



Linking soil profile formation and landscape development with a quantitative mechanistic model

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Both soil formation and soil redistribution by erosion-deposition have an important impact on the spatial arrangement of soils in the landscape. Nevertheless, these processes have largely been considered separately in respectively soil formation and landscape evolution models. Here, we use a simple numerical model to analyse the interaction between soil formation and soil redistribution at the landscape scale.

We present a 4-layer mass-balance model. The model includes the main soil forming processes like bedrock lowering, physical and chemical weathering, neoformation of clays, bioturbation and vertical clay mobilization, all of which are parameterised based on literature data. Cellular automata are used to model soil erosion, taking into account important processes such as grain size selectivity and reduction of erodibility with increasing vegetation or stone cover. The model also includes a carbon module. Transition matrices are used to optimise the computational efficiency and allow application at the landscape scale.

Results are presented from simulations in a 6,25 km² area natural area in SW-Australia. Different scenarios, with episodes of varying soil formation and erosion intensities are contrasted.