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A simple model of soil genesis and weathering suitable for long term carbon cycle studies.

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In order to understand the functioning of the silicate weathering feedback in the geological carbon cycle, we need to characterize the processes which control global spatial variability of weathering rates. This variability of weathering rates and of associated soil states reveals a high dependency on climate and weathering history. Here, the concept of a dynamic model of soil genesis and associated rock weathering rates is presented in the perspective of application to the long term geological carbon cycle. In the model formulation the state of the soil system, i.e. temperature, water balance, depth, composition and partial pressure of carbon dioxide (CO_2) determines the outflow of weathered elements to rivers and ultimately the ocean. This allows us to quantify the sensitivity of silicate weathering rates to climate, the direct and indirect effects of vegetation, and soil age. The model is suitable for integration with an Earth System Model of Intermediate Complexity (EMIC). In this setup the geographic variation of weathering rates and soil state is examined with a present day simulation and the result evaluated.