
Proceedings

of the 21st World Congress of Soil Science

VOLUME II



RIO18

21st World Congress
of Soil Science

SOCIEDADE BRASILEIRA DE CIÊNCIA DO SOLO
Viçosa, MG, Brazil - April 2019

SYSNO _____
PROD _____

ACERVO, 2019

PROCEEDINGS
of the 21st WORLD CONGRESS OF SOIL SCIENCE
Rio de Janeiro, August 12-17, 2018 BRAZIL

SOIL SCIENCE
Beyond Food and Fuel



PROCEEDINGS

of the 21st WORLD CONGRESS OF SOIL SCIENCE

VOLUME II

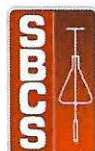
EDITORS

LEANDRO SOUZA DA SILVA
LÚCIA HELENA CUNHA DOS ANJOS
DALVAN JOSÉ REINERT
HEITOR CANTARELLA
CRISTINE C. MUGGLER
RAPHAEL B. A. FERNANDES
IGOR RODRIGUES DE ASSIS
FLÁVIO A. DE OLIVEIRA CAMARGO

SOCIEDADE BRASILEIRA DE CIÊNCIA DO SOLO
Viçosa, MG, Brazil
2019



International Union of Soil Sciences



**Sociedade Brasileira de
Ciência do Solo**

Cover: Seculo Comunicações.

Layout: Flávio Camargo and Luana Redivo

Review: Scientific committee

English review: Ted King

Online Abstract: Brantan Chagas

To cite the abstracts of the 21WCSS:

<Author's Name>. 2019. <Title of Abstract>. In: 21WCSS: Proceedings of the 21st World Congress of Soil Science; 2018, August 12-17; Rio de Janeiro, Brazil: SBCS. Vol. II, p.<XXX>.

Example:

Sukhoveeva, O.E.; KARELIN, D.V. 2019. Modelling soil respiration and net ecosystem exchange in agrolandscapes. In: 21WCSS: Proceedings of the 21st World Congress of Soil Science; 2018, August 12-17; Rio de Janeiro, Brazil: SBCS. Vol. II, p.544.

The content of the abstracts is the responsibility of the presenting authors.



Prepared by the Cataloging Section and Classification of the UFV Central Library

ISBN 978-85-86504-27-3

W927
2019

World Congress of Soil Science (21. : 2018 : Rio de Janeiro, RJ, Brazil)

Soil science: beyond food and fuel : proceedings of the 21st World Congress of Soil Science, Rio de Janeiro, RJ, Brazil, August 12-17, 2018 / editors Leandro Souza da Silva [et al.] -- Viçosa, MG : SBCS, 2019. 2 livros eletrônicos (pdf, 5,1MB, 7,9MB)

Texto em inglês.

ISBN 9788586504280 (obra completa). – ISBN 9788586504297 (v.1). - ISBN 9788586504273 (v.2)

1. Ciência do solo - Congressos. I. Silva, Leandro Souza da, 1972-. II. Anjos, Lúcia Helena Cunha dos, 1957-. III. Reinert, Dalvan José, 1956-. IV. Cantarella, Heitor, 1953-. V. Muggler, Cristiane Carole, 1960-. VI. Fernandes, Raphael Bragança Alves, 1969-. VII. Assis, Igor Rodrigues de, 1980-. VIII. Camargo, Flávio Anastacio de Oliveira, 1966-. IX. Sociedade Brasileira de Ciência do Solo. X. Título. XI. Título: Proceedings of the 21st World Congress of Soil Science.

CDD 22. ed. 631.4

Responsible librarian
Alice Regina Pinto Pires CRB6 -2523

length of the rootstock were analyzed, with diameter <1.0 mm, 1.0-2.0 mm and >2.0 mm, by volume of soil. The results were submitted to analysis of variance, according to the design in subdivided plots, arranged in bands and comparison of means by Tukey's test ($p < 0.05$).

The soil density ranged from 1.11 to 1.64 Mg m⁻³ with higher values found in WT, followed by BWT and CLP, in which the planting line managed with the use of the grid and trimmer showed higher values in relation to the others, as a consequence, in the reverse order, changes occurred in the pore space of the soil with a reduction of macroporosity, which presented values between 0.06 and 0.19 m³ m⁻³. Soil compaction was accentuated between 15 and 30 cm, evidenced by higher values of PR at this depth. CLP presented lower resistance to penetration, whereas BWT and WT presented moderate to high values, regardless of the type of implement used. The rootstock of the bergamots presented a higher density of roots at the site of the crown projection line, in all the depths, concentrated in the class of diameter <1.0 mm. The promoted soil movement promoted a reduction in the volume of soil explored by the bergamot root system, as evidenced by the use of the harrow in the orchard.

Keywords: controlled traffic, physical attributes, bergamots.

Financial support: Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq

C3.2.3 - Artificial drainage systems: maintaining soil functions and protecting water resources

(4253 - 1793) Colloids control the transport and the fractionation of REEs in a river impacted by ion-adsorption rare earth mining

Wen-Shen Liu¹; Meng-Yuan Zheng¹; Le-Lan Wu¹; Keng-Bo Ding¹; Xi Zhong¹; Chun-Mei Zhao¹; Yuan-Qing Chao¹; Hermine Huot¹; Ye-Tao Tang¹; Rong-Liang Qiu¹

School of Environmental Science and Engineering, Sun Yat-sen University, Guangzhou, China; Guangdong Provincial Key Laboratory of Environmental Pollution Control and Remediation Technology, Guangzhou, China¹

Middle rare earth elements (MREEs) and heavy REEs (HREEs) enrichment have been observed in most of the natural waters, while the reasons are still incongruent. In ion-adsorption rare earth deposits, REEs occur at trivalent cationic state (60%-95% of the total REEs) and are adsorbed onto clays and readily extractable by a simple leaching technique with an aqueous ammonium sulfate solution via an ion-exchange process. The objective of this work was to study the contribution of the colloids and the complexation by ligands to REE fractionation in a river impacted by ion-adsorption REE mining activities. In particular, the complexation of REEs by SO₄²⁻, present in high concentrations at the upstream and by natural organic matter (NOM) at the downstream of the river were investigated. We sampled thirteen sites (3 parallels of each) along with a river influenced by ion-adsorption rare earth mining and one site of control at Dingnan, Southern China. REEs (<0.45 and <0.22 μm), anions and cations (<0.45 and <0.22 μm), pH, NOM (<0.7 μm) were tested. Results showed a high REEs concentration in the water samples (<0.45 μm), which had a significant positive correlation with SO₄²⁻ and nitrogen concentrations, indicating mining activities sources. There was a transfer from MREEs to HREEs enrichment (normalized with Post-Archean Australian Shale (PAAS)) from upstream to downstream. At the downstream REEs were predominantly concentrated in 0.22-0.45-μm colloid fraction (59-94% of the <0.45 μm water). The proportion of REEs in the 0.22-0.45-μm colloids increased with the content of TOC in <0.45 μm water. In addition, the REEs in 0.22-0.45 colloids enriched HREEs at downstream, indicating a possible REE-NOR composition of 0.22-0.45 colloids in the downstream. These results were congruent with the results of the modelling by WHAM, which showed that NOR-

REE colloids induced an enrichment in HREEs and were the dominant form of REEs (87-96% of the <0.45 μm water) at the downstream. The results modeled by WHAM also showed that the major speciation of REEs was present in REE³⁺ (12-44% of the <0.45 μm water) and REE(SO₄)⁺ (16-66% of the <0.45 μm water) at the upstream water. In all, our results support that NOR-REEs colloids control the transport and fractionation of REEs in the river impacted by ion-adsorption rare earth mining activities. This stresses the need of ecotoxicological evaluation of REE-NOR colloids in such water bodies.

Keywords: ion-adsorption rare earth mine; rare earth elements (REEs); natural organic matter (NOM); colloid; fraction

Financial support: This work was supported by National Natural Science Foundation of China (NSFC) under Grant No. 41771343 and No. 21607178; Science and Technology Planning Project of Guangdong Province under Grant No. 2016A020221013; Fundamental Research Funds for the Cent

(7984 - 2361) Diagnosis of the conflict of use and occupation of soil in hydric quality: a study in the córrego da olaria watershed – Pindorama, São Paulo, Brazil

Maria Conceição Lopes¹; Antonio Lucio Mello Martins²; Mariana Bárbara Lopes Simedo¹; Teresa Cristina Tarlé Pissarra¹; Renato Farias do Valle Junior³; Renata Cristina Araújo Costa¹
São Paulo State University (UNESP), Faculty of Agrarian and Veterinary Sciences, Jaboticabal Campus¹; Polo Regional Centro Norte of São Paulo Agribusiness Technology Agency (APTA)²; Federal Institute of the Triângulo Mineiro – IFTM, Uberaba Campus³

The analysis of the ecosystem in the watershed, with respect to the use and suitability of the soil and the physical characteristics, of a given region should be managed in order to improve the knowledge to the quality of the water resources. The objective of this work was to identify the areas of conflict of land use, monitoring the physical-chemical parameters of the water, differentiating the variables in the area of environmental conflict according to the methodology of the roughness coefficient, which together with the mapping of the current use allowed to identify areas of conflict regarding the use and occupation and suitability of the soil in Córrego da Olaria watershed, Pindorama, São Paulo State, Brazil. Geographic Information System were used, and information integration was performed with overlapping information plans, identifying conflicts of use that correspond to 40.02% of the area of forests and agriculture, occupied by agricultural activities. The physical-chemical parameters: Temperature, Electrical Conductivity, Turbidity and Dissolved Total Solids differed according to the areas of environmental conflict of use and soil suitability.

Keywords: water resource, environmental monitoring, potential land use.

Financial support: FAPESP, Project Number. 2013/11932-1

(1457 - 3134) Forest litter evaporation on Cerrado woodland

Livia M. P. Rosalem¹; Edson Wendland¹
University of Sao Paulo¹

Understanding hydrological and erosive processes are crucial to improve the efficiency of agricultural production. In many countries efforts have been done to better comprehend the processes and impacts related to the erosion process. Studies present that the forest litter helps the maintenance of moisture on soil and can affect the availability of water for runoff and soil infiltration. Regardless the impact of the forest litter, few studies evaluated the water evaporated from forest litter. For directly measurements of forest litter evaporation, an equipment called LID (Litter Interception Device) was installed in a Cerrado woodland area. From 1st June to 20th December

the total rainfall and the forest litter evaporation were recorded each 10 minutes. The collected data were separated into intervals of 3 hours and only the intervals without rainfall record were analyzed. It was observed lower values of total forest litter evaporation (2.3 and 3.7 mm) in June and September, respectively. The total forest litter evaporation was 71.0 mm that corresponds to 16.7% of the total rainfall (423.9 mm) for the period. Although the monitoring was just along 6 months, the results pointed that the evaporation of forest litter may be considered a significant hydrological process to the total evaporation in forests of Cerrado woodland. Thus, if the forest litter does not intercept this significant quantity, it would affect some processes as infiltration or runoff. Therefore, the forest litter interception should not be neglected. The monitoring must be carried out for more periods to achieve better analysis of variation of this interception along the year.

Keywords: Evaporation; Forest litter interception; Unsaturated zone; Available water.

Financial support:

(6828 - 1082) Monitoring of available water content variation on different upland soils using undisturbed weighable lysimeters

Junghun Ok¹; Kyunghwa Han¹; Yongseon Zhang¹; Heerae Cho¹; Kangho Jung¹; Dongjin Kim¹

Soil and Fertilizer Division, National Institute of Agricultural Sciences¹

The droughts can be assessed based on soil moisture by monitoring of available water content (AWC) change in upland soil. The AWC is the range of available water that can be stored in soil and be available for growing crops. However, the AWC in the soil varies greatly depending on soil texture and bulk density. Therefore, the monitoring of AWC is difficult to know precise exact change value continuously in upland field. The aim of this study was to evaluate the effect of AWC change on crop growth using weighable lysimeters. The experiment was conducted at NAS lysimeter station (35°49'29.0"N, 127°02'46.4"E) with 18 weighable lysimeters (diameter 1 m, depth 1.5 m) with upland soil monoliths. The each 6 weighable lysimeters filled upland soils for silty clay loam, loam, and sandy loam, respectively. The tensiometers and soil moisture sensors (UMP-1) were installed at 10 cm, 30 cm, 55 cm, 85 cm and 125 cm soil depth from the surface, respectively. And the weight sensors were installed on the bottom of the lysimeter vessel to measure changes in water content in real times. The target crop was selected soybean because a large cultivation area and relatively high water consumption in Korea. The water management was treated irrigation at 50 kPa and no irrigation. In 2016, it showed low precipitation and high solar radiation compared to the last 30 years average. The yield of soybeans was reduced to 30% when the AWC for 10 days was continuously maintained at 15-45% without precipitation compared to the appropriate irrigation treatment. In addition, the whole leaf of the soybean was stunted when AWC was maintained lower than 15% for more than 7 days continuously. Therefore, the prediction of available water content variations in advance is considered necessary for appropriate water management.

Keywords: available water content, weighable lysimeter, soil texture, upland

Financial support:

(4256 - 1772) Spatial variability of soil attributes in a cultivated area of underground dam in the State of the Paraíba, Brazil

Maria Sonia Lopes da Silva¹; Alexandre Ferreira do Nascimento²; Hilton Luís Ferraz da Silveira³

Embrapa Solos UEP Recife. Rua Antônio Falcão, 402. Boa Viagem. Recife, PE. 51020-230. E-mail: sonia.lopes@embrapa.br¹; Embrapa Agrossilvipastoril. Rodovia MT, 222, Km 2,5, s/n. Zona Rural, Caixa Postal 343. Sinop, MT. CEP: 78550-970. E-mail: alexandre.nascimento@embrapa.br²; Embrapa Solos UEP Recife. Rua

Antônio Falcão, 402. Boa Viagem. Recife, PE. 51020-230. E-mail: hilton.ferraz@embrapa.br³

The implementation of several municipal, state, and federal government programs aiming to facing the water scarcity has substantially improved the number of underground dams in the semiarid region of Brazil. That technology consists in the building of a waterproof wall transversal to drainage water preventing the lateral flow of water in and on the soil, stream bed, and River. So, the water is stored into the soil pores and may be used to crops "in situ" or to irrigate areas "ex situ", as well as to animal watering. Among the advantages in adopting the underground dams we highlight the functionality, low cost to building, low risk of contamination, low water loss by evapotranspiration, moreover it is possible to use the land around to crops. The areas of the underground dams are disturbed environments once it changes the natural water flow and its dynamic. Knowing the spatial variability of soil attributes in this colluvial/alluvial areas would aid to choose the better soil management that should be adopted to guarantee the sustainable food production in this environment. Geostatistic is a powerful tool for this purpose, allowing showing the special variability of soil attributes. This work aimed to assess the spatial variability of chemical and physical soil attributes of an underground dam located in Solânea county, Curimataú region, state of the Paraíba, semiarid area in northeast Brazil. Disturbed soil samples were collected from depth of 0-0.2 m and 0.2-0.4 m of 16 points distributed in a grid of 25 m x 30 m within the area of the underground dam. Soil attributes assessed were: pH, Ca²⁺, Mg²⁺, K⁺, Na⁺, Al³⁺, H⁺, P₂O₅, Organic Carbon, clay, silt, sand, and bulk density. The model applied to elaborate the maps to show the spatial variability was the Spline. The whole maps elaborated for each soil attribute did not show spatial dependence, indicating that even changing the environment by building a wall into the soil, there were no significantly disturbs in the soil attributes. Actually, the soil of the underground dam showed high fertility, high organic matter content, low acidity and Al³⁺ exchangeable, and with texture suitable to store water and to cropping. Therefore, underground dams did not trigger soil processes that can lead to soil degradation, as ions accumulation, acidity, low level of exchangeable bases, and high bulk density, however, we have realized just the opposite, very good condition to plants growing.

Keywords: soil and water management; technology to coexist with the semiarid; family farming.

Financial support: Mandacaru-I Awards; Spanish Agency for International Development Cooperation (AECID); Brazilian Ministry for social development and fight against hunger; and Environmental institute sustainable Brazil (IABS).

(1641 - 3104) Standardized difference vegetation index in the relationship of productivity and nitrogen content in corn cultivated in ilpf system

Hugo Miranda Faria¹; Vinícius Marchioro¹; Henildo De Sousa Pereira¹; José Eduardo Corá¹

UNESP Jaboticabal¹

Knowledge about the possible interactions of components of the crop-livestock-forest integration system (ILPF) can help in the selection of management techniques that optimize the production system. In this way the objective of the work was to evaluate if there are synergic, null or antagonistic effects of the forest component in the productivity and nitrogen content in corn plants. The study was developed at the Teaching, Research and Extension Farm of UNESP, Campus de Jaboticabal. The experiment was composed of two areas, cultivated with maize in the intercropping, intercropped with Brachiaria, in the ILPF system, being the first area cultivated with Eucalyptus clone Urograndis I144, and the second, with the species Corymbia citriodora, in a double row system, spaced of 20 m. Nitrogen content