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Sensitivity of long term processes influencing evaporation on the hydrological response

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Evaporation is one of the most important fluxes in the hydrological response, yet it is difficult to measure and conceptualize. In most hydrological models, the level of conceptualization of evaporation is limited by the availability of input data. As a result, some long term processes are simplified or parameterized to a single value, since they are not expected to change much within the usual simulation length. However, in studies investigating the long-term hydrological response under e.g. climate scenarios, assumptions like these are likely to no longer be valid. For example, it is known that the concentration of CO_2 in the atmosphere influences both the stomata conductance in plants and the leaf area index, which both influence the evaporation from plants. Furthermore, long term trends in radiation like the "global dimming and brightening" event are known to influence evaporation. In this study, we investigate the sensitivity of these processes on both the evaporation and the hydrological response in the Rhine basin. Two previous years are used as representative years for the future in order to keep precipitation constant between the runs. Sensitivities to the individual processes are calculated both separately and collectively. The computationally efficient dS2 rainfall-runoff model is used to simulate the hydrological response based on an ensemble of potential process combinations.