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The effect of lakes and reservoirs parameterization on global riverflow modeling

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Lakes and man-made reservoirs are key components of terrestrial hydrological systems. They affect flow regimes by modifying the timing and magnitude of stream flowing in and out of the water bodies, making them important physical entities in flood modeling. In this study we used 463 large lakes and 667 large reservoirs obtained from global databases to investigate their effects on daily streamflow simulations of the Global Flood Awareness System (GloFAS). GloFAS is a grid-based ensemble flood forecasting system that produces daily forecasts with a forecast horizon of 30 days. We assessed the sensitivity of the hydrological model outputs to lake and reservoir parameters using Global Sensitivity Analysis (GSA) methods. Evaluation results against observed streamflow show that incorporation of lakes resulted in improvement of model performance downstream for several catchments globally. While inclusion of reservoirs also resulted in improvement of model skill for majority of catchments, it poses more challenges due to the variability of individual reservoir's operating rules. The GSA test identified some lake and reservoir parameters as higher priority for improving the model performance. Focusing on the high priority parameters for model calibration will reduce the dimensionality without significant loss of model skill