## Modification of the manuscript due to the updated climate forcing PGFv2.1

During review time of the submitted manuscript, we were informed by the project coordinators of the Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP), that there is a problem in the PGFv2 data for temperature during the period 1901-1947. "The problem was a mistake in the data provider's processing scripts for temperature and humidity" (https://www.pik-potsdam.de/research/climate-impacts-and-vulnerabilities/research/rd2-cross-cutting-activities/isi-mip/for-modellers/isi-mip-phase-2/input-data/input-data-issues, last access at 2016-03-10)). We have therefore assessed the difference between PGFv2 (which was used in the original submission) and the update PGFv2.1 and decided to use the updated variant in the revision of the manuscript. Here, we describe briefly the effect of the differences of the updated T (and its effect to water balance components) and the modifications that would result in the revised manuscript.

### Global means of climate forcing variables and model results

As seen in Fig. 1, the correction of temperature T affects yearly or decadal aggregations of T by about 0.1 to 0.5 °C which is very large for global averages. The new T pattern fits well to those of the other forcings (comp. to Fig. 2 in the HESSD manuscript). SWD, LWD and P are not affected by the error. As for calculation of longwave outgoing radiation temperature is considered, NR differs by around 1 W $m^{-2}$. AET and Q are differs up to 500 $km^3$ $yr^{-1}$, whereas the influence of modified T on WCa is only marginal.

### Spatial differences and effect for calibration

WaterGAP is calibrated to observed long-term average river discharge, and for PGFv2 preferably for the years 1971-2000 but years of calibration differs in basins with limited data availability. Within 21 river basins (shown in Fig. 2), (some) of the years which are affected by the T error are between 1901 and 1947. Thus, the error could have influenced the calibration approach. However, as shown in Fig. 2, these basins are located mainly outside of "hot spots" where discharge and other variables (except for PET, but these regions are mostly in water-limited areas) are strongly affected by the differences between PGFv2 (erroneous) and PGFv2.1. We therefore would not re-calibrated WaterGAP with PGFv2.1 climate input but use the calibration parameters of the calibration with PGFv2 for the new model runs with PGFv2.1.

## Consequences for the revised manuscript

Fig. 2 will be updated showing model results computed with PGFv2.1 as climate input instead of PGFv2. At (nearly) all occurrences in the text, we changed PGFv2 into PGFv2.1. We would add a sentence at the end of the description of the forcing: "During review process of this manuscript, we were informed about an error in T data for the period 1901-1947. We therefore used the updated forcing PGFv2.1." Numbers will be updated where necessary.

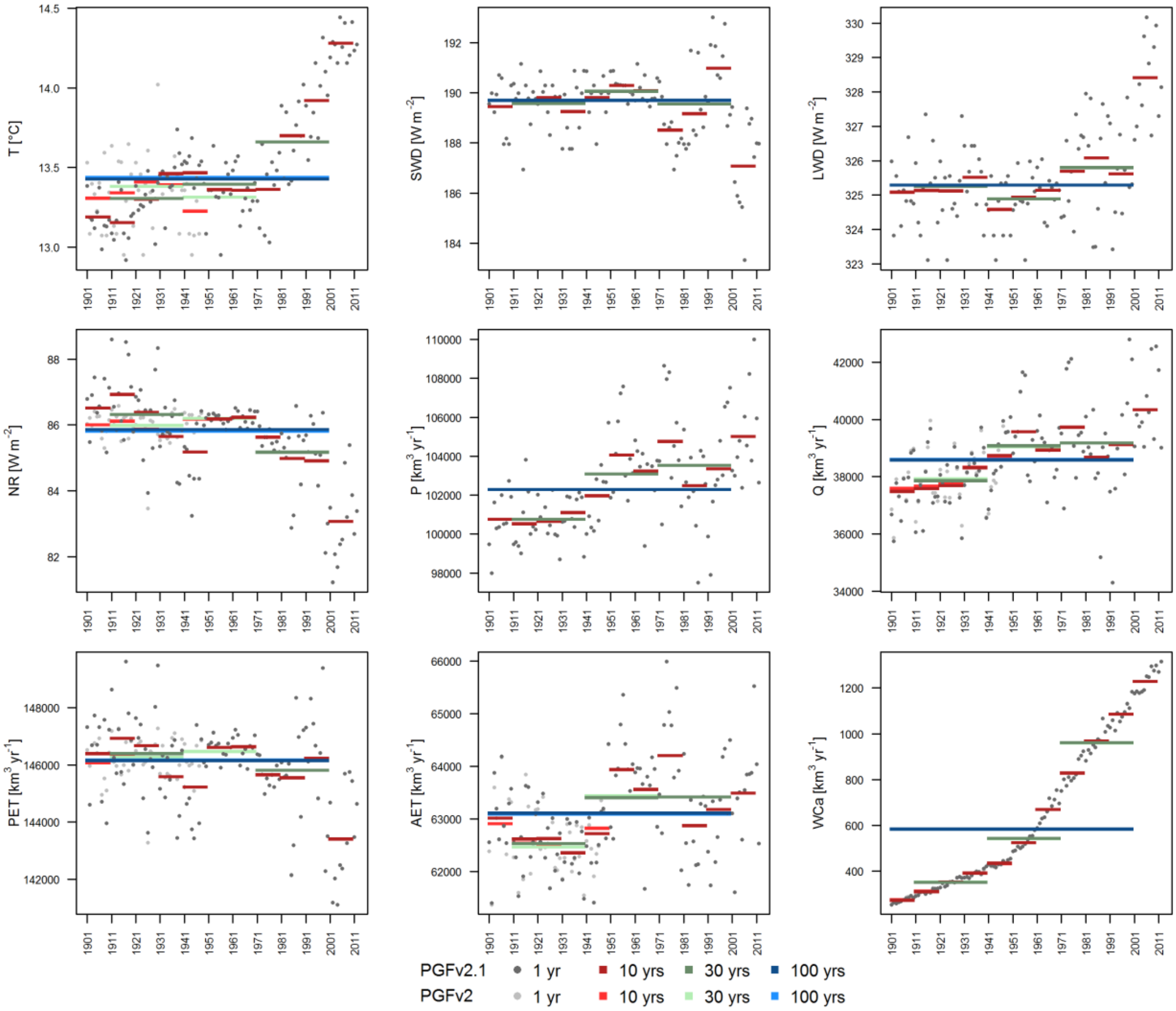


Figure 1: Global means of climate forcing variables and model outputs (T: temperature, SWD: shortwave downward radiation, LWD: longwave downward radiation, NR: net radiation, P: precipitation, Q: river discharge, PET: potential evapotranspiration, AET: actual evapotranspiration, WCa: consumptive water use) for the climate forcings PGFv2 (light colors) and PGFv2.1 (with corrected error for T during 1901-1947, dark colours).

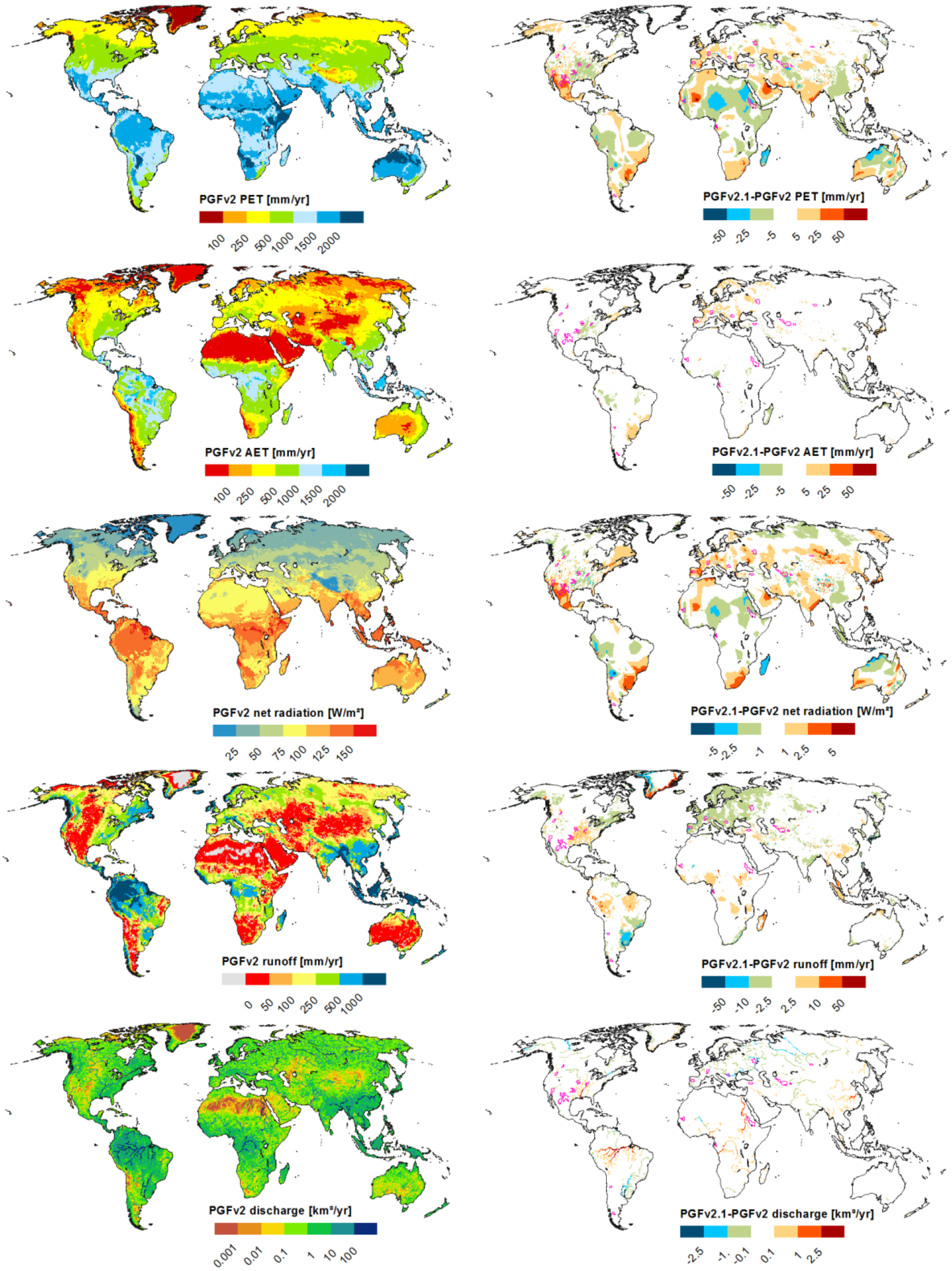


Figure 2: Spatial differences of simulated model outputs of PGFv2 compared to PGFv2.1 for the time span 1901-1947. PET: potential evapotranspiration, AET: actual evapotranspiration. Purple basin outlines included in right column show all the river basins where (some of) the calibration years are within the period 1901-1947 and therefore could be affected by the erroneous PGFv2 climate data.