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The Soil Model Development and Intercomparison Panel (SoilMIP) of the International Soil Modeling Consortium (ISMC)

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The Soil Model Development and Intercomparison Panel (SoilMIP) is an initiative of the International Soil Modeling Consortium. Its mission is to foster the further development of soil models that can predict soil functions and their changes (i) due to soil use and land management and (ii) due to external impacts of climate change and pollution. Since soil functions and soil threats are diverse but linked with each other, the overall aim is to develop holistic models that represent the key functions of the soil system and the links between them. These models should be scaled up and integrated in terrestrial system models that describe the feedbacks between processes in the soil and the other terrestrial compartments. We propose and illustrate a few steps that could be taken to achieve these goals. A first step is the development of scenarios that compare simulations by models that predict the same or different soil services. Scenarios can be considered at three different levels of comparisons: scenarios that compare the numerics (accuracy but also speed) of models, scenarios that compare the effect of differences in process descriptions, and scenarios that compare simulations with experimental data. A second step involves the derivation of metrics or summary statistics that effectively compare model simulations and disentangle parameterization from model concept differences. These metrics can be used to evaluate how more complex model simulations can be represented by simpler models using an appropriate parameterization. A third step relates to the parameterization of models. Application of simulation models implies that appropriate model parameters have to be defined for a range of environmental conditions and locations. Spatial modelling approaches are used to derive parameter distributions. Considering that soils and their properties emerge from the interaction between physical, chemical and biological processes, the combination of spatial models with process models would lead to consistent parameter distributions correlations and could potentially represent self-organizing processes in soils and landscapes.