Developing a feedbacks toolkit for regional water resource assessments

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Abstract There is a need to include the atmospheric feedbacks that alter evaporative demand in a region when water availability is changed. This is because the water resource implications of large-scale irrigation or soil water depletion cannot be assessed unless the subsequent changes to air temperature, humidity and cloudiness are accounted for. Here, we propose a simple tool that can be used to assess such feedback strengths anywhere in the globe, although it will not always be appropriate. The tool is based on a simple box model for the planetary boundary layer, assuming a semi-permeable lid at the top, but taking advection into account as well. Sample calculations with a prototype of the tool and an analysis of atmospheric data in North America showed that atmospheric feedbacks can play an important role in water resource assessments in some regions. If the region has a relatively straightforward feedback regime dominated by one-dimensional feedback processes, this can be quantified using the simple tool.

Key words water resource management; evapotranspiration; land–atmosphere feedback