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Evaluation of regional-scale hydrological models using multiple criteria for 12 large river basins on all continents

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A good performance of hydrological impact models under historical climate and land use conditions is a prerequisite for reliable projections under climate change. The evaluation of nine regional-scale hydrological models considering monthly river discharge, long-term average seasonal dynamics and extremes was performed in the framework of the ISI-MIP project for 12 large river basins on all continents. The modelling tools include: ECOMAG, HBV, HYMOD, HYPE, mHM, SWAT, SWIM, VIC and WaterGAP3. These models were evaluated for the following basins: the Rhine and Tagus in Europe, the Niger and Blue Nile in Africa, the Ganges, Lena, Upper Yellow and Upper Yangtze in Asia, the Upper Mississippi, MacKenzie and Upper Amazon in America, and Darling in Australia. The model calibration and validation was done using WATCH climate data for all cases. The model outputs were evaluated using twelve statistical criteria to assess the fidelity of model simulations for monthly discharge, seasonal dynamics, flow duration curves, extreme floods and low flow. The reproduction of monthly discharge and seasonal dynamics was successful in all basins except the Darling, and the high flows and flood characteristics were also captured satisfactory in most cases. However, the criteria for low flow were below the thresholds in many cases. An overview of this collaborative experiment and main results on model evaluation will be presented.