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Sensitivity of hydrologic simulations to bias corrected driving parameters

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Climate model outputs feature systematic errors and biases that render them unsuitable for direct use by the impact models. To deal with this issue many bias correction techniques have been developed to adjust the modelled variables against observations. For the most common applications adjustment concerns only precipitation and temperature whilst for others all the driving parameters (including radiation, wind speed, humidity, air pressure) are bias adjusted. Bias adjusting only part of the variables required as biophysical model input could affect the physical consistency among input variables and is poorly studied. It is important to determine and quantify the effect that bias adjusting each climate variable has on the impact model's simulation and identify parameters that could be treated as raw outputs for specific model applications. In this work, the sensitivity of climate simulations to bias adjusted driving parameters is tested by conducting a series of model runs, for which the impact model JULES is forced with: i) not bias corrected input variables, ii) all bias corrected input variables, iii-viii) all input variables bias corrected except for: iii) precipitation, iv) temperature, v) radiation, vi) specific humidity, vii) air pressure and viii) wind speed. This set of runs is conducted for three climate models of different equilibrium climate sensitivity: GFDL-ESM2M, MIROC-ESM-CHEM and IPSL-CM5A-LR. The baseline for the comparison of the experimental runs is a JULES run forced with the WFDEI dataset, the dataset that was used as the observational dataset for adjusting biases. The comparative analysis is performed using the time period 1981-2010 and focusing on output variables of the hydrological cycle (runoff, evapotranspiration, soil moisture).