Dendrochronological laboratory for studies relate to ENSO events in the tropical zone of South-America.

Rodolfo Rodriguez (1) , Antonio Mabres (1) , Luis Flores (1), Ronald Woodman (2) and (3)Brian H. Luckman

(1) Universidad de Piura, Apartado 353, Piura, Peru
(2) Instituto Geofísico del Peru, Apartado 3747, Lima, Peru
(3) University of Western Ontario, London, Ontario, Canada, N6A 5C2

1. Abstract

The Collaborative Research Network (CRN) project 'The assessment of present, past and future climate variability in the Americas from treeline environments', currently under development by institutions of Argentina, Bolivia, Canada, Chile and United State. The goal of the CRN project is the recovery of tree-ring records of past climate from treelines sites along the cordillera between Alaska and Tierra del Fuego. It will be used to reconstruct the major modes of interhemispheric climate variability for the past centuries. Tree-ring reconstruction of precipitation and temperature will allow detailed study of local and regional climate variability, how it changes with latitude and is linked to the major elements of ocean and global circulation. Through a proposal to the 'Program to Expand Scientific Capacity in the Americas (PESCA)" of Inter-American Institute for
Global Change Research (IAI) a very important and critical area of South-America has been incorporate to such as studies. This is most west area of South-America between north coast of Peru and the south one of Ecuador. This area is very sensible to the climatic change due to the ENSO hence a suitable area to find several records, including dendrochronological ones, of climate variability cause by the ENSO events. So that a dendrochronological laboratory will be installed at Universidad de Piura under the base of reconstruction the ENSO chronology and its impact on the Global change. This facility has been a big priority for dendrochronological community.

The facilities at Piura will be similar to those in Bolivia and Mexico where the CRN project is installing. Similar facilities and computational programs made easy the information exchange between the laboratory belong to the this network. With these facilities it is possible to contribute dendrochronological information from that area which are potential useful to reconstruction of ENSO chronology and climatic variations which in turn are useful for temperature and rain reconstruction. The expertise of human resources from that region will improve whereas scientific meetings on dendrochronology or by training in others laboratory.

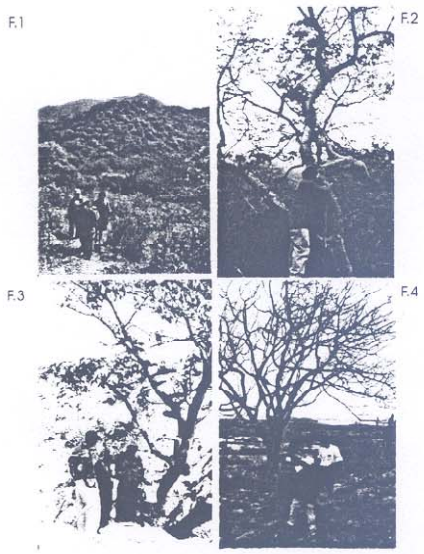

Figure 1. Some photos of tree ring measurements in Peruvian Coast. F.1.L. Flores in Arteza Hill, F.2. R. Rodriguez in Las Lomas, F.3 A. Mabres and L. Eguiguren in Qda Paloma and F.4. R. Rodriguez and K. H. Park in Poechos.

4. Tree ring records of ENSO

From 1986 a group of investigators of the University of Piura began mensurations of growth in trees with species characteristic of the region, the first results of this study were presented in March of 1992 in the 'Paleo ENSO records international Symposium' in the article Advances on studies dendrocronológicos in the region coastal north of the Peru, to obtain a last registration of the phenomenon El Niño, R. Rodriguez, R.F. Woodman, A. Mabres and R. Phipps. During the following years it has been continued with the taking of samples and mensurations in the region north western. Now we present the poster Dendrochronological studies in the Peruvian north coast relates to ENSO that includes information of the recent event ENSO 1997-1998, until beginning of the 2000.

2. ENSO impact on the tropical west coast of South-America

El Niño and Southern Oscillation (ENSO) with their oceanic component (A significant increase of the superficial temperature of the sea in the Center and East of the equatorial Pacific - more than 2 degrees on the average -) and their atmospheric component (South Oscillation or Descent of the atmospheric Pressure in the This of the Pacific) involves changes of global order(1). It is a recurrent phenomenon that affects geologic and climatically in the whole globe and particularly in the west coast of South America, whole communities have been strongly affected by environmental changes associated with the healing ENSO and for cold events(2).
Along the South America coast, El Niño events are accompained by radical changes in fish population, wish major repercussions on the local fishing industry. ENSO episodes cause drought in one the region and floods in another, around the world and is integral part of interannual climate variability inside of global change (2).

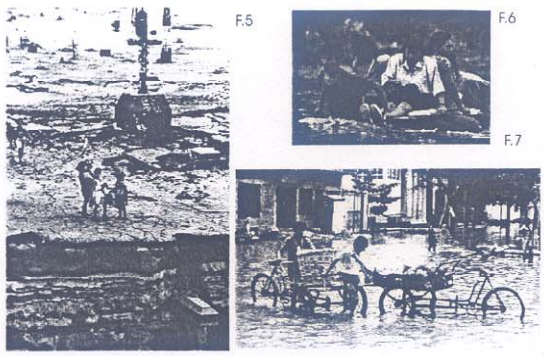

Figure 2. Negatives effects of El Niño 1998 in Tambogrande, Peru. Some photos that shown disasters. F.5. Destroyed Cementery in Malingas(1998). F.6. Inundation of Tambogrande (1998) and F.8. Inundation in Sullana (1983)

5. ENSO reconstruction and future work

The studies before mentioned as so many others that are about the oceanic characteristic of South America's western coast they will allow to relate with registrations of rings of growth of trees, on the whole it will be looked for to supplement the information and to enlarge the chronologies up to now existent on the Bay, for it is thought it to reconstruct the climate of the past based mainly in the rains and in the temperatures that influenced in the growth of you hoist.

To future other species will be looked for and the study area will extend with an eye toward carrying out a similar work to the one described by R. Villalba Tree-Ring evidence for long-term precipitation changes in tropical south South América (11) and using similar method to the one described in Tree-ring based reconstructions of northern Patagonia precipation since AD. 1600'(12) insofar as possible

Zone	Site	Latitud	Longitud	Heigh	Province	District	Ground Environment	Tree
Zorritos	Zorritos	03°40'03"	80°39'21"	30 m.	Contralm. Villar	Zorritos	Tablazo litoral	Muestras de Hualtaco
Punta Sal	Punta Sal	03°58'00"	80°58'00"	15 m.	Contralm. Villar	Zorritos	Coastal Hill	Hualtaco Halatuco
Encuentros	Palo Santal	04°19'00"	80°30'00"	300 m.	Sullana	Lancones	"Pie de monte"	PaloSanto
Río Quiroz	Pampa Larga	04°23'30"	80°16'00"	200 m.	Sullana	Lancones	Piedemonte	Guayacan
Poechos	Montesillo	04°31'30"	80°28'30"	200 m.	Piura	Lancones	"Pie de monte"	Hualtaco, PaloSanto, Charan
Las Lomas	Arteza Hill	04°35'00"	80°15'00"	450 m.	Piura	Lancones	"Pie de monte"	Hualtaco, PaloSanto
Santa Grimanesa	Santa Grimanesa	04°47'00"	80°27'00"	150 m.	Sullana	Sullana	"Pie de monte"	Hualtaco, PaloSanto, Charan
Ejidos	El Molino	05°04'00"	80°30'54"	75 m.	Piura	Piura	Desert	Sapote
Road to Chulucanas	Jose Marquez	05°10'00"	80°12'00"	75 m.	Morropon	Castilla	Desert	Sapote
Vicus	Vicus Hill	05°10'00"	80°09'00"	200 m.	Piura	Chulucanas	"Pie de monte"	PaloSanto
Sechura Desert	Km. 960 Panamer.	05°10'00"	80°35'30"	100 m.	Sechura	Catacaos	Desert	Sapote
Sechura Desert	Km. 940 Panamer.	05°30'30"	80°35'00"	75 m.	Sechura	Cristo Nos Valga	Desert	Sapote
Sechura Desert	Km. 910 Panamer.	05°47'00"	80°32'30"	50 m.	Sechura	Sechura	Desert	Sapote
Frías	Frías	04°55'00"	79°56'00"	1673m	Ayabaca	Frías	Mountain	
El Alto	Quebrada Paloma	03°40'03"	80°39'21"	170 m.	Talara	El Alto	Uninhabited	Hualtaco, PaloSanto

Table 1. Sites for Denorochronological studies at Peruvian North from Dendrocronological studies in Northern coastal Peru in search for past records of the El Niño phenomena: A progress report (8)

3. Several records of ENSO in the tropics

Several studies that evidence the impact of ENSO in the west coast of South America to mention only one 'The Niño/Southern Oscillation climate variability in South América exist shovel-environmental records"(3) and other particularly in on the North of the Peru among them one has "on the formation of a new beach ridge in Mancora, Peru, after El Niño of 1983, R. F.Woodman (4); Historical record of El Niño events in Peru(XVI-XVIII centuries: The Quinn et al(Cronology revisted)(5), Some Aoditional historic notes on The chronology of the El Niño, A. Mabres, R.F. Woodman, and R. Zeta (6), Phenomenon El Niño in the last seventy years, M. Valverde and I. Trebejo (7). All these articles reflect the great study potential that has this region their high sensibility to the changes caused by the ENSO.

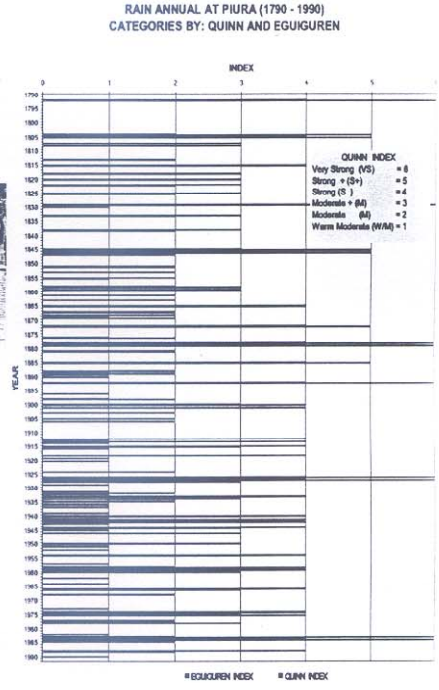

Figure 3. Annual rains in Piura from 1790 to 1990. Two clasifications by V.H. Quinn and V. Eguiguren, from "Some Aoditional Historical notes on the Chronology of the El Niño (6)

References

(1) Recent research of record of former El Niño events in Peru."Paleo ENSO Records". L. Ortlieb and J. Macharé, intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.177-183.

(2) ENSO research in the tropical South America: Future Directions. P. Lagos (GPI) intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.165-166

(3) "The Niño/Southern Oscillation climate variability in South América exist paleo-environmental records". Markgraf V. intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.185.

(4) "On the formation of a new beach ridge in Mancora, Peru, after El Niño of 1983, R. F.Woodman, Bull. Inst. fr. études andines, 1993 22(1)p.213-226

(5) Historical record of El Niño events in Peru(XVI-XVIII centuries: The Quinn et al(Cronology revisted). intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.255.

(6) Some Aoditional historical notes on the chronology of the El Niño, A. Mabres, R.F. Woodman, and R. Zeta. Bull. Inst. fr. études andines, 1993 22(1)p.395-406.

(7) Phenomenon El Niño in the last seventy years, M. Valverde and I. Trebejo intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.319-321.

(8) Advances on chronological studies in the region coastal north of the Peru, to obtain a last registration of the phenomenon El Niño, R. Rodriguez, R.F. Woodman, A. Mabres, B. Bailey and R. Phipps., intern. Symp.(Lima, march 1992)ORSTOM-CONCYTEC, p.275-280.

(9) Tree Ring evidence for long-term precipitation changes in south tropical South America, R. Villalba, H. R. Grau, J. A. Boninsegna, G. Jacoby and A. Ripalta. Int J. Climatol. 18: 1463-1478 (1998).

(10) Tree-ring based reconstructions of northern Patagonia precipation since A.D. 1600, R. Villalba, E. R. Cook, G. C. Jacoby, Rosanne D.D'Arrigo, T. T. Veblen and P. D. Jones, the Holocene 8,6 (1998)pp. 659-674.