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SWAP 50 year: Advances in modelling soil-water-atmosphere-plant interactions

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Modelling soil-water-atmosphere-plant interactions and the modelling of processes in the unsaturated zone is performed in research and engineering projects worldwide, often extended to practical applications by stakeholders. The hydrological model SWAP stands out as a frequently used tool in this context. We consider the SWAP model and its predecessors like SWATR and SWACROP to have been initiated half a century ago, in 1974, in an article by Feddes, Bresler and Neuman in *Water Resources Research* entitled 'Field test of a modified numerical model for water uptake by root systems'.

Over the years, the evolution to the present version of SWAP went through a great number of alterations, additions and improvements. In this contribution we will provide an overview on these developments, especially those from most recent years. This will include, amongst others, root growth dynamics, root water uptake and links to crop growth modelling. We aim on further improvements given new challenges like those resulting from climate change, extreme weather events, aspects of environmental sustainability, model parameterization, and model structure.