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Coupling the H08 model to the CaMa-Flood model for explicit representation of dams in global flood inundation simulations

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The H08 model is able to simulate the water cycle globally at a daily interval, at a spatial resolution of $0.5° \times 0.5°$ (1, 2). The model simulates both natural and anthropogenic water flow, the latter consisting of manmade structures such as dam and reservoir, agricultural irrigation practices, industrial and domestic water use. The CaMa-Flood model is a new generation of global river routing model (3) which, by explicitly parameterizing sub grid-scale topography of a floodplain, can realistically simulate floodplain inundation dynamics. However, CaMa-Flood does not yet consider the impacts of dams and reservoirs on the hydrological cycle.
The H08 and CaMa-Flood models were coupled to express the operation of dams in the hydrology of lower reach. The former model provided CaMa-Flood with daily river discharge (kg/s) at the outlet of dams and runoff (m3/s) of the grid cells below the dams. The input meteorological dataset used in this study were provided by the ISIMIP2b project (4) and consisted of 4 GCMs and 4 scenarios.
Discharge predicted with the CaMa-Flood model were compared to those obtained with the coupled model. The seasonal discharges in rivers heavily affected by reservoir operation were very different between the 2 simulations. Generally, annual minimum (maximum) 7-day discharge was significantly higher (lower) for the simulation explicitly representing dams. In addition, timings of the discharge peaks were also different between the 2 simulations. During the wet season, the discharge was lower in the simulation considering dams resulting from the storage of excess water into reservoirs. The water was released during the dry season resulting in higher discharge for the dam simulation than for the original CaMa-Flood simulation.

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