Annual Congress on

SOIL SCIENCES

December 04-05, 2017 | Madrid, Spain

Keynote Forum

Day 1

Soil Science 2017

Kelly T Morgan, J Geol Geophys 2017, 6:6(Suppl)
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Kelly T Morgan

University of Florida, USA

Irrigation management effect on water dynamics of citrus huanglongbing trees and soil

Due to production declining and negative economic effects, there is an urgent need for strategies that reduce the impact of Huanglongbing (HLB) on citrus (Citrus x sinensis (L.) Osbeck). The objective of this study was to evaluate the impact of different irrigation schedules on soil volumetric water content (θv) and water uptake characteristics of citrus trees affected by HLB in central and southwest Florida. The study was conducted during two years on five-year-old sweet orange (Citrus x sinensis (L.) Osbeck) trees located in three commercial groves at Arcadia, Avon Park, and Immokalee, Florida. Three irrigation treatments included University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) recommendations, daily irrigation, and a schedule intermediate to the selected treatments and provided similar volumes of water per week based on ETo. Sap flow (SF), leaf area, leaf area index, and stem water potential (Ψ) were determined at selected intervals. Also, θv was measured using capacitance soil moisture sensors at incremental soil depths of 0-15, 15-30, and 30-45 cm. Significant differences (α=0.05) were found in average SF, leaf area index, Ψ, and θv measurements among treatments. Diurnal SF value under daily irrigation treatment increased by 91%, 51%, and 105% and θv under daily treatment increased by 39%, 13%, and 57% compared to UF/IFAS irrigation treatment in Arcadia, Avon Park and Immokalee, respectively. Results indicate that, daily irrigation improves trees water dynamics and greater mean soil water content than UF/IFAS or intermediate treatments and reduce trees stress with the same volume of irrigation water.

Biography

Kelly T Morgan is a Professor of Crop Irrigation and Nutrient Management at the University of Florida. He has received his graduate degrees from the University of Florida in Soil and Water Science and Agricultural Engineering Departments. He has worked in University of Florida for 26 years specializing in improving water and nutrient use efficiency in the sandy soils of central and south Florida. His studies to assess nutrient application rates and irrigation management to increase nutrient use efficiency and minimize nutrient loss to the environment. He has published over 75 peer reviewed journal papers, 10 book chapters, and nearly 200 other publications.

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Vladimir L Andreev, J Geol Geophys 2017, 6:6(Suppl)
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Vladimir I Andreev

NRU MGSU, Russia

Stress state of a soil array at break of the pipeline

The rupture of water and sewer pipes leads to numerous accidents (subsidence, swelling, etc.). This is especially characteristic for clay, loess, peat and other soils. We consider the stress state of clay array at different models on fluid propagation from a fracture site. Accordingly, the problems are solved in cylindrical and spherical coordinates. The problem is solved by the methods of stationary and non-stationary moisture elasticity. The feature of the calculation is the accounting of the inhomogeneity of the clay during moistening. Figure 1 shows the dependence of the clay deformation modulus on moisture. Depending on the depth of the pipe where the fracture occurred, the ground pressure can be considered axisymmetric (large depth) and non-axisymmetric (small depth). Accordingly, one-dimensional and two-dimensional problems of moisture elasticity are considered. Analytical and numerical-analytical solutions are obtained. An analysis is made of the convergence of the Fourier series as a function of the number of terms in the series. As a result of calculations, it was found that taking into account the inhomogeneity caused by the change in the deformation properties of bodies leads to a significant change in the stress state of bodies compared to the calculation of homogeneous bodies. In clay soils, against the background of a marked reduction in the peaks of compressive stresses, the most dangerous maximum tensile stresses for a cylindrical model increase by 53%, and for a spherical stress increase by 38%.

Recent Publications

1. Andreev V I and Avershyev A S (2013) Elastic-plastic equilibrium of a hollow cylinder from inhomogeneous perfectly plastic material. Applied Mechanics and Materials 405-408:3182-3185.
2. Andreev V I and Avershyev A S (2013) About influence of moisture on stress state of soil taking into account inhomogeneity. International Journal for Computational Civil and Structural Engineering 9 3 14-20
3. Andreev V I and Avershyev A S (2014) Nonstationary problem moisture elasticity for nonhomogeneous hollow thick-walled sphere. Advanced Materials Research 838-841:254-258.
4. Andreev V I and Avershyev A S (2015) The Stress State in The Rock Mass Exposure to Moisture and Temperature Fields. Procedia Engineering 111:30-35.

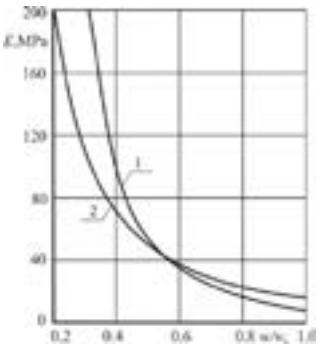

Figure 1: Dependence of the soil deformation modulus on moisture:1-loam and clay; 2-sandy loam.

Biography

Vladimir I Andreev is a Head of Department Strength of materials at National University Moscow State University of Civil Engineering. He is also an Professor, Doctor of Technical Sciences, full member of the Russian Academy of Architecture and Construction Sciences (RAASN), a member of UMO universities of Russia for education in the field of construction. He is an Honored Worker of Higher School, member of the Russian National Committee on Theoretical and Applied Mechanics and Honorary professor at the Warsaw University, honorary builder of Russia.

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Day 2

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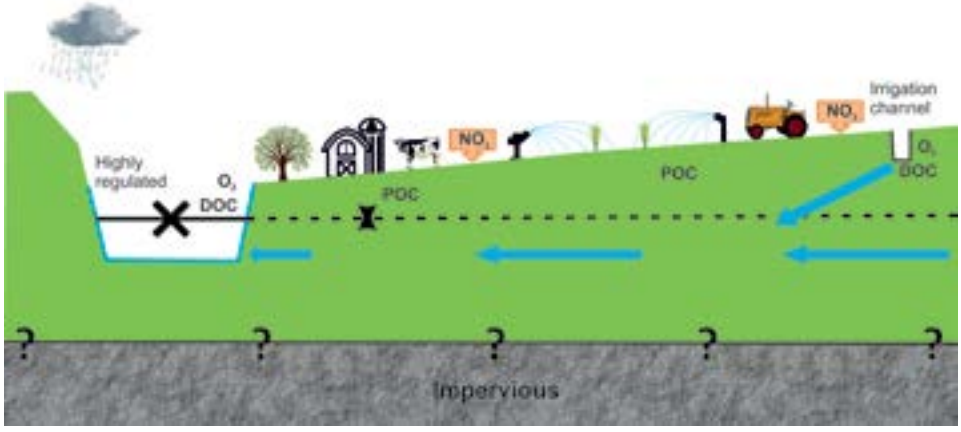
Bodoque J M

University of Castilla-La Mancha, Spain

Restoring hydromorphological functionality to improve natural purification capacity of a heavily modified water body

We determined the natural purification ability of a floodplain where irrigated agriculture is a dominant and hydraulic connection with the associated river is limited. Denitrification activity was characterized by using different methodological approaches based on i) End-Members Mixing Analysis; ii) characterization of macroinvertebrates of the hyporheic zone; iii) analysis of the denitrification potential; iv) analysis of the bacterial community structure; and v) hydrologic modeling. All the approaches, except EMMA analysis, lead to the same conclusion. Denitrification is almost non-existent because the study site does not have the hydric soil and oxygen-limited conditions needed to enable denitrification. Invertebrates did not show statistically significant differences (P-value higher than 0.05) between the diversity indices corresponding to each of the sampling campaigns. However, significant differences (P-value less than 0.01) were found between the piezometers closest to the river banks and the rest; this may be interpreted because of low hydraulic connectivity. Denitrification potential did not show significant statistical differences (P-value less than 0.01) between the sampling campaigns conducted. This shows that besides the absence of connectivity, irrigation is not able to significantly activate denitrification. Additionally, results from the characterization of the bacterial community structure are consistent with floodplains where denitrification is not effective since most bacterial communities are not linked with NO3. Hydrologic modeling showed that decay change is very low, on the order of 0.01 mgN/L.day, although it would improve around 10% if ordinary floods occur. During the summer months theoretical concentrations of nitrates were lower than expected (e.g. ΔNO3 = - 41 in August 2013), according to the EMMA analysis, which might be due to the intensity of irrigation is spatiotemporally variable in the study site. Our results show that floodplain denitrification has been drastically reduced due to the suppression of flood-pulses. In this context, the creation of riverine wetlands where the hydrological regime is restored would lead to a decay of nitrates whose dynamic evolution increases with flooding, as scenarios tested by hydrological modeling have demonstrated.



Recent Publications

1. Bodoque J M, Ladera J, Yela J L, Alonso-Azcarate J, Brito D, Antiguedad I, Duran R, Attard E, Lauga B and Sanchez-Perez J M (2017) Recovering hydromorphological functionality to improve natural purification capacity of a highly human-modified wetland. Ecological Engineering 103:332-343.
2. Havrylenko S B, Bodoque J M, Srinivasan R, Zucarelli G V and Mercuri P (2016) Assessment of the soil water content in the Pampas region using SWAT. Catena 137:298–309.
3. Bodoque J M, Ballesteros-Cánovas J A, Lucia A, Díez-Herrero A and Martín-Duque J F (2015) Source of error and uncertainty in sheet erosion rates from dendrogeomorphology. Earth Surface Processes and Landforms 40(9):1146–1157.
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5. Martín-Duque J F, Sanz M A, Bodoque J M, Lucía A and Martín-Moreno C (2010) Restoring earth surface processes through landform design. A 13-year monitoring of a geomorphic reclamation model for quarries on slopes. Earth Surface Processes and Landforms 35:531–548.

Biography

Bodoque J M obtained his PhD in Geology from Complutense University of Madrid, Spain. He undertook his Postdoctoral studies at the Department of Civil Engineering, Texas A&M University, USA. Currently, he is a Professor of the Faculty of Environmental Sciences and Biochemistry at the University of Castilla-La Mancha His main research is focused on Hydrology and Geomorphology, which has resulted in more than 40 papers in international peer reviewed journals related to fluvial geomorphology, flood risk assessment and management, soil erosion, water quality and ecological restoration.

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Irena Ymeti, J Geol Geophys 2017, 6:6(Suppl)
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Irena Ymeti

University of Twente, The Netherlands

Monitoring the effect of drying-wetting cycles on soil aggregate breakdown using SPECIM hyperspectral camera

To monitor soil surface changes, such as aggregate breakdown, it is important to understand the interaction between soil surface and the surrounding environment at high temporal resolution. Within different spatial, temporal and spectral resolution remote sensing (RS) provides continuous data that are suitable for assessment and monitoring of environmental conditions. Using a SPECIM hyperspectral camera under laboratory conditions at a micro-plot scale, we aim to detect and estimate soil aggregate changes over time. We designed an indoor experiment by exposing triplicates of four soils susceptible to detachment (silty loam with various amount of organic matter content and silty loam mixed with hematite) to drying, field capacity and wetting conditions. Twelve soil samples were kept at field capacity for the entire period that the experiment ran. The rest of soil samples were imposed to drying and wetting conditions which were alternated with field capacity condition every three days. All the soil samples were scanned with the SPECIM hyperspectral camera each three days. We collected images data from April to June 2016. When an image has a sufficient high spatial resolution, pixels are smaller than the object so grouping of pixels is possible in order to obtain real-world homogeneous features. Therefore, object-based image analysis (OBIA) is a suitable approach for soil aggregate change detection. However, finding an appropriate method for monitoring soil aggregate breakdown using object-based image analysis for hyperspectral data is required. Moreover, our focus will be on quantifying soil aggregate break down over time using hyperspectral imagery.

Biography

Irena Ymeti is following the PhD program at the Earth Systems Analysis department at ITC, University of Twente, The Netherlands and working on monitoring soil aggregate breakdown using remote sensing technology. She started to work at the Institute of Geosciences, Energy, Water and Environment at the Polytechnic University of Tirana, Albania building a geo-information (GIS) and RS laboratory for processing and analyzing data for earth science applications.

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Emmanuel Mousset

Universite de Lorraine, France

Advanced electrochemical treatments for soil remediation

Statement of the Problem: The remediation of polluted soil and sites is a major of concern not only for the consequence on the ecosystem but also for the contamination of groundwater as resource of drinking water. In this context, many studies have been devoted to find the most cost-efficient solution for soil remediation. Most of the organic pollution is composed of aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (HAPs) but most of them are not biodegradable, which make not efficient enough the biological treatment. Physical techniques only contain the pollution but does not eliminate it while thermal treatment still remain expensive and denature the soil composition. Chemical oxidation methods have been proposed as well, but the addition of oxidants into the soil make the technique uncertain regarding the degradation yield and the hazardous oxidation by-products that can be formed.

Methodology & Theoretical Orientation: Soil washing (SW) and soil flushing (SF) technology using agents to extract and solubilize the pollutants have emerged and have shown promising results. Since these methods only transfer the pollution from soil matrix to liquid matrix, a post-treatment is required. The combination of SW/SF with electrochemical advanced oxidation process (EAOP) have been therefore proposed. EAOP have the advantage to not require the addition of oxidant that are produced continuously and in situ through electrochemical reactions.

Findings: Three major insights emanate from this combination: the surfactant structure has an importance in the pollutant degradation efficiency and the reusability of the washing agent, the integrated process can be performed at neutral pH and without addition of iron source for Fenton reaction, and the biodegradability enhancement with electrolysis time of SW/SF solutions.

Conclusion & Significance: These results gave new possibility of soil remediation by minimizing the use of reagent and by maximizing the pollutants degradation rates and yields.

Recent Publications

1. E Mousset, N Oturan, E D van Hullebusch, G Guibaud, G Esposito and M A Oturan (2013) A new micelle-based method to quantify the Tween 80® surfactant for soil remediation. Agronomy for Sustainable Development 33:839–846.
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5. E Mousset, D Huguenot, E D Van Hullebusch, N Oturan, G Guibaud, G Esposito and M A Oturan (2016) Impact of electrochemical treatment of soil washing solution on PAH degradation efficiency and soil respirometry. Environmental Pollution 211:354–362.

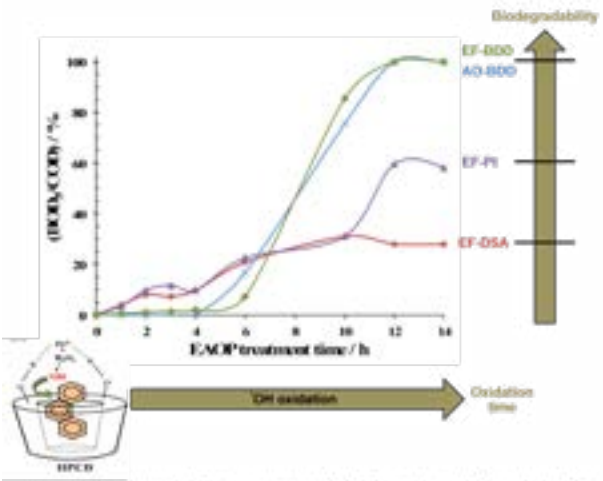

Figure 1: biodegradability improvement of soil washing solutions during the EAOP treatment and according to the kind of anode materials employed.

Biography

Emmanuel Mousset has his expertise in developing advanced electrochemical processes for environmental applications, e.g. soil remediation and wastewater treatment. He got his PhD under supervision of Prof. M A Oturan in the framework of Erasmus mundus ETeCoS3 programme. As tenured CNRS researcher expert in the field, he has been invited in several conferences. He developed the kinetics of primary soil pollutant and the intermediates have been monitored and modeled which allowed predicting the evolution of these molecules. He demonstrated that this kinetics of pollutants degradation depend on the kind of washing agent employed (i.e. its chemical structure) to extract the pollutant from the soil. He also highlighted the ecotoxicity and biodegradability enhancement of the soil washing effluent treated by advanced electrochemical treatment after a certain electrolysis time. From this approach, new scientific and technological insights have emerged and have been patented and awarded.

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Notes: