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Soil biogeochemical cycles under climate change: a model scheme implementation

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The issue of climate changes is one of the main threats to the earth of the last decades, with the raise of the mean global temperature, due to increment of carbon dioxide concentration in the atmosphere, and the consequently twisting of forest ecosystem dynamics. On the other hand, forests provide responses to the effects of climate changes, playing a key role in the mitigation of the problem. However, studying these responses is intricate since there are many factors interacting with each other. Among them, the cycle of nutrients in the soil, in particular carbon, nitrogen and phosphorous, takes on great importance. On this issue, many questions without an answer still persist. The analysis and the studies of the last years have revealed that the increase of atmospheric CO_2 concentration facilitates forest productivity. Nevertheless, this more pronounced forest growth should be supported by an high availability of nutrients in the soil. On the other hand, the increase of global temperature could accelerates the soil organic matter decomposition, causing the rise of nutrients that could be used by the plants.
To study the evolution of these dynamics and to give answers to this kind of questions, a new simulation model of biogeochemical cycles in the soil, the 3D-CMCC-SOIL, is in implementation.
Five different phases (atmosphere, plant, litter, soil and anthropogenic activity) are defined, determining the main carbon, nitrogen and phosphorous pools in every phases and the fluxes between them. In the litter and soil, the organic pools are subdivided in labile, intermediate and recalcitrant, on the base of the chemical composition of the dead biomass. The soil mineral nitrogen and phosphorous are exchanged with plants, by uptake process, and atmosphere, by the transformation in gases forms.