

IV International Conference on El Niño Southern Oscillation: ENSO in a warmer Climate

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Abstracts Book

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Table of Content

Table of Content	i
Session 1. ENSO Observations	1
Oral presentations	1
The 2015-16 El Niño and Climate Change	2
Advances in paleo-ENSO: a past to future perspective	3
ENSO complexity: a monitoring and forecasting perspective	4
El Niño diversity, cross-equatorial winds, and the intertropical convergence zone	5
ENSO variability in Galápagos corals: New insights on variability and trends	6
Impacts of the Pacific Equatorial Undercurrent on the Northern Peruvian Coast.....	7
The impact of global warming on ENSO is clearer now than ever before	8
Posters	9
The 1877-1878 Mega Niño and its social impact in Costa Rica, Central America.....	10
What makes Protracted El Niño to last longer than Canonical El Niño?	11
Insights into ENSO activity during the last two millennia from archaeological bivalve isotopic records from Peru.	12
Balance of Moisture Transport in the North Coast during El Niño.....	13
Presence of oceanic Kelvin waves during the 2017 coastal El Niño event	14
Is El Niño current part of the equatorial current system?	15
On the possible cause of distinct El Niño types in the recent decades	16
Variability of Barrier Layer in the Equatorial Pacific associated with ENSO	17
External and internal origins of ENSO modulation revealed by Holocene corals and climate model simulations	18
Sea surface temperature inter-annual variability in the northeastern tropical Pacific and its relationship with El Niño and La Niña conditions	19
ENSO Indices for a Changing Climate	20
Assessment of twentieth century reanalyses to represent ENSO impacts over the Tropical Atlantic and Ceará rainy season	21
Spatial and temporal analysis of daily precipitation during the coastal El Niño 2017 in Peru	22
Enso Influence on the Precipitation Pattern along the Ecuadorian Coast	23
Uncertainty estimation of rainfall anomalies during ENSO in Colombia	24
Spectral Analysis of Sea Surface Temperature on the Equatorial Pacific from 1950 to 2014.....	25
Seasonal Variation in Microclimates and the Role of Regional Weather and Environmental Factors	26
Distribution of functional groups of phytoplankton in the Pacific Equatorial Post El Niño 2015-2016.....	27

The 1877-1878 Mega Niño and its social impact in Costa Rica, Central America

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Key words: ENSO, Social Impact, Central America, El Niño, Locusts

This work analyzes the social impact of the 1877-1878 Mega-Niño event in Costa Rica, through the comparison of data about droughts, rains, locust plagues and epidemics, collected from documentary sources of that time, with analysis of meteorological data. During the years 1877-1878, Central America was dominated by drier, warmer and windier conditions, like the ones observed during a warm El Niño event in the eastern equatorial Pacific. That scenario did not favor the formation of mesoscale convective systems on the Central American Pacific slope, nor the formation of tropical cyclones in the Atlantic basin, what is in agreement with the drier observed conditions. The present research also establishes the relationship between the plague of locusts that took place in Costa Rica between 1877 and 1878 with the Mega-Niño described (one of those that caused the greatest impacts on a planetary scale during the 19th century) from the analysis of the historical sources and the meteorological information corresponding to the period of study. According to the reports of that time, mainly contained in documents of the Congress, Governance and Municipal Funds of the National Archive of Costa Rica, this plague began to manifest itself in 1876 in the province of Guanacaste and in the following months it was largely extended of the Costa Rican territory, affected several populations within the Central Valley, the Pacific coast, the Northern Plains and to a lesser extent the Comarca de Limón. The atmospheric conditions prevailing with the presence of the 1877-1878 Mega-Niño favored the gregarization of these insects, which expanded the clouds of locusts that caused significant effects for agriculture due to the invasion of agricultural lands, so measures were taken to combat the presence of locusts and mitigate their impact on the Costa Rican society.



The 1877-1878 Mega Niño and its social impact in Costa Rica, Central America.

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ABSTRACT:

This work analyzes the social impact of the 1877-1878 Mega-Niño event (Aceituno et al. 2008) in Costa Rica, through the comparison of data about droughts, rains, locust plagues and epidemics, collected from documentary sources and the analysis of meteorological data. During the years 1877-1878, Central America was dominated by drier (Fig. 1 & 2), warmer (Fig. 2 & 3) and windier (Fig.4) conditions, like the ones observed during a warm El Niño event in the eastern equatorial Pacific. That scenario did not favor the formation of mesoscale convective systems on the Central American Pacific slope, nor the formation of tropical cyclones in the Atlantic basin, what is in agreement with the drier observed conditions. The purpose of this research is also to analyze the relationship between the plague of locust in Costa Rica with the Mega-Niño of 1877-1878. To achieve this, it was necessary to carry out a bibliographic review of reports that show the impact of this plague on the country, which were conserved in the Congress, Governance, Municipal and Police Files of the National Archive of Costa Rica. According to the documentation consulted, the clouds of locust began to manifest themselves in the province of Guanacaste in June 1876 and in the following months it spread to a large part of the Costa Rican territory, affecting several populations within the Central Valley, the Pacific coast, the Plains of the North and to a lesser extent the Region of Limón (Caribbean coast); this is why it affected mainly the zones of Costa Rica located within the Central American Dry Corridor (CADC, Fig. 5). Based on the analysis of existing meteorological data, it can be concluded that the conditions generated by the Mega-Niño favored the propagation of insects, a fact that caused significant effects in agriculture due to the damage caused to agricultural lands. The sources also show the measures implemented to combat the clouds of locust and mitigate their impact on the Costa Rican society.

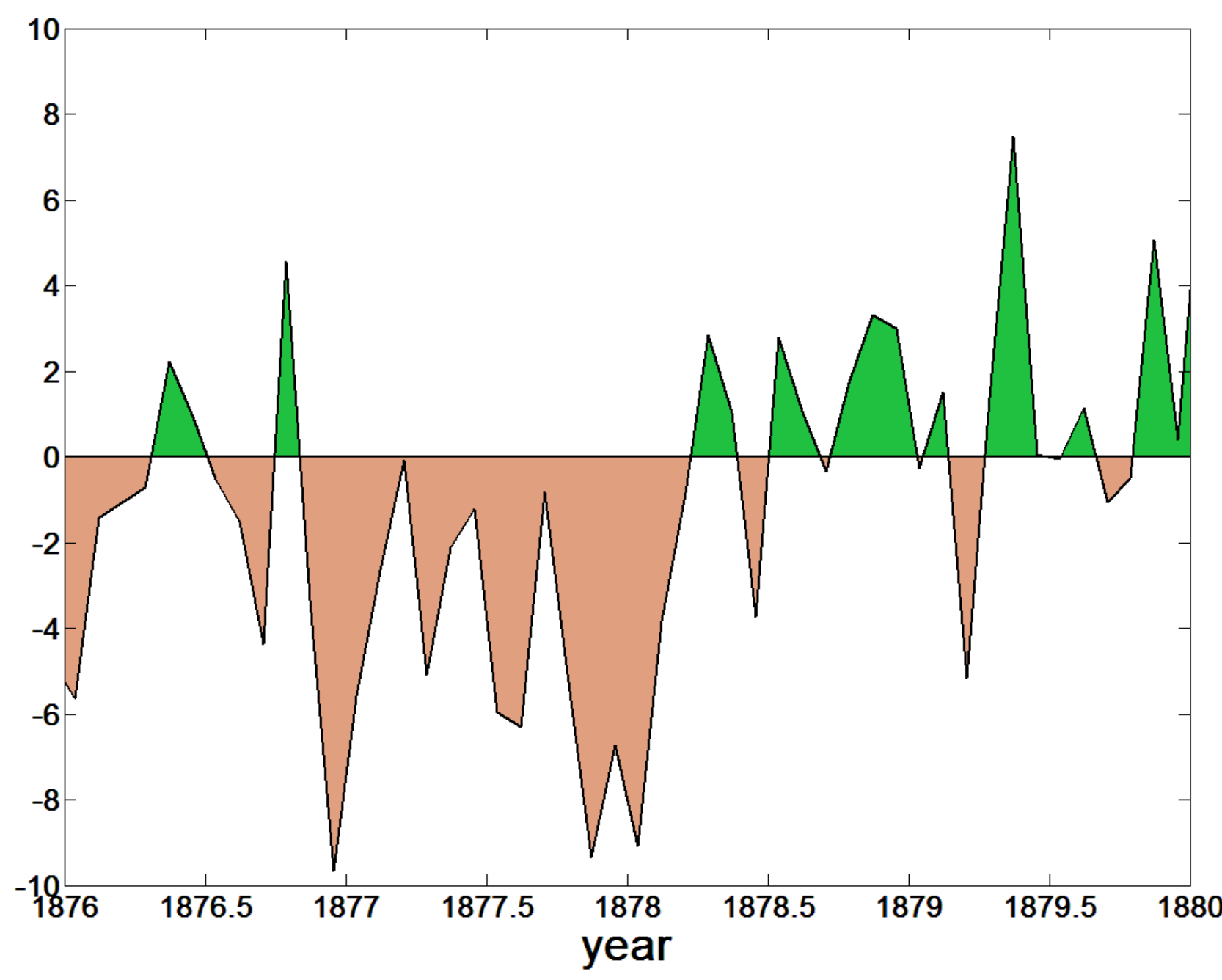


Fig. 1a. Precipitation normalized anomalies for the first EOF over the domain 6.7-14.3° N, 75-93.4° W (Fig. 1b), according to Compo et al. (2011) data set. Base period 1871-1901.

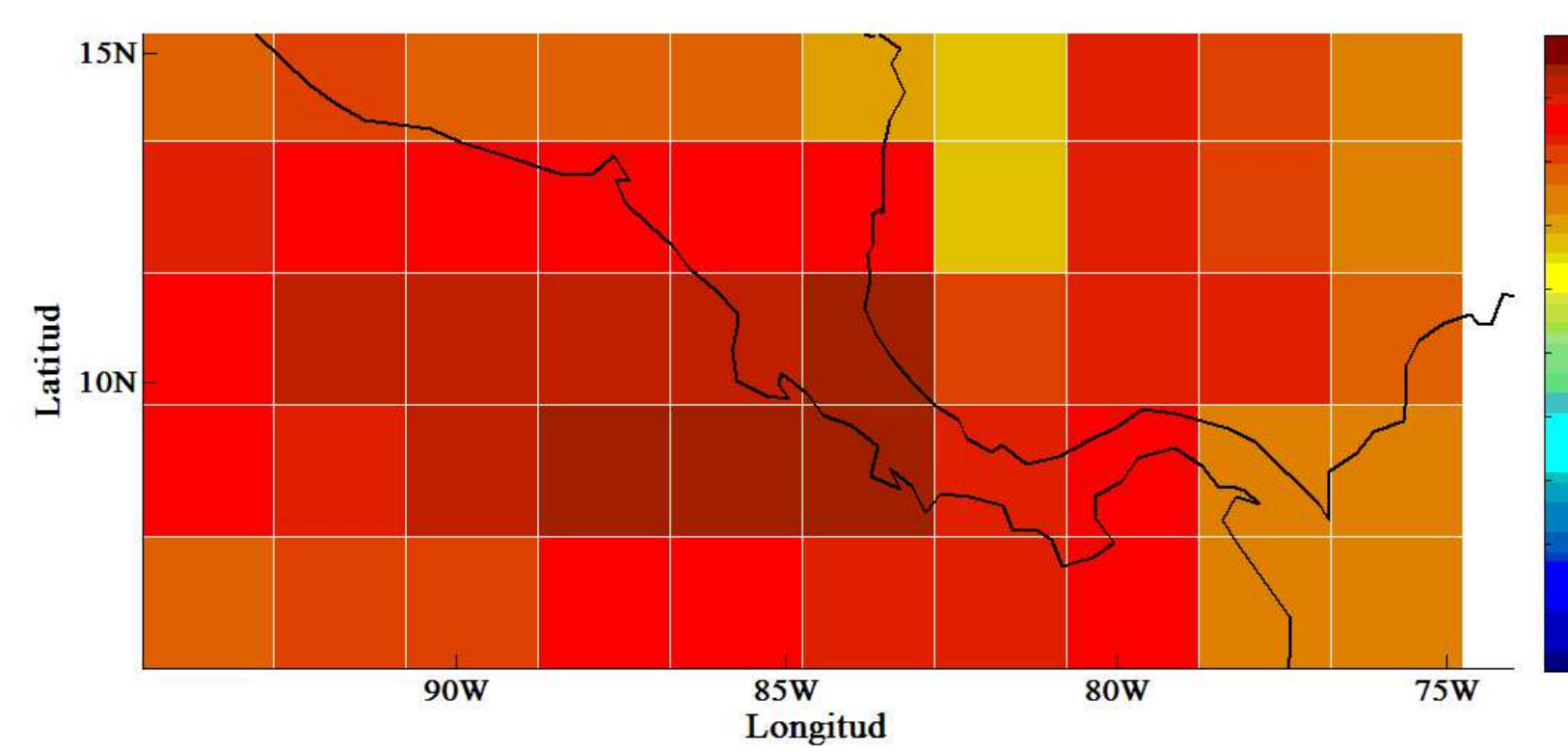


Fig. 1b. Correlation values between the first EOF in Fig. 1a and the grid points over the study domain.

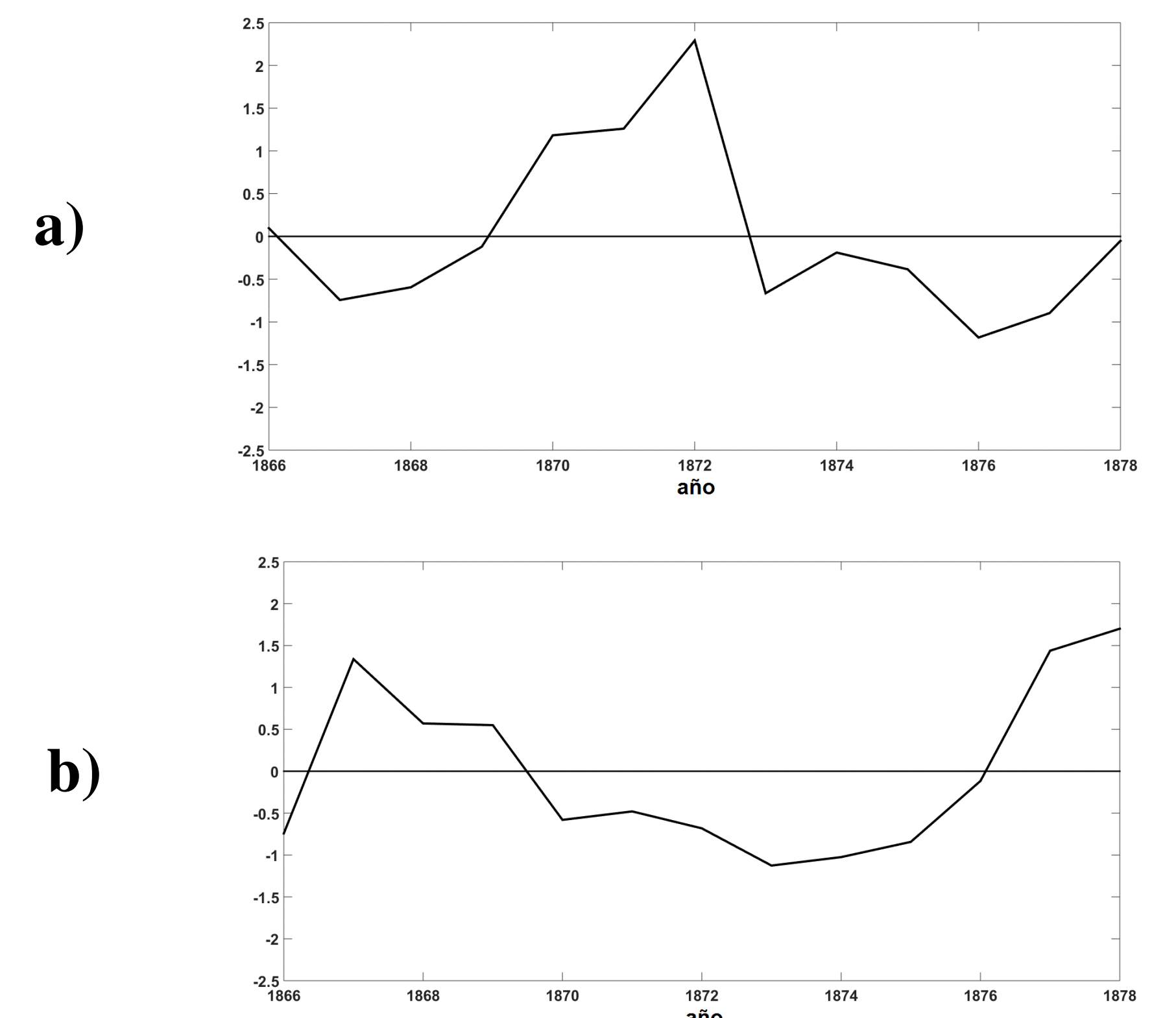


Fig. 2. – Annual normalized anomalies observed in San Jose, Costa Rica by Maison (1879): a) accumulated precipitation and b) average air surface temperature. From 1866 to 1878.

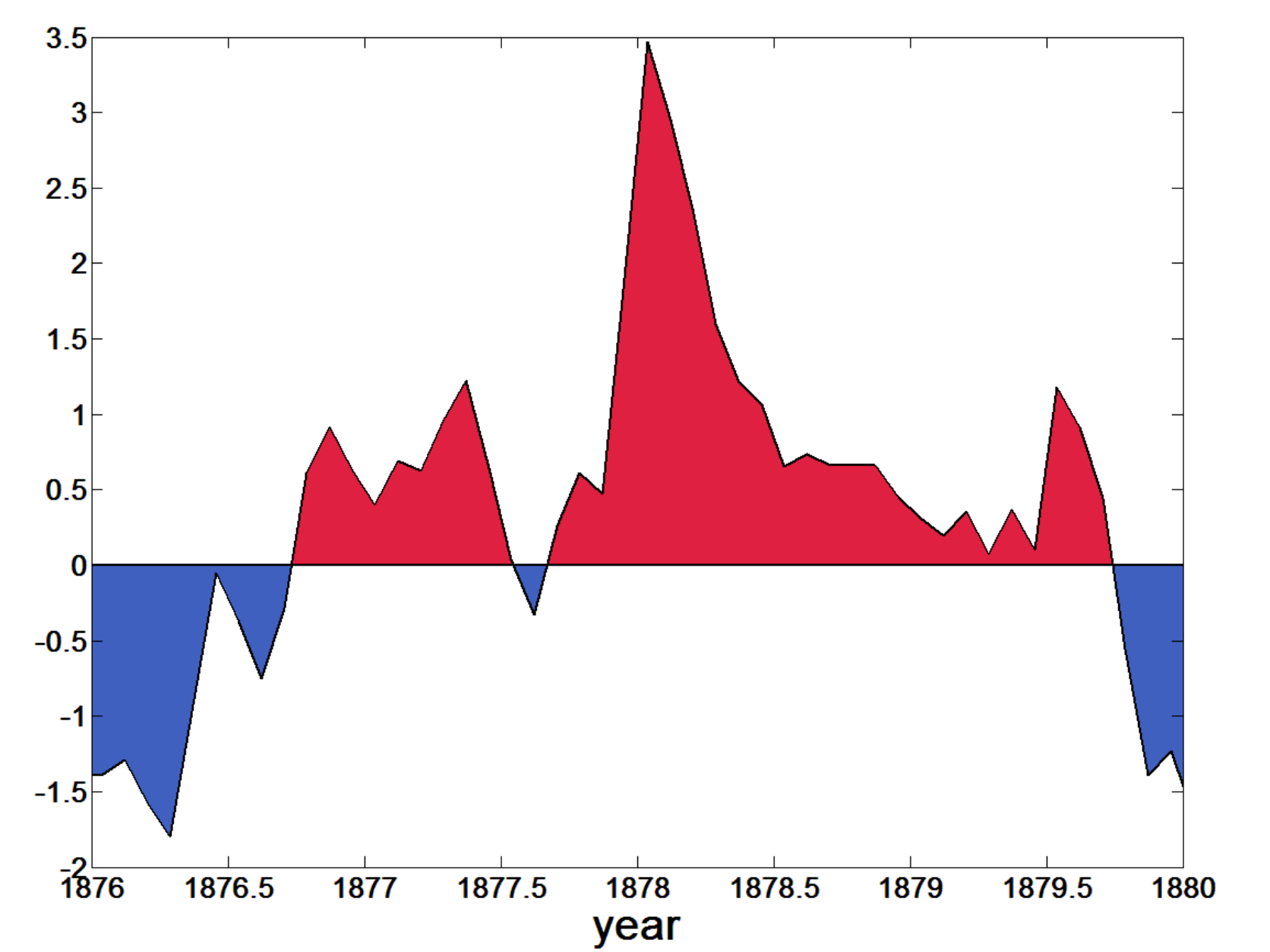


Fig. 3a. Average of the Normalized SST anomalies over the domain 5° N, 92° W Northeastward to the Central American Pacific coast (Fig. 3b), according to Smith et al. (2008) data set. Base period 1862-1892.

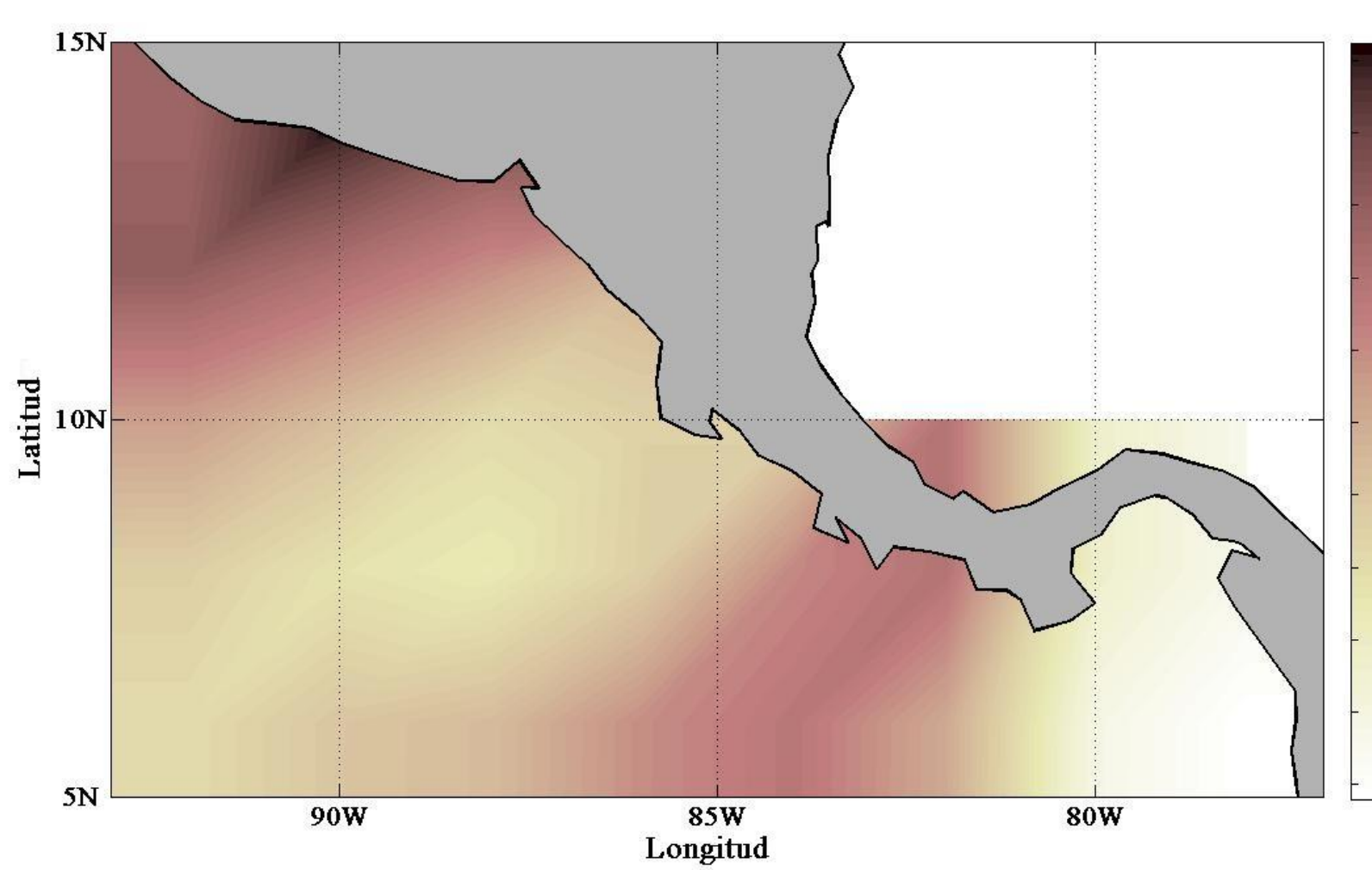


Fig. 3b. Spatial distribution of SST anomalies for January 1878 from average time series presented in Fig. 3a.

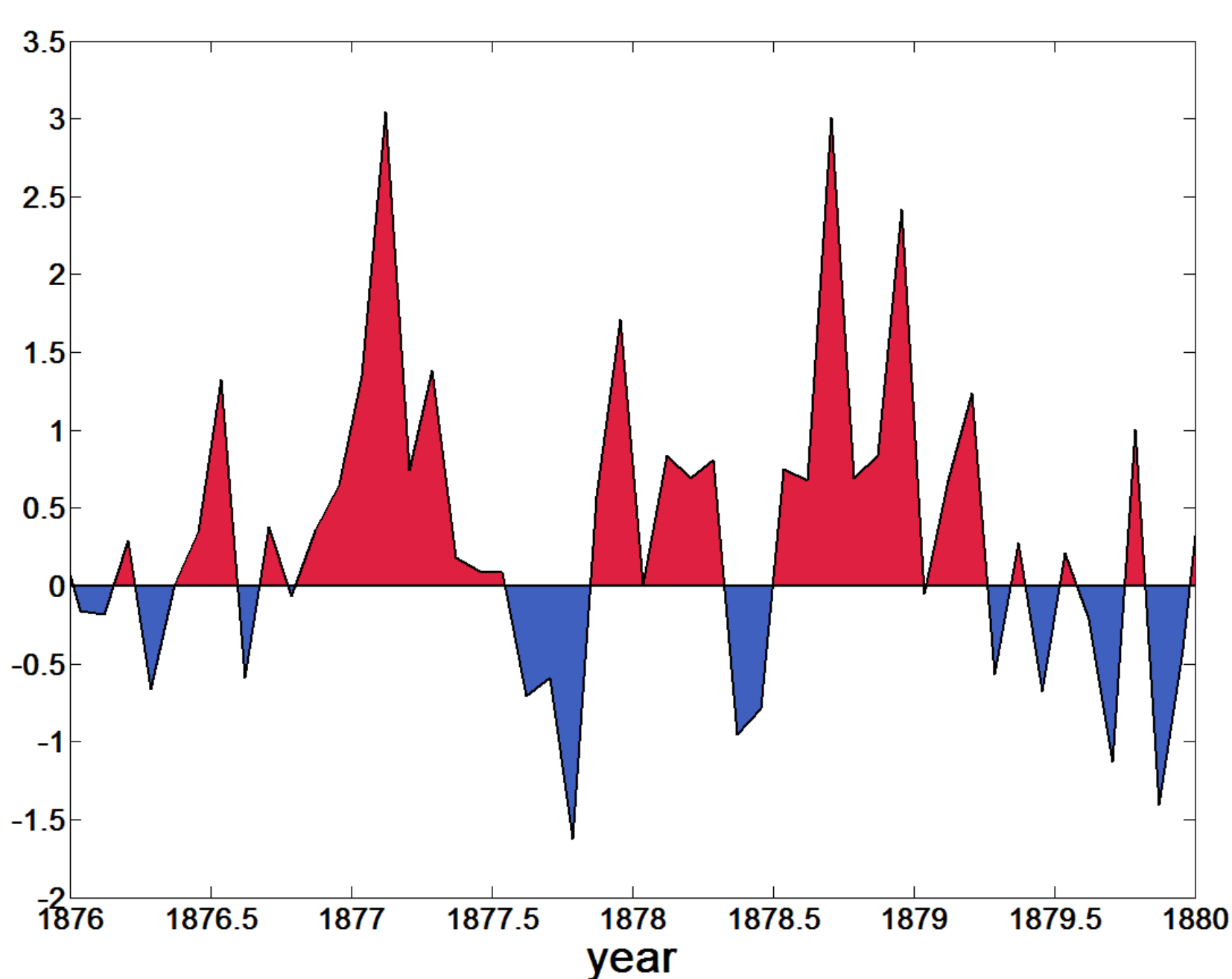


Fig. 4. Vertical wind shear normalized anomalies between the 1000 and 925 hPa levels for the Caribbean Low Level Jet core region (12.5–17.5° N, 75–80° W, Amador 2008; Amador et al. 2010), according to Compo et al. (2011) data set. Base period 1871-1901.

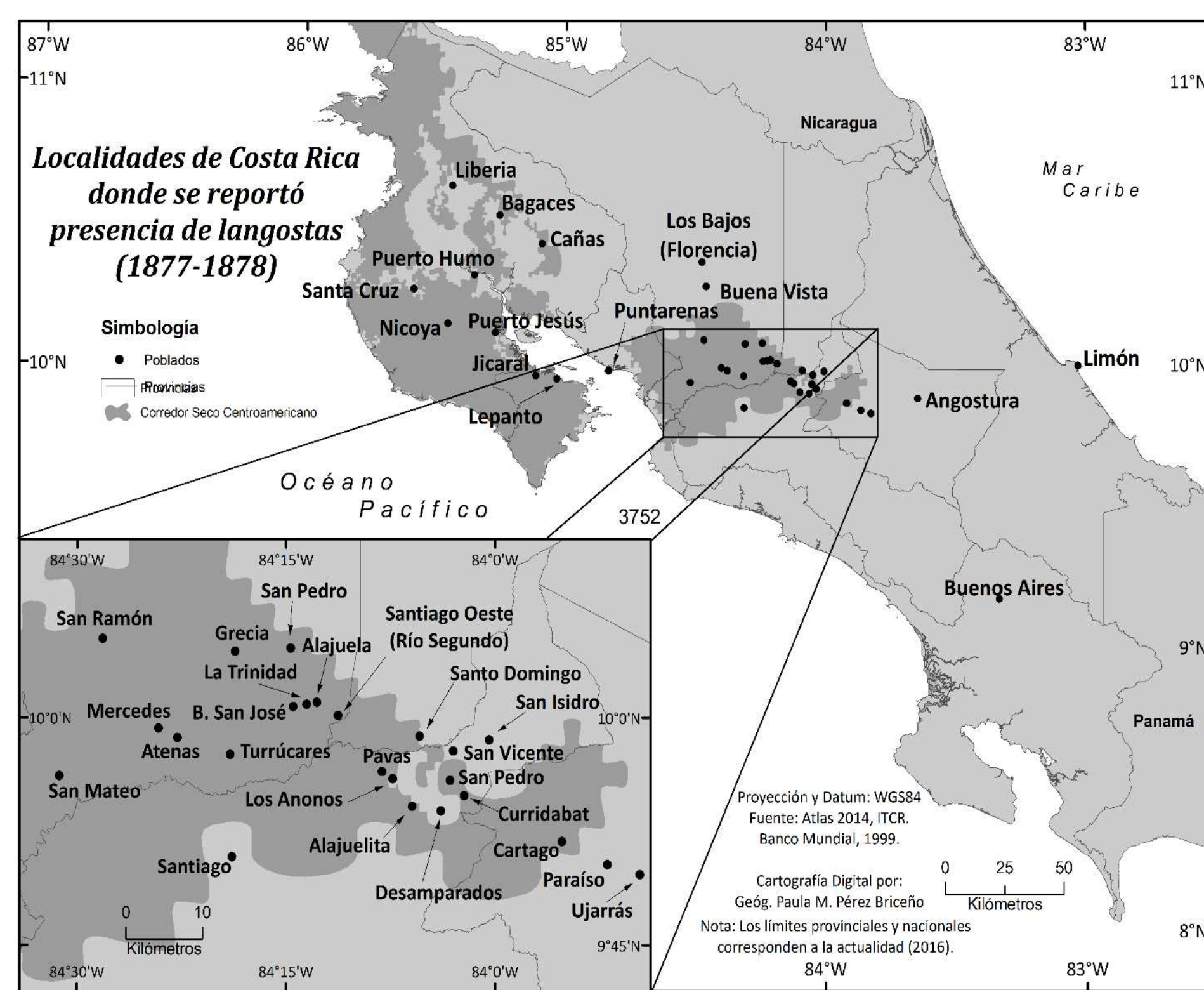


Fig. 5. Costa Rican cities, towns and villages in which locust's plague was reported (1877-1878), according to the documents consulted at the Costa Rican National Archives. The area of the Central American Dry Corridor (CADC) is shadowed in dark gray.

Poster based on the works:

Díaz, R. & Alfaro, E. (2016). El Mega-Niño de 1877-1878 y su impacto social en Costa Rica. *Tópicos Meteorológicos y Oceanográficos*, 15(2), 20-32.

Díaz, R. E., E.J. Alfaro y L.L. Gutiérrez (2018). El impacto de la plaga de langostas en Costa Rica y su relación con el Mega Niño de 1877-1878. *Submitted to Cuadernos de Investigación*.

https://www.researchgate.net/profile/Eric_Alfaro/contributions
<https://ucr.academia.edu/EricAlfaro/Papers>

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Poster available after the event at: <http://kerwa.ucr.ac.cr/>

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6. SCIENTIFIC PROGRAMME

6.1 Programme at a glance

Date	Day 1 Tuesday, October 16	Day 2 Wednesday, October 17	Day 3 Thursday, October 18
AM	8:30 - 9:00 Registration		
	9:00 – 10:00 Opening Ceremony & Inaugural Keynote	9:00 – 10:00 Oral Session: Session 3: ENSO and Modes of Climate Variability	9:00 – 10:00 Oral Session: Session 5: ENSO impacts and Regional process
	10:00- 10:30 <i>Coffee Break</i>	10:00- 10:30 <i>Coffee Break</i>	10:00- 10:30 <i>Coffee Break</i>
	10:30- 12:30 Oral session: Session 1: ENSO Observations	10:30- 12:10 Oral Session: Session 3: ENSO and Modes of Climate Variability	10:30- 12:10 Oral Session: Session 5: ENSO impacts and Regional process
		12:10- 12:30 Poster Express: Session 3: ENSO and Modes	12:10- 12:30 Poster Express: Session 5: ENSO impacts and Regional process
Noon	12:30- 13:30 Lunch Climate Services Stage	12:30- 13:30 Lunch Climate Services Stage	12:30- 13:30 Lunch Climate Services Stage
PM	13:30- 14:10 Oral session: Session 1: ENSO Observations	13:30- 14:30 Poster viewing (Sessions 1, 2, 3)	13:30- 14:30 Poster viewing (Sessions 4,5,6)
	14:10- 14:30 Poster Express: Session 1: ENSO Observations		
	14:30- 15:30 Oral Session: Session 2: ENSO Dynamics	14:30- 15:30 Oral Session: Session 4: ENSO Modelling and Prediction	14:30- 15:30 Oral Session: Session 6: Climate information and sustainable development
	15:30- 16:00 <i>Coffee Break</i>	15:30- 16:00 <i>Coffee Break</i>	15:30- 16:00 <i>Coffee Break</i>
	16:00-17:40 Oral Session: Session 2: ENSO Dynamics	16:00-17:40 Oral Session: Session 4: ENSO Modelling and Prediction	16:00-17:40 Oral Session: Session 6: Climate information and sustainable development
	17:40- 18:00 Poster Express: Session 2: ENSO Dynamics	17:40- 18:00 Poster Express: Session 4: ENSO Modelling and Prediction	17:40- 18:00 Poster Express: Session 6: Climate information and sustainable development
			18:00-18:20 Closure & Poster awards