Supplemental Information for

Regime Shifts in Arctic Terrestrial Hydrology Manifested From Impacts of Climate Warming

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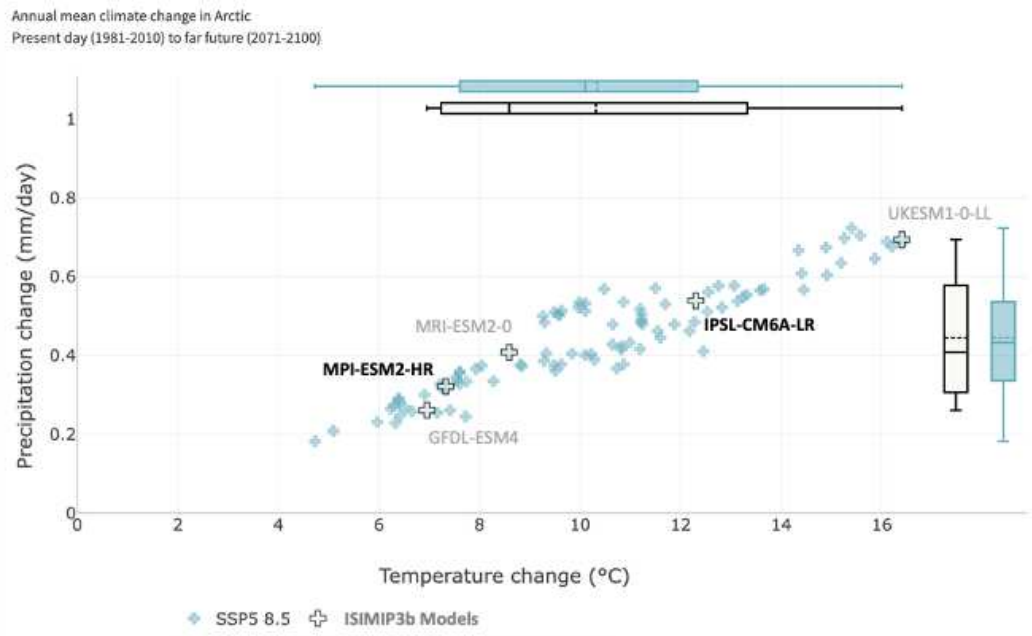

Figure S1: Projected changes in temperature (in °C) and precipitation (in mm day^{-1}) for 2070–2100 relative to 1981–2010 mean for the Arctic based on climate models in the CMIP6 archive. The projections are shown for SSP5-8.5. Five CMIP6 models included in ISIMIP3b are highlighted, with the two that were selected as climate inputs in this study shown in bold. Box and whiskers show ranges in temperature and projections spanned by the full CMIP6 ensemble (blue) and the five ISIMIP3b models (black). The figure was created using the GCMeval tool at https://gcmeval.met.no/

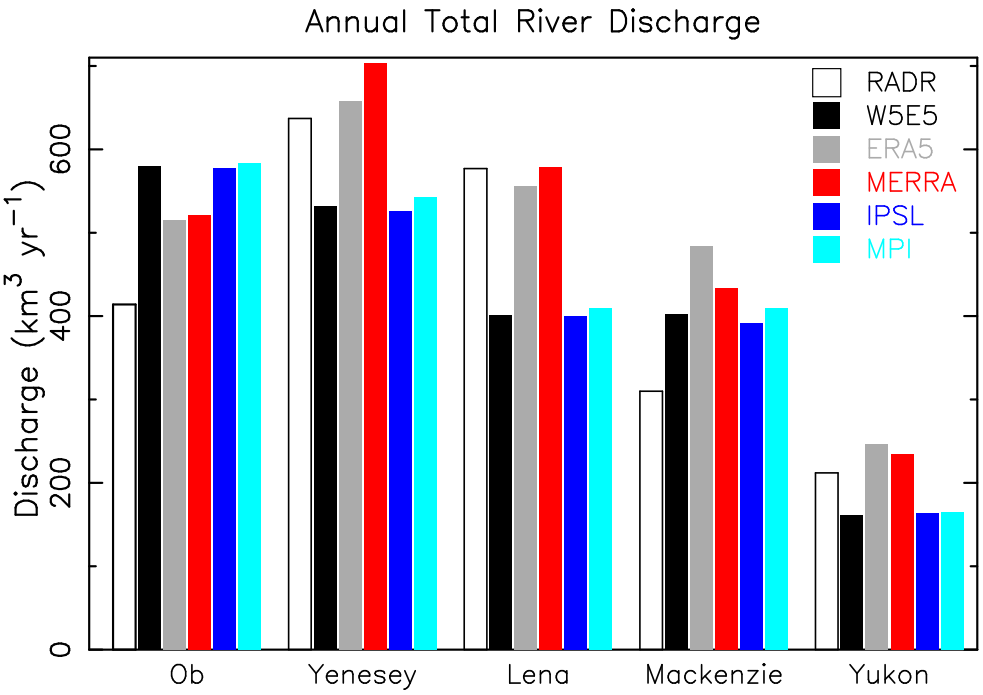

Figure S2: Annual total river discharge (km^3 yr^{-1}) for the five largest Arctic rivers. The RADR dataset (Feng et al., 2021) serves as validation for the simulated estimates (PWBM-). Discharge volume shown as an average over the period 1984–2018 for the RADR data, 1980–2019 for the simulations forced by W5E5, ERA5, IPSL, and MPI, and 1980–2013 for the simulation forced by MERRA.

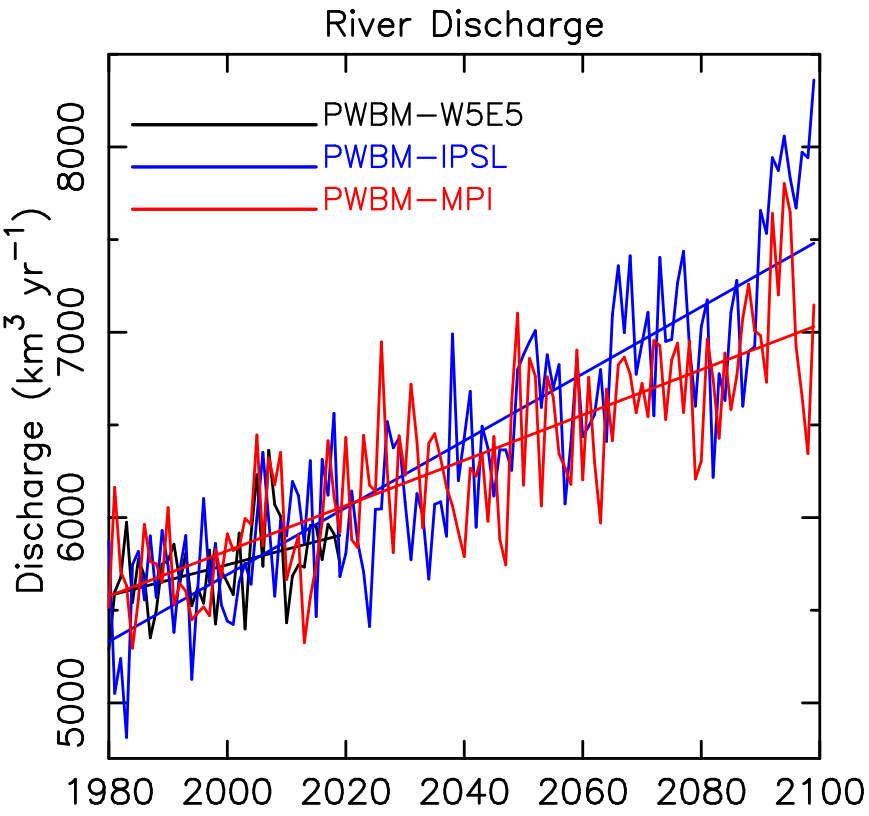

Figure S3: Annual total river discharge ($km^3\ yr^{-1}$) from simulations for 1980–2019 and 1980–2100. Linear trend shown.

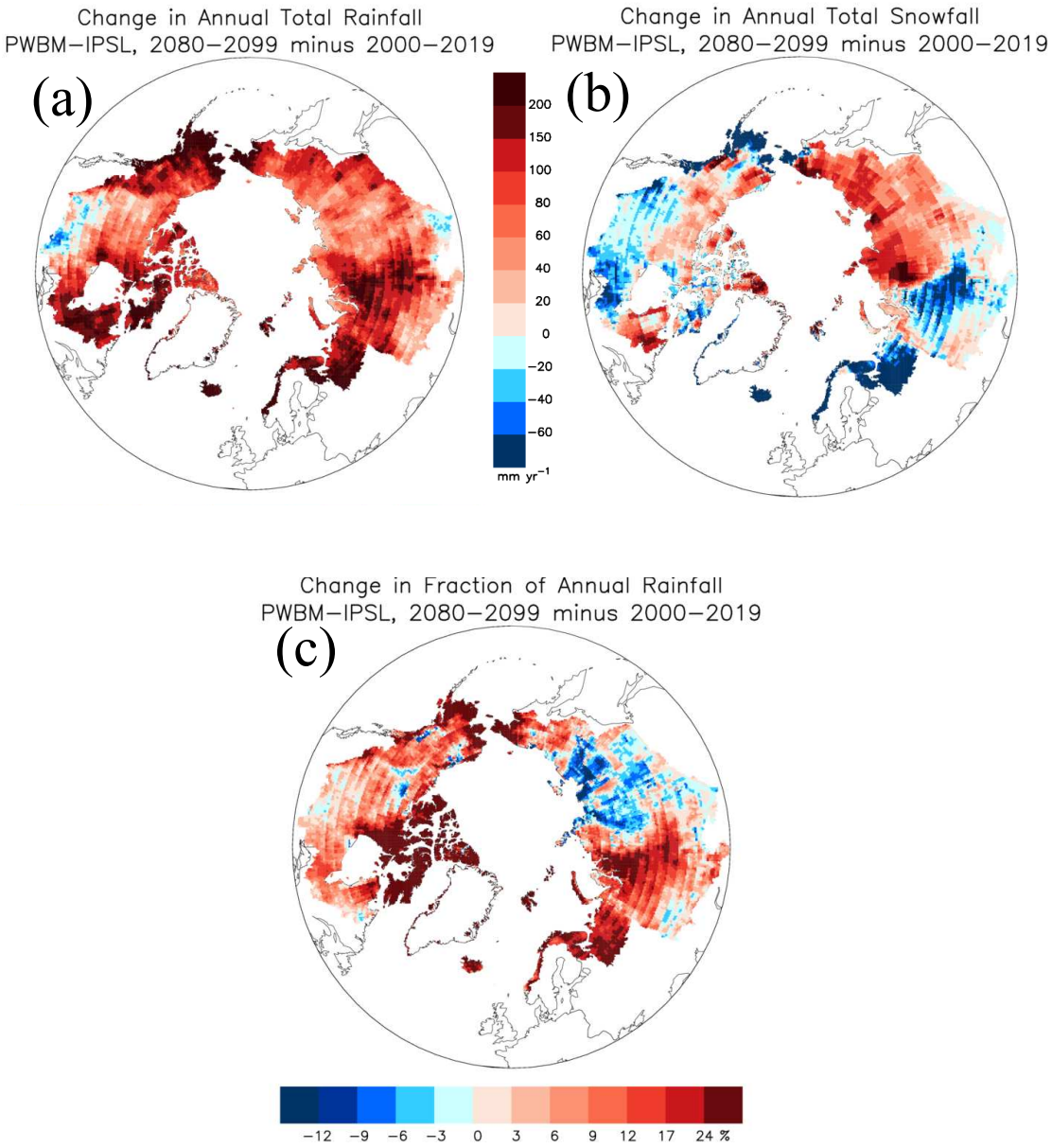

Figure S4: Change in (a) annual rainfall (mm yr^{-1}), (b) snowfall (mm yr^{-1}), and (c) the fraction of rainfall to total precipitation from PWBM-IPSL simulation.

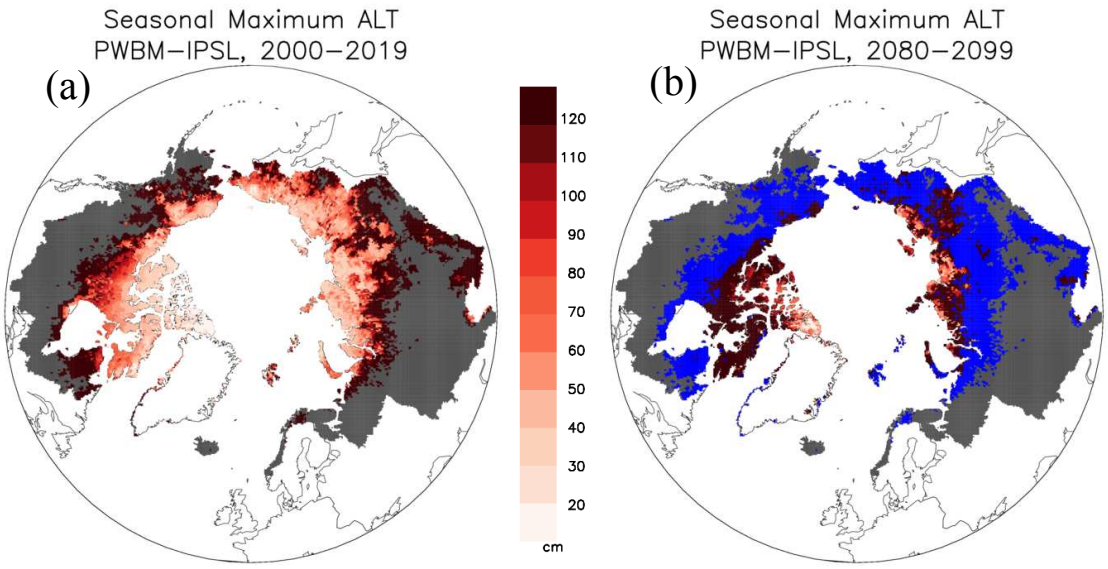

Figure S5: Simulated active-layer thickness (ALT, cm) for (a) early (2000–2019) and (b) late century (2080–2099) periods from PWBM-IPSL. Blue shading highlights areas that are no longer characterized as permafrost in the future period. Gray areas are non-permafrost areas of the Arctic basin.

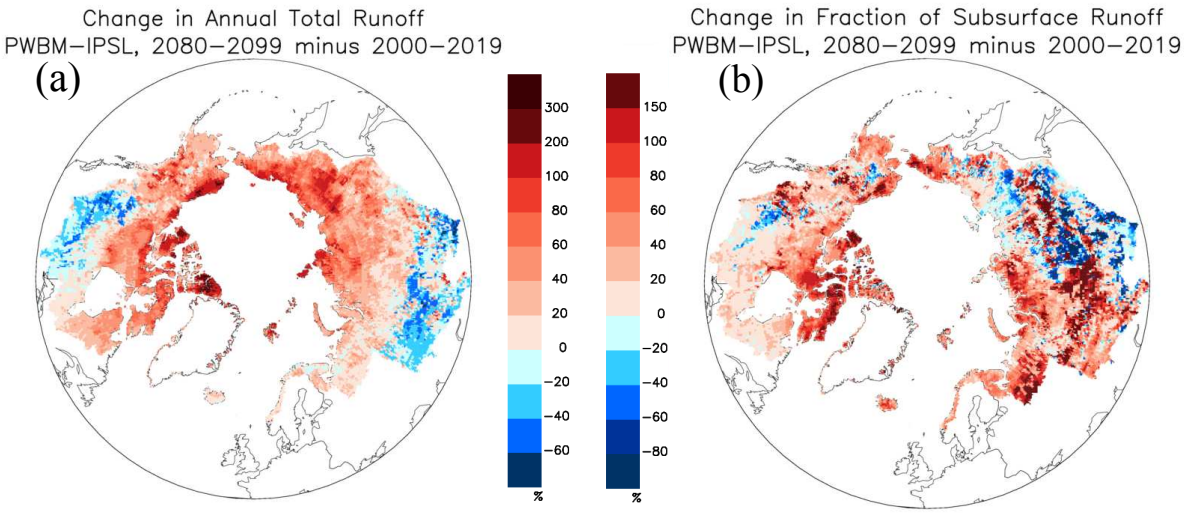

Figure S6: Change in (a) annual total runoff (%) and (b) F_{sub} (%) from PWBM-IPSL.

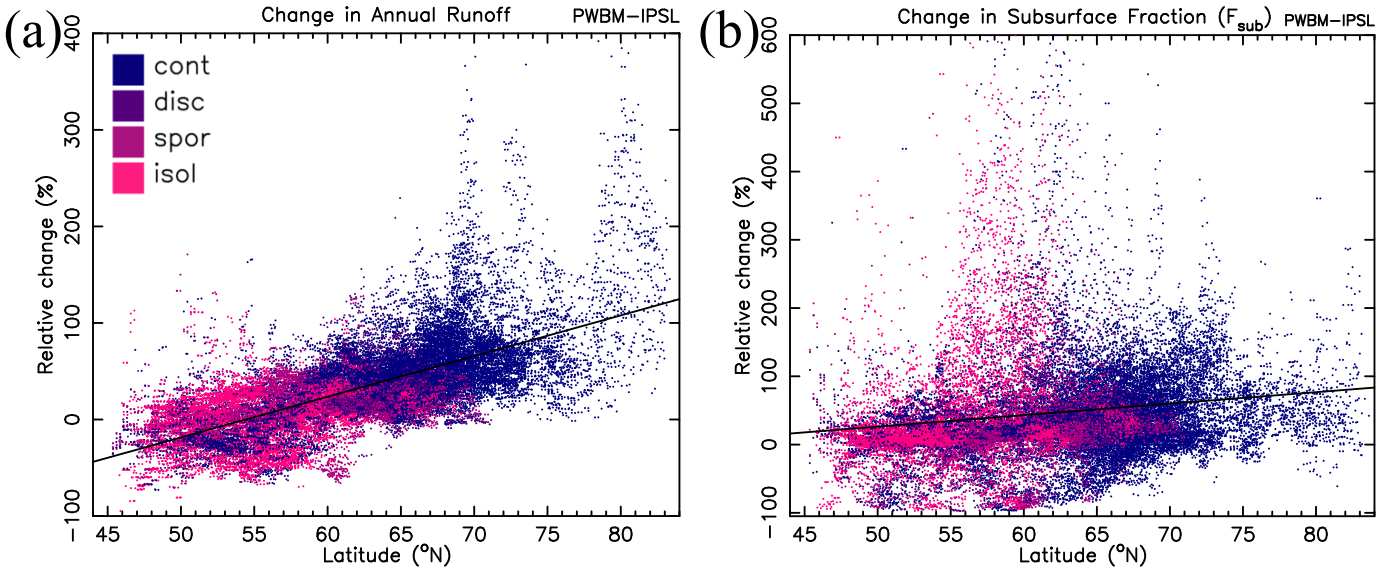

Figure S7: Change in (a) annual total runoff (%) and (b) F_{sub} with gridcell latitude from PWBM-IPSL simulation for all pan-Arctic domain gridcells. Colors indicate permafrost classification for the cell from IPA (Fig. 1a).

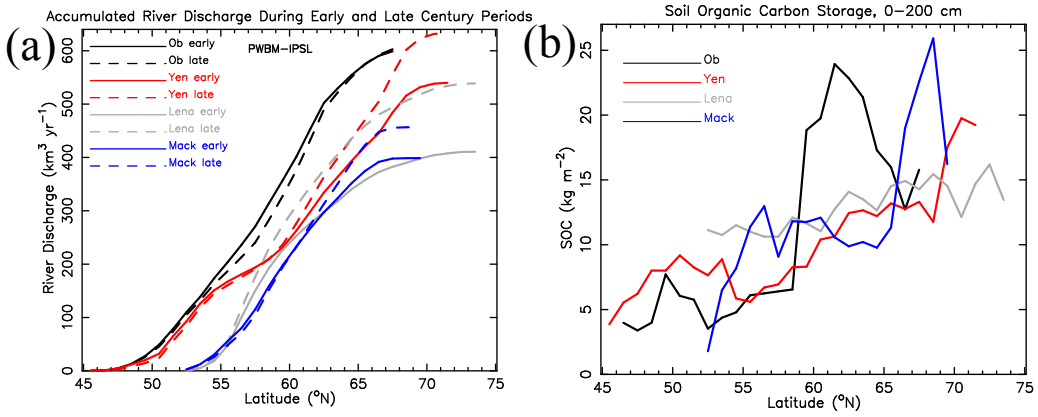

Figure S8: (a) Accumulated annual total river discharge (km^3 yr^{-1}) for the Ob, Yenesey, Lena, and Mackenzie Rivers for 1° latitude bands as averages over early (solid line) and late (dashed) century periods from PWBM-IPSL. (b) Soil carbon storage (kg m^{-2}) in soil 0–200 cm zone from the Northern Circumpolar Soil Carbon Database (Hugelius et al., 2013).

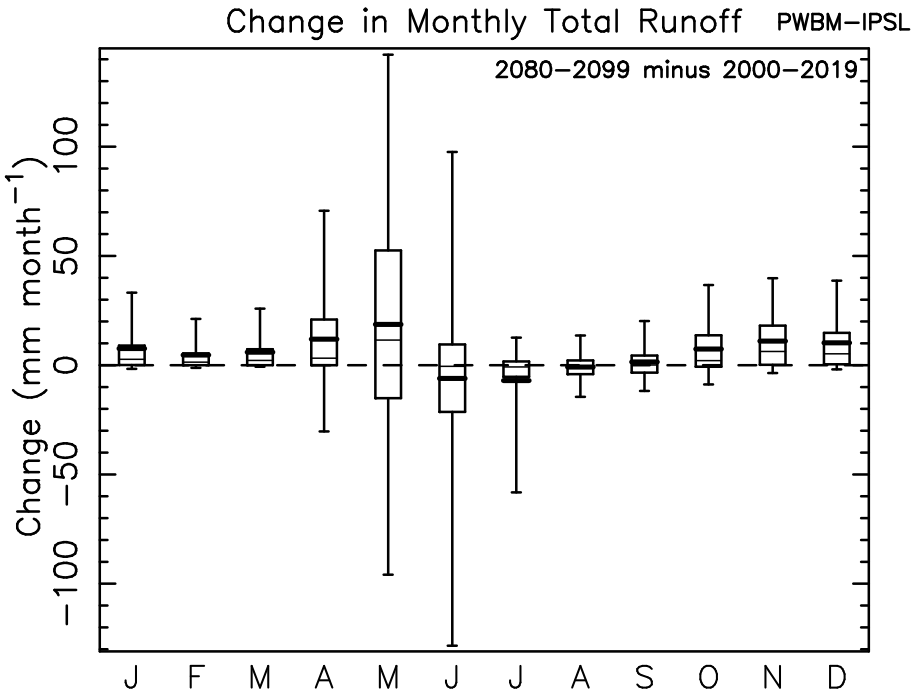

Figure S9: Distribution in change in monthly total runoff (mm month^{-1}) between early and late century periods for all pan-Arctic gridcells from PWBM-IPSL.