



Modelling Pedogenesis in the Anthropocene

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► To cite this version:

Sophie Leguédais, Geoffroy Séré, Jérôme Cortet, Stéphanie Ouvrard, Françoise Watteau, et al.. Modelling Pedogenesis in the Anthropocene. 20. World Congress of Soil Science, Jun 2014, Jeju, South Korea. 2014, 20th World congress of soil science. In Commemoration of the 90th Anniversary of the IUSS. Soils Embrace Life and Universe. June 8 -13, 2014 Jeju, Korea. hal-01189992

HAL Id: hal-01189992

<https://hal.science/hal-01189992>

Submitted on 3 Jun 2020

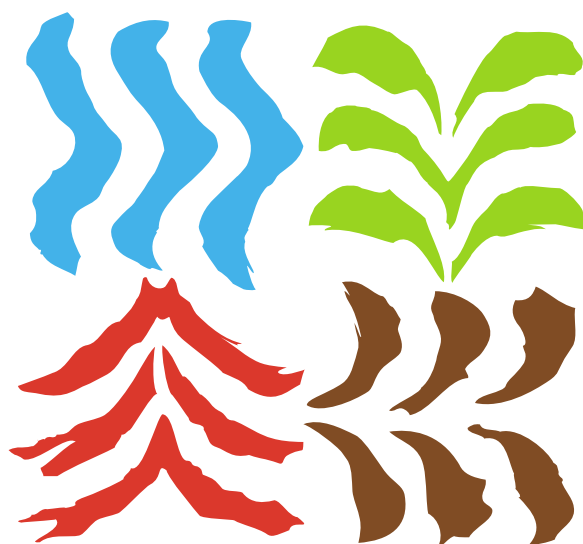
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O81-5

[DS1] Micromorphological Answers to Palaeopedological and Polypedogenetic Questions

Modelling Pedogenesis in the Anthropocene

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The objective of this paper is to develop a framework for pedogenetic modelling in the Anthropocene, i.e., the present geological epoch during which humanity has become the main factor impacting the environment. We review the concepts of soil evolution as well as 15 existing quantitative models to determine the features of soil evolution modelling in an Anthropocene context. We emphasise soil-plant interactions by considering the importance of vegetation, both as a provisioning service and as a factor in soil evolution. Our review covers output variables, time scales, spatial representation, model structure, and control variables. Our synthesis in this work demonstrates that the modelling of pedogenesis in the Anthropocene requires the following specific features: (i) a description of the human impact on soil evolution, (ii) outputs related to ecosystem functions and services, (iii) the integration of a dual time scale (decade and cyclic shorter-term), (iv) multiple and interactive processes modelling, (v) the simulation of vegetation and its feedback on soils, and (vi) a representation of spatial heterogeneities, at least at the profile scale. No specific models of soil evolution in the Anthropocene have been developed thus far; however, certain required characteristics have been integrated into existing soil-plant models. Some others features will require further development, particularly a coherent and tested conceptual cornerstone that enables dual-time-scale modelling and is based on the resilience concept and energy metrics. We thus propose a general framework as a conceptual basis from which we can develop models of pedogenesis in the Anthropocene.

Keywords : Soil evolution, Soil functioning, Resilience, Soil-plant interactions, Dual-time-scale, Decadal time scale, Energy metrics