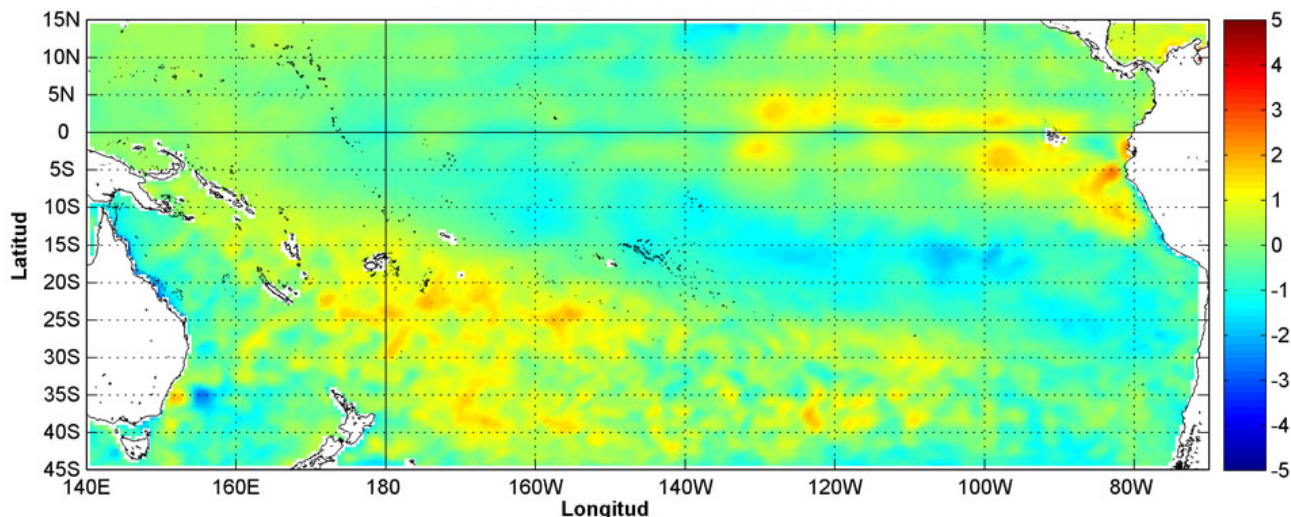


COMISIÓN PERMANENTE DEL PACÍFICO SUR (CPPS)



GHRSSST/OSTIA L4. UKMO/NASA/JPL/PO.DAAC This product has been derived from the UK Met Office data © Crown copyright 2010
Anomalías de Temperatura según Levitus/WOA-2005. Mes de definición: Julio CPPS-GRASP. Procesamiento: Instituto Oceanográfico de la Armada INOCAR, Ecuador

Sea Surface Temperature monthly anomaly (°C), (1-31/August/2011). UKMO/INOCAR

AUGUST 2011

BAC N° 251

ERFEN

(Estudio Regional del Fenómeno El Niño)

BOLETÍN DE ALERTA CLIMÁTICO *CLIMATE ALERT BULLETIN*



OMM



CPPS



COI

COLOMBIA
CCCP

ECUADOR
INOCAR

PERÚ
DHN

CHILE
SHOA

COMISIÓN PERMANENTE DEL PACÍFICO SUR
SECRETARIA 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; 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 August, Sea Surface Temperature (SST) in the Equatorial Pacific, held values close to normal averages, similar to the previous month observing a slight cooling towards the central region. At subsurface level, there was a strengthening of the core of cool anomalies present in the central Pacific. Regarding the behavior of the SST in the monitoring stations of the countries of the Region, negative anomalies, of up to 1.2° C, were observed in Manta and La Libertad – Ecuador.

For the next month, it is expected that the SST in the equatorial pacific continues with normal values or a tendency to diminish, as product of the influence of Humboldt current and the strengthening of the trade winds of the southeast.

In the El Niño monitoring geographic zones, the SST remained around its normal values; being 0.6°C the maximum negative anomaly observed in the Niño 3.4 region and 0°C the minimum in the Niño 1+2 region. In the occidental and central equatorial Pacific, El Niño 4 and El Niño 3 regions, slight negative anomalies, around -0.4°C, dominated.

The Mean Sea Level (MSL) in the equatorial fringe (between 5°S – 5°N of latitude and 80 – 110°W of longitude), presented values around normal. The same way as in the coastal stations of the countries of the region, the values were found close to normal, so that the greatest value observed of positive anomaly was of 4cm, in the Peruvian stations Talara and Paita.

The Southern Oscillation Index (SOI) was of 0.4, again indicating descending values as presented between February and May of 2011. The standardize pressure anomalies at sea level were: 0.9 in Papeete (Tahiti), and 0.2 in Darwin (Australia).

The Intertropical Convergence Zone (ITCZ) had an intensity between weak and moderate, in the form of disperse cells and was located around 5°N.

The air temperature (AT) was variable. In Ecuador values above normal, according to the seasonality, prevailed; meanwhile in Peru and Chile values below normal were present. Precipitations have diminished in a general way in Ecuador, Peru and part of Colombia in accordance to the monthly climatology; however a surplus of more than 40% is reported in some Colombian regions and central and southern Chile.

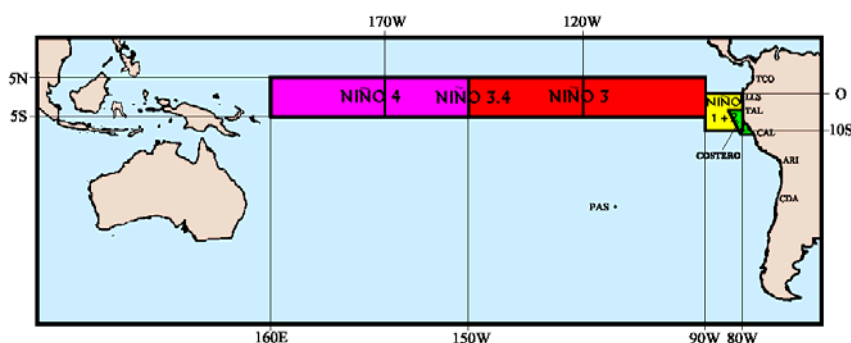


Figure 2.- Map indicating locations and codes of series. Rectangles show the average area of Sea Surface Temperature (SST °C)

INSTITUICIÓN	Dirección electrónica
CCCP - Centro Control de Contaminación del Pacífico (Colombia);	cccp@cccp.org.co
IDEAM – Instituto de Estudios Ambientales (Colombia);	meteorologia@ideam.gov.co
INOCAR - Instituto Oceanográfico de la Armada (Ecuador);	nino@inocar.mil.ec
DHN - Dirección de Hidrografía y Navegación (Perú);	oceanografia@dhm.mil.pe
SHOA - Servicio Hidrográfico y Oceanográfico de la Armada (Chile)	shoa@shoa.cl
DMC - Dirección de Meteorología (Chile)	metapli@meteochile.cl

CLIMATE ALERT BULLETIN
BAC N° 251, AUGUST 2011

I. GLOBAL AND REGIONAL IMAGE

In August 2011, the SST along the equatorial fringe of the Pacific, between 5°N and 10°S, maintained a similar condition to the previous month, predominating neutral values; however in the eastward Pacific, some patches of positive anomalies of 1.0° C were observed. Consequent to the behavior, the SST anomaly registers in the El Niño monitoring geographic zones, were neutral in the Niño 1+2, Niño 3 and Niño 4 regions (0.0, -0.4 and -0.36 respectively) and of 0.6°C in the Niño 3.4 region. In the subsurface layers of the Equatorial fringe, in the eastern Pacific, the positive anomalies of sea temperature diminished, while between 100°W and 140°W and between 30 – 100 m of depth, negative anomalies were recorded of up to 4°C, and westward Pacific, anomalies up to 3°C were recorded (150m depth).

The MSL in the fringe between 5°S and 5°N of latitude and, 80 and 180°W of longitude, maintains normal conditions.

The ITCZ in August was observed around 5°N, formed by disperse cells of moderate activity.

The ocean-atmospheric conditions in the countries of the Southeast Pacific region show that in Colombia the sea temperature is around normal, with positive anomalies of 0.2°C, unlike the coast of Ecuador, Peru and Chile where the SST has diminished according to seasonality. Regarding anomalies, in coastal stations, negative anomalies of up to 1.2°C prevailed in the central coast of Ecuador; while in Peru the anomalies fluctuated between 0.1°C (Talara) and 0.6°C (San Juan) and in the Chilean coast negative anomalies prevailed with a maximum of 1°C in the north.

The MSL in the region remained around its normal averages, being the stations Talara and Paita of Peru; those where the greatest positive anomalies were observed (4.0cm).

In August, the value of standardized pressure anomalies at sea level, was positive in Papeete (Tahiti) and in Darwin (Australia), with values of 0.9 and 0.2 respectively. In consequence, the IOS was of 0.4, reached neutral values, demonstrating a decay of La Niña observed since the beginning of 2011.

Concerning the AT, in Ecuador the monthly averages were higher than normal, registering in all the stations positive anomalies between 2.1°C north (Esmeraldas) and 0.4°C south (Guayaquil). In Peru and Chile, the AT anomalies were negative; up to 1.3°C in Paita-Peru and maximum negative between 1.9°C and 2.6°C in Coyhaique-Balmaceda, southern part of Chile.

The precipitations during August, showed excess higher than 40% in some areas of the Andean, Amazonian and Caribbean region of Colombia and positive anomalies between 25 and 70mm in central and southern Chile. In Ecuador (except San Lorenzo) and Peru, the rainfalls were zero to low, in accordance to the climatology of the month; however marked rainfall deficits prevailed in Southern regions and Santiago in Chile and the Orinoco and Amazon region of Colombia.

II. NATIONAL IMAGE

A. CONDITIONS IN THE COLOMBIAN COAST

The Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) reported that the frequency and transit activity in the eastern tropical wave over the Caribbean Sea (four in total during August), was again the ocean-atmosphere phenomenon of major influence, in which atypical rainfall was recorded in a month, that many areas of the country (especially in central and south), are neither abundant nor frequent. The interaction of these systems, with the presence of the monsoon depression (segment of the ITCZ that generates circulation and vortex that may favor cyclonic systems), north and north-westward of the country, specifically to the Caribbean region and north Pacific, produced strong rainfalls. We should emphasize, that those rainfalls at central and north national territory during the third week of the month, were associated with bands of feeding generated by IRENE HURRICAN.

Excess of rainfall, higher than 40%, were registered, especially northward Colombia and in specific areas of north Andean region, central and southern Caribbean and in the southern Amazonian. Abundant and frequent rains were registered in almost all the Pacific region, although in the northern area the total of precipitations were close to seasonal average, and in the central part some deficits were recorded; the opposite occurred in the south, where light excess were observed. In other hand, the Orinoco and Amazon regions (except south Amazonian region of Colombia), presented precipitation values below seasonal average and some areas show a deficit higher than 40%.

In the Atlantic the high pressure system going along north and central of Caribbean Sea prevailed. It was displaced a little northward of the Ocean (between 30°N and 30°W) giving place to the tropical cyclones developed during the month. Thus, the formation of six tropical storms were recorded, two of these reach the category of hurricane: TROPICAL STORMS EMILY, FRANKLIN, GERT, HARVEY, JOSÈ; HURRICANES IRENE and KATIA; and TROPICAL DEPRESSION 10.

During August, the location of the monsoon depression and ITCZ oscillated between 10 and 12 degrees in latitude north, prevailing at the north of Panama and Colombia; the location of ITCZ increased the rainfalls in the littoral of the Caribbean region and in the Pacific basin in the last week of the month.

Regarding the Madden & Julian intra seasonal oscillations (MJO), its behavior was variable. From August 1 to 7, a subsiding phase predominated; a short convective phase was preceded, from August 8 to 11, in the western country and subsiding phase eastward. From the 12th to 17th, a wave with phase that supports the rainfalls with moderate gradient entered. From 18 to 21 a wave between neutral to convective prevailed. From 23 to 26 a broad wave in phase that supports the rainfalls entered from the west, covering the north of South America. From 27 to 28 a neutral phase and from 30 to 31 a broad wave in phase that inhibits the rainfalls entered from the west, with a moderate gradient.

A prevailing atmospheric circulation in high levels at the atmosphere, towards the central and south of the country, origins less entry of humidity from Amazonian of Brazil, with which the precipitations over the east of national territory (Orinoco and Amazon regions), diminish in quantity and frequency. However, the divergence in height presented high values toward Caribbean region, western Caribbean Sea, Pacific and western Andean regions, supporting during some days the rainfalls at surface level. The flux in high levels, prevailed at north-eastward with average velocity between 10 and 30 knots.

Finally, it is pointed out that according to the station of the IDEAM located in the south of the Colombian littoral (Tumaco), the sea level at the end of August of 2011, has already taken a value slightly below to the average historical value of the season.

During the monitoring of July of 2011, performed by the Oceanographic Operational Area of the Center of Oceanographic and Hydrographic investigations of the Pacific – CCCP, to the fixed coastal station N°5 located at 10 miles from the bay of Tumaco in the coordinates 78.51° W y 2° 00 N, the observed register of Sea Surface Temperature (SST) for August was 27.6°C and 27.29°C, during the first and second fortnight respectively. At surface level a positive anomaly of 0.2°C was reached in relation to the historical mean between year 1999 and what has been 2011.

The thermocline during the first fortnight of this August presented an increase of 9m compared to the last registry of the first fortnight of July of 2011, locating at 35m of depth. During the second fortnight the thermocline ascended 13m, compared to the second fortnight of July of 2011, locating at 29m of depth.

The surface value of salinity for the first fortnight of August was of 30.621, while in the second fortnight it was 30.978. A negative anomaly of -0.9772 was presented at surface level compared to the historical mean between year 1999 and what has been 2011.

B. CONDITIONS IN THE ECUADORIAN COAST

The Oceanographic Institute of the Ecuadorian Navy (INOCAR), reports that the mean value of the SST, during August, decreased compared to the previous month, between -0.1°C toward north coast of country (San Lorenzo) to -1.2°C toward central coast (Manta and La Libertad), and -0.6°C at south (Puerto Bolívar).

At subsurface level, the 10 miles monitoring out of the coast in the stations of Manta and Libertad, the 20 isotherm was located at 33 and 29 m depth respectively, while thermocline was located in 33 m depth for both stations, which implies a normal behavior in the Manta station, but a deepening of more than 10 m in La Libertad, compared to its monthly value, which evidences less influence of the warm waters of western Pacific and Panama compared to the cold current of Humboldt. In the new stations of Galapagos Islands, located 8.8 miles southern Santa Cruz Island and 9.5 miles southern Pinzon Island, the thermocline was located around 40 m deep, while the 20°C isotherm was at 34 m deep.

The mean air temperature, in relation to the previous month and according to the seasonality, diminished in all the coastal stations, except in Esmeraldas (+0.1°C). However the monthly value of AT, in all the coastal stations was above their respective monthly averages; presenting positive anomalies between 2.1°C at north (Esmeraldas), 1.7°C and 1.4°C at center (Manta and La Libertad), and 0.4°C and 0.5°C at south (Guayaquil y Puerto Bolívar), respectively.

The winds in the coast were from the quadrant S/W, with variable intensities between 6 to 12 knots.

The precipitations during August were deficient in the entire Ecuadorian coast, except in San Lorenzo, presenting, however, variable and disperse rains and drizzles, especially to the south (La Libertad y Puerto Bolívar).

The Intertropical Convergence Zone (ITCZ) was presented during the month with a mean relative axe towards the 5°N.

There were no anomalies in the MSL in the 10 mile station of La Libertad during this month.

C. CONDITIONS IN THE PERUVIAN COAST

The Hydrographic and Navigation Direction of Peru (DHN) reports that, in general along the Peruvian coast, an average 0.5°C decrease was registered in the SST anomalies compared to the previous month; except for the Ilo station which registered an increase of 0.4°C. Negative anomalies prevailed, which fluctuated between 0.1°C (Talara) and 0.6°C (San Juan); while the Lobos de Afuera station presented positive anomalies of 0.1°C, and Ilo station presented a behavior similar to its normal of the month.

The MSL along the Peruvian coast continued presenting positive anomalies, registering a decrease in its values around 2.0cm, respect to the previous month. The minimum anomaly was presented in the Callao station (1.0 cm) and the maximum anomaly in the Talara and Paita stations (4.0 cm); while San Juan station presented a behavior similar to its normal of the month (0.0 cm).

In general, an average decrease of 0.5°C has been registered in the AT anomalies, compared to the previous month. The negative anomalies fluctuated between 0.1°C (Lobos de Afuera, Mollendo e Ilo) and 1.3°C (Paita) respectively.

During the second and fourth week of August, intermittent drizzles of light intensity were present in the locations of Lobos de Afuera, registering precipitation values of 0.4mm and in Callao presented trace type drizzles.

In the Peruvian littoral, winds of South and Southeast direction were present. In relation to the velocity, positive anomalies prevailed, except for the station of Paita, which presented a negative anomaly of 1.6m/s. The positive anomalies fluctuated between 0.5 m/s (Callao) and 2.2 m/s (Lobos de Afuera).

D. CONDITIONS IN THE CHILEAN COAST

The Hydrographic and Oceanographic Service of the Chilean Navy (SHOA) holds along the coast a net of stations at sea level to monitor a series of oceanic and atmospheric variables. Next is a description of the Sea Surface Temperature (SST) and Sea Level (SL) between Arica (18°29'S) and Talcahuano (36°41'S) for the month of August of 2011.

Respect to SST, negative anomalies in all stations still prevail, similar to the conditions observed in July 2011 except in Coquimbo that presented a value close to historic average (0.1°C). Specifically in the north area of country, located between Antofagasta and Caldera, negative anomalies of 0.1°C were registered, while in the central-south area, located between Valparaiso and Talcahuano, negative anomalies of 0.5°C were registered.

The sea level showed positive and negative anomalies in the Chilean coast, however, both are considered close to normal values. The north area presented negatives anomalies that fluctuated between 1 and 2 cm, while central-south area, registered positives anomalies of 1 cm.

The Meteorology direction of Chile (DMC) communicates that the mean air temperature was characterized by presenting a cooling in great part of the continental and coastal territory. The greatest negative anomalies were concentrated in two regions; first the northern coast, with anomalies between -0.5 and 1.0°C and second, in the austral region, with greater anomalies between -1.9 and -2.6°C.

The maximum mean air temperature, presented a cooling that affected the northern region, observing great decreases in the north coast (Arica – Antofagasta), with negative anomalies between -1.1 and -1.6°C. Other regions in central Chile (Santiago), central-south (Chillán) and austral (Covhaique), maintain negative anomalies of 1.1, 1.0 and 0.9°C respectively. Only the coastal region between La Serena and Valparaíso presented a positive anomaly between 0.1 and 0.9°C.

The minimum mean air temperature presented the largest cooling in the austral region (Coyhaique-Balmaceda), with anomalies between 1.9 and 2.6°C. The second area that experimented a cooling of the air, but with less intensity, was observed in the northern part of the country, between Antofagasta and La Serrana, with negative anomalies between 0.7 and 1.1°C.

The atmospheric circulation in the Southern Pacific, presented anticyclonic anomalies greater than normal conditions associated with atmospheric pressure at sea level and geo-potential height in 500hPa in the subtropical region of southern Pacific, and with greater intensities above oceans adjacent to Antarctic continent. The dominant pattern during August was related to the negative phase of the Antarctic Oscillation, which help the major activity of frontal systems and accumulation of rains above normal in central and south Chile. The monitoring stations of atmospheric pressure presented positives anomalies in the central and southern regions of Chile, between 1.0 and 1.5 hPa, besides of those located in the insular region like Juan Fernandez (1.1 hPa) and Isla de Pascua (2.5 hPa).

The precipitation in Chile during August 2011 was characterized by presenting accumulated amounts above normal in central Chile, with positive anomalies between 25 and 70 mm. On the contrary, the austral region, between Coyhaique and Punta Arenas, and the region of Santiago, accumulated rains below climatologic average of the month, with negative anomalies between 15 and 40 mm.

III. PERSPECTIVE

A. GLOBAL

From the revision of the different dynamic and statistical numerical models about the climatic prediction of the SST, of the pronouncements performed by different international weather investigation entities, and the follow-up and analysis of the current behavior of the oceanic and atmospheric indicators, it is expected that the normal conditions of temperature and sea level are maintained in the Central Pacific.

B. REGIONAL

Considering the follow-up of the ocean-atmospheric conditions in the Southeast Pacific ocean, executed by the ERFEN program (integrated by the National ERFEN committees of Chile, Colombia, Ecuador and Peru), and coordinated by the CPPS, it is foreseen that the values of sea temperature and mean sea level maintain and continue around and below their normal averages, as consequence of the influence of the Humboldt current.

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
JUN 11	5.8	9.5	7.0	28.5	27.5	26.6	23.7*	***	14.7	13.5	0.2
JUL 11	5.3	9.9	7.1	28.5	27.0	25.6	22.1	***	15.8	13.2	1.0
AUG 11	5.4	9.6	8.0	28.3	26.2	24.6	20.8	***	15.6	13.6	0.4

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	
JUN 11	27.8	24.9	18.2	16.9	15.7	14.8	14	13.2	
JUL 11	27.3	24.6	16.6	15.9	14.9	13.5	13.4	12.1	
AUG 11	27.3	23.3	15.6	15.9	14.4	13.1	13.4	12.0	

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	
JUN 11	168.0	266.9*	113.0*	165.1	74.6	***	97.7	79.5	
JUL 11	164.0	263.5	107.0*	157.6	67.5	***	89.4	76.1	
AUG 11	160.0	257.4	102.0	154.7	64.1	***	86.8	72.8	

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)	
	LLS (INOCAR)	TAL (DHN)	CAL (DHN)	LLS (INOCAR)	CAL (DHN)	
JULY	2	25.0	18.7	17.0	265.4	107.77
	7	25.0	18.3	16.8	266.0	108.50
	12	24.7	17.6	16.7	259.2	107.37
	17	25.4	18.8	16.7	268.5	105.49
	22	25.3	21.2	16.5	266.2	106.71
AUGUST	27	22.7	18.2	16.6	***	104.10
	1	22.5	17.6	15.5	263.0	101.44
	6	23.7	17.7	15.7	256.5	102.34
	11	23.9	18.4	15.8	255.1	103.81
	16	23.3	17.7	16.0	260.4	104.32
	21	23.2	17.5	15.4	258.0	101.20
26	22.9	17.8	15.2	252.6	99.61	

Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami

Note.

* Values revised

***. Information not received

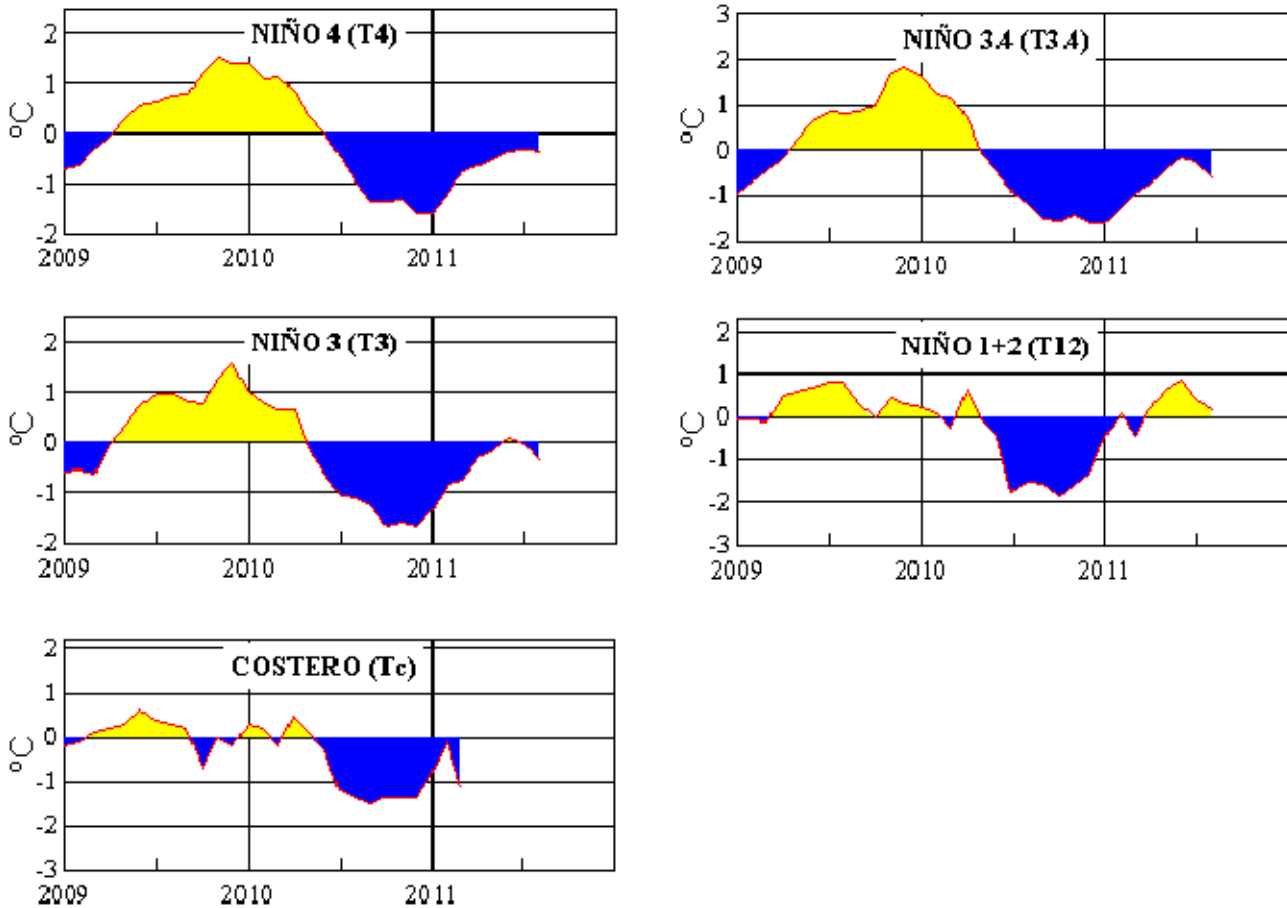


Figure 3.- Oceanic anomalies indices (Niño 4, Niño 3.4, Niño 3, Niño 1+2 and Tc). The location of the oceanic indices appears in figure 2. (Source: NCEP/NWS/NOAA/USA).

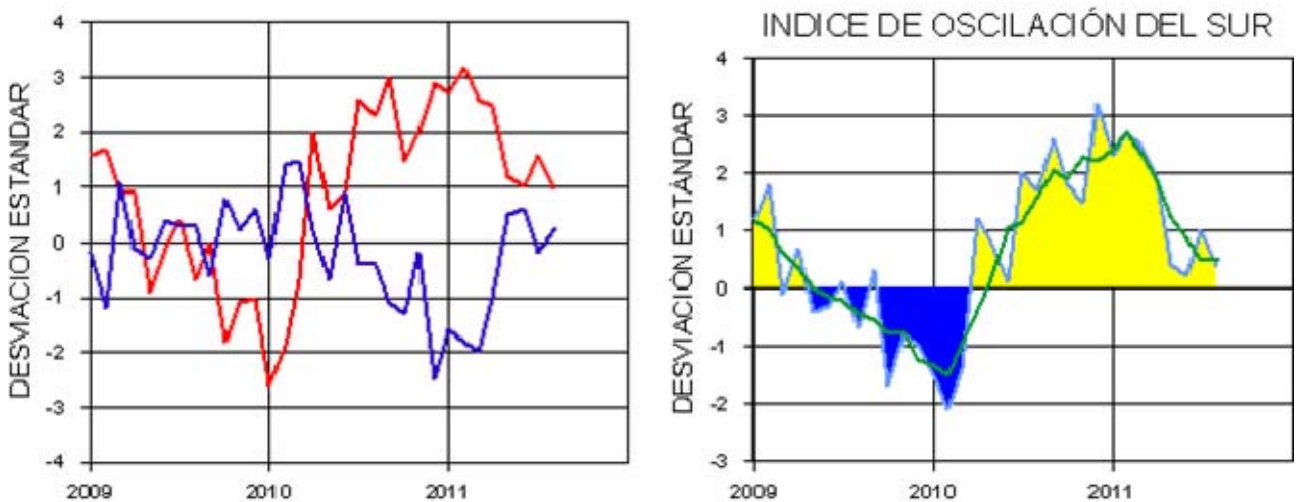


Figure 4.- Left Panel: Five-months running mean for atmospheric pressure anomalies in Tahiti and Darwin (mb). Right Panel: Southern Oscillation Index. (SOI) with monthly values and five-months running mean graphed as a green line. The SOI is based on the difference between standardized pressure values: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

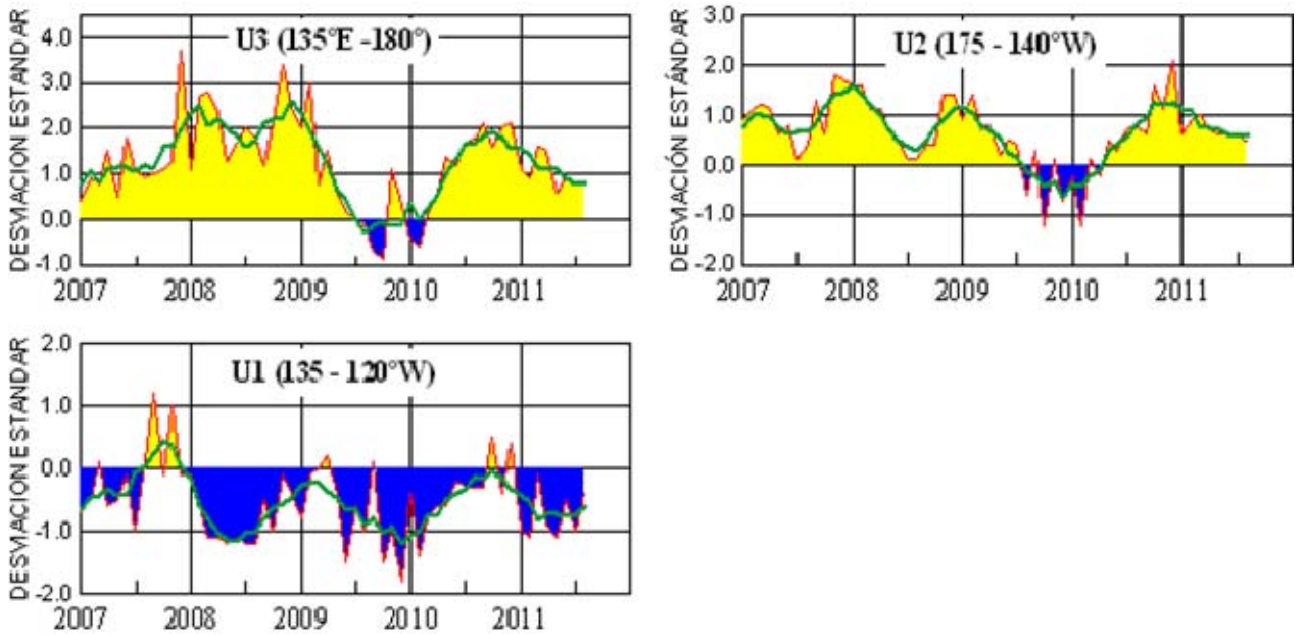


Figure 5.- Series and moving averages of five months of zonal wind standardized anomalies (m/s) averaged between 5°N and 5°S for three Equatorial zones: western (U3), central (U2) and eastern (U1). (Source: NCEP/NWS/NOAA/USA).

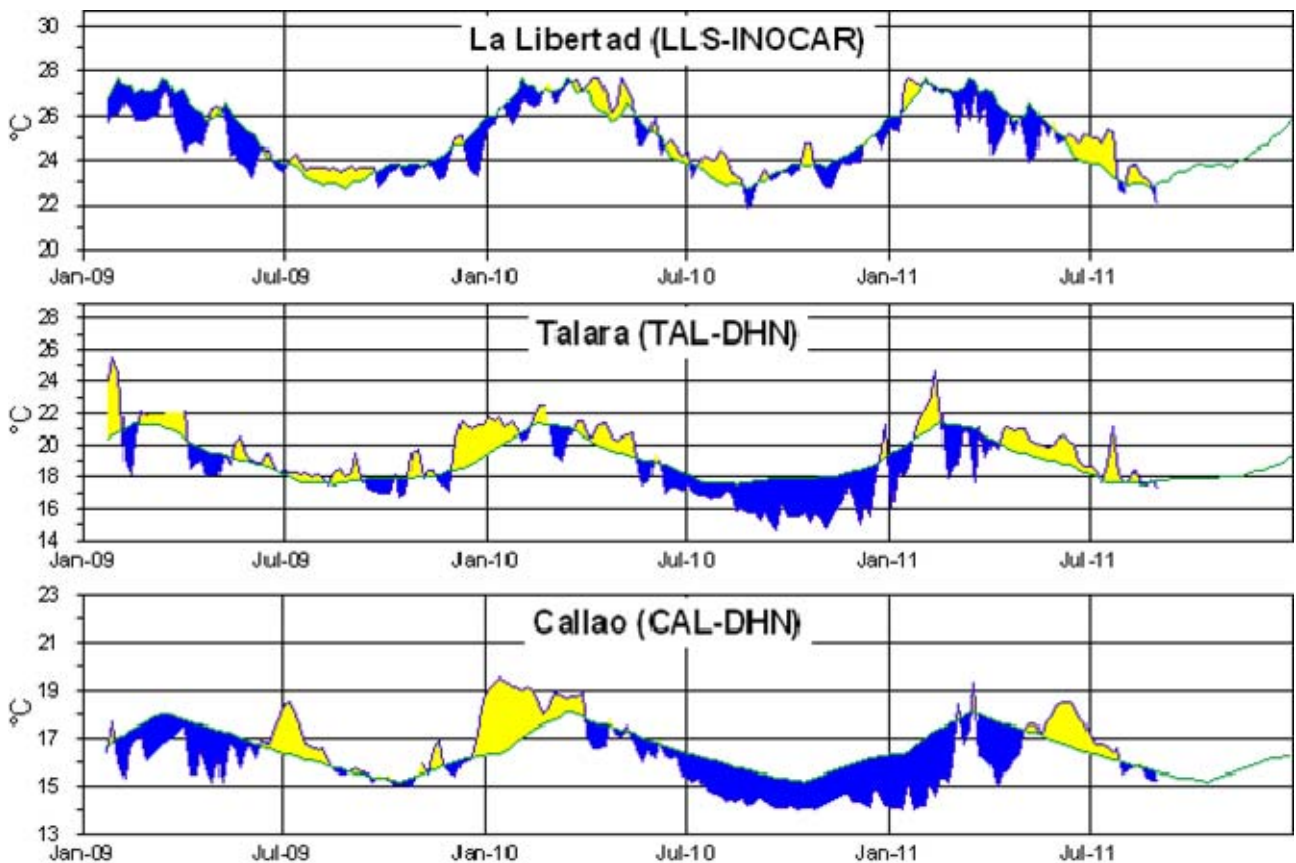


Figure 6.- Five day averages (pentads) of SST (°C) in Ports of Ecuador and Peru. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Source: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami.)

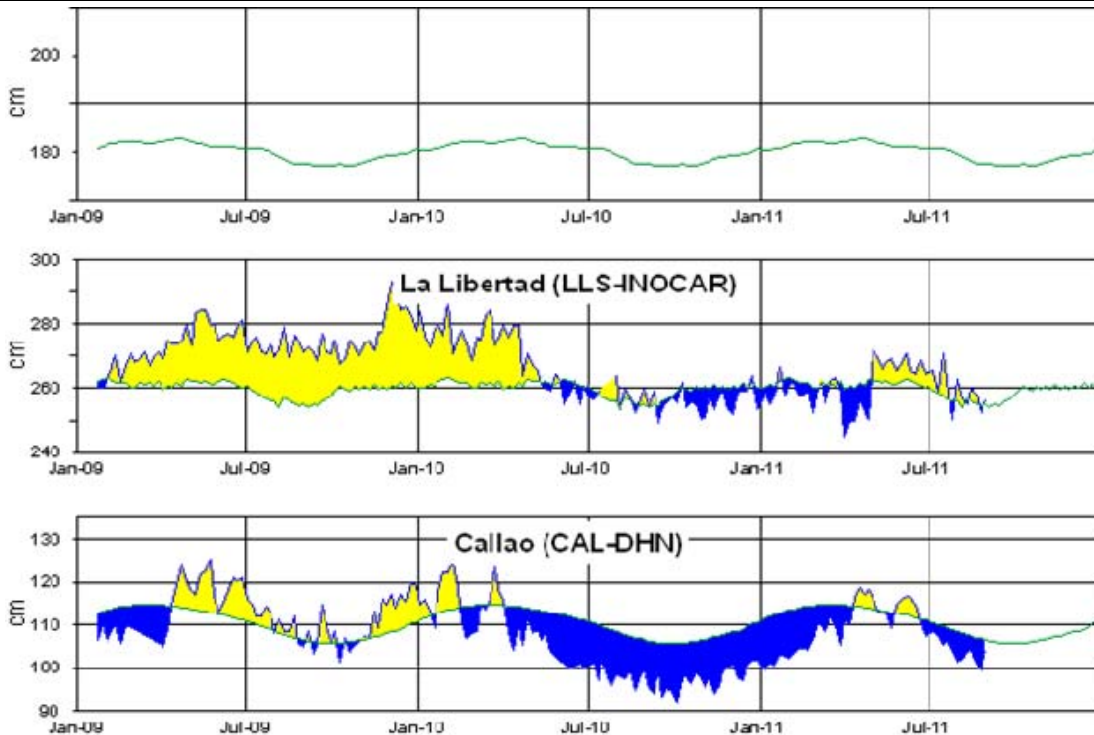


Figure 7.- Five-day running mean (pentads) of MSL (cm) in Ports of Peru and Ecuador. The green curve indicates climatology. The location of oceanic indices appears in figure 1. (Sources: NOAA/Atlantic Oceanographic and Meteorological Laboratory – Miami, e INOCAR).

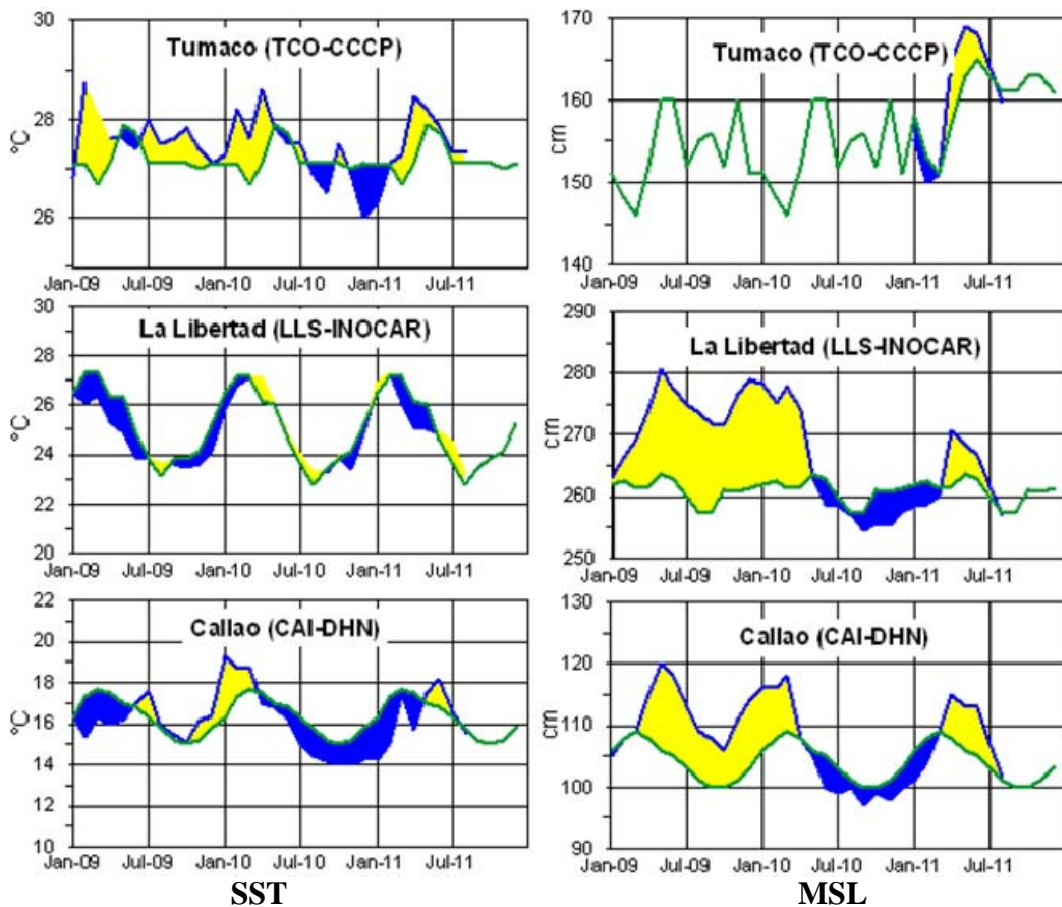


Figure 8a.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP, INOCAR y DHN).

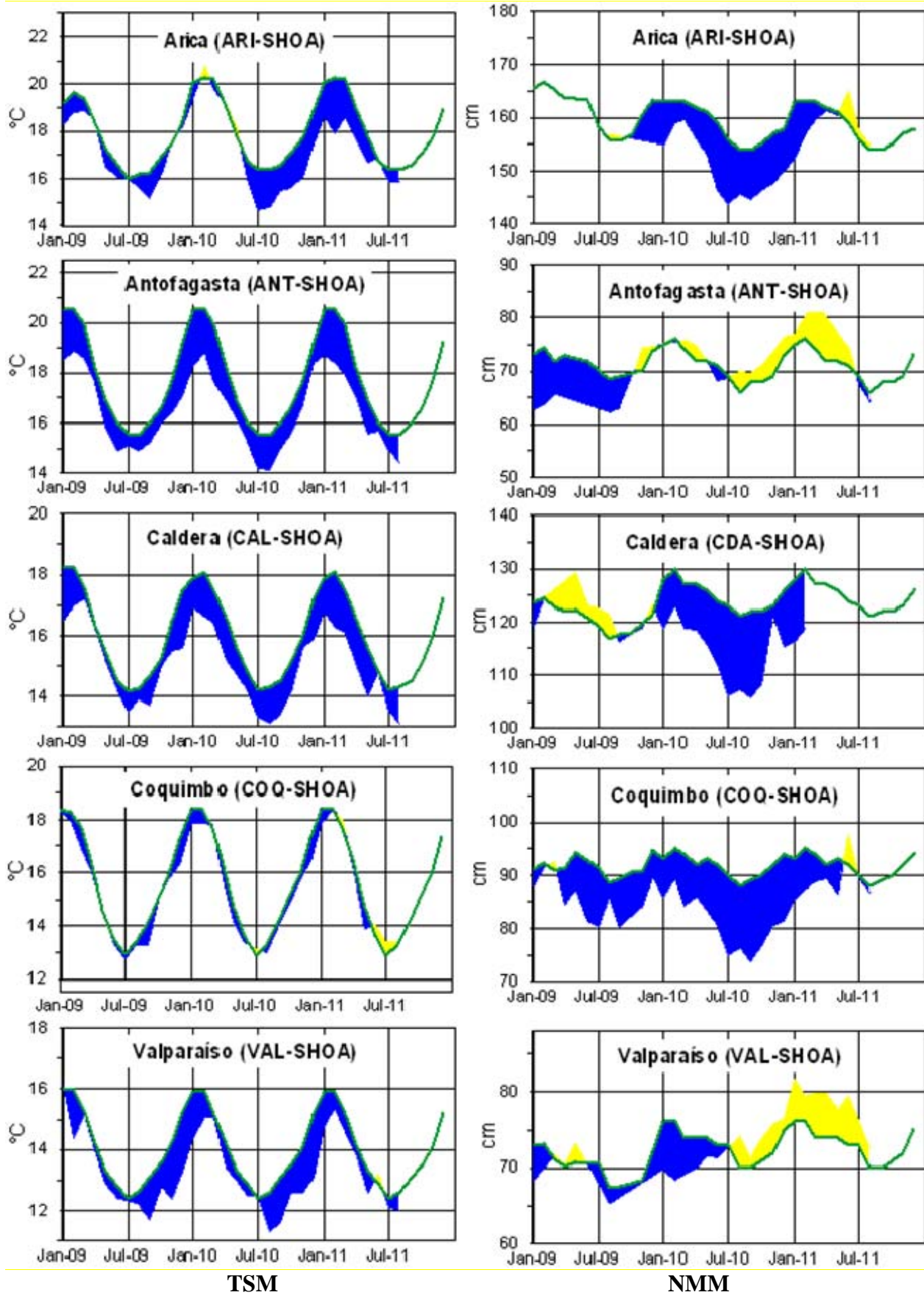


Figure 8b.- Monthly means of the SST (°C) and MSL (cm) in five stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Source: SHOA).

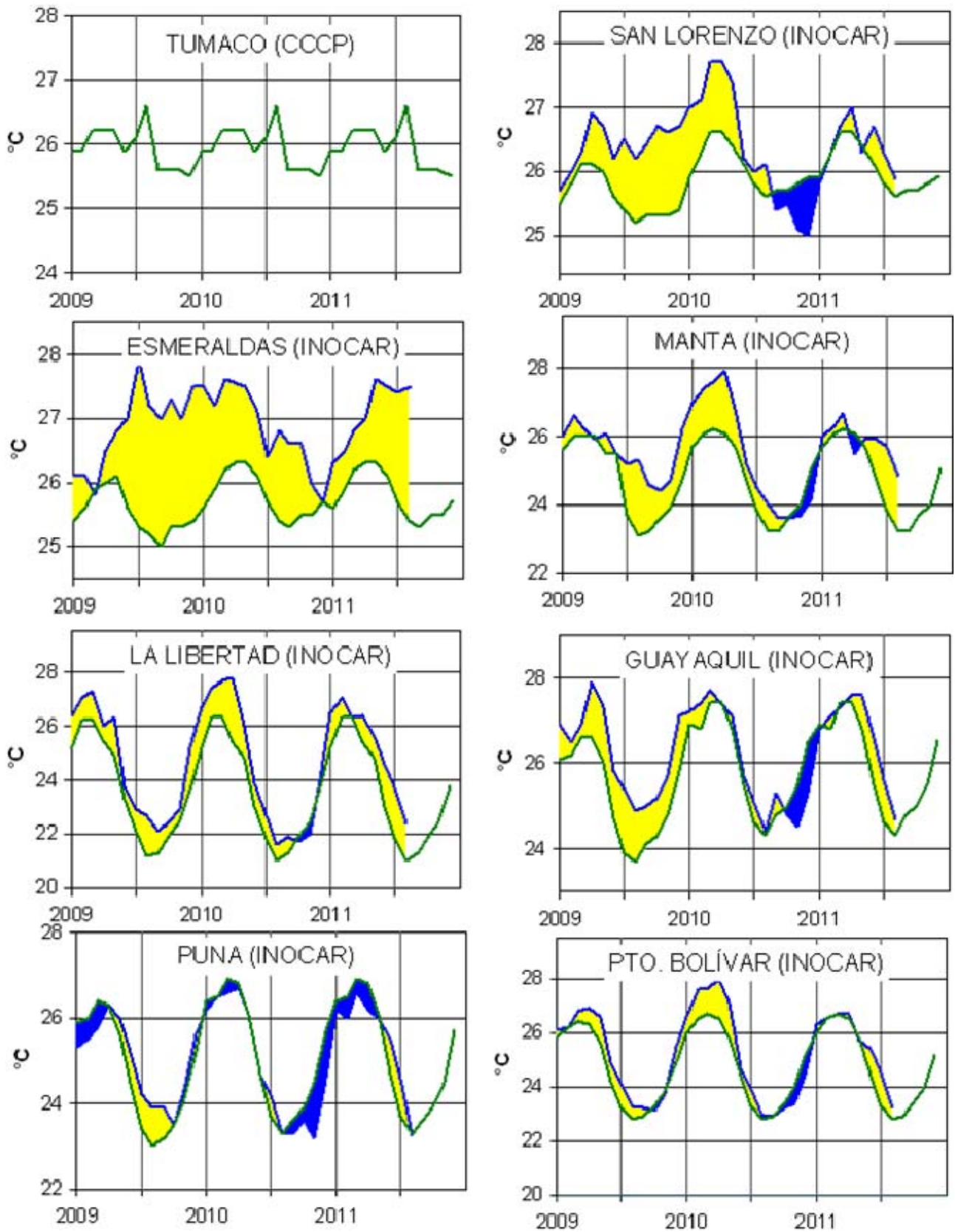


Figure 9a.- Monthly means of the air temperature (°C) in 8 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: CCCP & INOCAR).

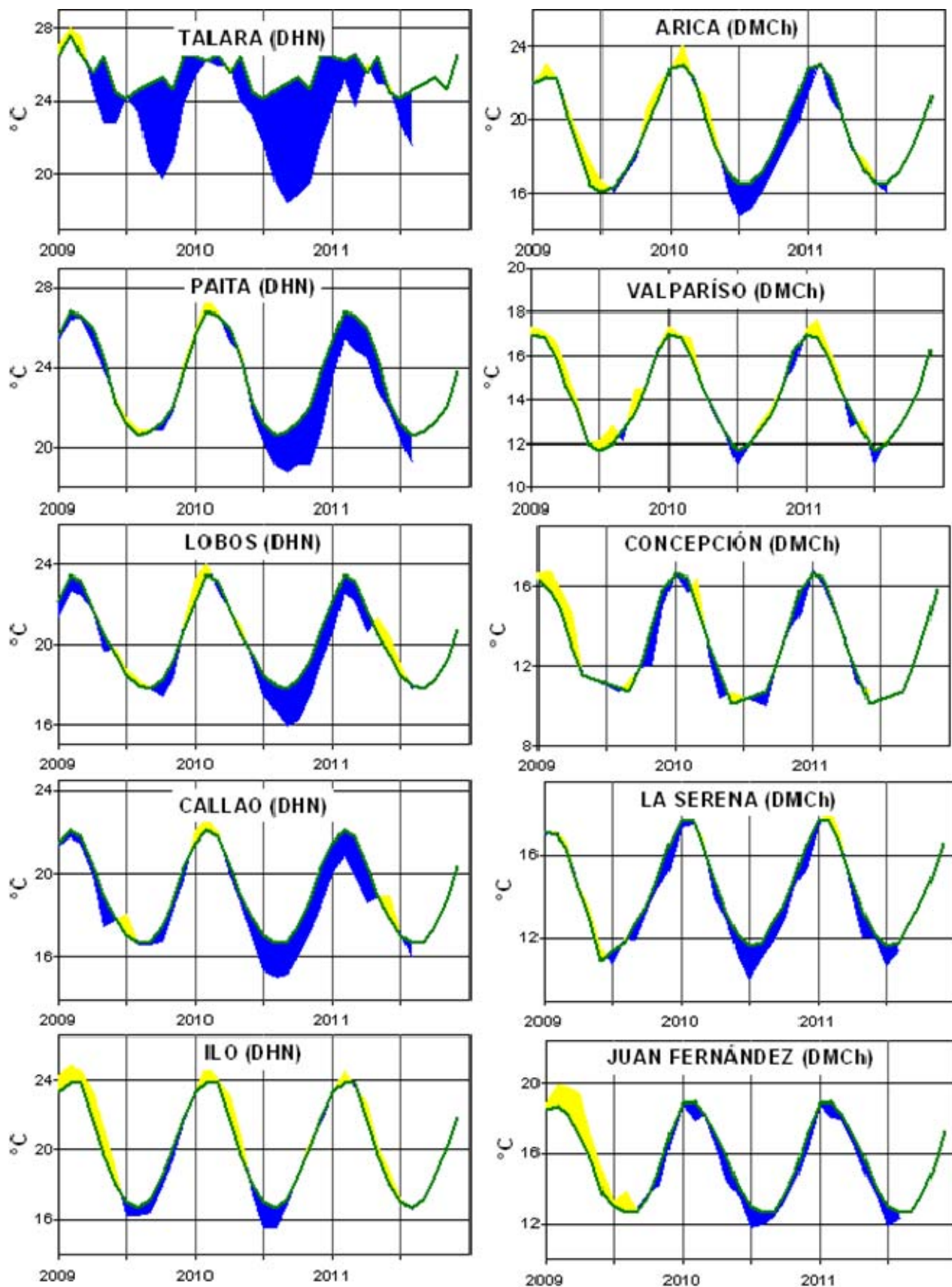


Figure 9b.- Monthly means of the AT (°C) in 10 stations of the ERFEN region. Green curve indicates historic monthly mean. The location of the stations appears in Figure 1. (Sources: DHN & DMCh).

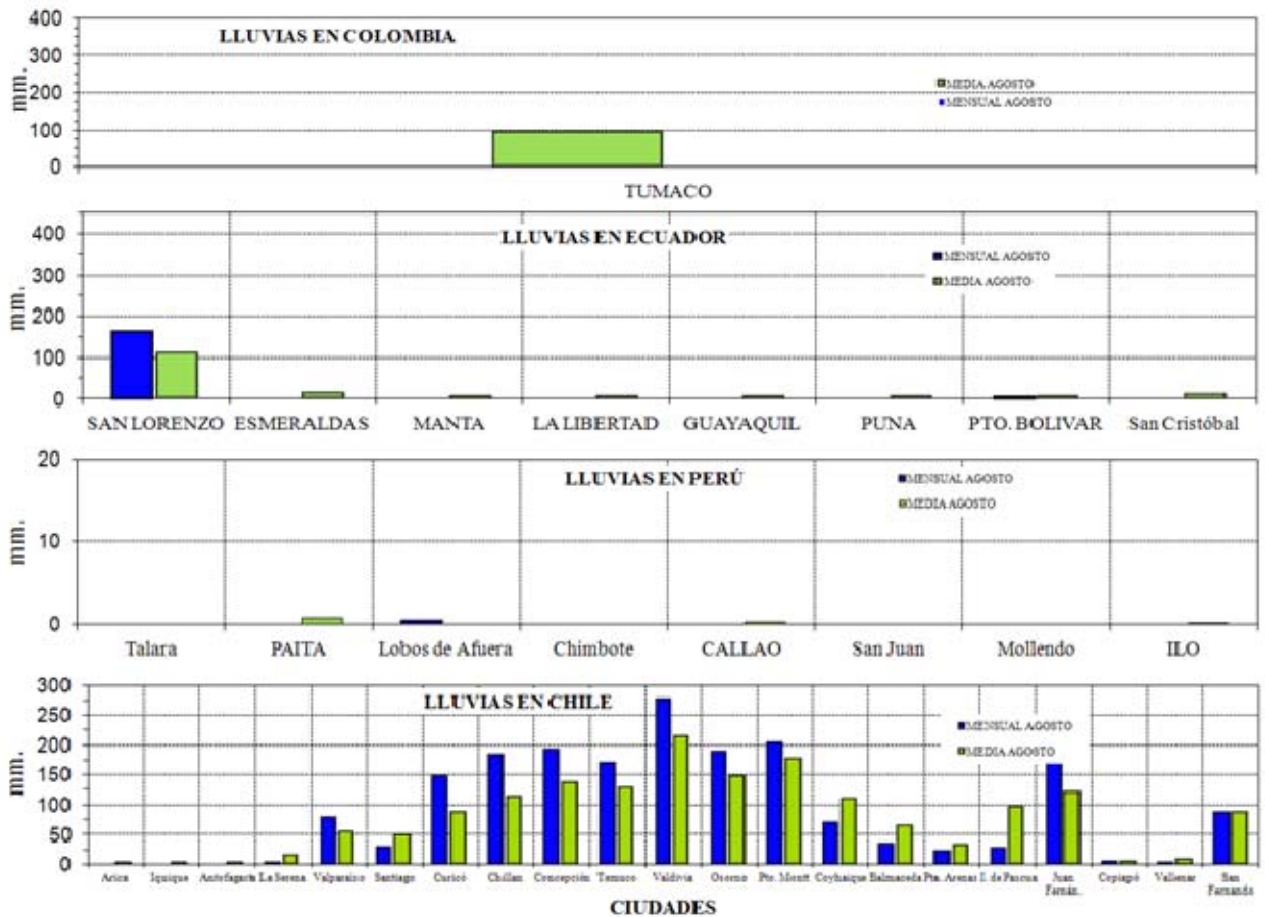


Figure 10.- Rains during July in the coastal stations of Colombia, Ecuador, Peru and Chile. Location of the stations appears in Figure 1. (Sources: CCCP, INOCAR, DHN & DMCh).

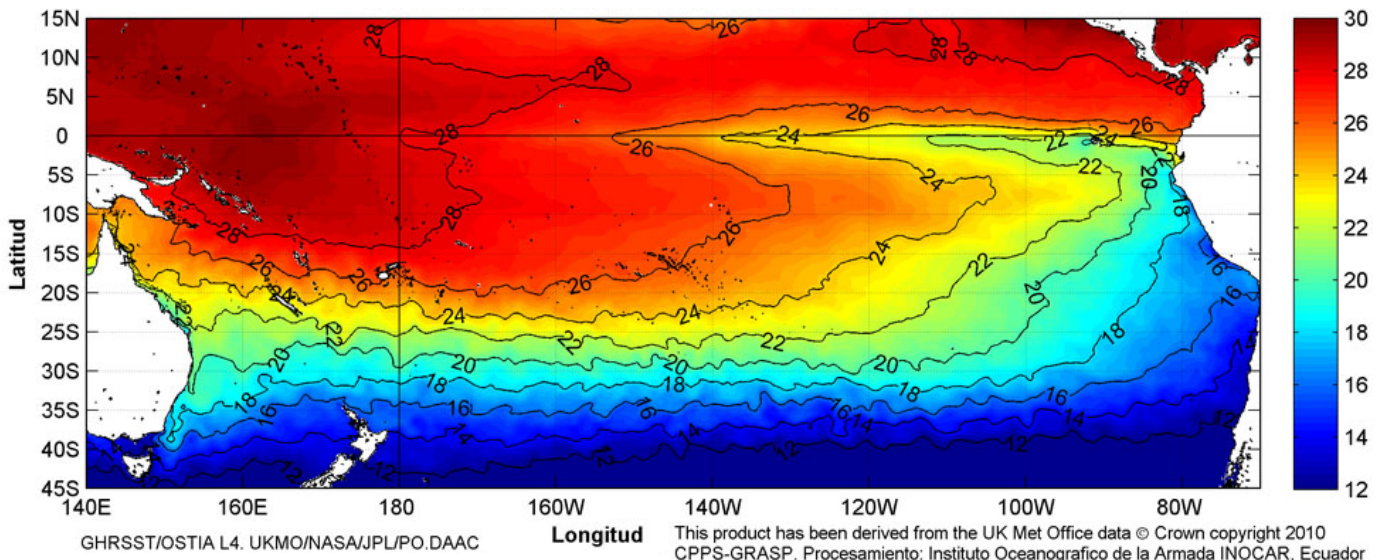


Figure 11.- Sea Surface Temperature Anomalies (°C) August 2011. (Source: International Research Institute for Climate and Society)

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