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Influence of elevated atmospheric CO_2 levels on BVOC emissions

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Recent investigations showed, that BVOC (biogenic volatile organic compounds) emissions, especially in the case of isoprene, are influenced by atmospheric CO_2 levels. Doubling the ambient CO_2 concentration leads to a drop in emission potential up to 50% in poplar seedlings. A biochemical regulation scheme of this behavior was recently proposed by Monson and coworkers; Introducing a cellular level regulation scheme that include enzymatic transport steps of triose phosphates, phosphoenolpyruvate (PEP), and pyruvate over the chloroplast membrane. Because of this link between cytosolic and chloroplastic processes, affected by CO_2 concentrations, a regulation of the metabolite precursors entering the 2-C-methyl-D-erythritol-4-phosphate (MEP) pathway.

In this modeling approach, we set up a skeleton model to describe the proposed membrane transport processes and the influence of cytosolic PEP-carboxylase activity on the precursors of the MEP pathway. We used poplar seedlings, grown under ambient and elevated CO_2 levels to verify the modeling results.