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A global water resources assessment under climate change: A perspective on sub-annual variation in water resources and water use

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For realistic and informative global water resources assessments, not only spatial distribution but also sub-annual variation of water resources and water use should be considered. An integrated global water resources model was developed consists of six modules, namely land surface hydrology, river routing, crop growth, reservoir operation, environmental flow requirement estimation and anthropogenic water withdrawal. It simulates both natural and anthropogenic water flow globally (excluding Antarctica) at a daily interval, at 1 degree x 1 degree (longitude and latitude) spatial resolution. The model reproduced well the current runoff (major water resources) and agricultural water demand (major water use). Using the model, a global simulation was conducted from 2001 to 2100, and global water resources were assessed with a newly devised indicator. It detects water stressed region caused by the gap between sub-annual variation of water resources and water use, such as Sahel, Asian Monsoon region, and southeast Africa, where most of earlier studies overlooked.