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TECHNISCHE UNIVERSITÄT WIEN

2017 DISC lab | Mexico City

Electromagnetics for the Investigation of Landfills: Three (Short) Case Studies from the Valley of Mexico

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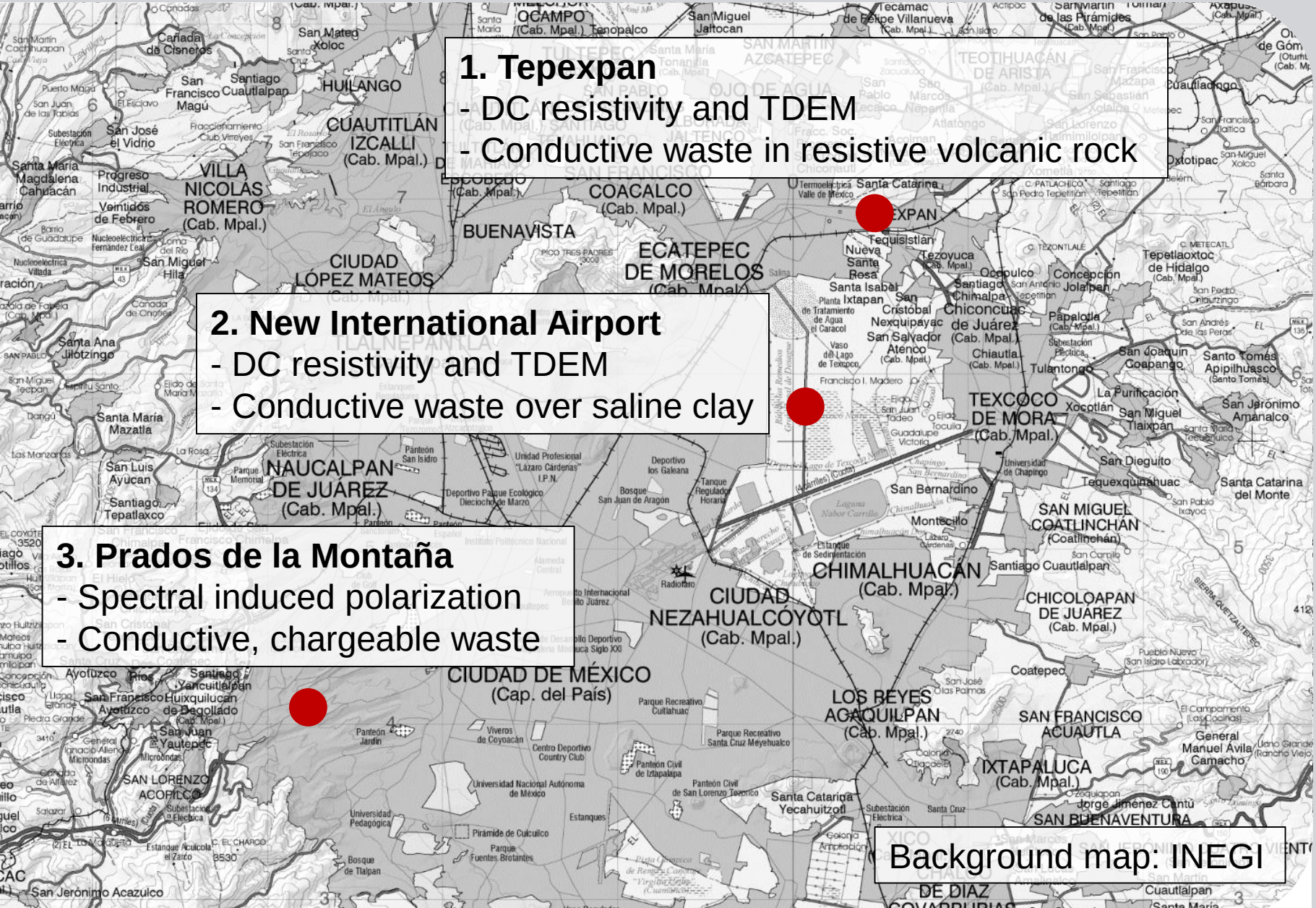
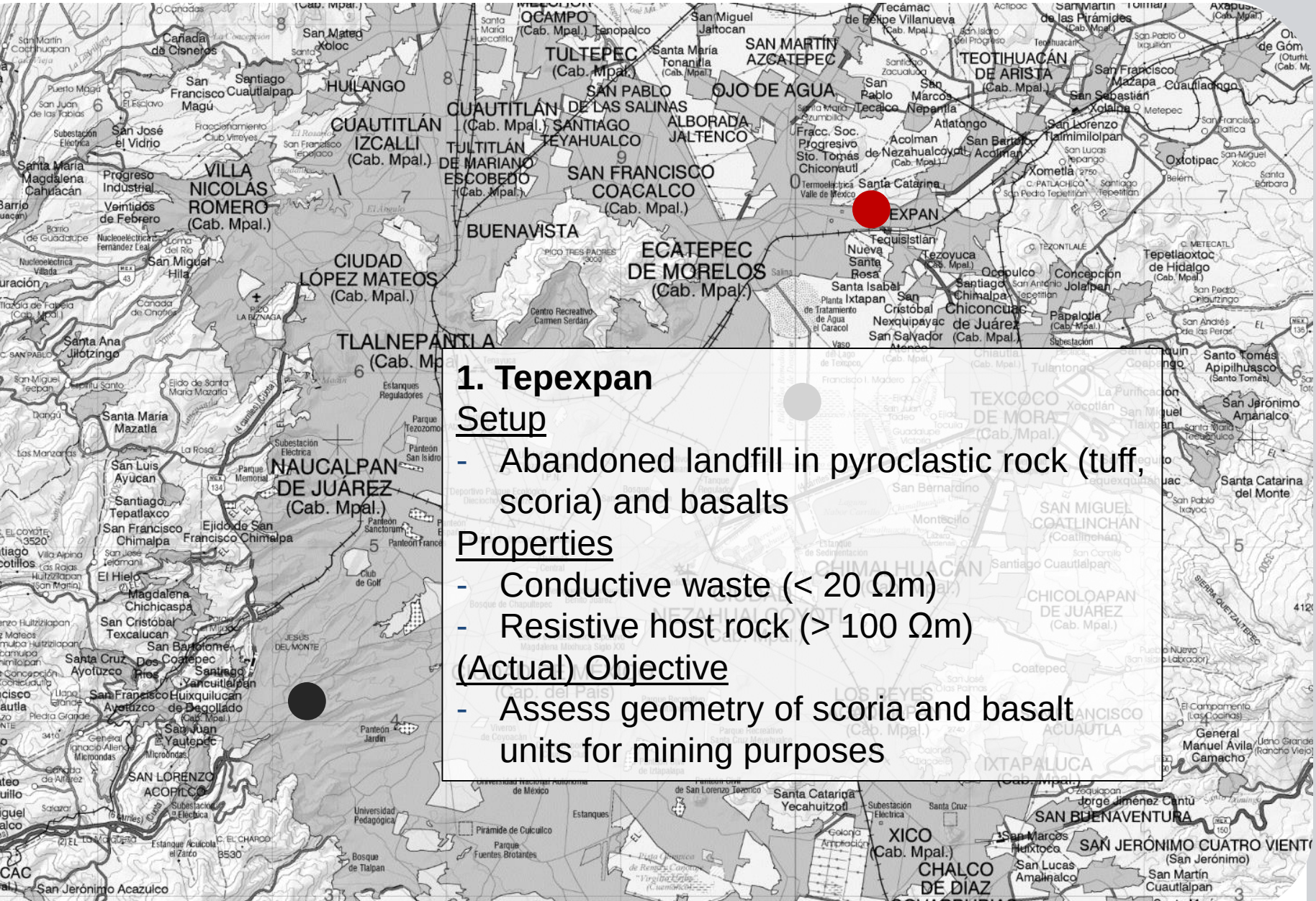
Study sites in the Valley of Mexico



1. Tepexpan (State of Mexico)



1. Tepexpan

Setup

- Abandoned landfill in pyroclastic rock (tuff, scoria) and basalts

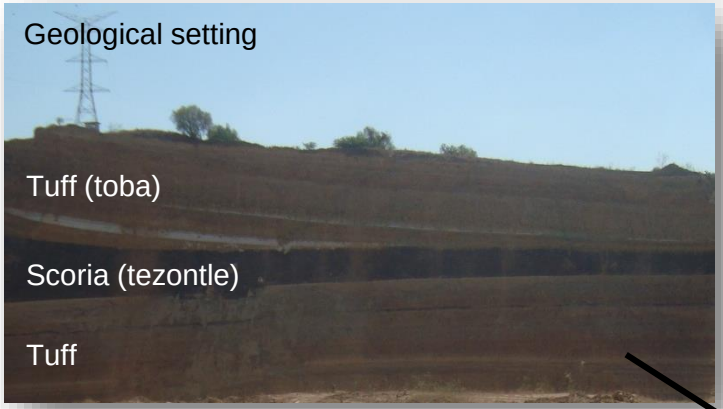
Properties

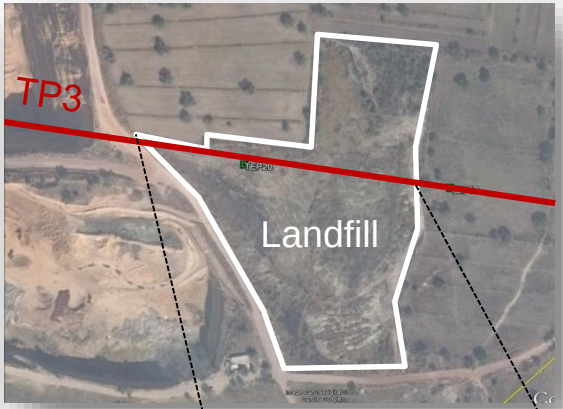
- Conductive waste (< 20 Ωm)
- Resistive host rock (> 100 Ωm)

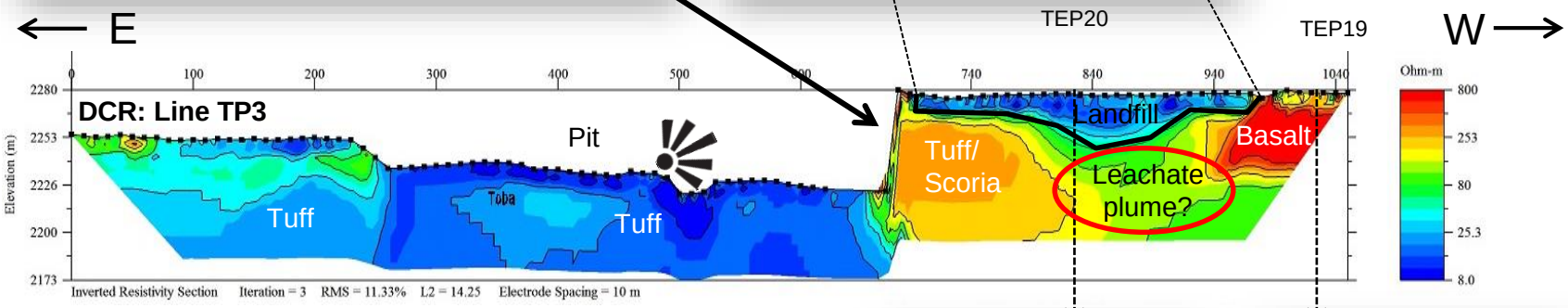
(Actual) Objective

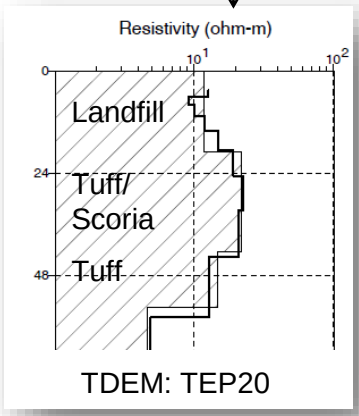
- Assess geometry of scoria and basalt units for mining purposes

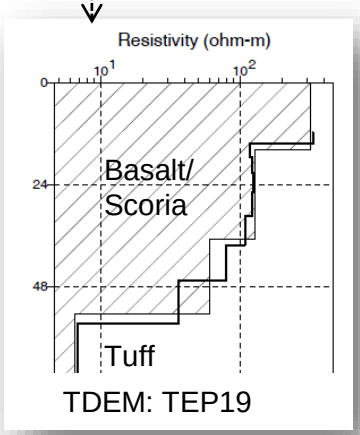
1. Tepexpan (State of Mexico)











Survey
- DCR (10 m spacing, ~ 1 km line length)
- TDEM (50 m x 50 m loop)

Processing
- DCR: 2D inversion (EarthImager)
- TDEM: 1D inversion (WinGLink)

Summary
- Identified abandoned landfill and possible leachate plume by low resistivity values from DCR and TDEM.

2. New International Airport (State of Mexico)

2. New International Airport

Setup

- Abandoned landfill on top saline clay (former lake Texcoco)

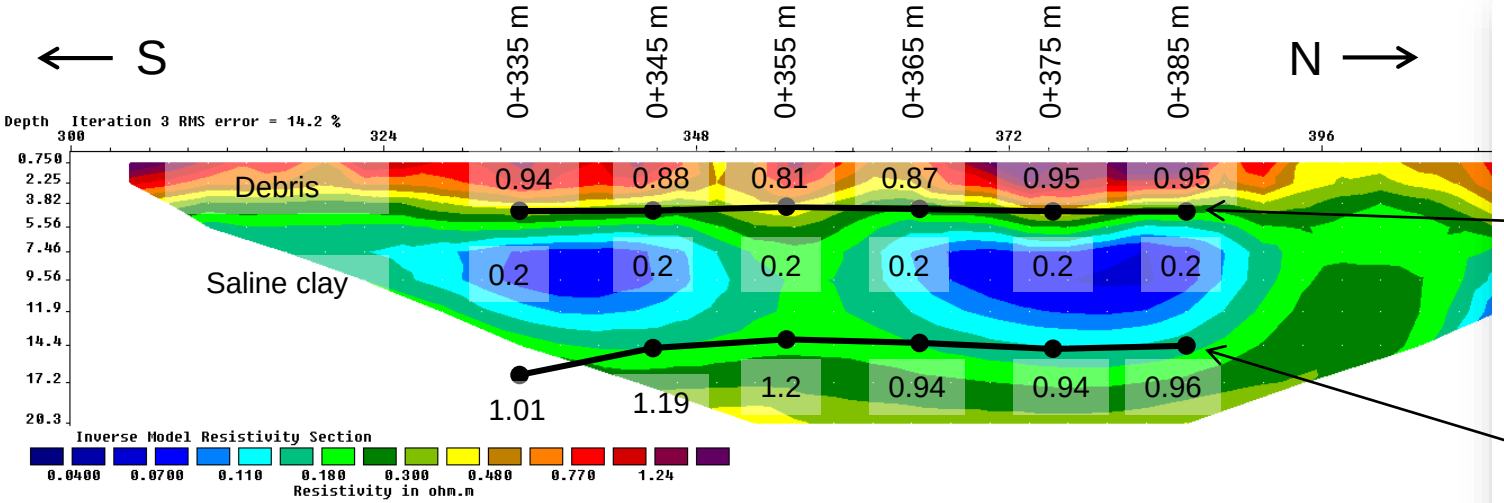
Properties

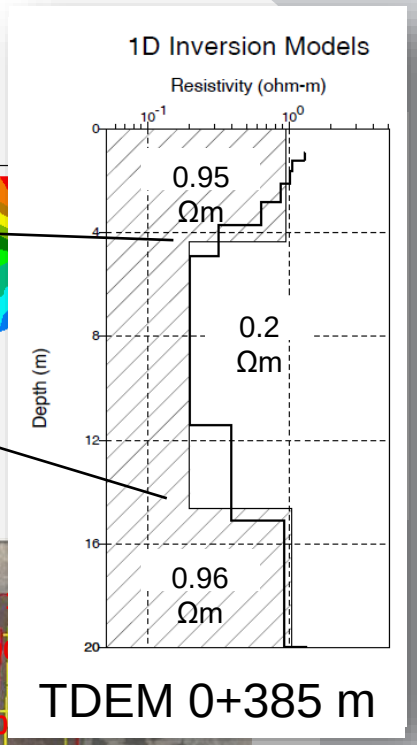
- Conductive waste (~ 1 Ωm)
- Even more conductive clay (<< 1 Ωm)

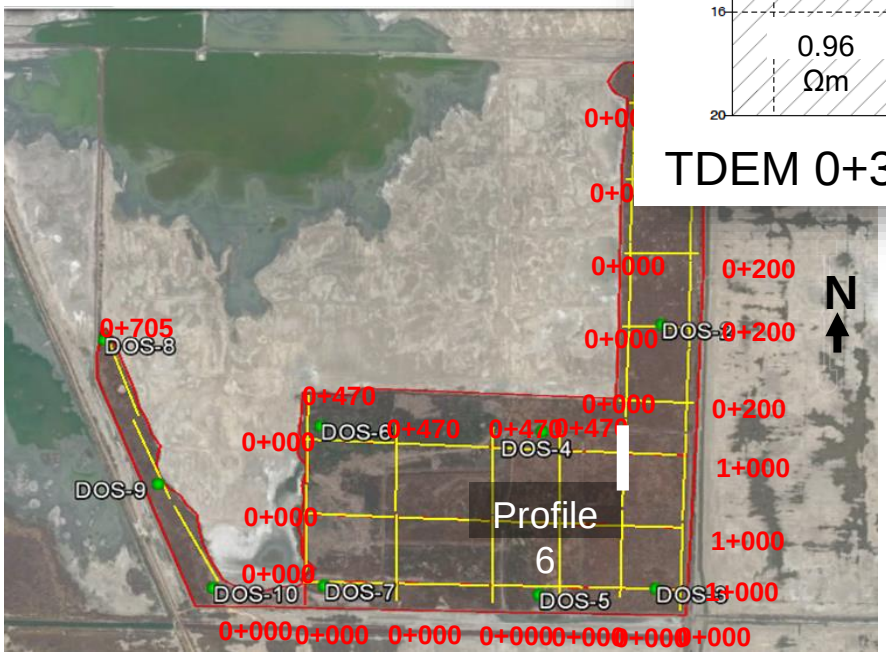
Objective

- Estimate thickness (and volume) of waste deposits

NAICM landfill | Profile 6





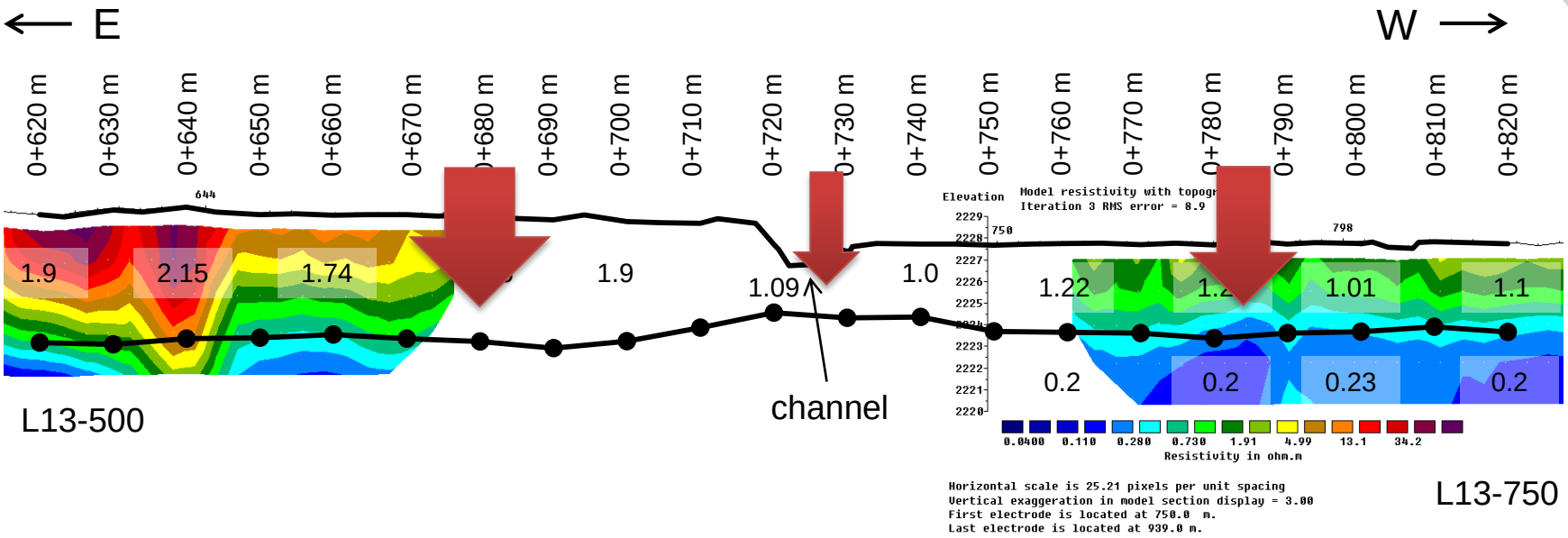


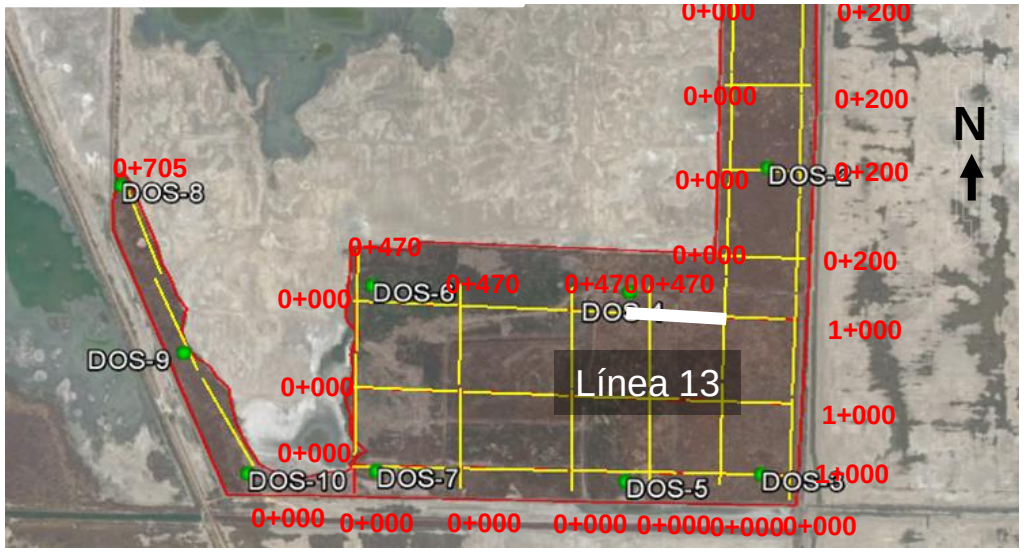
Survey
- DCR (Ares, 3 m spacing)
- TDEM (TerraTEM, single loop, 10 m x 10 m loop)

Processing
- DCR: 2D inversion (Res2DInv)
- TDEM: 1D (WinGLink)

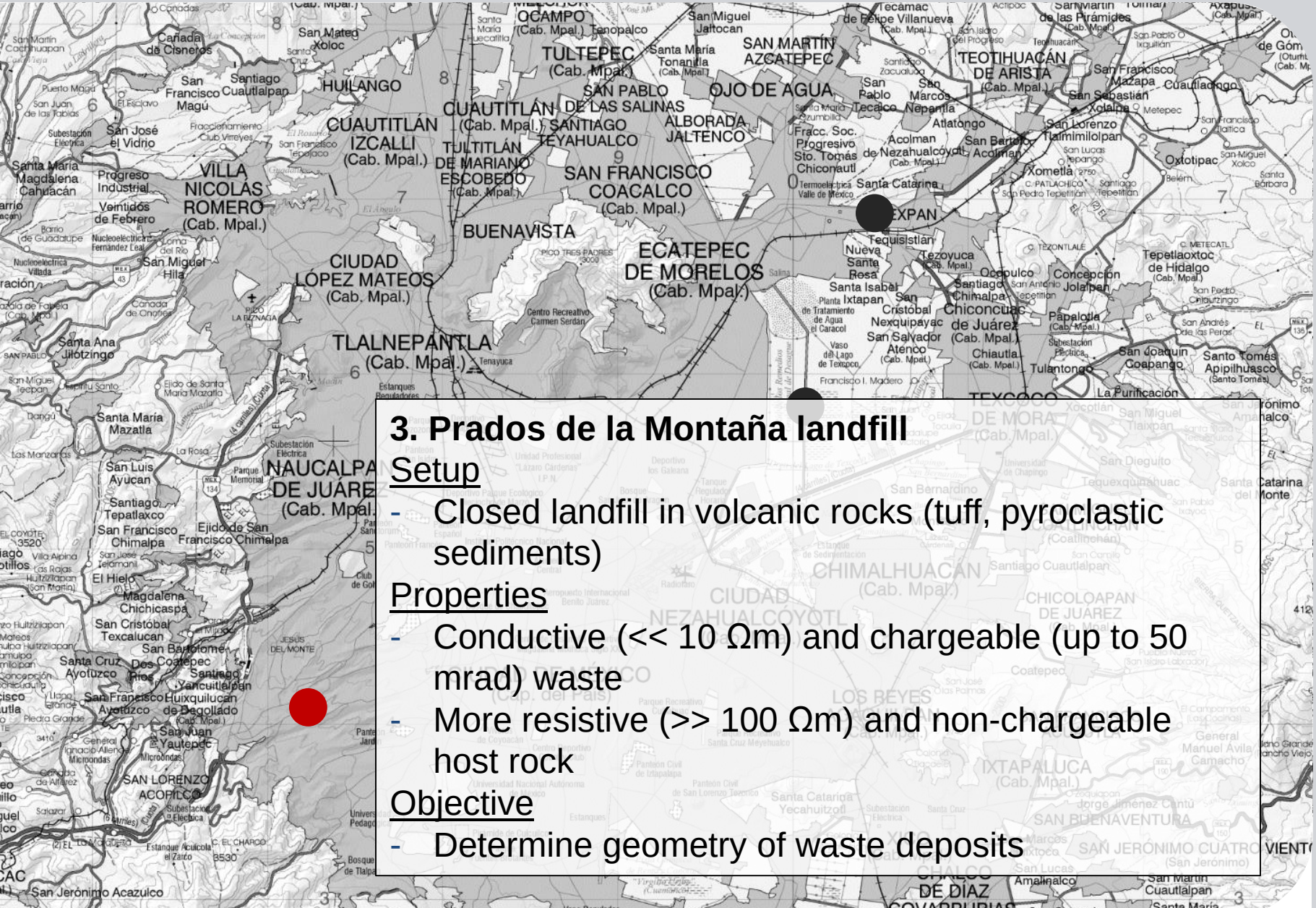
Summary
- Identified waste/debris layer by (relatively high resistivity)
- Excellent agreement of DCR and TDEM (three-layer inversion) results

NAICM landfill | Profil 13





3. Prados de la Montaña, Mexico City



3. Prados de la Montaña landfill

Setup

- Closed landfill in volcanic rocks (tuff, pyroclastic sediments)

Properties

- Conductive (<< 10 Ωm) and chargeable (up to 50 mrad) waste
- More resistive (>> 100 Ωm) and non-chargeable host rock

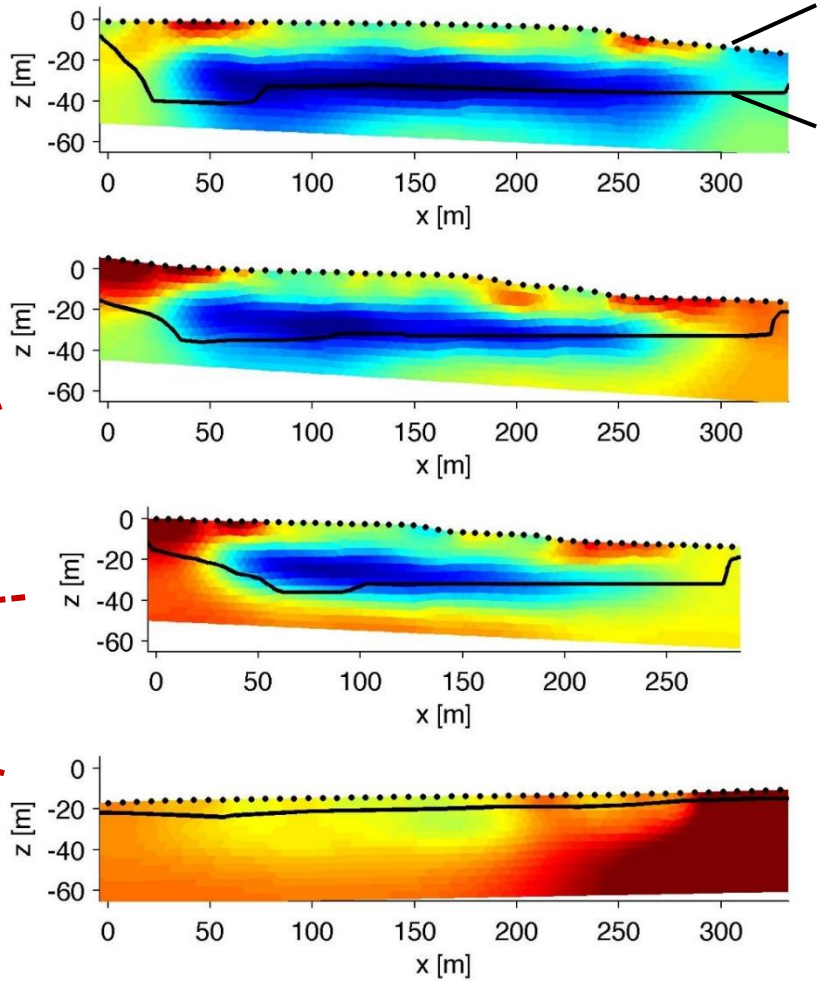
Objective

- Determine geometry of waste deposits

3. Prados de la Montaña

Survey
- DCR (Syscal Pro Switch, Dipole-dipole, 6-7 m spacing, 48 electrodes)

Processing
- DCR: 2D inversion (CRTomo)

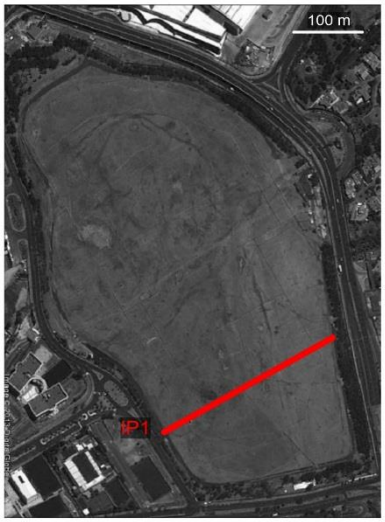


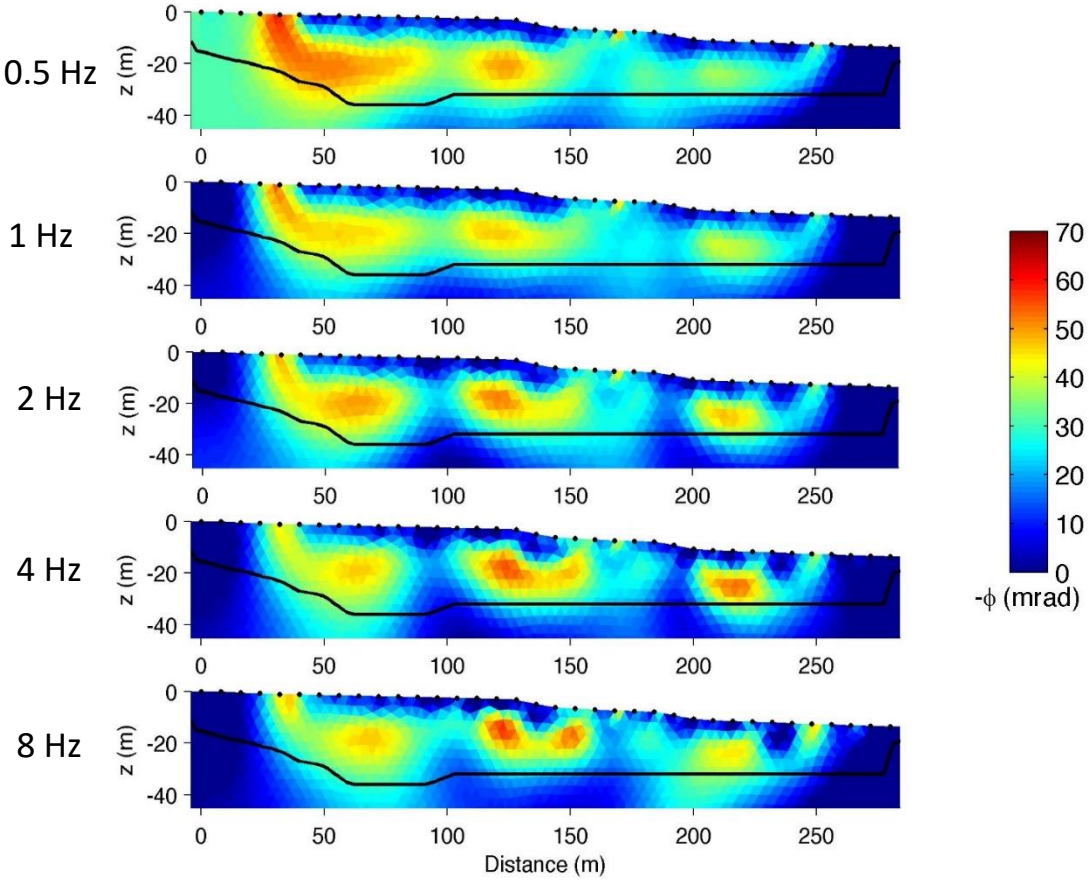
Summary DCR
- Waste only conductive, where saturated with leachate?
- Leachate plume beneath actual landfill?

3. Prados de la Montaña

Survey
- SIP (GDP32ii, Dipole-dipole, 8 m spacing, 30 electrodes)

Processing
- SIP: 2D inversion (CRTomo by Andreas Kemna, Bonn)





Summary SIP
- Phase correlates better with known geometrical limits of landfill
- Lateral heterogeneities might give a hint to waste composition
- Open question: What information does the spectral variation contain? (-> composition, saturation, fluid chemistry, particle sizes)?

Thanks to…

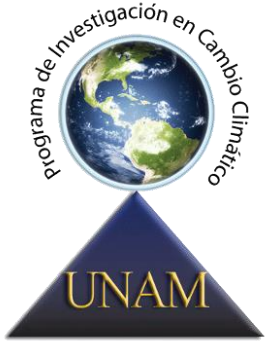

CFE
Comisión Federal de Electricidad


GEIC
Ingeniería civil
y ciencias de la tierra


GEOTEM
Ingeniería S.A. de C.V.


DAAD
Deutscher Akademischer Austauschdienst
German Academic Exchange Service


geOFISICA
UNAM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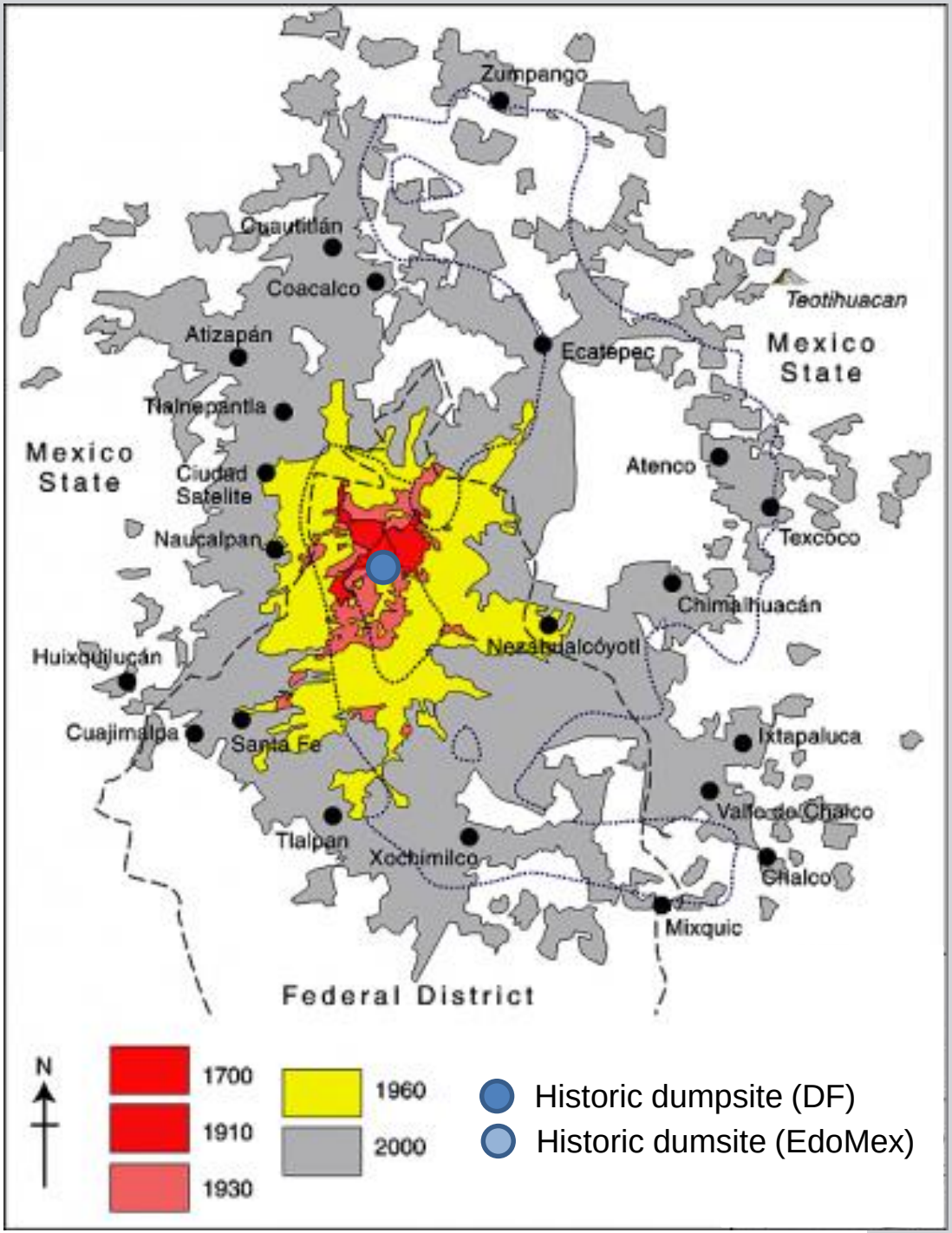
19th century

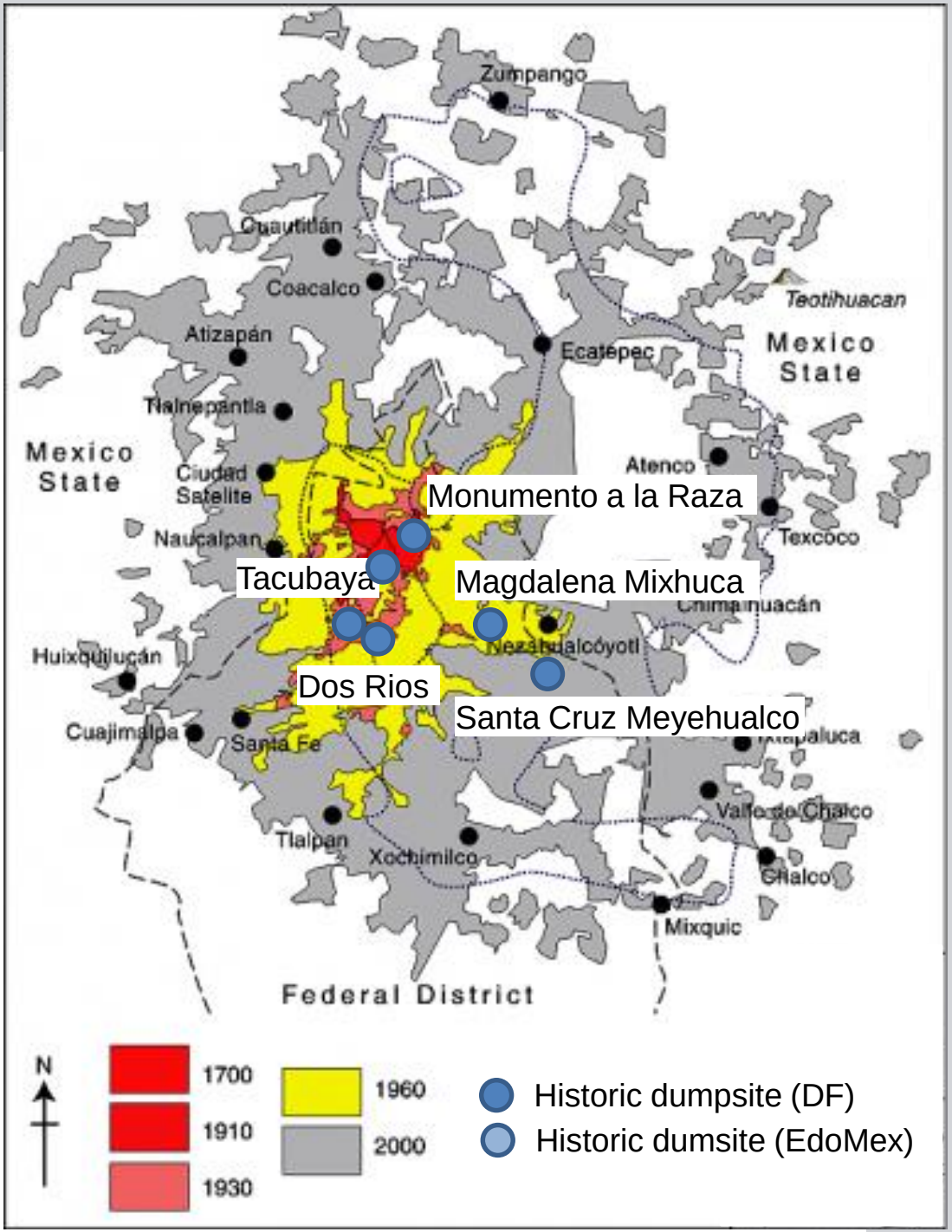
~ 1750 Dumpsites located in *Santa María la Ribera*



20th century (1st half)

1924 *Santa Cruz Meyehualco*

1938 Dumpsites at the *Monumento a la Raza* and in *Tacubaya*, *Dos Ríos*, *Magdalena Mixhuca*



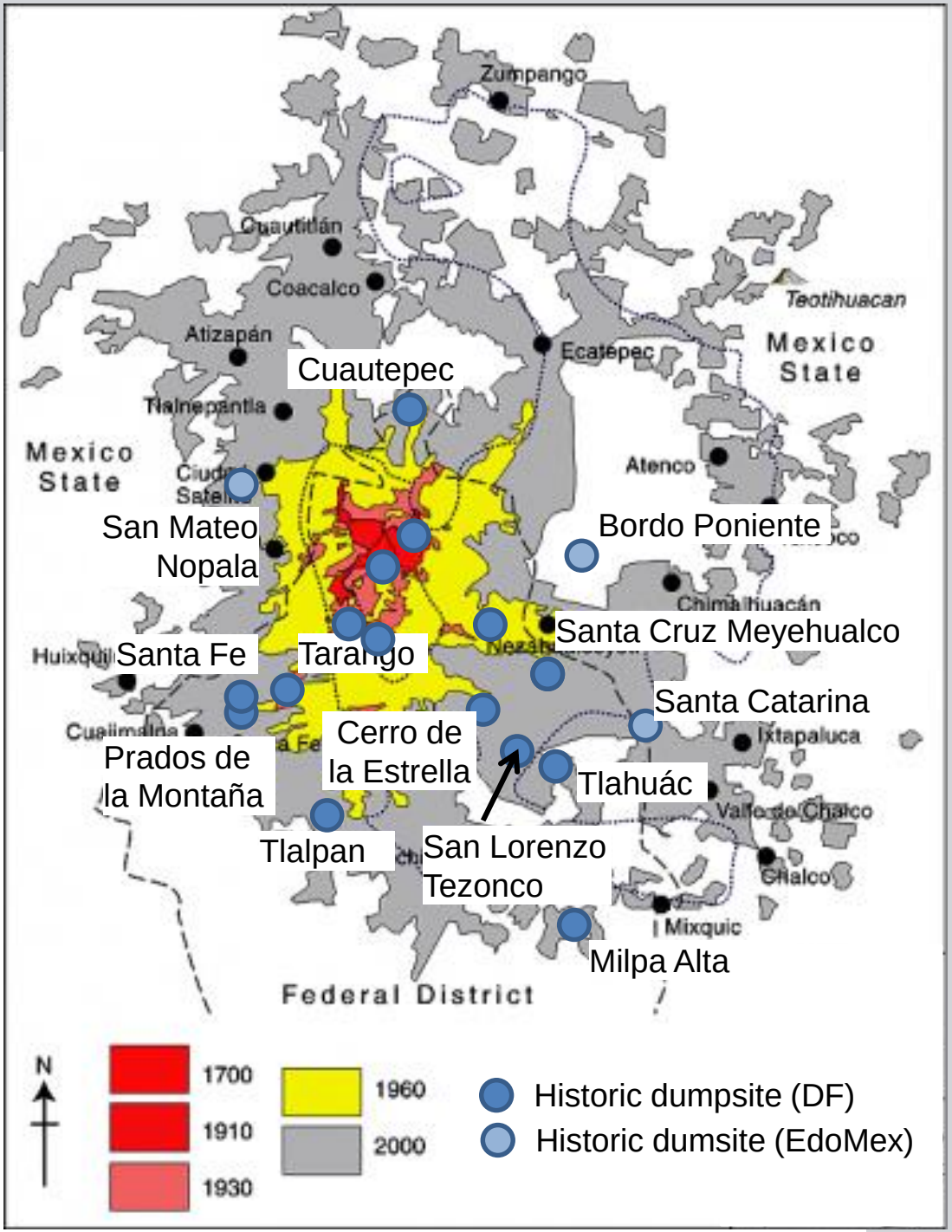
20th century (2nd half)

1958 *Santa Fe*

1983 Closure of *Santa Cruz Meyehualco* causes the opening of dumpsites *San Lorenzo Tezonco, Tlalpan, Milpa Alta, Cerro de la Estrella, Tarango,, Santa Catarina, Bordo de Xochiaca, Tlahuác, San Mateo Nopala, Cuautepec.*

1985 *Bordo Poniente*

1985-87 *Santa Catarina, Prados de la Montaña*



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