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Towards making karst hydrologic models more user-friendly – The integration of the LuKARS model into FREEWAT

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Modeling karst spring discharge while considering potential impacts of land use changes in a recharge area is a crucial task for water resource managers worldwide. Generally, such models are based on sophisticated mathematical functions developed and applied by researchers and their complex nature does not allow an intuitive applicability. To overcome this limitation and to make these models applicable for stakeholders, they need to be integrated in an applicable and open source framework that can be used by water managers without losing the original and full modeling functionalities.

In our work, we introduce a user-friendly modeling environment by integrating the recently proposed LuKARS (Land use change modeling in KARSt systems) model into FREEWAT (FREE and Open Source Software Tools for WATer Resource Management). LuKARS is a lumped, rainfall-discharge model for karst systems that considers impacts of land use changes by changing the area of a so-called hydrotope, representing a landscape unit with homogeneous soil and land use properties. FREEWAT provides an open source toolkit for water resource management that is implemented as a plugin in QGIS. The integration of LuKARS benefits from QGIS' mapping, visualization and geospatial manipulation capabilities. The plugin of FREEWAT provides a modular concept of pre- and post-processing tools that facilitate the setup, calibration, analysis, storage and sharing of a LuKARS model.