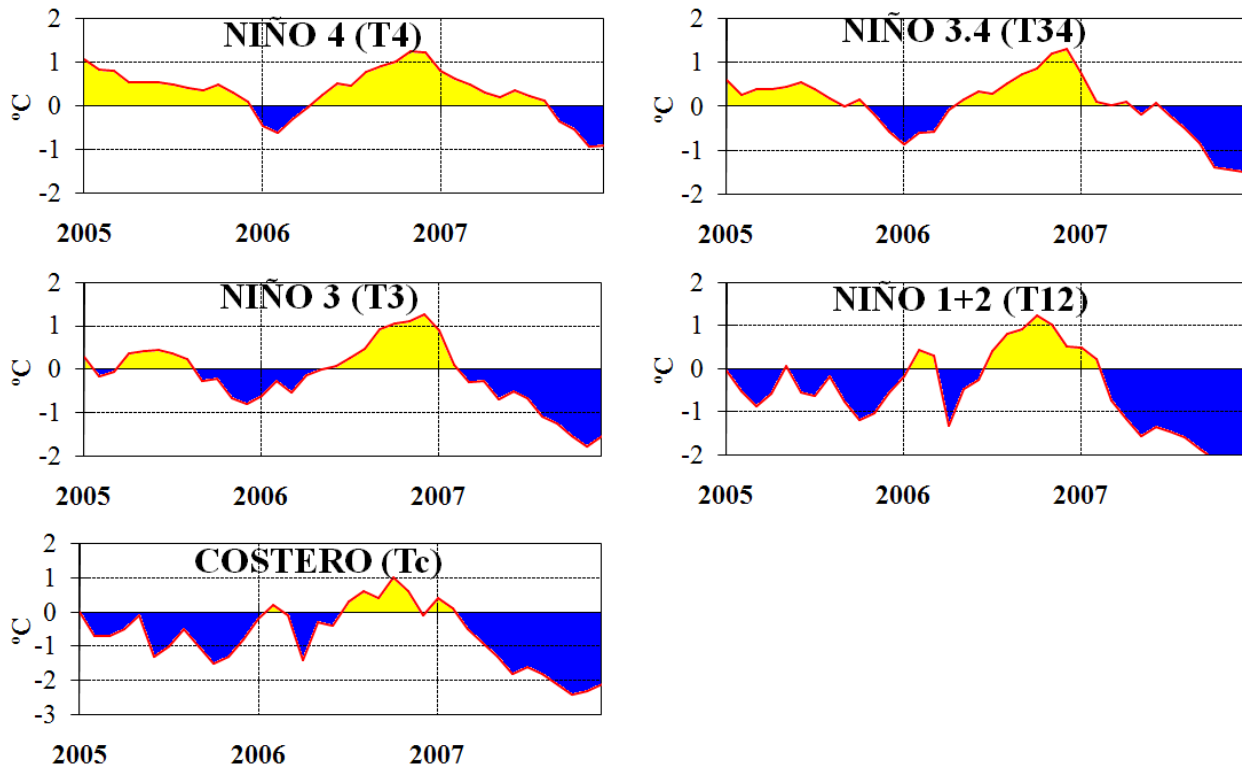
PENTADS		Sea Surface Temperature (SST)			Mean Sea Level (MSL)		
		BALTRA	TALARA	CALLAO	BALTRA	LLS (INOCAR)	CALLAO
<b>NOV</b>	04	***	16.2	13.8	***	256.2	87.9
	09	***	16.4	13.7	***	262.4	***
	14	***	17.8	13.6	***	264.0	***
	19	***	18.2	14.1	***	264.4	***
	24	***	16.3	13.7	***	264.0	***
	29	***	16.0	13.8	***	263.8	***
<b>DIC</b>	03	***	15.8	13.6	***	259.7	98.1
	08	***	15.4	14.0	***	259.0	94.9
	13	***	16.2	13.9	***	266.0	96.3
	18	***	17.5	13.7	***	262.2	97.0
	23	***	18.3	13.8	***	267.4	96.9
	28	***	20.4	13.6	***	269.9	***

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

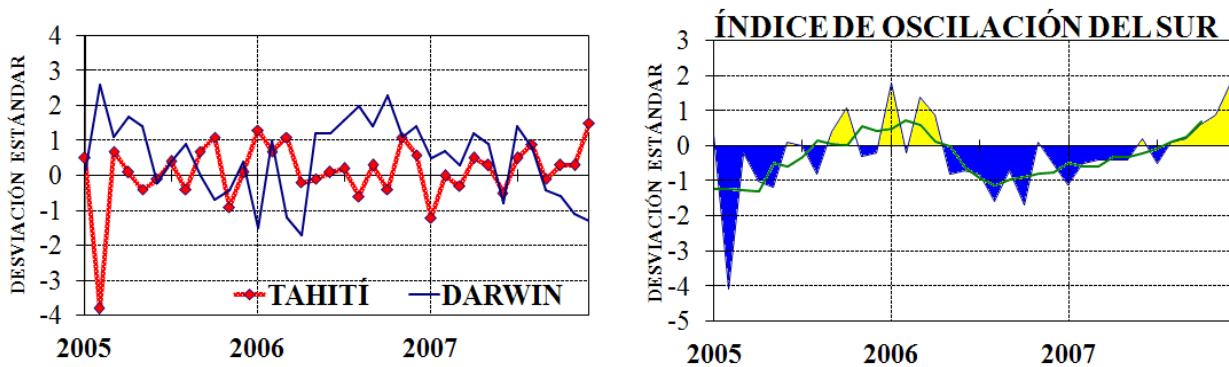
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\* Values revised

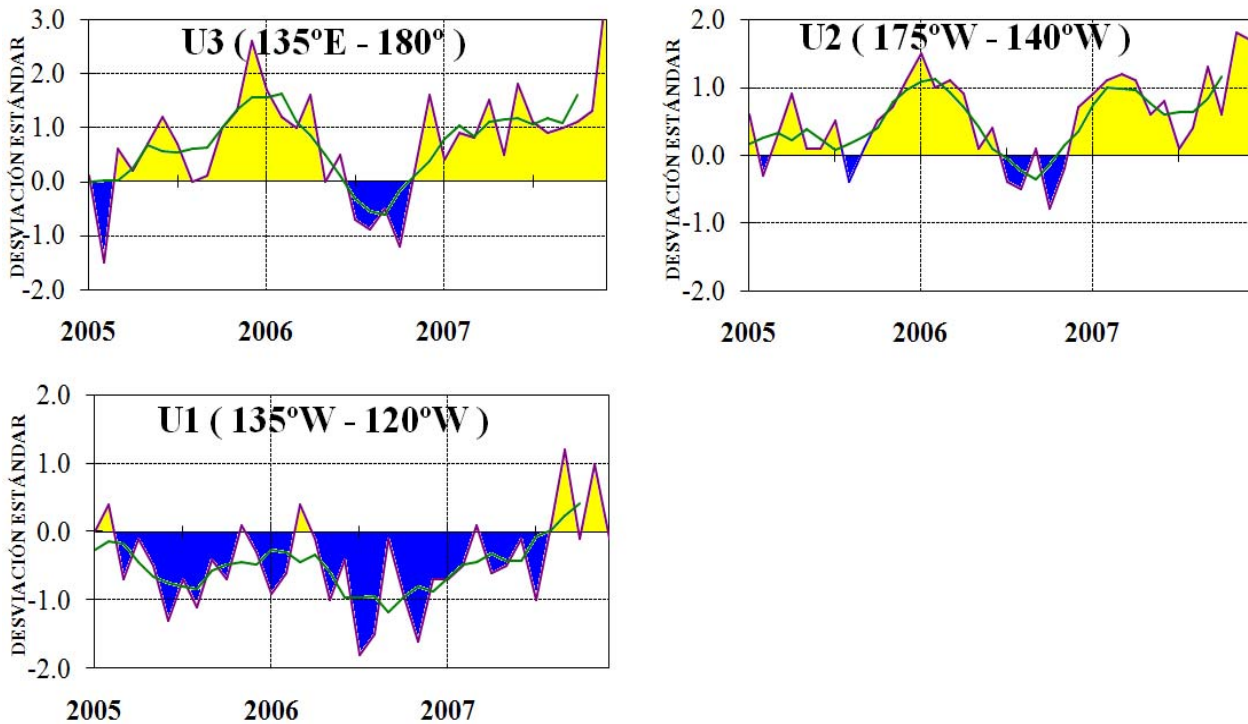
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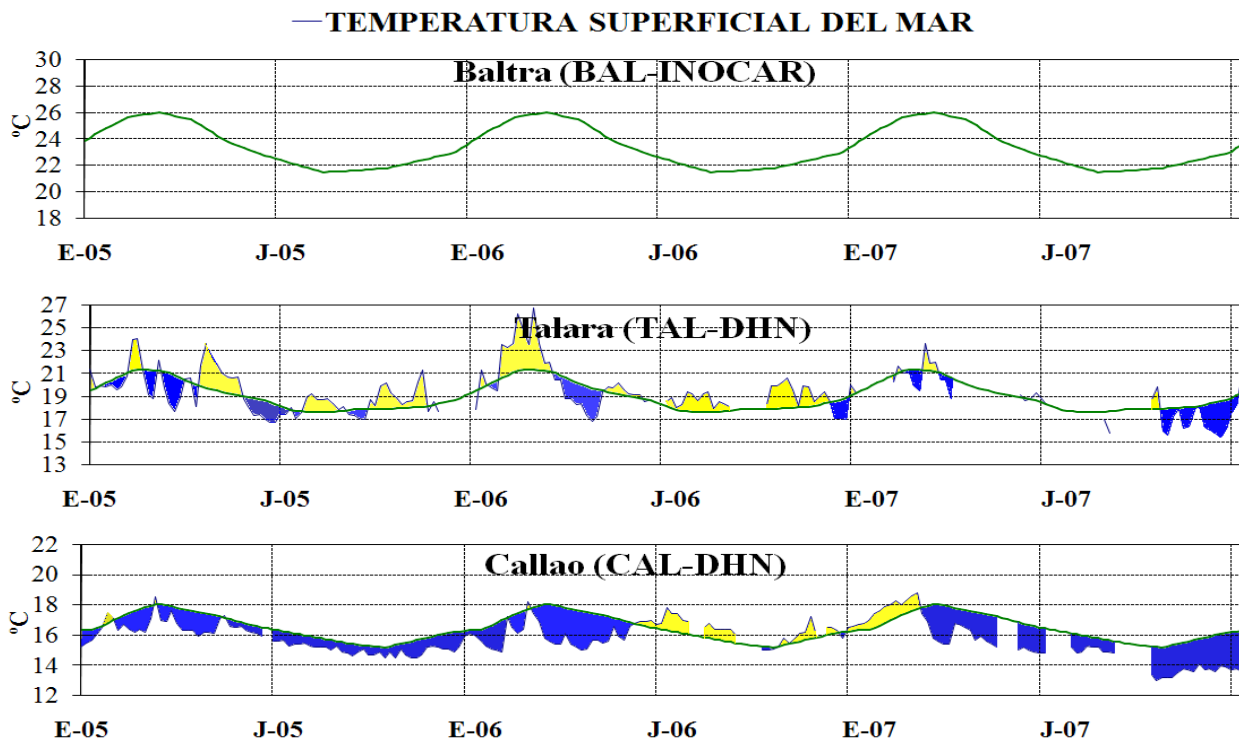
**Figure 3.-** Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).



**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).

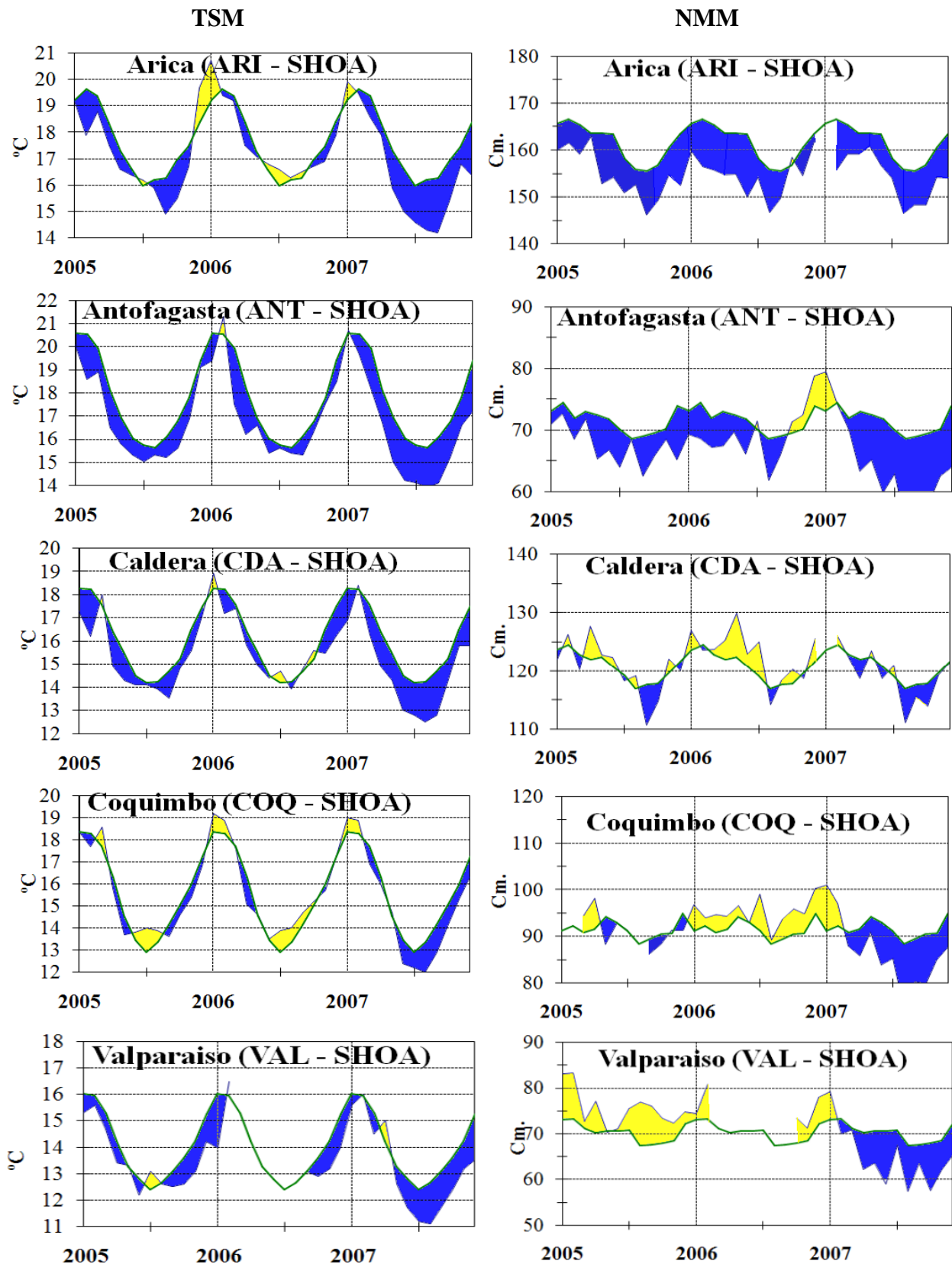


**Figure 5.-** Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).



**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 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).

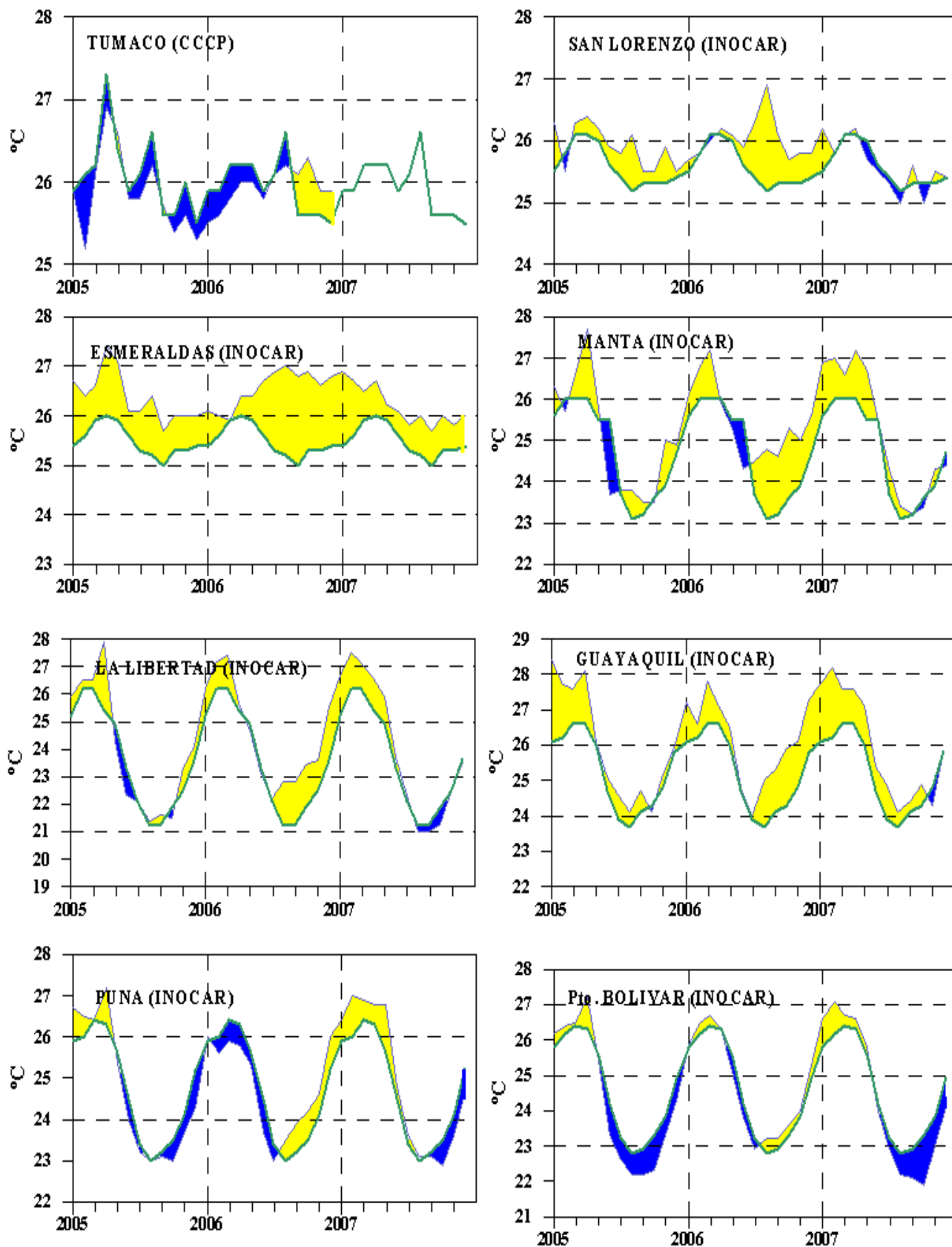


Figure 9a.- Monthly means of the AT (°C) in 8 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP & INOCAR).

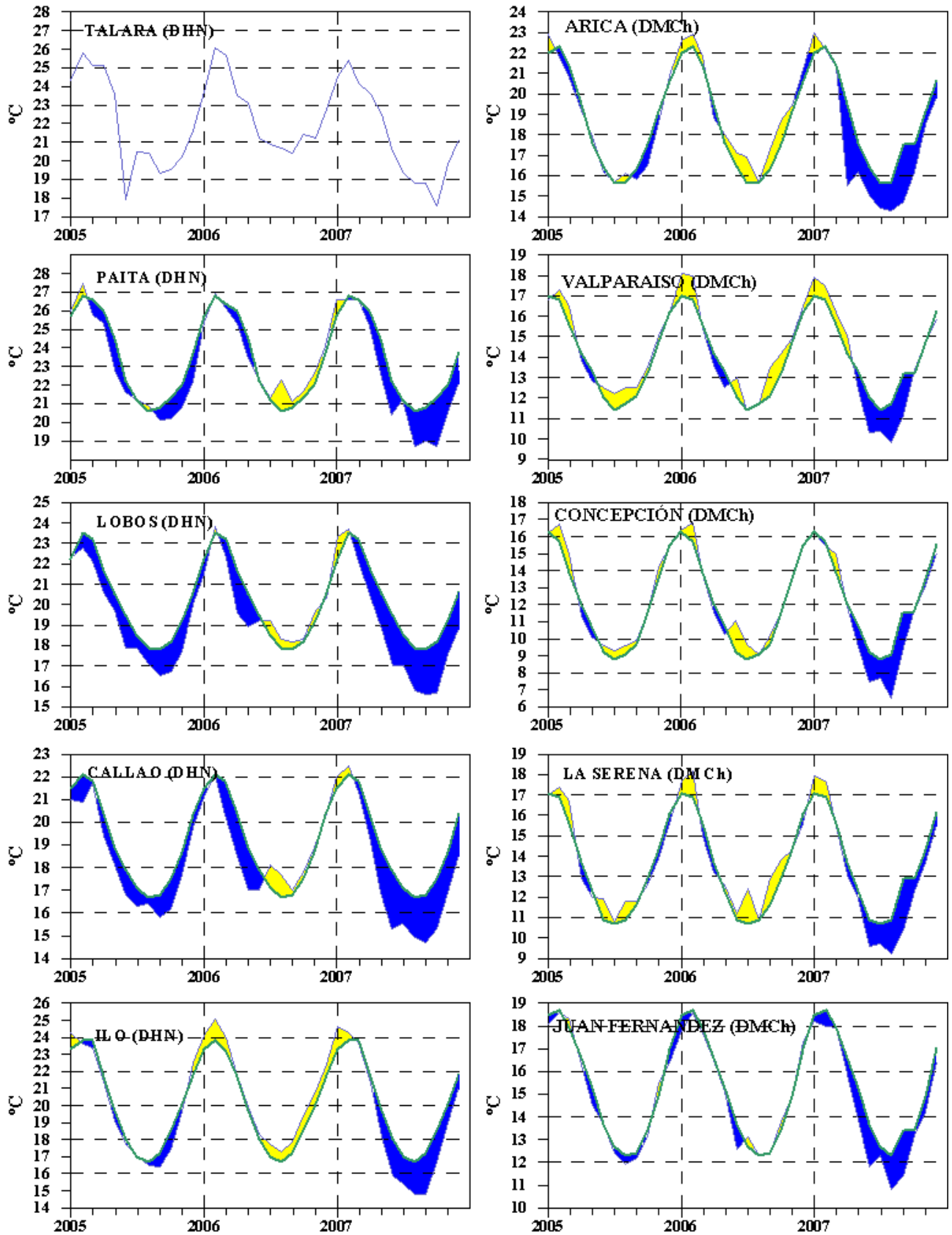
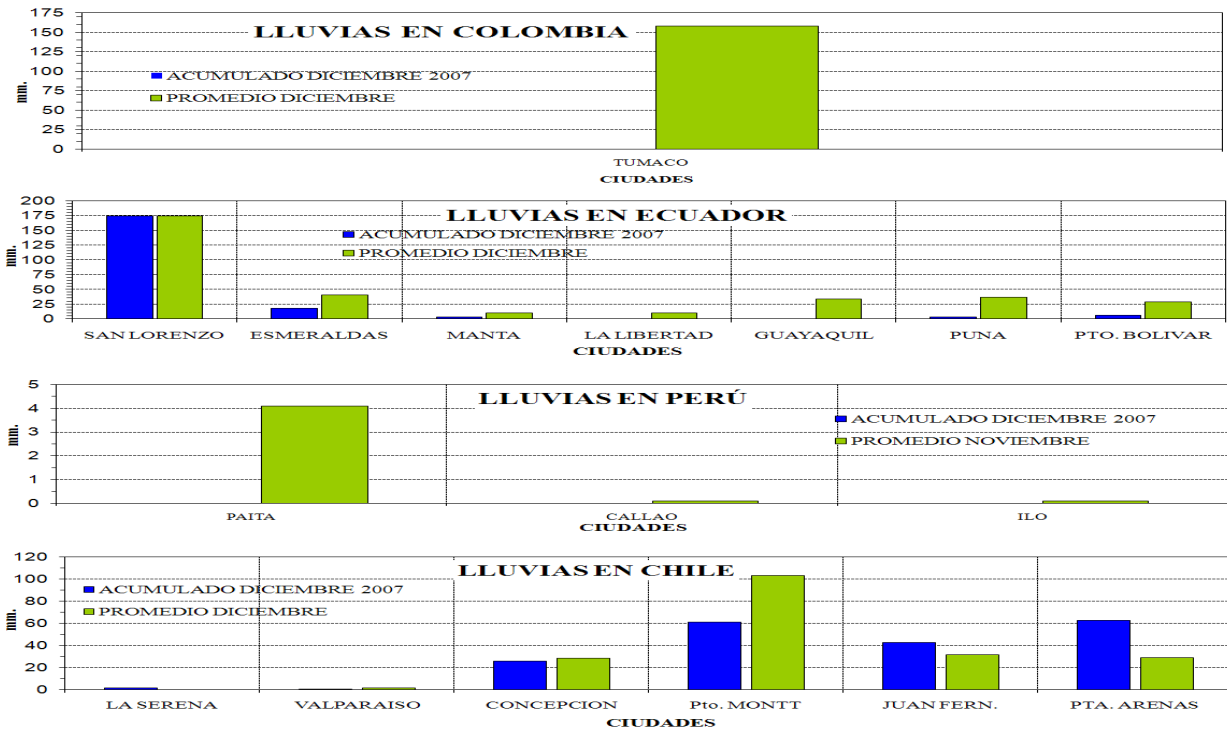
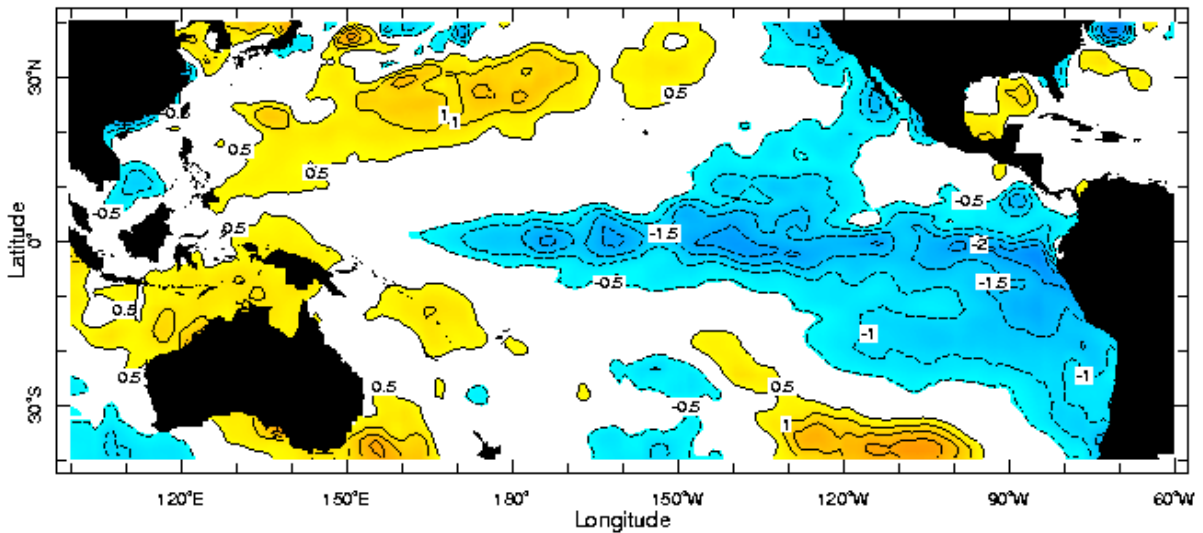


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).



**Figure 10.-** Rains during December 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) Diciembre de 2007



Dec 2007

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

**EDITED IN THE OCEANOGRAPHIC INSTITUTE OF THE NAVY OF ECUADOR**

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