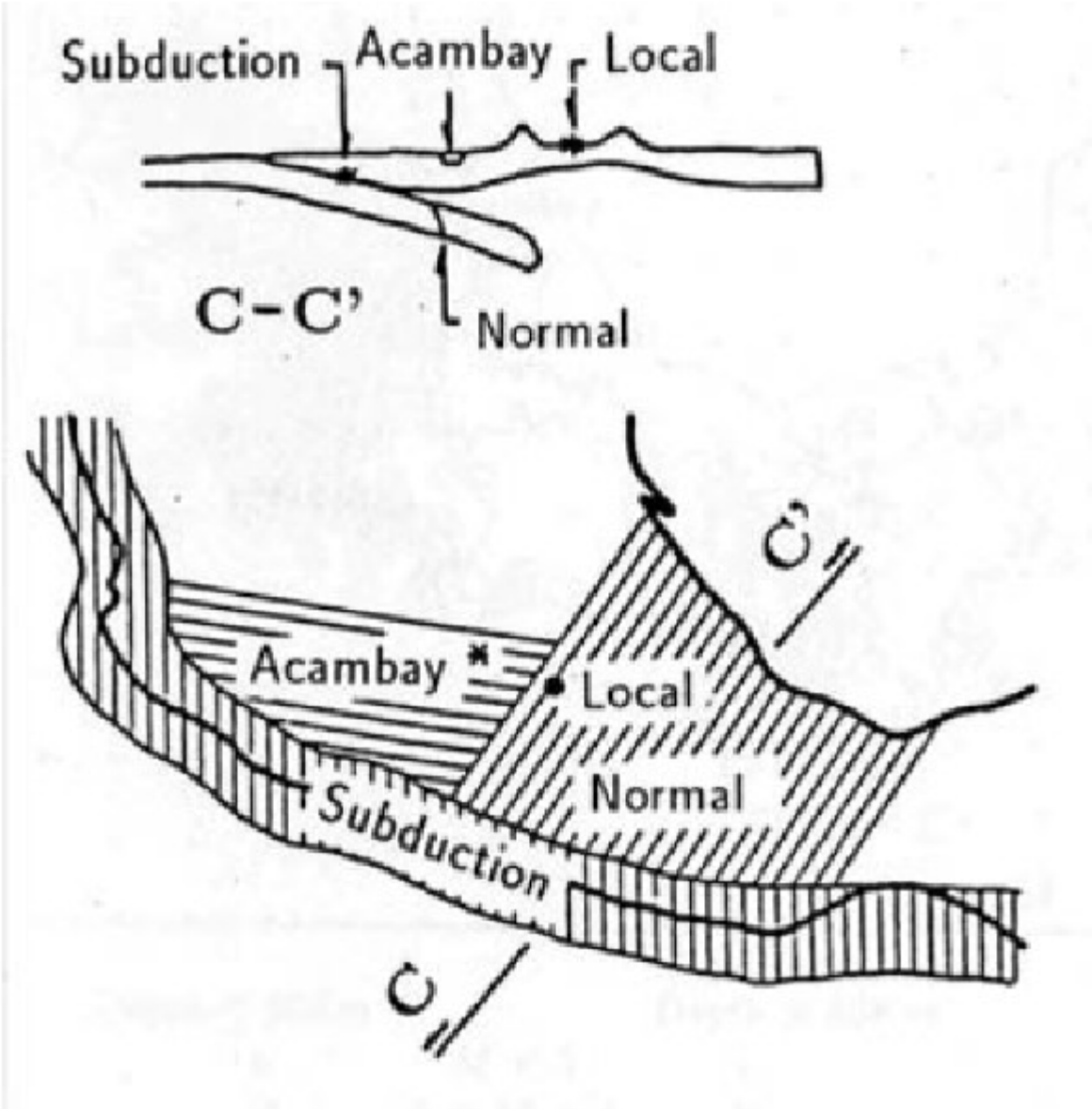
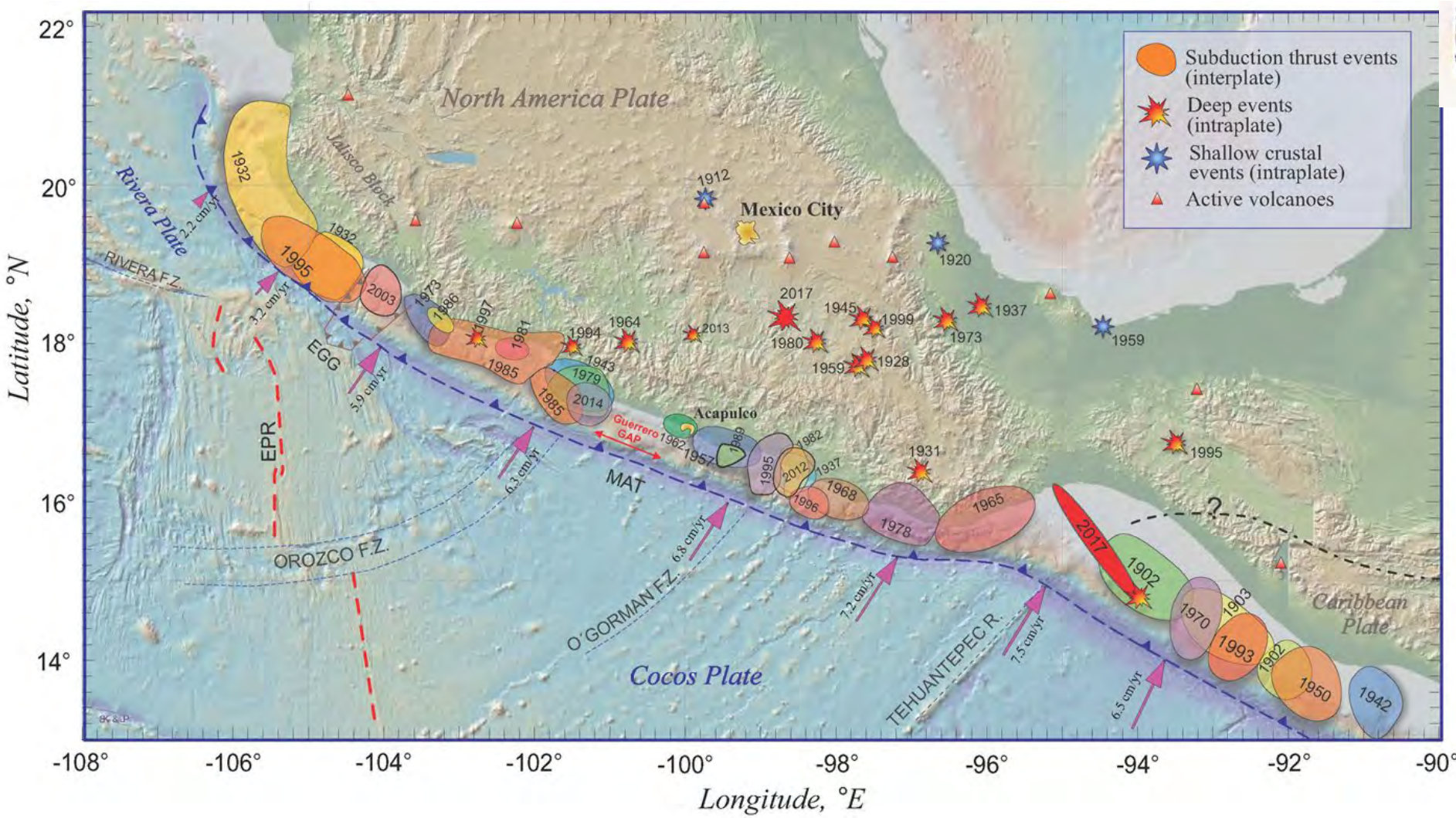
Caracterización de la amenaza sísmica para el centro de México

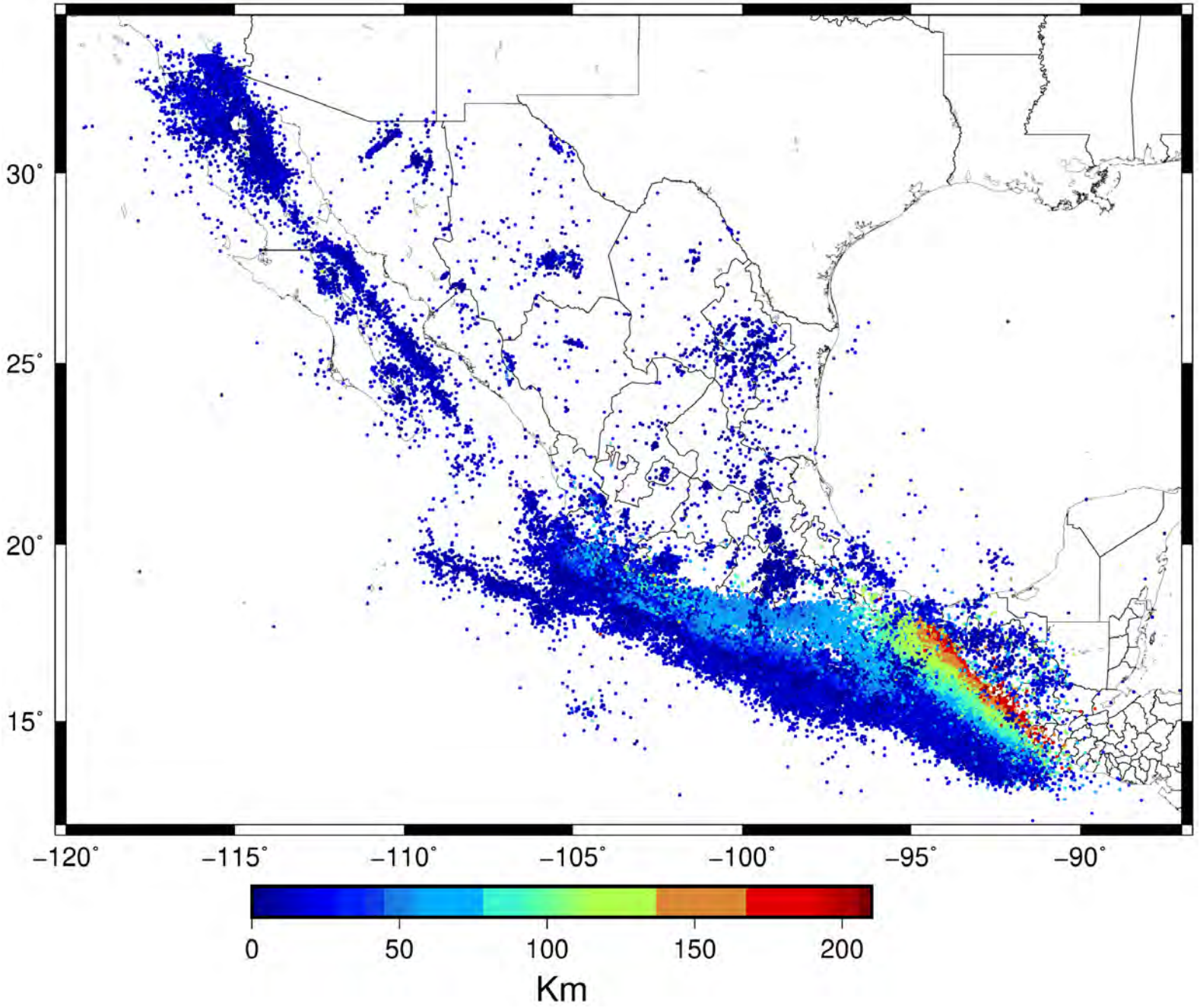
Dr. Arturo Iglesias Mendoza
Servicio Sismológico Nacional
Instituto de Geofísica, UNAM



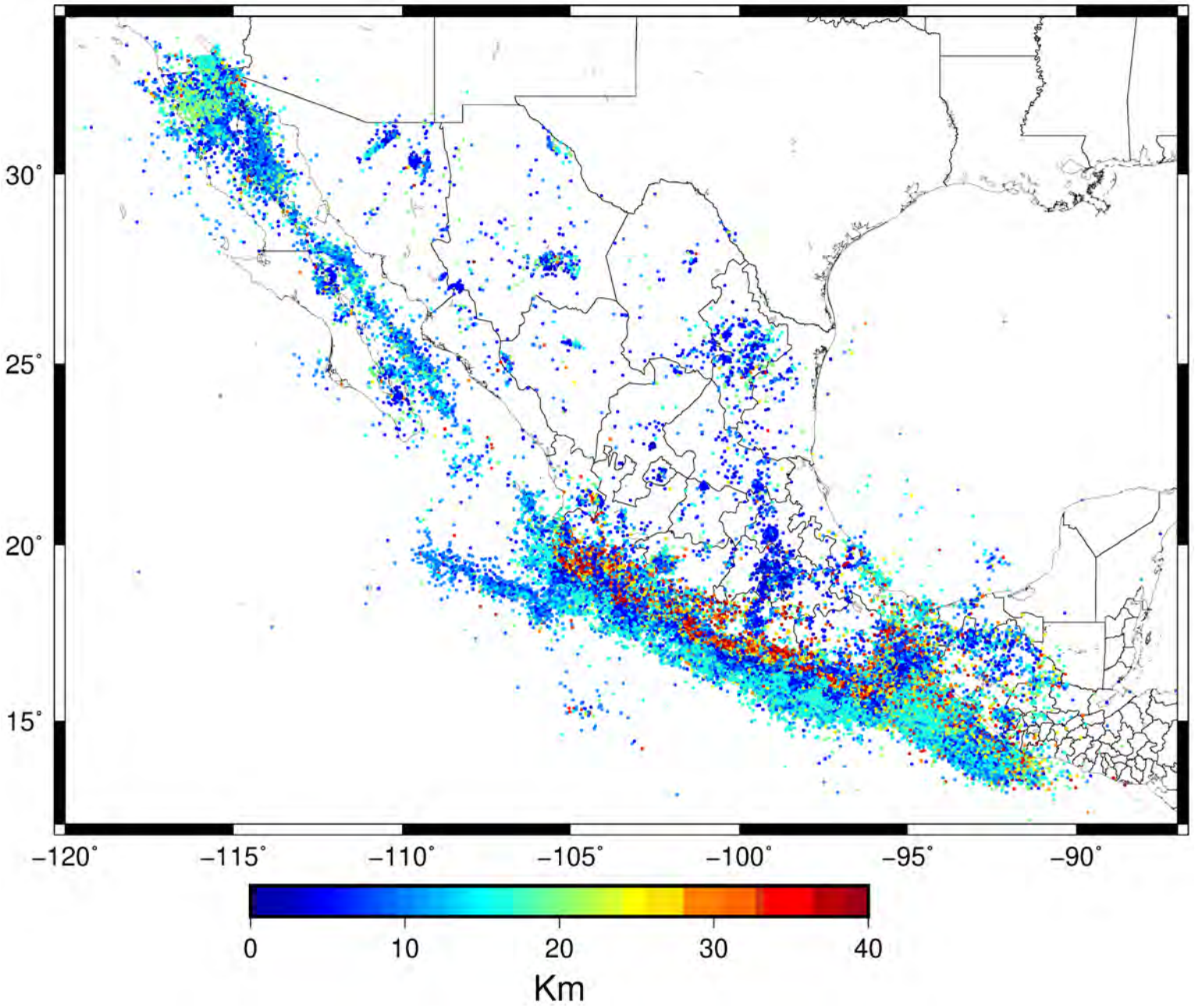
Rosenblueth et al., 1987



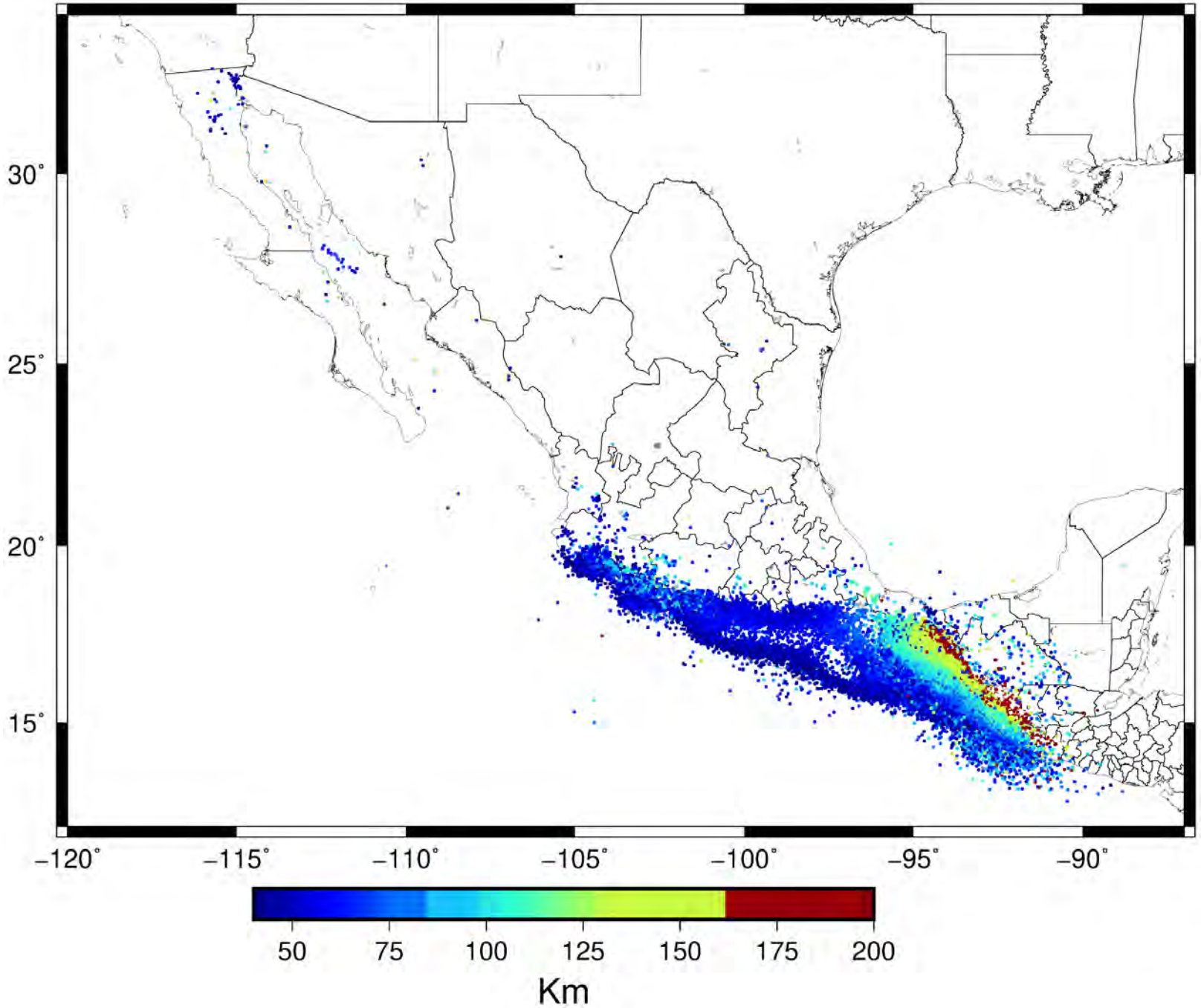
Kostoglodov y Pacheco:
https://usuarios.geofisica.unam.mx/vladimir/images/EQ_map_2013_es_clear.jpg



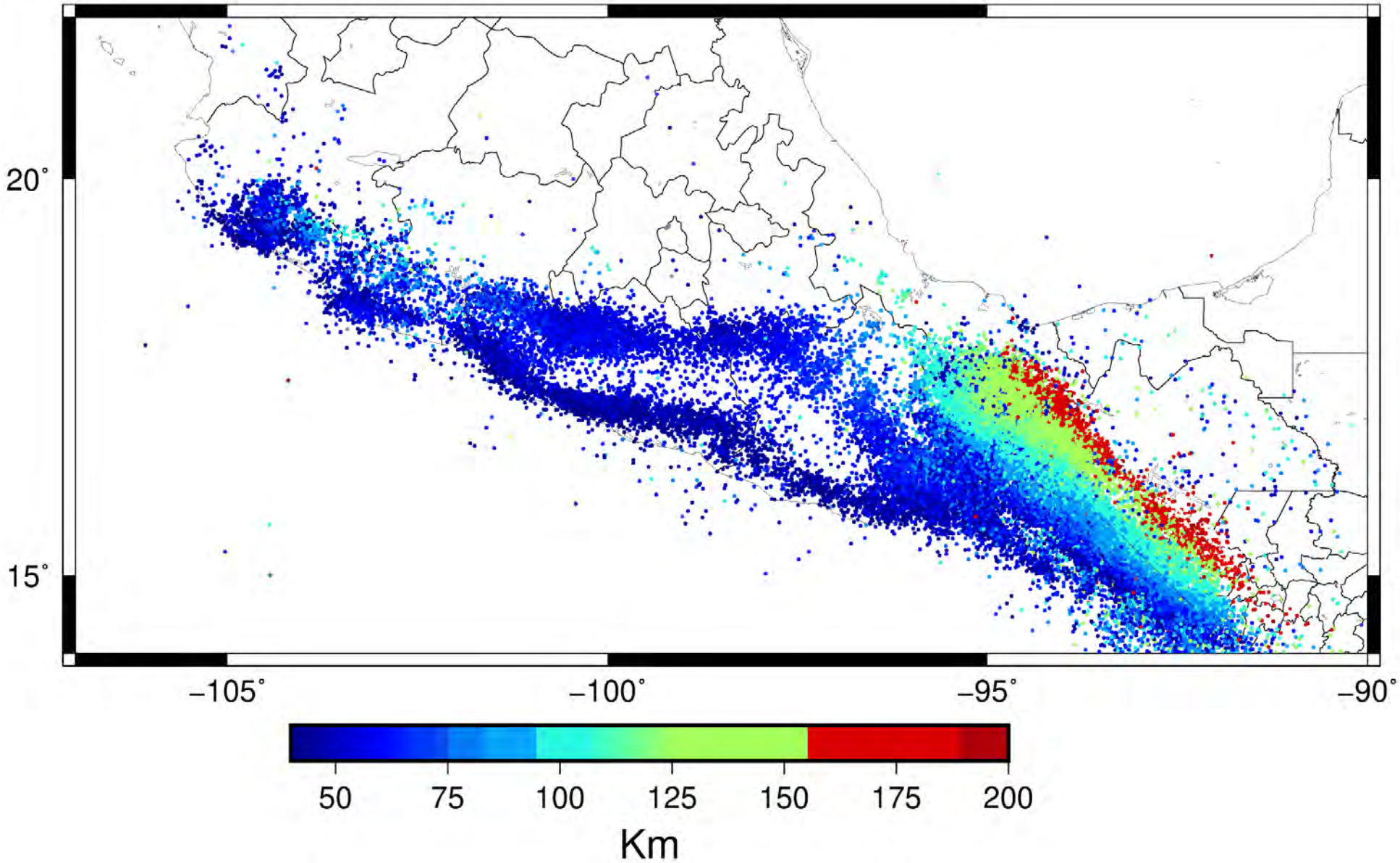
257,425 sismos en este siglo
Catálogo del SSN



Sismos someros

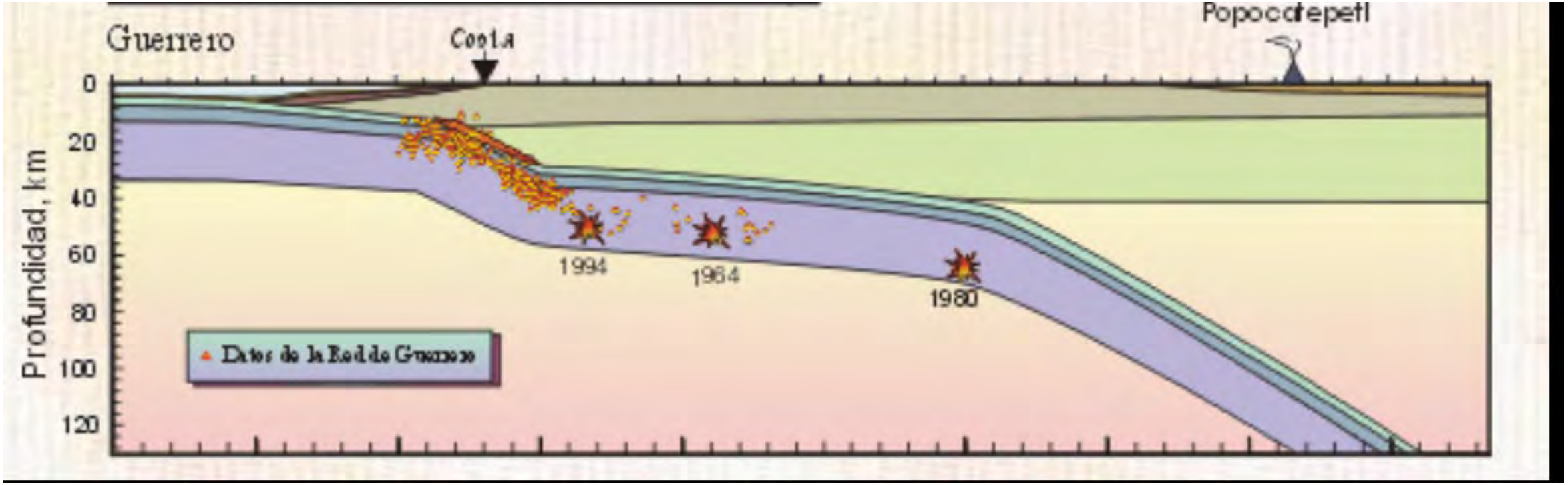


Sismos profundos

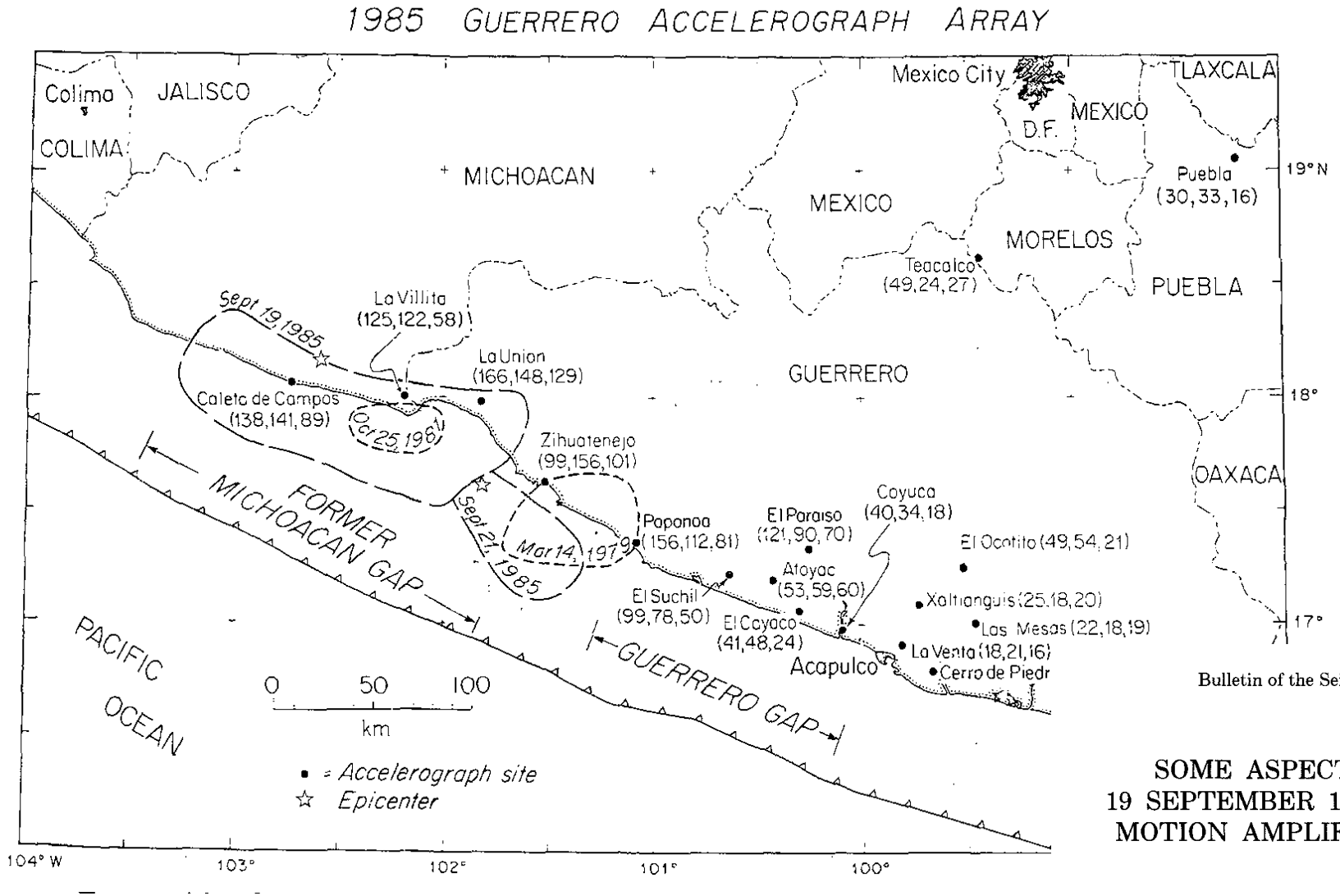


Sismos profundos

Sismos Interplaca



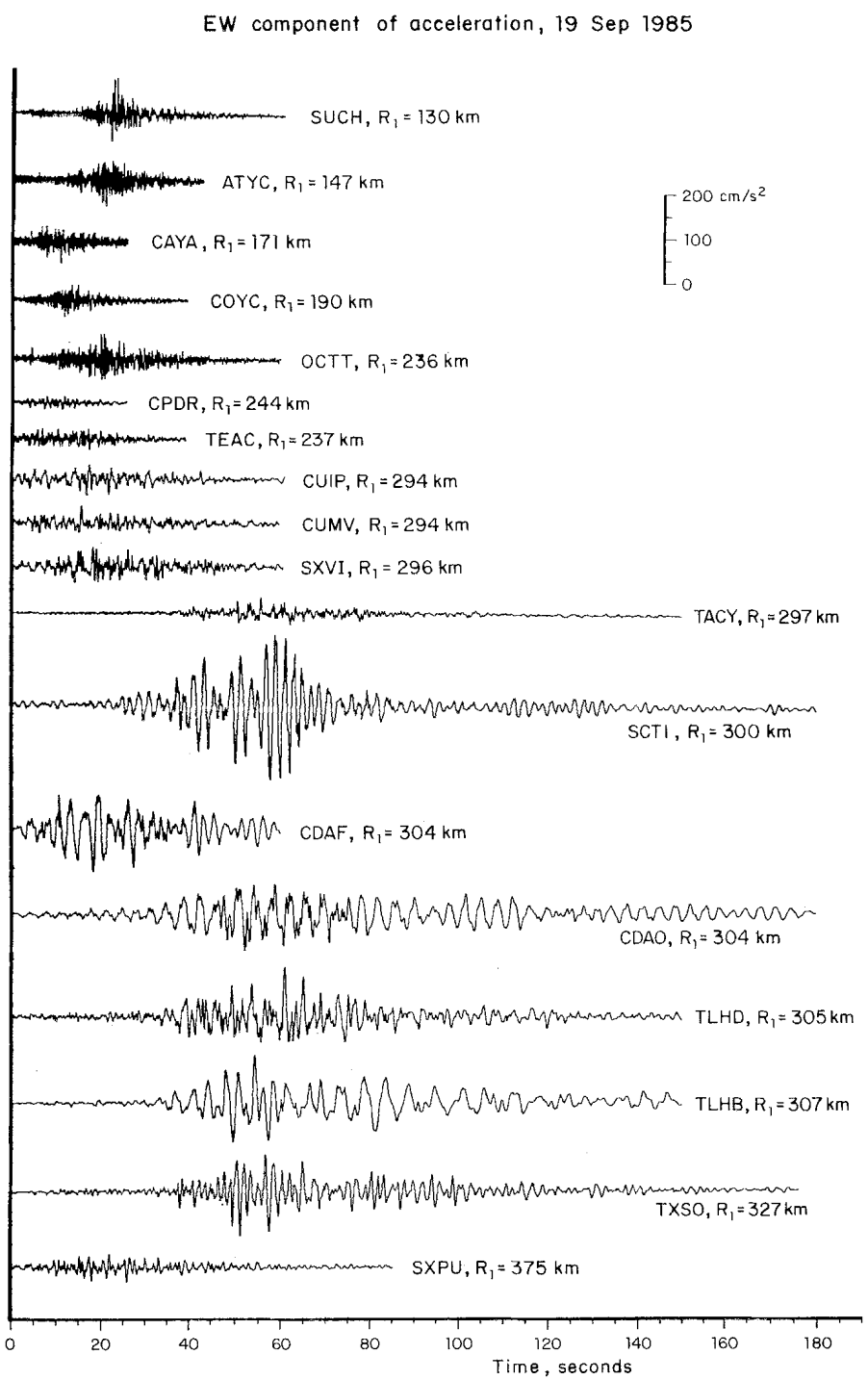
19 de septiembre de 1985



Bulletin of the Seismological Society of America, Vol. 78, No. 2, pp. 451–477, April 1988

SOME ASPECTS OF SOURCE CHARACTERISTICS OF THE 19 SEPTEMBER 1985 MICHOACAN EARTHQUAKE AND GROUND MOTION AMPLIFICATION IN AND NEAR MEXICO CITY FROM STRONG MOTION DATA

BY S. K. SINGH, E. MENA, AND R. CASTRO



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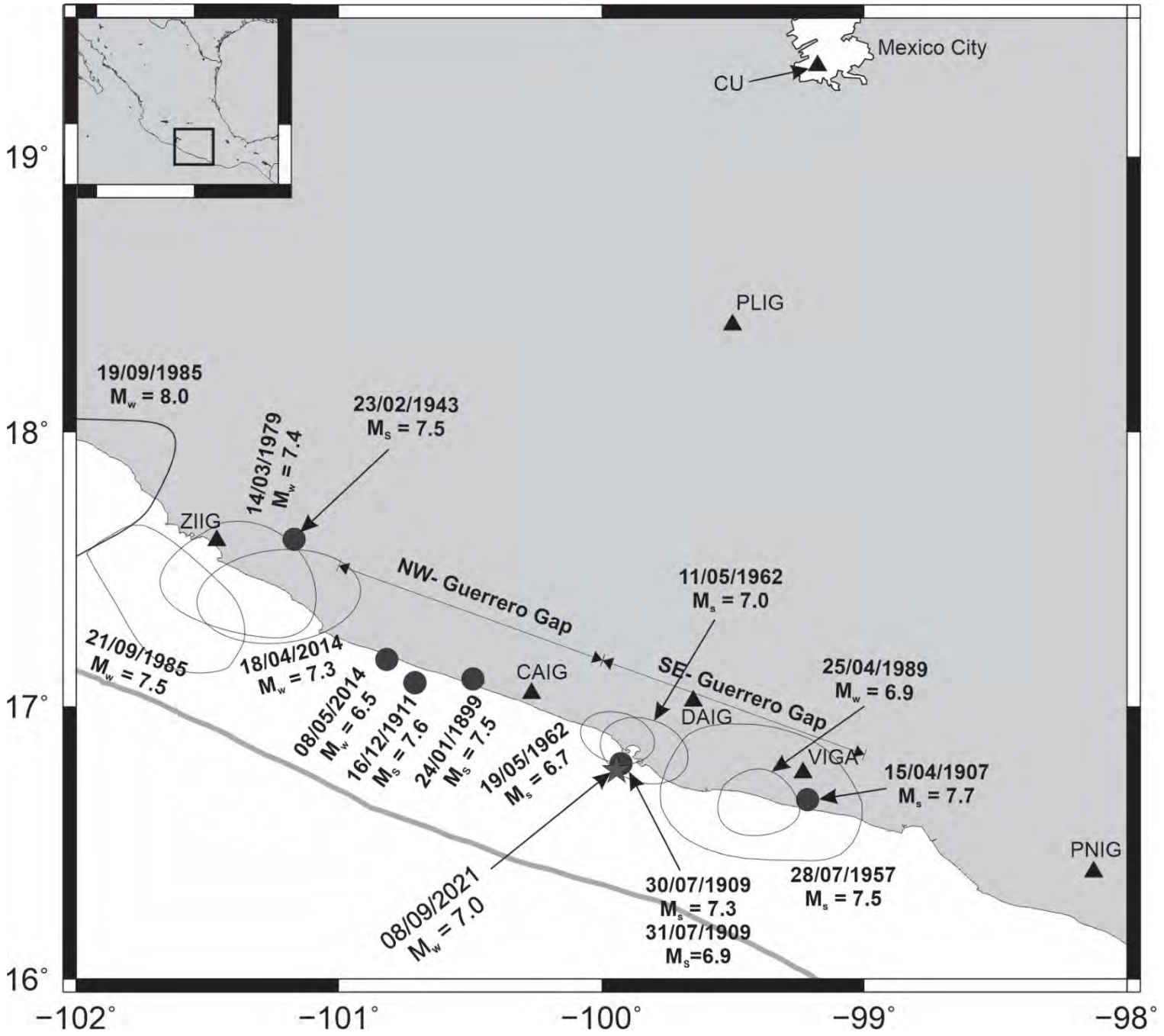


08/09/2021, Mw=7.0

RESEARCH ARTICLE | SEPTEMBER 07, 2022

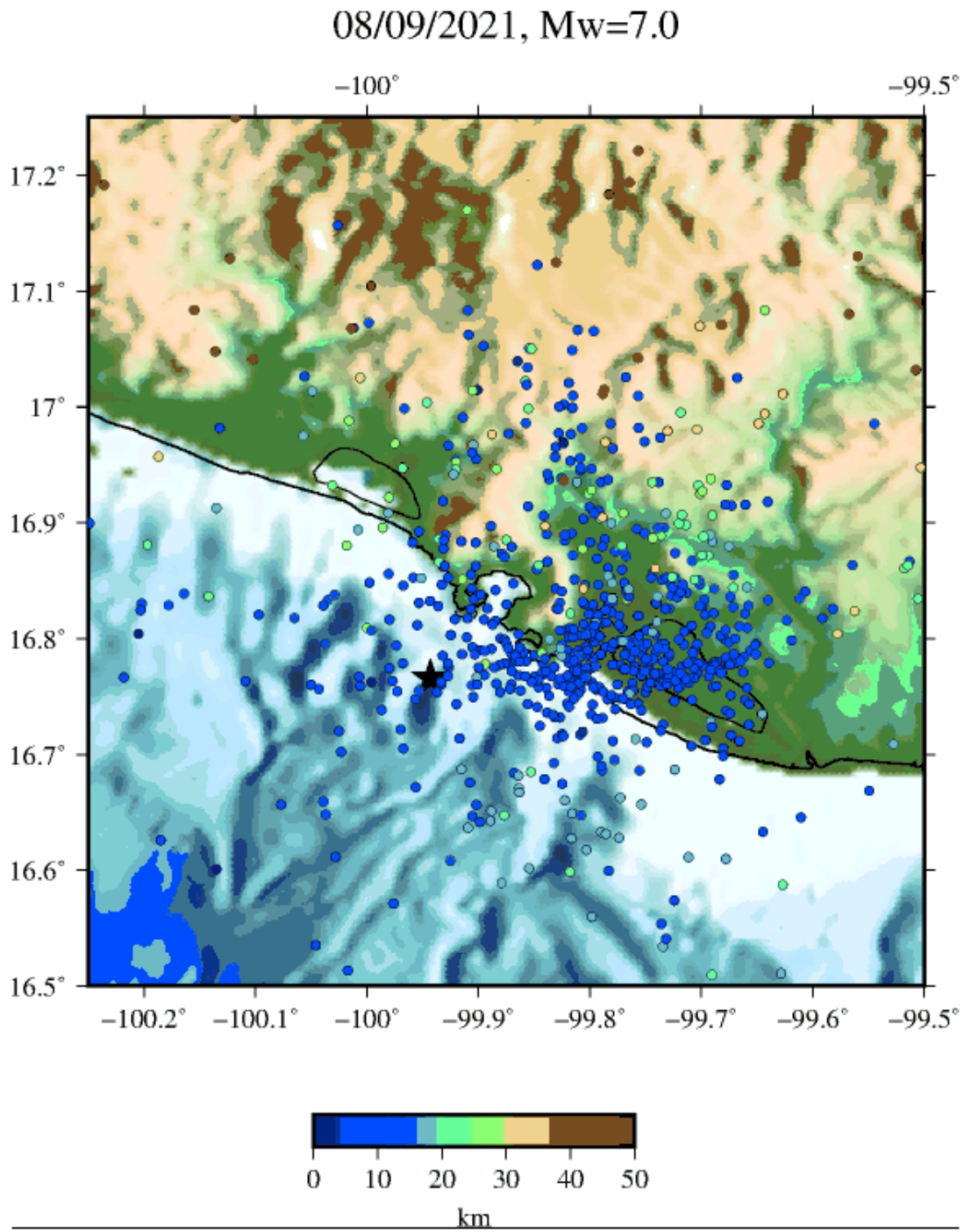
A Source Study of the M_w 7.0 Acapulco, Mexico, Earthquake of 8 September 2021

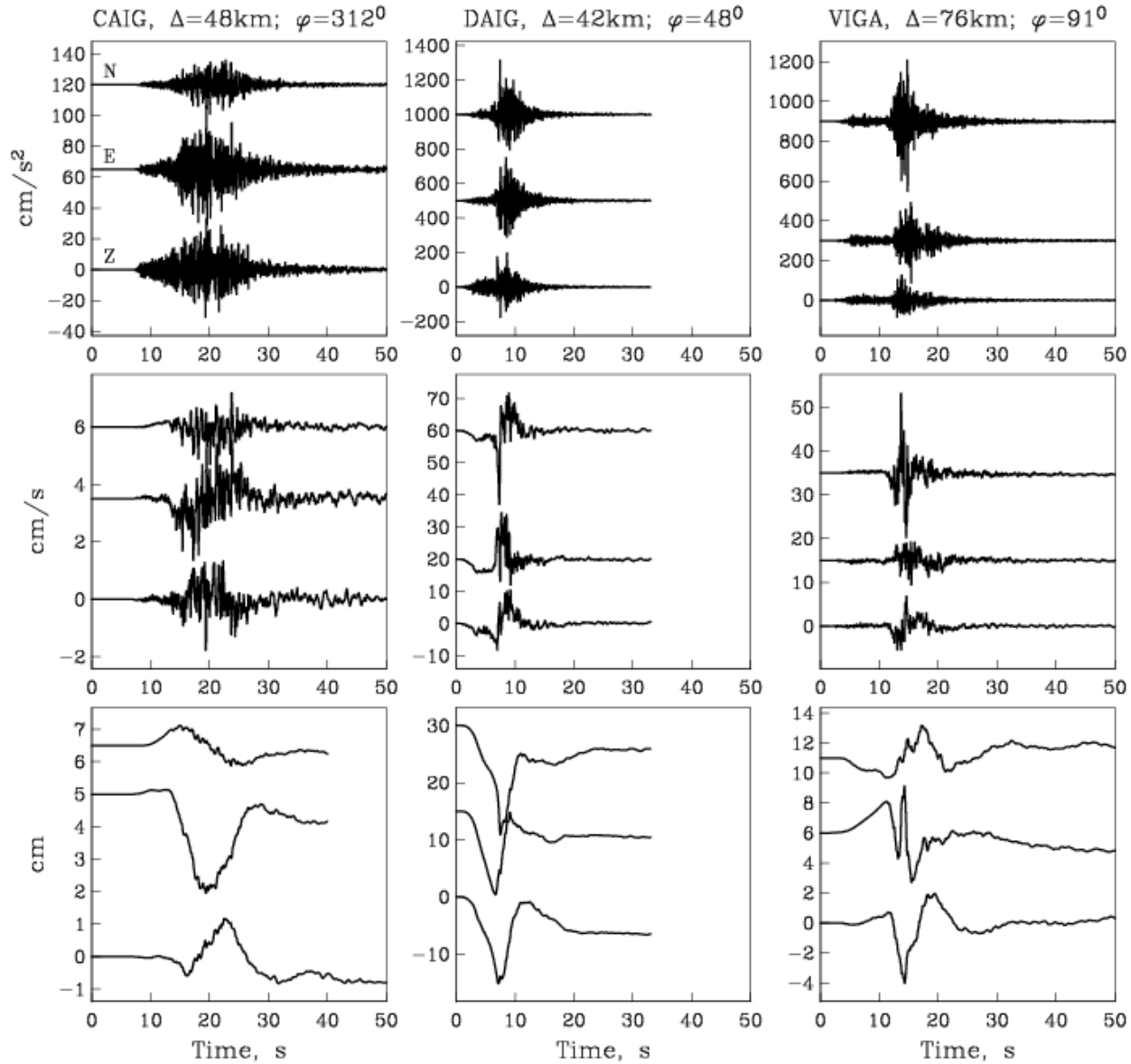
Arturo Iglesias ; Shri K. Singh; Oscar Castro-Artola; Xyoli Pérez-Campos; Raul D. Corona-Fernandez; Miguel A. Santoyo; Víctor H. Espíndola; Danny Arroyo; Sara I. Franco

+ Author and Article Information

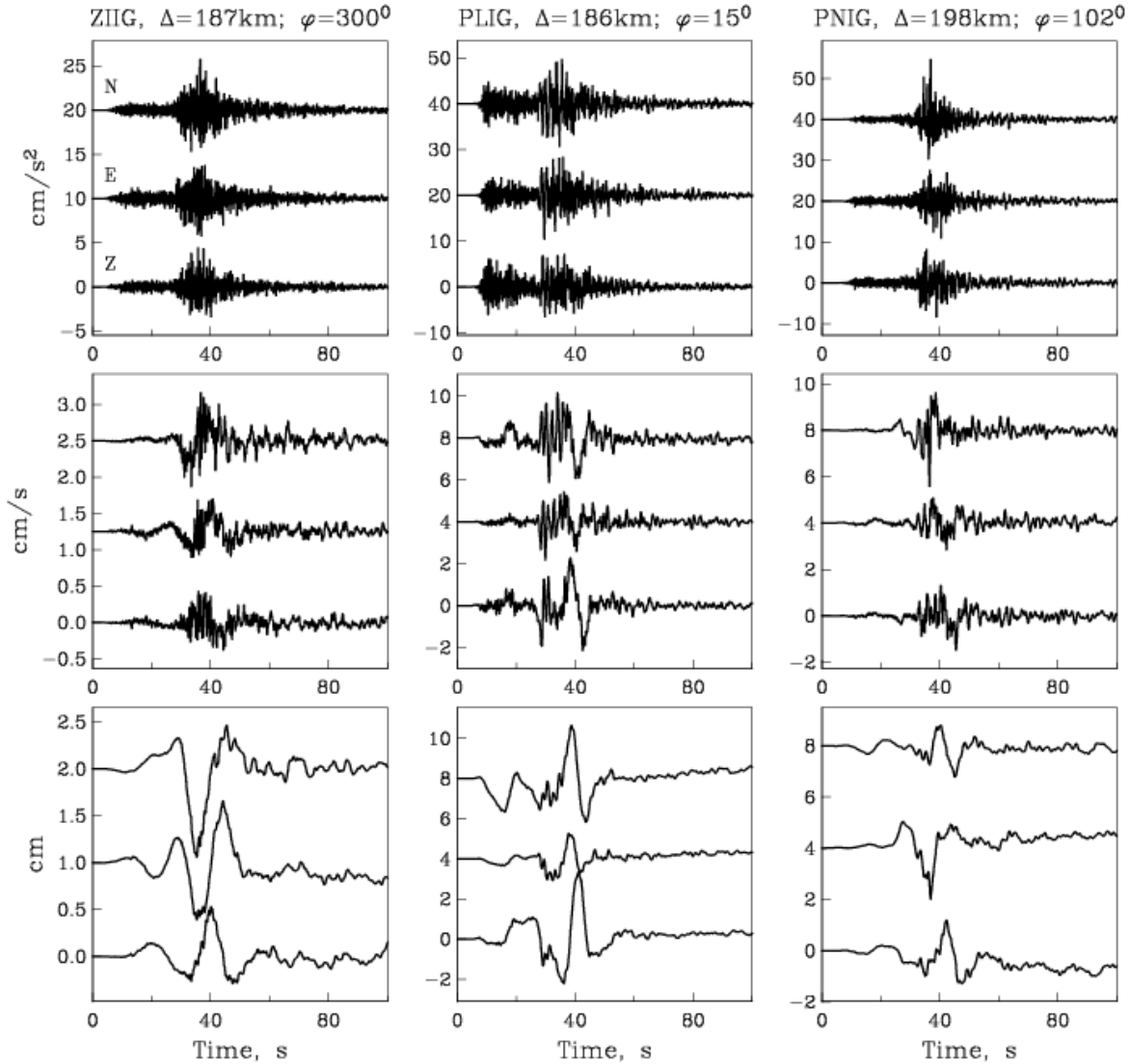
Seismological Research Letters (2022) 93 (6): 3205–3218.
https://doi.org/10.1785/0220220124 | Article history

Localización y una semana de réplicas

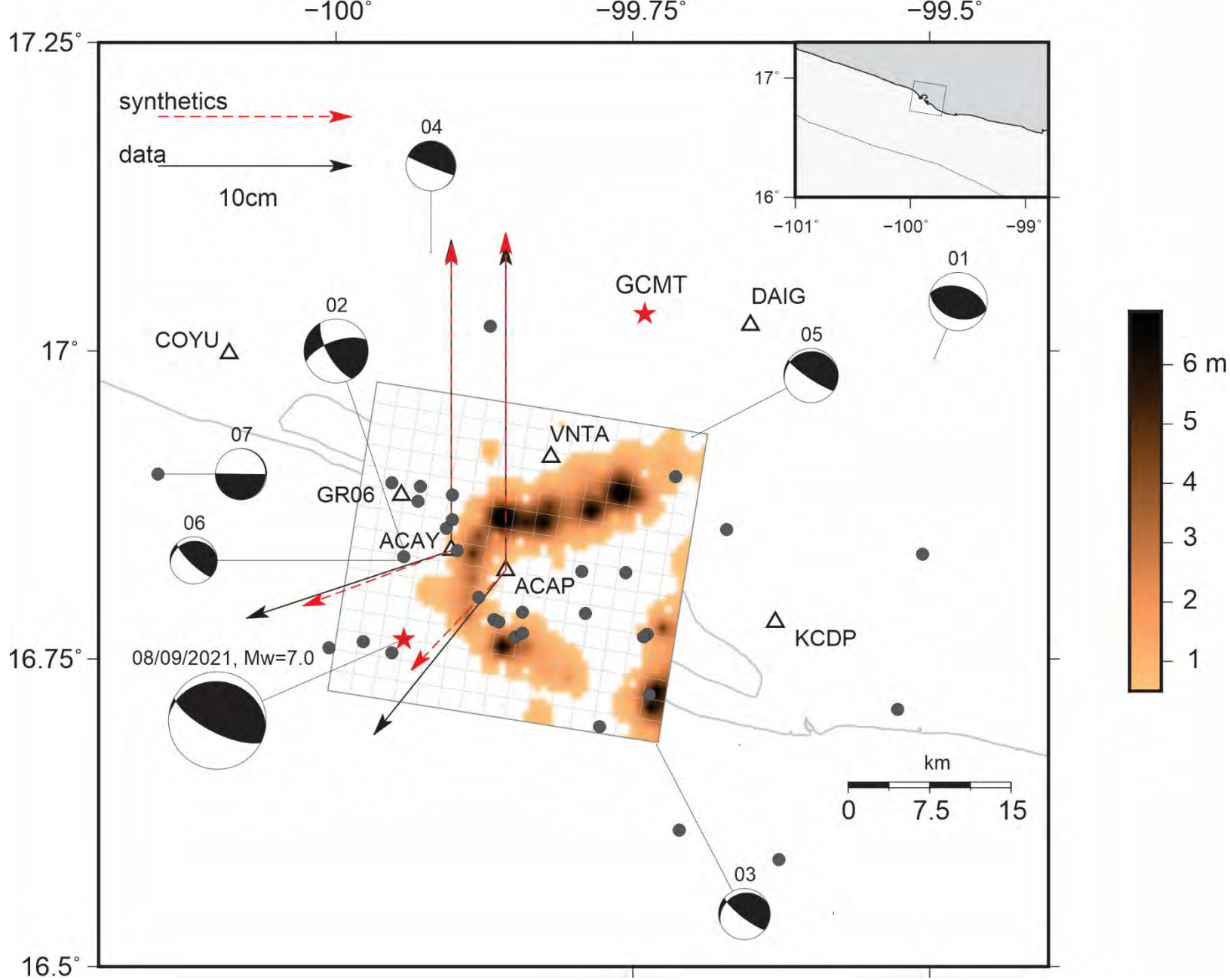


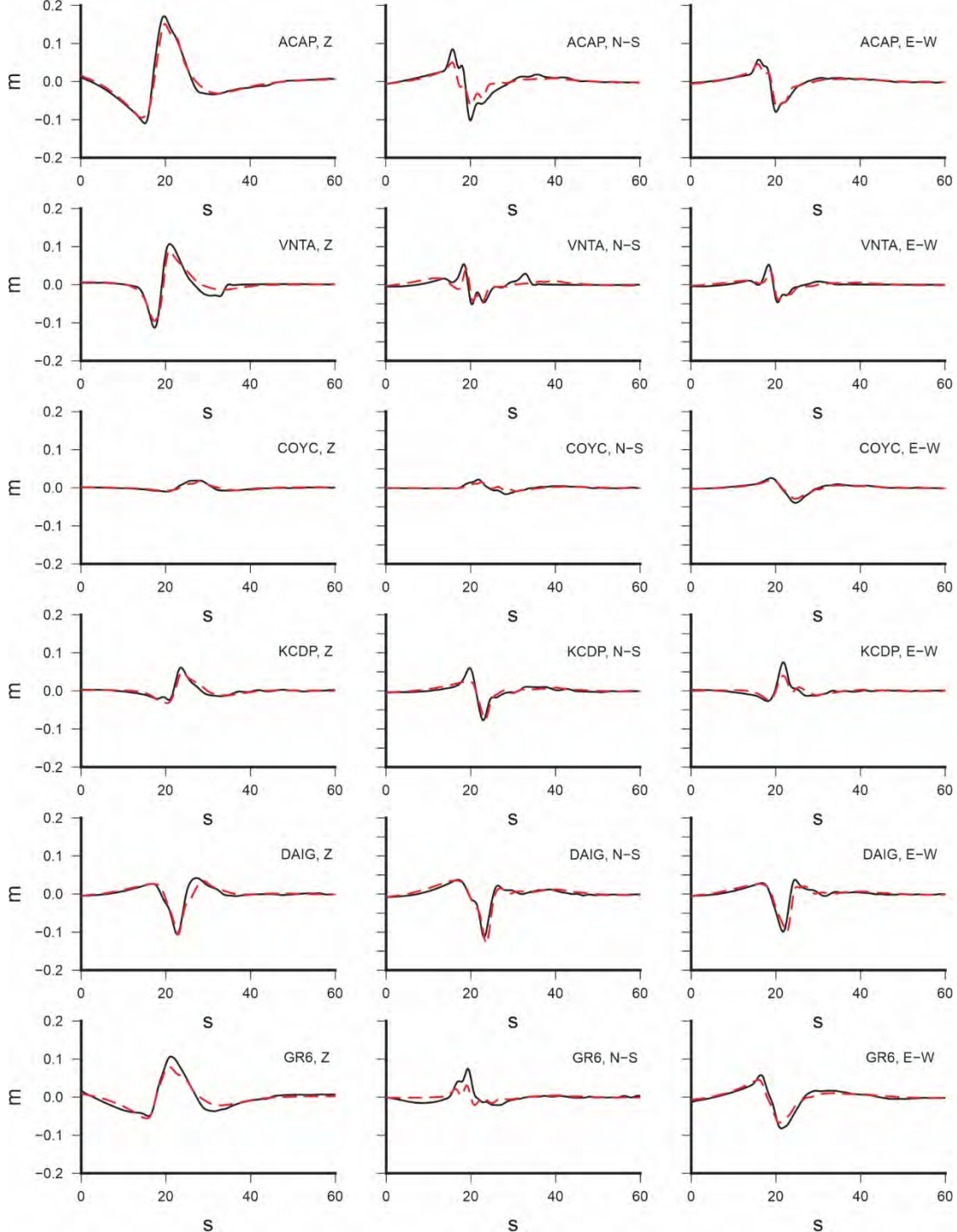


Comparación de registros a distancias similares (notar la diferente escala vertical)



Comparación de registros a distancias similares (notar la diferente escala vertical)


−100°
−99.75°
−99.5°
17.25°
17°
16.75°
16.5°
synthetics
data
10cm
04
02
01
05
03
07
06
GCMT
DAIG
COYU
VNTA
GR06
ACAY
ACAP
KCDP
08/09/2021, Mw=7.0
km
0
7.5
15
17°
16°
−101°
−100°
−99°
6 m
5
4
3
2
1



Comparación de registros a distancias similares (notar la diferente escala vertical)

Journal of Seismology

Volume 23, Issue 4, 15 July 2019, Pages 683-697

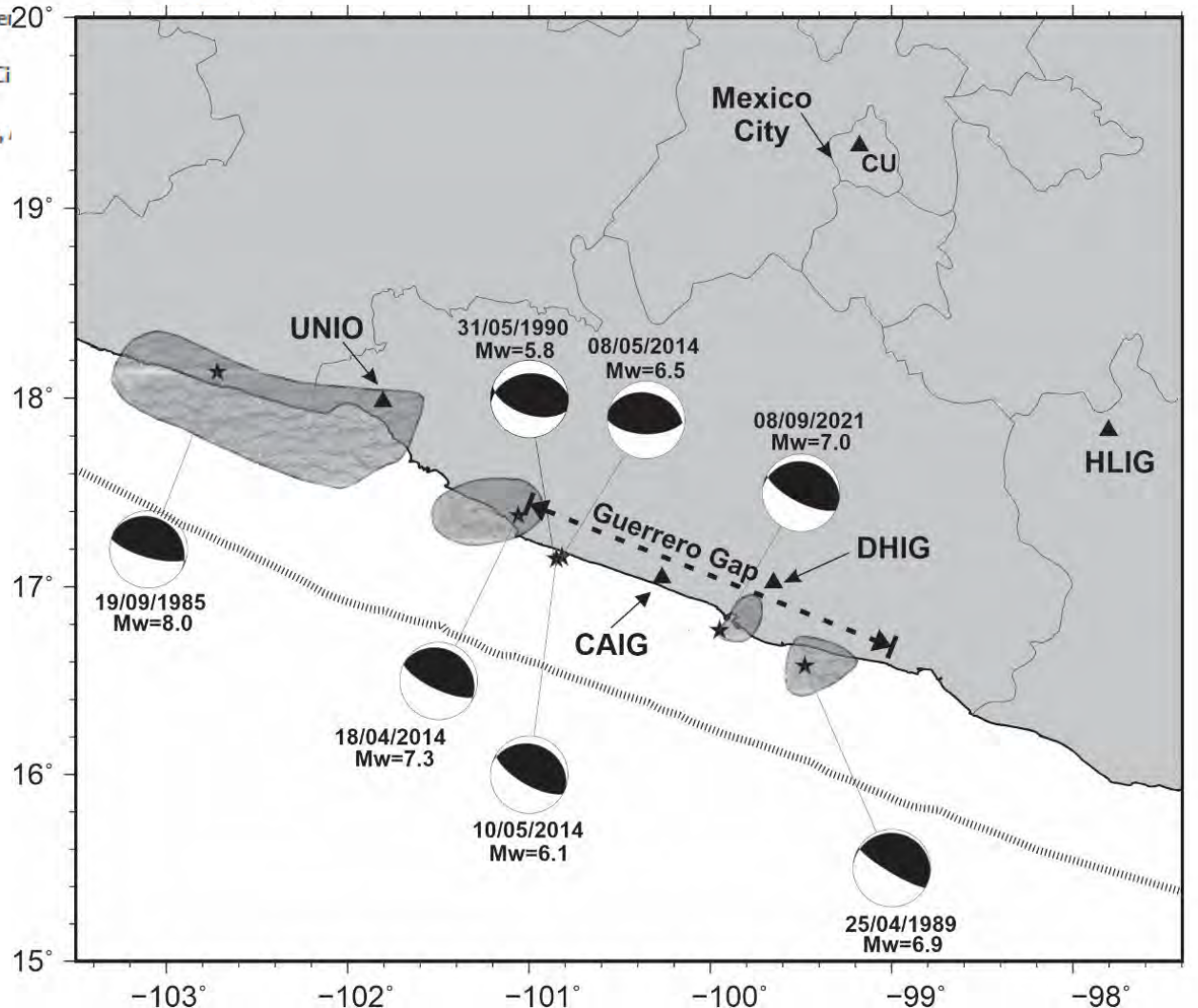
Evidence of directivity during the earthquakes of 8 and 10 May 2014 (M_w 6.5, 6.1) in the Guerrero, Mexico seismic gap and some implications(Article)

Singh, S.K., Plata-Martínez, R., Pérez-Campos, X., Espíndola, V.H., Arroyo, D., Iglesias, A.

[a]Instituto de Geofísica, Circuito de la Investigación s/n, Universidad Nacional Autónoma de México, Ciudad Univer 04510, Mexico

[b]Posgrado en Ciencias de la Tierra, Circuito de la Investigación s/n, Universidad Nacional Autónoma de México, Ci Mexico City, 04510, Mexico

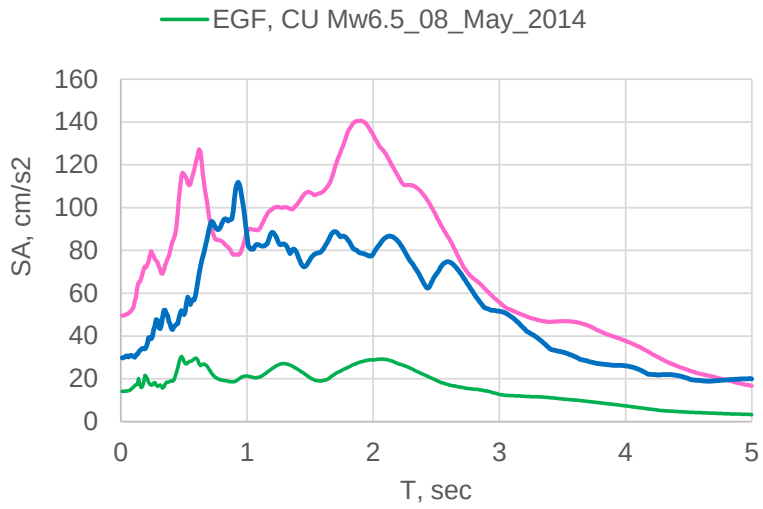
[c]Departamento de Materiales, Universidad Autónoma Metropolitana, Av. San Pablo 180, Col. Reynosa Tamaulipas, Mexico

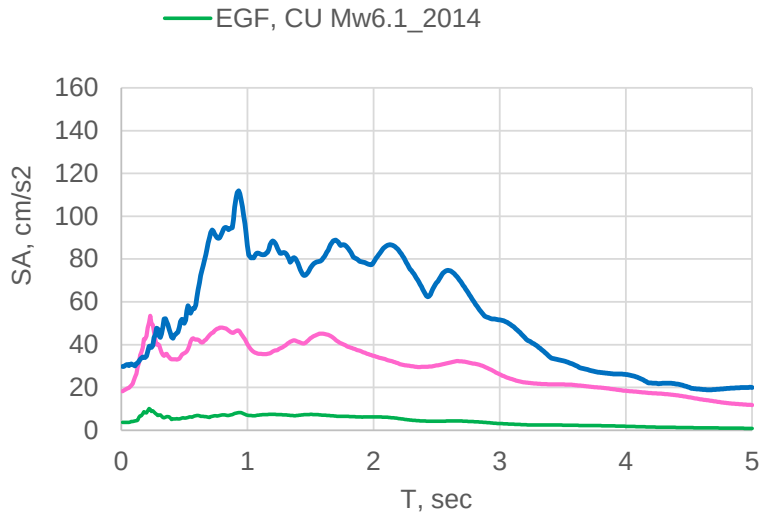


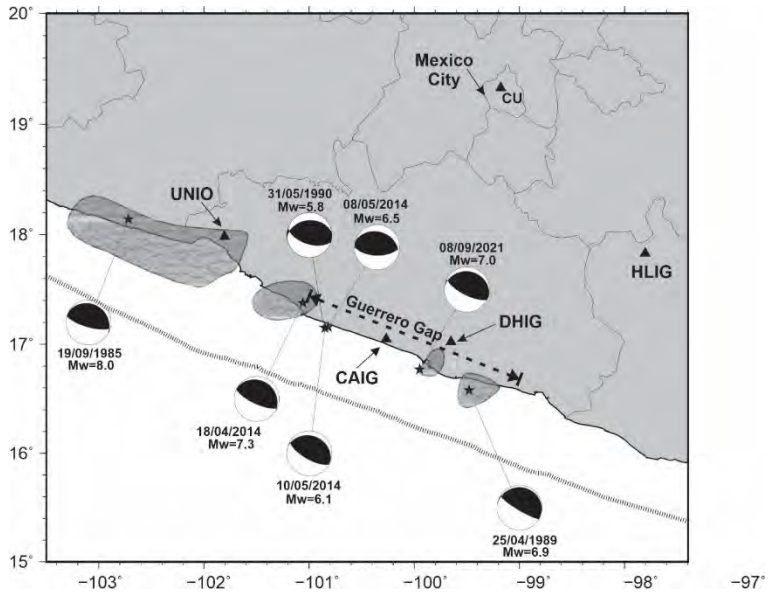
Verde: EGF

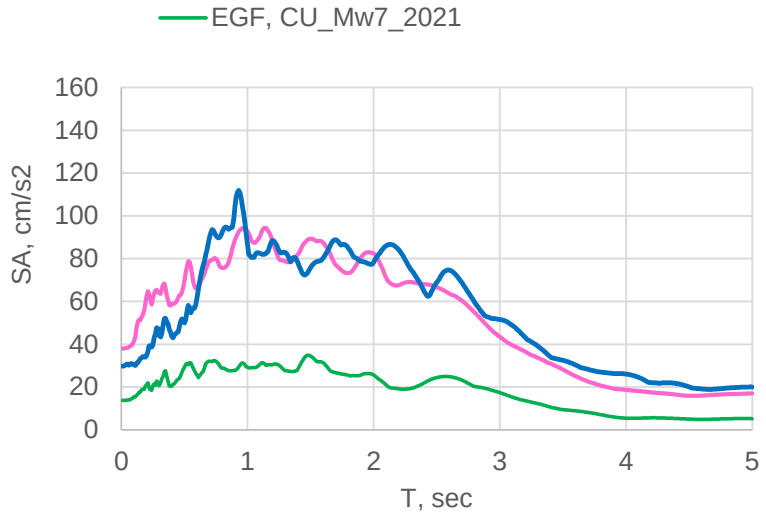
Azul: 19/09/1985

Magenta: Sintético, Mw8

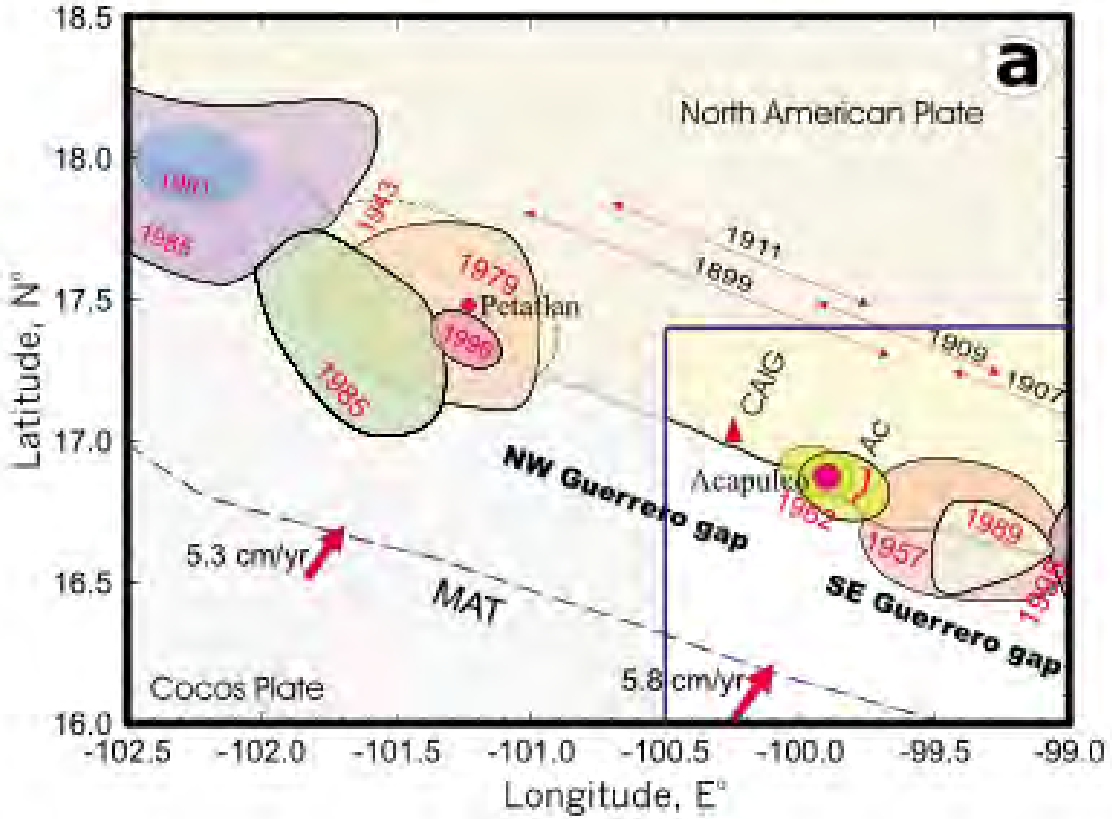




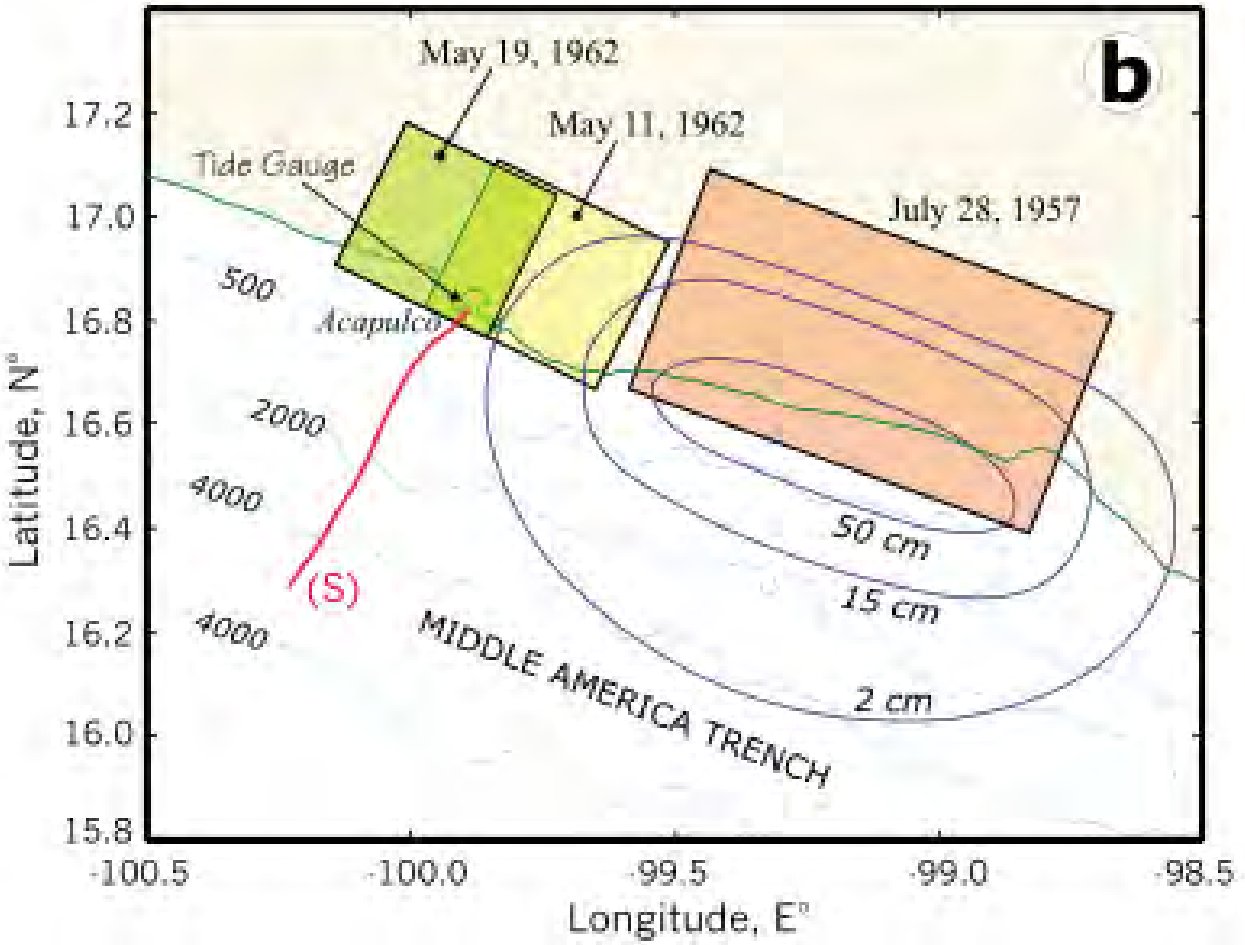


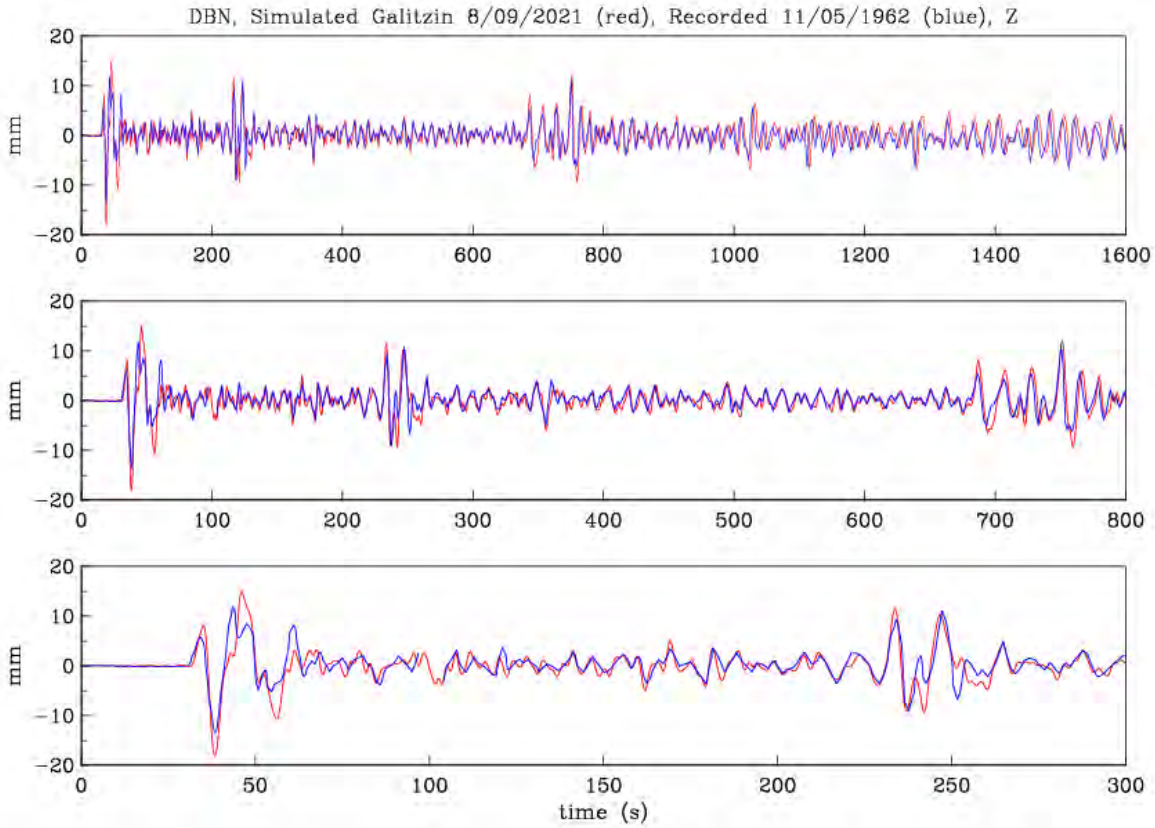


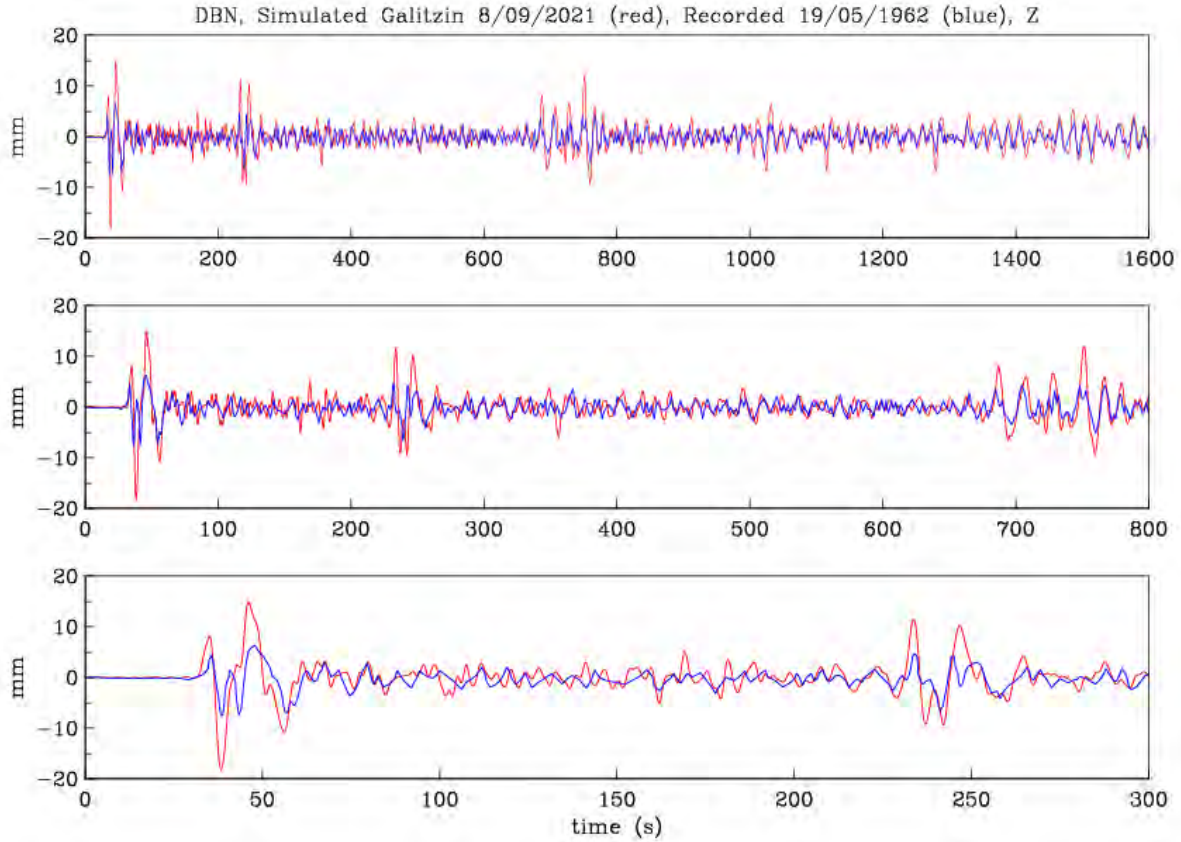
Arroyo et al., 2023



Ortiz et al., 2000







RESEARCH ARTICLE | OCTOBER 20, 2023

Repeating Large Earthquakes along the Mexican Subduction Zone

Shri Krishna Singh; Raúl Daniel Corona-Fernandez; Miguel Ángel Santoyo; Arturo Iglesias

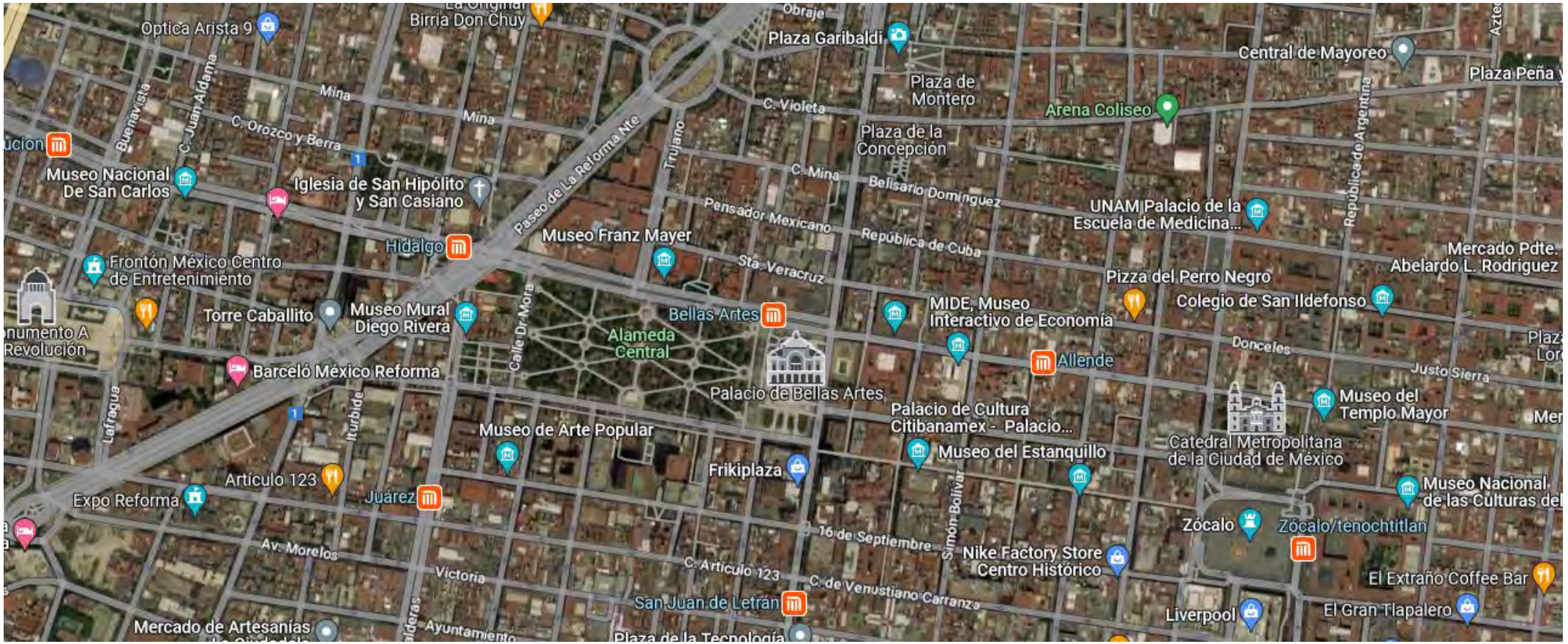
+ Author and Article Information

Seismological Research Letters (2023) | https://doi.org/10.1785/0220230243 | Article history

Bulletin of the Seismological Society of America. Vol. 54, No. 1, pp. 209–231. February, 1964

STRONG GROUND MOTIONS RECORDED DURING EARTHQUAKES OF MAY THE 11TH AND 19TH, 1962 IN MEXICO CITY

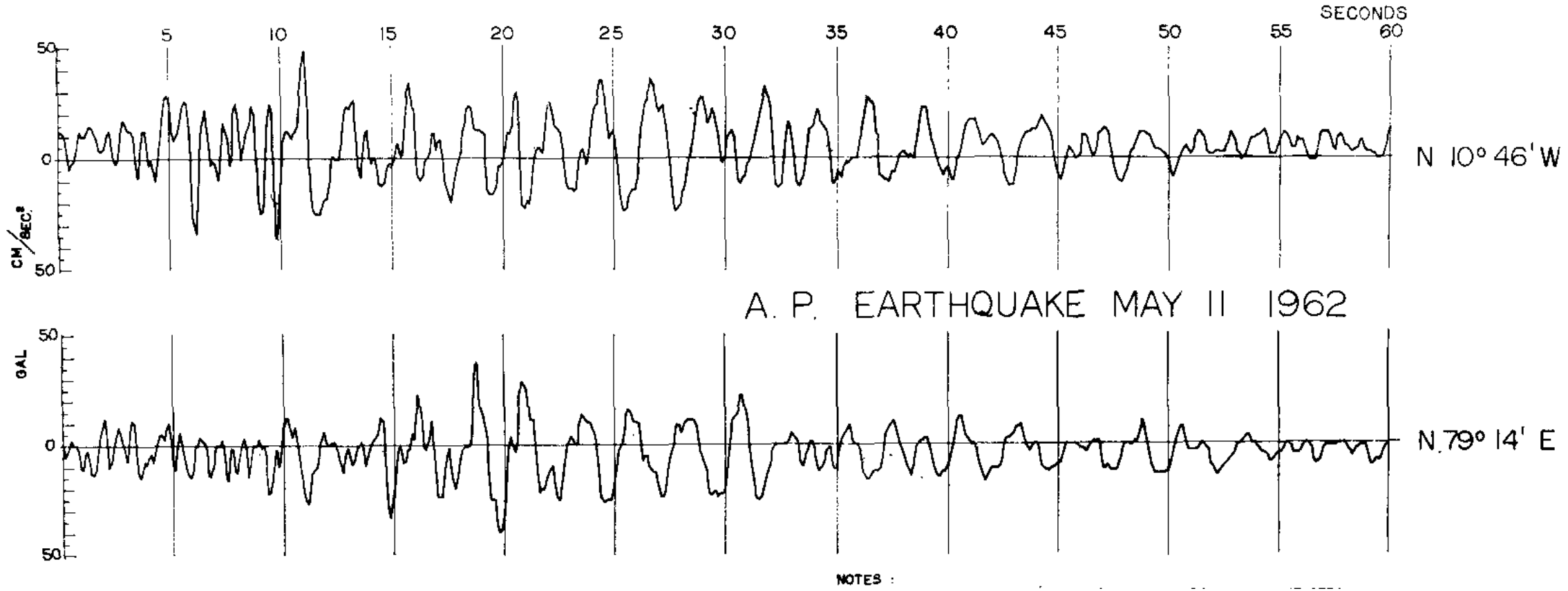
By Leonardo Zeevaert

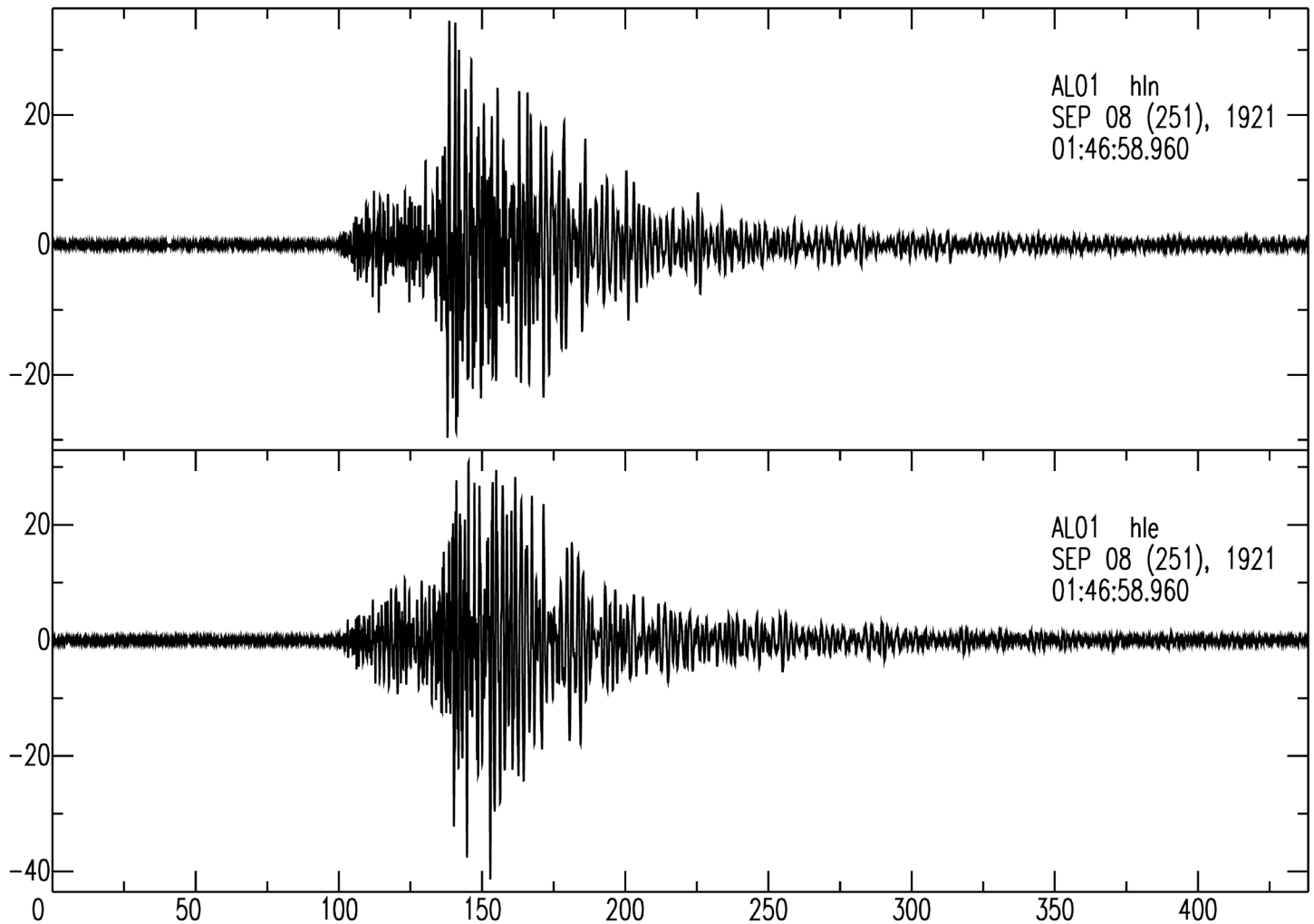


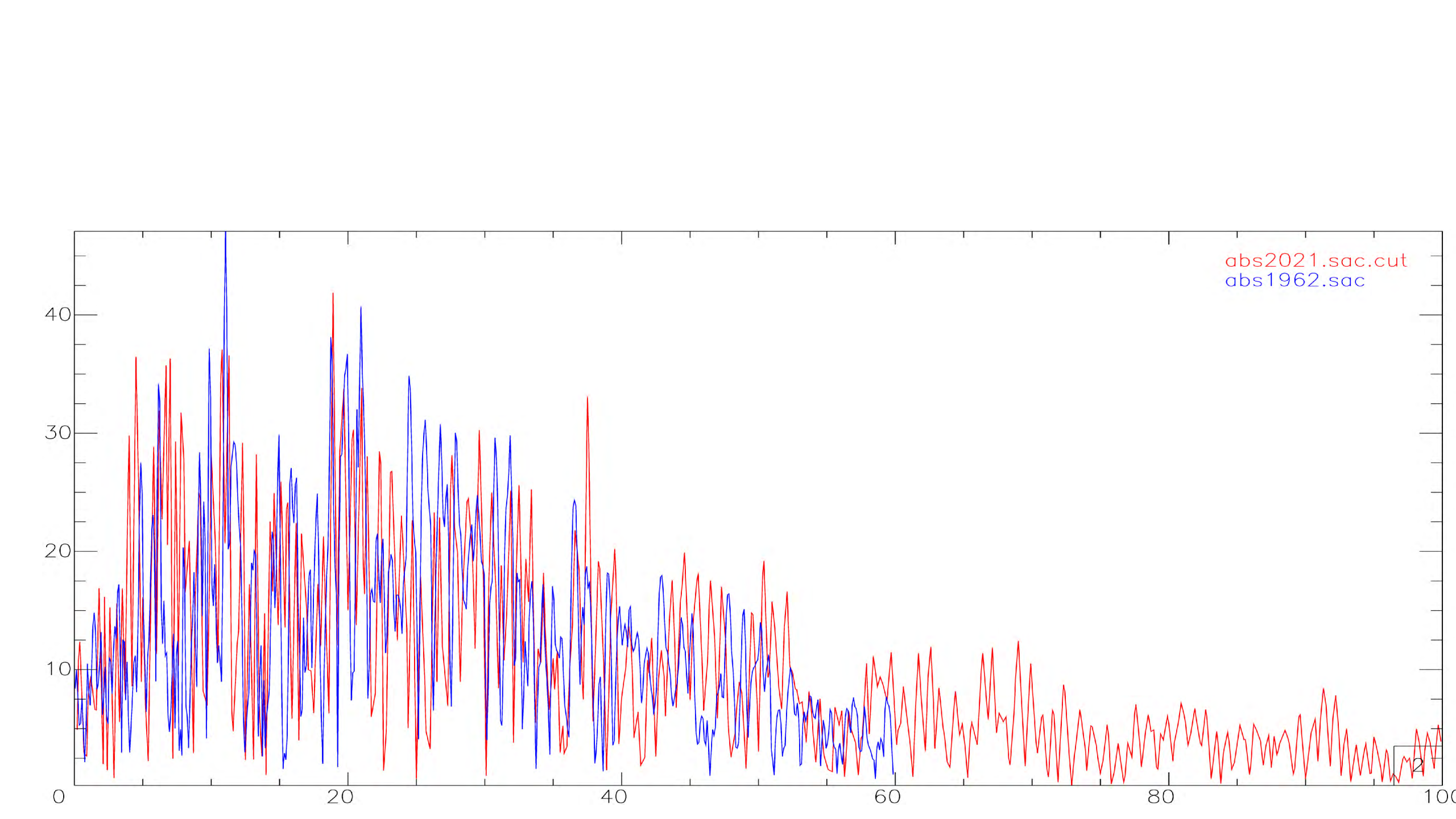
Bulletin of the Seismological Society of America. Vol. 54, No. 1, pp. 209–231. February, 1964

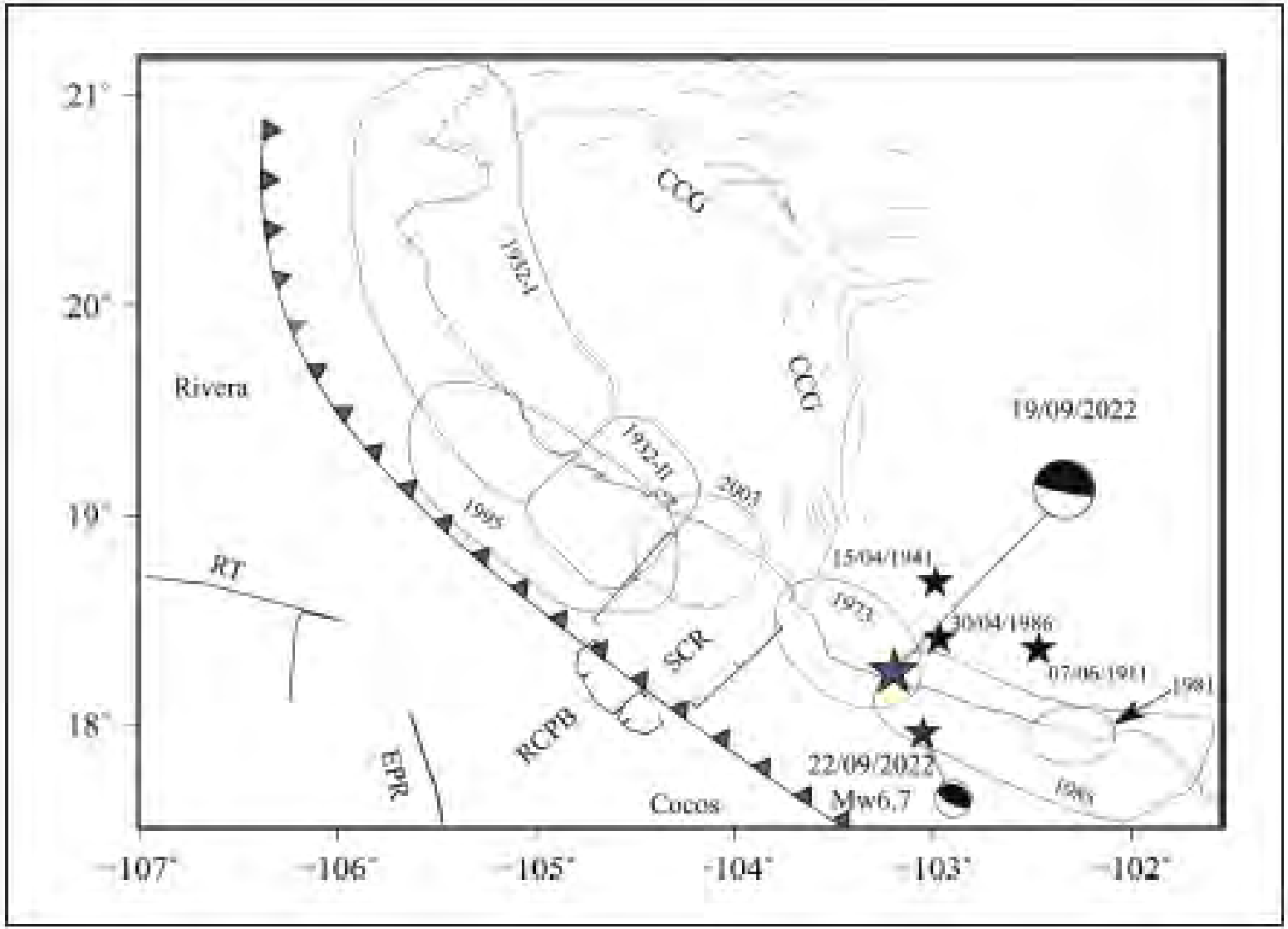
STRONG GROUND MOTIONS RECORDED DURING EARTHQUAKES OF MAY THE 11TH AND 19TH, 1962 IN MEXICO CITY

By Leonardo Zeevaert




AL01 hln
SEP 08 (251), 1921
01:46:58.960
AL01 hle
SEP 08 (251), 1921
01:46:58.960
20
0
-20
20
0
-20
-40
0
50
100
150
200
250
300
350
400


abs2021.sac.cut
abs1962.sac
40
30
20
10
0
20
40
60
80
100
2



19/09/2022, Mw=7.6

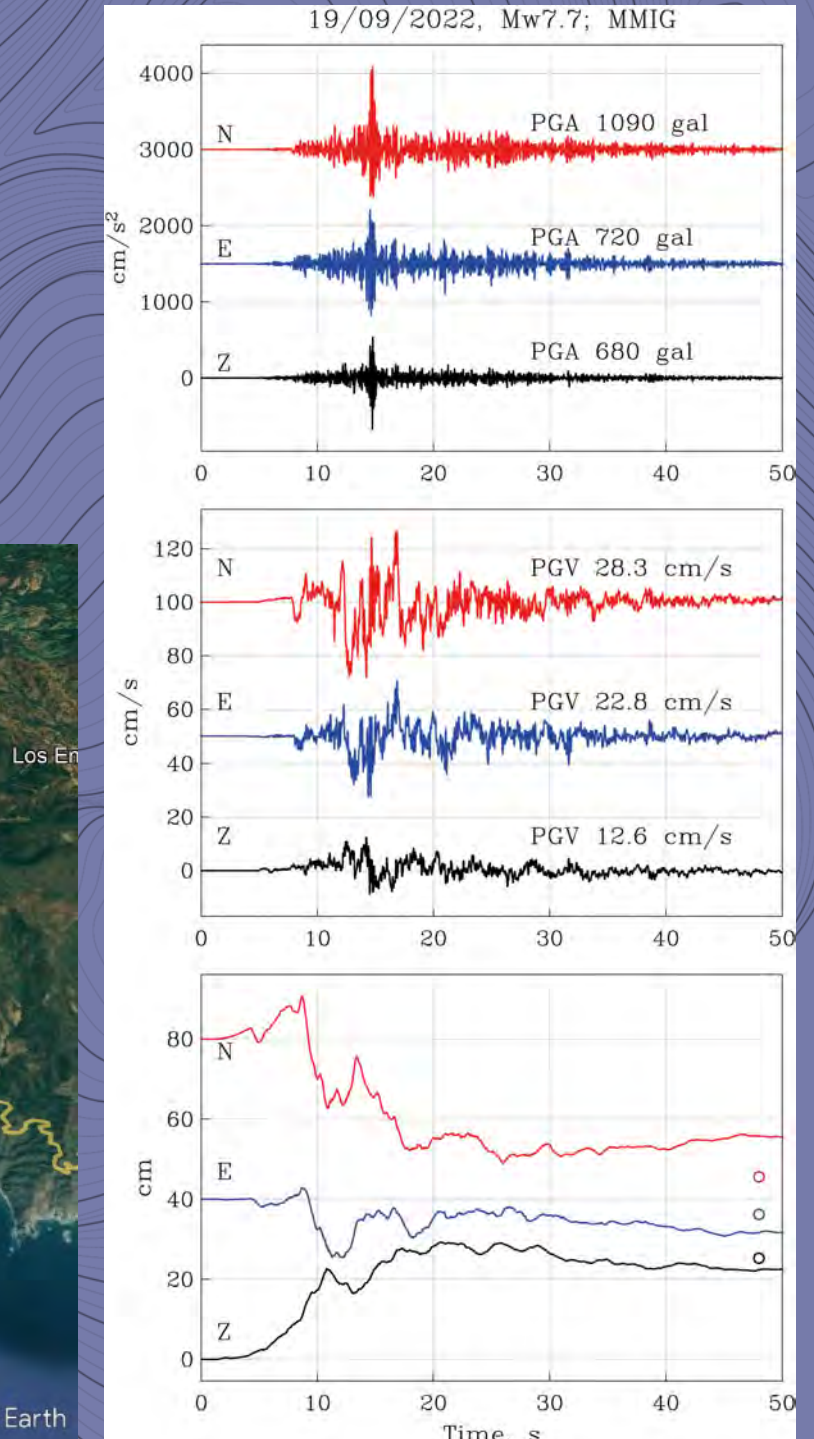
onal (2023) **62-2**: 445 - 465

A Seismological Study of the Michoacán-Colima, Mexico, Earthquake of 19 September 2022 (M_w7.6)

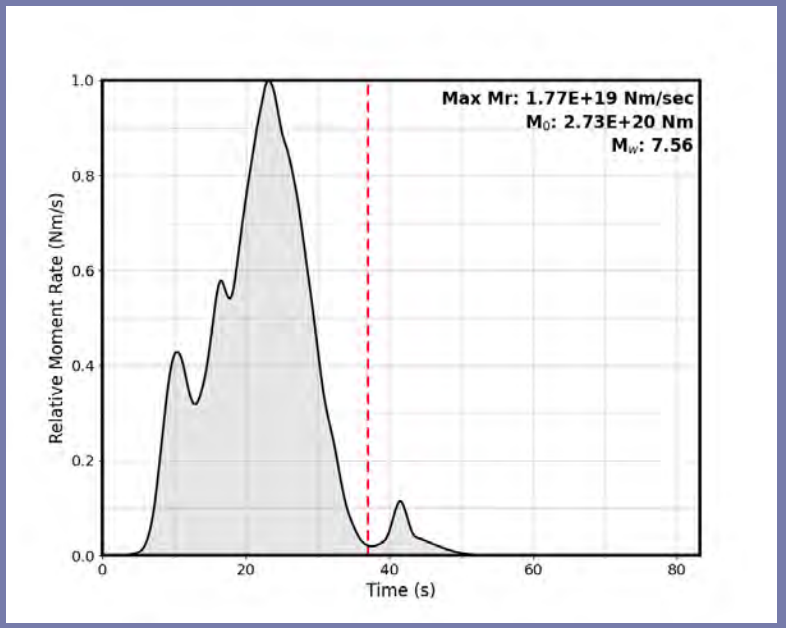
S. K. Singh[1], A. Iglesias[1*], D. Arroyo[2], X. Pérez-Campos[1,8], M. Ordaz[3], C. Mendoza[4], Corona-Fernández[5], L. Rivera[6], V. H. Espíndola[1], D. González-Ávila[1], R. Martínez-López

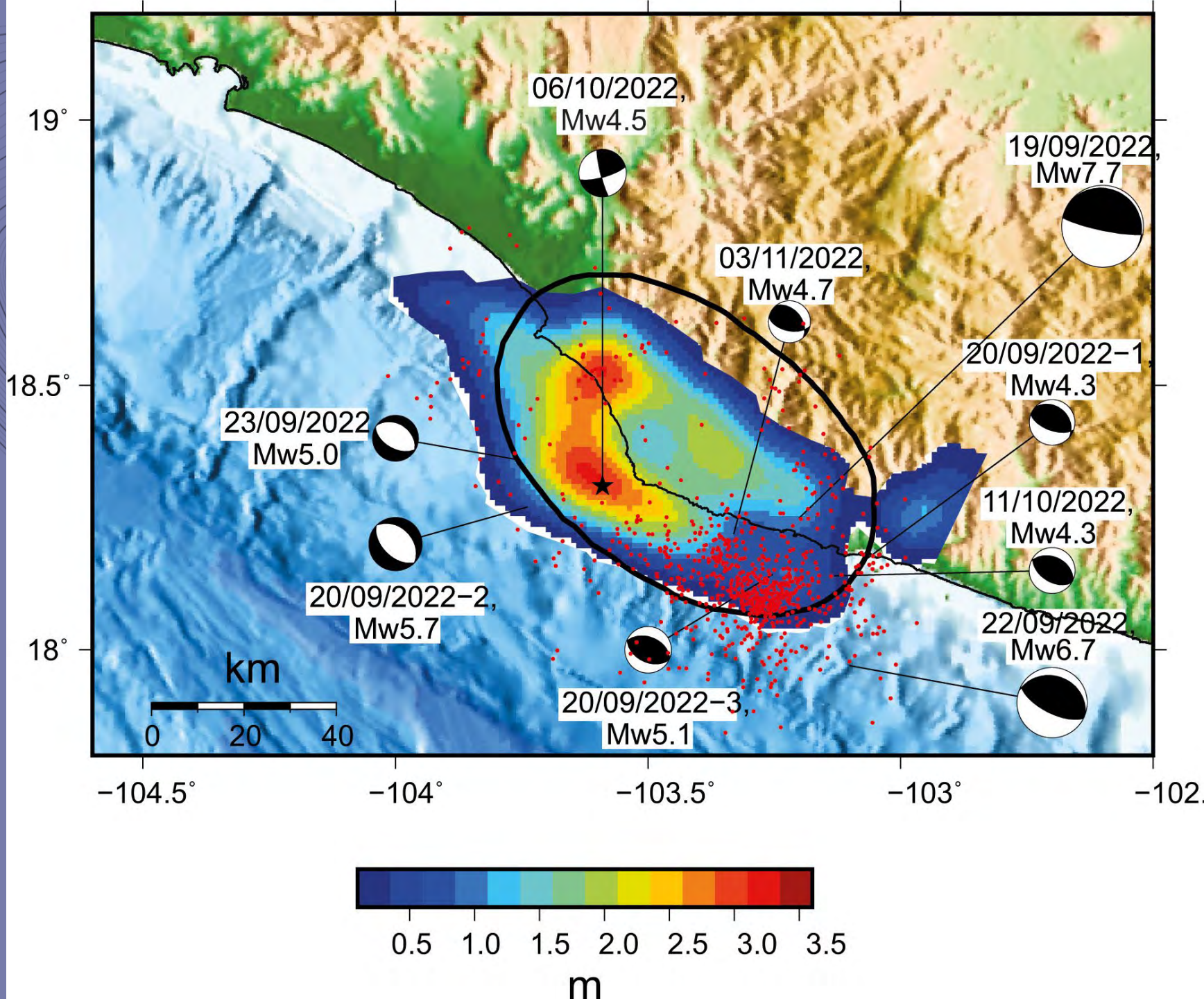

geofísica UNAM
Estación Sismológica Maruata (MMIG)
Red Sísmica de Banda Ancha
Maruata, Michoacán

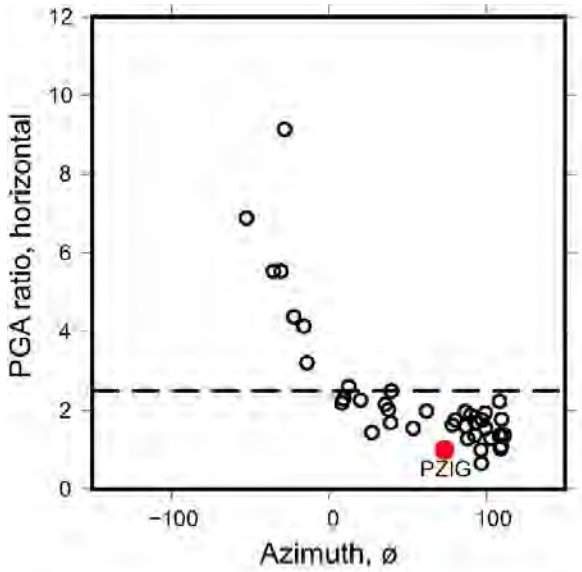

Pomaro
Cuirla
MMIG
El Zapote
Playa Maruata Viejo
Maruata
Paso de Noria
Santa Cruz de Cachán
El Naranjito
Abarrotes Juan Ramos
~10km
19/09/2022, Mw=7.6
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2023 CNES / Airbus
Google Earth

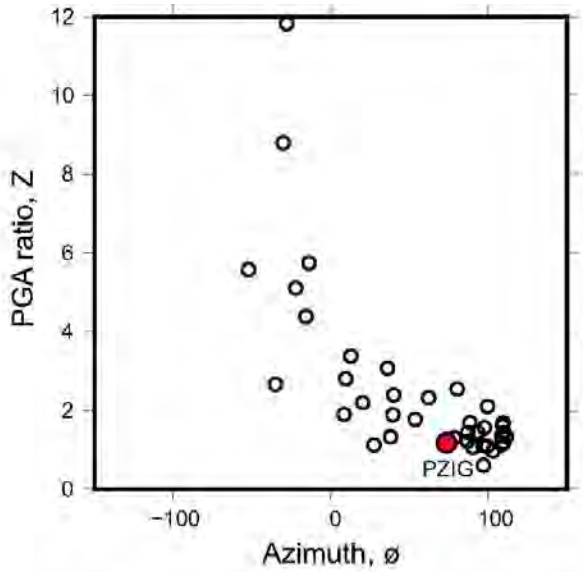

19/09/2022, Mw7.7; MMIG
PGA 1090 gal
PGA 720 gal
PGA 680 gal
cm/s²
PGV 28.3 cm/s
PGV 22.8 cm/s
PGV 12.6 cm/s
cm/s
cm
Time, s

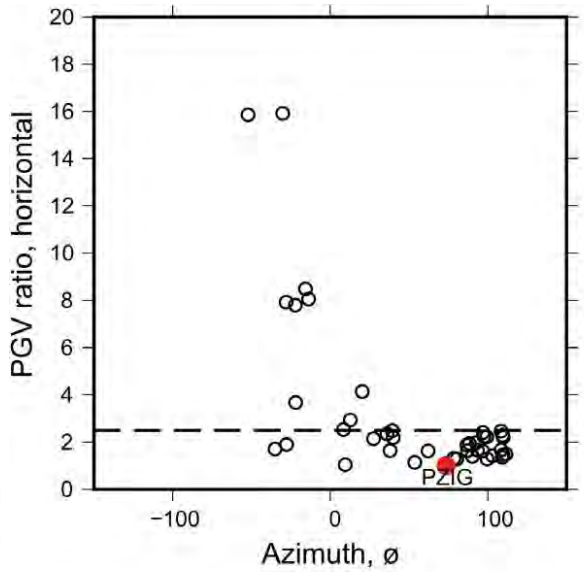
MRF

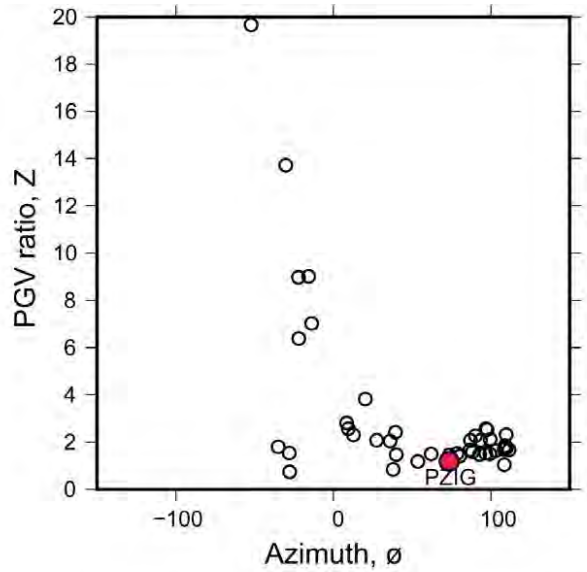

Max Mr: 1.77E+19 Nm/sec
M_0: 2.73E+20 Nm
M_w: 7.56
Relative Moment Rate (Nm/s)
Time (s)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80

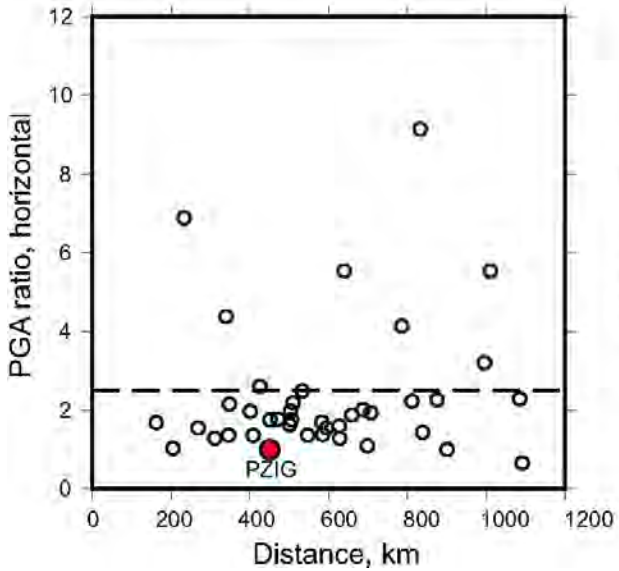

06/10/2022,
Mw4.5
19/09/2022,
Mw7.7
03/11/2022,
Mw4.7
20/09/2022−1,
Mw4.3
23/09/2022
Mw5.0
11/10/2022,
Mw4.3
20/09/2022−2,
Mw5.7
22/09/2022,
Mw6.7
20/09/2022−3,
Mw5.1
km
0
20
40
19°
18.5°
18°
−104.5°
−104°
−103.5°
−103°
−102.
0.5
1.0
1.5
2.0
2.5
3.0
3.5
m

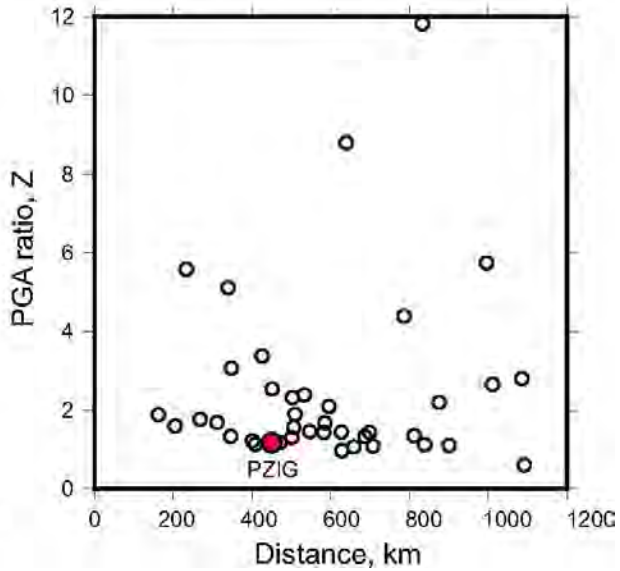

PGA ratio, horizontal
Azimuth, ø
PZIG

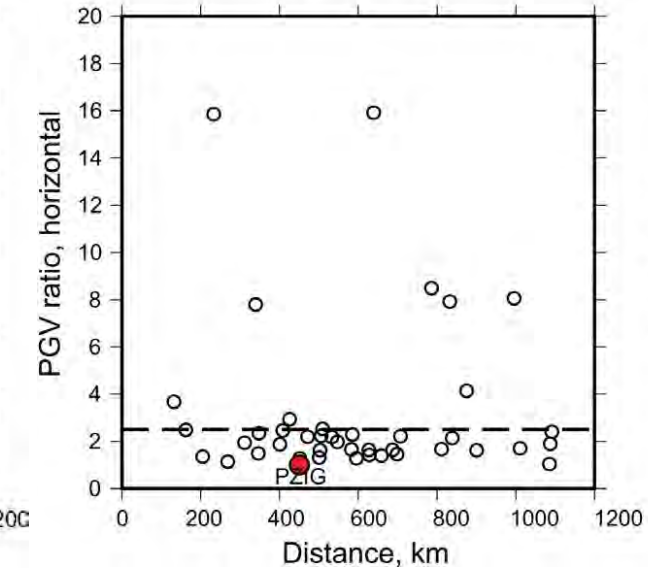

PGA ratio, Z
Azimuth, ø
PZIG

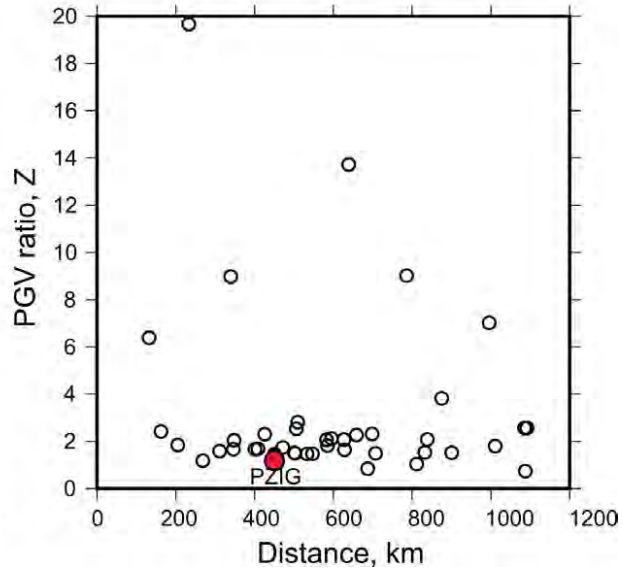

PGV ratio, horizontal
Azimuth, ø
PZIG


PGV ratio, Z
Azimuth, ø
PZIG


PGA ratio, horizontal
Distance, km
PZIG


PGA ratio, Z
Distance, km
PZIG


PGV ratio, horizontal
Distance, km
PZIG


PGV ratio, Z
Distance, km
PZIG

GeoScienceWorld

From: **Repeating Large Earthquakes along the Mexican Subduction Zone**

Seismological Research Letters. Published online October 20, 2023. doi:10.1785/0220230243

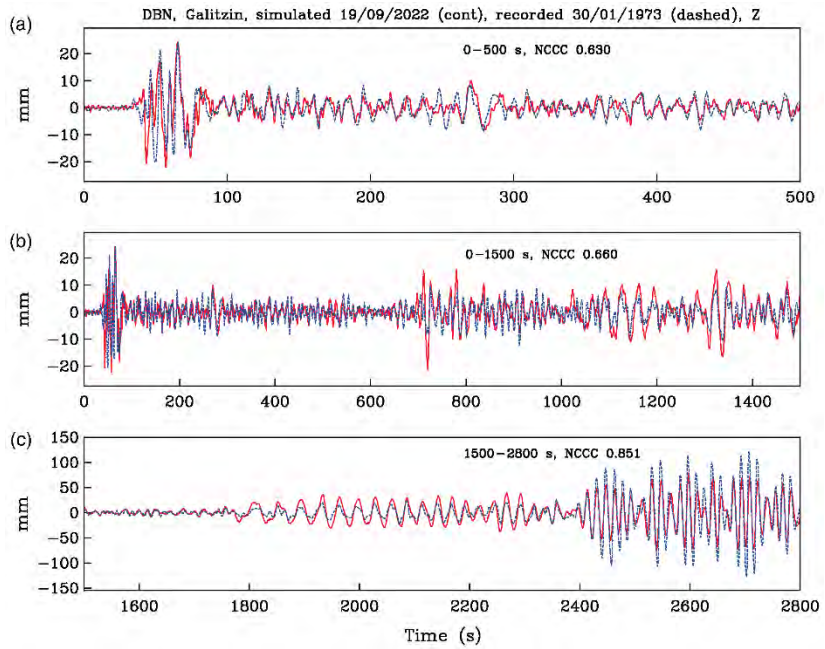
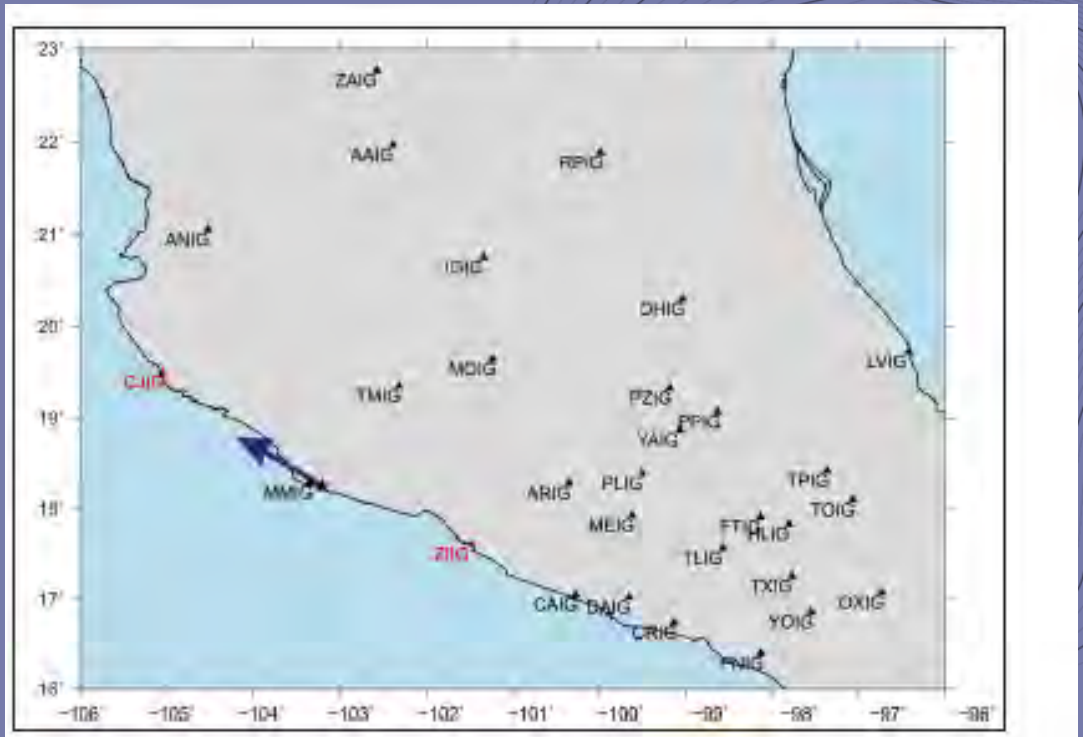
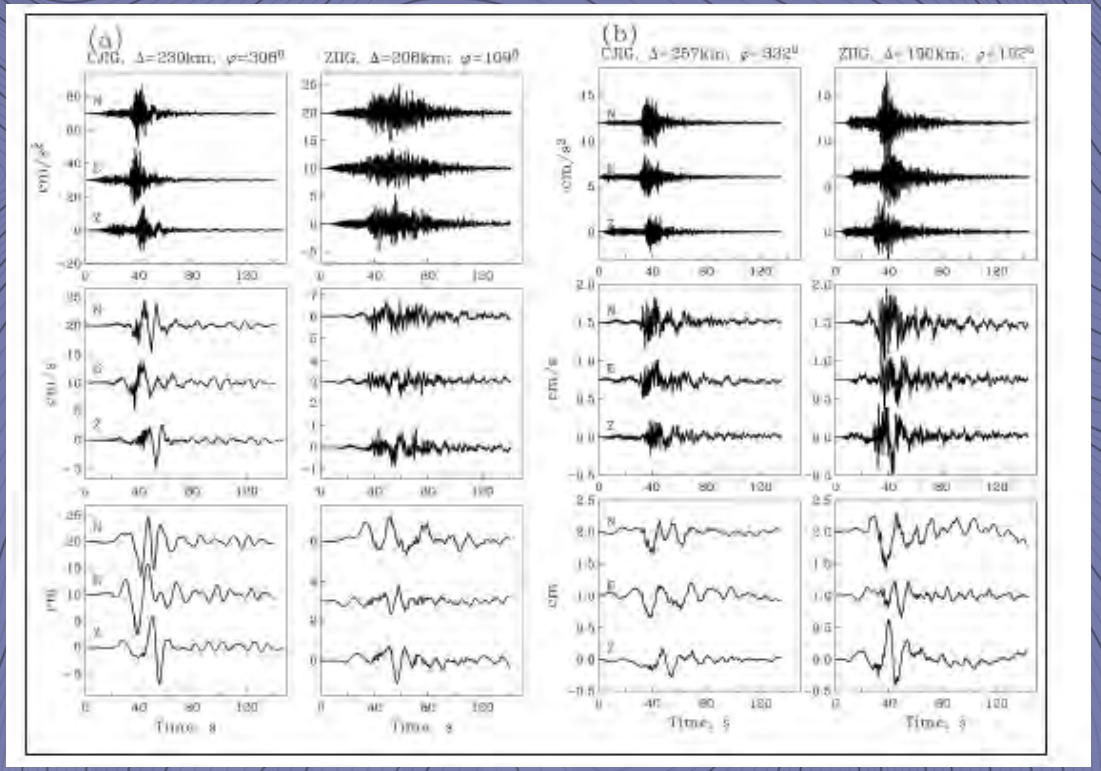


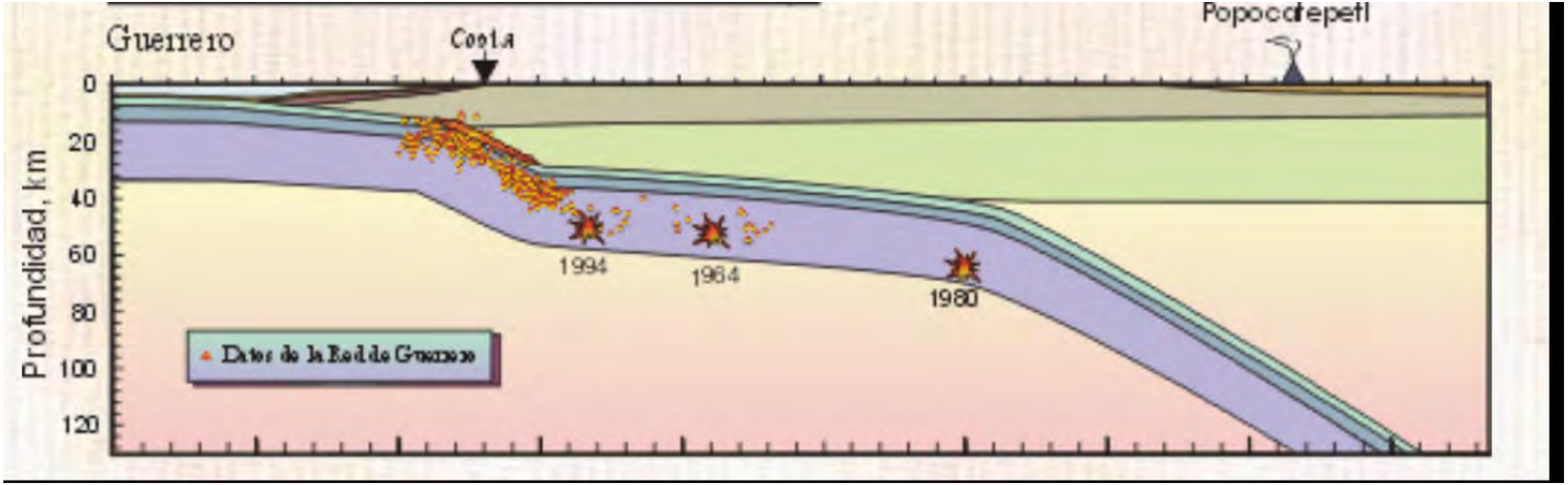
Figure Legend:

Galitzin seismograms at DBN of Michoacán–Colima earthquakes of 2022 and 1973. Time window of (a) 0–500 s, (b) 0–1500 s, and (c) 1500–2800 s. NCCC values are low in the time windows covered in the upper two frames but is relatively high, 0.85, during the surface waves (panel c), suggesting that the events are quasi-repeaters. The color version of this figure is available only in the electronic edition.


ZAIG
AAIG
RPIG
ANIG
IGIG
DHIG
MOIG
LVIG
CUIG
TMIG
PZIG
PPIG
YAIG
ARIG
PLIG
TPIG
TOIG
MMIG
MEIG
FTIG
HLIG
ZIIG
TLIG
TXIG
OXIG
CAIG
DAIG
YOIG
CRIG
PNIG
23°
22°
21°
20°
19°
18°
17°
16°
−106°
−105°
−104°
−103°
−102°
−101°
−100°
−99°
−98°
−97°
−96°


(a)
CJIG, Δ=230km, φ=306°
ZIIG, Δ=208km, φ=109°
(b)
CJIG, Δ=357km, φ=332°
ZIIG, Δ=190km, φ=102°
Time, s

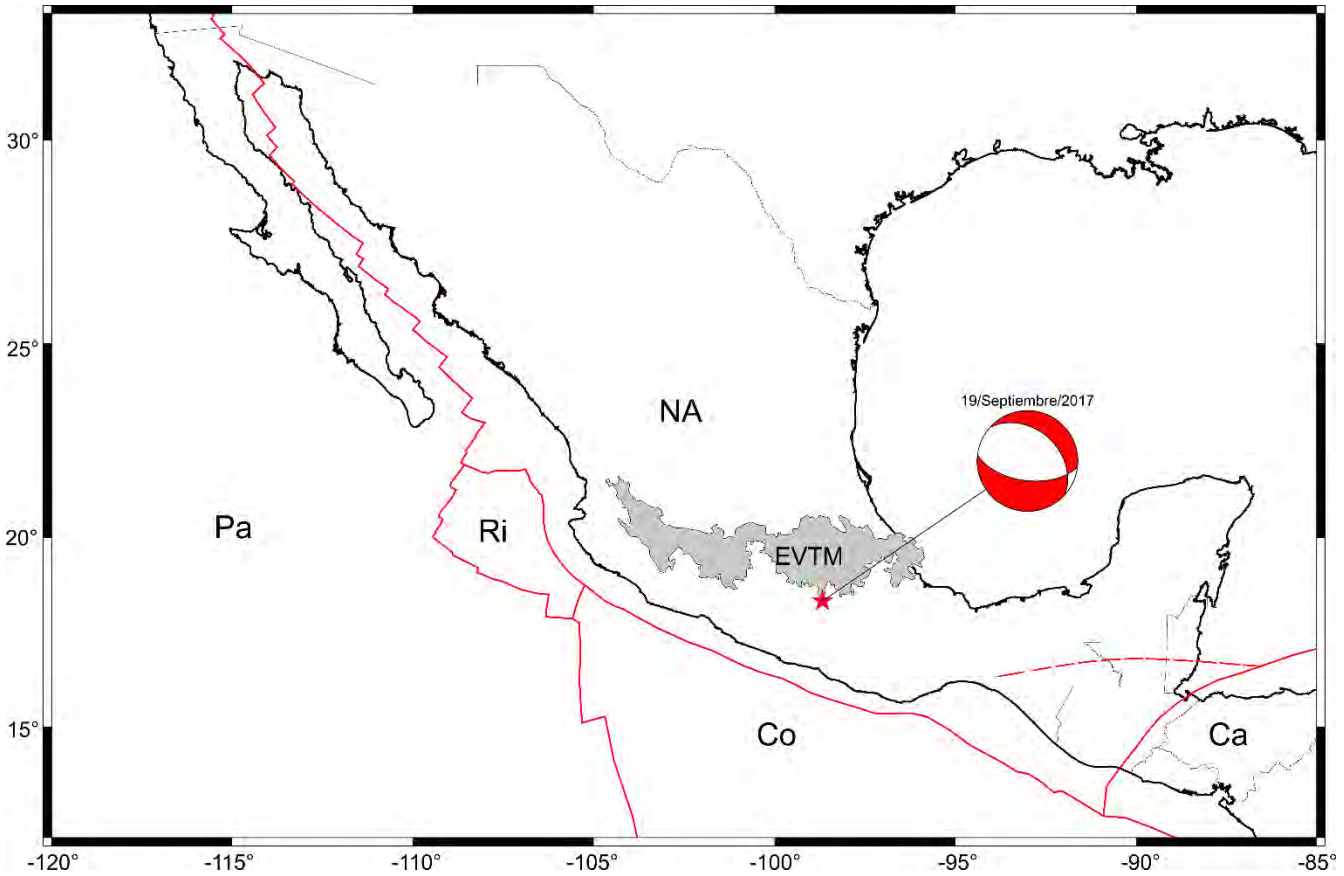
Sismos Intraplaca (*intraslab*)



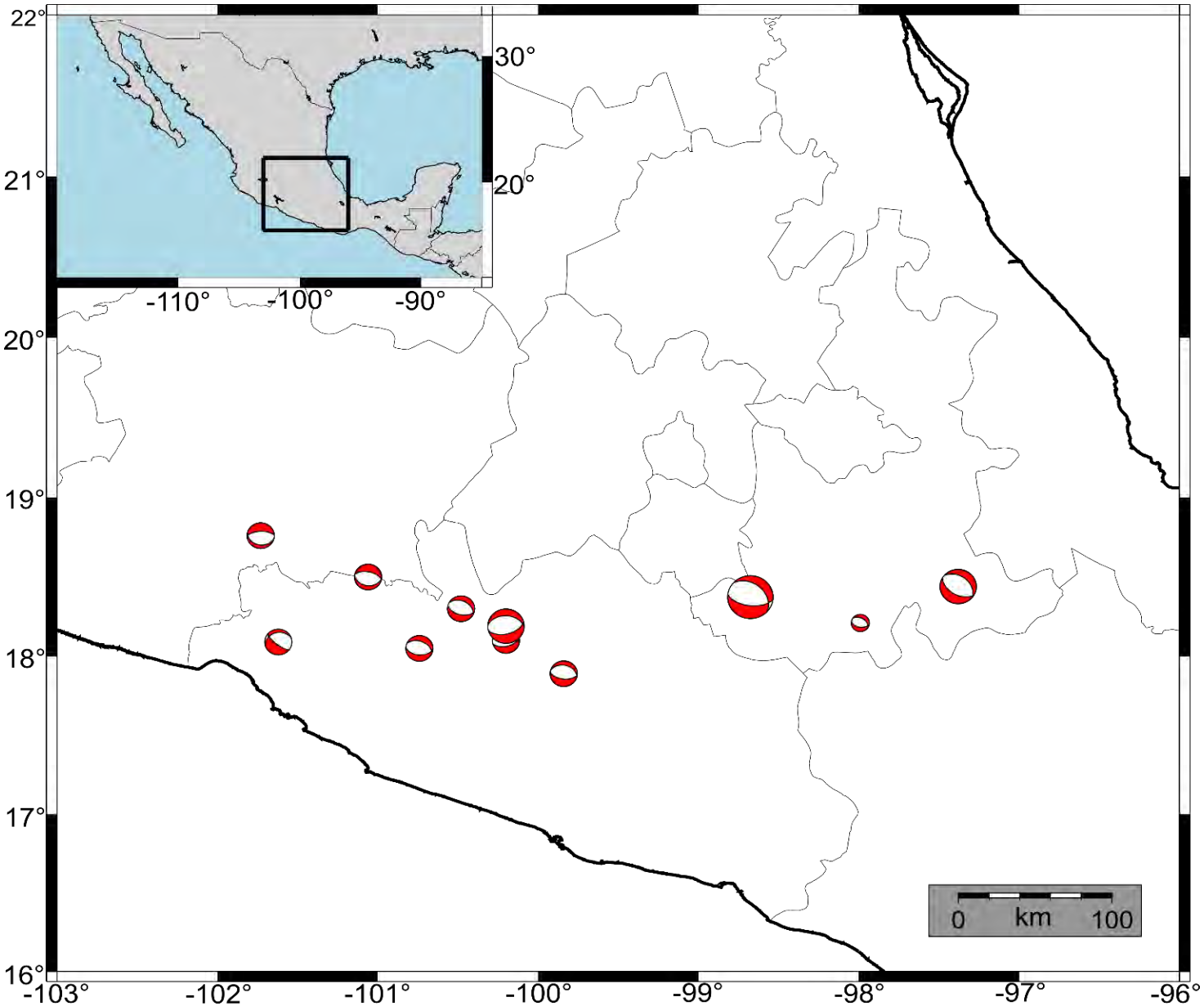
19 de septiembre de 2017

Inaugurado en 1949

19 de septiembre de 2017, 13:14:39 (18:14:39 UTC),
M 7.1 Prof. 51.2



Miguel Méndez, 2021



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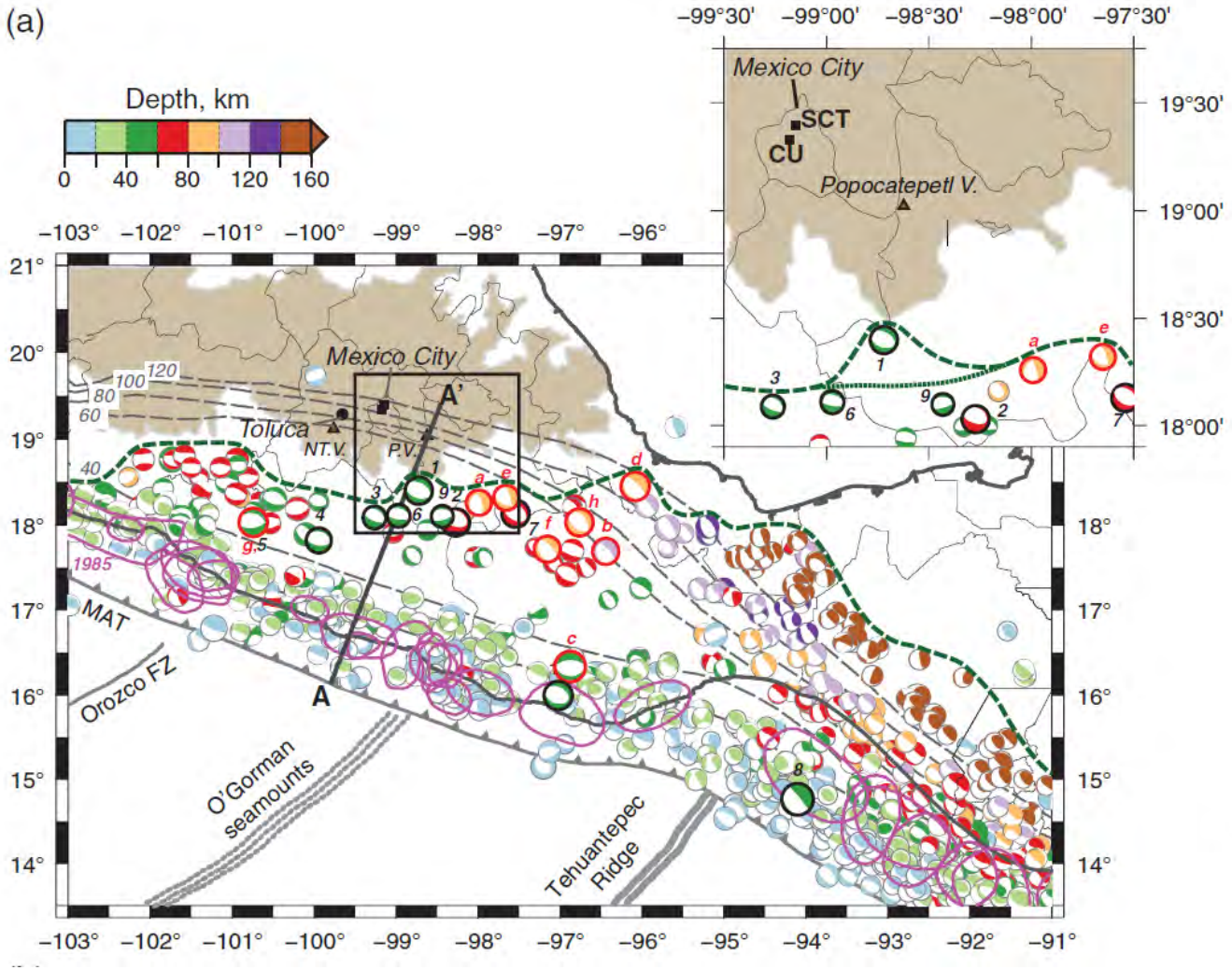

Deadly Intraslab Mexico Earthquake of 19 September 2017 (M_w 7.1): Ground Motion and Damage Pattern in Mexico City

by S. K. Singh, E. Reinoso, D. Arroyo, M. Ordaz, V. Cruz-Atienza, X. Pérez-Campos, A. Iglesias, and V. Hjörleifsdóttir

doi: 10.1785/0220180159

GeoScienceWorld

From: **Deadly Intraslab Mexico Earthquake of 19 September 2017 (Mw 7.1): Ground Motion and Damage Pattern in Mexico City**

Seismological Research Letters. 2018;89(6):2193-2203. doi:10.1785/0220180159

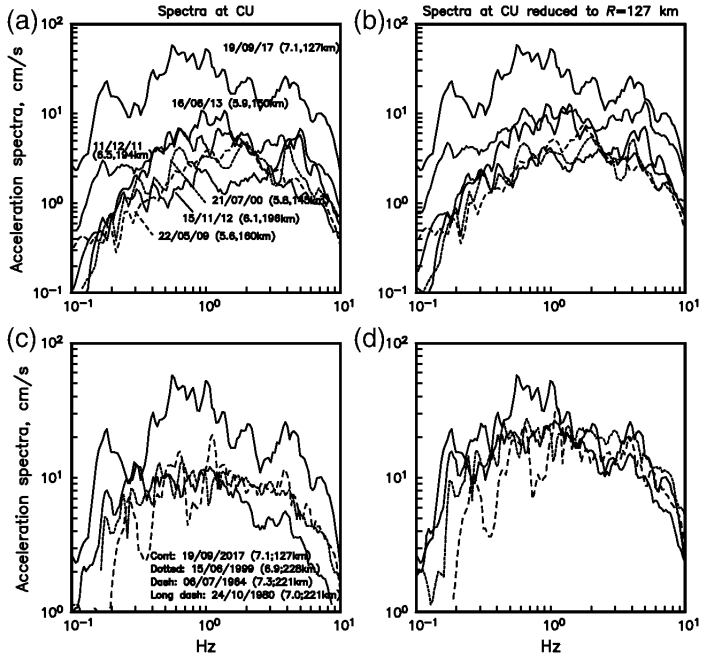

Figure Legend:

Fourier acceleration spectra (FAS) of intraslab earthquakes at CU (Table 1). (a) 19 September 2017 and five moderate, 5.6≤Mw≤6.5, events; (b) the spectra shown in (a) reduced to a common distance of 127 km. (c) 19 September 2017 and three similar magnitude, 6.9≤Mw≤7.3, events, (d) spectra shown in (c) reduced to a common distance of 127 km. The plotted spectra are the geometric mean of the two horizontal components.

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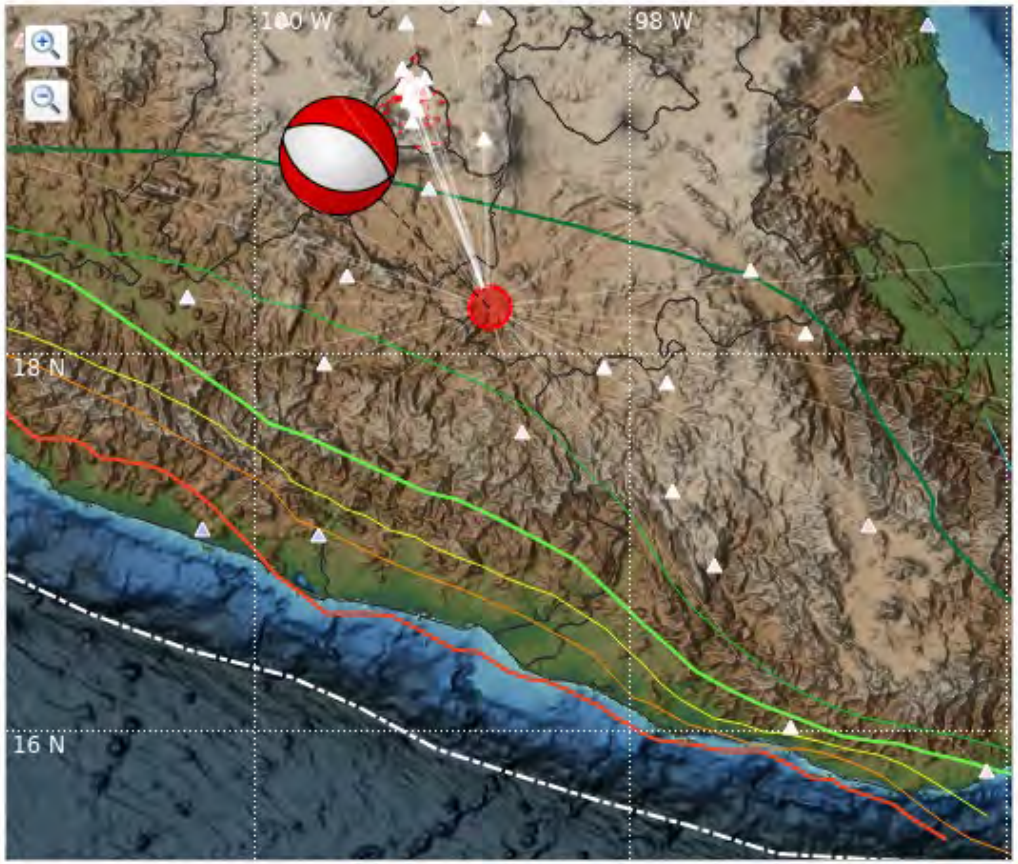


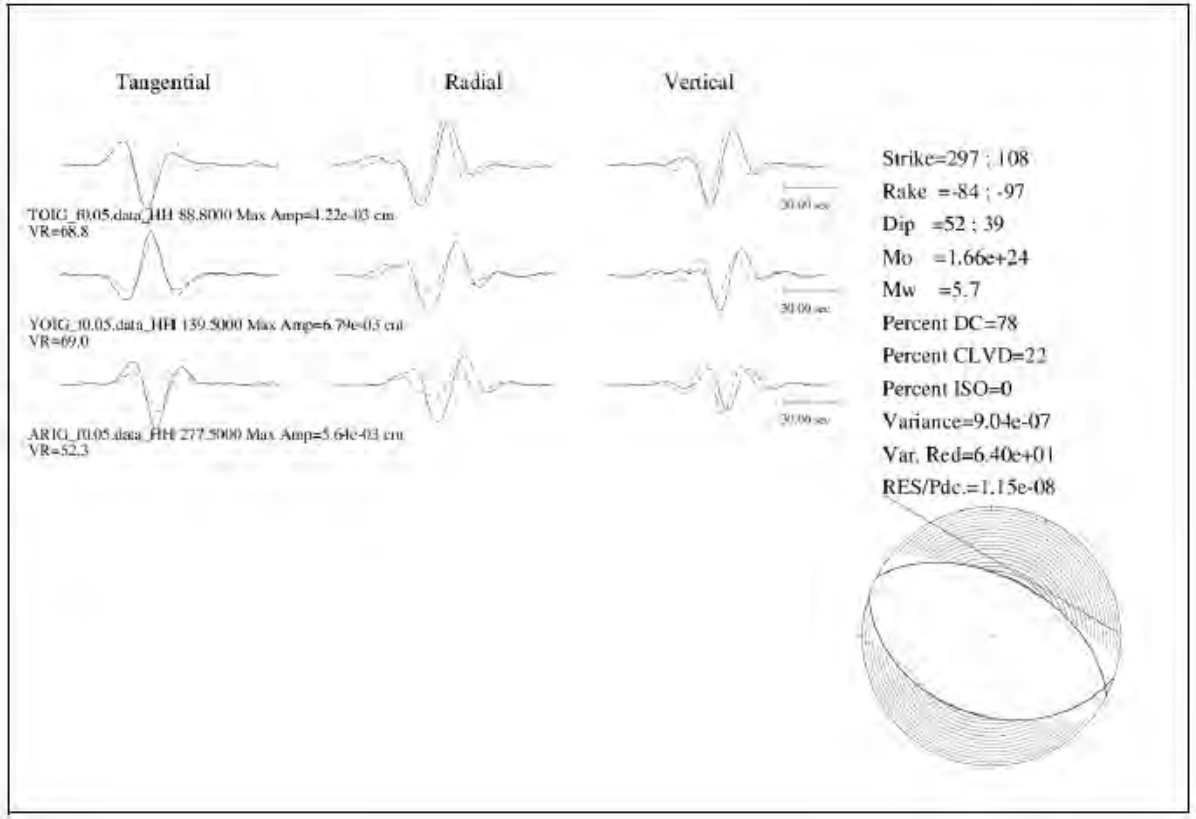


Figura 3. Mecanismo focal del temblor del día 7 de diciembre de 2023.

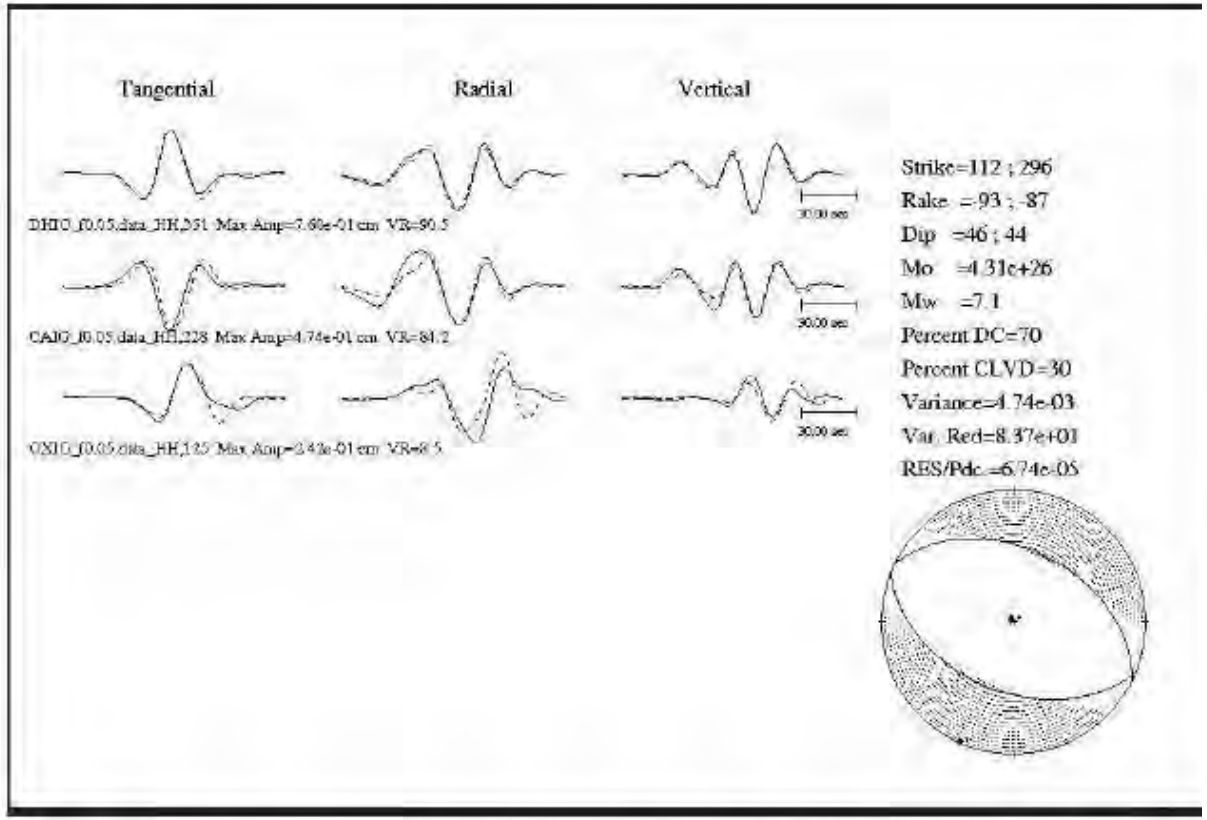


Figura 3. Mecanismo focal del temblor del día 19 de septiembre de 2017.

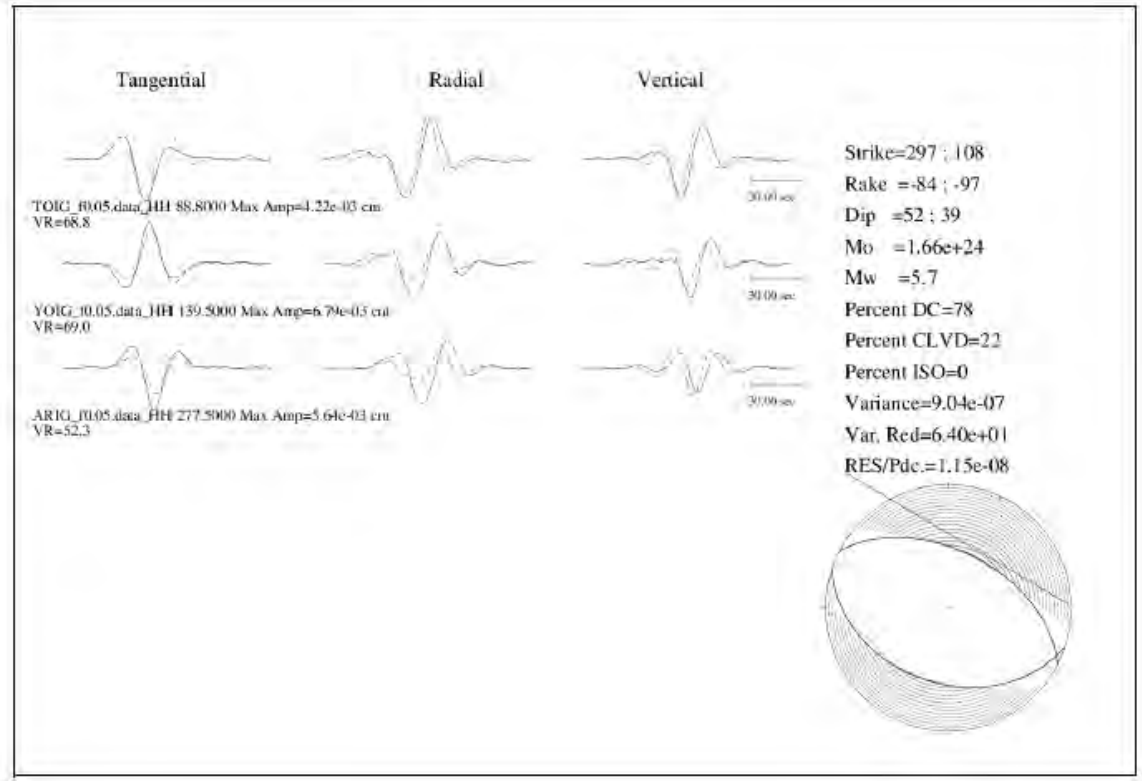


Figura 3. Mecanismo focal del temblor del día 7 de diciembre de 2023.

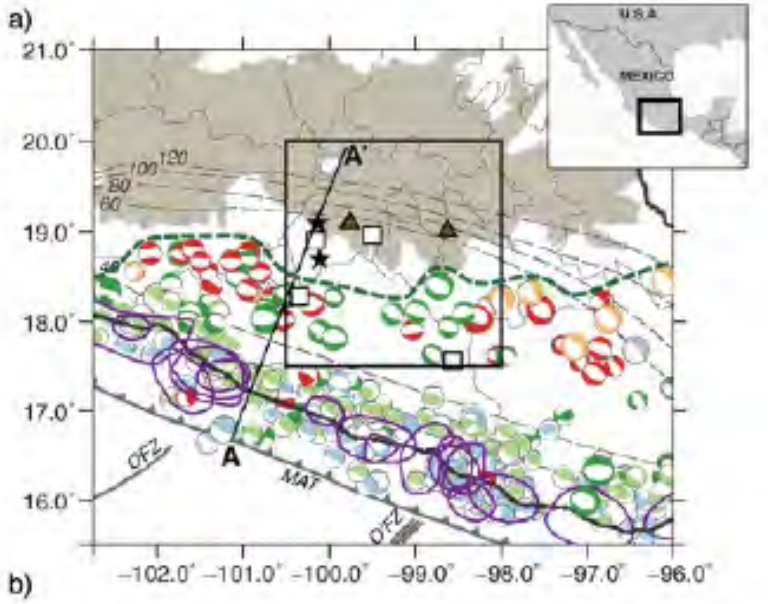
GEOFÍSICA INTERNACIONAL (2020) 59-1: 5-12

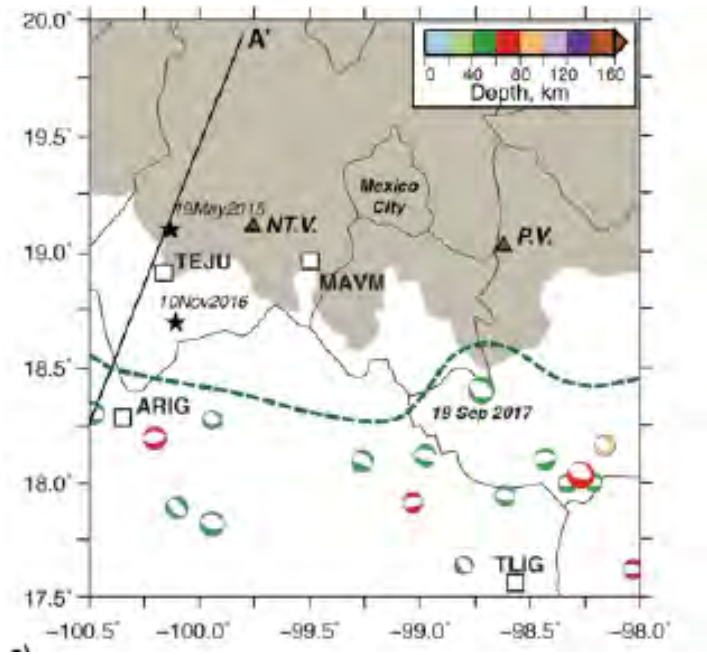
ORIGINAL PAPER

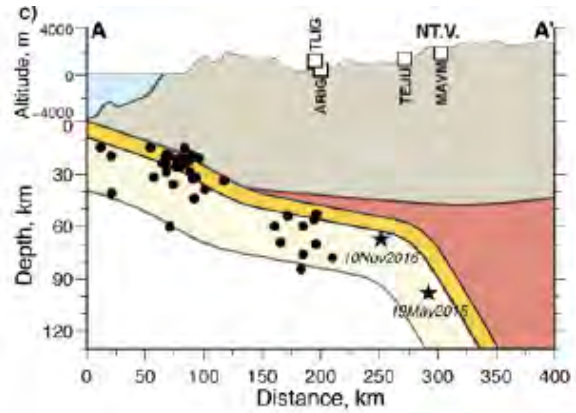
An intraslab earthquake at a depth of 100 km in the subducting Cocos plate beneath Nevado de Toluca volcano

Shri K. Singh, Xyoli Pérez-Campos, Víctor Hugo Espindola, Arturo Iglesias, Luis Quintanar

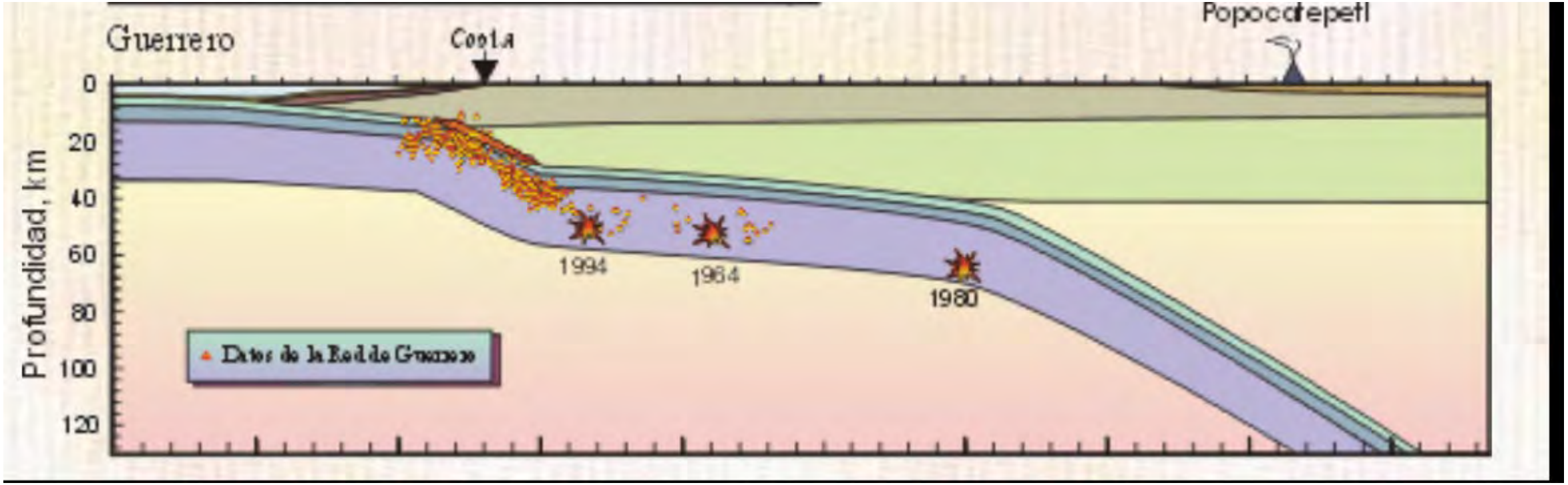
Received: June 4, 2018; accepted: June 3, 2019; published on line: January 6, 2020



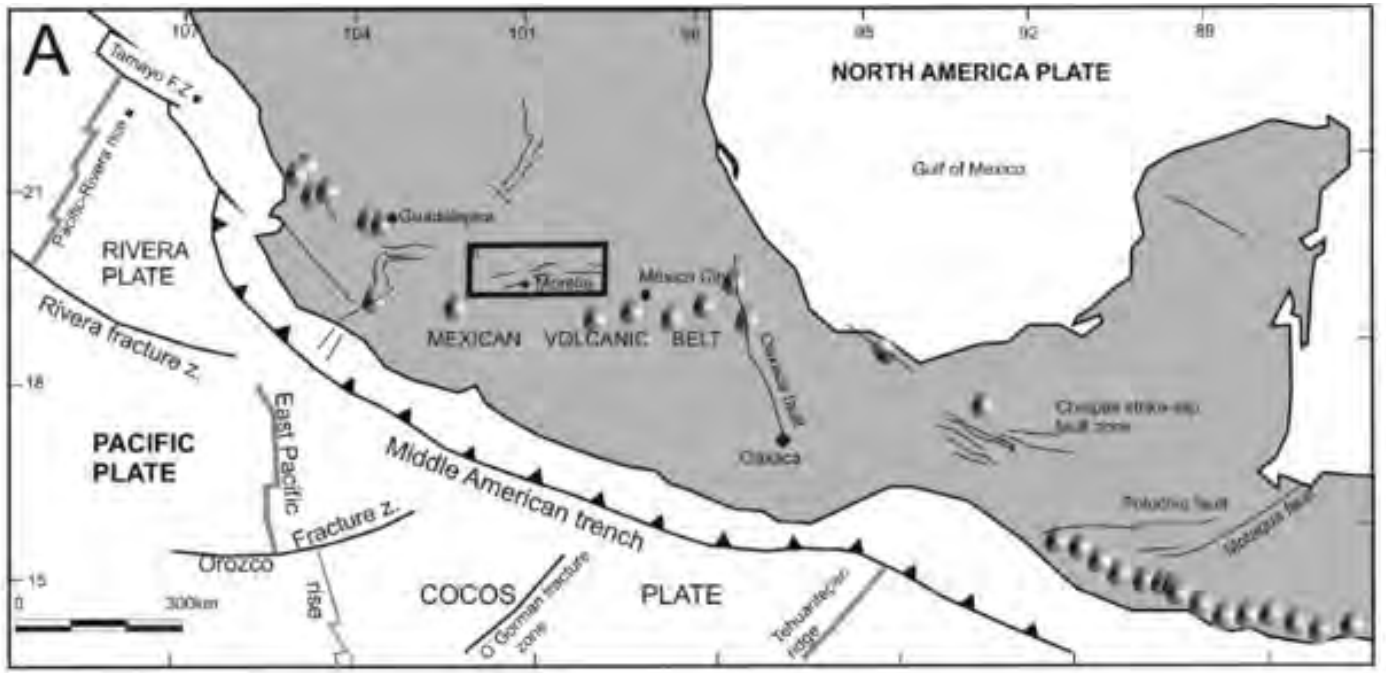




Sismos Intraplaca (*Placa Cabalgante*)



Sismo de Acambay, 1912



The Acambay earthquake of 1912, revisited 100 years after

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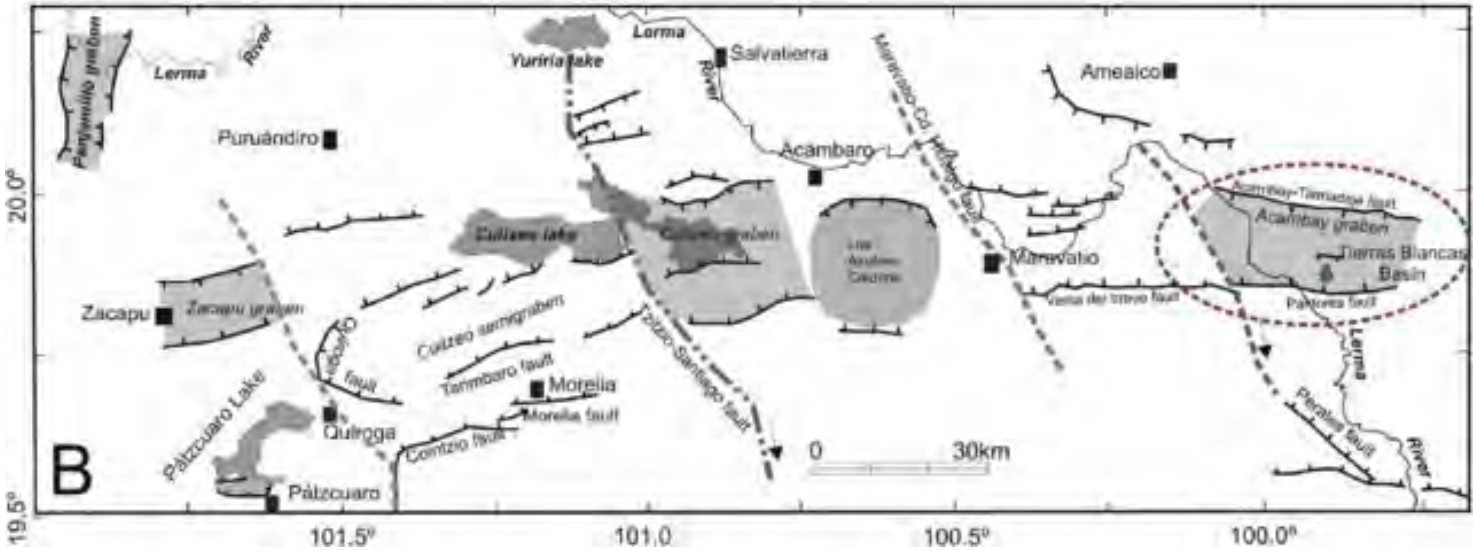
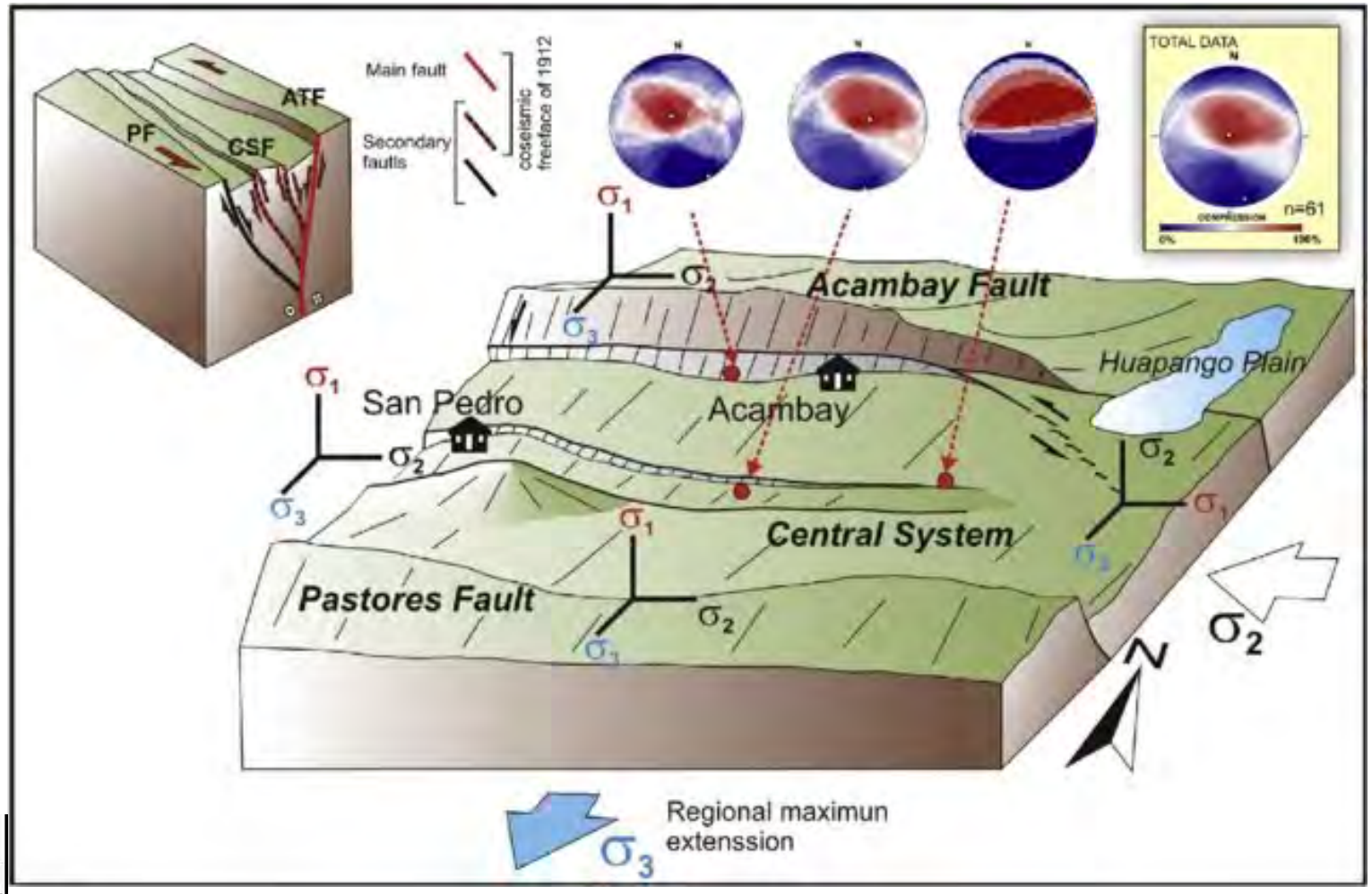
Estimation of the epicentral area of the 1912 Acambay earthquake (M 6.9, Mexico) determined from the earthquake archaeological effects (EAE) and the ESI07 macroseismic scale

M.A. Rodríguez-Pascua [a,*], R. Pérez-López [a], V.H. Garduño-Monroy [b], M.A. Perucha [a], I. Israde-Alcántara [b]

[a] Instituto Geológico y Minero de España (IGME), Madrid, Spain
[b] Instituto de Investigaciones Metalúrgicas, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Mexico



Sismo de Acambay, 1912



he Acambay earthquake of 1912, revisited 100 years after

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[a] Instituto Geológico y Minero de España (IGME), Madrid, Spain
[b] Instituto de Investigaciones Metalúrgicas, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Mexico

Sismos Locales

GeoScienceWorld

From: **Lessons from a Small Local Earthquake (Mw 3.2) That Produced the Highest Acceleration Ever Recorded in Mexico City**

Seismological Research Letters. 2020;91(6):3391-3406. doi:10.1785/0220200123

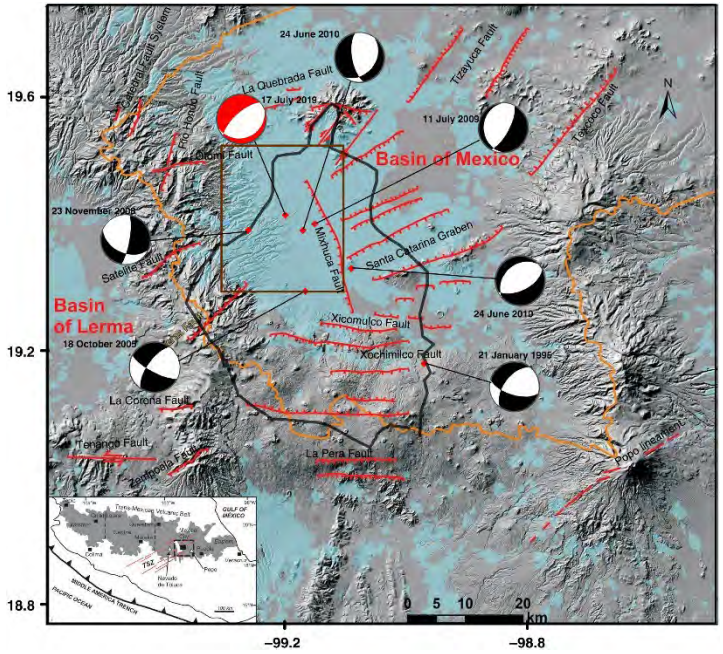

Figure Legend:

Geological map of Mexico basin situated within the central Trans-Mexican volcanic belt (CTMVB) showing faults and focal mechanisms of earthquakes in the region. Strike of the faulting during the 2019 event agrees with northeast–southwest orientation of mapped faults. Thick contour encloses Mexico City. The inset shows the map of Mexico in which the rectangle indicates the area covered by the figure. Modified from Arce et al. (2019). The color version of this figure is available only in the electronic edition.


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1 km al NOROESTE de COYOACAN, CDMX.

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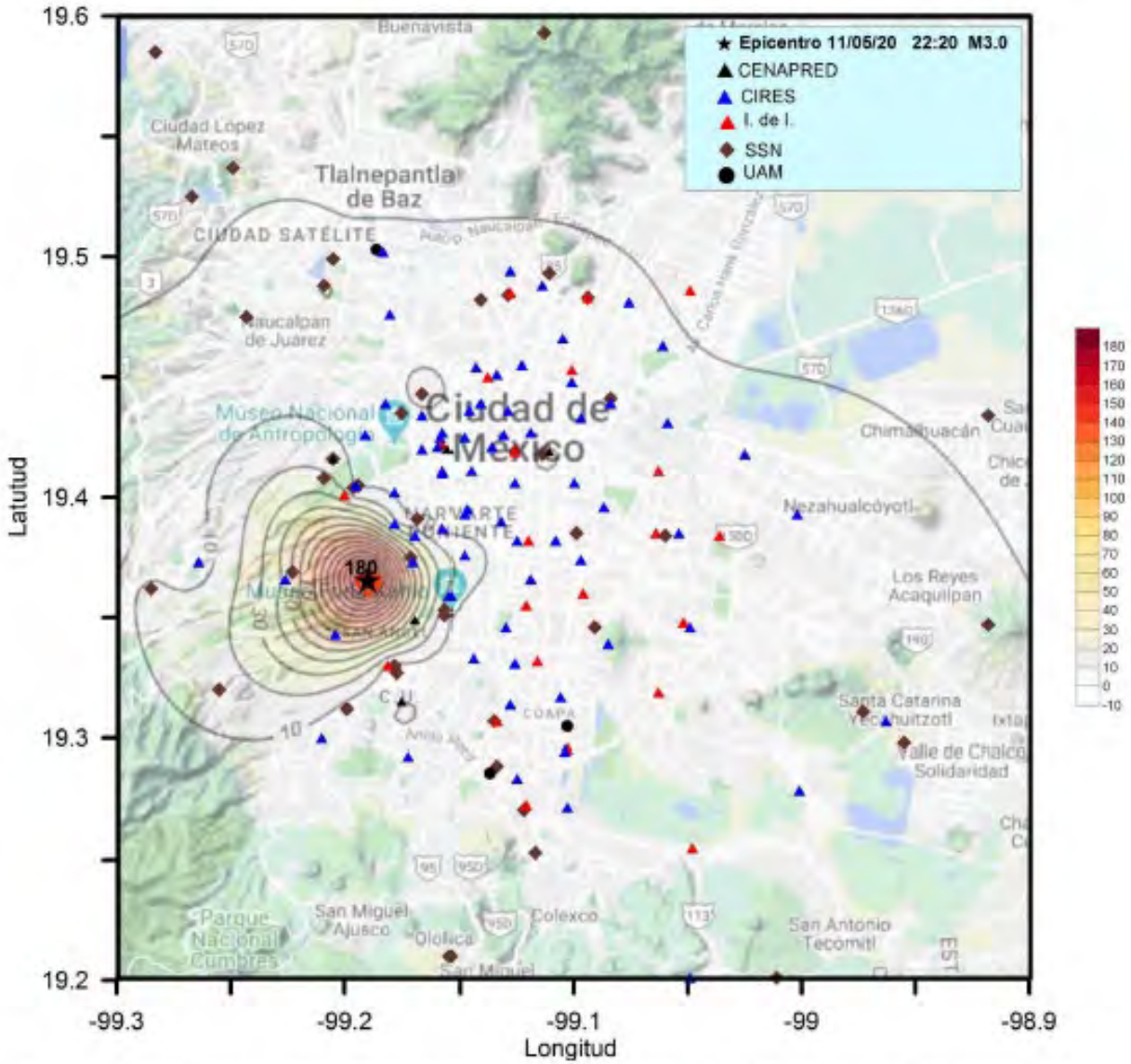
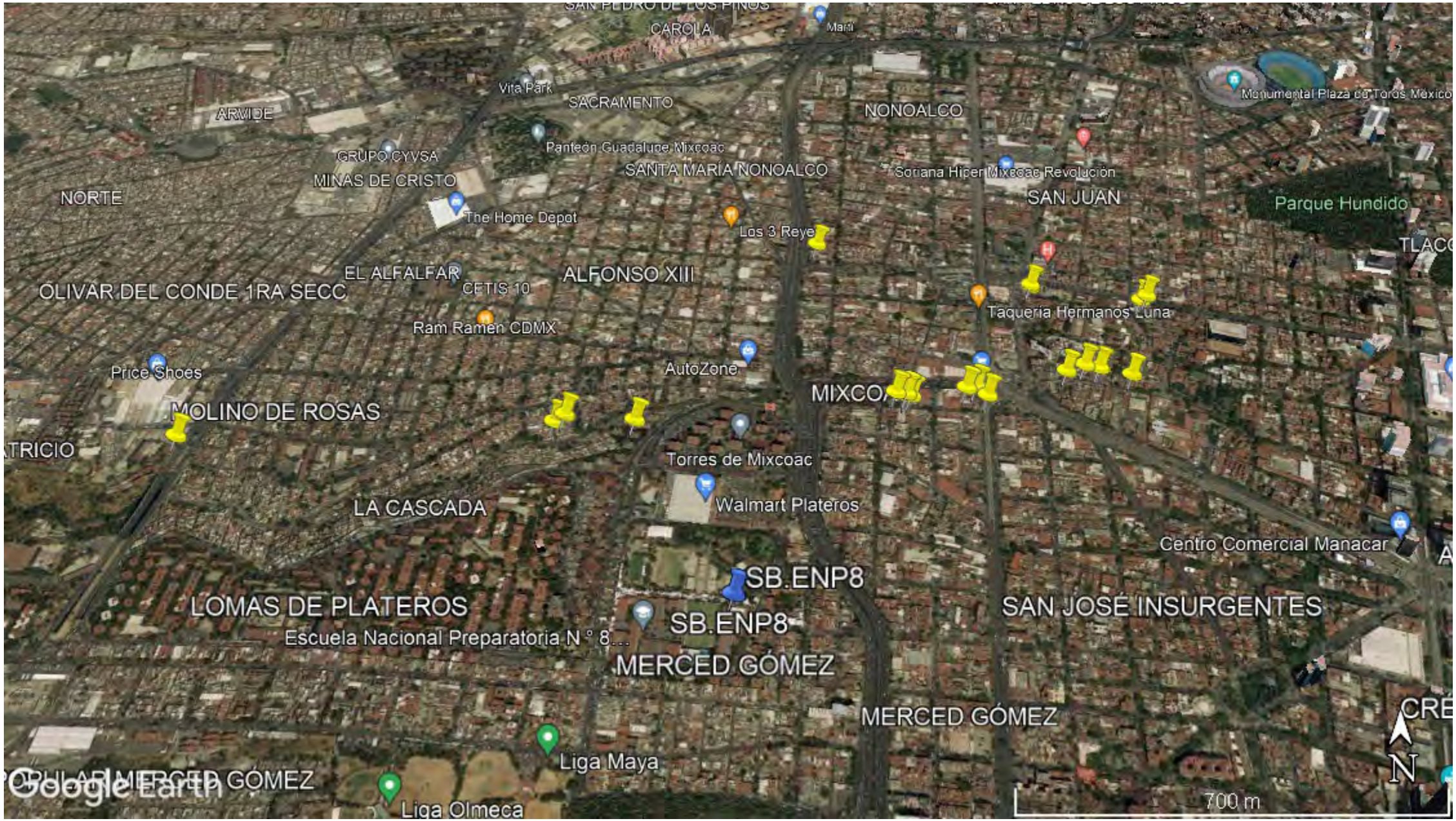


Figura 4. Mapa de isoaceleraciones producidas por el sismo del 10 de mayo de 2023, magnitud 3.0

Posibles daños del sismo del 14 de diciembre de 2023



Gracias por la invitación