Field course on Environmental Monitoring Techniques
In the Critical Zone Observatory "Mezquital Valley"

Postgraduate program in Earth Sciences
National Autonomous University of Mexico (UNAM)

Teaching staff: Dr. Christina Siebe, Dr. Blanca Prado and Dr. Lucy Mora Palomino
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Dates: January, 9-27th, 2017
Credits: 8

General objective: participants will practice field methods to characterize soil and surface and groundwater and to measure water movement and pollutant transport in the unsaturated zone as well as green house gas emissions from the soil surface. They will compare different methods and recognize their advantages and limitations.

Study object: an agricultural field irrigated with untreated wastewater in Las Palmas ranch, Mezquital Valley.

Specific methods:

1) Field survey methods: dimensions and gradient, detailed soil survey and soil description, soil sampling (disturbed, undisturbed samples).
2) Field methods for soil characterization (pH, electric conductivity, Redox potential, temperature, infiltration, soil penetration resistance) and water characterization (dissolved oxygen concentration, pH, electric conductivity, temperature, redox potential, major ion concentrations).
3) Measurement of fluxes of surface water with a flow meter and of groundwater by installation of observation wells.
4) Monitoring of soil solution constituents (suction cup lysimeters) and ion leaching (resin boxes).
5) Monitoring of green house gas emissions.

General schedule:

Days 1 and 2: Introduction to the reutilization of wastewater in agriculture. Development of a conceptual model of relevant processes.

Days 3 and 4: review of principles of the different methods.

Day 5: visit to the Mezquital Valley irrigation district.

Day 6: Field survey.

Days 7 and 8: installation of observation wells, TDR probes, suction cup lysimeters, redox electrodes, etc.

Day 9: Irrigation (monitoring of water fluxes, water tension, moisture contents, gas emissions, etc.)

Days 10 and 11: Field monitoring

Days 12 to 16: Data analysis (out put: water balance, N balance).

Days 17 and 18: Report compilation and presentation of results.

The course is a full-time course starting at 9.00 am till 6 pm, with lunch break between 2 and 3 pm. It takes place in the Institute of Geology (days 1-4 and 12-18), and at Las Palmas ranch, Tlahuelilpan, Hidalgo (days 5-11).

Maximum number of participants: 15

Costs to be covered by the participants:

Hosting and food expenses during field work (in Mexican pesos). approx. $4000.00

All other costs will be covered by the postgraduate program

Basic knowledge of soil science and hydrology are required:

Brady N.C. y Weil, R.R. (1996). The Nature and properties of soils, 11a. ed., Prentice Hall International Editions.

Logsdon, S.; D. Clay, D. Moore, T. Tsegaye (Eds.): Soil Science step-by-step-field analysis. Soil Science Society of America, Madison WI, USA.

Stumm, W., and Morgan JJ. (1996): Aquatic Chemistry. Environmental Science and Technology. Wiley Interscience Series of texts and monographs. 3rd edition. John Wiley and Sons. Inc. 1022 p.

Wolt J. 1994. *Soil Solution Chemistry: Applications to Environmental Science and Agriculture.* John Wiley, New York, USA. 345 p.