A review on the global soil property maps for Earth system model

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Soil is an important regulator of Earth system processes, but remains one of the least well-described data layers in Earth System Models (ESMs). We reviewed global soil property maps from the perspective of ESMs, including soil physical and, chemical and biological properties. These soil datasets provide model inputs, initial variables and benchmark datasets. For modeling use, the dataset should be geographically continuous, scalable and with uncertainty estimates. The popular soil datasets used in ESMs are often based on limited soil profiles and coarse resolution soil type maps. Updated and comprehensive soil information needs to be incorporated in ESMs. New generation soil datasets derived by digital soil mapping with abundant, harmonized and quality controlled soil observations and environmental covariates are preferred to those by the taxotransfer rule-based method for ESMs. Because there is no universal pedotransfer function, an ensemble of them may be more suitable to provide derived soil properties to ESMs. Aggregation and upscaling of soil data are needed for model use but can be avoid by taking a subgrid method in ESMs at the cost of increases in model complexity. Uncertainty of soil data needs to be incorporated in ESMs.

Keywords: Earth system model, soil hydrology, soil data, pedotransfer function

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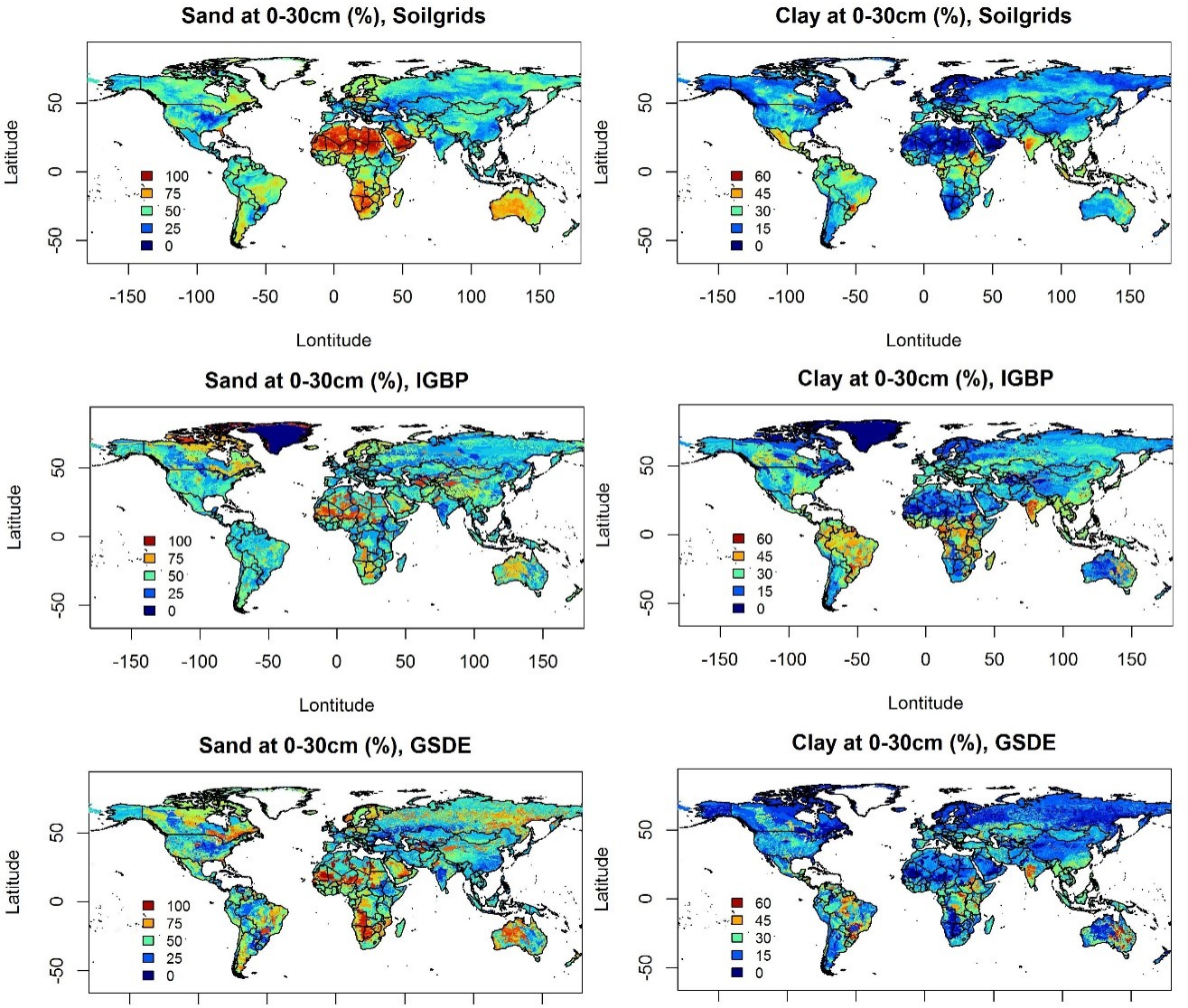

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