Modeling ecosystem services (es) in soils of urban, industrial, traffic, mining, and military areas (suitmas)

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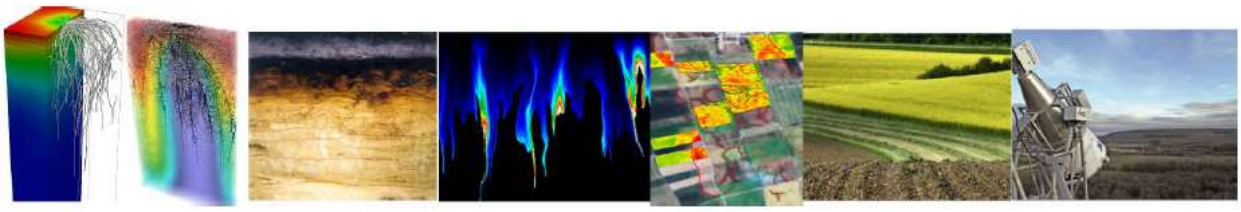

AUSTIN INTERNATIONAL CONFERENCE ON SOIL MODELING

INTERNATIONAL SOIL MODELING CONSORTIUM (ISMC)

March 29 – April 1, 2016
Austin, Texas, USA

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March, 2016

Dear Colleagues:

On behalf of Harry Vereecken, Andrea Schnepf, Jan Vanderborght and the entire technical organizing committee, we welcome you to Austin, Texas, for the first Workshop of the International Soil Modeling Consortium (ISMC). This workshop is the outcome of discussions over the last several years across the soils community, particularly related to the connections between the models/codes we use in our research, and the models/codes that our scientific colleagues use in other disciplines. In general, though the soil modeling community has made enormous progress in the last decades on code and concept development, we continue to face several challenges. Firstly, models that simulate soil processes are still strongly embedded and rooted in specific soil disciplines with a lack of exchange of knowledge and experience between them. Our community needs to expand into a new generation of models based on a systemic approach comprising relevant (physical, chemical, and biological) processes to address critical knowledge gaps in our understanding of soil processes and their interactions. Expanding our research will facilitate exchanges between soil modeling and climate, plant, and social science modeling communities.

We welcome you to join in this discussion; provide ideas, data and algorithms; and help us expand the use of soil models into other disciplines and societal discussions. We have designed an exciting and vigorous technical agenda that includes invited talks by thought leaders, flash talks and posters, and World Café Style working groups that will suggest the framework for an enduring and effective community of scientists to help foster communication with other Earth science disciplines. We specifically aim at establishing an International Soil Moisture Consortium with a visionary mission, an effective governance that serve as a platform for scientific exchange and communication with other Earth sciences disciplines. Of course, we have time reserved for events for informal discussion and opportunities to create new collaborations.

We hope you will enjoy this workshop and your time in Austin, TX.

Sincerely, Members of the ISMC Workshop organizing committee:

Harry Vereecken	Michael Young	Andrea Schnepf	Jan Vanderborght	Ralf Kunkel
Forschungszentrum Juelich GmbH	University of Texas at Austin	Forschungszentrum Juelich GmbH	Forschungszentrum Juelich GmbH	Forschungszentrum Juelich GmbH

MODELING ECOSYSTEM SERVICES (ES) IN SOILS OF URBAN, INDUSTRIAL, TRAFFIC, MINING, AND MILITARY AREAS (SUITMAS)

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In the current Anthropocene, in which human activities have become the major driving force affecting the environment, Soils of Urban, Industrial, Traffic, Mining, and military Areas (SUITMAs) are spreading. If we consider urban expansion as a proxy of these areas, up to 3 % of the world land surface is already covered by SUITMAs and this percentage is growing. SUITMAs are often considered as degraded soils however they provide a wide range of ecosystem services (ES), including provisioning, regulating, and cultural services. To design and explore sustainable, and consistent scenarios for land-use planning including operations like brownfield rehabilitation or the development of urban green areas, there is a need to asses the various ES that are supported by SUITMAs. Whereas still under-developed, soil models adapted to SUITMAs are a basis to quantify and predict ES at the territory scale. Thus the objective of this communication is to review the state of development in the modeling of soil processes that support ES in SUITMAs. Our work is based on two recently published position papers (Morel et al., 2015, Ecosystem services provided by soils of urban, industrial, traffic, mining, and military areas (SUITMAs), Journal of Soils and Sediments and Leguédois et al., 2016, Modelling pedogenesis of Technosols, Geoderma). This mixed technical and conceptual analysis, including a detailed review of a corpus of existing models, allows us to address at once the features of a modeling framework for SUITMAs: the modeling approach, the identification of relevant soil processes, the time scales, and the spatial representation. Concerning the modeling approach, our work highlights that a SUITMAs' framework can be based on: (i) the process-based approach already well developed for others soils; (ii) the coupling of the numerous existing models, this coupling being facilitated by the use of techniques like modeling platforms, uncertainty and sensitivity analyses, or Bayesian methods. According to our work, the most crucial processes needed to represent ES in SUITMAs are related to structure dynamic (aggregation and porosity evolution, compaction), microbial activity, water transfer, and evolution of anthropic or natural organic matters. Whereas water transfer is globally well modeled, developments are necessary for the others processes. As soil processes like organic matter degradation or water transfer are highly seasonal, the models designed for ES assessment have to perform at the annual scale. Longer-term changes have also to be integrated at a decade scale as this timing is consistent with land-use planning. However, models at the decade scale are lacking. Soil's process-based models are mainly dealing with the profile scale and the developments for SUITMAs are focused on this scale but integration at a larger scale is needed to consider ES assessment at the territory level. Along with identified developments in SUITMAs' modelling, the global quantification and prediction of ES need to integrate, among others, economical and social dimensions. To do so, soil models could either by used in a companion approach or coupled in interdisciplinary global models.