

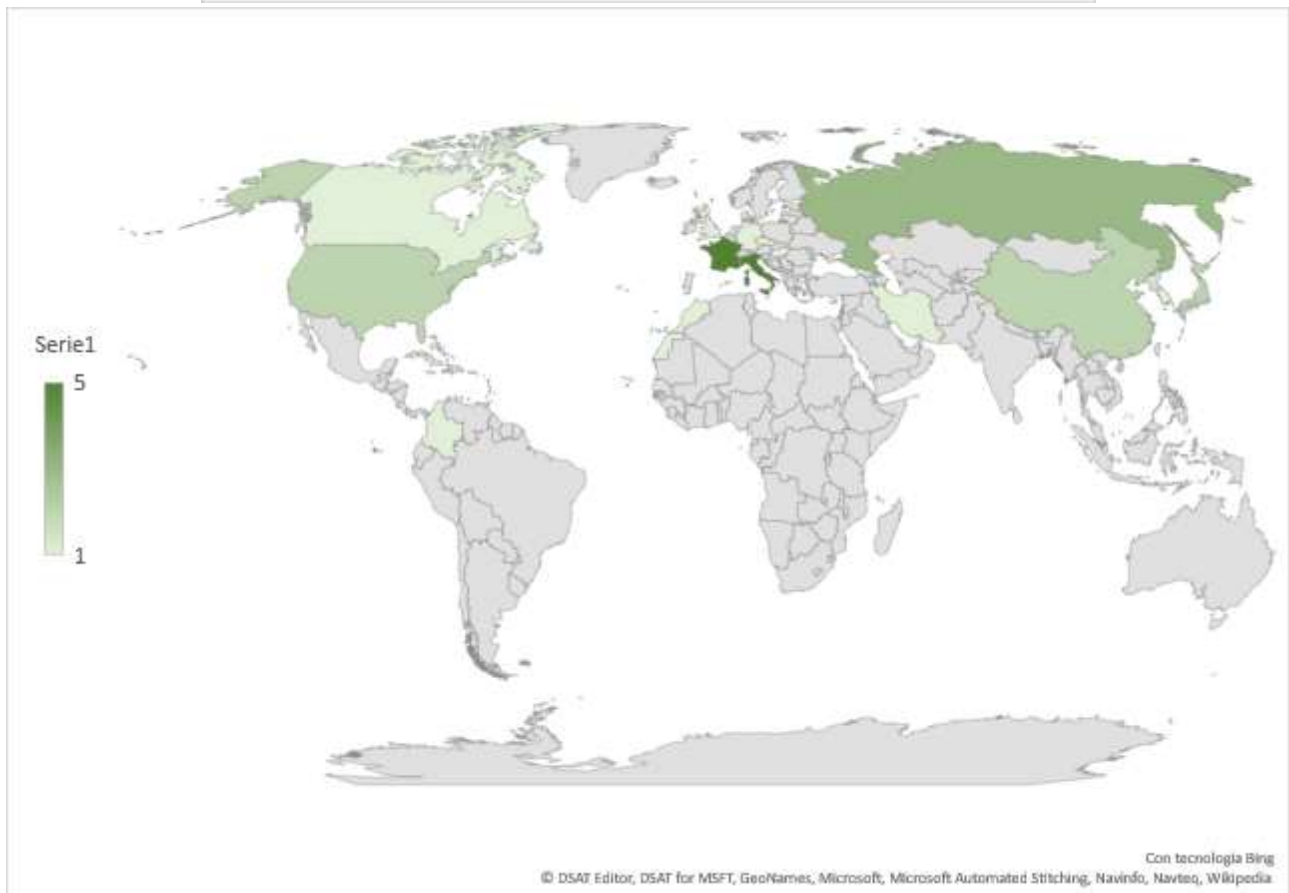
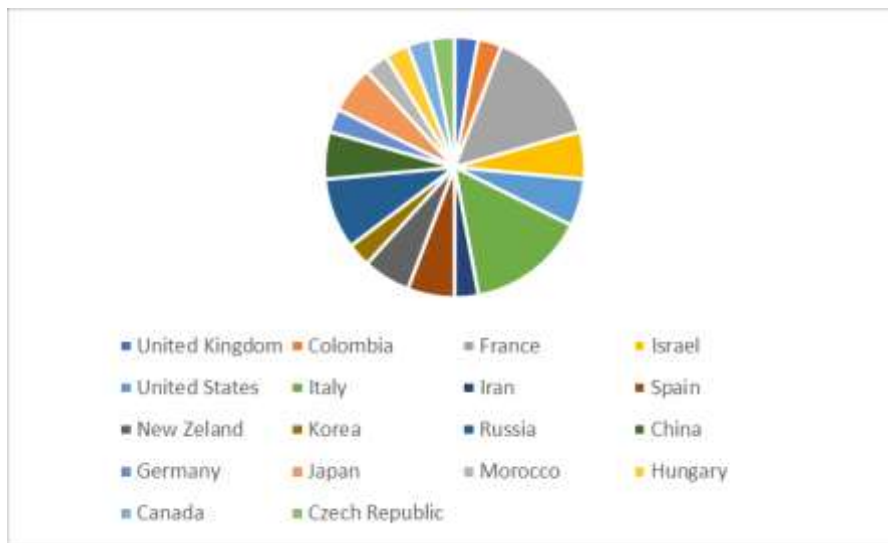
SSS6.4 **Soil water Infiltration: Measurements, assessment and modeling**

Co-organized by HS13

Conveners: Rafael Angulo-Jaramillo, Simone Di Prima^{ECS}, Massimo Iovino, Jay Jabro, Laurent Lassabatere

Chat Tue, 05 May, 14:00–15:45

Session impact: 23 abstracts, Authors from 18 countries



Issues arising from contributions to the session:

- How to take into account soil management and amendments in the modelling of infiltration: induced hydrophobicity, preferential flow generation
- Modeling the infiltration process in a climate change context: mitigation of flood risk and pollutant control
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- Influence of soil physical, chemical and biological factors on infiltration: from laboratory to field scale
- Improvement of infiltration models and knowledge of hydrodynamic properties: the role of geophysical techniques (XCAT, GPR, ERT, ...) and
- Representativeness of samples to study water flow in soils: how to sample the infiltration process?
- Measuring and modelling water infiltration

Water Shedding Properties of Oil Impregnated Hydrophobic Soils

Rebecca McCerery, John Woodward, Glen McHale, Kate Winter

United Kingdom

Infiltration and hydrophobicity. Experiments conducted by impregnating soil surface with oil. In the absence of oil, model hydrophobic soil surfaces are superhydrophobic. In the presence of oil, a sediment-based SLIP/LI surface was observed with water contact angles of 90 degrees.

Modelling gravity-driven fingering in soils having an intrinsic nonzero contact angle (water repellent soils) using the innovative moving-boundary approach

Rony Wallach, Naaran Brindt

Israel, US

Water repellency, preferential flow, fingering. Water content and capillary pressure distributions along fingers are non-monotonic. A new conceptual modelling approach is suggested for the non-monotonic water content distribution in the gravity-driven unstable flow.

How different are effects of vinasse biochar on soil erosion in Loess and Marl soils?

Seyed Hamizedra Sadeghi, Mahboobeh Kiani-Harchegani, Zeinab Hazbavi, Habibollah Younesi,

Padideh Sadat Sadeghi, Rafael Angulo-Jaramillo, Laurent Lassabatere

Iran, France

Biochar produced from deleterious raw vinasse (by-product of sugarcane industries) to control splash and interrill erosions. Biochar decreased soil loss compared to the control plot but such effects strongly depend on the type of soils

Sorptivity and water imbibition into air-dry surfactant-containing soil

Thuc Nguyen, Gilboa Arye

Israel

Surfactants adsorption onto soil particles can change the hydraulic properties of the soil. Surfactant application to hydrophilic soils may eventually induce temporal hydrophobic nature. The sorptivity was reduced relatively to the control.

Evaluation of the retention capacity of Pb and Cu in technosoils of Sustainable Urban Drainage Systems (SUDs) in Bogota, Colombia

Karel Aldrin Sanchez Hernandez, Germán Ricardo Santos Granados, Rafael Angulo-Jaramillo, Carlos Alberto González Murillo, Catalina Lozada Lopez

Colombia, France

Sustainable Urban Drainage systems (SUDs). Technosoils (compacted mixture of sand, loam and rice husk ash). Adsorption isotherms measurements, unsaturated column breakthrough flow experiments and numerical modeling with RETC, STANMOD and HYDRUS 1D models. Order of selectivity: $Pb^{+2} > Cu^{+2}$.

Experimental Evaluation of Equivalent Permeability for Permeable Interlocking Concrete Paver (Soil-Block) Composite System

Jaehun Ahn, Yunje Lee

Korea

The permeability and effect of clogging were evaluated. Equivalent permeability.

Numerical assessment of chemical species infiltration in the Prosecco area

Leonardo Costa, Stefano Mazzega Ciamp, Alessandra Cardinali, Laura Carretta, Nicola Dal Ferro, Marta Mencaroni, Francesco Morari, Giuseppe Zanin, Paolo Salandin

Italy

Pesticides contamination risks. Monitoring activities in two experimental sites consisting in applying Bromide and Glyphosate and measuring temperature and Volumetric Water Content at different depths. Calibration procedure performed using PEST. The Bromide simulations agree with the infiltration behaviour.

Heterogeneity of unsaturated flow measured in the dry summer of 2018 in Germany recorded by the combination of ERT and soil data

Stadler Susanne, Fishkis Olga, Noell Ursula

Germany

Combined geophysical and small-scale instrumentation to measure soil conditions (soil water tension, water content, electrical resistivity, temperature, seepage water at suction plates) in a maize field. Heterogeneity of the subsurface water content shows that cross-scale methods are needed for an adequate assessment of unsaturated flow

Millimeter scale water movement on convex and concave surfaces of porous media under microgravity

Yuichi Maruo, Naoto Sato, Natsumi Naganuma, Kento Nogawa, Maho Tsukano, Hayato Mizutani, Kosuke Noborio

Japan

Air entrapment on pore neck may induce higher tortuosity and made capillary flow slower under microgravity. Evaluating the capillary flow rate on convex and concave surface on the particle of porous media under microgravity and under 1 G.

Infiltration rate in unsaturated glass beads porous media under various gravity made by parabolic flight.

Naoto Sato, Yuichi Maruo, Kento Nogawa, Natsumi Naganuma, Kosuke Noborio

Japan

Understand water movement in porous media under microgravity to establish a plant growth system for crop production for astronauts. Water infiltration experiments under microgravity, 1/6G, and 1/3G conditions made by parabolic flights.

Effect of compaction on soil water holding capacity: Case of Moroccan semi-arid context

Yassine al Masmoudi, Khalid ibno Namr, Abdellah el Aissaoui

Morocco

Investigation of the effects of soil compaction on available water holding capacity. Evaluation of AWHC using pedotransfer function showed similar results to data taken from direct evaluation based on bulk density.

Effect of persistent water cover on soil structure, investigated on representative Hungarian soil samples

Viktória Labancz, András Sebők, Imre Czinkota, Tamás Szegi, András Makó

Hungary

Investigating the effect of permanent water cover on soil structure. Aggregate stability with Mastersizer 3000 Hydro LV laser diffractometry device.

A field study of depletion-replenish water storage mechanism in tree stems in semi-arid region

Yiben Cheng, Yunqi Wang, Qunou Jiang

China

Use of water storage in tree stem. Continuous monitoring and analysis of the sap flux. The start time and the peak time of sap flow at stem top is later than the sap flow at stem breast. Stem water storage increases the drought tolerance of trees.

Testing an infiltrometer methodology to investigate water impact effects on both soil sealing and hydraulic properties of a loam soil under conventional tillage and no-tillage

Mirko Castellini, Simone Di Prima, Anna Maria Stellacci, Massimo Iovino, Vincenzo Bagarello

Italy

Three water pouring heights (low, L=3 cm; medium, M=100 cm; high, H=200 cm) on both no-tilled (NT) and conventionally tilled (CT) loam soil were investigated. BEST-procedure to estimate the soil hydraulic properties. A recently tilled loamy soil can be less resilient as compared to a no-tilled one. The methodology looks promising to mimic effects of high energy rainfall events.

Modelling soil physical properties based on XCT scans processed using state-of-the-art local and machine learning based segmentation approaches

Konstantin Romanenko, Efim Lavrukhin, Roman Vasilyev, Kirill Gerke

Russia

Microtomography, saturated hydraulic conductivity. Multi-scale structure modelling techniques. Two different binarization approaches were applied to classify all grayscale voxels into pores and solids.

Binarization of soil X-ray tomography images: revisiting Otsu's method

Konstantin Abrosimov, Konstantin Romanenko, Kirill Gerke

Russia

Binarization: division of the gray-scale images into solids and pores. Automatic global/local methods based on gray-scale image variance minimization (Otsu's method and its variations). Otsu method (3D) worked only for detailed images of microaggregates and its usage for all soils is generally unacceptable,

How representative is the conventional undisturbed soil core sample in terms of flow properties?

Kirill Gerke, Marina Karsanina

Russia

REV analysis for saturated hydraulic conductivity and porosity based on X-ray microtomography scans.

Hydro-mechanical Dependent Hydraulic Conductivity within Alluvial Gravelly Soil: An Experimental Study

Chenghao Chen, Shiang Mei, and Shengshui Chen

China

Hydraulic conductivity of alluvial gravelly soil. Influences of both the packing state and the hydraulic pressures were experimentally studied in a novel large-scale triaxial seepage apparatus. Increasing hydraulic gradient diminishes the hydraulic conductivity.

Infiltration experiments with ultra-high spatial and temporal resolution of saturation measurements

Greg Siemens, Chris Oldroyd, Ryley Beddoe

Canada

2D infiltration apparatus to examine the influence of confined air on infiltration. Digital image analysis techniques incorporating a refractive index that increase spatial resolution of saturation measurements. 2D experiments agree with previous column infiltration results showing air confinement decreases infiltration rate by more than one half. Detectable influence of thin heterogeneities on wetting front migration.

Estimating the macroscopic capillary length using steady state infiltration

Simone Di Prima, Ryan D. Stewart, Mirko Castellini, Vincenzo Bagarello, Majdi R. Abou Najm, Mario Pirastru, Filippo Giadrossich, Massimo Iovino, Rafael Angulo-Jaramillo, Laurent Lassabatere

Italy, France, US

Beerkan infiltration test. Estimation of the macroscopic capillary length from the steady state of infiltration. Validated using analytically generated data and 433 Beerkan runs. The proposed method constitutes a simple solution for estimating λ_c .

A general BEST method predicting soil hydraulic parameters for any type of water retention and hydraulic conductivity curves

Jesús Fernández-Gálvez, Joseph Pollacco, Laurent Lassabatere, Rafael Angulo-Jaramillo, Sam Carrick

Spain, New Zealand, France

BEST methodology to derive soil hydraulic parameters for any type of unimodal water retention and hydraulic conductivity functions. A link between the Kosugi parameters was introduced to reduce the number of parameters estimated and to avoid the need of PTF.

Ponding time, hydraulic conductivity and sorptivity – experimental determination by a single ring infiltrometer with rain simulator

Igor Pelíšek, Jakub Štibinger, Zbyněk Kulhavý, Luca Melorio

Czech Republic, Italy

Stormy rain with constant intensity was applied by rain simulator in a single ring infiltrometer. Compared to traditional methods (single or double ring infiltrometer), soil hydro-physical characteristic (K, S) determined by this method is more reliable, informative and verified by ponding time.

Finite formulation for the computation of sorptivity

*Pierre-Emmanuel Peyneau, Laurent Lassabatere, Joseph Pollacco, Jesús Fernández-Gálvez,
Borja Latorre, David Moret-Fernández, Simone Di Prima, Rafael Angulo-Jaramillo
France, New Zealand, Spain, Italy*

A new expression for sorptivity by cutting the integral in two parts (water content and pressure head), in order to involve only the integration of a finite function over a finite interval.