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# Effects of interbasin water transfer on regional climate: A case study of the Middle Route of South-to-North Water Transfer Project in China

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Large-scale interbasin water transfer, which changes basins by creating new hydrological cycles, has the potential to affect local and regional climate. In this paper, the effects of interbasin water transfer on regional climate are studied based on numerical simulations with the regional climate model RegCM3. The Middle Route of South-to-North Water Transfer Project (MRSNWTP) in China is chosen as a case study to investigate the climatic responses under the three water transfer schemes with the intensities of 74.99, 85.31, and 118.16 billion $m^3$/year (named Scheme 1, Scheme 2, and Scheme 3, respectively) based on the simplifications of the project programming. Four ten-year simulations are performed, which are the control run (MCTL) without water transfer, and three water transfer runs MWT1, MWT2, and MWT3 related to the Schemes 1, 2, and 3, respectively. For the three Schemes compared to the case without water transfer, we find increases of 1.47, 1.71, and 2.32 mm in top-layer soil moisture, and increases of 5.57, 6.40, and 8.99W/$m^2$ in latent heat flux, respectively, as a directly influence for injecting water into the intake area. The increases in latent heat fluxes and those in evaporation are accompanied with the decreases of 4.30, 5.05, and 7.12W/$m^2$ in sensible heat flux, the decreases of 0.11, 0.14, and 0.18° in mean air temperature, and the increases of 8.54, 7.89, and 18.2 mm in precipitation in the intake grid cells and even their adjacent ones. The intensity of climatic influences positively relates to the transferred water quantity, has strong seasonal variability, and takes a greater effect in spring and autumn than that in summer and winter. Further analysis shows that the transferred water can reduce both the seasonal temperature range and the diurnal temperature range; the temperature decreasing can diffuse over almost the whole Huabei Plain below 700 hPa, and hence weaken the wind velocity of the easterly breeze. It follows from the analyses on vertical profile of water vapor content and the atmospheric moisture budgets that the transferred water can affect the local and regional climate by changing the local and regional water vapour transports, and especially influence the precipitation mainly by changing the convective precipitation over the intake area and the large-scale precipitation over the other adjacent region.