ENhanced Geothermal Innovative Network for Europe

SIXTH FRAMEWORK PROGRAMME

Capacity building through training by research in geothermal activity: an experience from Mexico and Latin America

José M. Romo-Jones

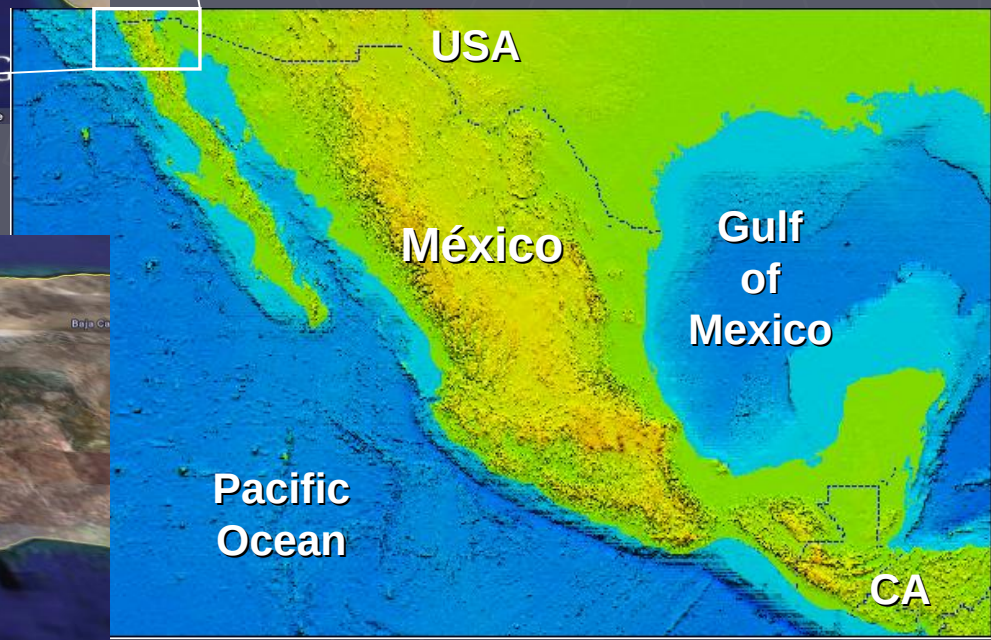
Centro de Investigación Científica y de Educación Superior de Ensenada, B. C.

México

CICESE

CICESE

Center for Scientific Research and Higher Education of Ensenada



Centro de Investigación Científica y de Educación Superior de Ensenada, B.C.

www.cicese.mx

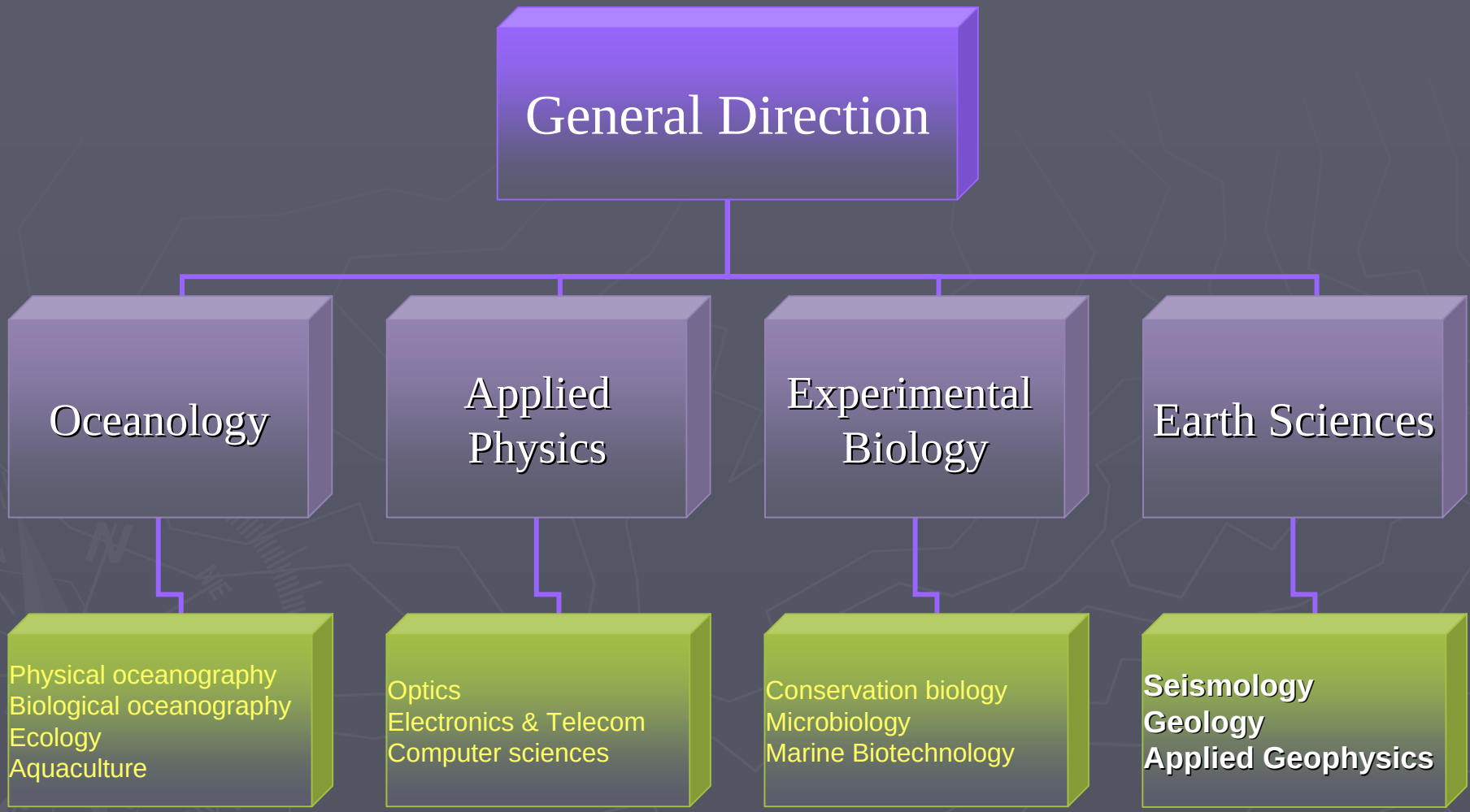
CICESE is part of a network of scientific research centers funded by the Mexican government through the National Council of Science and Technology (CONACYT)

Mission

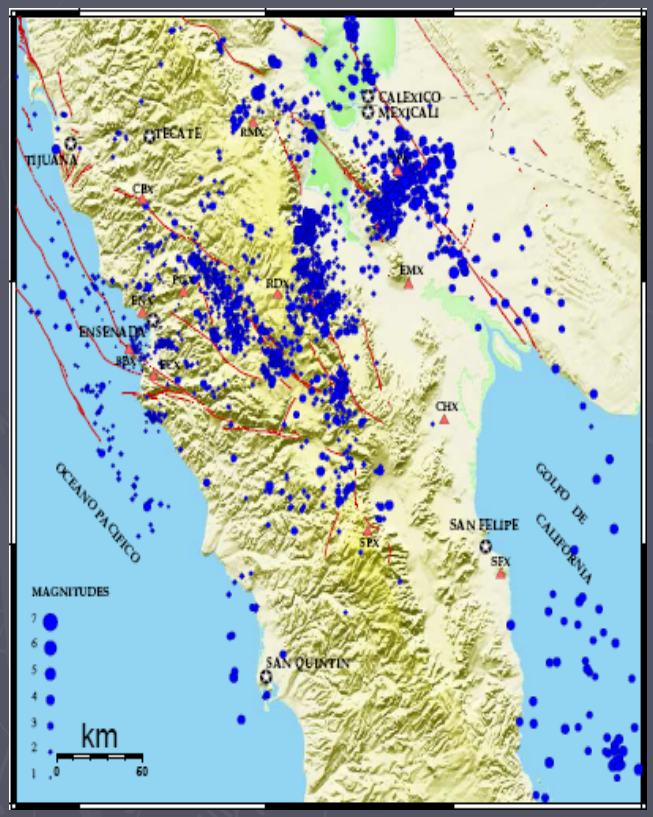
To conduct scientific research in the areas of Earth Sciences, Oceanology, Applied Physics and Experimental Biology

As well as training and preparation of people at graduate level (PhD and MSc) in each of our research areas.

Organization



Seismology Department



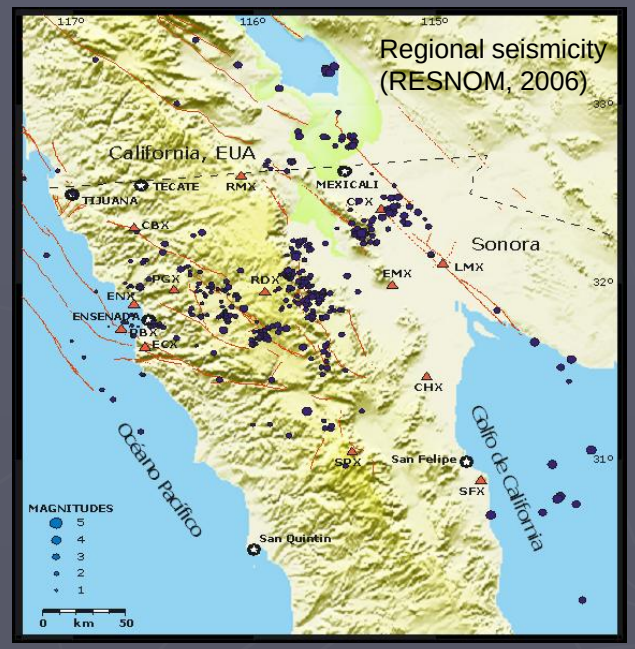
Mission

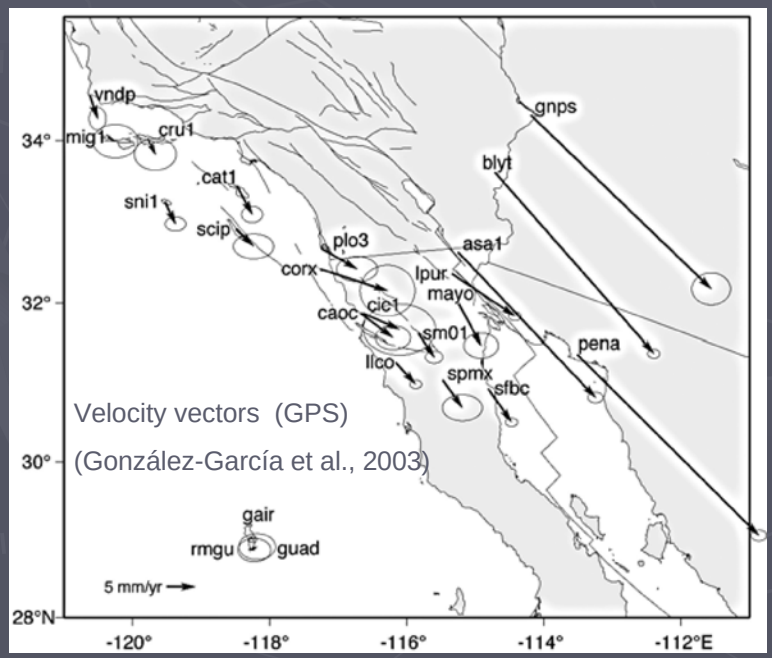
To study the origin and nature of earthquakes, how their energy propagates in the Earth's crust, as well as their destructive effects; particularly in northwestern Mexico.

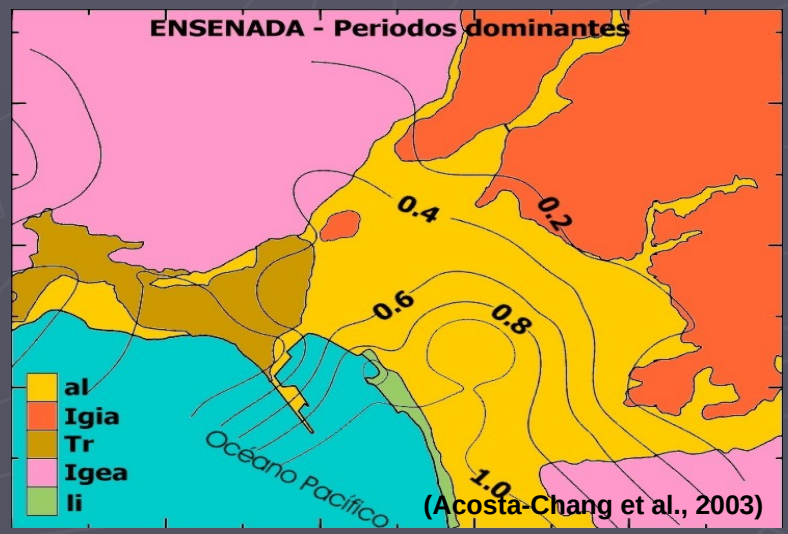
Seismology Department

Research lines

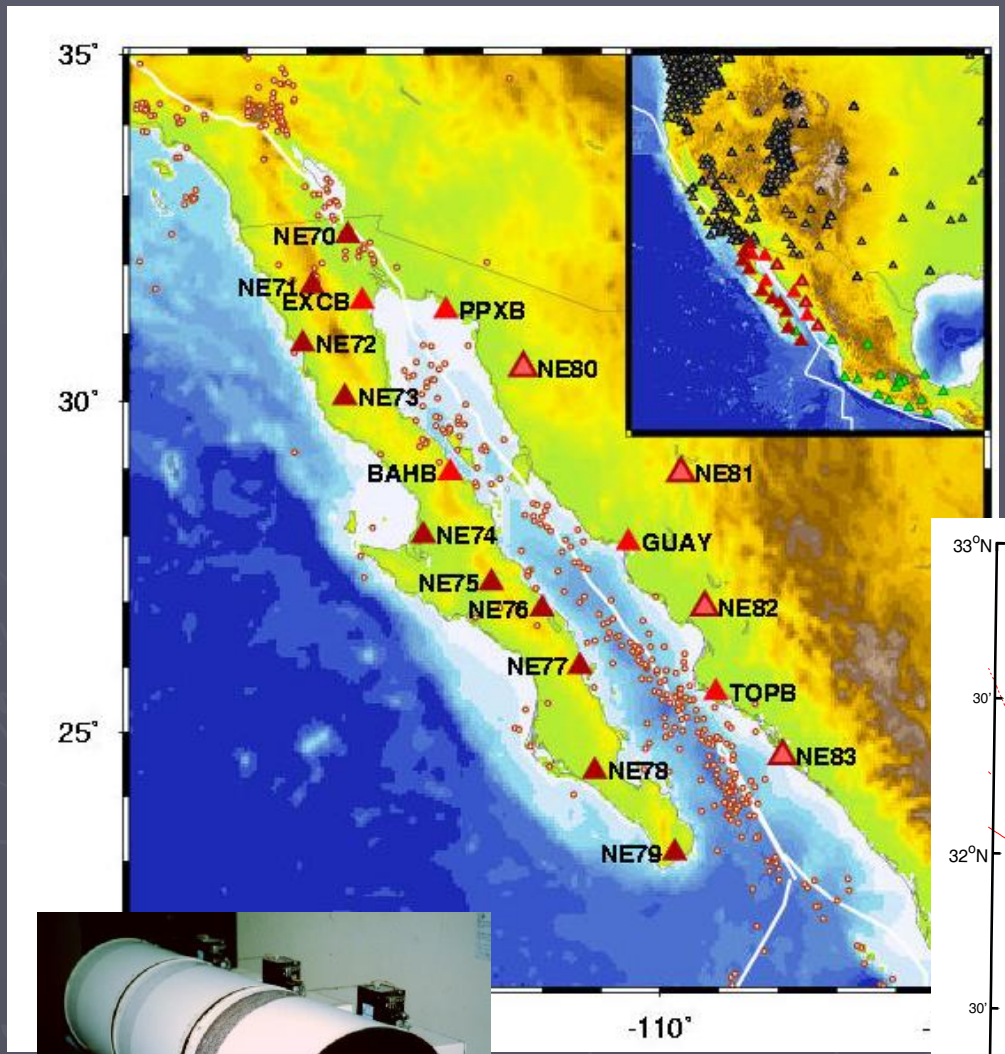
- Theoretical seismology
- Seismotectonics, geodynamics and geodesy
- Strong motion seismology
- Seismic hazards and engineering applications
- Seismic wave propagation and attenuation
- Structure and elastic properties of the lithosphere
- Elasticity of porous media
- Induced seismicity and deformation





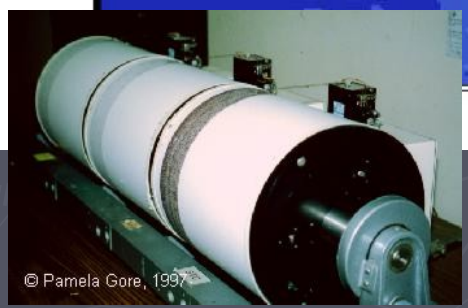


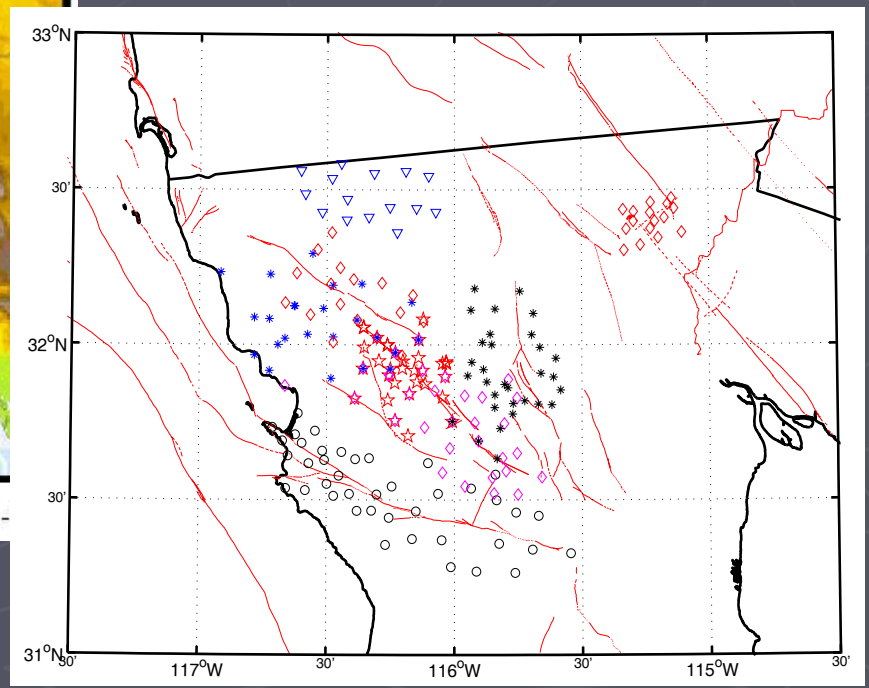
Seismology Department



Infrastructure

- Regional and local earthquake monitoring networks
- Geodetic and local deformation monitoring networks
- Computational facilities





Geology Department


Peninsular range batholith

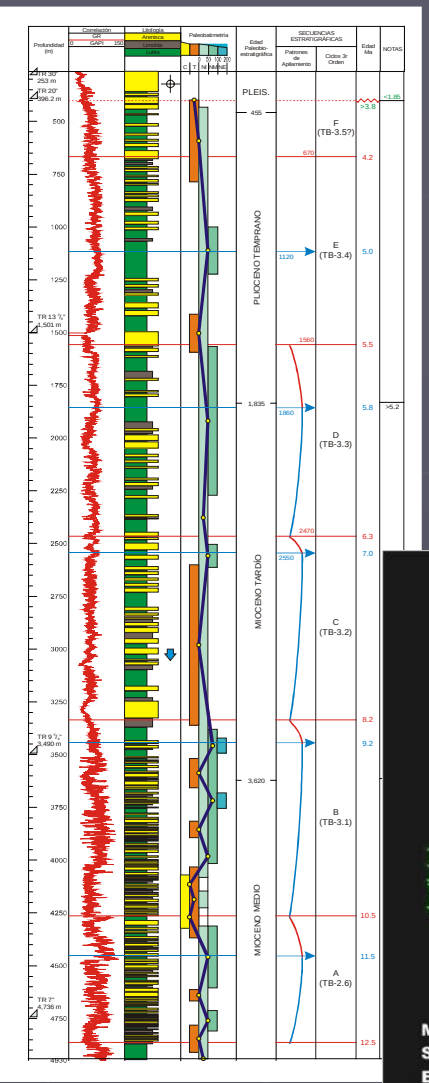
Mission

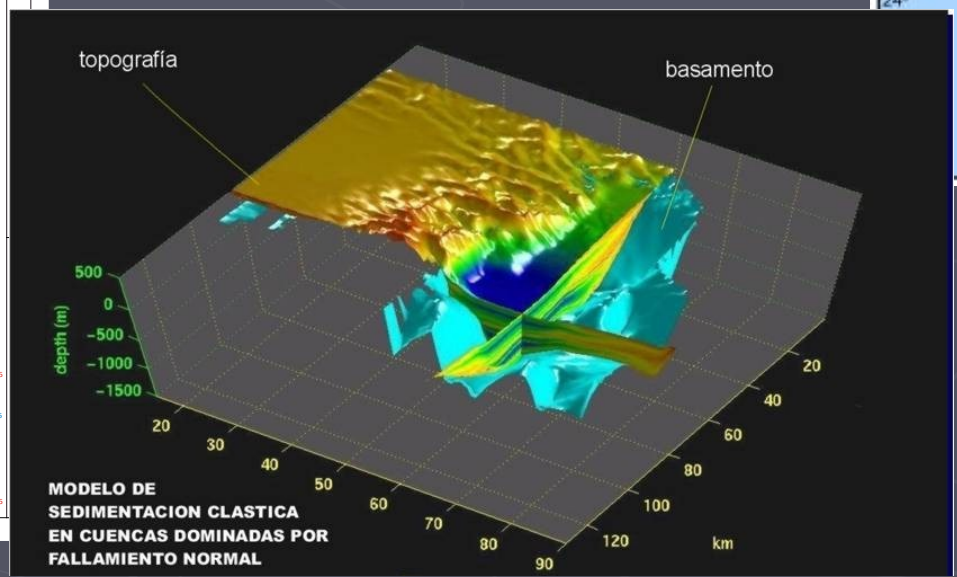
To reconstruct the geologic history of northwestern Mexico, studding the structure of the crust and the composition of their rocks, in order to understand the geologic processes that acted in the past as well as those occurring today.

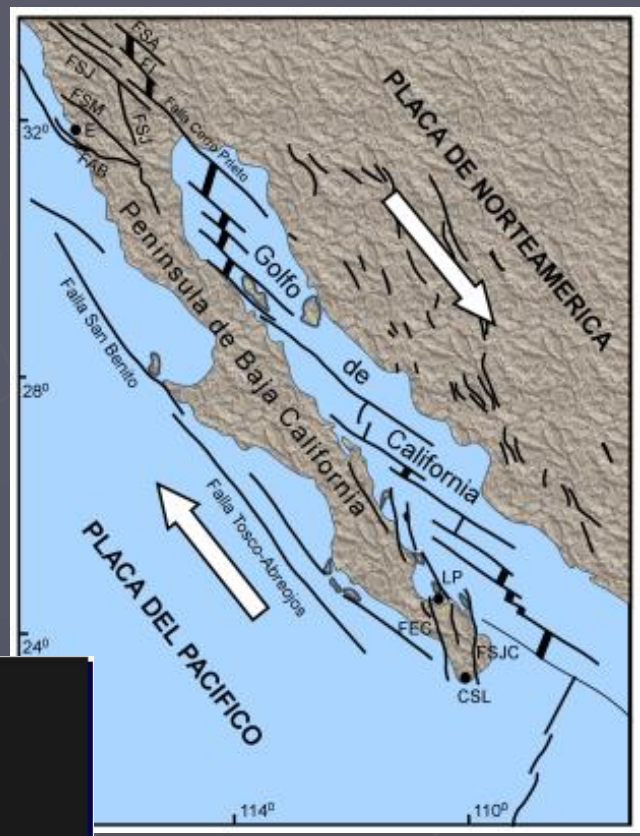
Geology Department

Research lines

- Structural geology and tectonics
- Petrology and rock geochemistry
- Basin analysis and modeling
- Geocronology
- Hydrogeology and water chemistry
- Paleomagnetism and vulcanology
- Biostratigraphy
- Remote sensing and geographical information systems





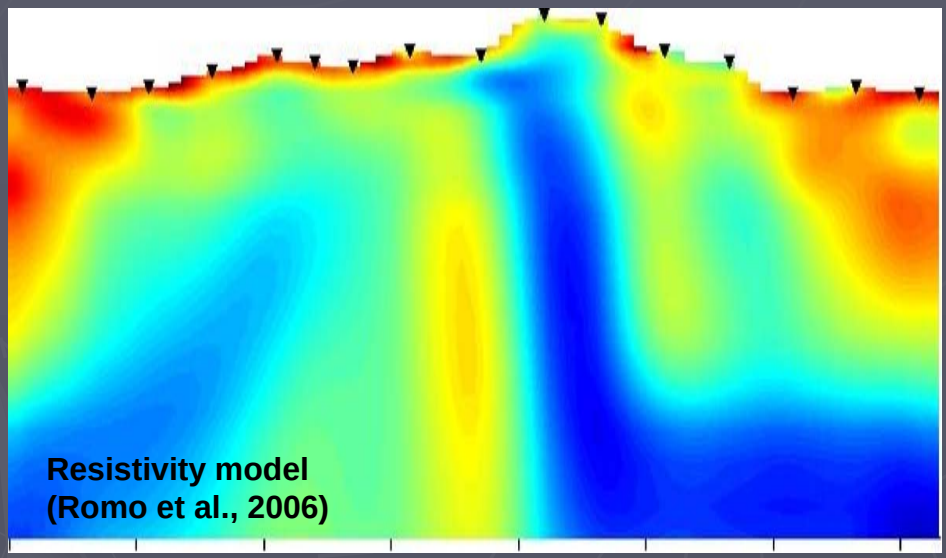


Geology Department

Infrastructure

- Specialized labs
  - Geocronology
  - Petrography
  - Hydrogeochemistry
  - Rock geochemistry
  - Electronic microscopy
  - Paleomagnetism
  - Palinology and micropaleontology
  - Image processing and GIS

Applied Geophysics Department



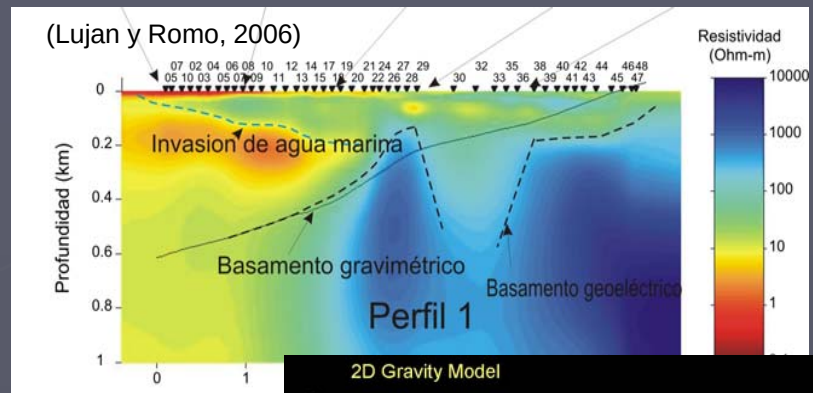
Mission

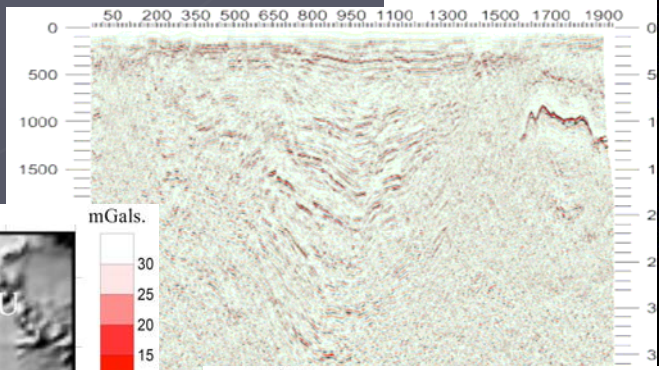
To apply the laws of physics to create and improve methodology for the exploration of the Earth's interior. Make use of these methods in the search of natural resources as well as for the investigation of the deep crust

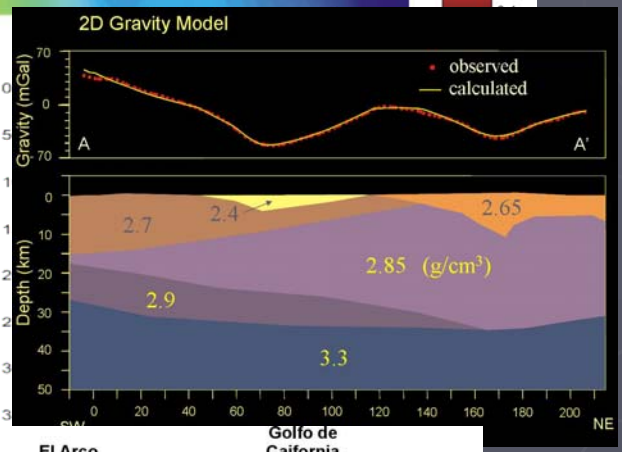
Applied Geophysics Department

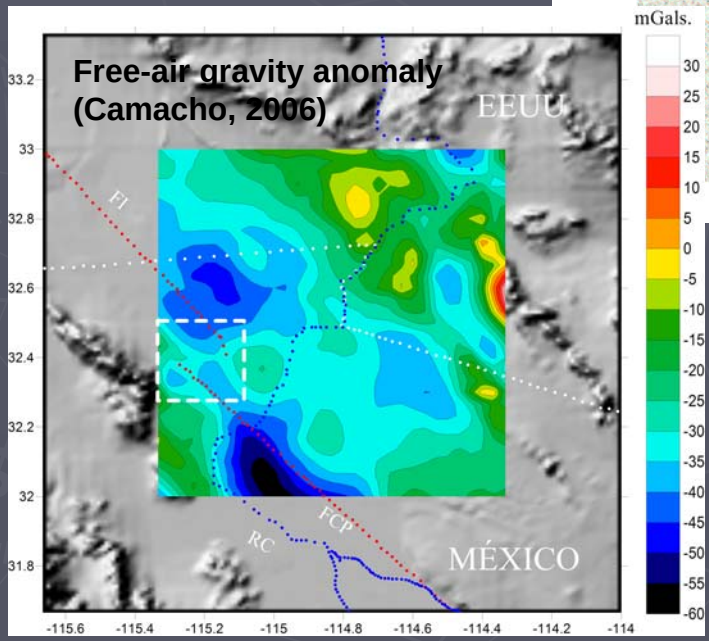
Research lines

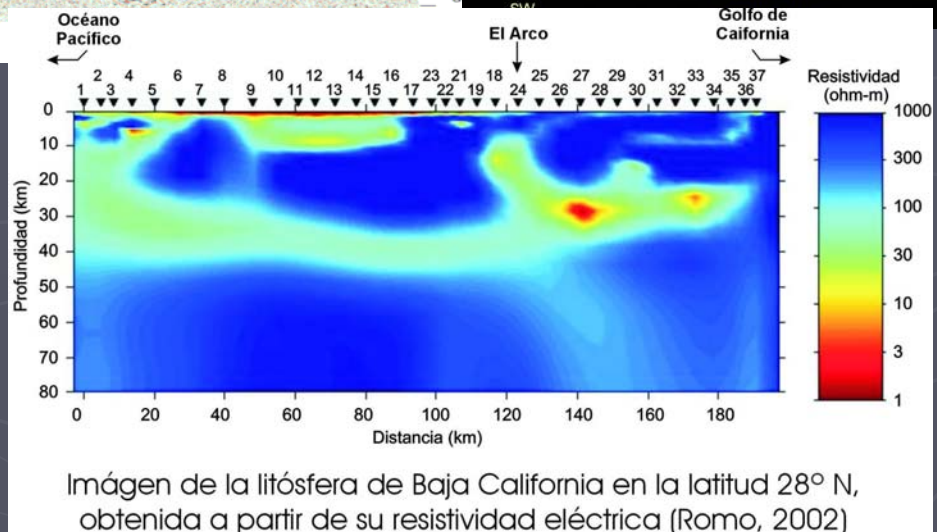
- Electric and electromagnetic methods
- Gravity and magnetic methods
- Seismic reflexion and refraction methods
- Inverse theory and geophysical modeling
- Exploration of natural resources
- Environmental geophysics
- Earth's crust geophysics











Imágen de la litósfera de Baja California en la latitud 28° N, obtenida a partir de su resistividad eléctrica (Romo, 2002)

Applied Geophysics Department

Infrastructure

- Geophysical equipment & instrumentatio
  - Gravity meter
  - Total field magnetometers
  - Flux gate magnetometers
  - Electrical resistivity systems
  - Wide band magnetotelluric system
  - High frequency magnetotelluric system
  - Time domain electromagnetic system
  - Frequency domain VLF and loop-loop systems
  - 24-channels seismograph

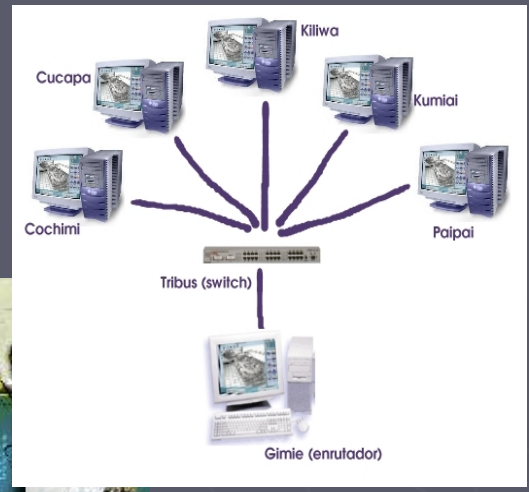







Computational facilities & Library

- Sun Fire 4800 parallel computer (8 cpu's)
- Sun Blade workstation cluster
- Local network of PC's and workstations
- Internet II connection to the Cray XD1 of the National Supercomputing Center

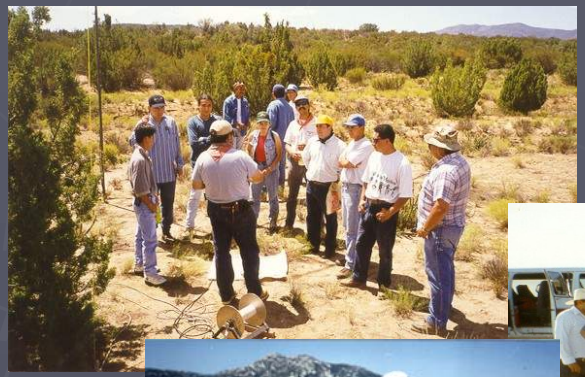


Library with over 5600 volumes, 350 print journals, access to over 500 electronic journals, catalogs, maps and thesis collections, interlibrary loan service, etc.

Graduate program

CICESE's Earth Sciences Division endeavors in creating specialist people, masters and doctors in sciences, as a essential part of the research activities.



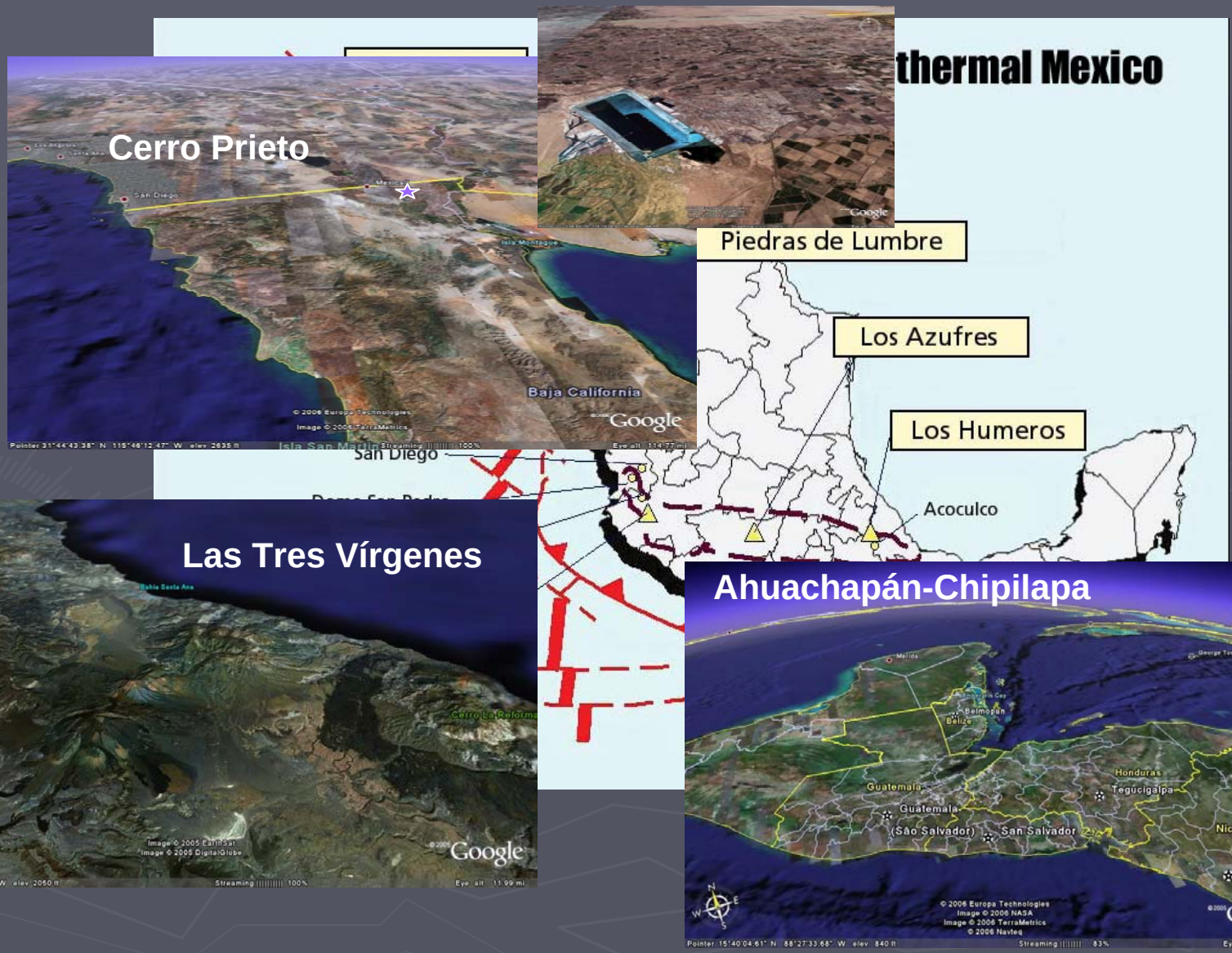






Options:

- Seismology
- Geology
- Applied Geophysics
- Environmental Geosciences

Examples of research projects related with geothermics



Cerro Prieto

Proceedings World Geothermal Congress 2000
Kyushu - Tohoku, Japan, May 28 - June 10, 2000

2-D INVERSION OF DC RESISTIVITY DATA FROM THE CERRO PRIETO GEOTHERMAL AREA, MEXICO

Adolfo S. Charré-Meza, Marco A. Pérez-Flores and **Enrique Gómez-Treviño**
Earth Sciences Division, CICESE, km 107 Carr. Tijuana-Ensenada, Ensenada, B.C., México.

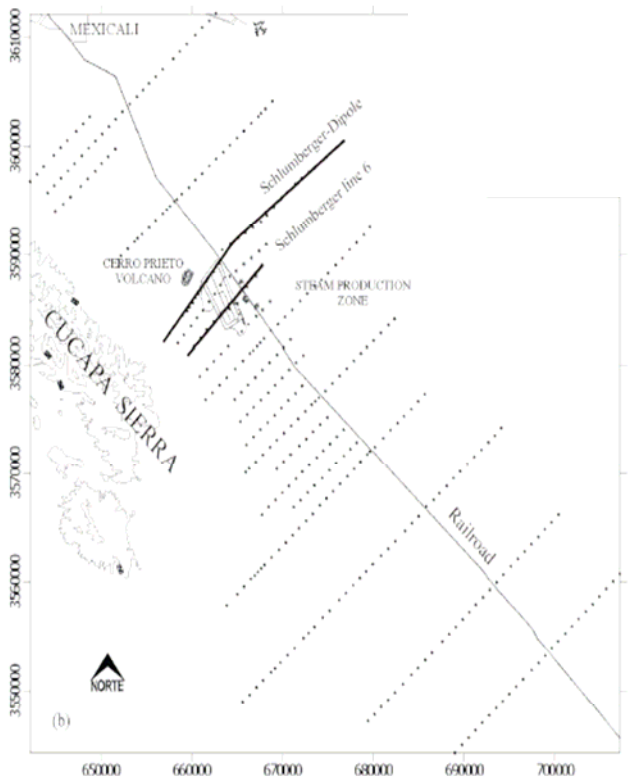


Figure 1.- (a) Location of Cerro Prieto Geothermal area. (b) Distribution of the Dipole-dipole and Schlumberger resistivity lines.

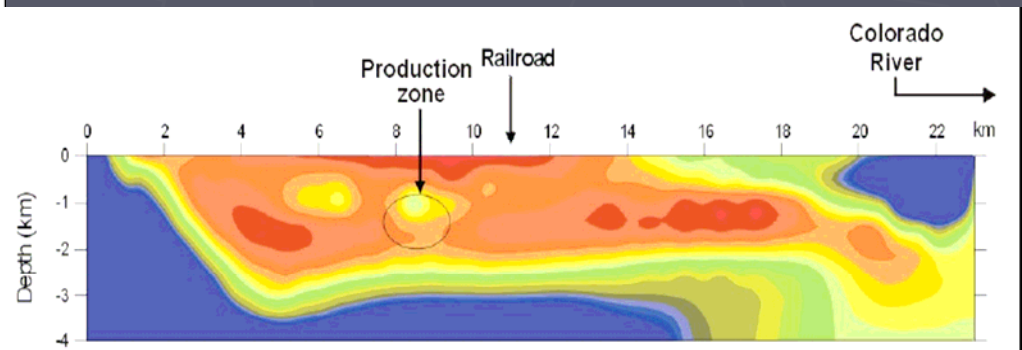


Figure 2.- Joint inversion of Dipole-dipole and Schlumberger resistivity data.

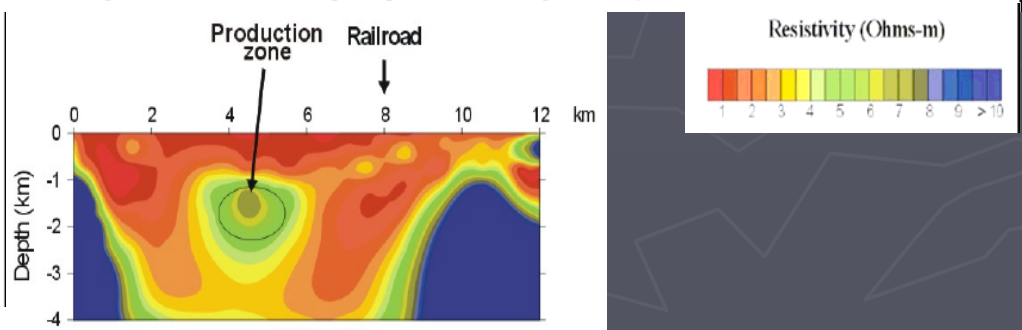
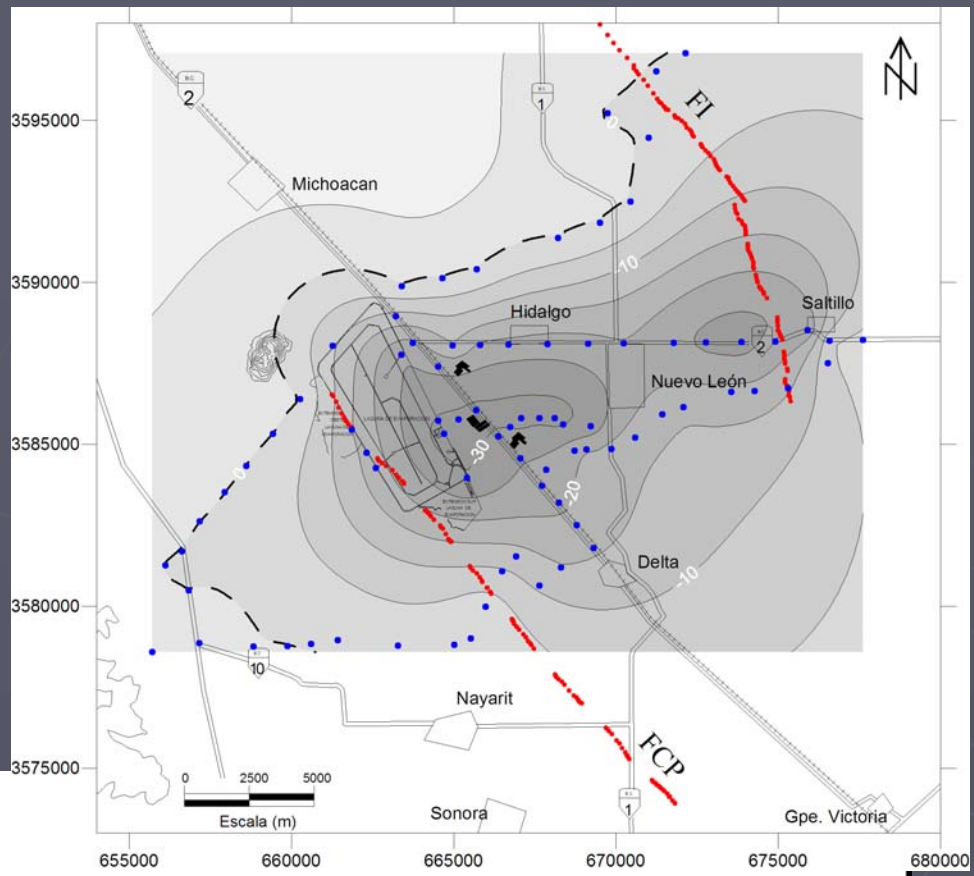


Figure 3.- Resistivity image of the Schlumberger line 6.

Cerro Prieto



Proceedings World Geothermal Congress 2005
Antalya, Turkey, 24-29 April 2005

Modeling of Subsidence in the Cerro Prieto Geothermal Field, B. C., Mexico

Olga Sarychikhina, Ewa Glowacka, F. Alejandro Nava Pichardo and Jose M. Romo

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Las Tres Vírgenes

Proceedings World Geothermal Congress 2000
Kyushu-Tohoku, Japan, May 28 - Jun 10, 2000

THE SUBSURFACE ELECTRICAL CONDUCTIVITY AND THE ATTENUATION OF CODA WAVES AT LAS TRES VÍRGENES GEOTHERMAL FIELD IN BAJA CALIFORNIA SUR, MÉXICO.

José M. Romo, Victor Wong, Carlos Flores and Rogelio Vázquez
CICESE, División de Ciencias de la Tierra, Ensenada B.C., México

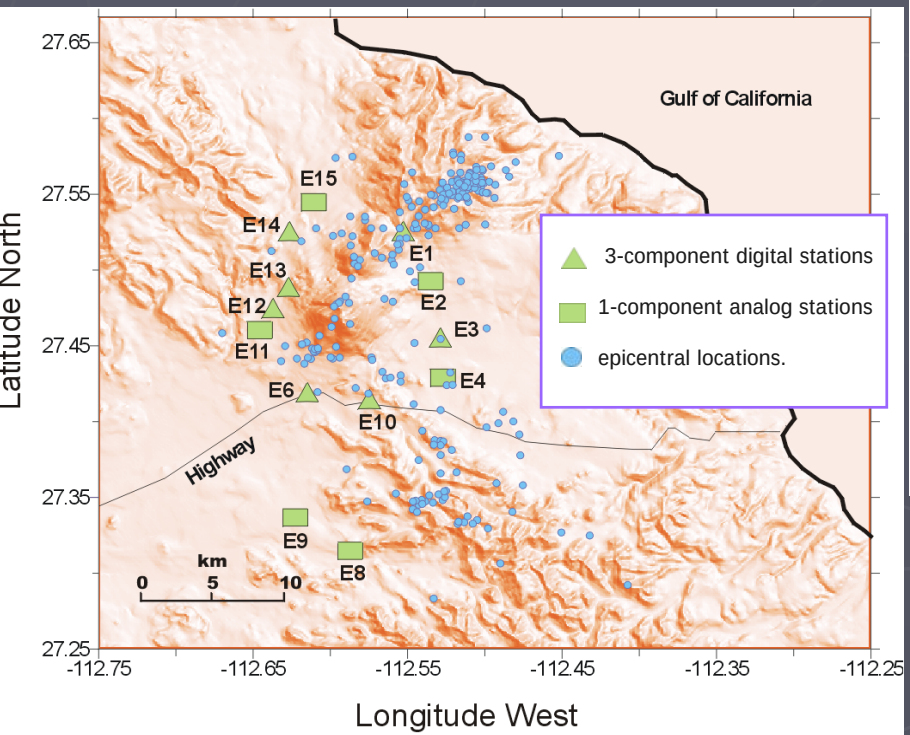


Figure 5. Seismic network and location of epicenters.

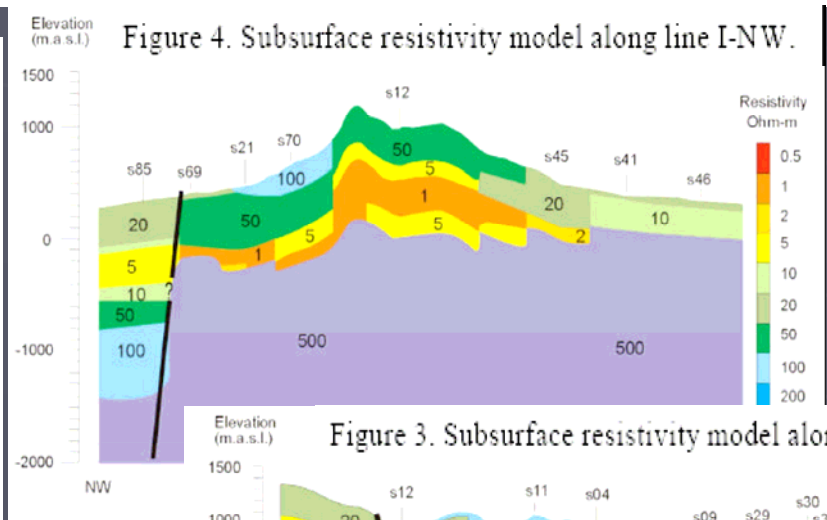


Figure 4. Subsurface resistivity model along line I-NW.

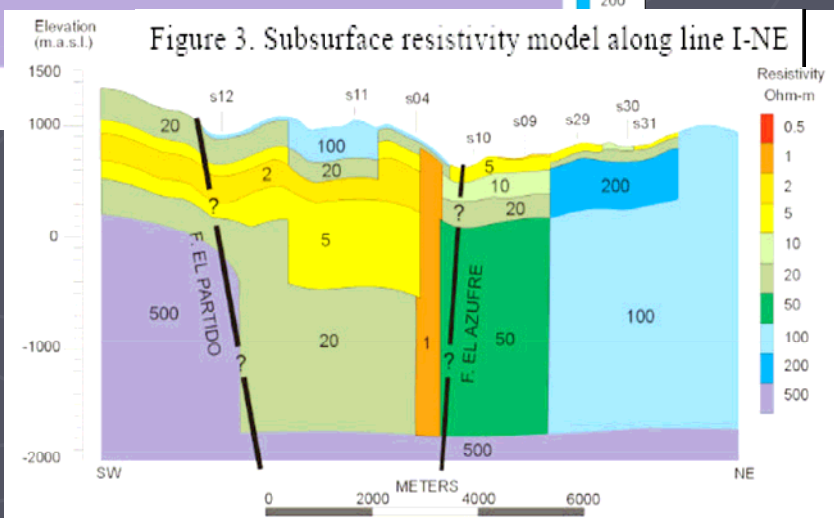
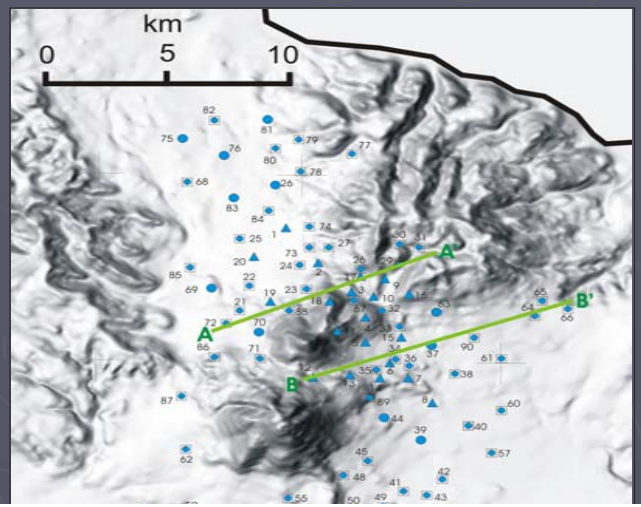
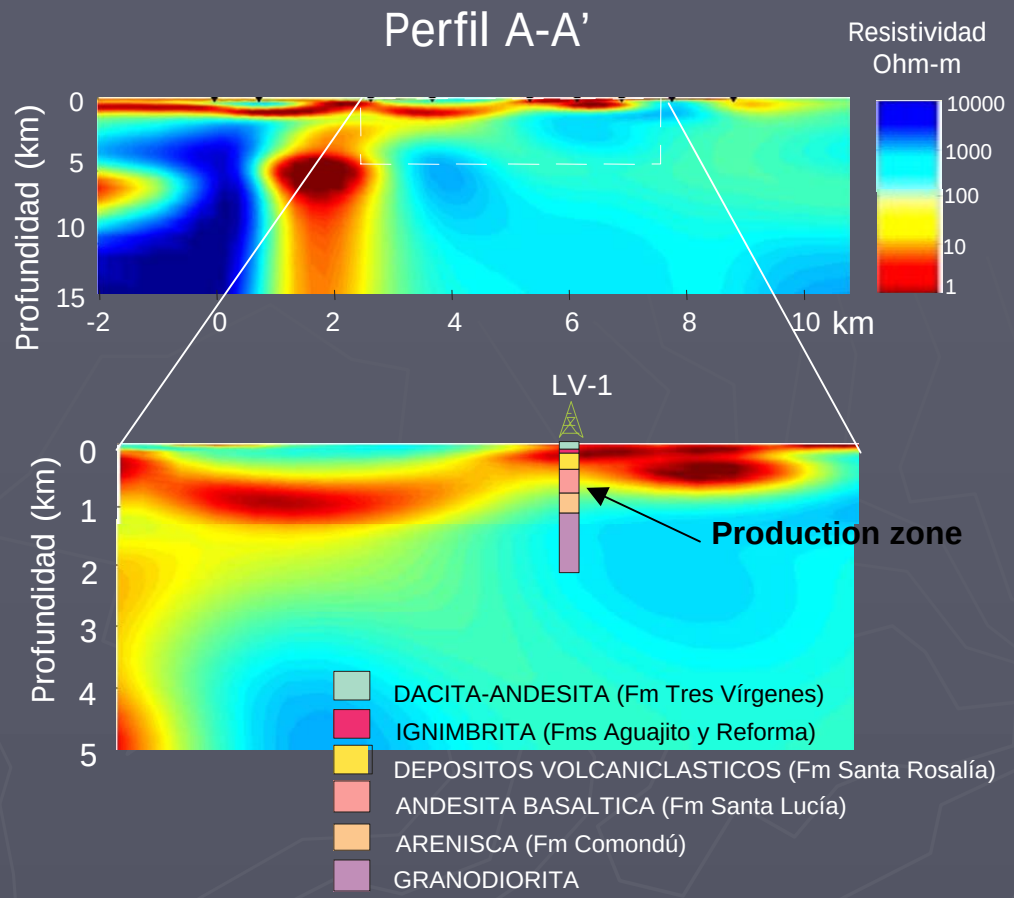


Figure 3. Subsurface resistivity model along line I-NE

Las Tres Vírgenes

MT data inversion using Series and Parallel response functions (Romo et al, 2005)





Proceedings World Geothermal Congress 2005
Antalya, Turkey, 24-29 April 2005

New magnetotelluric response functions for geothermal applications

José M. Romo, Enrique Gómez-Treviño and Ricardo G. Antonio-Carpio
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jromo@cicese.mx, egomez@cicese.mx, rantonio@vivese.mx

Ahuachapán-Chipilapa

Pergamon

Geothermics, Vol. 26, No. 5/6, pp. 627–656, 1997

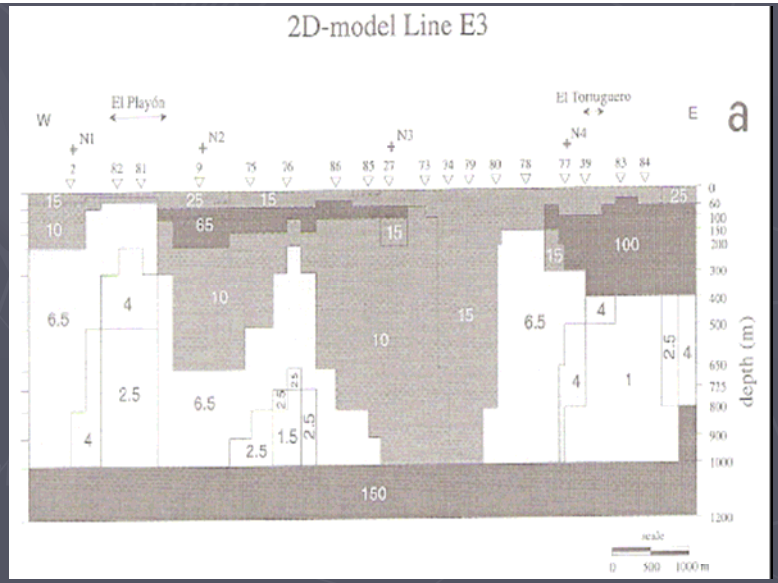
0375–6505/97 $17.00 + 0.00

PII: S0375–6505(97)00014–X

A CLOSELY-SPACED MAGNETOTELLURIC STUDY OF THE AHUACHAPÁN–CHIPILAPA GEOTHERMAL FIELD, EL SALVADOR

JOSÉ MANUEL ROMO,* CARLOS FLORES,* RAYMUNDO VEGA,* ROGELIO VÁZQUEZ,* MARCO A. PÉREZ FLORES,* ENRIQUE GÓMEZ TREVIÑO,* FRANCISCO J. ESPARZA,* JULIO E. QUIJANO† and VÍCTOR H. GARCÍA*

* *Centro de Investigación Científica y de Educación Superior de Ensenada, B.C. (CICESE) km 107 carr. Tijuana-Ensenada, Ensenada 22830, Baja California, México*
† *Comisión Ejecutiva Hidroeléctrica del Rio Lempa (CEL), Santa Tecla, La Libertad, El Salvador*



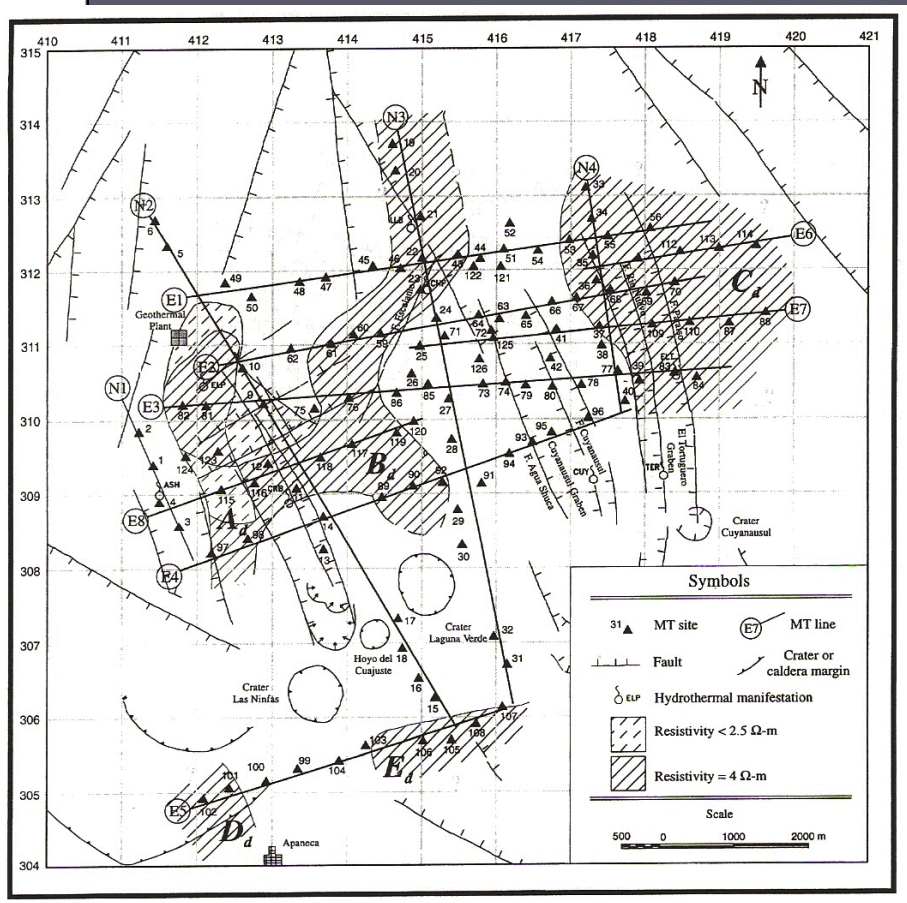
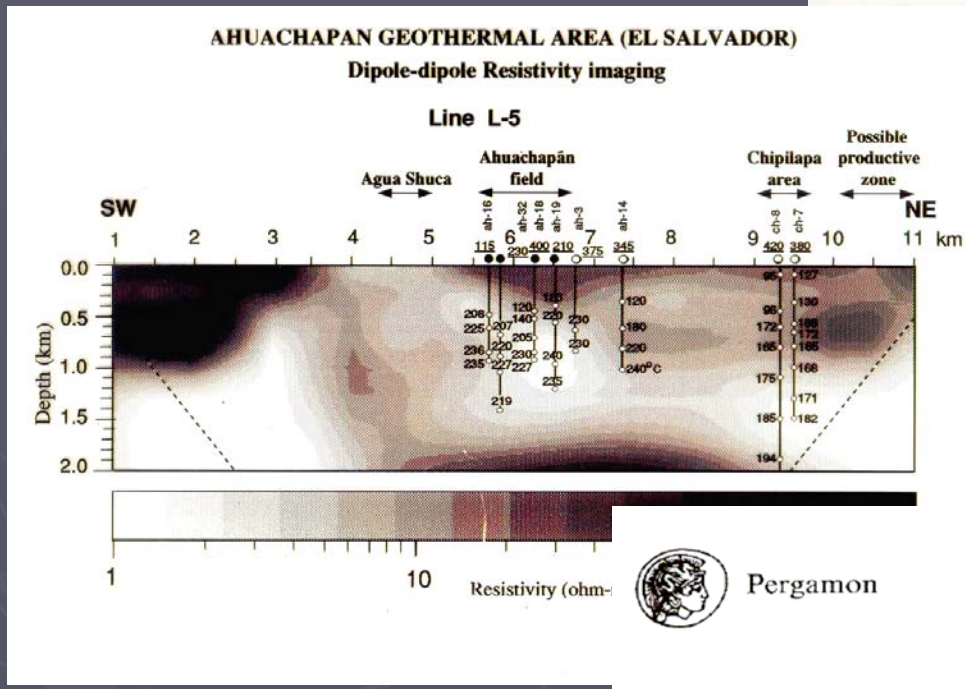
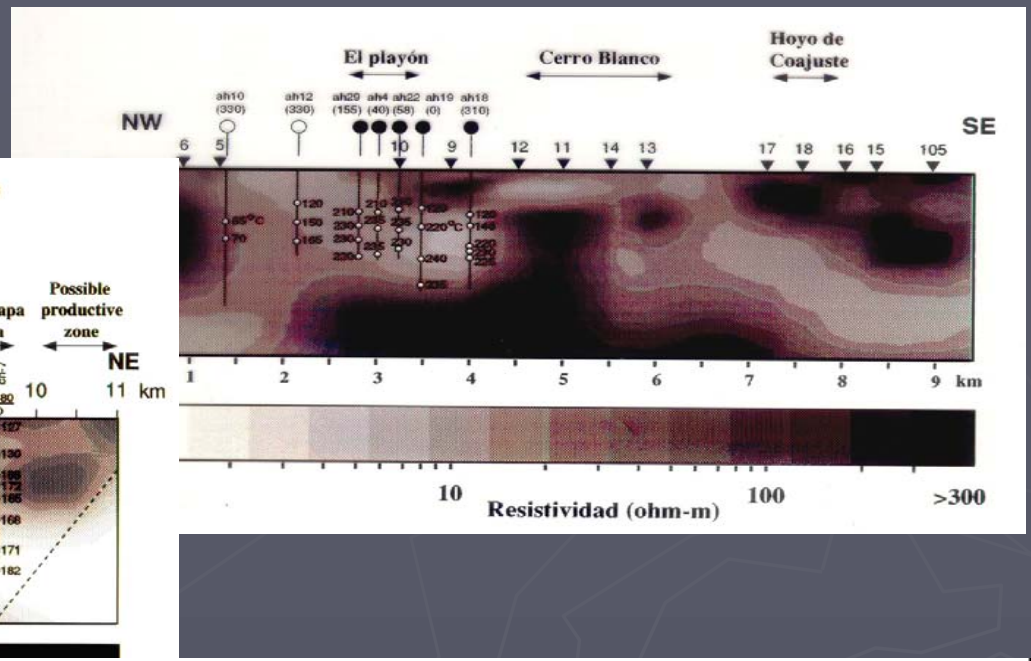


Fig. 9. Deep conductors.

Ahuachapán-Chipilapa





Pergamon

Geothermics, Vol. 26, No. 5/6, pp. 657–680, 1997

0375–6505/97 $17.00 + 0.00

PII: S0375–6505(97)00015–1

DIPOLE–DIPOLE RESISTIVITY IMAGING OF THE AHUACHAPÁN–CHIPILAPA GEOTHERMAL FIELD, EL SALVADOR

MARCO A. PÉREZ FLORES and ENRIQUE GÓMEZ TREVIÑO

CICESE, División de Ciencias de la Tierra, Ensenada, Baja California 22800, México

Diffusion activities

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Mexican Geophysical Union

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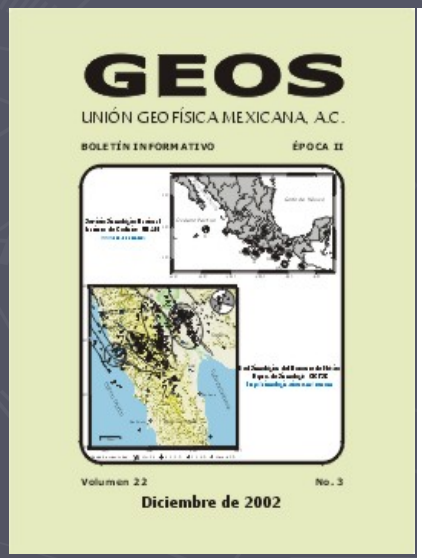
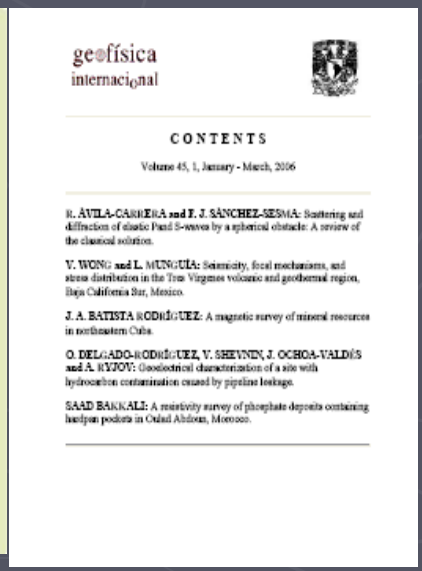
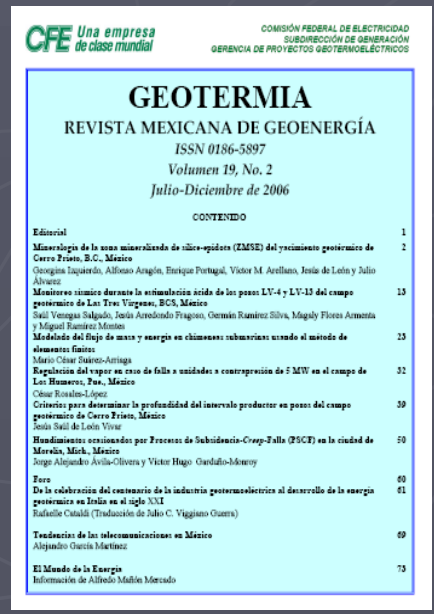
GEOTERMIA edited by CFE







Thanks for your attention