

# Impacts of Irrigation in Central Asia on Local and Regional Hydroclimatology

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The desiccation of the Aral Sea indicates the great impact anthropogenic effects can have on a natural hydroclimate system. The cause of the shrinkage has been attributed to the Soviet-era expansion of canals and the irrigation network. In this work, we hypothesize that this irrigation expansion also has significant impacts on local hydrological budget, atmospheric circulation, and thereby regional precipitation. Previous studies have shown an enhanced evapotranspiration after adding irrigation from the observed river discharges. However, how the irrigation water contributes to precipitation have not been extensively explored. In addition, studies have shown that irrigation generally contributes significantly to increased precipitation in downwind regions, while surface temperatures are not cooled by local increases of latent heat flux and added moisture from the irrigated land is transported into this region. In this regard, we examine the irrigation impact not only over Central Asia but the northwestern China farther to the east. Coupled and offline simulations are performed using Community Earth System Model (CESM) to consider the direct and indirect effects of irrigation on the atmospheric response. The inputs of irrigation water are estimated using both water balance model and observations, as derived by Wada and Bierkens (2014). A forward-trajectory method will also be used to estimate the contribution of irrigation water to the recent precipitation enhancement of Central Asia and the northwestern China.

**Key words:** irrigation, hydrological cycle, precipitation

## References

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