Palmer 2.0.0.1:Program to calculate the PDSI in Mexico

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The vulnerability from Mexico to the climatic effects show evidences to be increasing. The drought is a natural phenomenon that must be studied, by its great impact in the destruction of harvests and water availability for different uses; For that reason the study of its behavior, as physical phenomenon and the detection and alerts early must be considered as a national and regional priority.

- The 2.0.0.1 version of the program is presented.
- Palmer Ver. 2.0.0.1 Includes tools for the calculation of the index of drought on the basis of:

  ✓ Palmer Drought Severity Index (PDSI) and

  ✓ Standardized Precipitation Index (SPI)

- The options of the program appear and an example of results for the State of Baja California.

- International, national and regional institutions, universities and research institutions study this phenomenon.
- The advance is unequal between countries, regions and in many places rudimentary or practically null.
- Frequently the planning of strategies of evaluation in regions is underestimated where the drought does not appear frequently; the financial resources are insufficient, as much to investigate as to take care of the effects of the phenomenon;

- There are no coordinated actions because the legal responsibility of a region, State or Country is divided.

- Due to this, the countries and regions of the world have conceptions different from the drought, and definitions and methodologies for their diagnosis also different.

It is important to recognize that:

The planning through evaluation mechanisms, **mitigation**, and handling of risks is necessary in all the regions of the world, in special in those where the phenomenon appears every time most frequently, as it is the case of Mexico.

Although the cost of such planning can be very high, the devastating effect on the population justifies its use widely.

The evaluation and the pursuit of the drought phenomenon are fundamental tools for the decision making and the definition of policies to reduce the impact of the drought.

The standardization of procedures of evaluation to facilitate the generation of regional, state and international alert networks is necessary.

The standardization of methods must be result of investigations, where it evaluates the capacity of diagnosis of each one of them.

World Meteorological Organization (WMO, 1992), defines the drought
define the drought of the following form :

A period of time with abnormally
dry meteorological conditions,
sufficiently prolonged to cause
a serious hydrologic imbalance.

Wilhite and Glantz, (1985) define the drought of the following form:

The drought is an erratic natural process, as resulting from a precipitation deficiency during a period of extensive time, generally of a station or more, causing consequently desbalance hydric, affecting with it the human and environmental activities; it is a condition of deficient precipitation, in relation to a behavior average considered as normal.

- With base in the previous thing, the program was elaborated Palmer 2.0.0.1, for the calculation of two indices of drought: Palmer Drought Severity Index (PDSI) and Standardized Precipitation Index (SPI)
- Palmer based his index on the supply-and-demand concept of the water balance equation.
- The SPI is an index based on the probability of precipitation for any time scale.

Palmer Drought Severity Index (PDSI)

- The PDSI initiates with a monthly humidity balance, uses for it the precipitation data and temperature in addition considers the capacity of water storage in the ground:
- The topsoil is assumed to be able to hold 1.0 inches (25 mm) of moisture. This moisture is the first to be used up when demand is higher than supply, and the first to be recharged when there is a surplus. The lower level of the soil can then hold up to (AWC - 1.0) inches of moisture.

Palmer Classifications	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Standardized Precipitation Index (SPI)

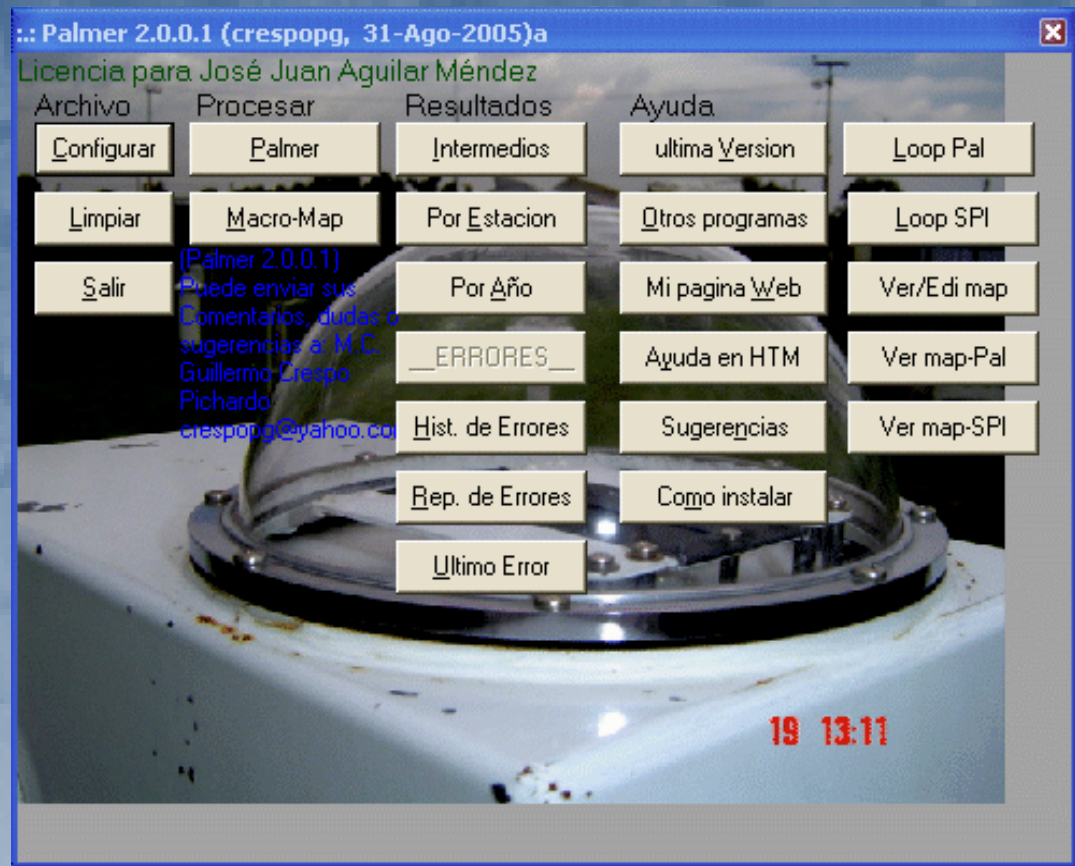
- The SPI is an index based on the probability of precipitation for any time scale.
  The SPI uses precipitation data. These data are fit to a distribution function, which is then transformed into a normal distribution so that the mean SPI for the location and desired period is zero (Edwards and McKee, 1997). Positive SPI values indicate greater than median precipitation, and negative values indicate less than median precipitation.

SPI Values	
2.0+	extremely wet
1.5 to 1.99	very wet
1.0 to 1.49	moderately wet
-.99 to .99	near normal
-1.0 to -1.49	moderately dry
-1.5 to -1.99	severely dry
-2 and less	extremely dry

Results

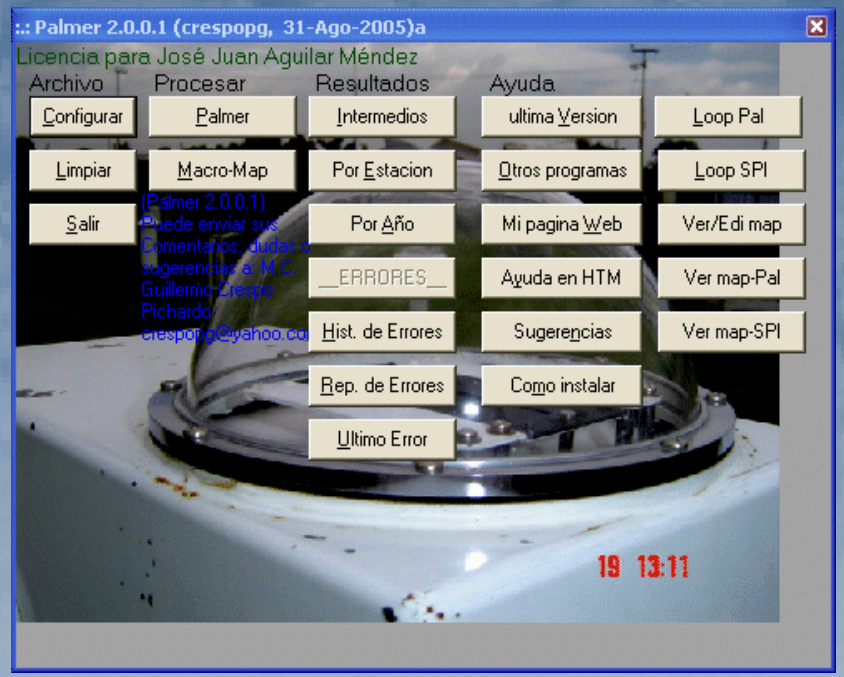
Developed software denominates Palmer Versión 2.0.0.1, with the following characteristics.

- Program developed for Operating systems Windows 98, 2000 and XP.
- Version 2.0.0.1.
- The program requires of 600 Mb in hard disk.
- El programa requiere de 600 Mb en disco duro.
- The program includes an installation process.



Results

- Palmer 2.0.0.1 includes data monthly averages of precipitation and temperature for Mexico, grouped by States.
- Palmer 2.0.0.1 includes routines for the estimation of missing data.
- The Software is available to download from the following Web site http://clima.cem.colpos.mx/crespo/index2.htm

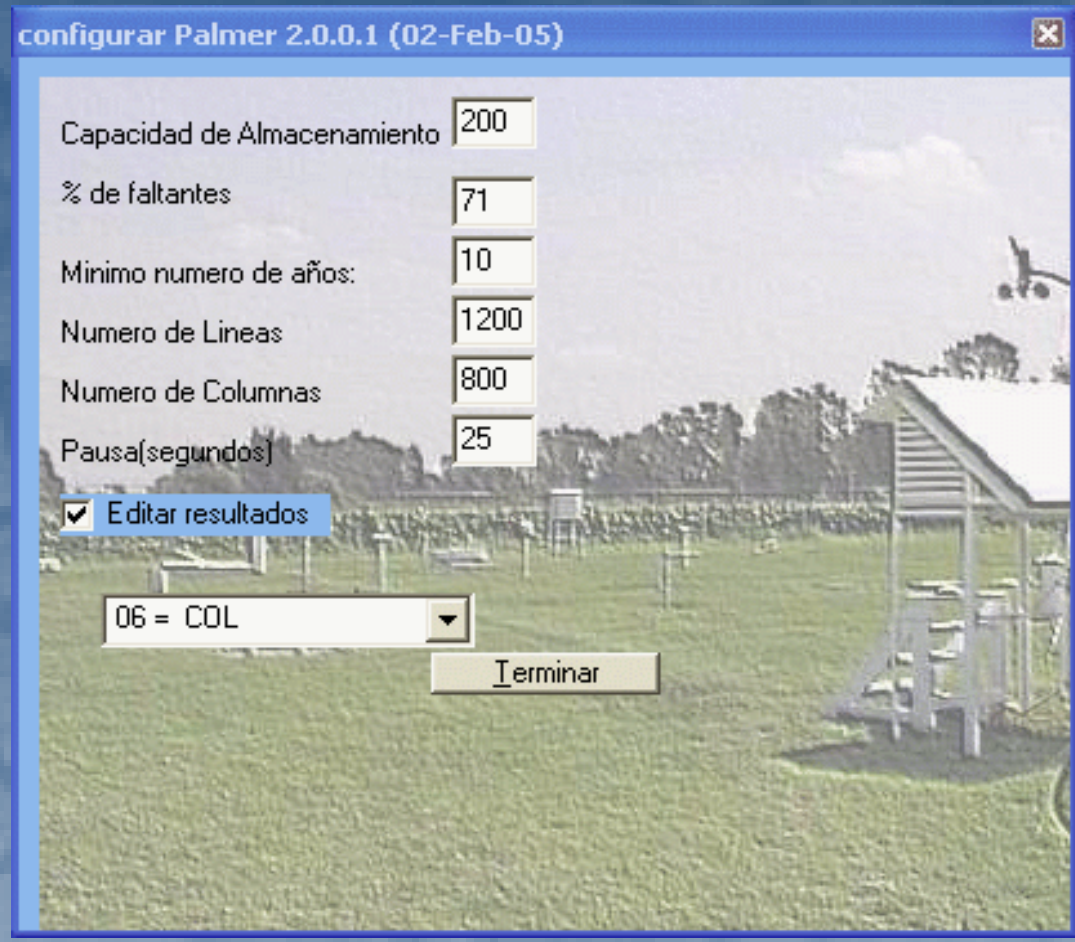


Results


:.: Palmer 2.0.0.1 (crespopg, 31-Ago-2005)a
Licencia para José Juan Aguilar Méndez
Archivo
Procesar
Resultados
Ayuda
Configurar
Palmer
Intermedios
ultima Version
Loop Pal
Limpiar
Macro-Map
Por Estacion
Otros programas
Loop SPI
Salir
(Palmer 2.0.0.1)
Puede enviar sus
Comentarios, dudas o
sugerencias a: M.C.
Guillermo Crespo
Pichardo
crespopg@yahoo.co
Por Año
Mi pagina Web
Ver/Edi map
__ERRORES__
Ayuda en HTM
Ver map-Pal
Hist. de Errores
Sugerencias
Ver map-SPI
Rep. de Errores
Como instalar
Ultimo Error
19 13:11

Results

- Option 'Configurar'. It establishes the parameters; The **Available Water Holding Capacity** (AWC, in mm), minimum percentage of missing data, minimum number of years by station, line number and columns for elaboration of maps, and selection of the State.



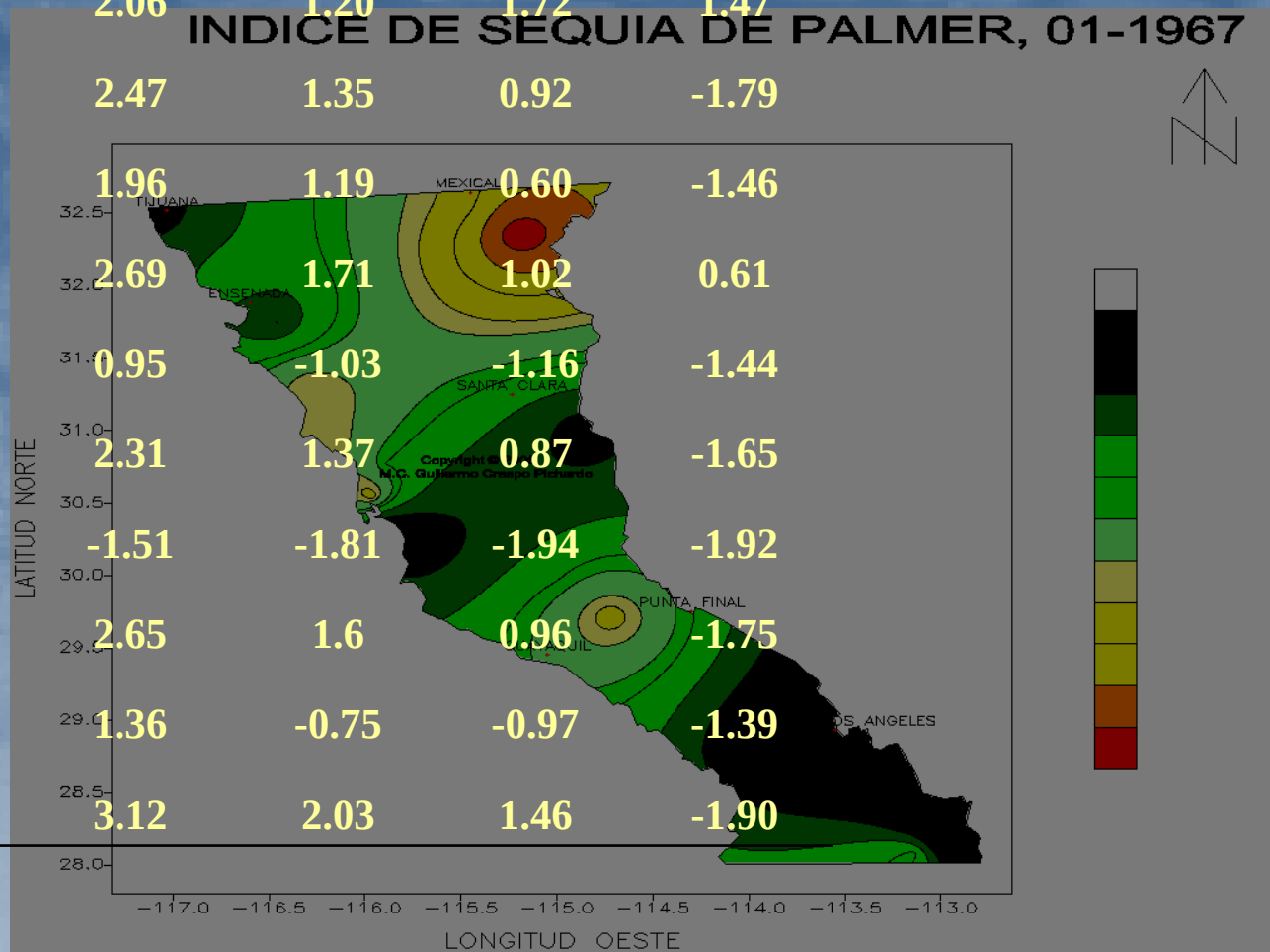
Results

- Button Palmer: It makes the estimation of missing data and calculates the indices of Palmer and SPI.

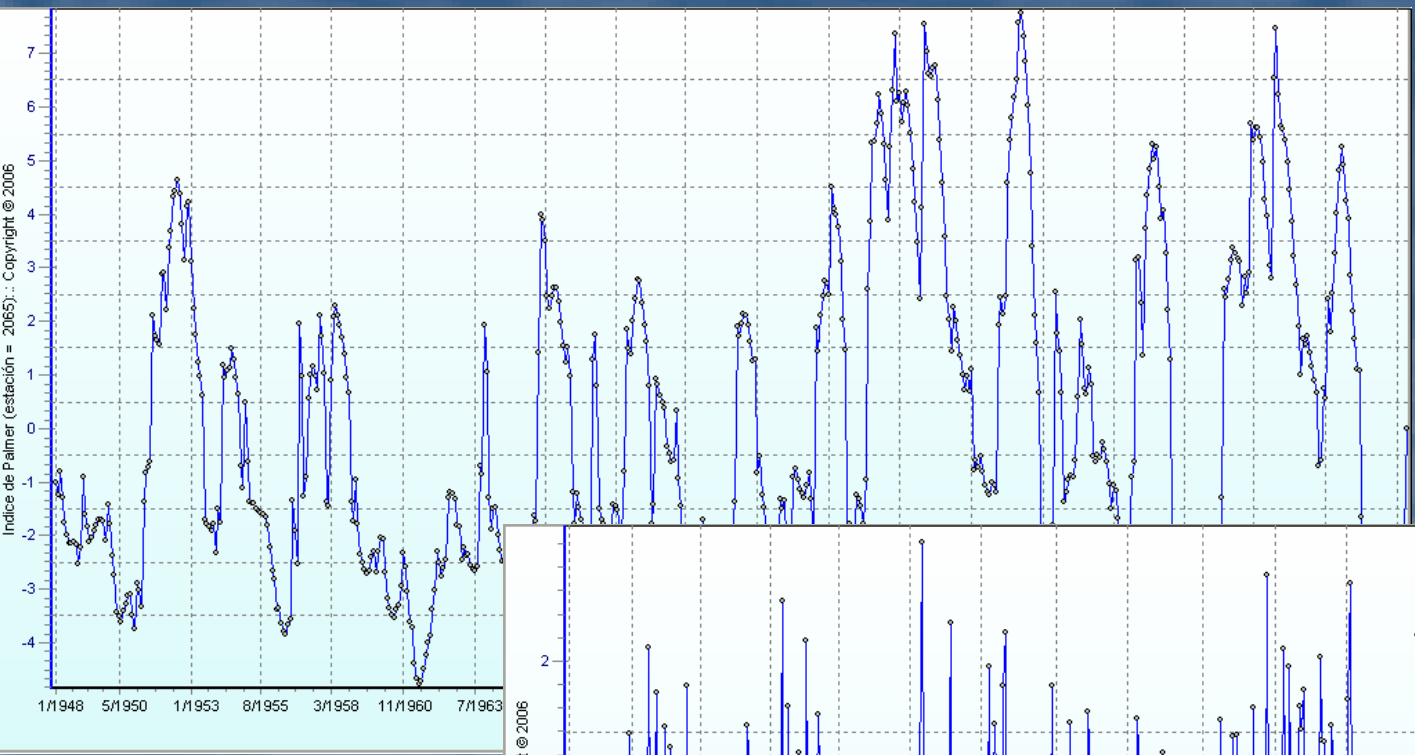
- Menu of results: Presentation of partial and total results.

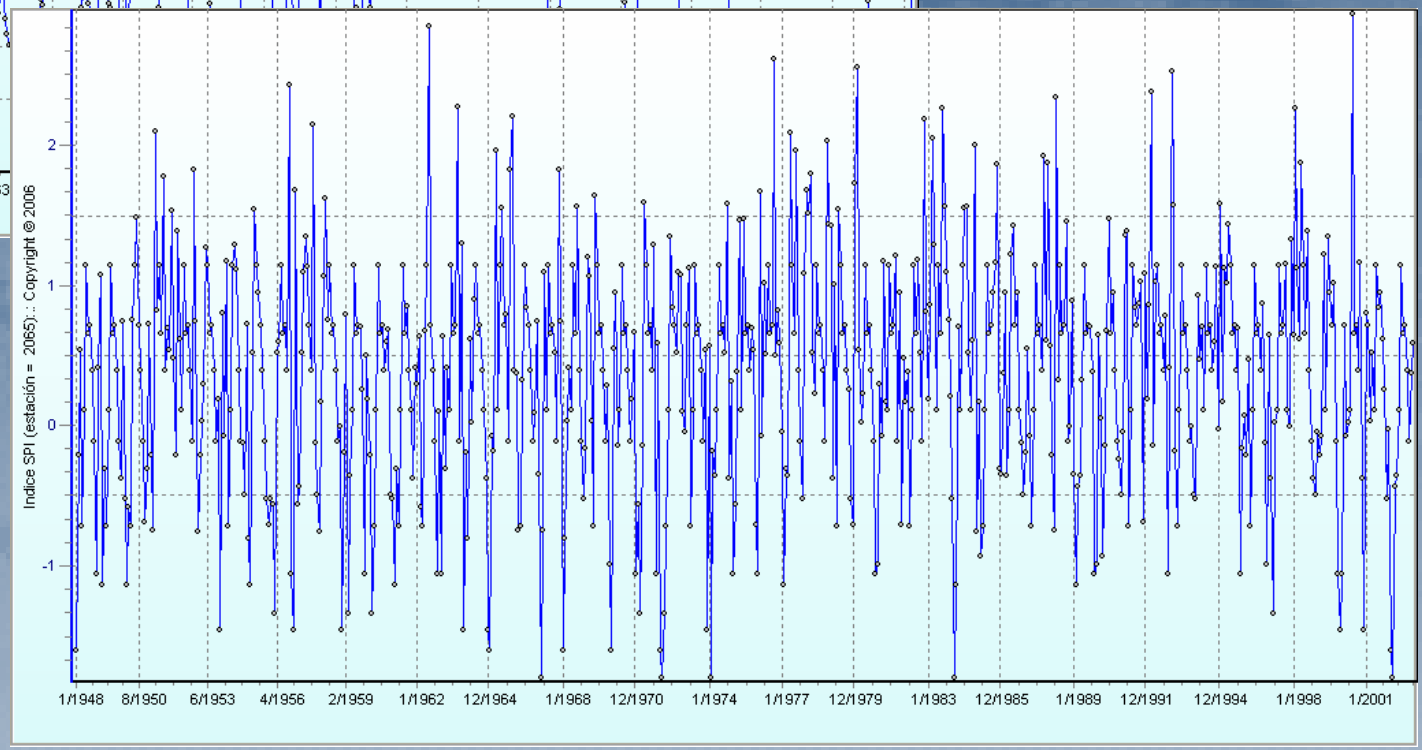
Partial results of the Palmer Drought Severity Index (PDSI)
for some stations of the state of Baja California.

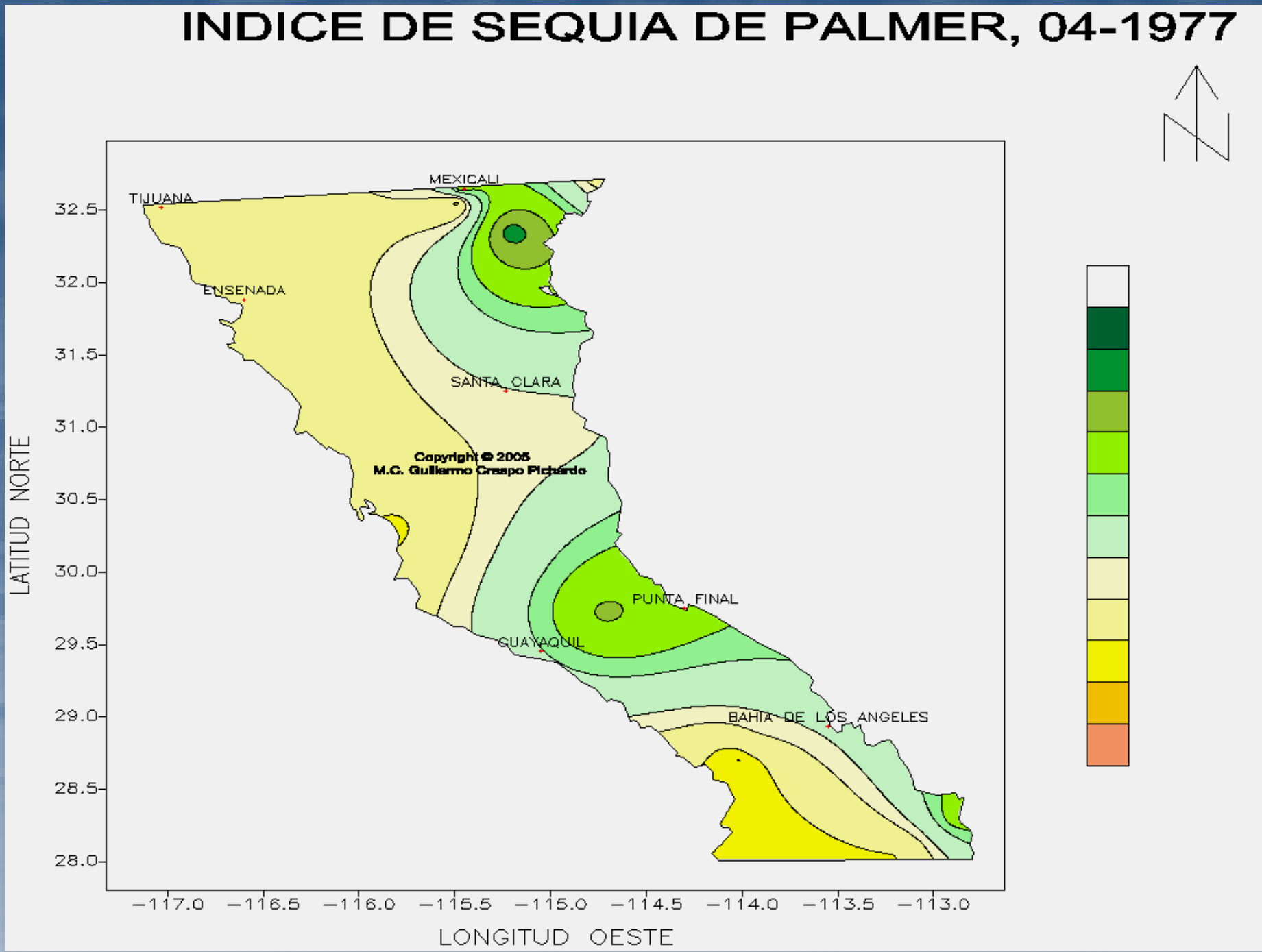
Station	Jan-77	Feb-77	Mar-77	Apr-77
2011	6.15	5.05	4.23	3.57
2012	-2.46	-2.95	-3.26	-3.08
2016	2.06	1.20	1.72	1.47
2036	2.47	1.35	0.92	-1.79
2037	1.96	1.19	0.60	-1.46
2043	2.69	1.71	1.02	0.61
2044	0.95	-1.03	-1.16	-1.44
2045	2.31	1.37	0.87	-1.65
2061	-1.51	-1.81	-1.94	-1.92
2063	2.65	1.6	0.96	-1.75
2064	1.36	-0.75	-0.97	-1.39
2065	3.12	2.03	1.46	-1.90



Graphs of the indices SPI and PALMER.






INDICE DE SEQUIA DE PALMER, 04-1977
MEXICALI
TIJUANA
ENSENADA
SANTA CLARA
PUNTA FINAL
GUAYAQUIL
BAHIA DE LOS ANGELES
Copyright © 2005
M.C. Guillermo Crespo Pichardo
32.5
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30.5
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28.0
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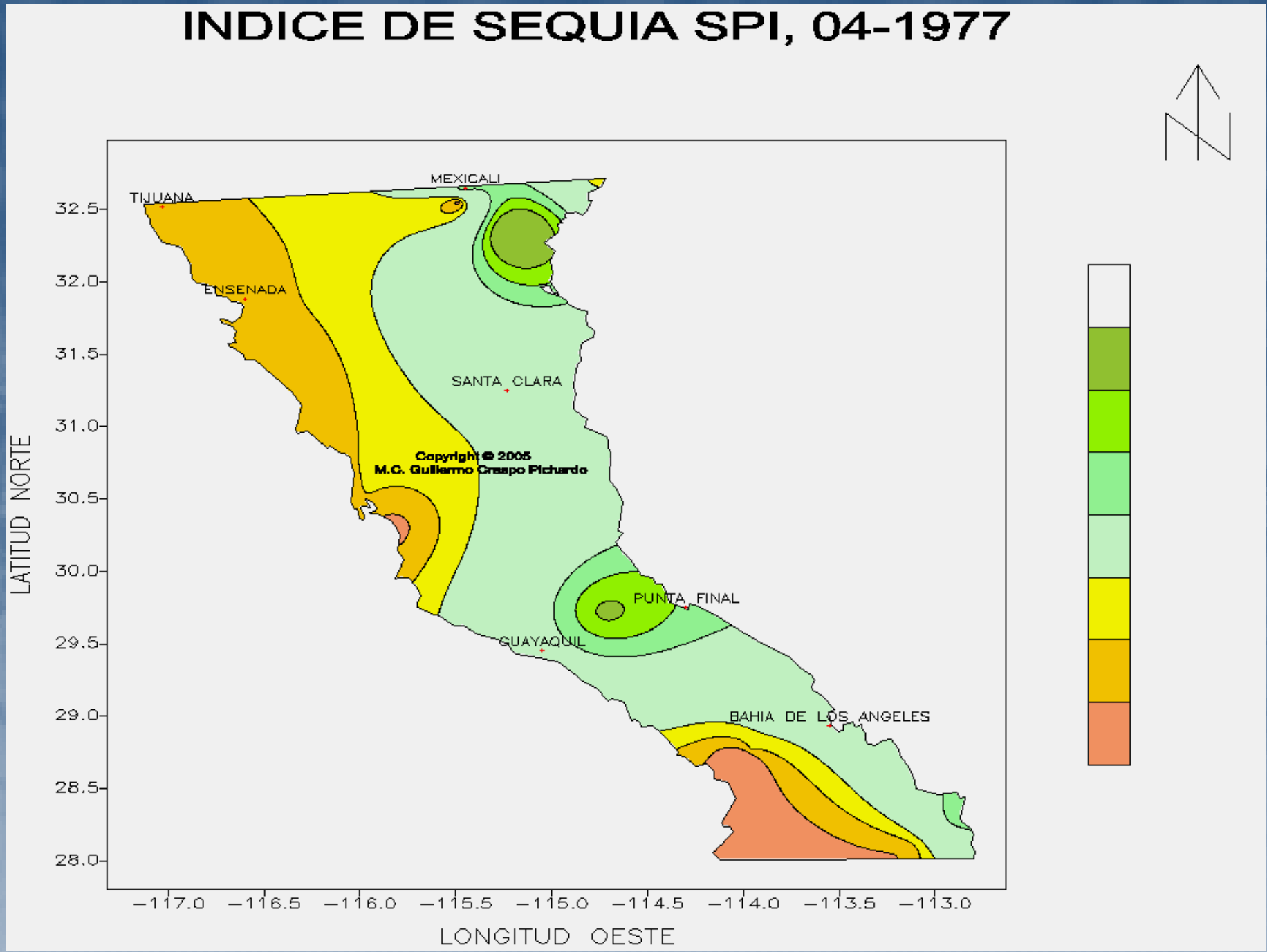
LONGITUD OESTE


INDICE DE SEQUIA SPI, 04-1977
MEXICALI
TIJUANA
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PUNTA FINAL
GUAYAQUIL
BAHIA DE LOS ANGELES
Copyright © 2005
M.C. Guillermo Crespo Pichardo
LATITUD NORTE
32.5
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LONGITUD OESTE

Conclusions.

- With the program Palmer version 2.0.0.1 is possible to calculate the index of drought of palmer and the SPI for Majority of the States in Mexico.
- It is possible to develop a real-time system to calculate the indices of drought for Mexico .
- I invite you to subscribe at discussion group about drought in Mexico in the next web page, http://espanol.groups.yahoo.com/group/sequia_mexico/
  Post message: sequia_mexico@gruposyahoo.com
  Susbscribe: sequia_mexico-subscribe@gruposyahoo.com

Thanks.