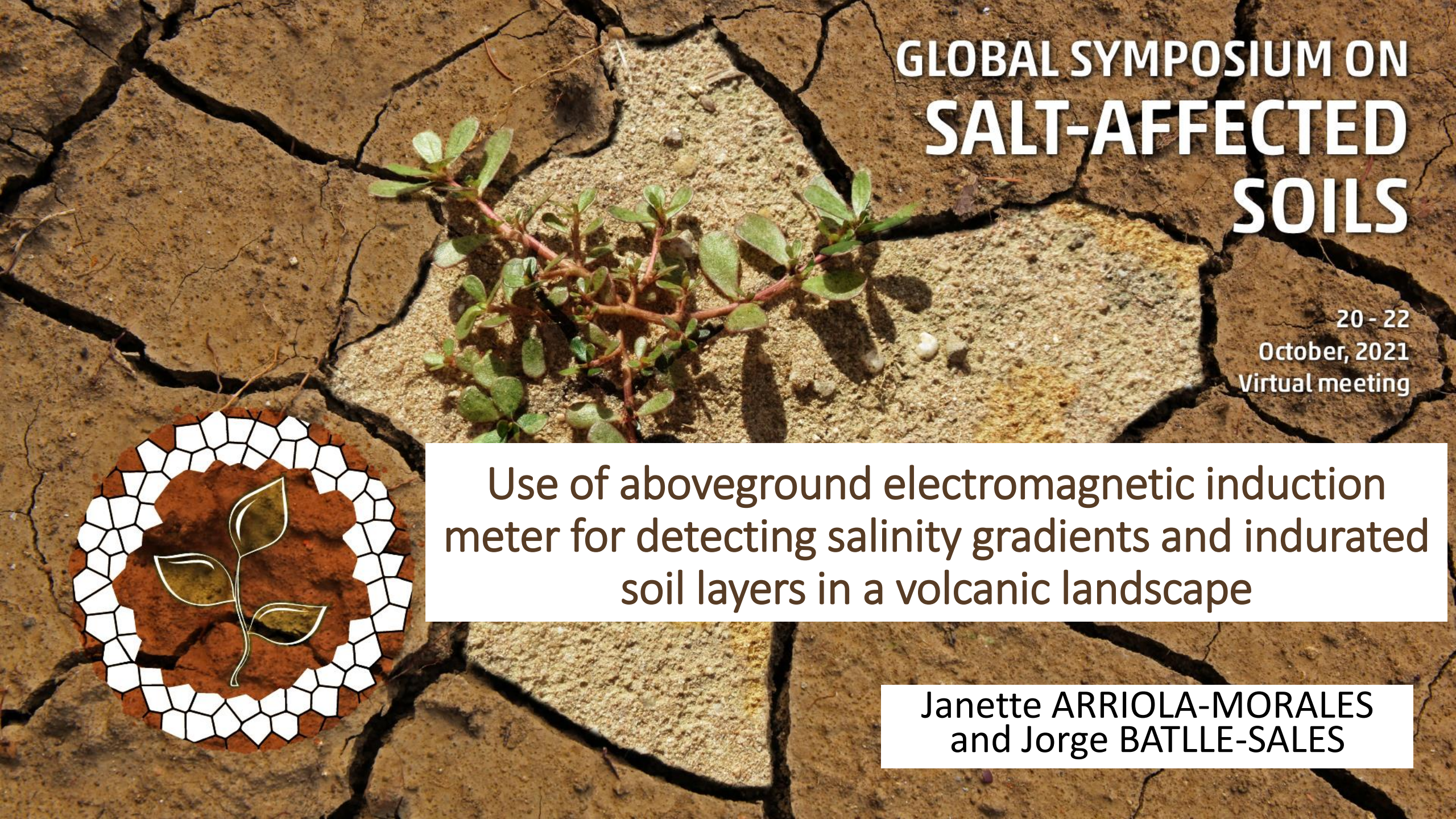
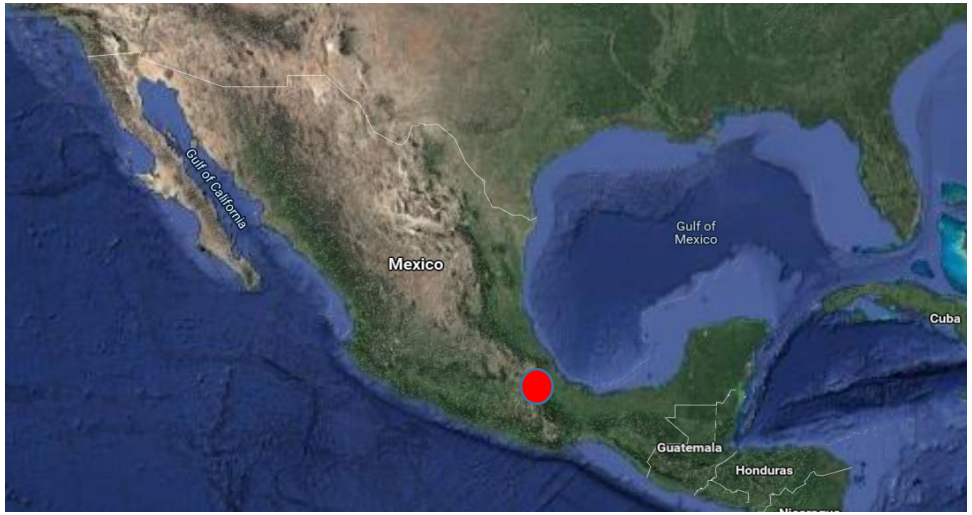
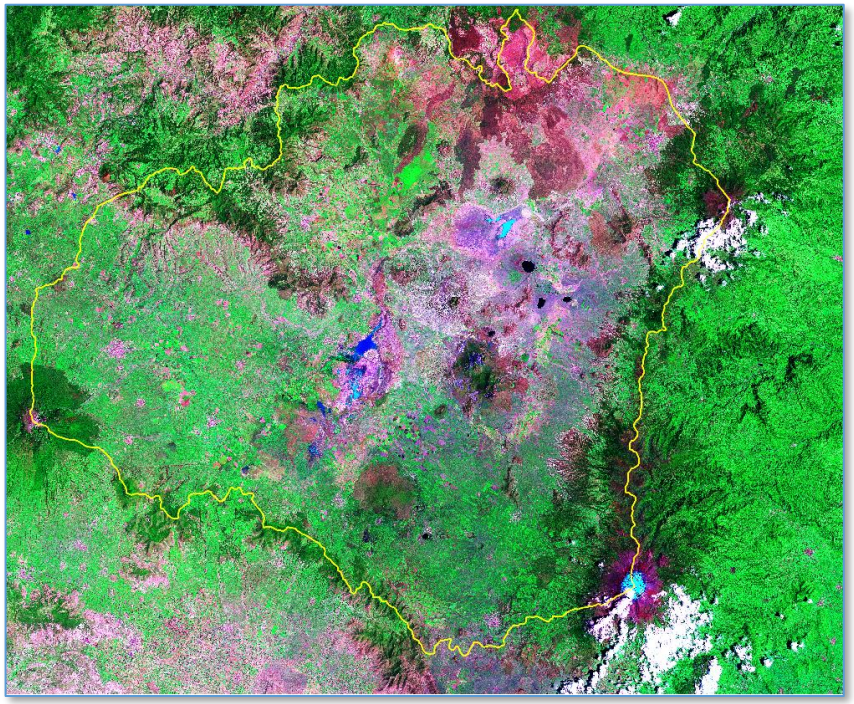


Use of aboveground electromagnetic induction meter for detecting salinity gradients and indurated soil layers in a volcanic landscape

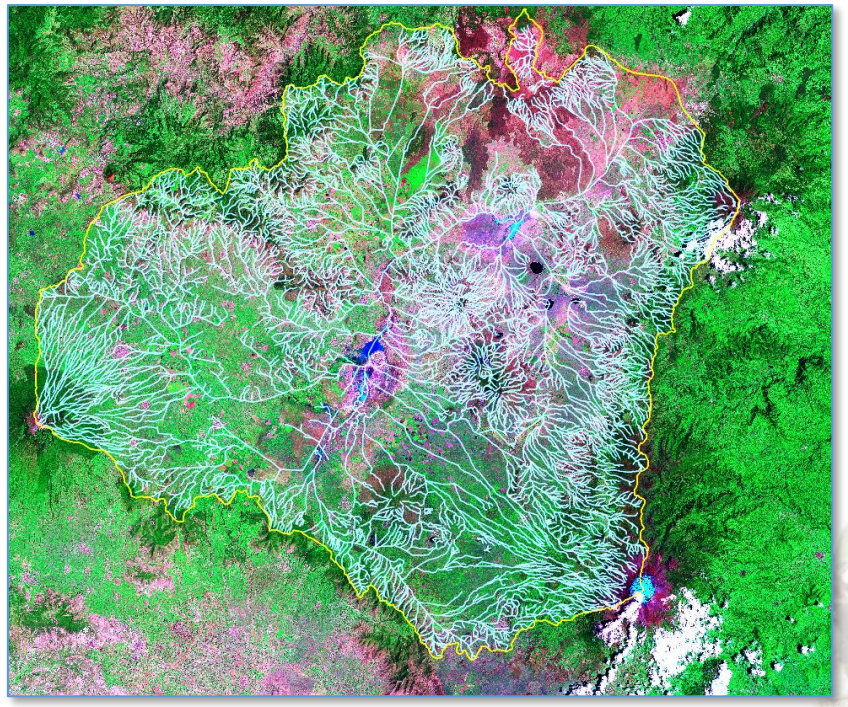
Janette ARRIOLA-MORALES
and Jorge BATLLE-SALES

Location and characteristics of the study area

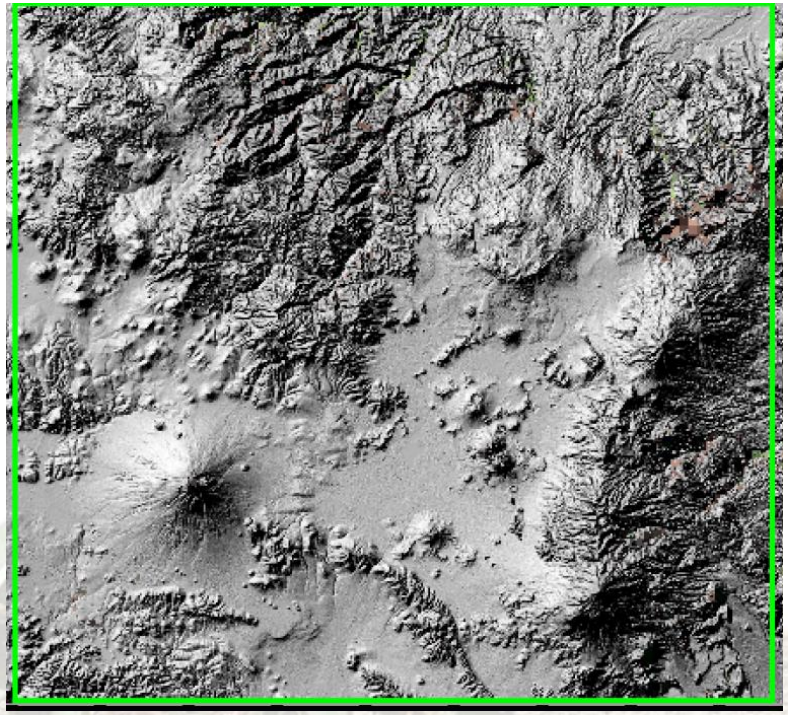




Landsat 7 RGB 742

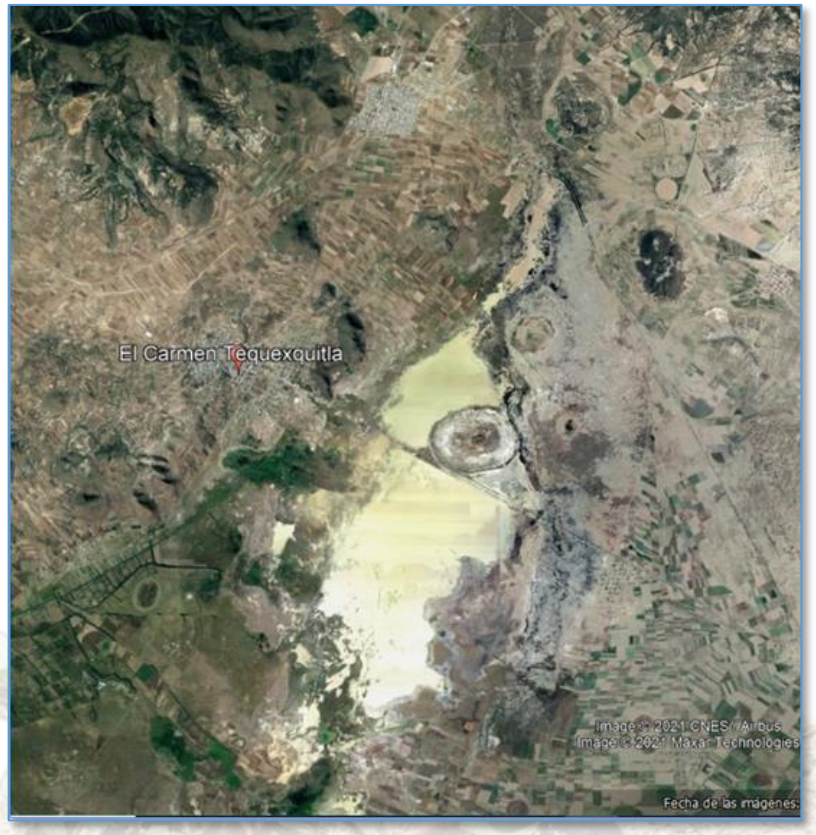


Landsat 7 RGB 742

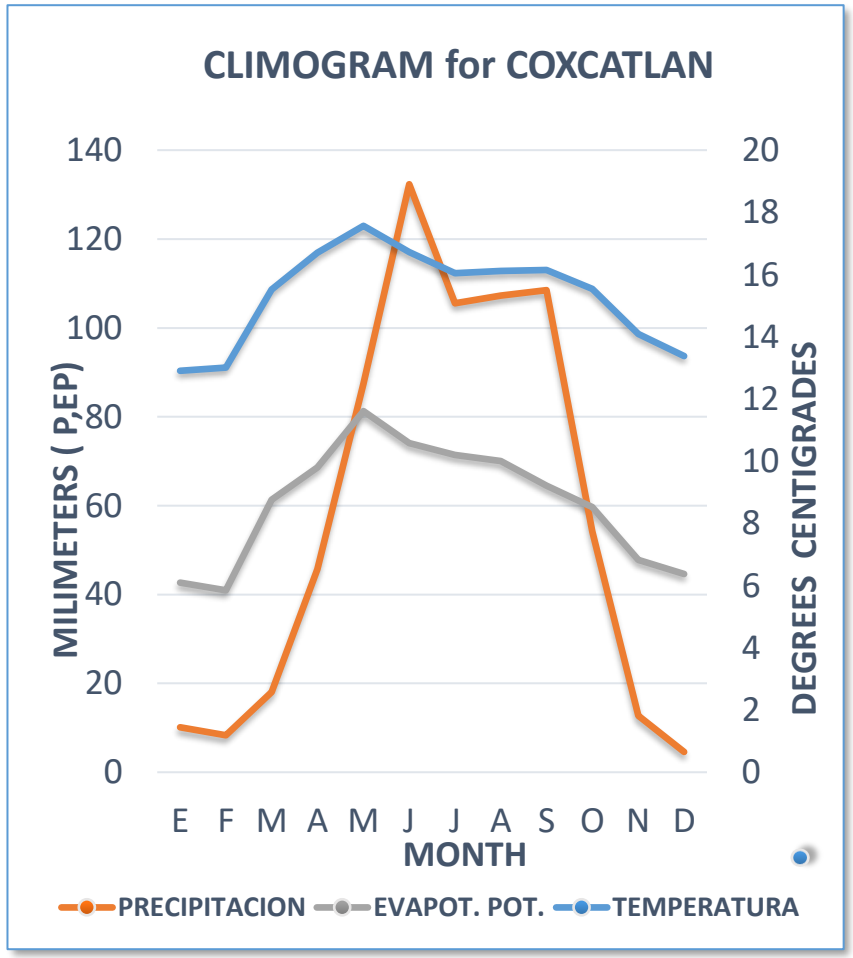


STRM 1 arc-sec

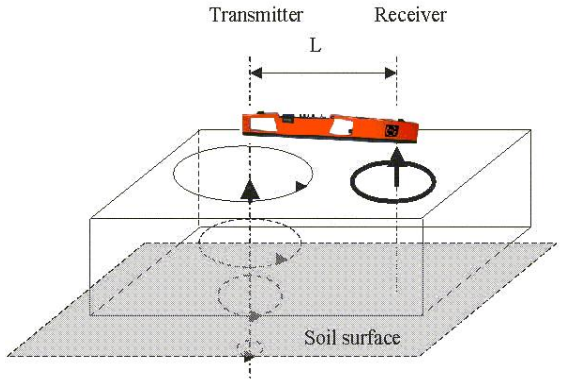
Location and characteristics of the study area

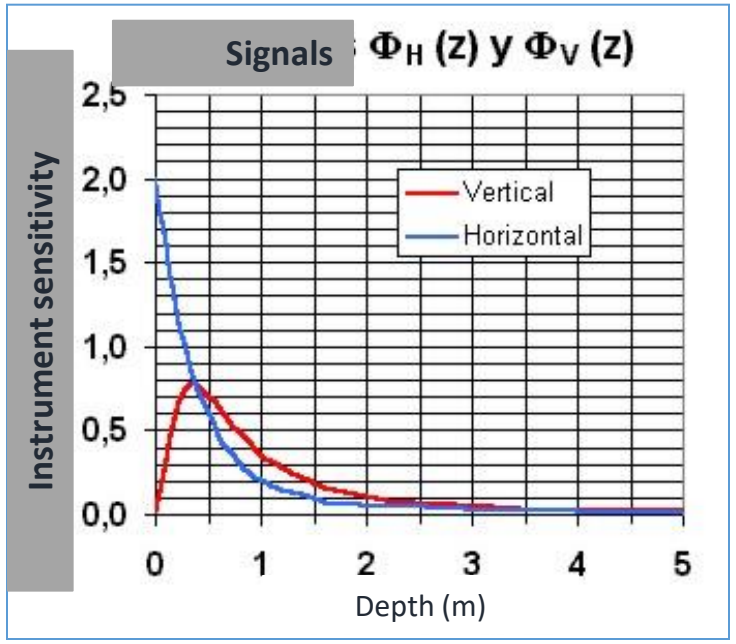


Climate into the watersheed



What measures the EM38?





The EM signal response can be related to apparent soil electrical conductivity (ECa) at particular depths, through statistical calibration (and to the ECs).

In a conceptual model, the EM signal response can be described as a complex function of:

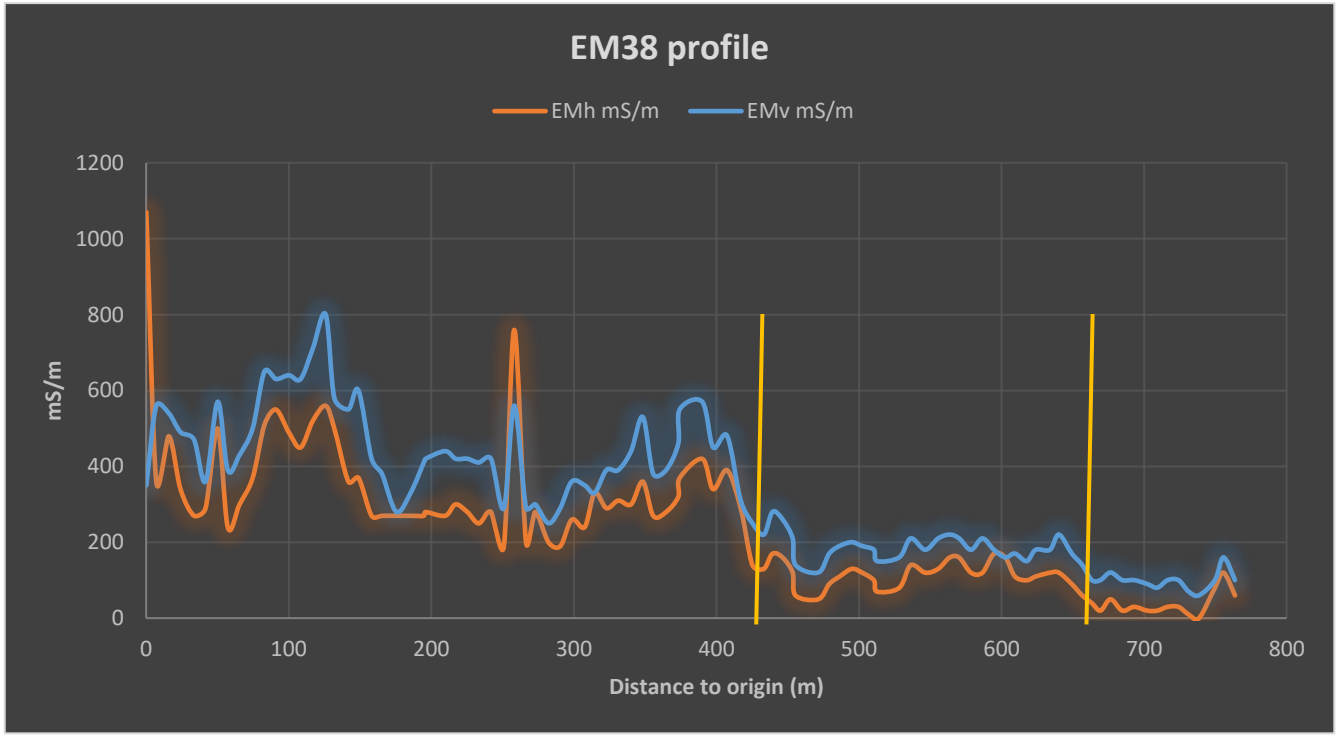
*soil solution conductivity
*soil moisture
*temperature
*amount and type of clay
... among other factors

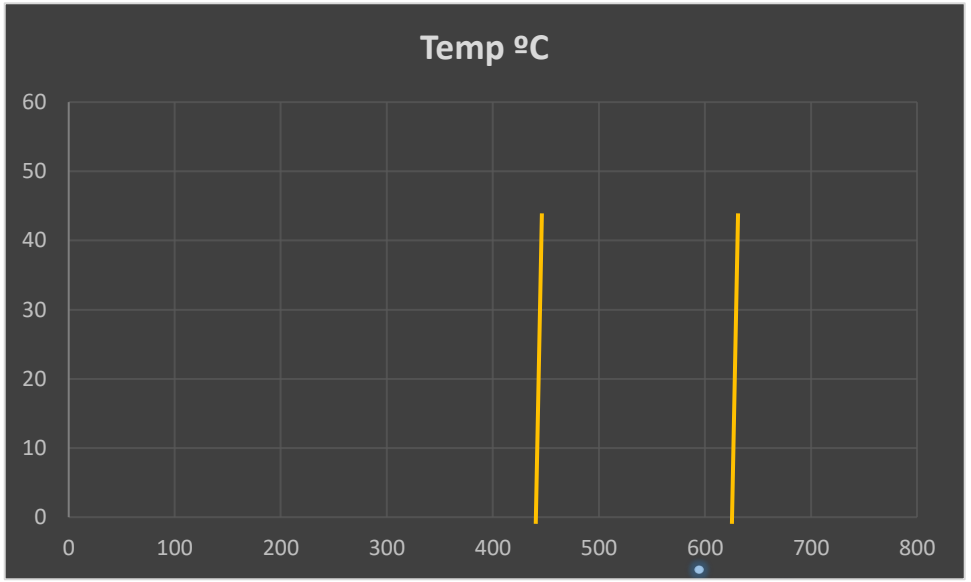
$$EC_a = EC_w\ \theta_v T + Ec_s$$

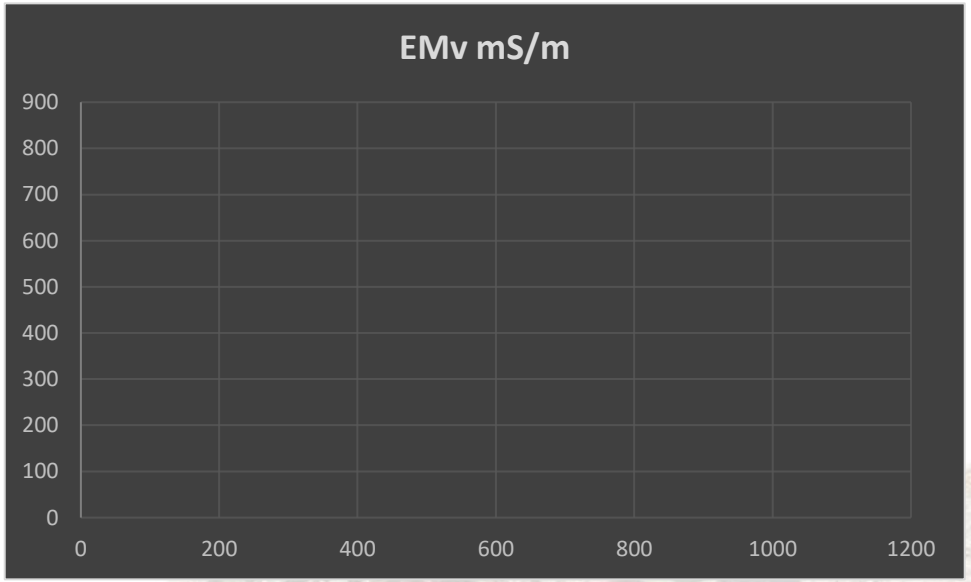
Rhoades y Corwin (1990)

Each soil depth contributing unevenly to total signal response.

The EM38 survey

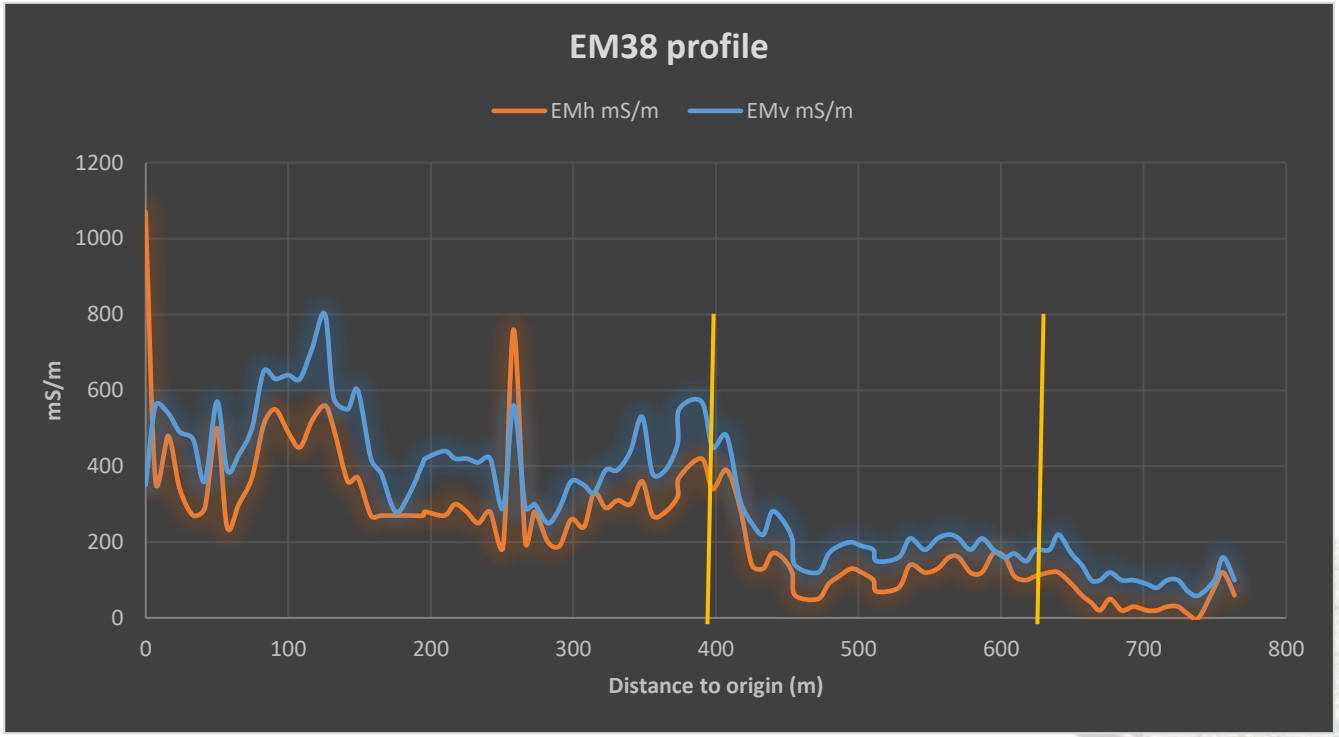


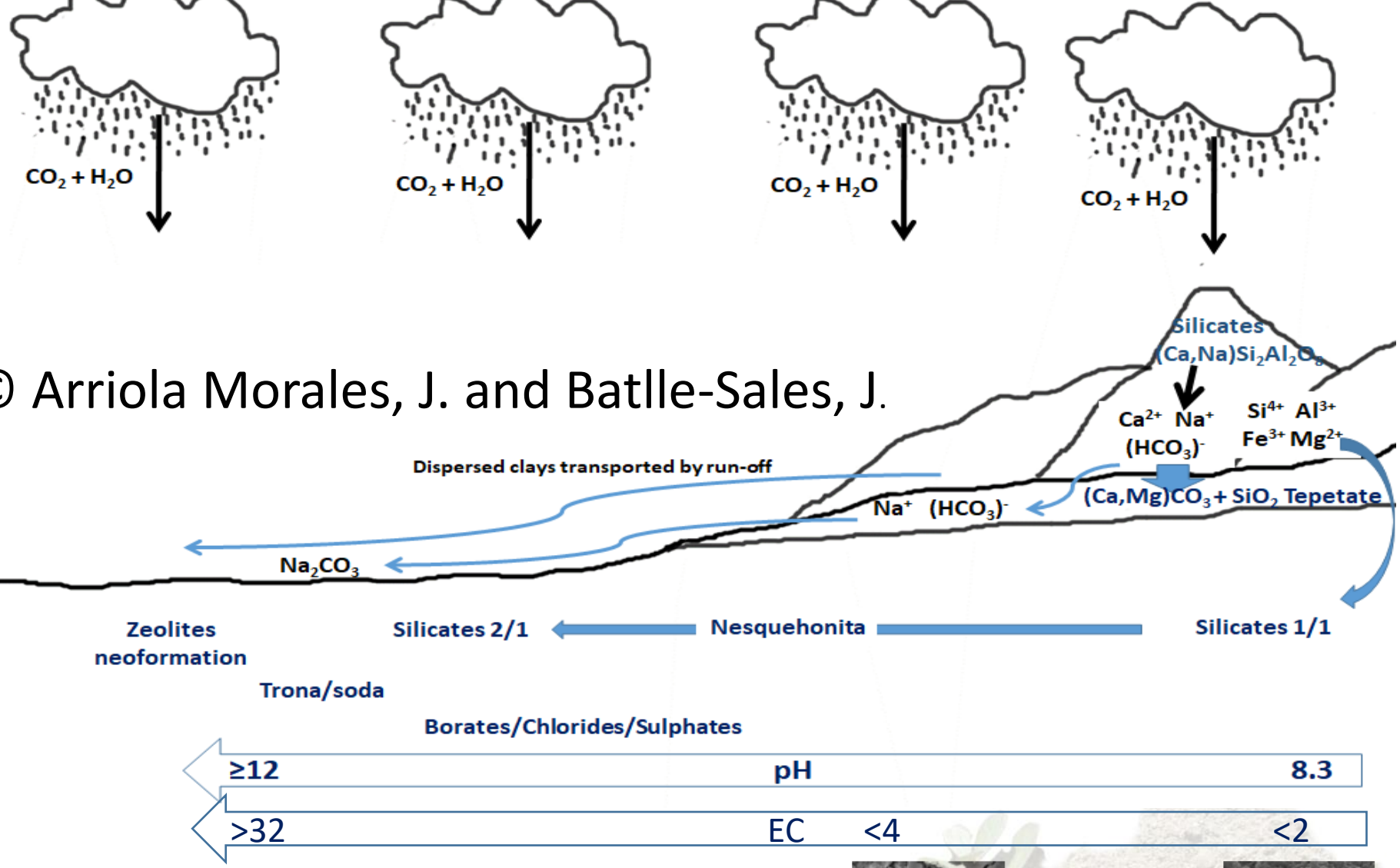


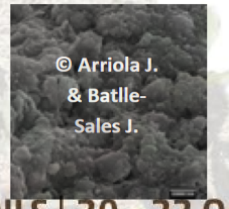


Soils

Plants


EM38 profile
EMh mS/m
EMv mS/m
1200
1000
800
600
400
200
0
mS/m
0
100
200
300
400
500
600
700
800
Distance to origin (m)





Discussion

- The measurements provided data for the bulk soil conductivity at every point, showed salinity gradients, area heterogeneity, detected the appearance of petrocalcic horizon and computed if salinity is in top- or in bottom soil.
- Three distinct soil zones were clearly discriminated: a first belt of shallow soils with moderated slope (entisols), a second belt with non-saline soils with petrocalcic horizon (tepetate) where halophytes are absent, and a third belt of saline-alkaline soils with halophytes and cactacea.
- The pH change gradually from neutral to extreme alkaline, and minerals recognized follow the series predicted by Eugster and Jones, starting with clays 1/1, sulphates, chlorides, borates, nesquehonite, clays 2/1, trona-soda, to zeolites.

Conclusions

- Electromagnetic induction was found very useful for detecting salinity gradients and for assisting soil sampling in order to investigate the geochemical process of sequential mineral formation.

- A good correspondence was found between EM signals and soil properties and mineralogy.

- The calibration of the EM device makes possible making a wide area map with prediction of the soil properties and mineralogy.

GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

20 - 22
October, 2021
Virtual meeting

Thank you for your attention